



RESEARCH ARTICLE

**Redescription of *Dicranocentrus heloisae* Arlé & Mendonça, 1982
(Collembola: Entomobryidae)**

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Abstract: *Dicranocentrus heloisae* Arlé & Mendonça 1982 is redescribed based on specimens collected from its type locality, “Parque Nacional da Tijuca”, Rio de Janeiro municipality, State of Rio de Janeiro. The presence of 6+6 macrochaetae S, 1+1 macrochaeta P, and absence of macrochaetae A1 and Ps dorsally on head, puts *Dicranocentrus heloisae* in the *gracilis*-group *sensu* Mari-Mutt (1979). This species is easily indentified mainly due to general color pattern of pale yellow on body with bluish to blackish pigmentation on head. Taxonomic characteristics not illustrated in the original description are given (dorsal cephalic chaetotaxy, sensory organ of the third antennal segment, eyes, labrum, maxillary palp, outer labial papilla, labial triangle, trochanteral organ, femur, tibiotarsus, unguis, ventral tube and tenaculum). New records from other localities in Brazil are provided. A neotype for *Dicranocentrus heloisae* is designated.

Key words: Biodiversity, Neotropical fauna, new records, Orchesellinae, springtails, taxonomy.

Introduction

Dicranocentrus Schött, 1893 is a pantropical genus of Orchesellinae characterized by species of medium to large size, conspicuous coloration, body covered with smooth or ciliated chaetae and rounded or truncated scales, antennae with 6 segments (the antennal segments I and II are subdivided, I:II:III:IV:V:VI=Ia:Ib:IIa:IIb:III:IV), absence of postantennal organ, 8+8 eyes, simple pre-labral chaetae, dens long and crenulated with spines on inner and/or external region (Mari-Mutt 1979, 1981; Najt *et al.* 1988). The genus includes

63 species nowadays, of which most are derived from the Neotropical Region (Bellinger *et al.* 2014; Xu & Zhang 2014). In Brazil, five species of this genus have been reported so far: *D. bicolor* Handschin, 1924 from Santa Catarina State, *D. termitophilus* Handschin, 1924 from Minas Gerais State, *D. heloisae* Arlé & Mendonça, 1982 from Rio de Janeiro State, *D. amazonicus* Bellini, Morais & Oliveira, 2013 from Amazonas State and *D. silvestrii* Absolon, 1903 from Rio de Janeiro State (Abrantes *et al.* 2012; Bellini *et al.* 2013).

In view of insufficient knowledge of the taxonomy and distribution of *Dicranocentrus* in a tropical and megadiverse country such as Brazil, a research regarding the biodiversity of the genus has been held in various locations, specially of the Southeastern region of the country. As an initial part of this project, the efforts were turned into the redescription of *D. heloisae*, we provided the inclusion of illustrations of dorsal cephalic macrochaetotaxy, antenna with subdivisions, apex of Ant. VI with pin setae, interocular chaetae, labrum, maxillary palp, outer labial papillae, labial triangle, unguis, tibiotarsal tenent hair, ventral tube, tenaculum and metathoracic trochanteral organ. This last organ, of great taxonomic importance among Entomobryidae, is rarely described for species of genus. In the present paper, the trochanteral organ is illustrated aiming to distinguish *D. heloisae* from other species. New occurrences were recorded for the State of Rio de Janeiro, expanding its geographic distribution.

Material and methods

Specimens were mounted in glass slides according to usual methodology for springtails (Arlé & Mendonça 1982). Illustrations were made with camera lucida and measurements with ocular micrometer on optic microscope. Photographs were taken with a digital camera in a stereomicroscope. A geographic distribution map is based on georeferenced data and was created using Google Earth software. Morphological terminology and measurement landmarks method after Mari-Mutt (1979). The studied material is deposited in the Collembola Collection of Museu Nacional/UFRJ, ZIP Code 20940-040, Rio de Janeiro, RJ, Brazil, under acronym CM/MNRJ.

