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TAXONOMY AND NOMENCLATURE

New species of *Nothobrya* (Collembola: Entomobryidae) from Southeast Brazil

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ABSTRACT. The collembolan family Entomobryidae, one of the most numerous, diverse and widely distributed, was recently reviewed in a work that integrated molecular and morphological characters. The new classification includes seven subfamilies, one of which, Nothobryinae, is characterized by the presence of PAO, falcate mucro and a few chaetae on the trochanteral organ. This subfamily is composed of only three genera: *Capbrya* Barra, 1999 from South Africa, *Hispanobrya* Jordana & Baquero, 2005 from Spain and *Nothobrya* Arlé, 1961 from Brazil. *Nothobrya* (type species *N. schubarti*, described from the state of Pernambuco) remained monospecific for about half a century, when samples taken from urban areas of Rio de Janeiro city revealed its first record for the Brazilian Southeast. This new species, *Nothobrya arlei* **sp. nov.**, is described and illustrated based on differences related to trochanteral organ, unguis, tenent hair shape and chateae on tenaculum. In this paper, characteristics of the macrochaetotaxy, sensillar and microsensillar sets and ventral tube chaetotaxy are provided, as well as a table with comparisons of *Nothobrya* species.

KEY WORDS. Biodiversity, Nothobryinae, *restinga*, taxonomy.

Entomobryidae is very diverse and is distributed worldwide. It was recently revised by Zhang & Deharveng (2014), who integrated molecular data with information on the specialized tergal chaetae. The new classification proposed included seven subfamilies, one of which, Nothobryinae, is characterized by the presence of PAO, falcate mucro and few chaetae on the trochanteral organ.

Nothobrya, one of the three genera of Nothobryinae, was proposed by Arlé (1961) for *N. schubarti* based on samples collected in the state of Pernambuco, Brazilian Northeast. Samples of *N. schubarti* had been previously collected by Otto Schubart in the state of Piauí (also Northeast), about 700 km from the type locality. A second genus of Nothobryinae, *Capbrya*, from South Africa, was described by Barra (1999), who noted its similarity with *Nothobrya* based on the presence of the PAO, falcate mucro, body segmentation and the absence of scales. Baquero et al. (2005) erected the third Nothobryinae genus, *Hispanobrya*, with the type species *H. barrancoi* from Spain. This genus, also monospecific, is similar to *Capbrya* and *Nothobrya* by the presence of PAO, absence of scales and falcate mucro. Although *Nothobrya* shares characteristics with *Capbrya* and *Hispanobrya*, it deviates from both genera, especially in the segmentation of the antenna (with six segments).

Nothobrya has remained monospecific until now. However, field work in the vicinity of urban areas of Rio de Janeiro city has revealed the presence of the genus in the Brazilian Southeast. The study of the external morphology from southeastern material has revealed that it consists of a new species, which is herein described.

MATERIAL AND METHODS

The specimens studied were collected using an entomological aspirator at an urban area. The fauna from litter and soil were extracted using Berlese-Tullgren funnels, sorted under a stereomicroscope and mounted on glass slides according to Arlé & Mendonça (1982). Illustrations were made using an optical microscope. The type material was deposited in the Collembola Collection of the Entomology Department, Museu Nacional/UFRJ, Rio de Janeiro, RJ, Brazil (acronym CM/MNRJ).

Abbreviations: (Abd) abdominal segment, (Ant) antennal segment, (MN/UFRJ) Museu Nacional da Universidade Federal do Rio de Janeiro, (PAO) postantennal organ, (Th) thoracic segment.

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TAXONOMY

Entomobryidae Schött, 1981
Nothobryinae Zhang & Deharveng, 2014
Nothobrya Arlé, 1961
Nothobrya arlei **sp.nov.**

Figs. 1-23

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Description. Body length up to 2.12 mm. Habitus like *Isotomurus*. Ground color greenish to pale, with bluish pigment distributed on interocular area and posterior portion of head, distal parts of antennal segments, anterior edges of tergites, and tibiotarsus.

