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First records of the genus *Cambalida* Simon, 1909 (Araneae: Corinnidae, Castianeirinae) from Asia, with the description of two new species from India and one new combination

PRASHANTHAKUMARA S. MURTHAPPA[1,2], DHRUV A. PRAJAPATI[1,3],
PRADEEP M. SANKARAN[1] & POTHALIL A. SEBASTIAN[1]

[1]*Division of Arachnology, Department of Zoology, Sacred Heart College, Thevara, Cochin, Kerala 682 013, India*
[2]*Department of PG Studies and Research in Applied Zoology, Bioscience complex, Kuvempu University, Jnana Sahyadri, Shankaraghatta, Shivamogga, Karnataka 577451, India*
[3]*Corresponding author. E-mail: dhruvspidy215@gmail.com*

Abstract

The hitherto Afrotropical corinnid spider genus *Cambalida* Simon, 1909 is recorded from Asia for the first time. Detailed morphological descriptions and genitalic illustrations of two new species, *C. deorsa* **sp. n.** and *C. tuma* **sp. n.** from India, are provided. One new combination is proposed: *Cambalida flavipes* (Gravely, 1931) **comb. nov.** The occurrence of distal femoral constrictions of III and IV legs of both male and female are recognised as additional somatic features for the genus *Cambalida*. The current distribution of all the three Indian *Cambalida* spp. is mapped.

Key words: Afrotropical, distribution map, genitalia, taxonomy, transfer

Introduction

Family Corinnidae Karsch, 1880 comprises 729 described species in 67 genera, currently distributed on all of the continents except the arctic regions (World Spider Catalog 2016). An overview of the available literature on corinnid spiders shows that the family is poorly studied in India. To date, six genera, *Aetius* O. Pickard-Cambridge, 1896, *Apochinomma* Pavesi, 1881, *Castianeira* Keyserling, 1879, *Coenoptychus* Simon, 1885, *Corinnomma* Karsch, 1880 and *Echinax* Deeleman-Reinhold, 2001, with 18 species, have been described from the country (Thorell 1891; Gravely 1931; Reimoser 1934; Patel & Patel 1973; Tikader 1981; Biswas 1984; Majumder & Tikader 1991; Gajbe 2003; Patil *et al.* 2015; Sankaran *et al.* 2015); all currently belong to the subfamily Castianeirinae (Deeleman-Reinhold 2001). The genus *Castianeira*, with 10 described species, is the most species rich corinnid genus in India (World Spider Catalog 2016). However, the majority of Indian *Castianeira* species are misplaced and should be transferred to other genera (Haddad, pers. comm.), including some species belonging to the liocranid genus *Oedignatha* Thorell, 1881, which was previously included in the Corinnidae.

In the present paper, we record the Afrotropical genus *Cambalida* Simon, 1909 from India for the first time and provide descriptions of two new species. Based on generic similarities, especially regarding colouration, somatic and genitalic morphology, we transfer *Castianeira flavipes* Gravely, 1931 to *Cambalida*. Certain morphological features described by Raven (2015) are also reported in the genus *Cambalida* for the first time. Additionally, a distribution map for all the Indian *Cambalida* spp. is provided.

Material and methods

Fresh material was collected directly by hand from the ground. The specimens were studied under a LEICA S8AP0 stereomicroscope. All measurements are in millimetres (mm) and were made with an ocular micrometer. The

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measurements of prosoma and opisthosoma length and height were taken at the middle of each structure. Length of palp and leg segments are given as: total (femur, patella, tibia, metatarsus (except palp), tarsus). Spine positions follow the format of Bosselaers & Jocqué (2000). Drawings were made by the aid of a drawing tube attached to the microscope. The microphotographic images were taken by Leica DFC2900 digital camera attached to Leica M205A stereomicroscope with the software package Leica Application Suite (LAS), version 4.5.0. The specimens are deposited in a reference collection housed at the Division of Arachnology, Department of Zoology, Sacred Heart College, Thevara, Cochin, Kerala, India (ADSH).

Abbreviations used in the text: ALE—anterior lateral eye, AME—anterior median eye, do—dorsal, pl—prolateral, PLE—posterior lateral eye, plv—prolateral ventral, PME—posterior median eye, rl—retrolateral, rlv—retrolateral ventral, v—ventral, vt—ventral terminal, WSC—World Spider Catalog, ZSI—Zoological Survey of India, I–IV—1st to 4th leg.

Taxonomy

Corinnidae Karsch, 1880

Castianeirinae Reiskind, 1969

***Cambalida* Simon, 1909** (in WSC, the genus establishment year is given as 1910)

Type species. *Cambalida insulana* Simon, 1909 by original designation (currently considered as *nomen dubium* as the types are lost (Haddad 2012)).

Diagnosis. For description and diagnostic features of the genus, see Haddad (2012).

***Cambalida deorsa* sp. n.**
(Figs 1A–K, 2A–E, 3A–E)

Type material. Holotype: ♂ with left leg I missing (ADSH 18102A), **INDIA: *Karnataka*:** Shimoga: Shankaraghatta: Jnana Sahyadri campus of Kuvempu University, 13°44'00.92"N, 75°37'44.22"E, 680 m a.s.l., S.M. Prashanthakumara leg., 28 May 2015, by hand from the ground; **Paratypes:** 2 ♀ (ADSH 18102B), same data as holotype except 14 September 2015; 1 ♀ (ADSH 18102C), **INDIA: *Gujarat:*** Gandhinagar, The Serenity Library and Botanical Garden in Koteshwar village, 23°06'42.27"N, 72°37'23.95"E, 63 m a.s.l., D.A. Prajapati leg., 26 June 2015, by hand from the ground.

Etymology. The specific epithet is an adjective and is derived from the downwardly directed median turn of the embolus. Latin *deorsum* = downward.

Diagnosis. *Cambalida deorsa* **sp. n.** is most similar to *C. compressa* Haddad, 2012 from West Africa but can be distinguished by the following combination of characters: embolus nearly uniform in width along the entire length (Figs 2A–C, 3A–C) (embolus in *C. compressa* broad proximally but narrow distally, see Haddad 2012: fig. 59); median turn of embolus oblique to the longitudinal axis and directed downward (Figs 2C, 3C) (in *C. compressa* and all other described *Cambalida* spp. with either transverse or oblique and distally directed median embolar turn, see Haddad 2012: figs 50–56); embolic tip directed at 11 o' clock in ventral view (Figs 2C, 3C) (embolic tip in *C. compressa* directed at 12 o' clock in ventral view, see Haddad 2012: fig. 50); epigyne with circular plate-like ridges (Figs 2D, 3D) (*C. compressa* with 6-shaped epigynal ridges, see Haddad 2012: fig. 57); copulatory ducts with sharp median curve (Fig. 3E) (copulatory ducts of *C. compressa* with less prominent median curve, see Haddad 2012: fig. 58); fertilization ducts short (Fig. 3E) (*C. compressa* with long fertilization ducts, see Haddad 2012: fig. 58); and posterior border of epigyne W-shaped (Figs 2D, 2E, 3D, 3E) (posterior border of epigyne in *C. compressa* convex, see Haddad 2012: figs 57, 58).

Description. *Male* in alcohol (holotype, Figs 1A–E): Prosoma, chelicerae, fangs, sternum reddish-brown. Prosoma pear-shaped, with tiny tubercles; fovea short, distinct. Eyefield black. Clypeus, labium, maxillae brownish. Clypeus provided marginally with long thick bristles. Maxillae with scopulae, labium not. Chelicerae

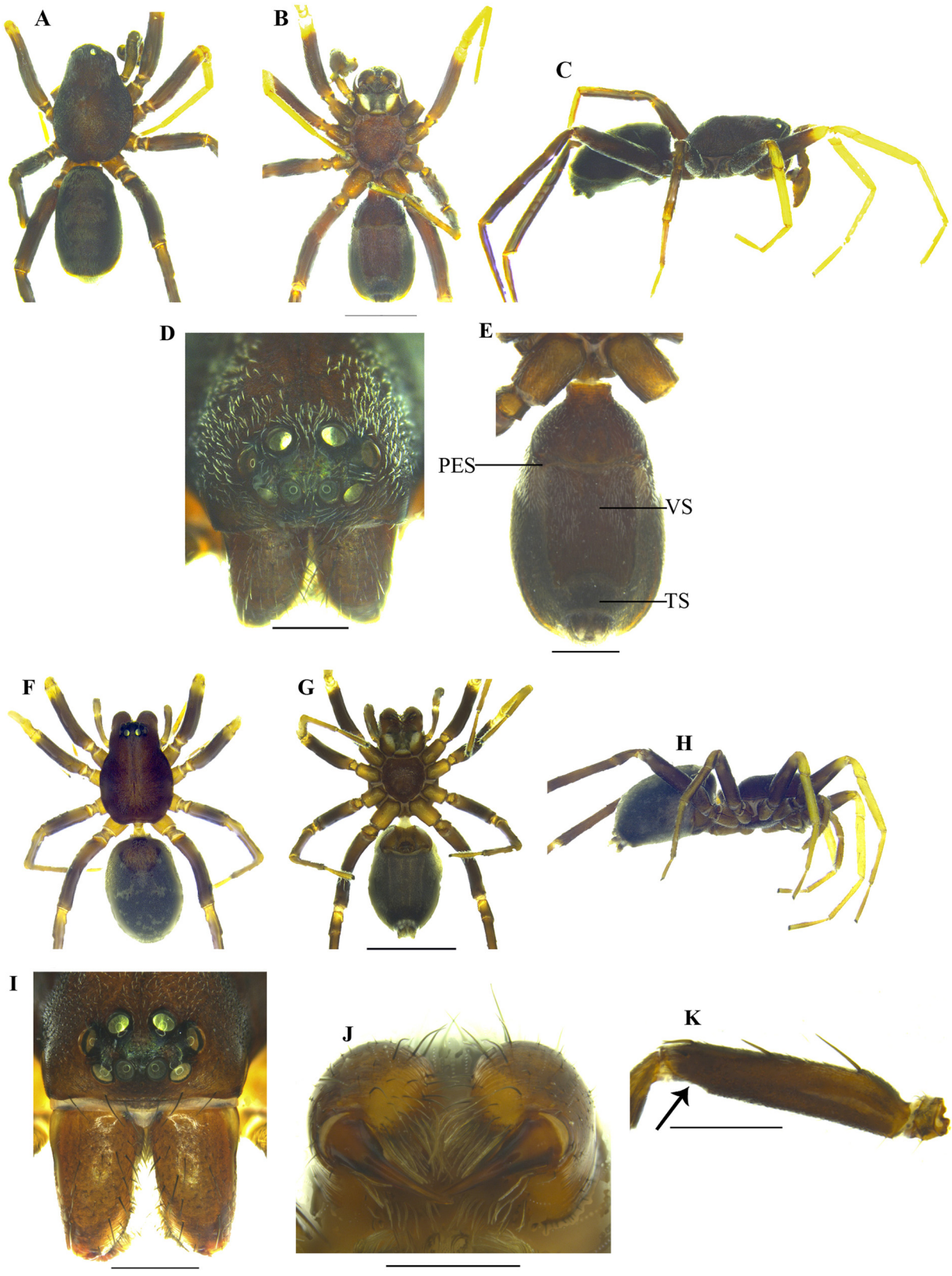

FIGURE 1A–K. *Cambalida deorsa* **sp. n.** A Holotype male from Jnana Sahyadri campus of Kuvempu University, dorsal view; B Same, ventral view; C Same, lateral view; D Male, frontal view; E Male opisthosoma, ventral view; F Paratype female from Jnana Sahyadri campus of Kuvempu University, dorsal view; G Same, ventral view; H Same, lateral view; I Female, frontal view; J Female chelicerae, ventral view showing the apical fang shield bearing long setae; K Femur IV (left), retrolateral view showing distal femoral constriction. Abbreviations: PES post-epigastric sclerite, TS tracheal scute, VS ventral sclerite. Scale bars: A–C, F–H: 2 mm; D–E, I–J: 0.5 mm; K: 1 mm.