Abbreviations: Abd.—abdominal segments; Ant.—antennal segments; CM/MNRJ—Cleide Mendonça/Museu Nacional do Rio de Janeiro; L.P.—lateral process; Th.—thoracic segments; UFRJ—Universidade Federal do Rio de Janeiro.

Results

Taxonomy

Entomobryidae Schäffer, 1896

Orchesellinae Börner, 1906

Dicranocentrus Schött, 1893

Dicranocentrus heloisae Arlé & Mendonça, 1982

Redescription

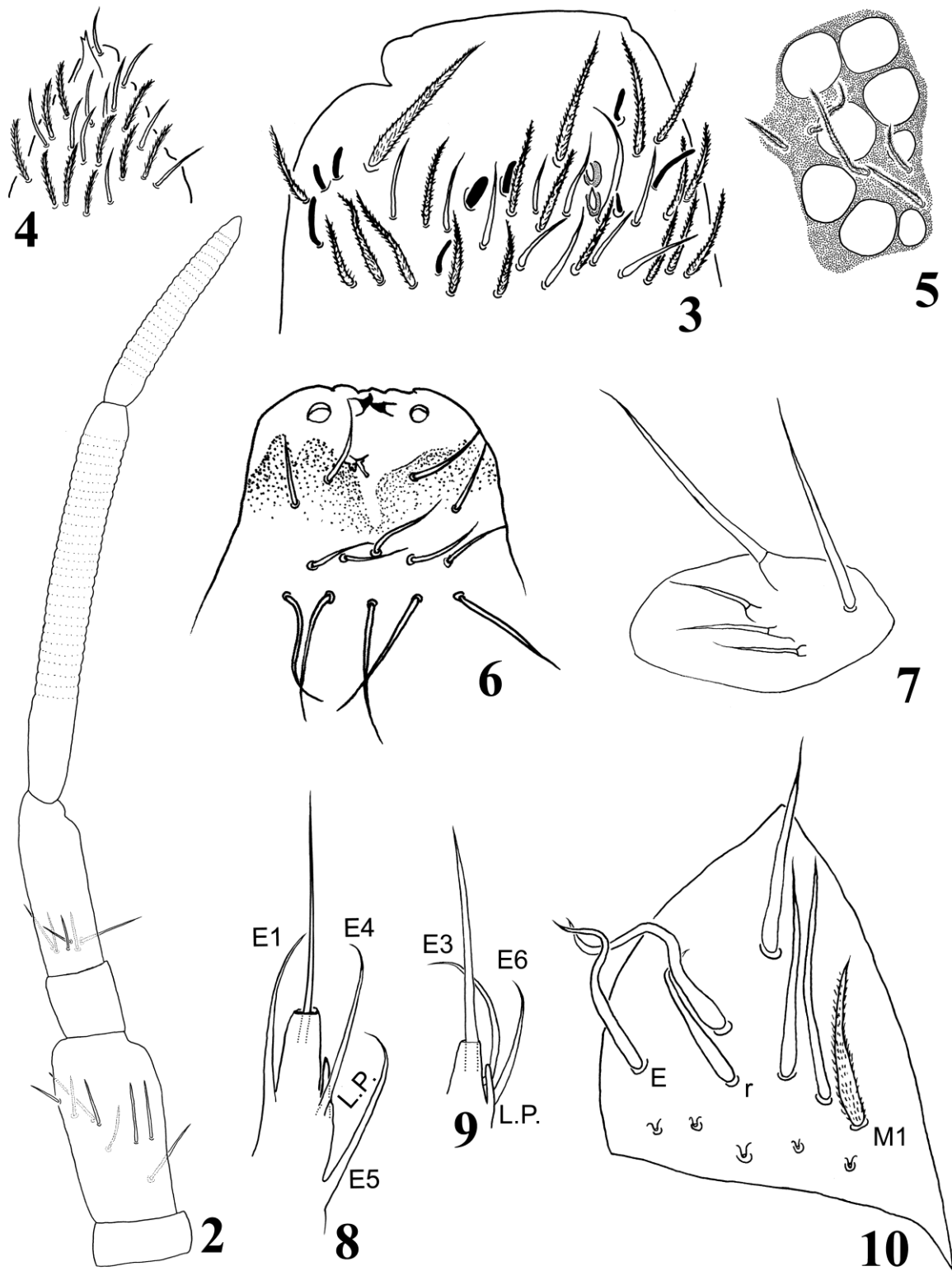
Total body length range of type series excluding antennae and furca of 3.2–3.7 mm. Habitus robust and elongated, typical of Orchesellinae. General color pattern pale yellow on tergites, legs, ventral tube and furca, and bluish to blackish pigmentation on head and apical regions of each antennal segment (Fig. 1).



