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## ORIGINAL ARTICLE

# A new species of *Ribautia* Brölemann, 1909 (Chilopoda: Geophilomorpha: Geophilidae) from Peruvian Amazonia, with a key to the Neotropical species of the genus with coxal organs grouped in clusters

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*Ribautia williamsi* sp. nov., a new dwarf geophilomorph centipede from the Lower Urubamba Region, Peruvian Amazonia, is described and illustrated based on the holotype female. The new species is characterized by having the coxal organs grouped in clusters (three of these in each coxopleuron of the ultimate leg-bearing segment) and ventral pore-fields present along all the body; these two combined traits being shared by five other Neotropical species currently included in the genus *Ribautia* Brölemann, 1909, i.e. *R. centralis* (Silvestri, 1907) (from Colombia and Brazil), *R. difficilis* Pereira, Minelli & Barbieri, 1995 (from Brazil), *R. montana* Kraus, 1954 (from Peru), *R. peruana* (Verhoeff, 1941) (from Peru), and *R. titicacae* (Turk, 1955) (from Peru). The new taxon is differentiated from the aforementioned species by the low number of leg-bearing segments and small body length; it is included in a key which will enable the identification of all known Neotropical members having coxal organs grouped in clusters. *R. williamsi* sp. nov. is the 14th species of *Ribautia* recorded from Peru.

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**Keywords:** Chilopoda; Geophilomorpha; Geophilidae; *Ribautia*; dwarf new species; Peru; Neotropical region

## Introduction

The genus *Ribautia* Brölemann, 1909 is one of the most widely distributed of the geophilid genera, and is actually pantropical (Pereira et al. 1997; Minelli 2006; Pereira 2007, 2008, 2010, 2013b, 2014; Bonato et al. 2009). In the Neotropics the taxon is currently known from South American mainland, where it has been recorded from Peru, Colombia, Guyana, Brazil, French Guiana, Ecuador, Venezuela, Bolivia, and Argentina.

A recent examination of myriapods collected in the rainforests of the Lower Urubamba Region, southeastern Peru (Amazon basin), resulted in the discovery of a new dwarf species of *Ribautia*, which is described herein under the name of *R. williamsi*, representing the 14th member of the genus to be recorded from this country.

*Ribautia* can be distinguished from all other genera currently recognized in the family Geophilidae by the following combination of features. Second maxillae: united by a small coxosternal bridge only; anterointernal corners of coxosternite with a more or less developed process; prominent distally convergent ridges (statuminia *sensu* Crabill 1960) present. Forcipules: pleurocoxosternal sutures extending obliquely to the outer margin; chitin-lines present; medial edge of trochanteroprefemur of telopodites either with a small unpigmented protuberance, with a conspicuous pigmented or unpigmented tooth, with two of these teeth, or without teeth. Sternal pores arranged in a single subcircular or longitudinally elongate area on the anterior part of the trunk, in a single or two paired areas on the posterior part of the trunk (or even totally absent on the latter). Each coxopleuron of the ultimate leg-bearing segment with coxal organs, distributed in one of the following ways: (1) opening separately; (2) an anterior organ opening separately and all the remaining grouped in a cluster; (3) grouped in one to three clusters. Pretarsus of ultimate legs either claw-like or tubercle-like.

The key presented below will enable the identification of the 18 Neotropical members of *Ribautia* having coxal organs grouped in clusters (including the new species described below which shares this trait).

## Material and methods

The holotype designated below is deposited in the Museo de Historia Natural (MUSM) of the Universidad Nacional Mayor de San Marcos, Lima,

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Peru (previously known as Museo de Historia Natural "Javier Prado").

A dissection was performed utilizing a stereomicroscope and standard dissecting tools. 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. No additional steps were carried out before mounting. Details of the preparation of microscope slides and dissection procedures are described in Pereira (2000), and 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, tables, and legends of the figures: aa, antennal article/articles.

## Results

Family GEOPHILIDAE
Genus ***Ribautia*** Brölemann, 1909

### *Type species of the genus*

*Ribautia bouvieri* Brölemann, 1909, by monotypy.

### *Neotropical species currently assigned to* Ribautia *(including the new taxon described below)*

*R. andecola* Kraus, 1954 (Peru)
*R. bouvieri* Brölemann, 1909 (Brazil)
*R. carpisha* (Chamberlin, 1957) (Peru)
*R. centralis* (Silvestri, 1907) (Colombia, Brazil)
*R. colcabensis* Kraus, 1957 (Peru)
*R. combinata* Pereira, Uliana & Minelli, 2006 (Peru)
*R. difficilis* Pereira, Minelli & Barbieri, 1995 (Brazil)
*R. donatellae* Pereira, Uliana & Minelli, 2006 (Brazil)
*R. ducalis* Pereira, Minelli & Barbieri, 1995 (Brazil)
*R. fuhrmanni* Ribaut, 1912 (Colombia, Guyana)
*R. jakulicai* Pereira, 2007 (Argentina)
*R. junina* (Chamberlin, 1957) (Peru)
*R. lewisi* Pereira, 2013 (Argentina)
*R. limaensis* Kraus, 1957 (Peru)
*R. montana* Kraus, 1954 (Peru)
*R. onycophaena* Pereira, Foddai & Minelli, 2000 (Brazil)
*R. pacifica* Kraus, 1954 (Peru)
*R. paranaensis* Pereira, 2014 (Argentina)
*R. peruana* (Verhoeff, 1941) (Peru)
*R. phana* (Chamberlin, 1955) (Peru)
*R. proxima* Pereira, Minelli & Barbieri, 1995 (Brazil, French Guiana)
*R. roigi* Pereira, 2008 (Bolivia)
*R. rossi* Chamberlin, 1957 (Ecuador)
*R. seydi* Ribaut, 1923 (Peru)
*R. silvana* Kraus, 1954 (Peru)
*R. titicacae* (Turk, 1955) (Peru)
*R. tropica* Brölemann, 1898 (Venezuela)
*R. vivasberthieri* Chamberlin, 1941 (Venezuela)
*R. williamsi* sp. nov. (Peru)