Head. Antennae longer than head; ratio head:antennae = 1.0:1.15. Antennae with six segments, subsegments of first and second antennal segments very small. Ratio of antennal segments: I:II:III:IV:V:VI = 1.0: 3.3: 1.6: 9.3: 5.3: 7.0. Ant.VI with subapical *pin seta* and about 35 thin sensilla, distributed among ciliated chaetae; apical bulb absent (105 µm) (Fig. 1). Ant. V with two exposed rod-like chaetae, three small proximal sensilla, two guard chaetae and 11 sensilla arranged along the segment (80 µm) (Fig. 2). Ant. IV, the longest segment (140 µm), with about 20 sensilla of different size and thickness; Ant. III with four basal microchaetae, two lateral, one dorsal and one ventral (25 µm) (Fig. 3). Ant. II with only ciliated chaetae (50 µm); Ant. I with one linear series of ciliated chaetae and two smooth microchaetae (15 µm) (Fig. 4). Eyes 8+8, G and H lightly smaller (10 µm). PAO oval with protruding edges (15 µm) (Fig. 5). Labrum with two ciliated chateae, distant from each other, 4/554 smooth labral chaetae and four hook-like papilla on tip (94 µm) (Fig. 6). Maxillary palp simple, with basal chaetae and four sublobal hairs (40 µm) (Fig. 7). Labial palps complete, with five papillae and lateral process not reaching papilla E. Papilla A without chaetae; papilla B with five chaetae (b1, b2, b3, b4 and b5); papilla C without chaetae; papilla D with four chaetae (d1, d2, d3 and d4) and papilla E with four chaetae (e3, e4, e5 and e6); three hipostomal chaetae and five proximal chaetae (Fig. 8).

Appendages. Trochanteral organ with about 15 lateral smooth spiny chaetae and approximately 40 ciliated chaetae along segment (90 µm) (Fig. 9). Femora with three internal robust macrochaetae measuring 50 µm each (Fig. 10). Tibiotarsi with one robust macrochaeta measuring 60 µm, covered with numerous ciliated chaetae, one on proximal region and six spiny ciliated chaetae on internal region (200 µm) (Fig. 11). Tenent hair pointed. Pretarsi with two short blunt chaetae. Claw elongate, with two basal teeth and one tooth on internal edges, two lateral teeth and one dorsal tooth (65 µm) (Figs. 12, 13). Unguiculi lanceolate, without tooth (30 µm), ratio unguis: unguiculi = 1.0:0.8. Ventral tube with 21 posterior ciliated chaetae, 33 anterior ciliated chateae and 24 apical ciliated chaetae, 2+2 longer than others (126 µm) (Figs. 14, 15). Tenaculum with 4+4 teeth and four long ciliated chaetae (80 µm) (Fig. 16). Dens long, crenulated, with final portion narrowed and striated. Mucro falcate, without basal spine (10 µm) (Fig. 17). Genital plate of male with 20 smooth and subequal chaetae, and 4+4 small eugenital chaetae (36 µm) (Fig. 18).

Body chaetotaxy: Body densely covered by chaetae of several sizes (Fig. 19), bothriotrica and sensilla. Head with macrochaetae on interocular area, lateral and posterior edges. Body with macrochaetae type two on thoracic and abdominal tergites (Figs. 20, 21); Th. II, III and Abd. I with several asymmetries, especially on distal portions on tergites. Bothriotricha on abdominal tergites II/III/IV: 2/3/2. Sensillary chaetotaxy of Th. II – Abd. V: Microsensilla: 1,0/1,0,0,0,0 (Figs. 22, 23); Sensilla: 1,2/1,3,3,8,3. Pseudopores not clearly visualized in tergites.

Type material. Holotype male on slide number 1937a CM/MNRJ Recreio dos Bandeirantes, Rio de Janeiro, 15/III/2009, Silveira, T.C. col. Locality: urban area previously covered by native "restinga" vegetation, sand beach and a large lacunar lagoon system, 22°59'51.10"S, 43°25'14.45"W, about 3 m a.s.l.Nine paratypes: slides numbers 1937a CM/MNRJ, 1937b CM/MNRJ, 1937c CM/MNRJ, 1937d CM/MNRJ, 1937e CM/MNRJ, 1937f CM/MNRJ, 1937g CM/MNRJ, 1937h CM/MNRJ, 1937i CM/MNRJ, same data as holotype. Ten paratypes in slides numbers 1940a CM/MNRJ, 1940b CM/MNRJ, 1940c CM/MNRJ, 1940d CM/MNRJ, 1940e CM/MNRJ, 1940f CM/MNRJ, 1940g CM/MNRJ, 1940h CM/MNRJ, 1940i CM/MNRJ, 1940j CM/MNRJ, 27/III/2009. Two paratypes in ethanol, number 1940. Silveira, T.C; Mendonça, M.C.; Fernandes, L.H & Bernardo, A.L. col., same locality as holotype.