Figure 1. *Dicranocentrus heloisae* Arlé & Mendonça, 1982. Habitus in ethanol.

Head. Antennae long, approximately two to three times the length of cephalic diagonal (Fig. 2). Ratio of antennal segments I:II:III:IV:V:VI=1.0:4.6:2.2:4.2:12.4:8.4. Ant. I with finely ciliated microchaetae and small scales dorsal and laterally; microchaetae subequal in basal region. Ant. II with scales, sensilla, ordinary smooth chaetae of varying sizes and long ciliated macrochaetae in median and apical region. Ant. III with scales and subequal smooth ordinary chaetae, the longer dorsoapically. Ant. IV with sensilla, scales and chaetae of various sizes, being longer and densely ciliated basal and apically. Ant. V with numerous ciliated chaetae of different sizes interspersed with numerous smooth chaetae and sensilla along the segment; sensory organ of the third Ant. with two robust and exposed rod-like sensilla, and two smaller sensilla inserted longitudinally in a slight tegument depression; about seven other sensilla laterally and some ordinary smooth chaetae (Fig. 3). Ant. VI with numerous thin sensilla interspersed with smooth ordinary chaetae along segment, one subapical pin setae on ventral side; apical bulb absent (Fig. 4). Ant. V and VI annulated, without scales, with ciliated chaetae arranged in rings on finely granulated tegument. Eyes 8+8 in strongly pigmented eyepatch, G and H eyes smaller than others; three interocular ciliated chaetae (Fig. 5). Labral chaetotaxic 4/5,5,4, all chaetae smooth; labral extremity with very thin tegument forming invagination in the median region; two foramens and two spicules in labral papillae (Fig. 6). Maxillary palp simple with basal chaetae subequal to apical chaetae, and three sublobal hairs (Fig. 7). Outer labial papilla with a small lateral process reaching half of papilla E (Figs 8, 9). Labial triangle with ciliated M1 chaetae; r chaetae smooth and smaller than E chaetae; five basal scales present (Fig. 10).

Appendages. Trochanteral organ conspicuous, consisting of approximately 100 small smooth and subequal chaetae; approximately 15 mesochaetae laterally; 1+1 smooth macrochaeta basally; two outer macrochaetae laterally; few scales distributed on trochanter (Fig. 11). Metathoracic femur covered with small scales; about 20 smooth chaetae arranged in a inner row, and one longer femoral chaetae (Fig. 12). Metathoracic tibiotarsus covered with numerous ciliated chaetae and small scales; approximately 15 smooth chaetae on inner margin and one row of spiny chaetae on outer margin (Fig. 12). Unguis long and robust with a pair of basal teeth and two internal unpaired teeth on inner margin; two lateral teeth and one



Figures 2–10. *Dicranocentrus heloisae* Arlé & Mendonça, 1982. 2, antenna; 3, sensory organ of the third antennal segment; 4, apex of antennal segment VI; 5, left eyepatch; 6, labrum; 7, maxillary palp and sublobal plate; 8, outer labial papilla with ventral guard chaetae (L.P. = lateral process); 9, outer labial papilla with dorsal guard chaetae (L.P. = lateral process); 10, labial triangle (only scales sockets and bases represented).