### *Remarks*

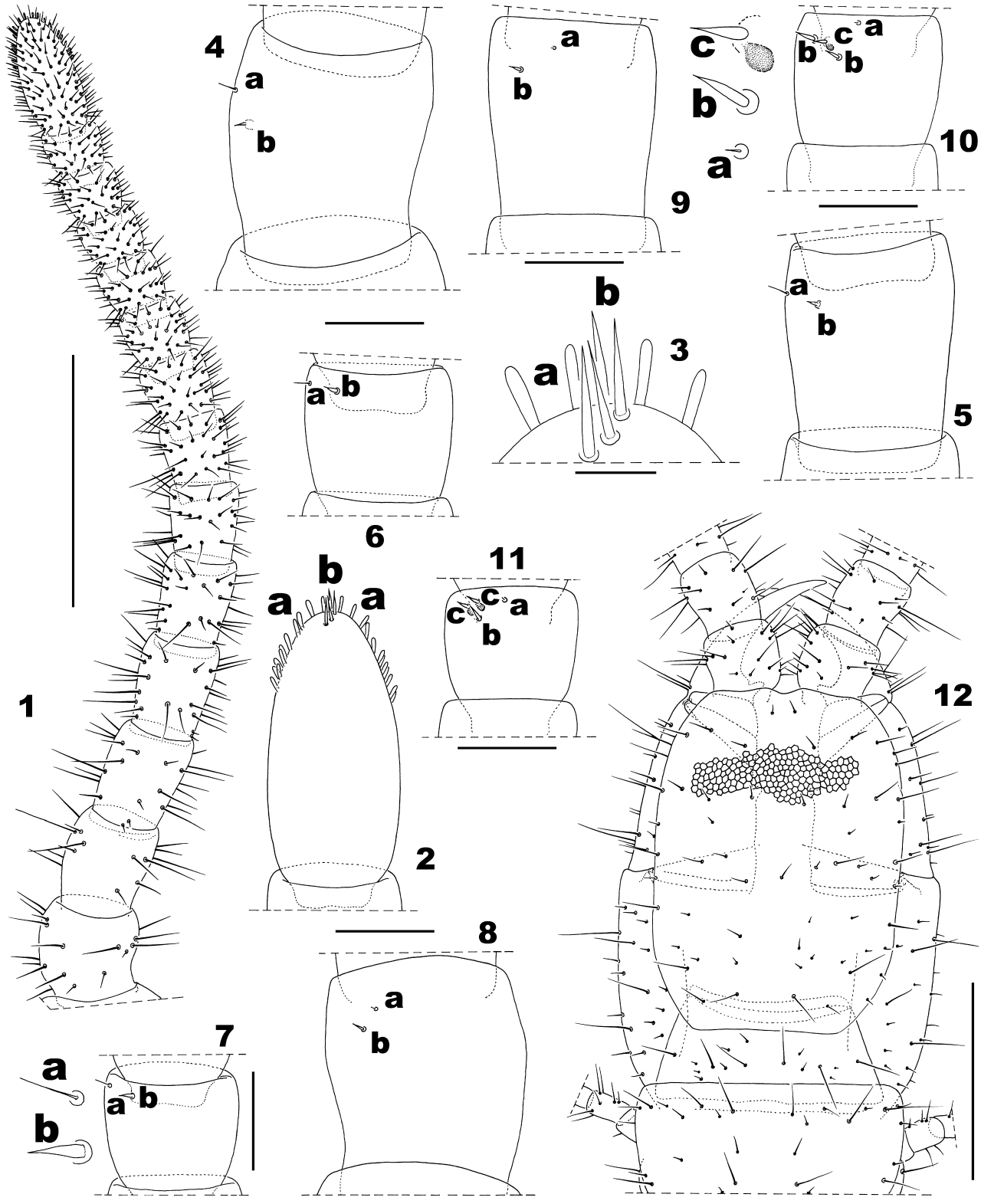
Of the 29 species listed above, one is distinguished from the others by having an independent, freely opening coxal organ and a cluster of coxal organs in each coxopleuron of the ultimate leg-bearing segment; 17 show all the coxal organs grouped in clusters (having either one, two or three of these in each coxopleuron); in the remaining 11 species, all coxal organs open separately. A key presented below will enable the identification of the 18 species with clustered coxal organs, including the new taxon described herein.

### ***Ribautia williamsi*** sp. nov. (Figures 1–47)

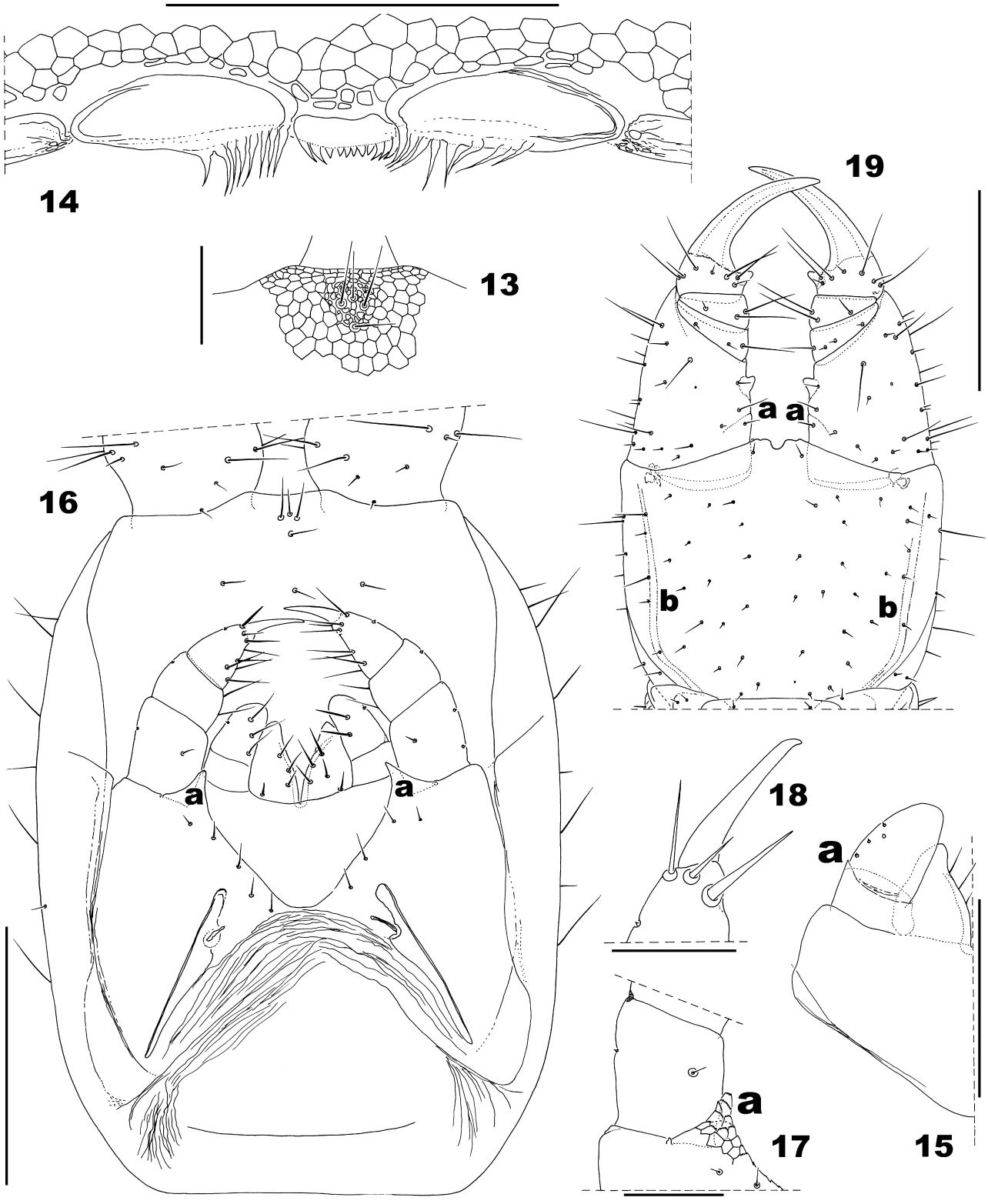
### *Diagnosis*

A Neotropical species of *Ribautia* with 3 + 3 clusters of coxal organs in the coxopleura of the ultimate leg-bearing segment and ventral pore-fields present in an uninterrupted series all along body. The other Neotropical members of the genus sharing these two combined traits are *R. centralis* (Silvestri, 1907), *R. difficilis* Pereira, Minelli & Barbieri, 1995, *R. montana* Kraus, 1954, *R. peruana* (Verhoeff, 1941), and *R. titicacae* (Turk, 1955). *R. williamsi* sp. nov. can be differentiated from all these taxa by the low number of leg-bearing segments, 37 (against 47–67) and small body size, 12 mm (against 22–64 mm). Among the latter, those having a range of leg-bearing segments roughly similar to the new species are *R. difficilis* and *R. peruana*.