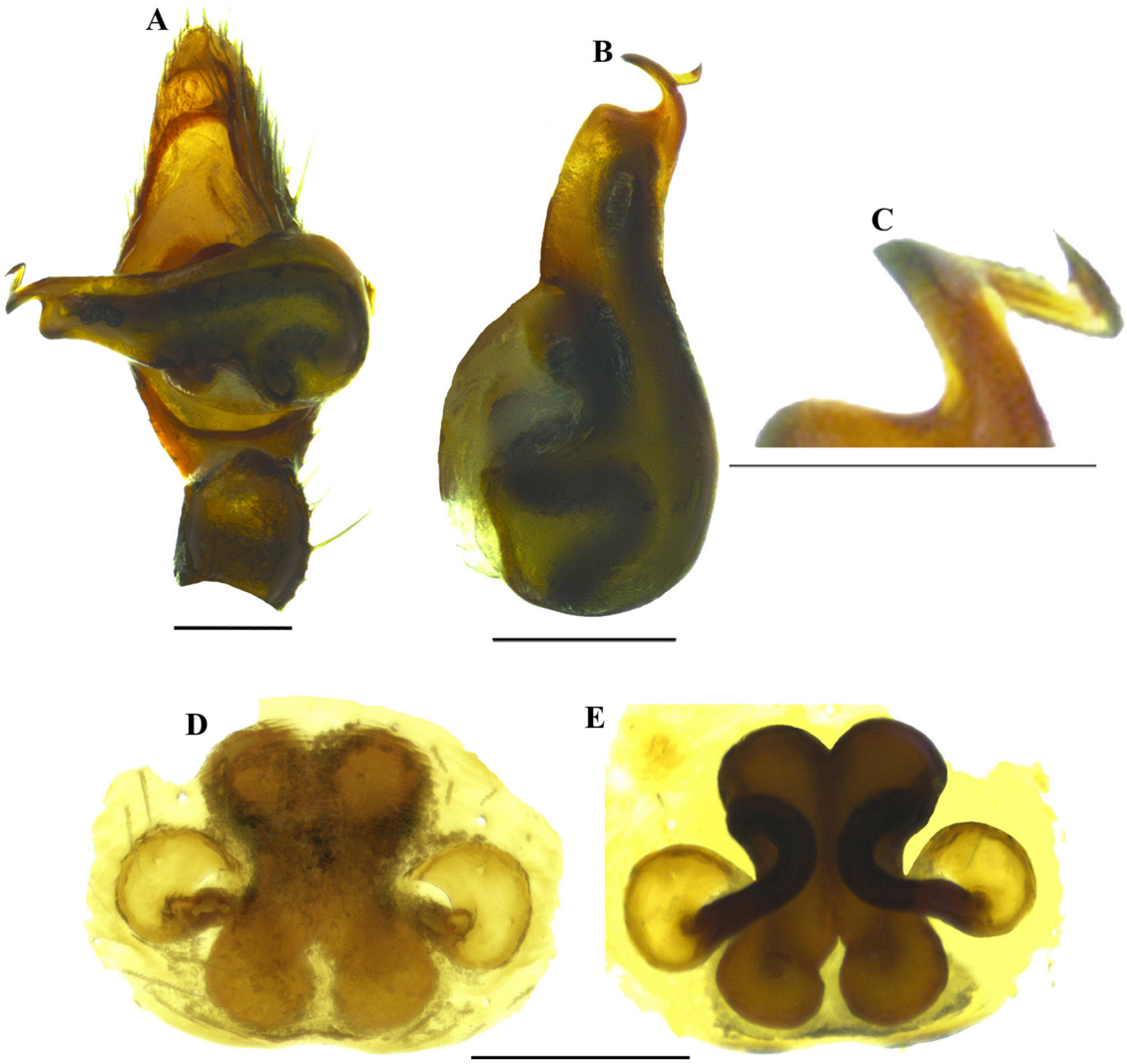

FIGURE 2A–E. *Cambalida deorsa* **sp. n.** A Male right pedipalp, ventral view; B Bulb, ventro-retrolateral view; C Embolus enlarged, ventral view; D Epigyne, ventral view; E Vulva, dorsal view. Scale bars: A–E: 0.2 mm.

with apical fang shield mound bearing long, unmodified setae; cheliceral promargin with 3 teeth, median largest; retromargin with 2 teeth. Coxae yellowish-brown; femora I & II brownish, III & IV yellowish; tarsi I & II brownish, III & IV yellowish. Opisthosoma rectangular, with dorsal, ventral, epigastric and tracheal (inframamillary) scuta; tracheal scute broad, nearly circular in shape (Fig. 1E); post-epigastric sclerites well developed (Fig. 1E); dorsum blackish-brown, with large whitish patch posteriorly just above the spinnerets; venter reddish-brown. Prosoma, opisthosoma, legs covered with feathery hairs; femora III and IV with distal constrictions (Fig. 1K, arrow). Spinnerets grey with whitish tip. Body length 3.7. Prosoma length 1.88, width 1.36, height 0.58. Opisthosoma length 1.82, width 1.16, height 1.04. Eye diameters: ALE 0.09, AME 0.08, PLE 0.11, PME 0.10. Eye interdistances: AME–AME 0.06, ALE–ALE 0.26, ALE–PME 0.16, PLE–PLE 0.36, PME–PME 0.12, PME–PLE 0.02, AME–ALE 0.01, AME–PME 0.12, ALE–PLE 0.07. Clypeus height at ALE 0.11, at AME 0.15. Chelicerae length 0.58. Measurements of palp and legs. Palp (right) 1.75 [0.57, 0.23, 0.24, 0.71], I (right) 4.97 [1.37, 0.45, 1.20, 1.10, 0.84], II 4.29 [1.22, 0.41, 1.01, 0.94, 0.71], III 4.23 [1.15, 0.42, 0.91, 1.15, 0.60], IV 6.66 [1.73, 0.53, 1.58, 1.93, 0.89]. Leg formula: 4123. Spination. Palp: femur do 2, patella do 1, tibia pl 1, cymbium/tarsus pl 3; legs: femora: I (right)–II pl 1 do 3, III–IV pl 2 do 3 rl 1; patellae: I–IV spineless; tibiae: I (right) plv 2 rlv 1, II rlv 1, III pl 2 do 1 rl 2 plv 2 rl 1 rlv 1, IV pl 2 do 1 rl 2 plv 3 rlv 2; metatarsi: I (right) plv 2 rlv 2, II plv 1 rlv 2, III pl 2 rl 2 plv 3 rlv 2 vt 1, IV pl 3 rl 3 plv 3 rlv 2 vt 1; tarsi: I–IV spineless. *Pedipalp* (Figs 2A–C, 3A–C). Palpal segments dark brown; cymbium/tarsus apically with six stout setae on dorsal surface, arranged in three rows (2–2–2); apical cymbium shows an unusual modification forming a ‘thick cone’ (Figs 2A, 3A). Bulb straw coloured; sperm duct

broad along the entire length; embolus with nearly uniform thickness, with 1¼ coils, with pointed tip directed at 11 o' clock in ventral view (Figs 2B–C, 3B–C).

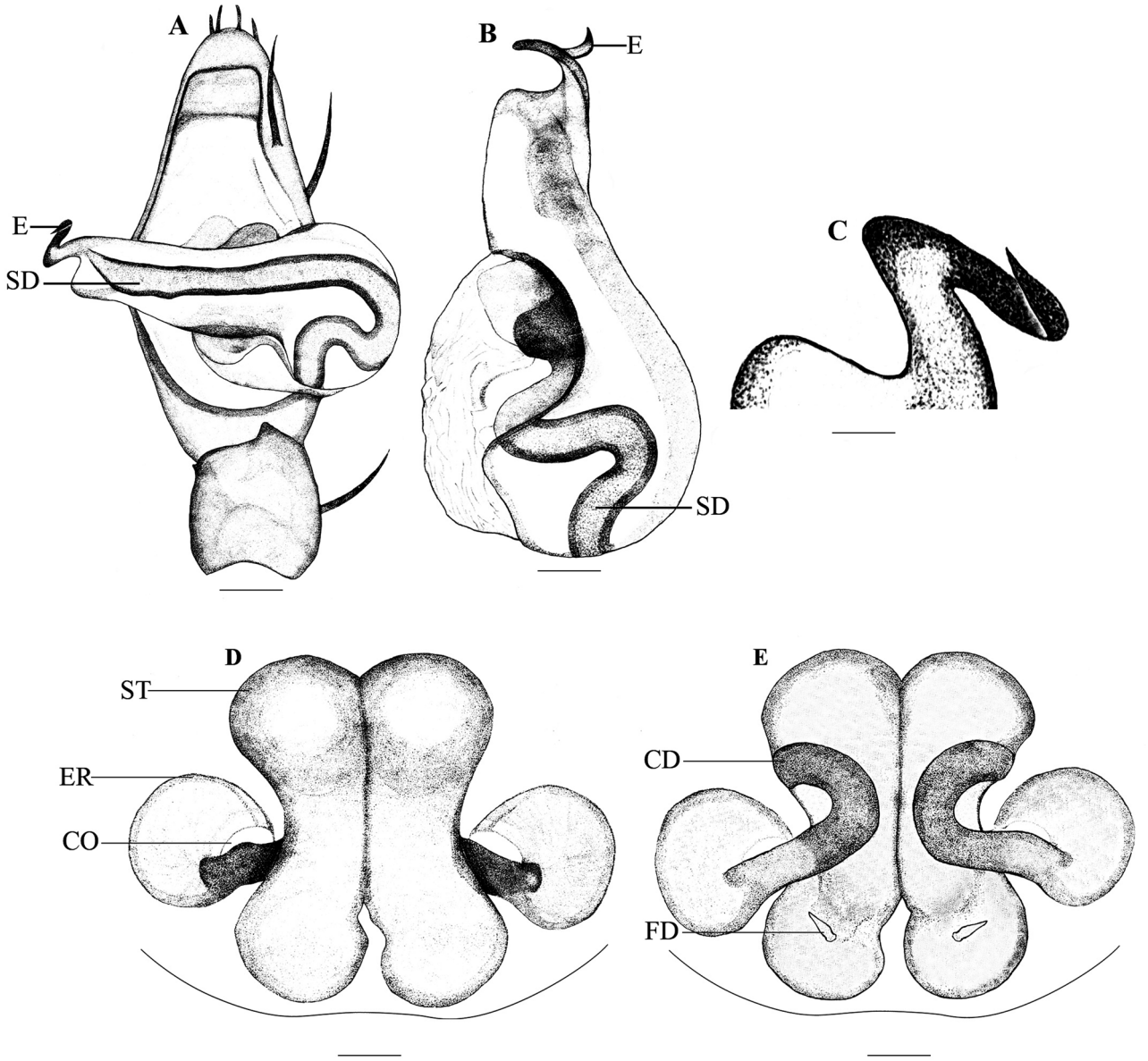

FIGURE 3A–E. *Cambalida deorsa* **sp. n.** A Male right pedipalp, ventral view; B Bulb, ventro-retrolateral view; C Embolus enlarged, ventral view; D Epigyne, ventral view; E Vulva, dorsal view. Abbreviations: CD copulatory duct, CO copulatory opening, E embolus, ER epigynal ridge, FD fertilization duct, SD sperm duct, ST spermatheca. Scale bars: A: 0.1 mm; B: 0.07 mm; C: 0.02 mm; D–E: 0.06 mm.

Female in alcohol (paratype, Figs 1F–K): In all details like male except the following: Prosoma with a median longitudinal dark band between the fovea and the posterior eye row, with dorso-lateral black striations. Chelicerae with apical fang shield mound bearing long, unmodified setae (Fig. 1J). Opisthosoma ovate, greyish; dorsum with small anterior scutum, with two pairs of sigilla; posteriorly with a pair of short, parallel, rectangular white patches; venter with four longitudinal discontinuous lines, without ventral scutum; post-epigastric sclerite poorly defined. Leg segments of III and IV brownish. Palpal segments yellowish-brown. Body length 4.94. Prosoma length 2.24, width 1.68, height 0.62. Opisthosoma length 2.70, width 1.76, height 1.74. Eye diameters: ALE 0.12, AME 0.11, PLE 0.14, PME 0.135. Eye interdistances: AME–AME 0.06, ALE–ALE 0.31, ALE–PME 0.15, PLE–PLE 0.49, PME–PME 0.13, PME–PLE 0.07, AME–ALE 0.01, AME–PME 0.12, ALE–PLE 0.07. Clypeus height at ALE 0.10, at AME 0.10. Chelicerae length 0.89. Measurements of palp and legs. Palp 2.17 [0.65, 0.31, 0.43, 0.78], I

6.01 [1.68, 0.57, 1.47, 1.31, 0.98], II 5.45 [1.58, 0.53, 1.26, 1.17, 0.91], III 5.17 [1.51, 0.40, 1.07, 1.40, 0.79], IV 7.94 [2.03, 0.60, 1.96, 2.24, 1.11]. Leg formula: 4123. Spination. Palp: femur do 2, patella pl 1 do 2, tibia pl 2 rl 2, tarsus pl 2 rl 1 plv 1 rlv 1; legs: femora: I pl 1 do 3, II pl 1 do 3 rl 1, III–IV pl 2 do 3 rl 1; patellae: I–IV spineless; tibiae: I plv 2 rlv 2, II pl 1 rlv 2, III–IV pl 2 do 1 rl 2 plv 3 rlv 2; metatarsi: I–II plv 2 rlv 2, III–IV pl 4 do 1 rl 4 plv 2 rlv 2 vt 1; tarsi: I–IV spineless. *Epigynum* (Figs 2D–E, 3D–E): Weakly sclerotised with circular epigynal ridges, with medium sized lateral copulatory openings, with W-shaped posterior margin (Figs 3D–E). Spermathecae dumb-bell shaped with spherical anterior part (spermathecae II) and reniform posterior part (spermathecae I). Copulatory ducts long, dark, with sharp median inward curving (Figs 2E, 3E). Fertilization ducts tiny, medially placed on spermathecae I (Fig. 3E).

Distribution. South and mid-western India (Fig. 7).

***Cambalida tuma* sp. n.**
(Figs 4A–K, 5A–E, 6A–E)

Type material. Holotype: ♂ (ADSH 18101A), **INDIA: *Gujarat*:** Narmada: Dediyapada, 21°37'36.39"N, 73°35'09.29"E, 172 m a.s.l., D.A. Prajapati leg., 17 June 2015, by hand from the ground; **Paratypes:** 7 ♀ (ADSH 18101B), same data as holotype.

Etymology. The specific epithet is an adjective derived from the prominent apico-retrolateral bulging of the tegular tip, which is unique to the species. Latin *tumes* = bulging.