small dorsal tooth; unguiculi lanceolate with a tooth in the median region; tibiotarsal tenent hairs elongated, acuminate or slightly capitate (Figs 13, 14). Ventral tube covered with ciliated chaetae of various sizes interspersed with scales on dorsal side; numerous scales and 2-3 pairs of macrochaetae along *linea ventralis*; distal lateral region with approximately 30 chaetae of different sizes, of which 2+2 posterior chaetae clearly longer than others (Figs 15, 16). Tenaculum well developed with 4+4 teeth and one ciliated macrochaetae in basomedian region (Fig. 17). Dens long, crenulate, with approximately 60 spines arranged in five rows on inner basal area and two rows of spines on the outer basal area; distal part of dens smooth and measuring about three times the length of mucro. Mucro small with two teeth and one basal spine (Figs 18, 19).

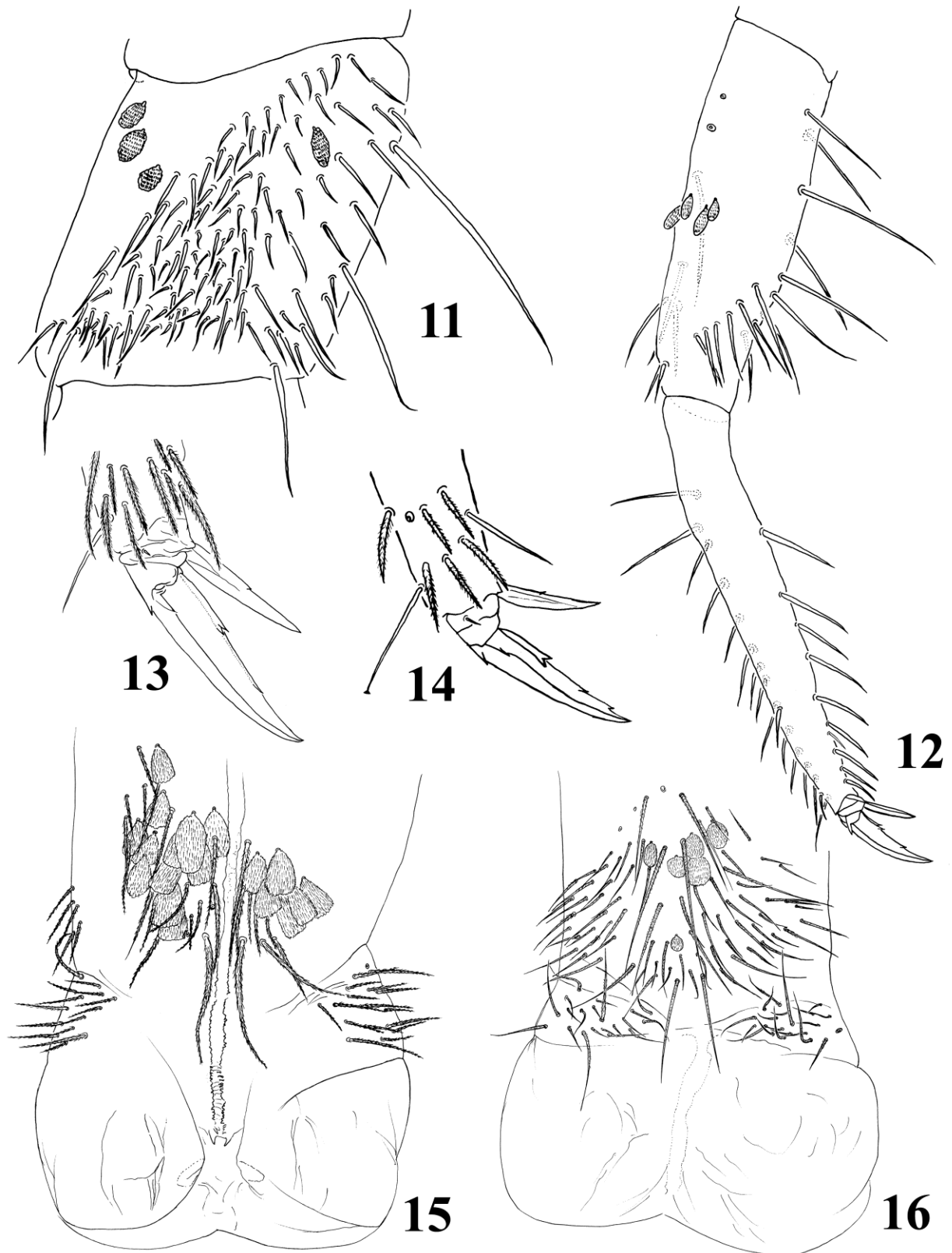
Macrochaetotaxy. Head with 12+12 chaetae on antennal group; anterior group with 4+4 chaetae (A2, A3, A4 and A5) and unpaired macrochaetae A0; median-ocellar line with 3+3 chaetae (M1, M2 and M3); sutural group with 6+6 chaetae (S1, S3, S4, S5, S6 and S7) and unpaired macrochaetae S0; post sutural chaetae absent; post ocellar chaetae present; posterior group with 1+1 chaetae (Fig. 20). Th. II with 2+2 inner macrochaetae and 4+4 outer macrochaetae in the median region; 7+7 posterior chaetae. Th. III with 9+9 chaetae. Abd. I with 5+5 chaetae. Abd. II with 2+2 inner chaetae and 1+1 outer. Abd. III with 2+2 inner and 2+2 outer chaetae. Abd. IV with 5+5 inner chaetae and 6+6 outer (Fig. 21).