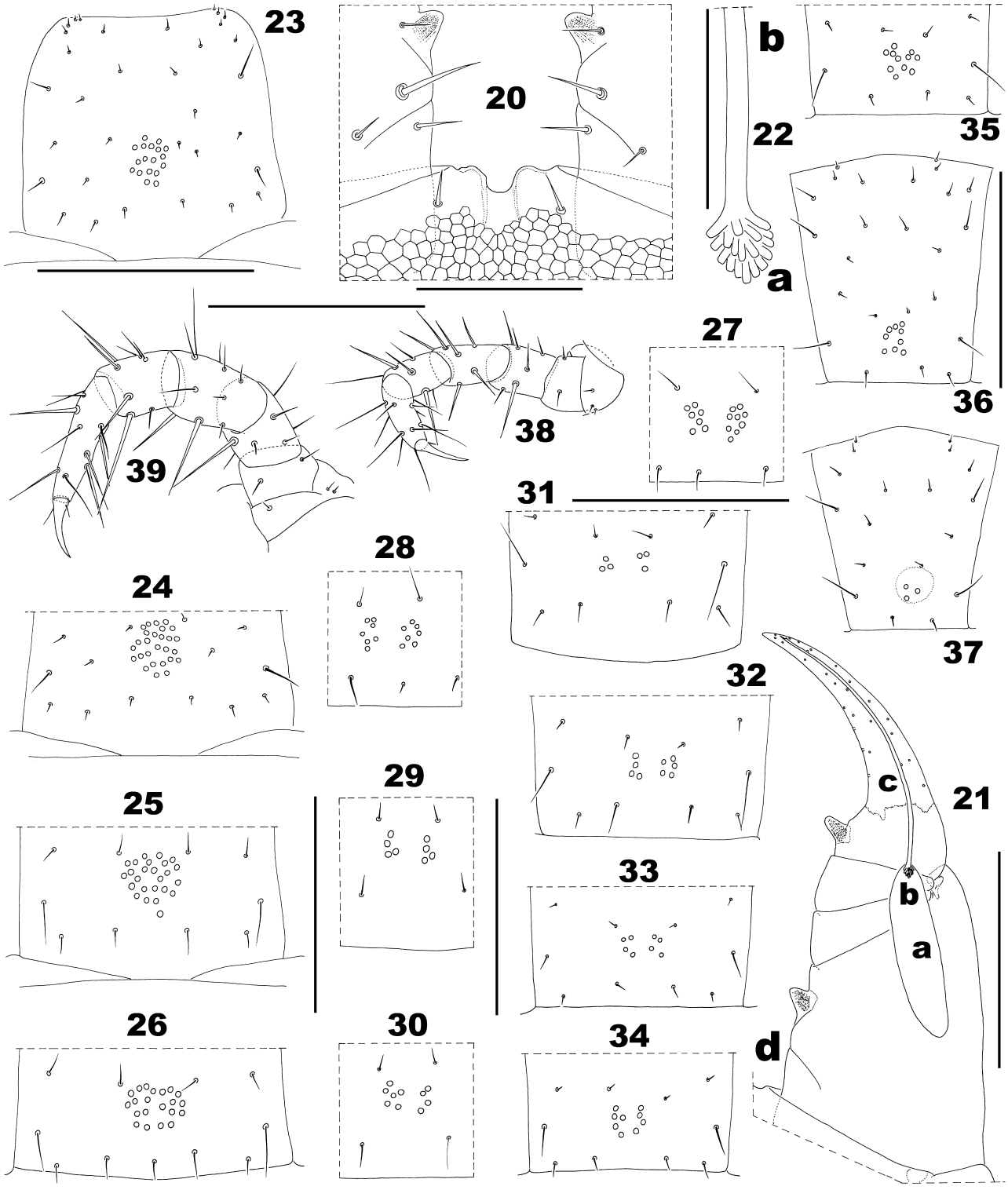
*Ribautia williamsi* can be differentiated from *R. difficilis* by means of the following selected traits (features in the latter are given in parentheses): body length of the female 12 mm (male: 22 mm); female with 37 leg-bearing segments (female: 49, male: 47, 49); ratio of length/width of cephalic plate *c.*1.36:1 (*c.*1.53:1); apex of aa XIV with claviform sensilla (without claviform sensilla); dorsal side of aa XIII with *c.*1 type *b* sensillum (with *c.*6–10 type *b* sensilla); coxosternites of second maxillae with *c.*5 + 4 setae distributed near the internal edges (Figure 16) (with *c.*13 + 14 setae distributed as in Figure 51); basal internal edge of forcipular trochanteroprefemur with