Diagnosis. *Cambalida tuma* **sp. n.** is most similar to *C. loricifera* (Simon, 1886), but can be distinguished by the following combination of characters: tegular tip with a prominent apico-retrolateral bulging (Figs 5A–C, 6A–C) (tegular tip of *C. loricifera* with less prominent apico-retrolateral bulging, see Haddad 2012: fig. 56); embolus with apico-prolateral origin (Figs 5C, 6C) (in *C. loricifera*, embolus originates apico-medially, see Haddad 2012: figs. 56, 91); median embolic turn long and transverse to the longitudinal axis (Figs 5C, 6C) (in *C. loricifera*, median embolic turn short and oblique to the longitudinal axis, see Haddad 2012: figs 56, 91); comparatively thick, blunt embolic tip (Figs 5C, 6C) (embolic tip in *C. loricifera* is narrow, angular, see Haddad 2012: figs. 56, 91); and copulatory ducts without median curve (Figs 5D, 5E, 6D, 6E) (in *C. loricifera*, copulatory ducts with median curve, see Haddad 2012: figs. 89, 90).

Description. *Male* in alcohol (holotype, Figs 4A–E): In colouration and general shape, like the male of *Cambalida deorsa* **sp. n.** except brownish segments of legs III and IV. Body length 4.01. Prosoma length 1.99, width 1.40, height 0.80. Opisthosoma length 2.02, width 1.17, height 0.98. Eye diameters: ALE 0.09, AME 0.08, PLE 0.12, PME 0.11. Eye interdistances: AME–AME 0.05, ALE–ALE 0.28, ALE–PME 0.16, PLE–PLE 0.44, PME–PME 0.10, PME–PLE 0.05, AME–ALE 0.02, AME–PME 0.13, ALE–PLE 0.05. Clypeus height at ALE 0.09, at AME 0.11. Chelicerae length 0.48. Measurements of palp and legs. Palp 1.62 [0.51, 0.16, 0.25, 0.7], I 4.55 [1.24, 0.40, 1.23, 0.94, 0.74], II 3.86 [1.09, 0.37, 0.88, 0.89, 0.63], III 3.8 [0.94, 0.37, 0.84, 1.03, 0.62], IV 5.76 [1.49, 0.55, 1.38, 1.56, 0.78]. Leg formula: 4123. Spination. Palp: femur do 2, patella pl 1, tibia pl 1, cymbium/tarsus pl 2; legs: femora: I–II pl 1 do 3, III pl 1 do 3 rl 1, IV pl 2 do 3 rl 1; patellae: I–IV spineless; tibiae: I plv 2 rlv 2, II rlv 2, III pl 2 do 1 rl 2 plv 1, rlv 1, IV pl 2 do 1 rl 2 plv 3 rlv 2; metatarsi: I–II plv 2 rlv 2, III pl 3 rl 3 plv 2 rlv 2 vt 1, IV pl 3 rl 3 plv 3 rlv 3; tarsi: I–IV spineless. *Pedipalp* (Figs 5A–C, 6A–C): Palpal segments brownish; cymbium/tarsus apically with six stout setae on dorsal surface, arranged in three rows (2–2–2); apical cymbium unusually modified as a ‘thick cone’ (Figs 5A, 6A). Bulb straw coloured; sperm duct broad along the entire length; tegular tip with a prominent apico-retrolateral bulging (Fig. 6C, arrow); embolus with 1¼ coils, with broad base, with transverse median turn, with blunt tip, directed at 1 o’ clock in ventral view (Figs 5A, 5C, 6A, 6C).

Female in alcohol (paratype, Figs 4F–K): Resembles the female of *Cambalida deorsa* **sp. n.** in body colour and general appearance, except brownish femur III and yellowish tarsus IV. Body length 4.84. Prosoma length 2.08, width 1.51, height 0.86. Opisthosoma length 2.76, width 1.76, height 1.76. Eye diameters: ALE 0.10, AME 0.09, PLE 0.13, PME 0.12. Eye interdistances: AME–AME 0.06, ALE–ALE 0.30, ALE–PME 0.17, PLE–PLE 0.49, PME–PME 0.10, PME–PLE 0.06, AME–ALE 0.03, AME–PME 0.15, ALE–PLE 0.07. Clypeus height at ALE 0.08, at AME 0.10. Chelicerae length 0.69. Measurements of palp and legs. Palp 1.78 [0.52, 0.22, 0.36, 0.68], I 4.98 [1.35, 0.59, 1.20, 1.04, 0.80], II 4.48 [1.24, 0.51, 1.07, 0.98, 0.68], III 4.44 [1.24, 0.51, 0.93, 1.17, 0.59], IV 6.78 [1.75, 0.69, 1.61, 1.92, 0.81]. Leg formula: 4123. Spination. Palp: femur do 2, patella pl 1 do 2, tibia pl 2 do 1 rl 2, cymbium/tarsus pl 3 rl 1 plv 1 rlv 1; legs: femora: I–II pl 1 do 3, III–IV pl 2 do 3 rl 1; patellae: I–IV spineless;

FIGURE 4A–K. *Cambalida tuma* **sp. n.** A Holotype male from Dediyapada, dorsal view; B Same, ventral view; C Same, lateral view; D Male, frontal view; E Male abdomen, ventral view; F Paratype female from Dediyapada, dorsal view; G Same, ventral view; H Same lateral view; I Female, frontal view; J Female chelicerae, ventral view shoving the apical fang shield bearing long setae; K Femur IV (left), retrolateral view showing distal femoral constriction. Abbreviations: PES post-epigastric sclerite, TS tracheal scute, VS ventral sclerite. Scale bars: A–C, F–H: 1 mm; D, I: 0.2 mm; E, J, K: 0.5 mm.

FIGURE 5A–E. A Male left pedipalp, ventral view; B Same, retrolateral view; C Embolus enlarged, ventral view; D Epigyne, ventral view; E Vulva, dorsal view. Scale bars: A–E: 0.2 mm.

tibiae: I plv 2 rlv 2, II rlv 2, III pl 2 do 1 rl 2 plv 3 rlv 1, IV pl 2 do 1 rl 2 plv 2 rlv 2; metatarsi: I–II plv 2 rlv 2, III pl 3 rl 3 plv 3 rlv 3 vt 1, IV pl 3 rl 2 plv 3 rlv 3 vt 1; tarsi: I–IV spineless. *Epigynum* (Figs 5D–E, 6D–E): Weakly sclerotised with circular epigynal ridge, with medium-sized lateral copulatory openings, with convex posterior margin (Fig. 6D). Spermathecae dumb-bell shaped with spherical anterior part (spermathecae II) and reniform posterior part (spermathecae I). Copulatory ducts medium sized, dark without median inward curving (Figs 5E, 6E). Fertilization ducts tiny, prolatero-medial to spermathecae I (Fig. 6E).

Distribution. Mid-western India (Fig. 7).

Cambalida flavipes (Gravely, 1931) comb. nov.

Castaneira flavipes Gravely, 1931: 275, figs 20D–E (Generic name misspelled; description and illustration of ♂ and ♀ [Type (whether ♂ or ♀ is unspecified) from INDIA: Odisha (formerly Orissa): Ganjam: Chilka Lake: Barkuda Island; F.H. Gravely leg.; repository ZSI—NOT EXAMINED]).

Castianeira flavipes Tikader, 1981: 260, figs 5–8 (Generic name corrected; redescription and illustration of ♂ and ♀); Majumder & Tikader, 1991: 135, figs 276–281 (Redescription and illustration of ♂ and ♀).

Justification for the transfer. Gravely (1931) described this species based on male and female specimens. Later

this species was redescribed by Tikader (1981) and Majumder & Tikader (1991). The original drawings and descriptive characters given by Gravely (1931: fig. 20D), Tikader (1981: figs 5, 7–8) and Majumder & Tikader (1991: figs 276, 278–279, 281) indicate that this species shares the characteristic features of *Cambalida* rather than *Castianeira*: broader carapace; prosoma, opisthosoma, legs brownish with some yellow bands; posterior eye row slightly larger than anterior; small dorsal opisthosomal scutum; palp without apophysis, with compressed, coiled embolus; vulva with spermatheca I (globular) and II (reniform) and copulatory ducts with median curving. Judging from this, it is clear that Gravely and the subsequent researchers misplaced this species within the genus *Castianeira*. Here we transfer this species from *Castianeira* to *Cambalida*.

Distribution. Southern and eastern India (Fig. 7).

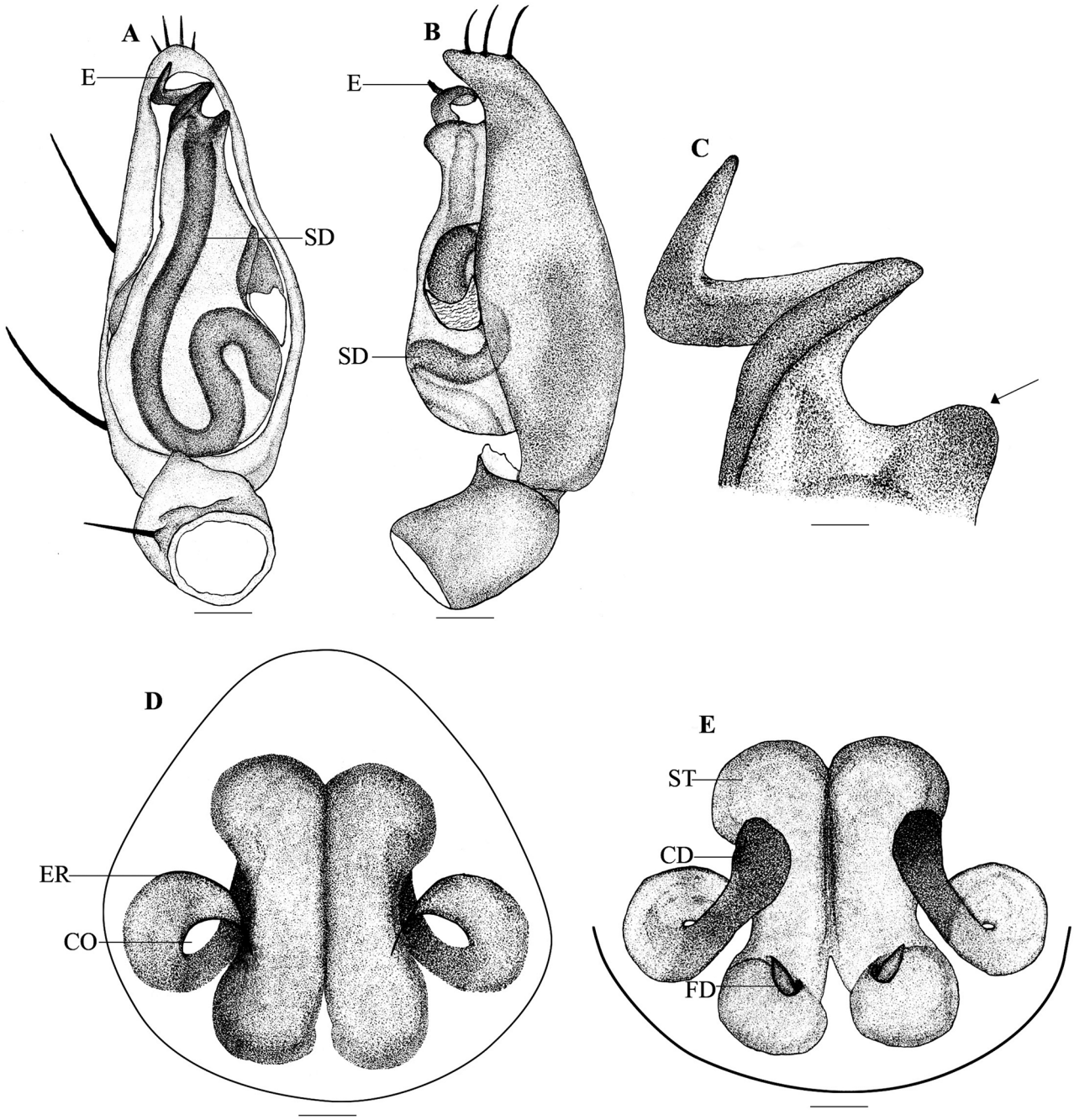

FIGURE 6A–E. *Cambalida tuma* **sp. n.** A Male left pedipalp, ventral view; B same, retrolateral view; C Embolus enlarged with prominent apico-retrolateral bulging of tegulum (arrow), ventral view; D Epigyne, ventral view; E Vulva, dorsal view. Abbreviations: CD copulatory duct, CO copulatory opening, E embolus, ER epigynal ridge, FD fertilization duct, SD sperm duct, ST spermatheca. Scale bars: A–B: 0.1 mm; C: 0.02 mm; D: 0.05 mm; E: 0.07 mm.

Remark. The two *Cambalida* species described here have distal femoral constrictions on legs III and IV in both sexes (Figs 1K, 4K). This character is seen in many Australian Castianeirines (Raven 2015), but was not reported in recent revision of *Cambalida* (Haddad 2012). It is, however, also found in all species of African *Cambalida* (Haddad, pers. comm.).