Material: Neotype designated: female on slide N° 97c CM/MNRJ, 03/I/1980, Mendonça, M.C. col. – BRAZIL, Rio de Janeiro State, Rio de Janeiro municipality, Parque Nacional da Tijuca, Mesa do Imperador. Local coordinates: 22°58'13.69"S 43°15'28.16"W.

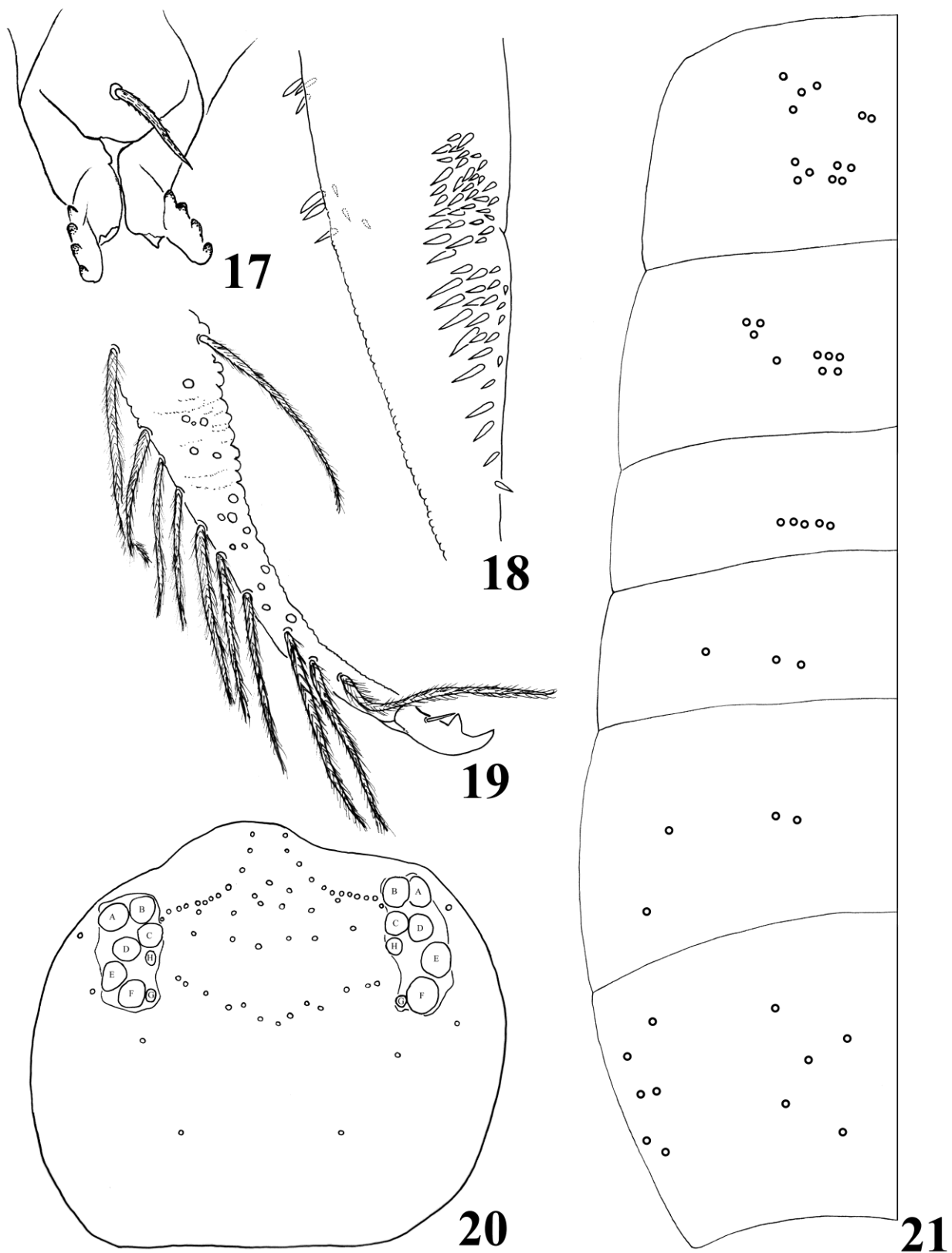
Other examined material: BRAZIL, Rio de Janeiro state. Rio de Janeiro municipality, Parque Nacional da Tijuca (22°57'13" S, 43°17'29" W): Açude Solidão – N° 93 CM/MNRJ, 2exs., 28/VIII/1979, Mendonça, M.C. col.; N° 95 CM/MNRJ, 3exs., 29/VIII/1979, Mendonça, M.C. col.; N° 2454 CM/MNRJ, 2exs., 30/I/2014, Mendonça, M.C., Xisto, T. & Silveira, T.C. col. Barracão – N° 83 CM/MNRJ, 7exs., 25/VII/1979, Mendonça, M.C. col. Cachoeira das Almas – N° 2452 CM/MNRJ, 1ex., 30/I/2014, Mendonça, M.C., Xisto, T. & Silveira, T.C. col. Esquilos – N° 