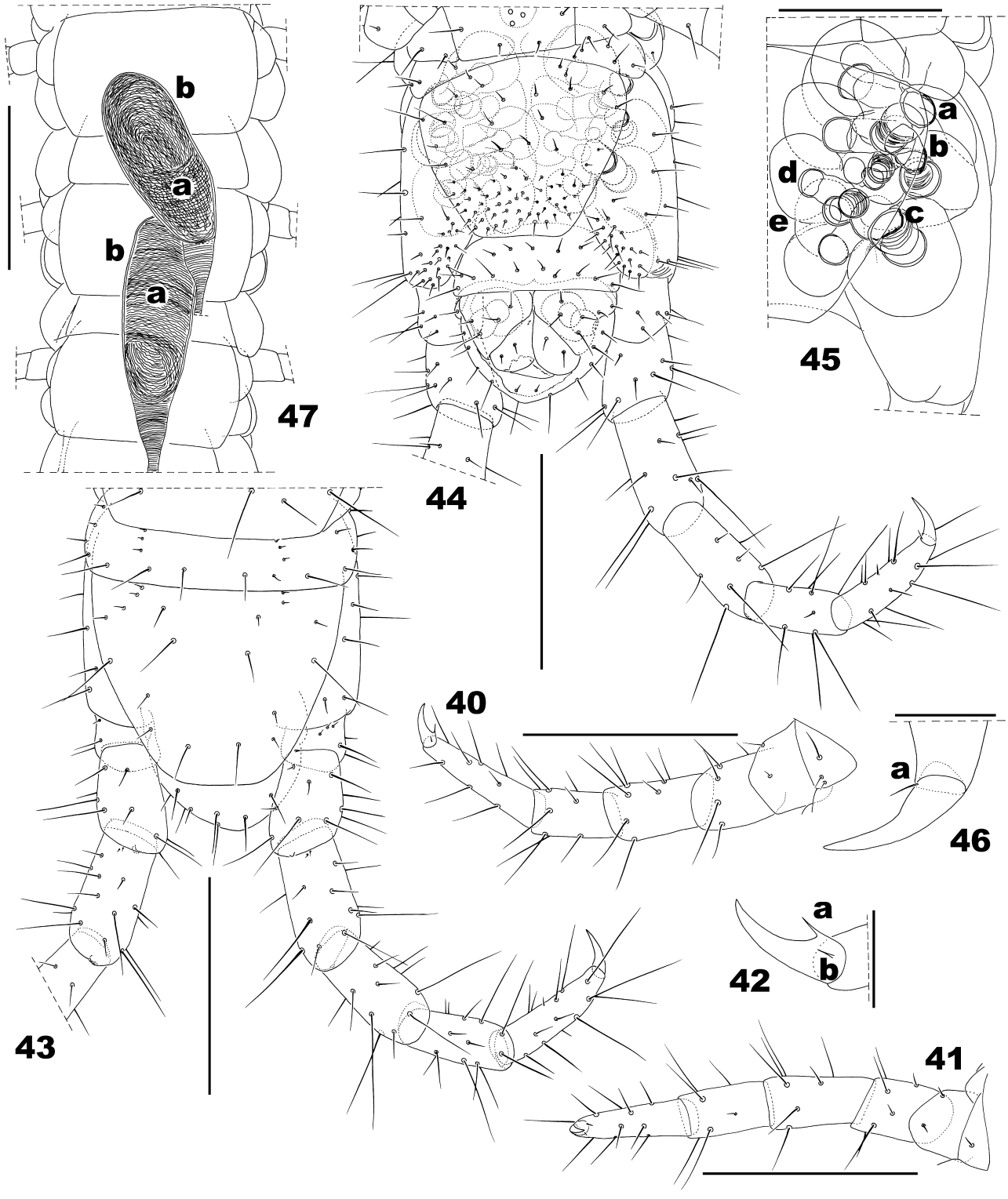

Figures 1–12. *Ribautia williamsi* sp. nov. (female holotype; Peru: Cuzco Department: La Convención Province, 11°46′17.0″ S, 72°46′ 52.6″ W): 1, left antenna, ventral; 2, left aa XIV, ventral (a: claviform sensilla, b: apical specialized sensilla); 3, detail of apex of left aa XIV, ventral (a: claviform sensilla, b: apical specialized sensilla); 4, left aa II, ventral (a, b: *a, b* type sensilla); 5, left aa V, ventral (a, b: *a, b* type sensilla); 6, left aa IX, ventral (a, b: *a, b* type sensilla); 7, left aa XIII, ventral (a, b: *a, b* type sensilla); 8, left aa II, dorsal (a, b: *a, b* type sensilla); 9, left aa V, dorsal (a, b: *a, b* type sensilla); 10, left aa IX, dorsal (a, b, c: *a, b, c* type sensilla); 11, left aa XIII, dorsal (a, b, c: *a, b, c* type sensilla); 12, dorsal view of anterior region of the body, showing cephalic plate, bases of antennae, forcipular segment, and anterior portion of leg-bearing segment 1. Scale bars: 0.01 mm (3); 0.05 mm (2, 4–11); 0.3 mm (1, 12).




Figures 13–19. *Ribautia williamsi* sp. nov. (female holotype; Peru: Cuzco Department: La Convención Province): 13, anterior central part of clypeus showing clypeal area; 14, labrum; 15, left side of first maxillae, dorsal (a: lappet of telopodite); 16, head, bases of antenna, first and second maxillae, ventral (a: process of anterointernal corners of coxosternites of second maxillae); 17, detail of process in anterointernal corner of coxosternite, right side of second maxillae, ventral (a: process of coxosternite); 18, claw of right telopodite of second maxillae, ventral; 19, forcipular segment, ventral (a: rudimentary unpigmented round pointed projection, b: chitin-lines). Scale bars: 0.03 mm (18); 0.05 mm (13, 17); 0.1 mm (14, 15); 0.2 mm (16); 0.3 mm (19).




Figures 20–39. *Ribautia williamsi* sp. nov. (female holotype; Peru: Cuzco Department: La Convención Province): 20, middle part of anterior border of forcipular coxosternite showing small unpigmented denticles, ventral; 21, detail of poison gland (a), calyx (b), and duct (c) of venom apparatus in left forcipular telopodite, ventral; 22, detail of calyx of poison gland (a) in left forcipular telopodite, ventral (b: duct); 23, sternite 2; 24–26, posterior half of sternites 4, 8, 12 respectively; 27–30, pore-field of sternites 13, 16, 24, 29 respectively; 31–35, posterior half of sternites 30, 31, 32, 33, 34 respectively; 36, sternite 35; 37, sternite 36; 38, right leg (pair 1), anteroventral view; 39, right leg (pair 2), anteroventral view. Scale bars: 0.03 mm (22); 0.1 mm (20); 0.2 mm (21, 23–39).




Figures 40–47. *Ribautia williamsi* sp. nov. (female holotype; Peru: Cuzco Department: La Convención Province): 40, right leg (pair 12), posteroventral view; 41, right leg (pair 34), ventral; 42, claw of the right leg (pair 12), posteroventral view (a: anterior spine, b: posterior spine); 43, ultimate leg-bearing segment and postpedal segments, dorsal; 44, ultimate leg-bearing segment and postpedal segments, ventral; 45, left coxal organs, ventral (a, b, c: coxal pores of anterior, middle and posterior clusters respectively, d: mucous layer, e: contour of lobe); 46, claw of right ultimate leg, ventrointernal view (a: single internal spine); 47, anterior and posterior spermathecae at level of leg-bearing segments 31–33, dorsal (a: spermatozoa, b: contour of spermatheca). Scale bars: 0.03 mm (42, 46); 0.1 mm (45); 0.2 mm (40, 41, 43, 44); 0.3 mm (47).

a vestigial protuberance (Figures 19a, 21d) (with a well-evident tooth, Figure 53a); posterior region of the trunk with pore-fields undivided on the last three sternites of the series, i.e. prior to antepenultimate, antepenultimate, and penultimate (Figures 35–37) (undivided on the last sternite in the series, i.e. penultimate); anterior legs with setae of different thickness (Figures 38, 39) (with setae of uniform thickness); sternite of female ultimate leg-bearing segment with small setae covering about the posterior third of its surface (Figure 44) (covering about the posterior fifth of its surface, Figure 56).

