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A new species of the genus *Cyphoderus* Nicolet, 1842 (Collembola: Paronellidae), and redescription of *Cyphoderus javanus* Börner, 1906 from India

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ABSTRACT. This study was performed on the collections of the National Zoological Collection of the Zoological Survey of India and described a new species in the “multidentati” *Cyphoderus* group from Bihar, India. This new species, *Cyphoderus bihariensis* sp. nov., is described with a distinguishing comparison among other species within this group. The new species is notably large compared to its counterparts in this group. This study also redescribed *Cyphoderus javanus* Börner, 1906 collected from various localities and habitats across India and provides additional morphological identification characters and chaetotaxy for taxonomic sufficiency. Earlier, India was home to nine *Cyphoderus* species from various localities across the country. Additionally, an identification key to the Indian *Cyphoderus* is included.

Keywords: *Cyphoderus bihariensis* sp. nov., taxonomy, Bihar, redescription, identification key

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INTRODUCTION

Collembola, the edaphic wingless arthropods, are equipped with a jumping organ, the furcula, and a tube-like structure, the collophore or ventral tube, used for gaseous exchange and ionic balance. These organisms are highly diverse and distributed across all biogeographical zones, both horizontally and vertically in the soil strata (Hopkins, 1997; Gillott, 2005). Currently, 9598 species of Collembola have been reported worldwide with presence in almost every continent (Bellinger et al., 1996–2024), whereas India recorded 381 species, representing only 3.97% of global diversity (Mandal et al., 2024a, 2024b, 2024c).

Currently, 86 species of *Cyphoderus* have been found globally (Bellinger et al., 1996–2024), of which India accounts for only 10.46%, with nine reported species (Mandal et al., 2024a). *Cyphoderus* belonging to the family Paronellidae differ from other genera of this family on the basis of the dens characteristics (Zeppelini & Oliveira, 2016). The dens is specialized with two rows of large feathered scales and a smooth or ciliated chaetal row between these two rows. *Cyphoderus*, generally eyeless, is mostly found in a condition with a very low amount of food and light (Jantarit et al., 2014). Members of *Cyphoderus* are usually myrmecophilic springtails (Fjellberg, 2007; Jantarit et al., 2014); however, they are also found in association with nests and mounds of other animals, in caves, and in leaf litter (Yoshii, 1987; Jantarit et al., 2014), as well as in soil, inside hermit crab shells and with turtles (Oliveira et al., 2023).

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The mucro of *Cyphoderus* also displays interesting morphology. Delamare-Deboutteville (1948) divided this genus into five different groups based on the number of mucronal intermediate teeth.

This study aims to revisit the unidentified and poorly described specimens of the *Cyphoderus* genus deposited in the National Zoological Collection (NZC) of the Zoological Survey of India (ZSI). The study added a new member to the genus *Cyphoderus*, belonging to “multidentati” group, and also thoroughly examined *Cyphoderus javanus* Börner, 1906, belonging to “bidenticulati” group and added new additional identifying characteristics for taxonomic sufficiency and more accurate identification.

MATERIAL AND METHODS

The specimens were collected using a mouth-operated aspirator and from soil extraction, then, preserved in 70 % ethyl alcohol. Sorting was done under a Leica® M205A stereomicroscope with an attached DMC6200 Pixel Shift camera. Specimens were mounted on the slide using Marc André II solution (Walter & Krantz, 2009) and dried on a hot plate for 24–48 hours. Identification was done following the standard key of Bellinger et al. (1996–2024) and photography was done using a Leica® DM2500 with an attached Leica® DFC 295 camera. Chaetotaxy and morphological characteristics drawings were made using CorelDraw Suite 2021 version 23.1.0.389. All specimens are deposited in NZC of ZSI. The cephalic dorsal chaetotaxy follows Szeptycki (1979) and Nunes & Bellini (2018), the clypeal chaetotaxy follows Yoshii & Suhardjono (1992), the labial chaetotaxy follows Zhang & Pan (2020), the labral chaetotaxy follows Cipola et al. (2014) and the dorsal body chaetotaxy follows Szeptycki (1979), Zhang et al. (2019) and Oliveira et al. (2023). The mucronal formula is according to Oliveira et al. (2023), where they refer to “figure 20. Mucro shape nomenclature modified from Delamare-Deboutteville (1948). In this figure ‘a’ refers to the apical tooth, ‘A’ refers to well-developed teeth and ‘I’ refers to reduced or vestigial teeth usually located between well-developed teeth; in the “multidentati” group the ‘I’ number must be replaced by the respective number of intermediary teeth (ex.: aA 2 A 2 A).” An identification key of this particular genus has also been provided for the specimens present in India by using appropriate literature (Nicolet, 1842; Börner, 1906, 1913; Baijal, 1955; Bhattacharjee, 1985; Tyagi & Baijal, 1979; Mandal et al., 2016) and based on our slide observation.

Abbreviations. PAO – Postantennal organ, Th. – Thoracic segment, Abd. – Abdominal segment, mac – macrochaetae, mes – mesochaetae, mic – microchaetae, De – external feathered scales on dens, Di – internal feathered scales on dens, m – medial chaetae on dens, pde – proximal dens external chaetae, pdm – proximal dens middle chaetae, pdi – proximal dens inner chaetae, M.f. – mucronal formula, psp – pseudopore/s, a.i. – anterior internal lamella, a.e. – anterior external lamella, p.i – posterior internal lamella, p.e. – posterior external lamella, b.a. – unguis basal anterior tooth, b.p. – unguis basal posterior tooth, m.t. – unguis median tooth. Institution acronym: NZC – National Zoological Collection; ZSI – Zoological Survey of India.