1979 CM/MNRJ, 2exs., 10/XII/2010, Mendonça, M.C., Fernandes, L.H., Abrantes, E.A., Queiroz, G.C., Silveira, T.C. & Neves, A.C.R. col. Mesa do Imperador – N° 97 CM/MNRJ, 2exs., 03/I/1980, Mendonça, M.C. col. Valença municipality, Parque Natural Municipal do Açude da Concórdia (22°21'0" S, 43°50'50" W) – N° 2413 CM/MNRJ, 2exs., 1-3/II/2013, Xisto, T. col. Valença municipality, Santuário de Vida Silvestre da Serra da Concórdia (22°24' S, 43°47' W) – N° 734 CM/MNRJ, 3exs, 10/VI/1997, Calil, E.R., Ribeiro, J.R.I. & Felix, M.E. col.; N° 2342 CM/MNRJ, 1ex., 28/III/2012, Mascarenhas, B. & Pereira, S. col.; N° 2367 CM/MNRJ, 1ex., 27/VII/2012, Mascarenhas, B. & Pereira, S. col. Teresópolis municipality, Parque Nacional da Serra dos Órgãos (22°26'57" S, 42°59'17" W) – N° 2422 CM/MNRJ, 2exs., 15/IX/2011, Carvalho, R.A. col.