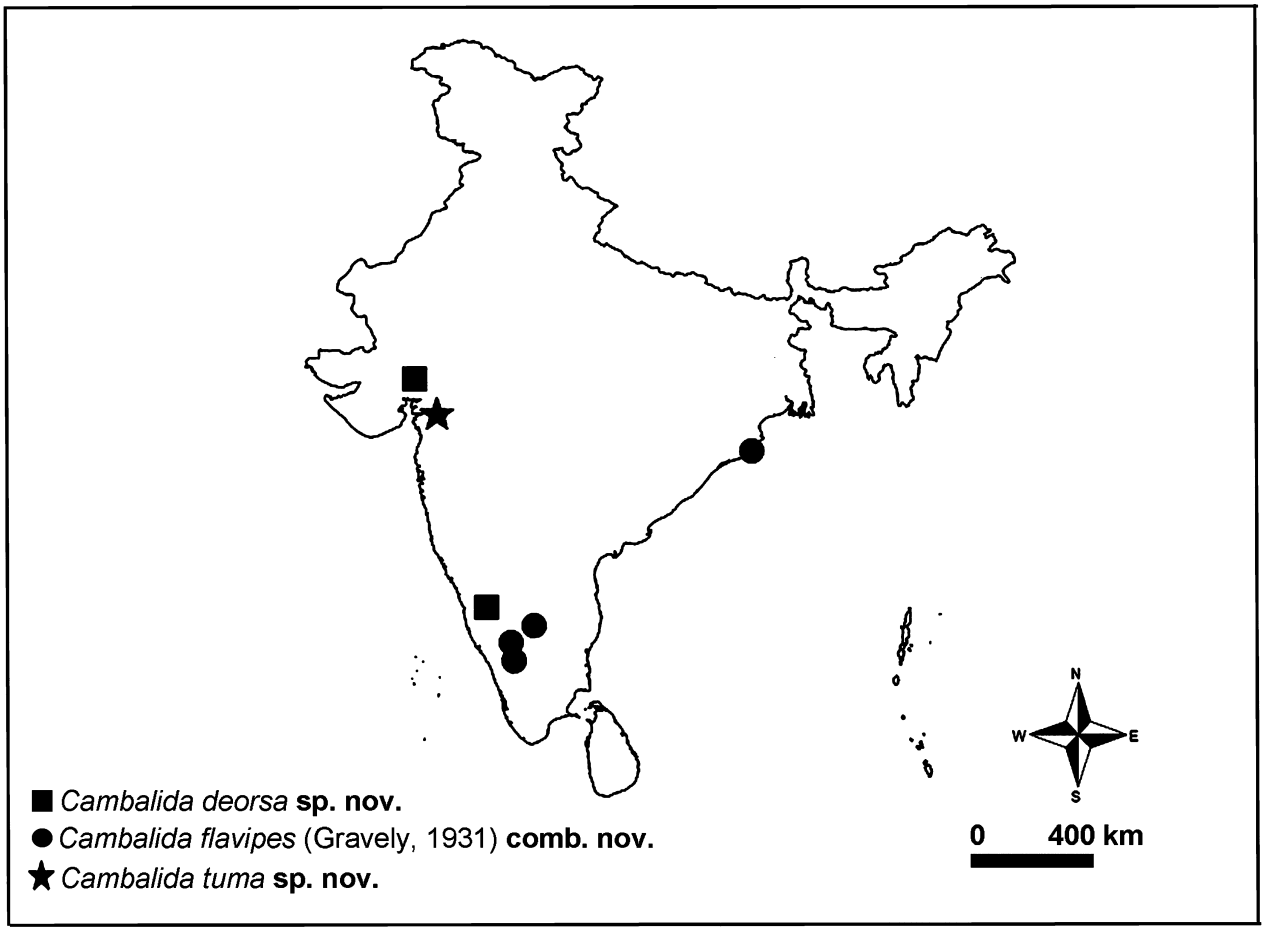

FIGURE 7. Distribution records of Indian *Cambalida* spp. ● records from literature.

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Two new species of *Stenaelurillus* Simon, 1886 from India (Araneae: Salticidae: Aelurillina)

DHRUV A. PRAJAPATI[1,3], PRASHANTHAKUMARA S. MURTHAPPA[1,2],
PRADEEP M. SANKARAN[1] & POTHALIL A. SEBASTIAN[1]

[1]*Division of Arachnology, Department of Zoology, Sacred Heart College, Thevara, Cochin, Kerala 682 013, India*
[2]*Department of PG Studies and Research in Applied Zoology, Bioscience complex, Kuvempu University, Jnana Sahyadri, Shankaraghatta, Shivamogga, Karnataka 577451, India*
[3]*Corresponding author. E-mail: dhruvspidy215@gmail.com*

Abstract

Stenaelurillus digitus **sp. nov.** and *Stenaelurillus gabrieli* **sp. nov.** are described from India. New distributional records for *Stenaelurillus albus* Sebastian *et al.*, 2015 and *Stenaelurillus lesserti* Reimoser, 1934 and maps for these species are given.

Key words: jumping spiders, Oriental region, taxonomy, systematics

Introduction

The jumping spider genus *Stenaelurillus* Simon, 1886 currently has 36 valid species, 27 of which described from Africa, and nine from Asian countries: China, India, Iran, Nepal, Tibet and Vietnam (World Spider Catalog 2016). Wesołowska (2014a) reviewed the Asian species; she synonymized *S. hainanensis* Peng, 1995 with *S. minutus* Song & Chai, 1991, and considered *S. setosus* Thorell, 1895 to be a *nomen nudum*. Sebastian *et al.* (2015) redescribed *S. lesserti* Reimoser, 1934 and documented the occurrence of mating plug in the genus. Despite of the recent efforts, Asian species of *Stenaelurillus* are still poorly understood and most of them remain known only from localities mentioned in their original descriptions. To date, five species of *Stenaelurillus* have been described from India: *S. lesserti* Reimoser, 1934, *S. sarojinae* Caleb & Mathai, 2014, *S. albus* Sebastian, Sankaran, Malamel & Joseph, 2015, *S. jagannathae* Das, Malik & Vidhel, 2015, and *S. metallicus* Caleb & Mathai, 2016. In the present paper, two new species of the genus are described from India.

Material and methods

Samples were collected directly by hand from the ground. The specimens were preserved in 70% ethanol and studied under a LEICA S8AP0 stereomicroscope. Morphological terminology and description style follows Wesołowska (2014b) and Sebastian *et al.* (2015). All measurements are in millimetres (mm) and were made with an ocular micrometer. Length of palp and leg segments are given as: total [femur, patella, tibia, metatarsus (except palp), tarsus]. Spine positions are as follows: prolateral, dorsal, retrolateral and ventral. Drawings were made by the aid of a drawing tube attached to the microscope. Field photos were taken with Sony H X 100V. The microphotographic images were taken by Leica DFC2900 digital camera attached to Leica M205 A stereomicroscope with the software package Leica Application Suite (LAS) version 4.5.0. The specimens are deposited in a reference collection housed at the Division of Arachnology, Department of Zoology, Sacred Heart College, Thevara, Cochin, Kerala, India (ADSH). Abbreviations used in the text: ALE = anterior lateral eye, AME = anterior median eye, PLE = posterior lateral eye, PME = posterior median eye, RTA = retrolateral tibial apophysis, VTA = ventral tibial apophysis.

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Taxonomy

Stenaelurillus Simon, 1886

Diagnosis. For diagnostic features of the genus, see Sebastian *et al.* (2015).

Type species. *Stenaelurillus nigricauda* Simon, 1886, by original designation.

Stenaelurillus gabrieli sp. nov.

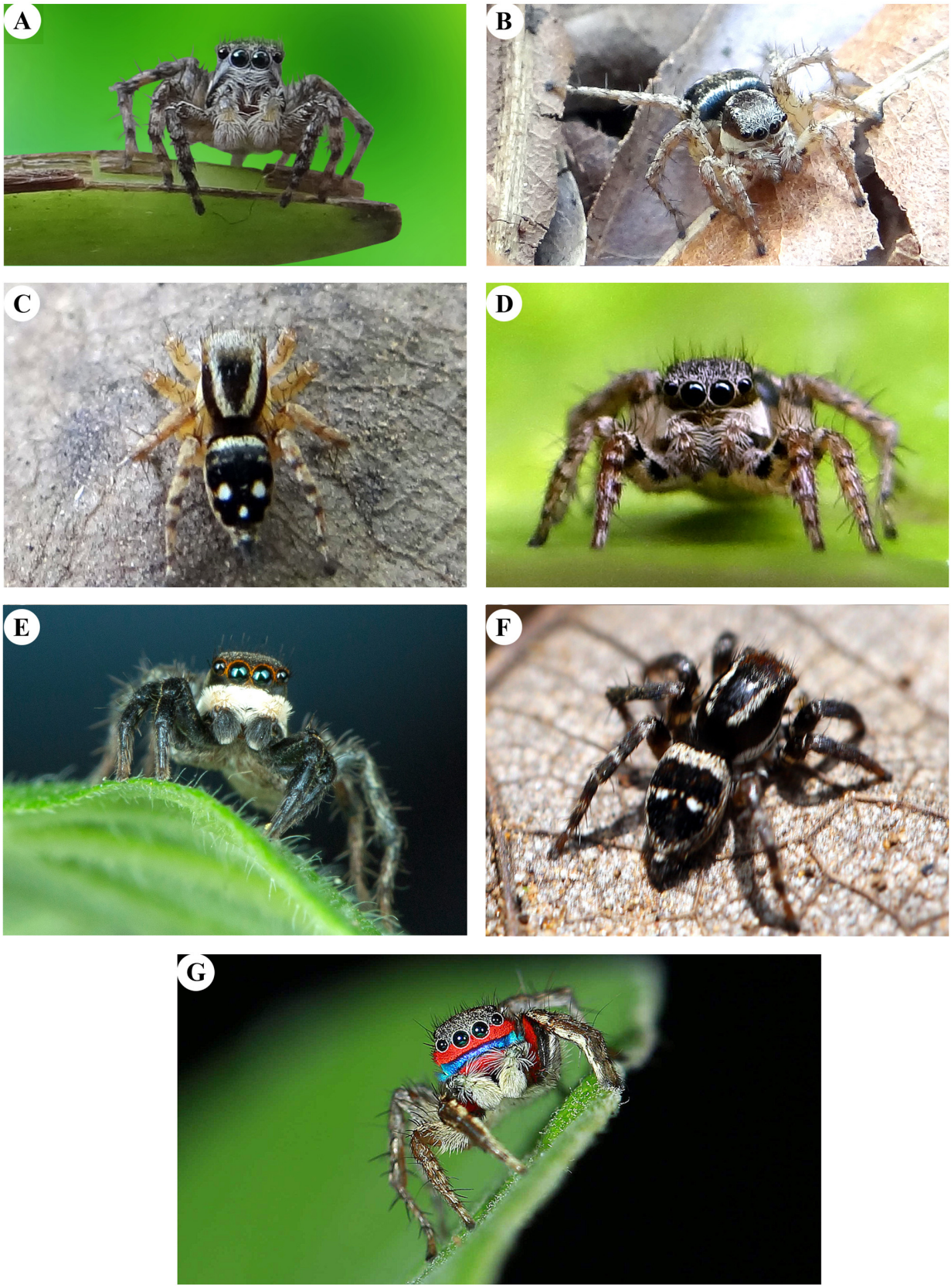
Figs 1A–B, 2A–C, 3A–F, 4A–C, 5A–D, 10

Type material. Holotype: male (ADSH 83503Ci) from Wilson Hills in Dharampur, 20°29'41.52"N, 73°19'52.19"E, Gujarat, India, 456 m. alt., 30 October 2014, D. A. Prajapati leg., by hand from the ground; **Paratypes:** 1 male, 1 female (ADSH 83503Cii), same data as holotype.

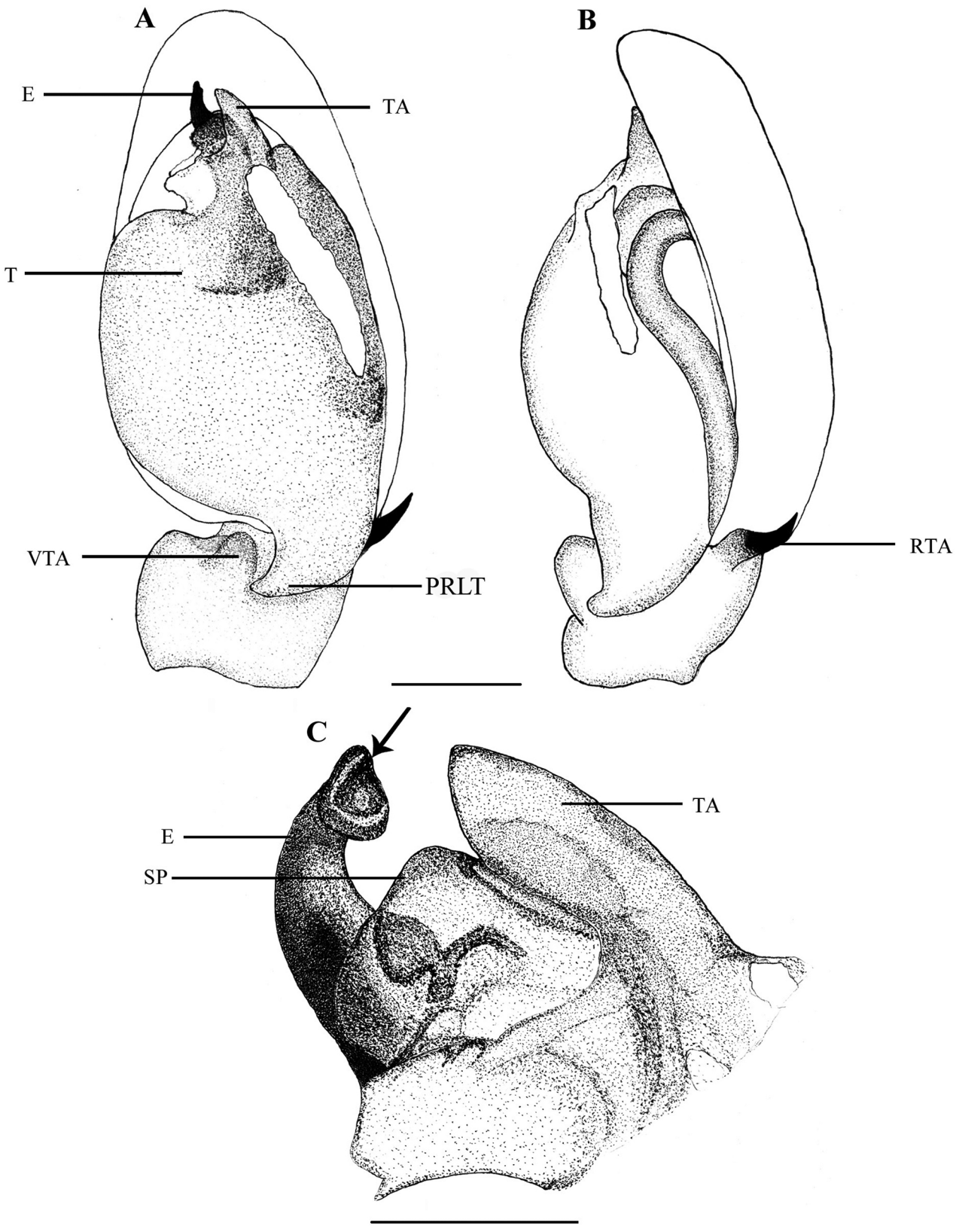
Additional material examined. INDIA: *Gujarat*: Vansda, 20°41'37.27"N, 73°32'09.07"E, 227 m. alt., 30 October 2014, D. A. Prajapati leg., by hand from the ground, 1 female, 2 juvenile females (ADSH 83503Ciii); Gujarat University Campus in Ahmedabad, 23°02'19.90"N, 72°32'35.79"E, 52 m.alt., 3 December 2014, D. A. Prajapati leg., by hand from the ground, 1 female (ADSH 83503Civ).