RESULTS

Taxonomic hierarchy

Class Collembola Lubbock, 1870

Order Entomobryomorpha Börner, 1913

Superfamily Entomobryoidea Womersley, 1934

Family Paronellidae Börner, 1913

Subfamily Paronellinae Börner, 1913

Tribe Cyphoderini Börner, 1906

Genus *Cyphoderus* Nicolet, 1842

Diagnosis. Eyes absent. Antenna four segmented and relatively short. Trochanteral organ generally L- or V-shape with up to 25 chaetae. Basal teeth of all unguis large, lamellate. Bifid unguiculus. Dens straight and with feathered scales.

Cyphoderus bihariensis Roy, Mandal & Suman sp. nov. (Figs 1–4, Table 1)

<https://zoobank.org/urn:lsid:zoobank.org:act:68AD1E2C-8A2C-4CB8-A0D8-59F9143B3160>

Type material. **Holotype** ♀ on slide, INDIA, Bihar, Gaya, D.F.O. Office, 24°47'39" N, 84°59'26" E, 135 m. a.s.l., 07.iii.2022, K.K. Suman leg., Reg. no– 3640/H14. **Paratypes:** 1♀, 1♂ on slide, 23 specimens in alcohol, same data as holotype. Reg. no– 3641/H14.

Etymology. The specific name is after the collection state.

Description. — **Female** holotype (Fig. 1). Body length approx. 1.97 mm (head to Abd. VI).

Colouration. Pale yellow-white ground colour without pigmentation (Fig. 1).

Head. Eyes absent. Ratio of Ant. I : II : III : IV = 1 : 2.26 : 1.19 : 3 (holotype). Antenna not annulated, apical bulb absent on Ant. IV. Apical organ presents on Ant. III. Clypeal chaetae smooth and acuminate, formula with 3 (pf0–1), 2(ft), 4(l1–2) (Fig. 2A). Prelabral and labral formula 4/5,5,4 with smooth chaetae (Fig. 2B). Labial triangle: all chaetae ciliated, E chaetae normal; formula A2–3, M1–2, E, L1 (Fig. 2C). Ciliated chaetae present along ventral groove. Asymmetric mandible with five teeth on left and four teeth on right. Labial palp with five papillae. *Cephalic chaetotaxy* as in Figure 2D: five mac in f series (f1–5); four mic in A series (A0, A2–3, A5); mic M1–5, S0', S2–5, Ps1 present in medio-ocellar to post-sutural areas; posterior chaetae Pa3, Pa5, Pa6 (Bt.), Pm3, Pp1, Pp5 present.



Figure 1. *Cyphoderus bihariensis* Roy, Mandal & Suman sp. nov., Holotype, lateral view of habitus.