Discussion

Among the species of *Dicranocentrus* occurring in Brasil, only *Dicranocentrus heloisae* Arlé & Mendonça 1982 and *Dicranocentrus silvestrii* Absolon, 1903 can be included into the *gracilis*-group (Mari-Mutt 1981; Arlé & Mendonça 1982; Najt *et al.* 1988), which is characterized by the presence of 6+6 macrochaetae S, presence of up to six macrochaeta P, and the absence of macrochaetae A1, S2 and Ps dorsally on cephalic region, according to Mari-Mutt (1979). The specie *Dicranocentrus amazonicus* Bellini, Morais & Oliveira, 2013, inserted into the *marias*-group (Bellini *et al.* 2013), is characterized by



Figures 11–16. *Dicranocentrus heloisae* Arlé & Mendonça, 1982. **11**, trochanteral organ; **12**, metathoracic femur and tibia; **13**, metathoracic distal part of tibia and unguis with acuminate tenent hair; **14**, metathoracic distal part of tibia and unguis with capitate tenent hair; **15**, anterior side of ventral tube; **16**, posterior side of ventral tube.



Figures 17–21. *Dicranocentrus heloisae* Arlé & Mendonça, 1982. **17**, tenaculum; **18**, arrangement of spines on basal region of dens; **19**, distal region of dens and mucro; **20**, dorsal cephalic macrochaetotaxy; **21**, half dorsal macrochaetotaxy of thorax II–III and abdomen I–IV.

absence of macrochaetae A1, S2, Ps, Po and group P (Mari-Mutt 1979). In the descriptions of *Dicranocentrus bicolor* Handschin, 1924 and *Dicranocentrus termitophilus* Handschin, 1924 were omitted their chaetotaxy of the head and tergites, so it is not possible to identify the group to which they belong (Handschin 1924; Mari-Mutt 1979).

Dicranocentrus heloisae was originally described based on material collected from “Parque Nacional da Tijuca” and is easily recognizable by its conspicuous coloration, represented by pale yellow body and bluish to blackish head.

The specimens of *D. heloisae* studied herein agrees with most of the characteristics described by Arlé & Mendonça (1982), but differences were observed in relation to the number of macrochaetae on some body segments. In the original description only 12+12 and 2+2 macrochaetae were illustrated on Th. II and Abd. III, respectively, while specimens from the same locality analysed in the present paper show the presence of 13+13 and 4+4 macrochaetae on Th. II and Abd. III, respectively.

Recent samples taken from four localities in Rio de Janeiro State, as “Parque Nacional da Tijuca” (Rio de Janeiro municipality), “Parque Nacional da Serra dos Órgãos” (Teresópolis municipality), “Santuário de Vida Silvestre da Serra da Concórdia” (Valença municipality) and “Parque Natural Municipal do Açude da Concórdia” (Valença municipality), revealed the presence of *D. heloisae* and expanded its distribution (Fig. 22). Material of *D. heloisae* proceeding from this latter locality, largely agreed with the present redescription, however differences were observed for body size and number of macrochaetae in the Th. II–III and Abd. I, showing 11+11, 6+6 and 3+3 macrochaetae, respectively. In relation to body size, this specimens was also presented maximum body size of 1.7 mm for adult females, unlike specimens of the other locations that exhibited adult body size ranging from 3 to 4 mm.