Diagnosis. *Stenaelurillus gabrieli* **sp. nov.** is similar to *S. natalensis* Haddad & Wesołowska (see Haddad & Wesołowska 2006: figs. 22–26, 28), but can be separated from the latter and all other congeners by the following combination of characters: males by the terminally bifurcated and thick embolus resembling the 'trunk' of an elephant (Figs 2C, arrow, 3F), the short, sclerotized plate lying between the basal parts of embolus and terminal apophysis (Figs 2C, 3F), the single disto-dorsal and long median spine on the palpal femur (Fig 3C, arrows) (this feature has not been recorded in any other described species, except *S. albus*, which has only a single disto-dorsal spine), the size and shape of terminal apophysis (Figs 2A, C). Females are distinguished by the thick and S-shaped copulatory duct, and the size and position of epigynal pocket (Figs 4A–B, 5C–D).

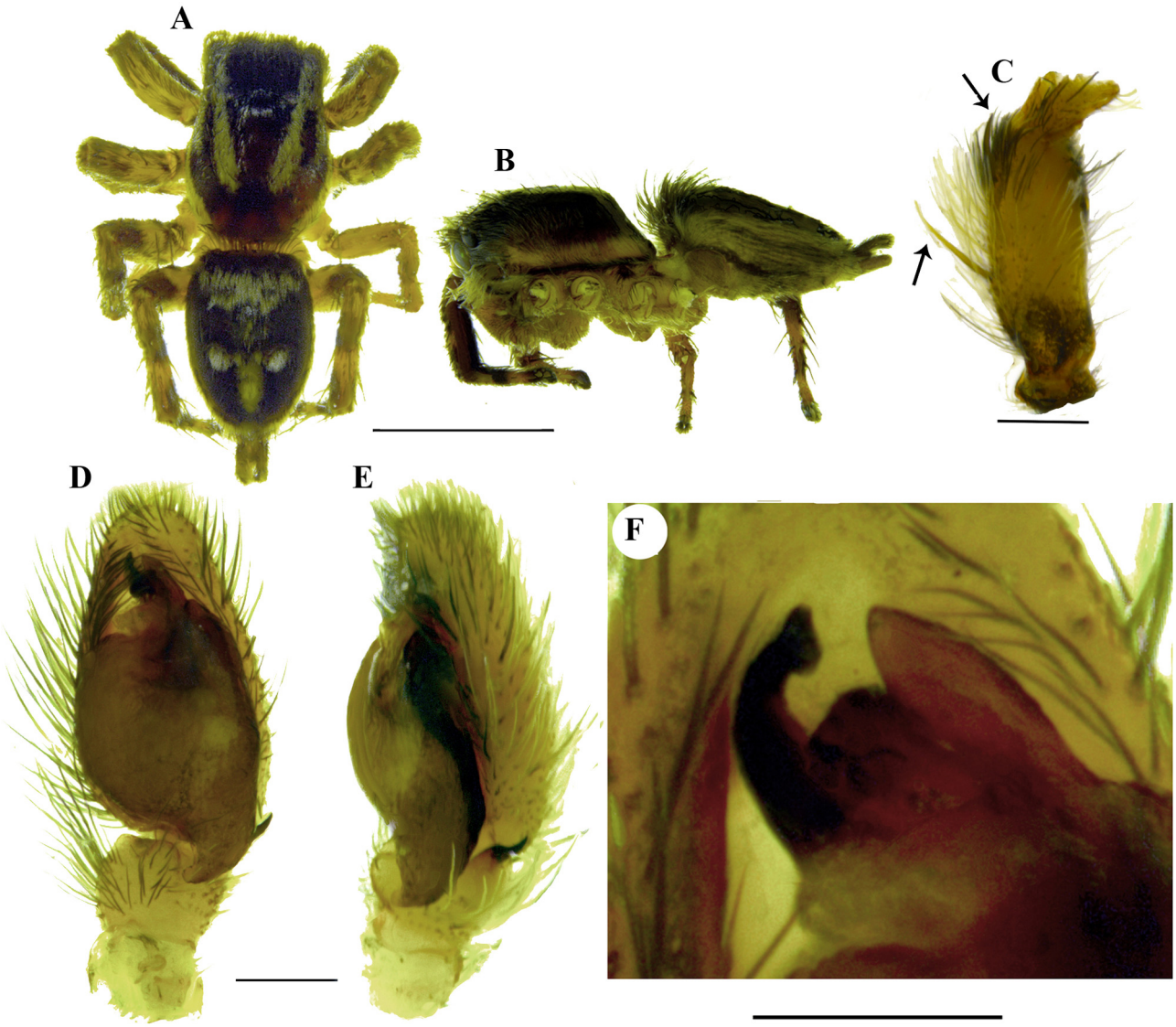
Description. Male (holotype, Figs 1A, 3A–C): Prosoma blackish-brown with white marginal bands of nearly uniform thickness; antero-lateral sides of prosoma provided with additional white hairs; thoracic region dorsally with paired white longitudinal bands extending back from the PLE. Eye field black; anterior row of eyes encircled by tiny black hairs; anterior margin of eye field with thick dense bristles. Clypeus, chelicerae brownish, sparsely covered by long, white hairs. Cheliceral promargin with two teeth, one large and one small, and retromargin with one large tooth. Fangs short, yellowish-brown. Endites, labium, sternum brownish; maxillae with scopulae. Opisthosoma shield-shaped; dorsum blackish-brown with an anterior somewhat 'spectacle'- shaped pattern and posterior two white spots and short, median, longitudinal patch, which together form an inverted triangle; lateral opisthosoma and venter brown with numerous black striae and patches of white hairs. Spinnerets blackish-brown. Leg segments brownish with black patches. Body length 5.66 (variation: 5.25–5.66, n=2). Prosoma length 2.92, width (at the middle) 2.13, height (at the middle) 1.81. Opisthosoma length 2.74, width (at the middle) 2.03, height (at the middle) 1.78. Eye diameter: ALE 0.32, AME 0.56, PLE 0.25, PME 0.07. Eye interdistances: AME–AME 0.07, AME–ALE 0.06, ALE–ALE 1.22, ALE–PME 0.28, PLE–PLE 1.48, PME–PME 1.65, PME–PLE 0.26. Clypeus height at ALE 0.30, at AME 0.20. Chelicera length 0.72. Measurements of palp and legs. Palp 2.08 [0.79, 0.27, 0.23, 0.79], I 4.63 [1.54, 0.83, 0.89, 0.73, 0.64], II 4.51 [1.59, 0.76, 0.84, 0.63, 0.69], III 6.55 [2.07, 0.77, 1.42, 1.48, 0.81], IV 6.82 [2.06, 0.78, 1.43, 1.72, 0.83]. Leg formula: 4312. Spination. Palp: 0200, 0000, 0000, 0000; legs: femora I 0500, II 0710, III 2600, IV 0700; patellae I–II 1000, III–IV 0200; tibiae I–II 2004, III 2323, IV 3133; metatarsi I 3204, II 2024, III 3234, IV 2534; tarsi I–IV 0000. Pedipalp (Figs 2A–C, 3D–F): palpal segments pale yellow; femur and patella with black blotches; femur with two dorsal spines; a short distal spine encircled by short black hairs, a long median spine; dorsally and prolaterally with long yellowish hairs (Fig 3C); patella with black hairs dorsally, yellowish hairs ventrally; tibia laterally with long yellowish-white hairs; cymbium dorsally with yellowish-white hairs, laterally with long black hairs. Ventral tibial apophysis short with blunt end, directed at 1 o'clock position in ventral view (Figs 2A, 3D). Retrolateral tibial apophysis simple with broad base, pointed end, directed at 1 o' clock position in ventral view, left palp (Figs 2A, 3D). Bulb yellowish-brown, with a retrolateral creamy-white region running from the base of the terminal apophysis up to the anterior curving of sperm duct (Figs 2A–B); tegulum disto-medially provided with a short, sclerotized plate, lying between embolus and terminal



FIGURES 1A–G. Field photographs. *Stenaelurillus gabrieli* **sp. nov.**: A male (from Wilson Hills); B female (from Vansda); *Stenaelurillus digitus* **sp. nov.**: C male (from Vijaynagar); D female (from Vijaynagar); *Stenaelurillus albus* Sebastian *et al.*, 2015: E male (from Cherukadu; photo credit K. S. Nafin); F female (from Cherukadu); *Stenaelurillus lesserti* Reimoser, 1934: G male (from Kuchimudi; photo credit K. S. Nafin).



FIGURES 2A–C. *Stenaelurillus gabrieli* **sp. nov.**, left male palp. A ventral view; B retrolateral view; C embolic division, prolatero-ventral view. Abbreviations: E = embolus; PRLT = proximal retrolateral lobe of tegulum; RTA = retrolateral tibial apophysis; SP = sclerotized plate; T = tegulum; TA = terminal apophysis; VTA = ventral tibial apophysis. Scale bars A–B, 0.2 mm; C, 0.05 mm.



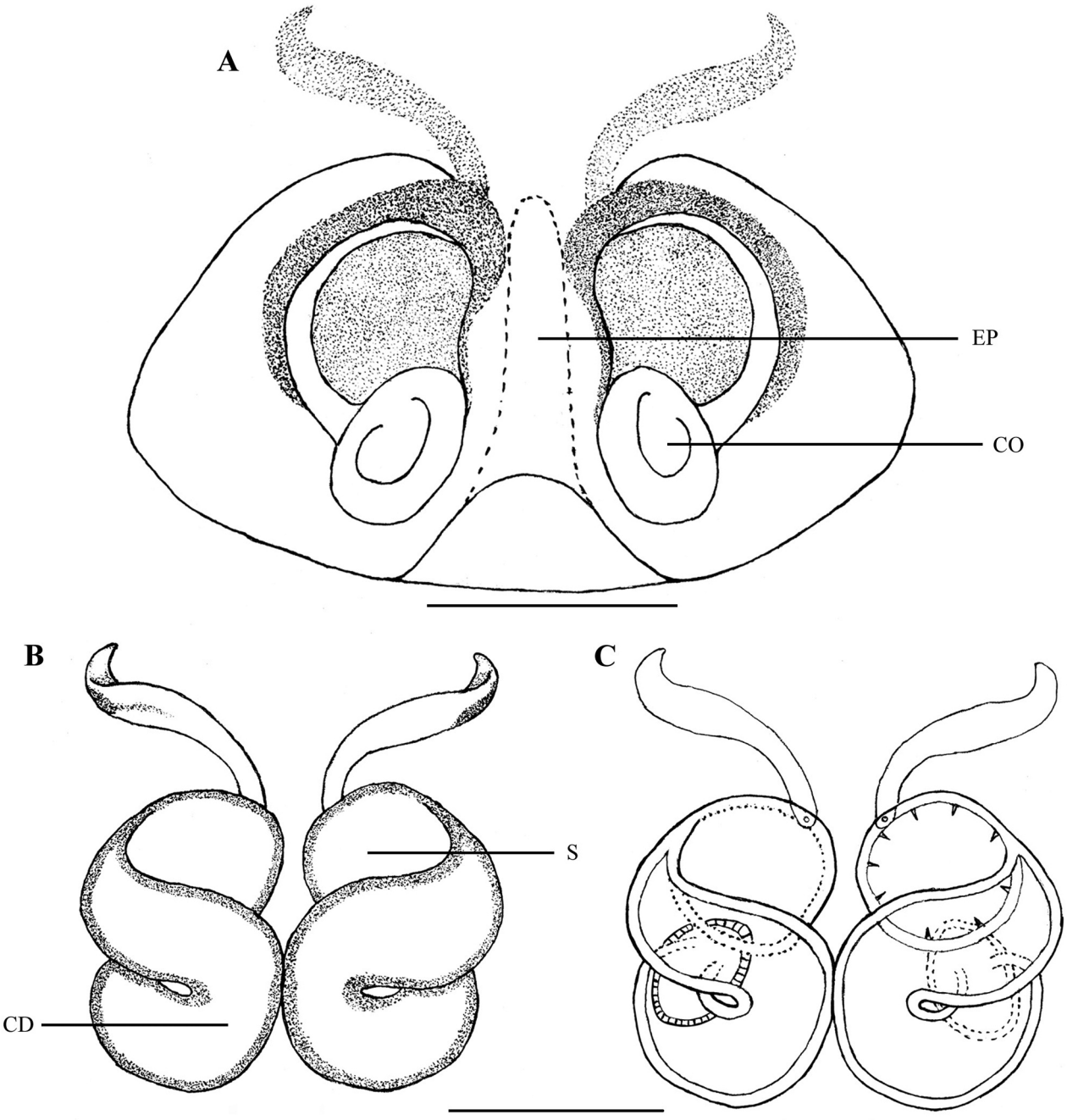
FIGURES 3A–F. *Stenaelurillus gabrieli* **sp. nov.**, male. A dorsal view; B lateral view; C left palpal femur, prolateral view (arrows showing dorsal spines); D left male palp, ventral view; E same, retrolateral view; F embolic division, prolatero-ventral view. Scale bars A–B, 2 mm; C–F, 0.2 mm.

apophysis (Figs 2C, 3F); proximal retrolateral lobe of tegulum not fused with tibia; embolus short, directed at 12 o'clock position in ventral view, with 'lip-like' tip resembling the 'trunk' of elephant (Figs 2A, 2C, 3F); conductor apparently absent; terminal apophysis thick, short, nearly as long as the embolus, directed at 10 o'clock position in ventral view (Figs 2A, 2C, 3F).