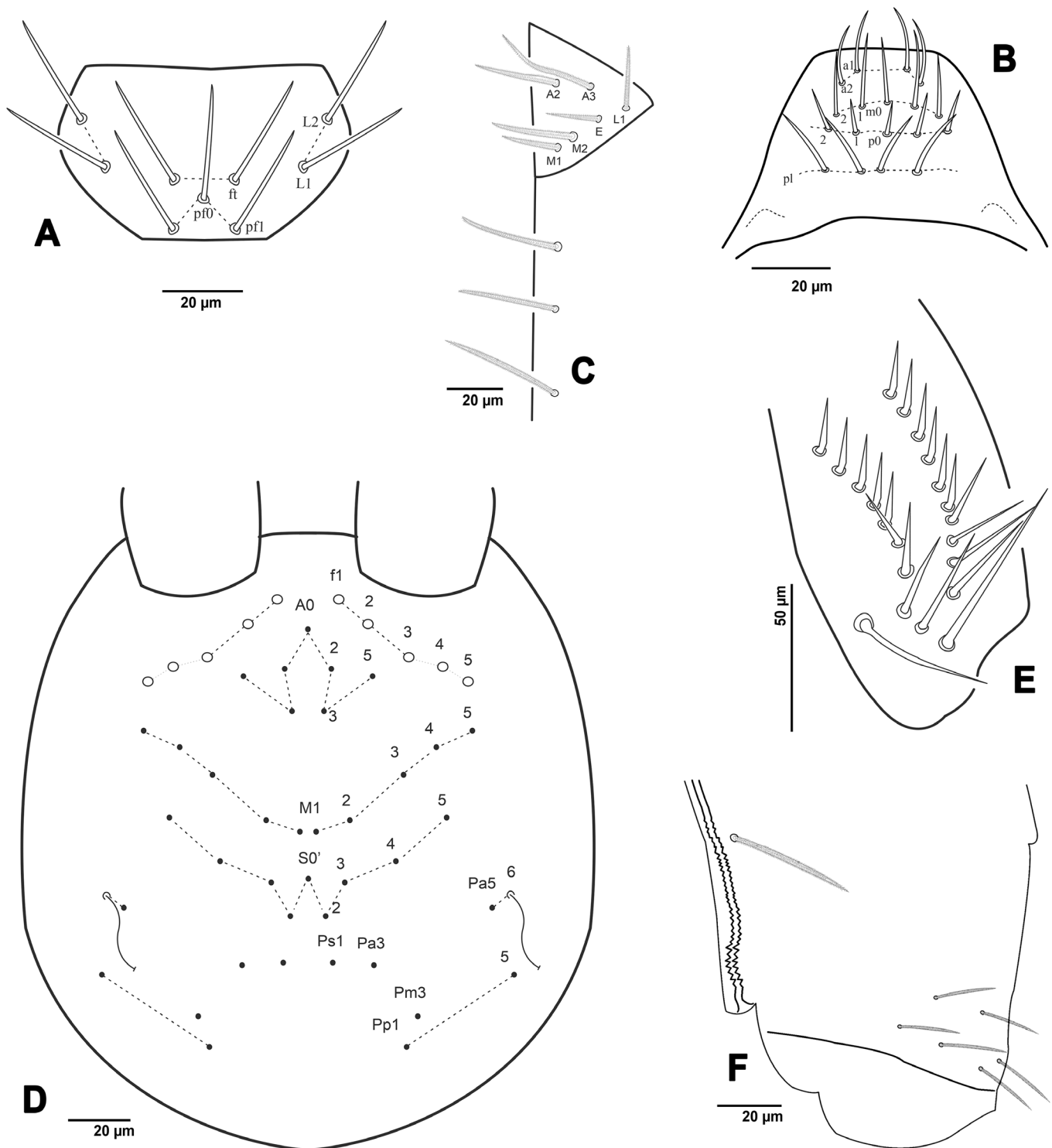


Figure 2. *Cyphoderus bihariensis* sp. nov.. **A.** Clypeal chaetotaxy; **B.** Prelabral and labral chaetotaxy; **C.** Labial triangle chaetotaxy; **D.** Cephalic chaetotaxy; **E.** Trochanteral organ; **F.** VT (posterior chaetae not showing).

Body. Ratio of Th. II : III = 1 : 1.06 (holotype). Trochanteral organ with 21 chaetae forming 'V' shape (Fig. 2E). Tibiotarsus with smooth clavate tenent hair. Unguis with paired unequal basal teeth (b.a. and b.p.) and a strong unpaired distal tooth (m.t.). Lanceolate acuminate unguiculus with two lamellae (a.i., a.e., p.i. and p.e.), a tooth on outer lamellae (p.e.) with length equal to the outer lamella (Fig. 3A). Ratio of Abd. I : II : III : IV : V : VI = 1.58 : 1.24 : 1.58 : 7.16 : 1.13 : 1 (holotype). Ventral tube with 2+2 anterior ciliated mac; six ciliated apical mes on each side; 1+1 mac (only socket) on posterior surface (Fig. 2F). Ratio of Manubrium: dens : mucro = 3.8 : 2.62 : 1 (holotype).



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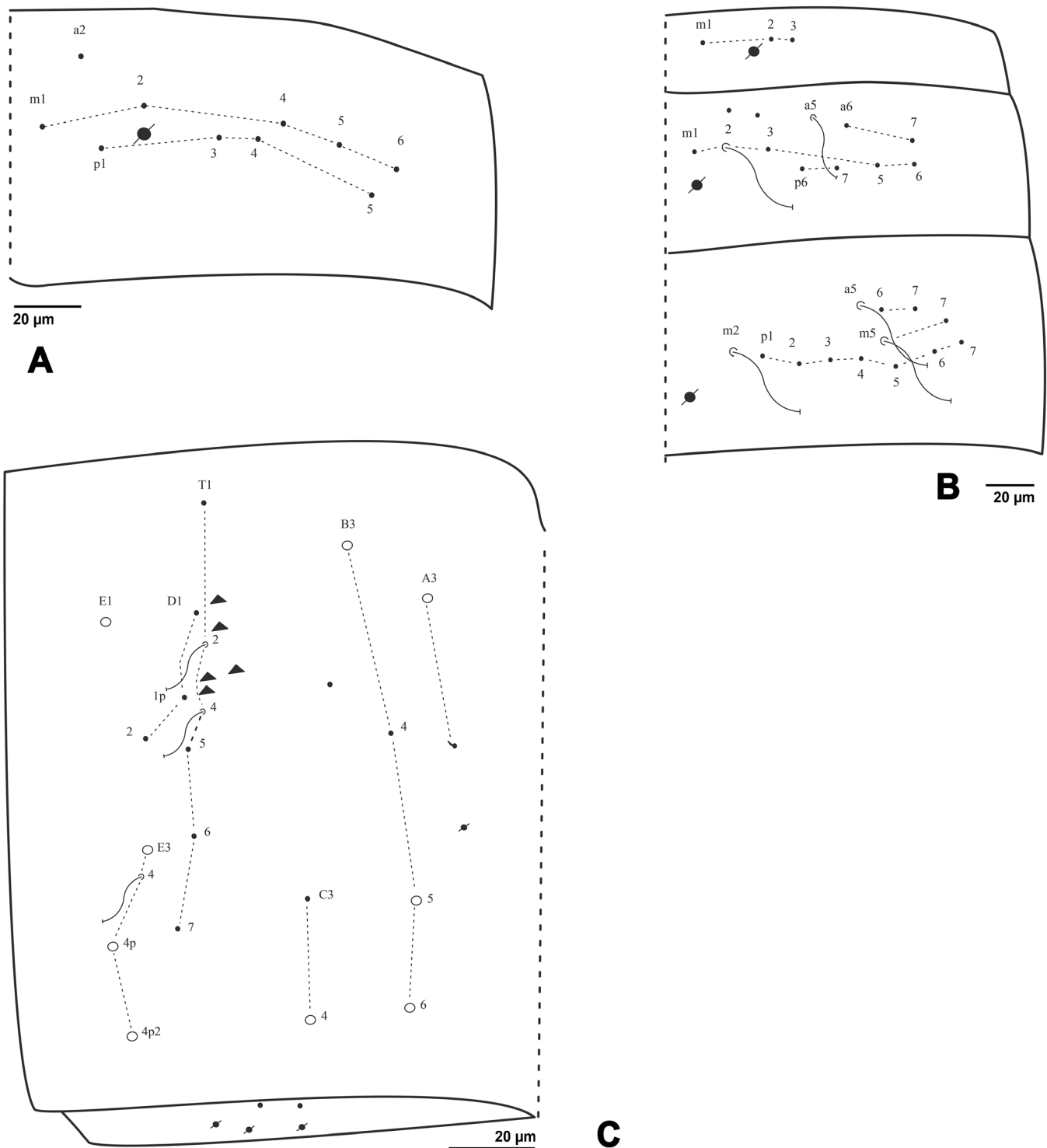


Figure 4. *Cyphoderus bihariensis* sp. nov.. **A.** Th. III chaetotaxy; **B.** Abd. I, II & III chaetotaxy; **C.** Abd. IV chaetotaxy.