Etymology. The species epithet is in honor of Roger Arlé, the author of *Nothobrya*.

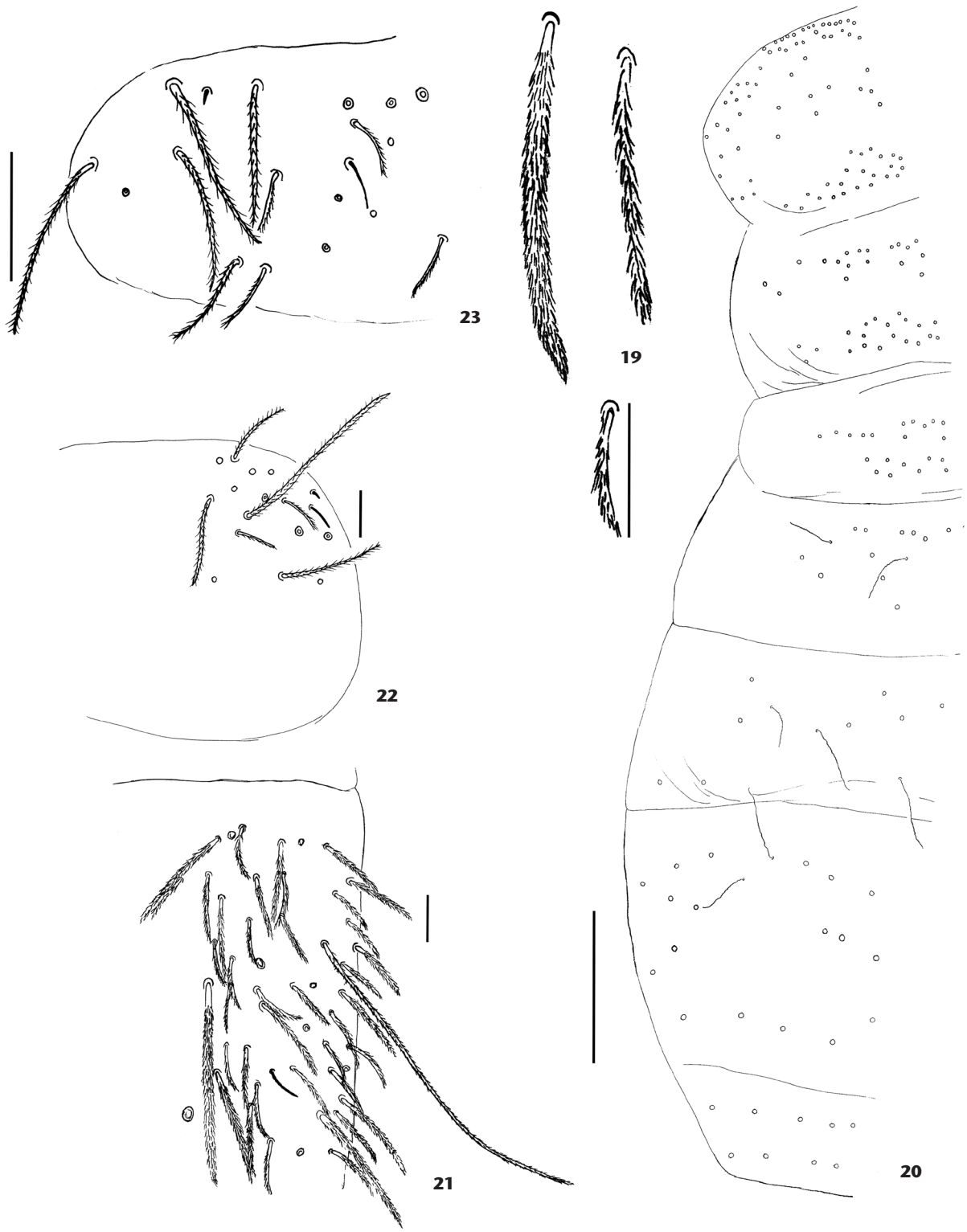
Remarks. The presence of *Nothobrya* in "restinga" areas configures its first record from the Southeast, distant about 1,700 km from the type locality of the genus. Both areas, despite the distance, are characterized by high temperature and sand soil.