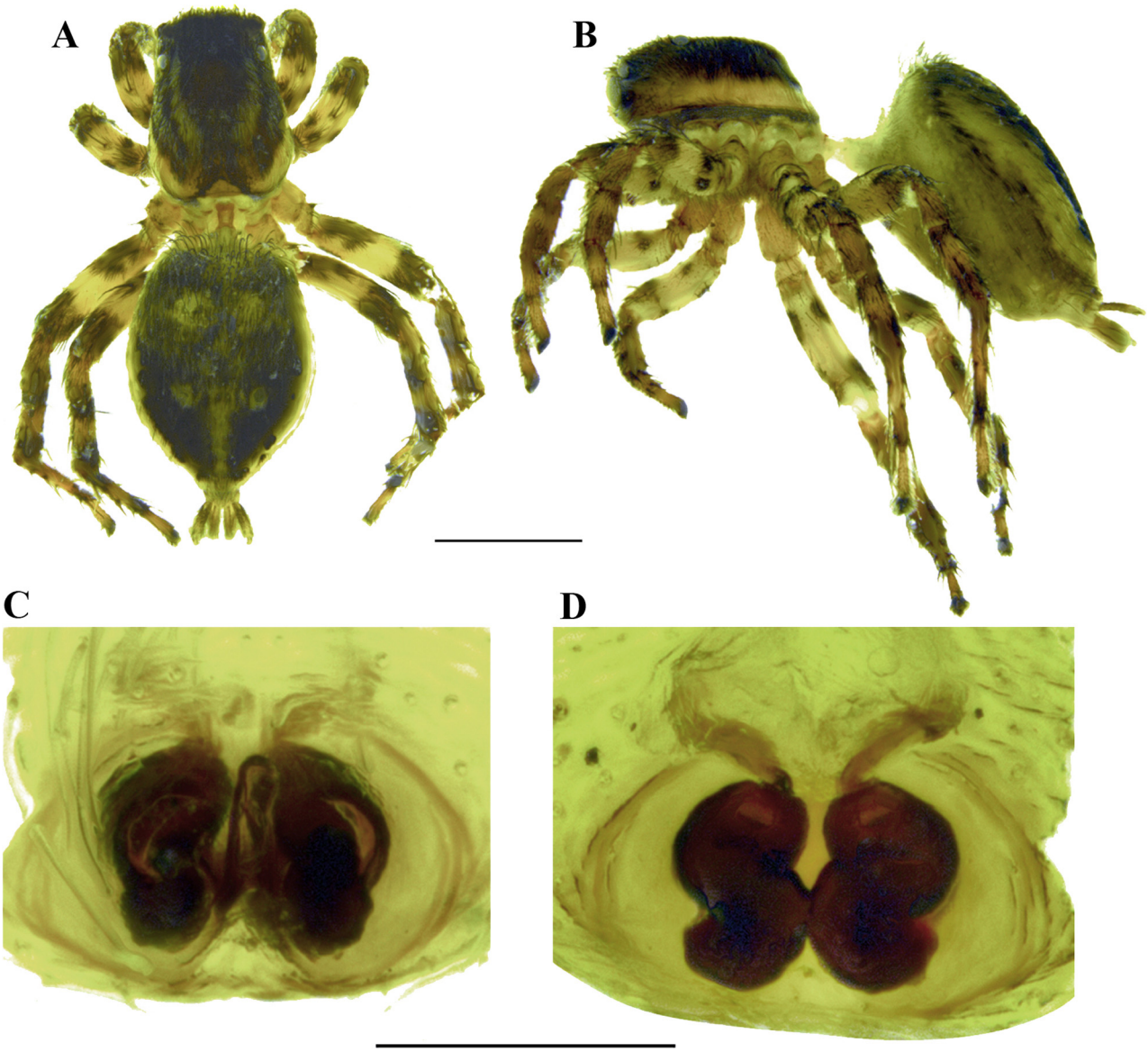
Female (paratype, Figs 1B, 5A–B): In all details like male, except the following: Prosoma brown. Anterior row of eyes encircled by tiny white hairs. Clypeus pale yellow. Fangs reddish-brown. Sternum pale yellow. Opisthosoma oval; dorsum brown to blackish-brown, provided anteriorly with a pair of large irregular, pale yellow patches and three small patches lying below the larger patches that roughly forming a triangle; posterior spots are brown. Palpal segments dull yellow with black patches. Body length 7.02 (variation: 6.50–7.02, n=3). Prosoma length 3.28, width (at the middle) 2.19, height (at the middle) 1.69. Opisthosoma length 3.74, width (at the middle) 3.01, height (at the middle) 2.70. Eye diameter: ALE 0.32, AME 0.57, PLE 0.26, PME 0.08. Eye interdistances: AME–AME 0.07, AME–ALE 0.06, ALE–ALE 1.23, ALE–PME 0.45, PLE–PLE 1.47, PME–PME 1.65, PME–PLE 0.24. Clypeus height at ALE 0.64, at AME 0.24. Chelicera length 0.79. Measurements of palp and legs. Palp 2.23 [0.82, 0.24, 0.45, 0.72], I 4.57 [1.63, 0.74, 0.79, 0.78, 0.63], II 4.6 [1.64, 0.78, 0.91, 0.67, 0.60], III 6.79 [2.36, 0.81, 1.48, 1.38, 0.76], IV 7.23 [2.19, 0.75, 1.46, 1.97, 0.86]. Leg formula: 4321. Spination. Palp: 0100, 0000, 0000, 0201; legs: femora I–II 1600, III 2510, IV 0510; patellae I–II 1000, III–IV 1010; tibia I 2005, II 2004, III

4133, IV 3333; metatarsus I 2004, II 1024, III 2634, IV 2524; tarsi I–IV 0000. Epigynum (Figs 4A–C, 5C–D): simple, represented by triangular sclerotized plate (Figs 4A, 5C). Copulatory openings large, obliquely placed, situated near the posterior epigynal margin (Figs 4A, 5C). Copulatory ducts thick, S-shaped with small, nearly spherical spermathecae (Figs 4B–C, 5D). Epigynal pocket narrow, elongated, reaching nearly up to the anterior epigynal margin (Figs 4A, 5C).

Etymology. The specific epithet is a patronym in honor of Padma Bhushan Fr. Gabriel Chiramel CMI, the founder of the Department of Zoology, for his great contributions to the Sacred Heart College, on the occasion of his 102th birthday.



FIGURES 4A–C. *Stenaelurillus gabrieli* **sp. nov.**, female copulatory organ. A epigyne, ventral view; B–C internal duct system, dorsal view. Abbreviations: CO = copulatory opening; CD = copulatory duct; EP = epigynal pocket; S = spermatheca. Scale bars A–C, 0.1 mm.



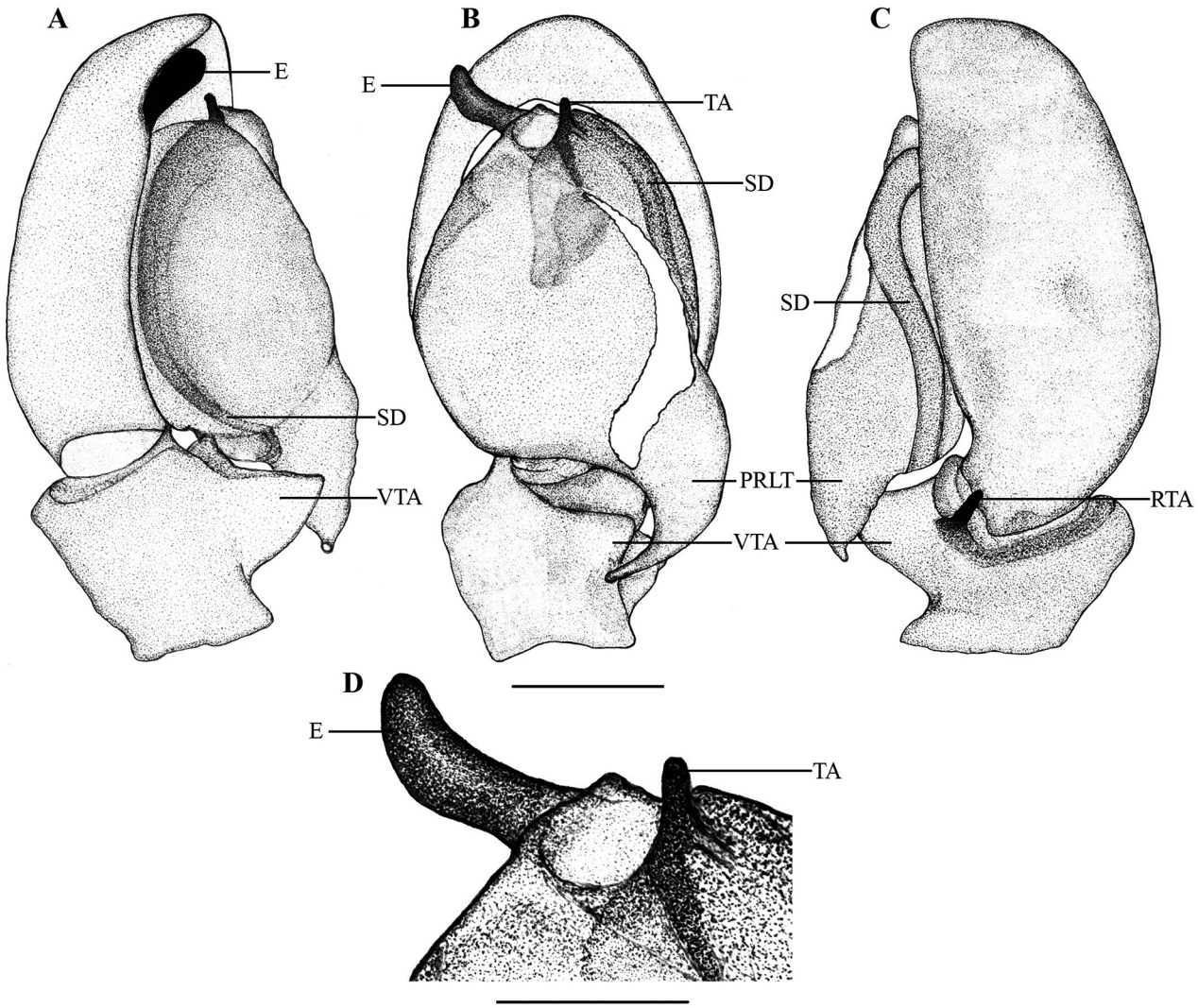
FIGURES 5A–D. *Stenaelurillus gabrieli* **sp. nov.**, female. A dorsal view; B lateral view; C epigyne, ventral view; D internal duct system, dorsal view. Scale bars A–B, 2 mm; C–D, 0.2 mm.

***Stenaelurillus digitus* sp. nov.**
Figs 1C–D, 6A–D, 7A–E, 8A–C, 9A–D, 11

Type material. Holotype: male (ADSH 83503Di) from Vijaynagar in Sabarkantha, 23°59'56.24"N, 73°16'48.79"E, Gujarat, India, 307 m. alt., 27 June 2014, D. A. Prajapati leg., by hand from the ground. **Paratypes:** 2 males, 3 females (ADSH 83503Dii), same data as holotype, except 21 May 2016.