Ecology. *Cyphoderus bihariensis* sp. nov. was found in the humus of decaying leaf litter.

Remarks. As shown in Table 1, the new species, *Cyphoderus bihariensis* sp. nov., differs in the number and formula of mucronal teeth. The number of outer dental feathered scales is similar to *C. subserratus* Delamare-Deboutteville, 1948 but differs in the inner dental feathered scales. The new species is clearly distinguished from *C. caetetus* Zeppelini & Oliveira, 2016 and *C. pinnatus* (Folsom, 1923) by the number of dental feathered scales. Body size also differs from other members of the genus (Table 1).

Cyphoderus javanus Börner, 1906 (Figs 5–7)

Cyphoderus javanus Börner, C., 1906:180. **Type locality.** Indonesia (Java), 25.iii.1904, Kraepelin leg. **Type depository.** Hamburg Natural History Museum.

Material examined. 06 specimens, INDIA, West Bengal, Jalpaiguri, Gorumara NP, South Range, Gorumara Beat, 26°45'22.9"N 88°47'50.9"E, 24.viii.2016, G.P.Mandal leg., Reg.no-2329/H14. 10 specimens, INDIA, Daman, Diu, Dadra and Nagar Haveli, Diu, Dagachi Forest, 20°43'14.0"N 70°54'21.9"E, 17.xi.2017, G.P.Mandal leg., Reg.no- 2634/H14. 20 specimens, INDIA, Odisha, Chilika Lake, Magarmuch Northside Chilika, 19°41'31.7"N 85°25'17.8"E, 05.ix.2018, G.P.Mandal leg., Reg.no-2698/H14. 55 specimens, INDIA, Odisha, Puri, Baradanda, 20 km away from Janhi Kuda, Chilika lake, 19°35'55.4"N 85°15'09.3"E, 17.i.2019, G.P.Mandal leg., Reg.no- 3262/H14. 58 specimens, INDIA, West Bengal, East Burdwan, Krishna Sayar Park, 23°14'43"N, 87°50'52"E, 26.x.2022, Pritha Mandal leg., Reg.no- 3290/H14. 1 specimen, INDIA, Gujarat, Kachchh district, Koteswar, Narayana sarovar, 23°40'54.8"N 68°32'04.5"E, 04.xi.2024, K.K. Bhattacharya leg., Reg. No- 3720/H14.

Redescription. — Average body length approx. 1.35 mm.

Colouration. White background colour.

Head. Ratio of Ant. I : II : III : IV = 1 : 2.5 : 1.7 : 4. Ant. IV devoid of apical bulb and without ring, dorsally a longitudinal (subapical) row with almost four rod sens, dorsally and ventrally with elongated rod sens, ciliated mac and mes. Ant. III dorsally and ventrally with elongated rod sens, acuminate smooth chaetae, ciliated mes, apical organ with two rod sens, one psp present on apical ventrally. Ant. II dorsally and ventrally with elongated rod sens, acuminate smooth chaetae, ciliated mac, one psp present on apical ventrally, apically two elongated rod sens. Ant. I dorsally with short and long acuminate smooth chaetae, ventrally with rod sens, elongated rod sens, acuminate smooth chaetae. Clypeas chaetae smooth and acuminate, formula: 3(pf0–1), 2(ft), 4(L1–2) (Fig. 5A). Prelabral and labral formula: 4/5,5,4 with smooth chaetae and subequal in length, Labral chaetae: 1st row with slender chaetae, 2nd row inner chaetae strong and thick (Fig. 5B). Labial triangle: all chaetae smooth, r chaetae normal, formula: A1, A3, M1, r, L1. Smooth chaetae present along the ventral groove (Fig. 5C). All labial papillae present with smooth chaetae.

Cephalic Chaetotaxy as in Figure 5D: f series with four mac (f1–3, f5), one mic (f4); four mic in A series (A0, A2–5); three mic in M region (M2–4); two mic in Ps region (Ps2–3); posterior chaetae as three mic Pa (Pa2–5), P6 (Bt.), Pm3 (mic), three mic Pp (Pp1, Pp3–4).

Body. Ratio of Th. II : III = 2 : 1. Trochanteral organ with almost 16 short and ciliated chaetae, arranged in 'L' shaped (Fig. 5E). Tenent hair clavated. Unguis with a pair of subequal basal teeth, and one distal tooth. Unguiculus is lanceolate with two acuminate and smooth lamellas (a.i., a.e., p.i. and p.e.) without tooth (p.e.) (Fig. 6A). Ratio of Abd. I : II : III : IV : V : VI = 2.7 : 2.7 : 3.3 : 12.8 : 1.8 : 1. Elongated ventral tube with 2+2 anterior chaetae, 7 (2+2,1,1+1) posterior chaetae, formula: L1–2 ciliated mes, L2 smaller than L1, M and D ciliated mac; L1, L2 and D are two in numbers while M is single and 2+2 lateral chaetae (Fig. 5F). Ratio of manubrium : dens : mucro = 4 : 2.6 : 1. Manubrium with dorsally ciliated chaetae and ventrally scales. Manubrium plate (dorsal view) with two ciliated chaetae of subequal in length and two psp. Dens dorsally with six external (De1–6), five internal (Di1–5) feathered scales, m chaetae (m1–4) subequal in length; pde is smooth and acuminate, pdm is ciliated and truncate, pdi is ciliated and acuminate (Fig. 6B–C), apical dens with three chaetae (only socket present), of which two external and one internal. Bidentate mucro subequal to De1, and with a slight lateral ledge, M.f.: aA (Fig. 6D).