*Ribautia williamsi* can be differentiated from *R. peruana* by means of the following selected traits (features in the latter are given in parentheses): body length of female 12 mm (34 mm); female with 37 leg-bearing segments (49); clypeal area present ("absent"); first divided pore-field of the series on sternite 13 (on sternite 17); posterior limit of pore-field series on penultimate sternite (on antepenultimate sternite).

### *Remarks*

Other morphological traits included in Table 1 differentiate *R. williamsi* from *R. difficilis*. Most of the traits considered in this matrix are known for *R. williamsi* and *R. difficilis* but unknown for *R. peruana*; for this reason the latter is not included in the table.

The new species can be separated from the other Neotropical species of *Ribautia* with coxal organs grouped in clusters by using the identification key below.

### *Type material examined*

Peru: Cuzco Department: La Convención Province: 11°46′17.0″ S, 72°46′52.6″ W, 458 m asl, 9–15 February, 2006, J. D. Williams legit: holotype female, 37 leg-bearing segments, body length 12 mm.

Depository of type: MUSM.

### *Description*

*Female holotype.* Thirty-seven leg-bearing segments, body length 12 mm, maximum body width 0.52 mm, maximum width of cephalic plate 0.37 mm, length of cephalic plate 0.52 mm, maximum width of forcipular coxosternite 0.48 mm. Ground color (of specimen preserved in ethanol) pale yellow, forcipular segment pale brown.

*Antennae*. Relatively short, about 2.25 times as long as cephalic plate, distally attenuate (Figure 1), ratio of width of aa II/width of aa XIV 1.68:1. Aa I and X–XIII nearly as long as wide, aa II–IX and XIV longer than wide. Ventral chaetotaxy: setae on aa I–VI of various lengths and relatively few in number, those of aa VII–XIV progressively shorter and more numerous towards the tip of the appendage (Figure 1). Dorsal chaetotaxy: setae on aa I–VI similar to the ventral side, setae on aa VII–XIV slightly less numerous. Aa XIV with 9–10 claviform sensilla on the external and internal margins of apical half and 4 on apex (Figures 2, 3a); distal end of this aa with 4–5 very small hyaline specialized sensilla apparently not split apically (Figures 2, 3b). Ventral and dorsal surface of aa II, V, IX and XIII with very small specialized sensilla. Ventrally, sensilla restricted to apical laterointernal area (Figures 4–7), and represented by two different types: *a* and *b*. Type *a* sensilla very thin and not split apically (Figure 7a); type *b* sensilla (Figure 7b) similar to those on apex of aa XIV. Specialized sensilla on dorsal side restricted to apical lateroexternal and middle area of the specified aa (Figures 8–11) and represented by three different types: *a* and *b* similar to *a* and *b* of ventral side (type *a* proportionately shorter) (Figure 10A, B), and type *c* sensilla similar in shape to type *b* having basally, still within the aa, a small dark semiovoid structure (Figure 10c). Number and distribution of specialized sensilla on ventral and dorsal sides of aa II, V, IX and XIII, as in Table 2.

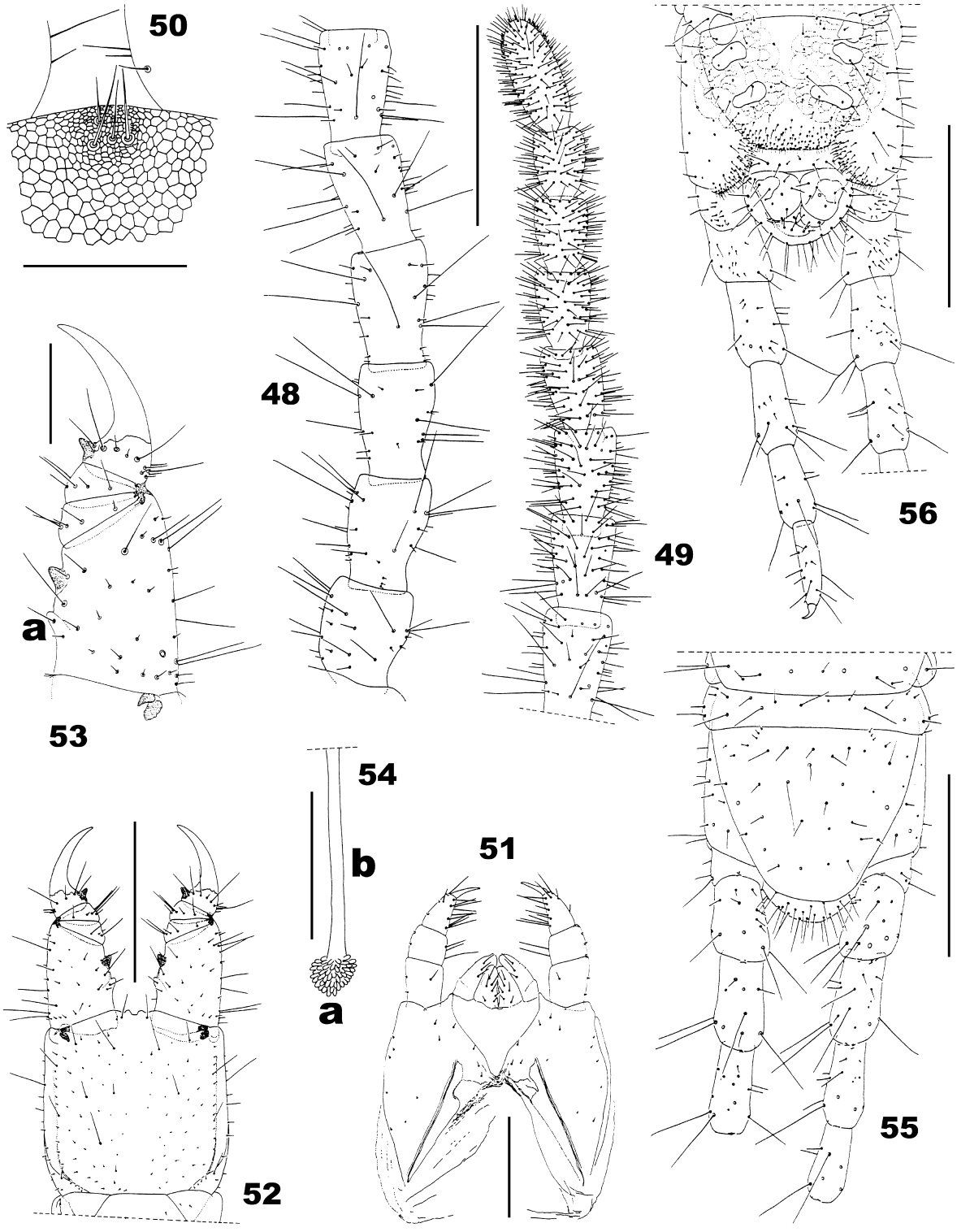
*Cephalic plate*. Distinctly longer than wide (length/width ratio 1.36:1). Middle part of lateral margins slightly convergent towards the posterior region; anterior margin concave in the center; posterior margin slightly concave; anterior and posterior sides, curved. Shape and chaetotaxy as in Figure 12.