Diagnosis. *Stenaelurillus digitus* **sp. nov.** is similar to *S. albus* Sebastian *et al*., 2015 (see Sebastian *et al*. 2015: figs 1–3, 8–9) and to *S. jagannathae* Vidhel *et al*., 2015 (see Vidhel *et al*. 2015: figs 3–6, 9–11), but can be distinguished from all congeners by the following combination of characters: males can be easily distinguished from those of *S. albus* by its opisthosomal pattern (blackish opisthosoma without any pattern in *S. albus*); long and prolaterally bend embolus, directed at 11 o'clock position in ventral view (left palp) and not visible from retrolateral view (short and directed at 12 o'clock position in *S. albus*; straight and directed at 12 o'clock position and clearly visible in retrolateral view in *S. jagannathae*); VTA massive, triangular in shape (short and blunt in *S.*

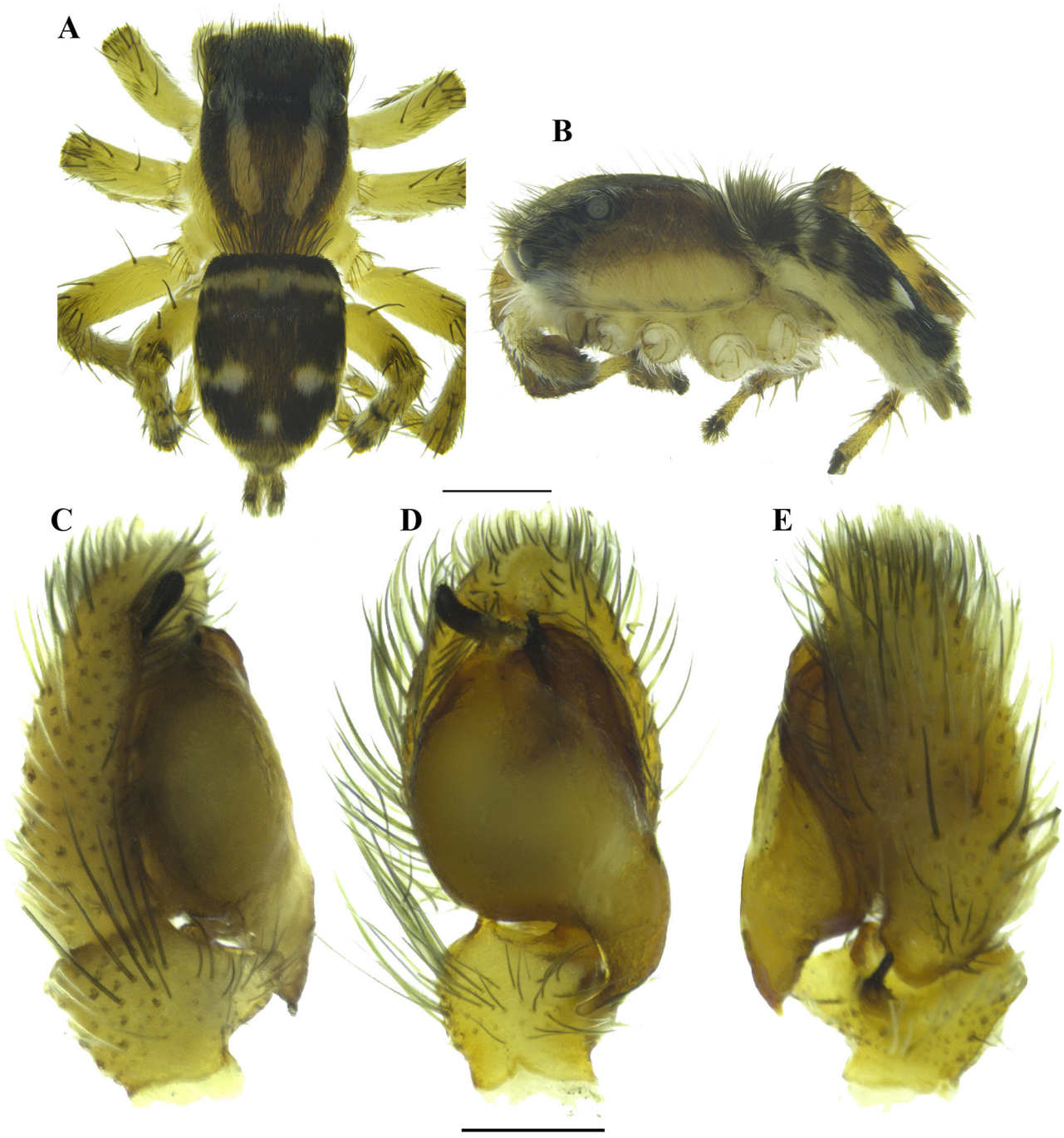
albus); RTA blunt, directed at 1 o'clock position in ventral view in left palp (pointed and directed at 1 o'clock position in *S. albus* and 12 o'clock position in *S. jagannathae*); depressed apical region of tegulum can be visible in retrolateral view (bulky in the case of *S. jagannathae*); proximal retrolateral lobe of tegulum significantly curved at retrolateral side (Figs 6B, 7D). Females can be distinguished by short and moderately broad epigynal pocket with two sclerotized lateral lobes, which form a "w-shaped" mark (Figs 8A, 9C); simple, linear copulatory duct (Fig 8C); contiguous spermathecae (Figs 8B, 9D) (separated in *S. jagannathae*).



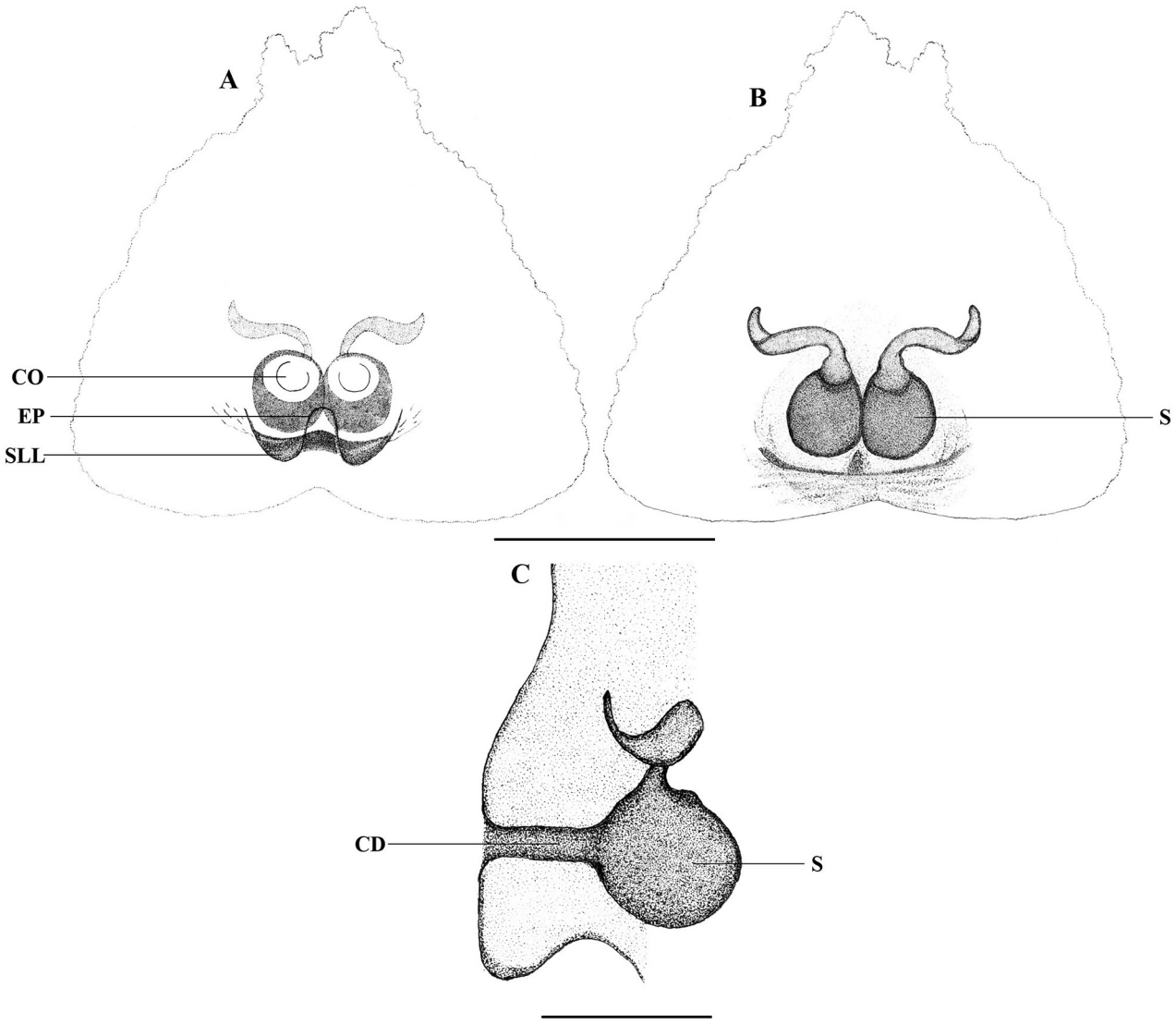
FIGURES 6A–D. *Stenaelurillus digitus* **sp. nov.**, left male palp. A prolateral view; B ventral view; C retrolateral view; D embolic division, ventral view. Abbreviations: E = embolus; PRLT = proximal retrolateral lobe of tegulum; RTA = retrolateral tibial apophysis; SD = sperm duct; TA = terminal apophysis; VTA = ventral tibial apophysis. Scale bars A–C, 0.2 mm; D, 0.1 mm.

Description. Male (holotype, Figs 1C, 7A–B): In all details like the males of *S. gabrieli* **sp. nov.**, except for the following: prosoma antero-laterally without additional white hairs. Fovea less prominent, located medially between PLEs. Thoracic region with few scattered bristles. Dorsum of opisthosoma anteriorly with a thick transverse white band; posteriorly with three white spots, which together form an inverted triangle (Fig. 7A). Body length 3.95. Prosoma length 2.04, width (at the middle) 1.63, height (at the middle) 0.98. Opisthosoma length 1.91, width (at the middle) 1.40, height (at the middle) 0.60. Eye diameter: ALE 0.26, AME 0.40, PLE 0.20, PME 0.08. Eye interdistances: AME–AME 0.03, AME–ALE 0.03, ALE–ALE 0.90, ALE–PME 0.31, PLE–PLE 1.05, PME–PME 1.23, PME–PLE 0.21. Clypeus height at ALE 0.46, at AME 0.19. Chelicera length 0.76. Measurements of palp and legs. Palp 1.48 [0.51, 0.24, 0.20, 0.53], I 3.07 [1.05, 0.41, 0.70, 0.44, 0.47], II 2.95 [1.09, 0.35, 0.63, 0.45, 0.43], III 4.57 [1.49, 0.69, 0.91, 1.04, 0.44], IV 4.60 [1.32, 0.58, 0.95, 1.23, 0.52]. Spination. Palp 0100, 0000,

0000, 0000; femora I 0700, II 0800, III 2600, IV 0500; patellae I 0010, II 1000, III–IV 0200; tibiae I 2005, II 2124, III 2323, IV 2523; metatarsi I 2014, II 1314, III 2613, IV 2514; tarsi I–IV 0000. Pedipalp (Figs 6A–D, 7C–E): palpal femur with single dorsal spine. Ventral tibial apophysis massive, triangular, directed at 2 o' clock position in ventral view (Figs 6B, 7D). Retrolateral tibial apophysis simple with less prominent base, with blunt tip (Figs 6C, 7E). Retrolateral creamy-white region of tegulum extends up to the base of proximal retrolateral lobe of tegulum (Figs 6B, 7D); tegulum lacks disto-median sclerotized plate; proximal retrolateral lobe of tegulum with a sharp baso-retrolateral curve, with narrow distal part; embolus long with prolateral bend resembling the 'thumb finger', its tip directed at 11 o'clock position in ventral view in left palp (Figs 6D, 7D); terminal apophysis short, originated apico-medially, directed at 12 o'clock position in ventral view in left palp (Figs 6D, 7D).



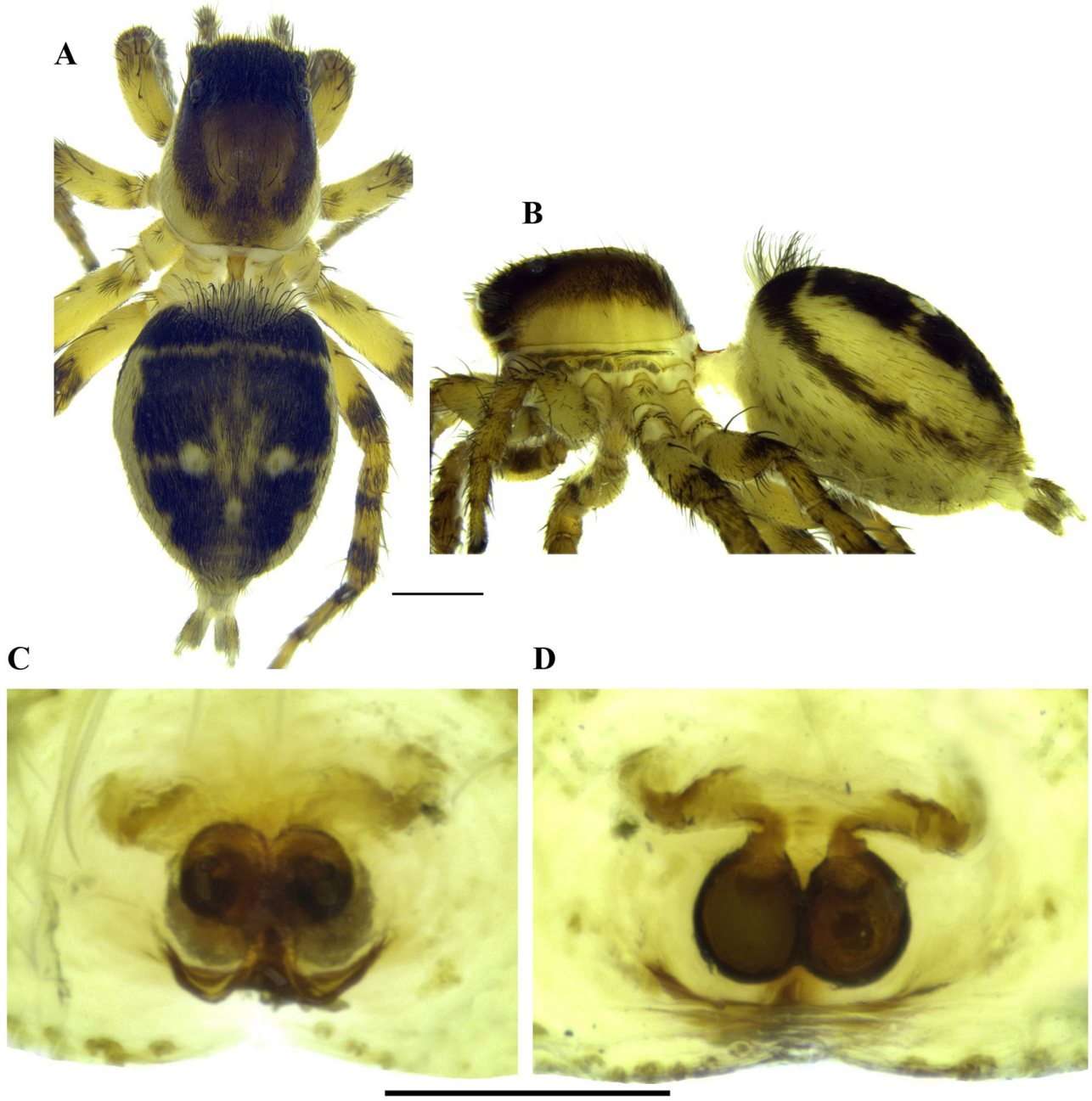
FIGURES 7A–E. *Stenaelurillus digitus* **sp. nov.**, male. A dorsal view; B lateral view; C left male palp, prolateral view; D same, ventral view; E same, retrolateral view. Scale bars A–B, 1 mm; C–E, 0.2 mm.