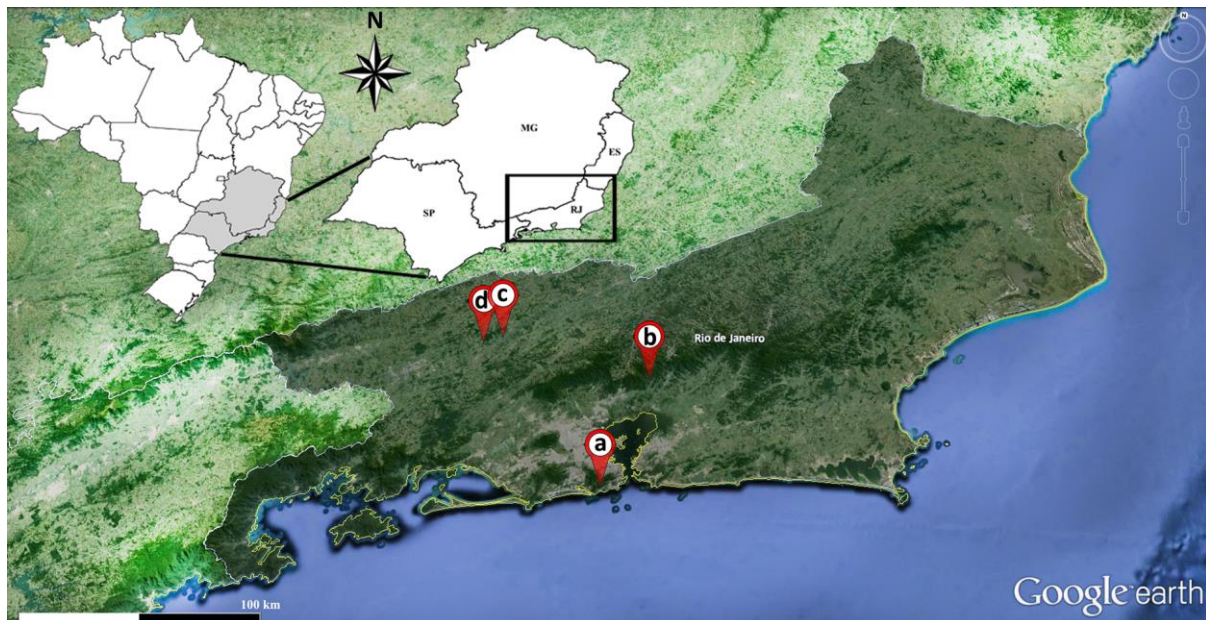


Figure 22. Geographical distribution of *Dicranocentrus heloisae* Arlé & Mendonça, 1982. **a**, Parque Nacional da Tijuca; **b**, Parque Nacional da Serra dos Órgãos; **c**, Parque Natural Municipal do Açude da Concórdia; **d**, Santuário de Vida Silvestre da Serra da Concórdia (Modified from Google Earth 2014).

According to the original description, *D. heloisae* resembles *D. silvestrii* due to body size, distribution of macrochaetae on head and body, eye arrangement and especially by the

presence of approximately 60 spines on inner side of the dens. However, the material herein examined of *D. heloisae*, was observed the presence of 1+1 macrochaeta of P group on dorsal macrochaetotaxy of head and 13+13 macrochaetae on the tergites of Th. II, differently than *D. silvestrii* with 3+3 and 12+12 respectively, as illustrated by Mari-Mutt (1981). These species are also distinguished by labial chaetotaxy, once *D. heloisae* shows only M1 chaeta ciliated and r chaeta smaller than E chaeta, and *D. silvestrii* have both M1 chaeta and r chaeta ciliated. Lastly, *D. heloisae* differs essentially from *D. silvestrii* by presence of spines on the inner and outer basal region of the dens and also by unique coloration among species of the genus. In *D. silvestrii*, the spines appears only on outer basal region of the dens and the coloration is pale yellow (Absolon 1903).

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