Body chaetotaxy as in Figs 6E–F, 7A–C: Th. II with m1–2, m4–5 and p1i–3 as mic. Th. III with a2, m2–4, p2–6 as mic. Abd. I with a3–5, m3–6e as mic. Abd. II with a5 (Bt.), a7, m2 (Bt.), m6–7, p6 as mic. Abd. III with a5 (Bt.), m2 & m5(Bt.), m7, p6–7 as mic. Abd. IV with mic A4–5, mic B3–6, mic C1p–2, T2 & T4 (Bt.), mic T3, T5–6, mac D2, mac E3, E4 (Bt.), mic F1–2, mac F3 and Fe4, posterior edge with two psp and five mic. Medial psp from Th. II to Abd. IV as 1,1/1,1,1,1.

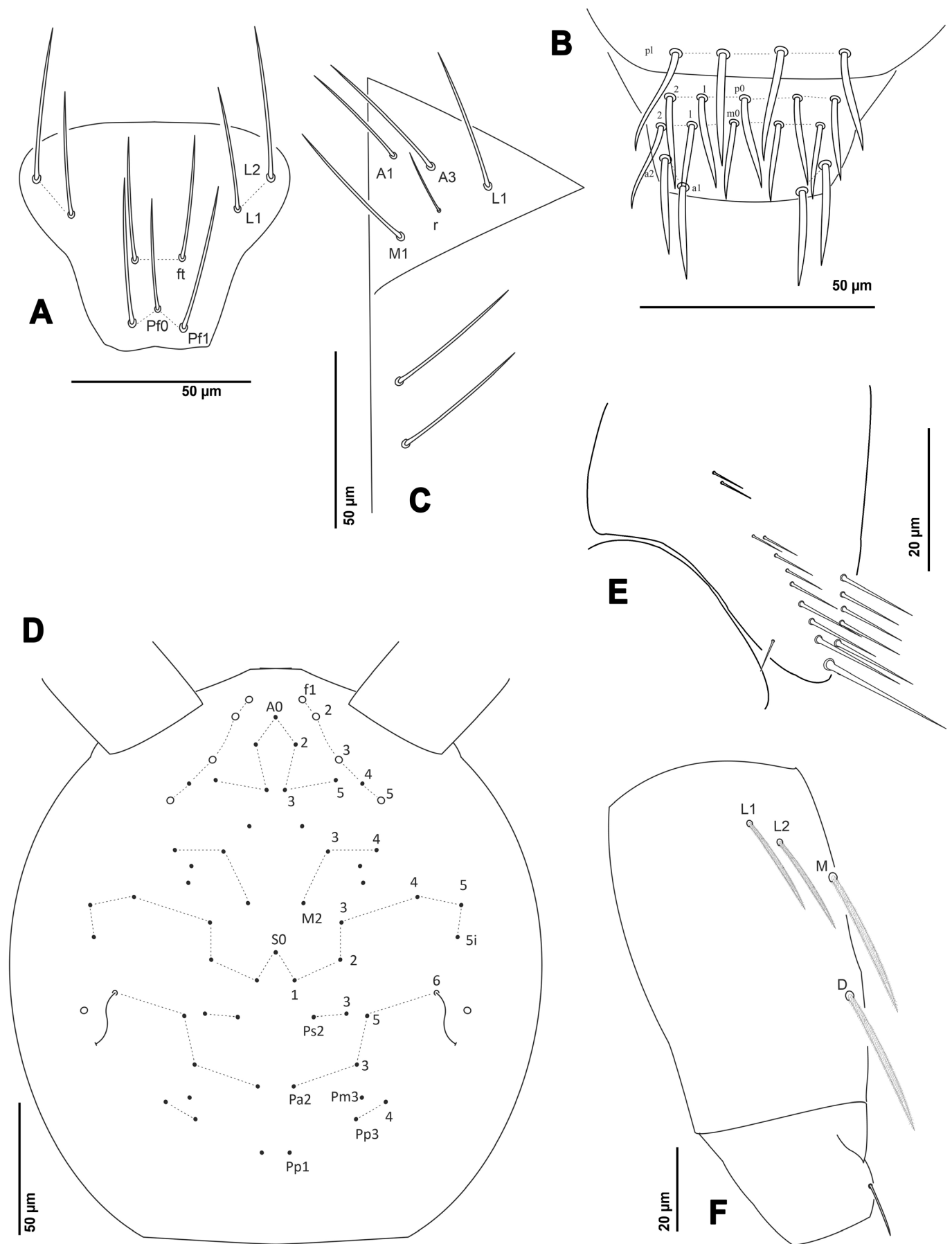


Figure 5. *Cyphoderus javanus* Börner, 1906. **A.** Clypeal chaetotaxy; **B.** Prelabral and labral chaetotaxy; **C.** Labial triangle chaetotaxy; **D.** Cephalic chaetotaxy; **E.** Trochanteral organ; **F.** Ventral tube.