*Clypeus*. With four setae located on the clypeal area; posterior to the latter one central seta and 1 + 1 setae distributed at both sides of middle line (Figure 16). Clypeal area relatively small, with sparsely areolate surface (Figure 13).

*Labrum*. Mid-piece well developed and pigmented, with 6 short sharp-pointed teeth on the middle and 2 + 3 longer sharply pointed teeth at their sides. Side-pieces with 8 + 8 filaments of variable sizes (Figure 14).

*Mandible*. Pectinate lamella with *c.*12 hyaline teeth.

*First maxillae*. Coxosternite without lappets, telopodites with very small lappets (Figure 15a). Coxosternite devoid of setae; coxal projections subtriangular, round tipped and provided with 4 + 5 setae (Figure 16). Apical article of telopodites with 3 + 2 large setae and 1 + 1 small sensilla on ventral side (Figure 16), and 4 + 4 small sensilla on dorsal side near the external edge (Figure 15).




Figures 48–56. 48–54: *Ribautia difficilis* Pereira, Minelli & Barbieri, 1995 (male holotype; Brazil: Amazonas: Lago Janauarí): 48, left aa I–VI, ventral; 49, left aa VII–XIV, ventral; 50, clypeal area; 51, first and second maxillae, ventral; 52, forcipular segment, ventral; 53, left forcipular telopodite, ventral (a: proximal tooth on medial edge of trochanteroprefemur); 54, detail of calyx of poison gland (a) in left forcipular telopodite, ventral (b: duct). 55–56: *Ribautia difficilis* Pereira, Minelli & Barbieri, 1995 (female allotype; Brazil: Amazonas: Lago Janauarí): 55, ultimate leg-bearing segment and postpedal segments, dorsal; 56, ultimate leg-bearing segment and postpedal segments, ventral. Scale bars: 0.05 mm (54); 0.1 mm (50); 0.2 mm (51, 53); 0.3 mm (55, 56); 0.4 mm (48, 49); 0.6 mm (52).

Table 1. Comparative matrix of morphological traits for *Ribautia williamsi* sp. nov. and *R. difficilis* Pereira, Minelli & Barbieri 1995. (Characters of *R. williamsi* from the holotype female herein described, those of *R. difficilis* from the original description by Pereira et al. (1995) based on the holotype male, allotype female, and paratype male).

| | *R. williamsi* | *R. difficilis* |
|---|---|---|
| Number of leg-bearing segments | ♀: 37<br>♂: ? | ♀: 49<br>♂: 47, 49 |
| Body length (mm) | 12 (♀) | 22 (♂) |
| Setae on middle part of clypeus | 3: one central, 1 + 1 at either side of middle line (Figure 16) | 5: one central, 2 + 2 at either side of middle line |
| Clypeal area | Sparsely areolate (Figure 13) | Very densely areolate (Figure 50) |
| Ratio of length/width of cephalic plate | *c.*1.36:1 | *c.*1.53:1 |
| Ratio of length of antennae/length of cephalic plate | *c.*2.25:1 | *c.*3.1:1 |
| Shape and ventral setation of aa I-XIV | As in Figure 1 | As in Figures 48, 49 |
| Claviform sensilla on apex of aa XIV | Yes (Figures 2, 3) | No |
| Number of type *b* specialized sensilla on dorsal side of aa XIII | *c.*1 (Figure 11b) | *c.*6–10 |
| Chaetotaxy of coxosternites of second maxillae | *c.*5 + 4 setae distributed near the internal edges (Figure 16) | *c.*13 + 14 small setae distributed as in Figure 51 |
| Lateral margins of forcipular coxosternite | Slightly convergent posteriad (Figure 19) | Slightly convergent anteriad (Figure 52) |
| Chaetotaxy of forcipular coxosternite | As in Figure 19 | As in Figure 52 |
| Basal internal edge of forcipular trochanteroprefemur | With a vestigial unpigmented round pointed projection (Figures 19a, 21d) | With a well evident tooth (Figure 53a) |
| Ratio of maximum length/maximum width of forcipular trochanteroprefemur | *c.*1.50:1 | *c.*1.61:1 |
| Relative size of calyx of poison gland | As in Figures 21b, 22a | As in Figure 54a |
| Number of pores on most posterior undivided pore-field of anterior sternites | *c.*21 (sternite 12, Figure 26) | *c.*68 (sternite 14) |
| Number of pores on first divided pore-field in the series | *c.*7 + 9 (sternite 13, Figure 27) | *c.*51 + 49 (sternite 15) |
| Posterior sternites with undivided pore-fields | Last three of the series (prior to antepenultimate, antepenultimate, and penultimate, Figures 35–37) | Last in the series (penultimate) |
| Number of pores on penultimate sternite | *c.*3 (Figure 37) | *c.*32 |
| Legs of anterior pairs bearing setae of different thickness | Yes (Figures 38, 39) | No |
| Distribution of small setae on sternite of female ultimate leg-bearing segment | Covering about the posterior third of its surface (Figure 44) | Covering about the posterior fifth of its surface (Figure 56) |
| Female postpedal segments: chaetotaxy of tergite of intermediary segment | Very few setae distributed as in Figure 43 | Numerous setae distributed as in Figure 55 |

Table 2. Number of type *a, b* and *c* sensilla on aa II, V, IX and XIII in the female holotype of *Ribautia williamsi* sp. nov.

| | Ventral | | Dorsal | | | |
|---|---|---|---|---|---|---|
| | a | b | a | b | c | Figures |
| II | 1 | 1 | 1 | 1 | — | 4, 8 |
| V | 1 | 1 | 1 | 1 | — | 5, 9 |
| IX | 1 | 1 | 1 | 2 | 1 | 6, 10 |
| XIII | 1 | 1 | 1 | 1 | 2 | 7, 11 |

*Second maxillae*. Coxosternites medially joined through a narrow, hyaline and non-areolate membranous isthmus and with 5 + 4 setae near the internal margins (Figure 16). Process of ventral anterointernal corners of coxosternite with shape and relative size as in Figures 16, 17a. Telopodites with setae of similar thickness; articles without distoectal process (Figures 16, 17); apical claw well developed, shape as in Figure 18. Chaetotaxy of coxosternites and telopodites as in Figures 16–18.

*Forcipular segment*. When closed, telopodites project slightly beyond anterior margin of head. Forcipular tergite trapeziform, chaetotaxy represented by an irregular transverse row of 6 large setae near the posterior margin and a few small setae distributed as in Figure 12. Coxosternite: with well-developed, almost complete chitin-lines (Figure 19b); anterior border notched in the midline, provided with 1 + 1 very small unpigmented denticles devoid of setae, aspect and relative size as in Figures 19, 20. Telopodites: medial edge of trochanteroprefemur apically with a well-developed round-tipped and slightly

pigmented tooth (Figures 19–21); proximally near the vestigial suture between trochanter and prefemur with a vestigial unpigmented round pointed projection (Figures 19a, 21d). Femur and tibia without denticles. Tarsungulum basally with a well-developed, round tipped and slightly pigmented denticle (Figures 19, 21); medial edge of tarsungulum not serrate (Figures 19, 21). Relative size of poison glands as in Figure 21, calyx of poison gland subtriangular in shape (Figures 21b, 22a). Chaetotaxy of coxosternite and telopodites as in Figures 12, 19.