The description of *N. schubarti* by Arlé (1961) is brief and lacks details of the morphology and general chaetotaxy, preventing an adequate comparison between it and the new species. Additionally, study of paratypes deposited in the Collembola Collection of the National Museum/UFRJ has not allowed the visualization of several characters due to the precarious condition of this material. However, the redescription of Baquero et al. (2004), based on topotypical material of *N. schubarti*, shows differences related to the trochanteral organ, number of teeth on unguis, shape of tenent hair, and chaetae on tenaculum (Table 1).

Nothobrya arlei **sp. nov**. shares similarities with *N. schubarti* such as the habitus, color, body size, type of chateae and falcate mucro. Nonetheless, the presence of 15 lateral smooth spiny chaetae with numerous ciliate chaetae on the trochanteral organ differentiates this species, since *N. schubarti* shows 3-4 chaetae, none of which is spiny. The unguis in *N. arlei* **sp. nov**. is also a reliable characteristic for species discrimination: in the new species, it has two teeth on inner margin, two lateral and one dorsal tooth, while in the redescription of *N. schubarti* there is reference only to the presence of two basal teeth. Comparisons

Figures 1-8. *Nothobrya arlei* **sp. nov**. (1) Ant. VI; (2) Ant. V; (3) Ant. IV-III; (4) Ant. II-I; (5) eyepatch with PAO; (6) labrum; (7) maxillary palp and sublobal hairs; (8) labial palps. Scale bars = 20 µm.

Figures 9-18. *Nothobrya arlei* **sp. nov**. (9) trochanteral organ; (10) femoral and tibiotarsal macrochaetae; (11) tibiotarsus of leg II; (12) unguis; (13) unguis with detail of two lateral and one dorsal teeth; (14) posterior side of ventral tube; (15) anterior side of ventral tube; (16) tenaculum; (17) distal region of dens and mucro; (18) male plate. Scale bars = 10 µm.



Figures 19-23. *Nothobrya arlei* **sp. nov**. (19) types of chaetae present on body; (20) body macrochaetotaxy of Th. II-III and Abd. I-V; (21) detail of Abd. IV; (22) detail of Th. II; (23) detail of Abd. I. Scale bars = 10 µm (19, 21-23), 100 µm (20).

Table 1. Comparisons of *Nothobrya* Arlé, 1961 species.

Characteristic	*N. schubarti* Arlé, 1961	*N. arlei* **sp. nov.**
Body size	0.95-2 mm	0.72-2.12 mm
Body pigment	greenish with blue pigment	greenish to pale with bluish pigment
Labral formula	4/554	4/554
Maxillary palp/Sublobal hairs	?	Simple/4
Labial palp	?	five papillae
Trochanteral organ	3-4 smooth chaetae	about 15 smooth chaetae
Tenent hair	truncated	pointed
Tita spines	?	6
Tenaculum chaetae	2 chaetae	4 ciliated chaetae
Mucro	falcate	falcate
Ventral tube chaetae	?	21 posterior, 33 anterior, 24 apical
Tergal sensillary formula	?	1,2/1,3,3,8,3
Tergal microsensillary formula	?	1,0/1,0,0,0,0
Shape of chaetae	type two and five	type two and five
Botriotricha	2/3/2	2/3/2
Distribution	Pernambuco and Piauí states	Rio de Janeiro state

also revealed that *N. arlei* **sp. nov**. displays four long ciliated chaetae on the tenaculum, whereas *N. schubarti* shows only two chateae. Moreover, the legs of *N. arlei* **sp. nov**. have three robust macrochaetae on femora, six ciliated spines and one robust macrochaeta on the proximal region of tibiotarsi. In the redescription of Baquero et al. (2004) no observation was made about the leg chaetotaxy of *N. schubarti*, except for the spatulate shape of the tenent hair, which Arlé (1961) refers to as pointed, a characteristic also observed in *N. arlei* **sp. nov**. The general chaetotaxy of both species is similar, with chaetae of type two and five (Christiansen 1958) and the same number of bothriotricha (2-3-2) on Abd. II/III/IV, respectively. In the specimens of *N. arlei* **sp. nov**. herein studied, the distribution of the macrochaetae from Th. II – Abd. I shows some asymmetries, but from the Abd. II onward a pattern is noted. Although the macrochaetotaxy and sensillar pattern of *N. shubarti* is unknown, the differences verified in individuals of *N. arlei* **sp. nov**. seem sufficient to support this species as the second of the genus.

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