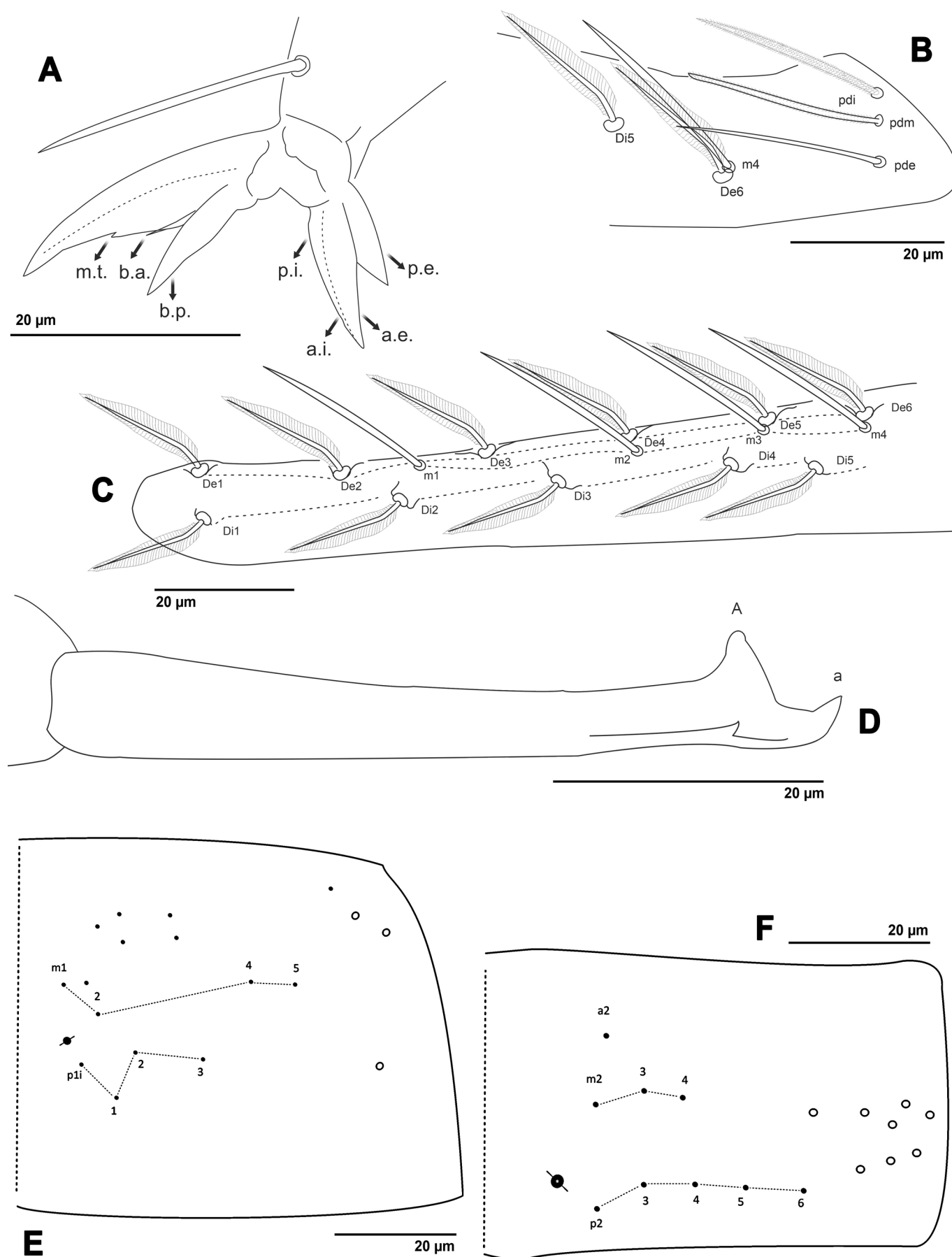


Figure 6. *Cyphoderus javanus* Börner, 1906. **A.** Claw; **B.** Proximal dens. **C.** Dens; **D.** Mucro; **E.** Th. II chaetotaxy; **F.** Th. III chaetotaxy.