*Sternites of leg-bearing segments 1 to penultimate*. Pore-fields present in an uninterrupted series from sternite 2 to penultimate inclusive. Pore-fields undivided on sternites 2–12 and 34–36, divided in two subsymmetrical areas on sternites 13–33. Shape and relative size of pore-fields changing along the trunk (Figures 23–37). Number of pores as follows: sternite 2 (18); 3 (22); 4 (27); 5 (24); 6 (23); 7 (25); 8 (25); 9 (27); 10 (23); 11 (24); 12 (21); 13 (7 + 9); 14 (7 + 6); 15 (7 + 3); 16 (7 + 7); 17 (6 + 4); 18 (4 + 5); 19 (5 + 4); 20 (5 + 6); 21 (1 + 1); 22 (4 + 4); 23 (3 + 3); 24 (4 + 4); 25 (4 + 2); 26 (4 + 2); 27 (2 + 2); 28 (3 + 3); 29 (6 + 4); 30 (3 + 3); 31 (4 + 5); 32 (4 + 4); 33 (5 + 4); 34 (11); 35 (9); 36 (3).

*Legs (pair 1 to penultimate)*. Ratio of length of first pair/length of second pair *c.*0.78:1 (relative size as in Figures 38, 39). Legs of pairs 1 to 10–11 with setae of different thickness, which is more evident on pairs 1 to 5 (Figures 38, 39) than on pairs 6 to 10–11; legs of remaining pairs bearing setae of similar thickness (Figures 40, 41). Distribution, number and relative size of setae as in Figures 38–41. Claws with two thin and pale accessory spines ventrobasally, one anterior (Figure 42a) and one posterior, a little shorter (Figure 42b).

*Ultimate leg-bearing segment*. Intercalary pleurites absent at both sides of the ultimate pretergite; ultimate presternite divided along the sagittal plane; length/width of tergite 0.77:1; length/width of sternite 0.87:1. Shape and chaetotaxy of tergite and sternite as in Figures 43, 44. Coxopleura slightly protruding at distal-internal ventral ends, setae small and numerous distributed on the internal ventral area, the remaining coxopleural surface with few larger setae (Figures 43, 44). Coxal organs arranged in 3 + 3 clusters, coxal pores opening on the membrane between coxopleuron and sternite, partially or totally covered by the latter (Figures 44, 45), internal cuticular structure of coxal organs as in Figure 45 (d: mucous layer). Anterior clusters with 2–3 organs; middle and posterior clusters with *c.*4 organs, arrangement of organs in each cluster as in Figure 45. Ultimate legs with seven, somewhat inflated articles. Length of telopodites of ultimate legs/length of sternite 3.40:1. Shape and chaetotaxy of ultimate legs as in Figures 43, 44. Ultimate pretarsus unguiform, bearing a single internal spine ventrobasally (Figure 46a).

*Postpedal segments*. Intermediate tergite with posterior margin strongly convex, bearing a few setae (Figure 43); intermediate sternite seemingly covered by the sternite of the ultimate leg-bearing segment; posterior margin of first genital sternite straight to very slightly concave (Figure 44). Gonopods not detected (none?) (Figure 44). Anal organs present.

*Male.* Unknown.

### *Remarks*

The adult (and mated) condition of the female holotype is indicated by the presence of spermatozoa in both spermathecae (Figure 47).

### *Etymology*

The species is respectfully dedicated to the collector of the type specimen described herein, Prof. Jorge Daniel Williams, herpetologist of the Museo de La Plata, National University of La Plata, La Plata, Argentina.

### *Ecology*

The holotype specimen was collected in leaf litter in a tropical rainforest environment, at about 500 m asl, in the Lower Urubamba region, southeastern Peru (Amazon basin).

### *Type locality*

Peru: Cuzco Department: La Convención Province: 11°46′17.0″ S, 72°46′52.6″ W.

### *Known range*

Only known from the type locality.

### Key to the Neotropical species of *Ribautia* with coxal organs grouped in clusters

Ribaut (1923) did not specify the number of clusters of coxal organs in each coxopleuron of the ultimate leg-bearing segment for *R. seydi*; however, this species is considered herein as having 2 + 2 clusters on the basis of two specimens from Peru ("40 miles E of Abancay") showing this trait and confidently assigned to this taxon by Chamberlin (1955–1956) (see Pereira 2008).

1. 1 + 1 clusters of coxal organs in the coxopleura of the ultimate leg-bearing segment .. 2
– 2 + 2 or 3 + 3 clusters of coxal organs in the coxopleura of the ultimate leg-bearing segment ..... 7
2. Each coxopleuron with an independently opening coxal organ anteriorly and a cluster of coxal organs posteriorly; ultimate pretarsus claw-like ..... ..... ***R. combinata*** Pereira, Uliana & Minelli
– All coxal organs of each coxopleuron grouped in a single cluster; ultimate pretarsus claw-like or tubercle-like ..... 3
3. Ultimate pretarsus claw-like ..... 4
– Ultimate pretarsus tubercle-like ..... 6
4. Internal limb of tentorium bearing an unusually conspicuous tooth-shaped sclerotized process directed inwards; first and second article of telopodites of second maxillae with a very small distoectal process, sternite of female ultimate leg-bearing segment with a narrow band of numerous very small setae near the posterior edge ..... ***R. lewisi*** Pereira
– Internal limb of tentorium without processes; first and second article of telopodites of second maxillae without a distoectal process; sternite of female ultimate leg-bearing segment without a band of setae near the posterior edge ..... 5
5. Female and male with 41, or 43 leg-bearing segments; body length 12 mm (female and male); dorsal side of aa XIII with type *c* sensilla; denticles on middle part of anterior border of forcipular coxosternite without an apical seta; pore-fields absent on some mid-body sternites; anterior legs with setae of different thickness ..... ***R. paranaensis*** Pereira
– Female with 57, or 59, male with 55, 57, or 59 leg-bearing segments; body length 28 mm (female), 23 mm (male); dorsal side of aa XIII without type *c* sensilla; denticles on middle part of anterior border of forcipular coxosternite each provided with an apical seta; pore-fields distributed in an uninterrupted series all along the trunk; anterior legs with setae of similar thickness ..... ***R. jakulicai*** Pereira
6. Male with 55 leg-bearing segments; body length 25 mm (male); middle part of anterior border of forcipular coxosternite with two small protuberances; apical medial edge of forcipular trochanteroprefemur with a small unpigmented protuberance ..... ..... ***R. limaensis*** Kraus
– Male with 49 leg-bearing segments; body length 14 mm (male); middle part of anterior border of forcipular coxosternite completely unarmed; apical medial edge of forcipular trochanteroprefemur with a well-developed and deeply pigmented tooth ..... ..... ***R. silvana*** Kraus
7. 2 + 2 clusters of coxal organs in the coxopleura of the ultimate leg-bearing segment . 8
– 3 + 3 clusters of coxal organs in the coxopleura of the ultimate leg-bearing segment ..... 11
8. Pore-fields on the anterior part of the trunk only; anal organs present ..... ***R. seydi*** Ribaut
– Pore-fields all along the trunk; anal organs absent ..... 9
9. 43 leg-bearing segments (male); dorsal side of aa IX and XIII without type *c* sensilla; sternite of leg-bearing segment 1 with pore-field ..... ***R. roigi*** Pereira
– 47–53 or 69, 71 leg-bearing segments; dorsal side of aa without type *c* sensilla; sternite of leg-bearing segment 1 without pore-field .... 10
10. Female with 49 (possibly 51), or 53 leg-bearing segments, male with 47, 49, or 51 leg-bearing segments; body length 23 mm (female); middle part of lateral margins of cephalic plate converging towards anterior region; first article of telopodites of second maxillae with a very small distoectal process; posterior limit of pore-field series on penultimate sternite; width of last five leg-bearing segments similar to width of the previous leg-bearing segments ..... ..... ***R. andecola*** Kraus
– Female with 69, or 71 leg-bearing segments; body length 38 mm (female); middle part of lateral margins of cephalic plate converging towards posterior region; first article of telopodites of second maxillae without a distoectal process; posterior limit of pore-field series on antepenultimate sternite; last five leg-bearing segments much narrower than the previous segments ..... ***R. colcabensis*** Kraus
11. Pore-fields present on anterior part of the trunk only ..... 12
– Pore-fields present all along the trunk ..... 13
12. Body length 34 mm (sex unknown); pore-fields increasing in size on posterior sternites of the series and becoming sub-elliptic; two setae on median line of clypeus but none caudoectad of clypeal area ..... ..... ***R. carpisha*** (Chamberlin)
– Body length 43 mm (sex unknown); pore-fields in a circular area, not thus changing in size and form; clypeus with two setae caudad of clypeal area but none on the median line ..... ..... ***R. junina*** (Chamberlin)