FIGURES 8A–C. *Stenaelurillus digitus* **sp. nov.**, female copulatory organ. A Epigyne, ventral view; B vulva, dorsal view; C epigyne, lateral view. Abbreviations: CO = copulatory opening; CD = copulatory duct; EP = epigynal pocket; S = spermatheca; SLL = sclerotized lateral lobe. Scale bars A–B, 0.2 mm; C, 0.1 mm.

Female (paratype, Figs 1D, 9A–B): In all details like male, except for the following: variation in colour and opisthosomal pattern. Body length 7.11. Prosoma length 3.09, width (at the middle) 2.38, height (at the middle) 1.79. Opisthosoma length 4.02, width (at the middle) 3.54, height (at the middle) 3.10. Eye diameter: ALE 0.33, AME 0.50, PLE 0.31, PME 0.10. Eye interdistances: AME–AME 0.09, AME–ALE 0.05, ALE–ALE 1.23, ALE–PME 0.26, PLE–PLE 1.43, PME–PME 1.59, PME–PLE 0.20. Clypeus height at ALE 0.51, at AME 0.28. Chelicera length 0.79. Measurements of palp and legs. Palp 2.01 [0.64, 0.25, 0.43, 0.69], I 4.27 [1.50, 0.70, 0.91, 0.62, 0.54], II 4.24 [1.61, 0.63, 0.84, 0.65, 0.51], III 6.99 [2.26, 0.99, 1.52, 1.62, 0.60], IV 7.01 [2.02, 0.82, 1.52, 1.88, 0.77]. Leg formula: 4312. Spination. Palp 0000, 0000, 0000, 0211; femora I 1510, II 1520, III 2510, IV 0510; patellae I–II 1000, III–IV 1010; tibiae I–II 2005, III–IV 2523; metatarsi I 0104, II 2004, III 1714, IV 2624; tarsi I–IV 0000. Epigynum (Figs 8A–C, 9C–D): simple, slightly bulging, which can be seen in lateral view (Fig. 8C); copulatory openings large; copulatory ducts simple, thin and linear, with highly sclerotized, spherical and contiguous spermathecae (Figs 8A–C, 9C–D); epigynal pocket moderately broad, short, with two sclerotized lateral lobes that form a "w-shaped" mark (Figs 8A, 9C).

Etymology. The specific epithet is a noun in apposition due to the finger-like embolus (Latin *digitus* = finger).



FIGURES 9A–D. *Stenaelurillus digitus* **sp. nov.**, female. A dorsal view; B lateral view; C epigyne, ventral view; D vulva, dorsal view. Scale bars A–B, 2 mm; C–D, 0.2 mm.

New records for *Stenaelurillus albus* and *Stenaelurillus lesserti* from India

Stenaelurillus albus Sebastian *et al.*, 2015

Figs 1E–F, 10

New records: INDIA: ***Kerala*:** Ernakulam, Cherukadu in Bhoothathankettu Forest Reserve (10°08'22.48"N, 76°40'02.14"E; 37 m. alt.): 1 male and 2 females, 21 April 2015; Illithodu (10°11'55.94"N, 76°33'00.57"E; 24 m. alt.): 2 females, 5 June 2015; Kodanad elephant training centre (10°10'57.72"N, 76°31'01.41"E; 16 m. alt.): 1 male and 1 female, 22 April 2015; Karimala peak, Parambikulam Tiger Reserve (10° 22'00.5"N, 76° 44'47.4"E; 1287

m. alt.): 3 males and 5 females, 27 October 2015. ***Karnataka*:** Shimoga, Kuvempu University Campus in Shankaraghatta (13°44'06.04"N, 75°37'52.10"E; 662 m. alt.): 1 male and 2 females, 19 August 2015. All collected by D. A. Prajapati and deposited in ADSH.

Distribution. India (Kerala, Karnataka).

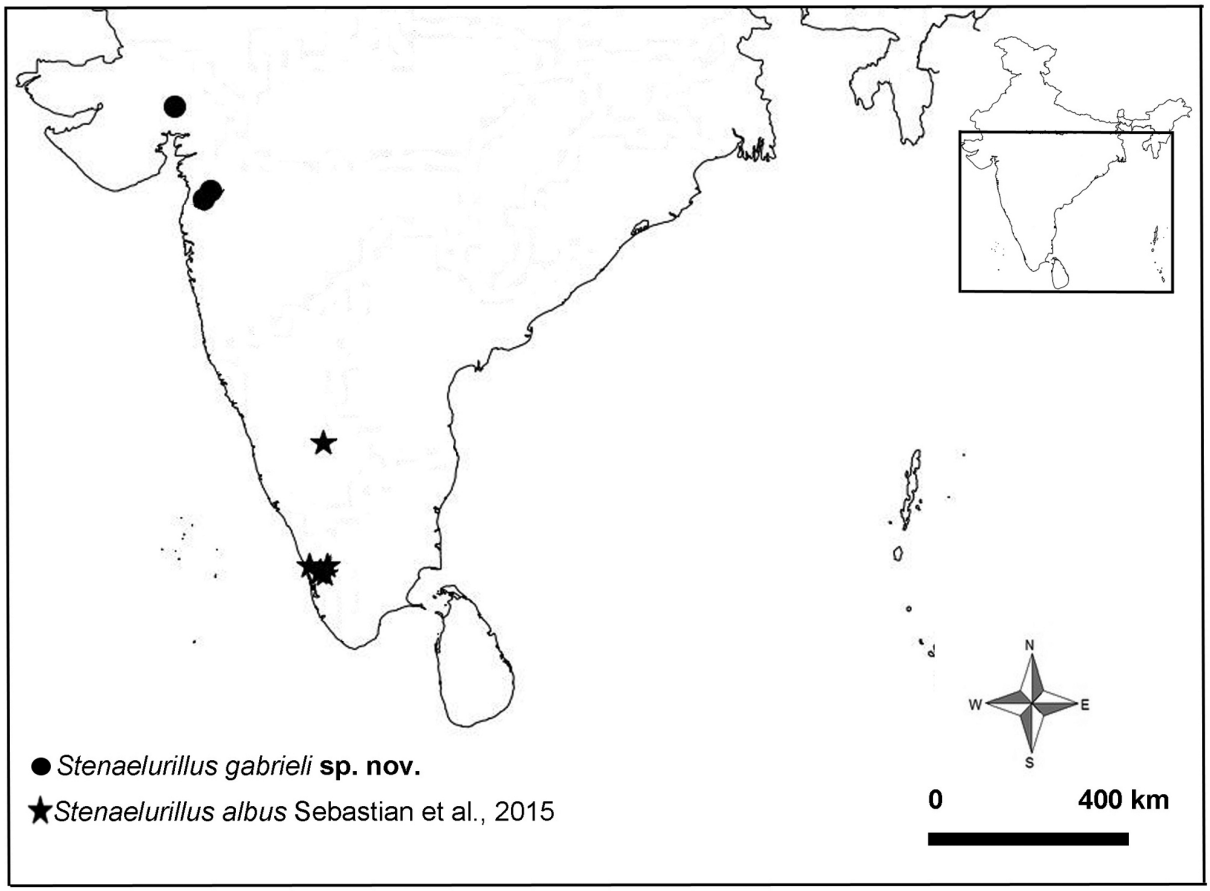


FIGURE 10. Distributional records of *S. gabrieli* **sp. nov.** and *S. albus* Sebastian *et al*., 2015 in India.

Stenaelurillus lesserti **Reimoser, 1934**
Figs 1G, 11

New records: INDIA: *Kerala*: Ernakulam, Cherukadu in Bhoothathankettu Forest Reserve (10°08'22.48"N, 76°40'02.14"E; 37 m. alt.): 1 male and 3 females, 23 April 2015; Hill Palace Campus in Thrippunithura (9°57′09.50″ N, 76°21′50.09″ E; 29 m. alt.): 1 male, 28 May 2015; Palakkad, Sungam Range in Parambikulam Tiger Reserve (10°31'22. 8"N, 76°50'16.8"E; 400 m. alt.): 10 males and 15 females, 28 October 2015.

Distribution. India (Kerala, Tamil Nadu), Sri Lanka.

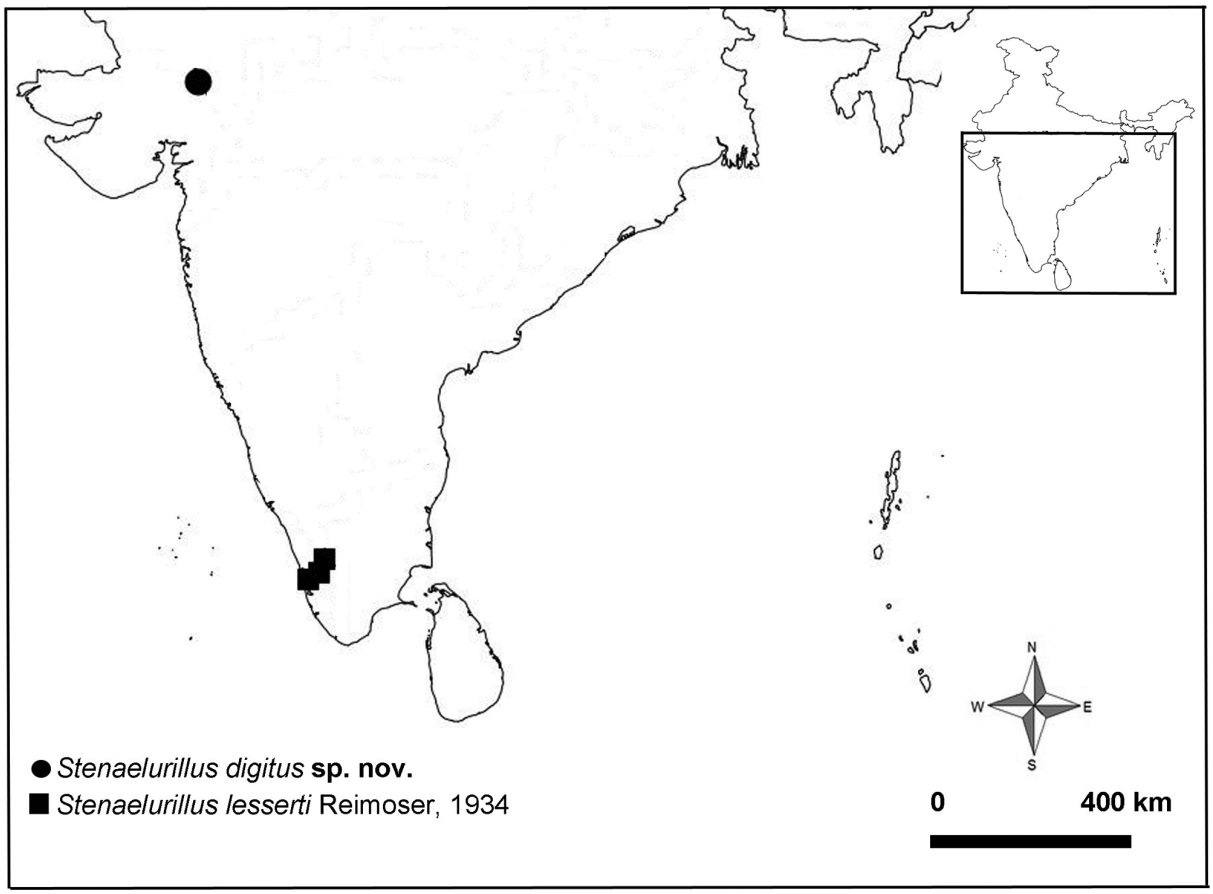


FIGURE 11. Distributional records of *S. digitus* **sp. nov.** and *S. lesserti* Reimoser, 1934 in India.

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