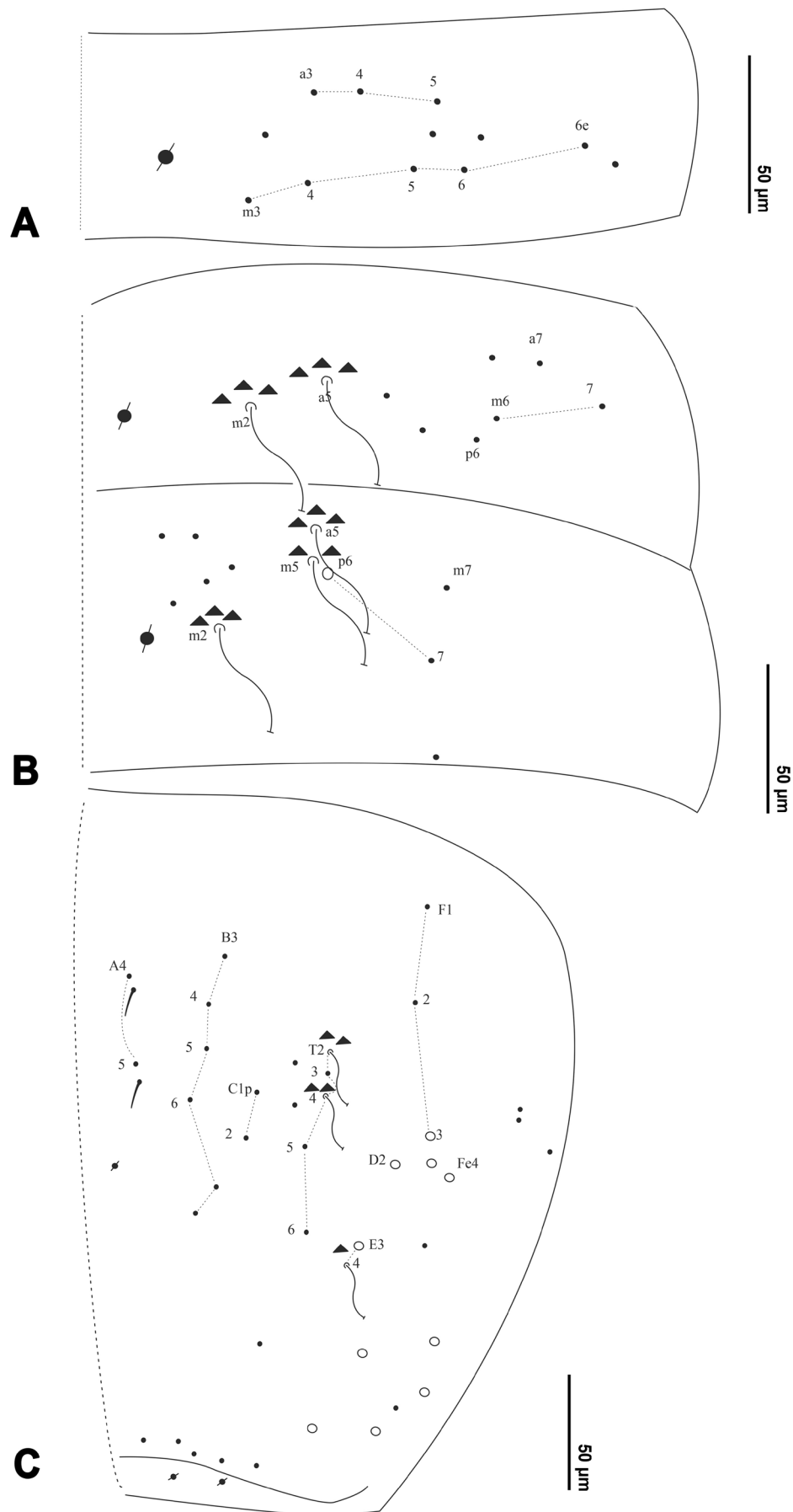


Figure 7. *Cyphoderus javanus* Börner, 1906. **A.** Abd. I chaetotaxy; **B.** Abd. II & III chaetotaxy, **C.** Abd. IV chaetotaxy.

Table 1. Comparison *Cyphoderus bihariensis* **sp. nov.** with *C. caetetus* Zeppelini & Oliveira, 2016, *C. pinnatus* (Folsom, 1923) and *C. subserratus* Delamare-Deboutteville, 1948; ‘-’ indicates absence or insufficiency of information.

| Characters | <i>Cyphoderus bihariensis</i> sp. nov. | <i>C. caetetus</i> Zeppelini & Oliveira, 2016 | <i>C. pinnatus</i> (Folsom, 1923) | <i>C. subserratus</i> Delamare-Deboutteville, 1948 |
|-------------------------------|--|---|-----------------------------------|--|
| Mucronal teeth | 8 | 8–12 | 3 to 9 or varies | 12–14 |
| Mucronal teeth formula | aAA4A | aAIAAA3A | aA2A4 or varies | – |
| Dens feathered scales (De+Di) | 10+11 | 7+5 | 5+4–6 | 10–11+7–9 |
| Body length | 2.25 mm | 1.5 mm | 0.54 to 1.2 mm | 1 to 1.5 mm |
| Unguis inner unpaired teeth | 2 | 1–2 | 1 | 1–2 |
| Tenent hair | Clavate | Clavate | Clavate | – |
| Trochanteral organ | 11 | 18 | – | – |

Remarks. In 1906, Börner identified *C. javanus* based on its morphological characteristics, such as a bidentate mucro with a slight lateral ledge, and the presence of clavated tenent hair and claw. Later, Yoshii (1966) described the species further and added some morphological details but details of chaetotaxy with the nomenclature of the head, body, mouthparts, dental feathered scales, ventral tube and mucro were not added. In 1971, Prabhoo’s findings were similar to Yoshii’s (1966) description but there were some variations in furcula. This study addresses those gaps. This study also aligns with Yoshii’s (1966) findings that smooth chaetae are present in the mouthparts, smooth medial dental chaetae, apical dens with three chaetae, proximal basal dens with three chaetae and the ratios of Ant. and furcular segments. However, the body length observed in this study is comparatively smaller. The trochanteral organ generally has 16–17 chaetae. In this study, two specimens show variation in chaetae number in this region, with counts such as 9 (reg. no. 3720/H14), and 13 (reg. no. 3471/H14). Prabhoo (1971) studied *C. javanus* from various habitats, such as tea gardens and zoo-garden in Kerala, India, and pointed out differences in the furcula, specifically, variations in the ratio of furcular segments and the absence of smooth chaetae on the inner side of the dorsal manubrium.

Identification keys to the species of *Cyphoderus* in India

- 1 Mucronal formula ‘inermes’ (‘a’ or ‘aI’) type. *C. limboxiphia* Börner, 1913
- Mucronal formula other than ‘inermes’ type. 2
- 2 Mucronal formula ‘multidentati’ (‘aA n.I A n.I A’) type; dental feathered scales as De1–10, Di1–11; trochanteral organ with 11 chaetae. *C. bihariensis* **sp. nov.**
- Mucronal formula ‘bidenticulati’ (‘aA’) type. 3
- 3 Unguis with a single proximal or basal inner tooth. 4
- Unguis with different teeth. 7
- 4 Dens with a single row of dorsally feathered scales. *C. rubiae* Baijal, 1955
- Dens with two rows of dorsally feathered scales. 5
- 5 Dens dorsally with five internal (Di1–5) feathered scales. 6
- Dens dorsally with six internal (Di1–6) feathered scales. *C. jharkhandensis* Mandal, Suman & Bhattacharya, 2016
- 6 Dens dorsally with six external (De1–6) feathered scales. *C. albinus* Nicolet, 1842
- Dens dorsally with seven external (De1–7) feathered scales. *C. ganaensis* Tyagi & Baijal, 1979