13. Body length 12, 22–34 mm; 37, or 47–57 leg-bearing segments ..... 14
– Body length 46-64 mm; 63-67 leg-bearing segments ..... 17
14. Posterior limit of pore-field series on penultimate sternite; body length 12, 22 mm ..... 15
– Posterior limit of pore-field series on antepenultimate sternite, 24–34 mm ..... 16
15. Body length 12 mm (female); female with 37 leg-bearing segments; apex of aa XIV with claviform sensilla; dorsal side of aa XIII with *c.*1 type *b* sensillum; coxosternites of second maxillae with *c.*5 + 4 setae distributed near the internal edges (Figure 16); basal internal edge of forcipular trochanteroprefemur with a vestigial protuberance (Figures 19a, 21d); posterior region of the trunk with pore-fields undivided on the last three sternites of the series (Figures 35–37); anterior legs with setae of different thickness (Figures 38, 39); sternite of female ultimate leg-bearing segment with small setae covering about the posterior third of its surface (Figure 44) ..... ..... ***R. williamsi*** sp. nov.
– Body length 22 mm (male); female with 49, male with 47, 49 leg-bearing segments; apex of aa XIV without claviform sensilla; dorsal side of aa XIII with *c.*6–10 type *b* sensilla; coxosternites of second maxillae with *c.*13 + 14 setae distributed as in Figure 51; basal internal edge of forcipular trochanteroprefemur with a well-evident tooth (Figure 53a); pore-field undivided on the last sternite in the series (penultimate); anterior legs with setae of uniform thickness; sternite of female ultimate leg-bearing segment with small setae covering about the posterior fifth of its surface (Figure 56) .... ***R. difficilis*** Pereira, Minelli & Barbieri
16. Body length 24 mm (female); with 55 (possibly 57) leg-bearing segments (female); chitin-lines of forcipular coxosternite long; undivided pore-fields sagittally subovoidal ..... ..... ***R. montana*** Kraus
– Body length 34 mm (female); with 49 leg-bearing segments (female); chitin-lines of forcipular coxosternite short; undivided pore-fields subcircular in shape ..... ..... ***R. peruana*** (Verhoeff)
17. Maximum body length 64 mm, male and female with 63, 65, 67, or 69 leg-bearing segments; labrum mid-piece large; proximal tooth on medial edge of forcipular trochanteroprefemur, unpigmented; undivided pore-fields longitudinally ovoidal ..... ..... ***R. centralis*** (Silvestri)
– Body length 46 mm (sex unknown); 63 leg-bearing segments (sex unknown); labrum mid-piece small; proximal tooth on medial edge of forcipular trochanteroprefemur deeply pigmented; undivided pore-fields transversely ovoidal ..... ***R. titicacae*** (Turk)

## Discussion

Of the three genera of Geophilidae currently known from Peru, *Ribautia* is the most species rich and widespread in the country, with 14 species inhabiting a wide variety of habitats at different altitudes. Three of them (*R. limaensis, R. silvana*, and *R. pacifica*) occur to the west of the Andean chain in the Coastal Region from about 200 m to 1100 m asl; two (*R. combinata* and *R. williamsi*) live in the Amazon Basin at about 100 m to 500 m asl; the remaining nine species are distributed in the Andes (those living at the highest elevations are *R. andecola, R. phana, R. titicacae* [at 3900 m asl], and *R. peruana* [at 4150 m asl]).

In 12 of the *Ribautia* species recorded from Peru (*R. andecola, R. carpisha, R. colcabensis, R. combinata, R. junina, R. limaensis, R. montana, R. peruana, R. seydi, R. silvana, R. titicacae*, and *R. williamsi*) the coxal organs are partially or totally grouped in clusters, and the species can be separated by using the identification key above. In the remaining two species, i.e. *R. pacifica* and *R. phana* (not included in the key) all coxal organs open independently.

The other two geophilid genera reported from Peru are the pantropical genus *Plateurytion* Attems, 1909 with one species, *P. lethifer* (Crabill 1960) from Cuzco Department, Urubamba, 2880 m asl in the Andes; and *Peruphilus* Chamberlin, 1944 (possibly endemic) with one species, *P. saborni* Chamberlin, 1944 from Lima Department, Chosica (Rimac River Valley), 971 m asl in the Coastal Region.

As is the case for *R. williamsi* sp. nov. (with 12 mm body length), a few other Neotropical species of *Ribautia* have a similar small body size (see Pereira 2014). Several other occurrences of species with reduced body size are known for the Geophilomorpha; besides the Geophilidae, this is known to occur in some genera of the Aphilodontidae, Ballophilidae, Linotaeniidae, Macronicophilidae, Mecistocephalidae, and Schendylidae (see Foddai & Minelli 1999; Minelli et al. 2000; Pereira et al. 2000; Foddai et al. 2003; Minelli 2003; Uliana et al. 2007; Pereira 2009, 2011, 2012, 2013a, 2013c, 2013d, 2014).

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