- 7 Dens dorsally with four external (De1–4) feathered scales; unguis with one outer tooth. *C. indicus* Mandal, Suman & Bhattacharya, 2016
- Dens dorsally with six external (De1–6) feathered scales; unguis with two inner teeth. 8
- 8 Unguis with single basal inner tooth; apex of tenent hair is clavate. 9
- Unguis with two basal inner teeth; apex of tenent hair curved. *C. sarojinii* Bhattacharjee, 1985
- 9 Two distal inner teeth on unguis. *C. assimilis* Börner, 1906
- One distal inner tooth on unguis. *C. javanus* Börner, 1906

DISCUSSION

The two main subfamilies of Paronellidae are distinguished by their morphological characteristics including scales (shapes such as round or pointed; present or absent), mac (reduced or absent to abundant), dental feathered scales and phylogeny (Zhang et al., 2019). The main classifying characteristics of *Cyphoderus*-like taxa are based on morphology, particularly the feathered scales on the dorsal side of the dens (Zhang et al., 2019). Delamare-Deboutteville (1948) mentioned the mucronal tooth as a precise character for *Cyphoderus* species, such as *inermes* (M.f.: a or aI), *bidenticulati* (M.f.: aA), *tridenticulati* (M.f.: aAA, aAI or aAAI), *quadridenticulati* (M.f.: aAAA) and *multidentati* (M.f.: aA n.I A n.I A).

The new species, *C. bihariensis* **sp. nov.** differs from other *Cyphoderus* species in terms of mucronal teeth and the number of dental feathered scales. Identification key presents a comparative analysis of previously recorded Indian *Cyphoderus* species with the newly described *C. bihariensis* **sp. nov.** *Cyphoderus javanus* is distributed across the Oriental, Indomalayan, Australasian & Neotropical biogeographical zones, which are present in the tropical region of both the northern and southern hemispheres (Bellinger et al., 1996–2024). In India, within the Oriental biogeographic zone, *C. javanus* occupies diverse habitats, from the Himalayan mountain to the Deccan plateau (dry or semi-dry regions), from desert (hot and dry) to tropical forest (humid and wet) and in islands, spanning multiple the states or union territories of India, including Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Daman, Diu, Dadra & Nagar Haveli, Himachal Pradesh, Kerala, Lakshadweep, Maharashtra, Manipur, Mizoram, Odisha, Rajasthan, Sikkim, Uttarakhand and West Bengal (Mandal, 2018; NZC unpublished database). Apart from its distribution in India, *C. javanus* is also found in Pakistan, Thailand, Vietnam, Malaysia, Indonesia (Java), Taiwan, Philippines and Japan (Börner, 1906; Yosii, 1966; Nguyen et al., 2022). This distribution signifies their adaptability to these diverse locations, which is further enhanced by their morphological characteristics. *Cyphoderus javanus* also bears rod senses on Ant., similar to other *Cyphoderus* species, and has smooth clypeal chaetae. The study on *C. javanus* identified two ciliated chaetae on dorsal manubrium which are not present in the specimens described by Prabhoo (1971). Chaetotaxy have been incorporated for the taxonomic sufficiency of this species.

This study is the first attempt to formulate an identification key for species of *Cyphoderus* in India, including the new species and *C. javanus* along with other eight species from India: *C. albinus* Nicolet, 1842, *C. assimilis* Börner, 1906, *C. indicus* Mandal, Suman and Bhattacharya, 2016, *C. jharkhandensis* Mandal, Suman and Bhattacharya, 2016, *C. limboxiphia* Börner, 1913, *C. rubiae* Baijal, 1955, *C. sarojini* Bhattacharjee, 1985, *C. ganeensis* Tyagi and Baijal, 1979. Given the extensive collection of unidentified specimens in the NZC, our morphological observations suggest a significant potential to discover new species with the *Cyphoderus* genus and other groups of Collembola. Additionally, this study highlights the necessity of combining molecular analysis with morphological characteristics to develop an integrated taxonomy for these numerous specimens.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: K.K. Roy: sorting, photographs, identification, drawing, manuscript preparation; G.P. Mandal: Survey and project supervisor, reviewer, identification of the specimens, review of the manuscript; K.K. Suman: Survey, reviewer, identification of the specimens, review of the manuscript; All authors approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The specimens described in this study are deposited in the National Zoological Collections of ZSI and are available from the curator, upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

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یک گونه جدید از جنس *Cyphoderus* Nicolet, 1842 (Collembola: Paronellidae) و توصیف مجدد *Cyphoderus javanus* Börner, 1906 از هند

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چکیده: این مطالعه بر روی نمونه‌های موجود در کلکسیون جانوری ملی هند انجام شد و یک گونه جدید از گروه "multidentati *Cyphoderus*" از بیهار هند توصیف شد. گونه جدید، *Cyphoderus bihariensis* sp. nov. بر اساس مقایسه افتراقی با دیگر گونه‌ها در این گروه توصیف شده است. این گونه به طور قابل توجهی بزرگتر از هم‌تایان خود در این گروه است. به علاوه، در این مطالعه گونه *Cyphoderus javanus* Börner, 1906 که نمونه‌های آن از مکان‌ها و زیستگاه‌های مختلف در سراسر هند جمع‌آوری شده بودند، توصیف مجدد شد. اطلاعات بیشتری از ویژگی‌های ریخت‌شناسی افتراقی و الگوی آرایش موها برای تکمیل مطالعات تاکسونومیک نیز ارائه شد. پیش از این، ۹ گونه از جنس *Cyphoderus* از مناطق مختلف در سراسر هند گزارش شده بود. علاوه بر این موارد، یک کلید برای شناسایی گونه‌های جنس *Cyphoderus* در هند نیز ارائه شد.

واژگان کلیدی: *Cyphoderus bihariensis* sp. nov.، طبقه‌بندی، بیهار، توصیف مجدد، کلید شناسایی