



On the type species of the genus *Aetius* O. Pickard-Cambridge, 1896: The first description of male with notes on cymbial notch and mating plug (Araneae: Corinnidae: Castianeirinae)

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The rare ant mimicking sac spider genus *Aetius* was erected by O. Pickard-Cambridge in 1896 based on an unspecified number of female specimen(s) collected from Sri Lanka. The type species of the genus, *A. decollatus* O. Pickard-Cambridge, 1896, has been redescribed twice based on the holotype (Majumder & Tikader 1991; Deeleman-Reinhold 2001). Reimoser (1934) recorded the genus for the first time from India, who collected a male specimen from Mudumalai Tiger Reserve in Tamil Nadu State of southern India. This specimen was identified as *A. decollatus*, but it was never formally described and was later recognised to be a penultimate male (Dankittipakul & Singtripop 2013). Deeleman-Reinhold (2001) described the second representative of the genus, *A. nocturnus*, based on a single female specimen from Borneo, 105 years after the establishment of the genus. Dankittipakul & Singtripop (2013) described the male of *A. nocturnus*, thereby revealing the male genitalia of the genus, but the type species was still known only from the female sex.

This paper provides the first description of the hitherto unknown male of *A. decollatus* and redescribes the female based on freshly collected materials from the Wayanad Wildlife Sanctuary in the Kerala State, which is part of the Western Ghats of India, and the agricultural plains of Pollachi in the Tamil Nadu State of India. The proposed function and significance of the semi-circular cymbial notch of the male palp, which is unique to the males of *Aetius* spp. (Dankittipakul & Singtripop 2013), is discussed. The occurrence of mating plugs in the genus and variations in body pattern are reported. Additionally, the current distribution of *A. decollatus* is mapped.

Fresh material was collected directly by hand. All measurements are in millimetres (mm). Length of palp and leg segments are as follows: total (femur, patella, tibia, metatarsus (except palp), and tarsus). Description and terminology follow Reiskind (1969) and Raven (2015), and spine positions follow the format of Bosselaers & Jocqué (2000). The following morphological indices are also recorded: carapace index = carapace width/carapace length x 100, sternum index = sternum width/sternum length x 100, abdominal index = abdominal width/abdominal length x 100, dorsal sclerite index = dorsal sclerite width/dorsal sclerite length x 100. Drawings were made by the aid of a drawing tube attached to the microscope. The micro photographic images were taken with Olympus EPL-3 digital camera attached to a Magnus MSZ TR stereo microscope; the photographs were stacked using Combine ZP software (www.hadleyweb.pwp.blueyonder.co.uk) to create a final image. The specimens are deposited in a reference collection housed at the Centre for Animal Taxonomy and Ecology, Department of Zoology, Christ College, Irinjalakuda, Kerala (CATE).

Abbreviations used in the text: AER—anterior eye row, ALE—anterior lateral eye, AME—anterior median eye, do—dorsal, MOQ—median ocular quadrangle, OUMNH—Oxford University Museum of Natural History, pl—prolateral, PER—posterior eye row, PLE—posterior lateral eye, PME—posterior median eye, rl—retrolateral, rlv—retrolateral ventral, vt—ventral.

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spider at Pollachi and Mr Alex C. Jose for preparing the distribution map. We are thankful to the Principal Chief Conservator of Forests, Kerala for the collecting permit, and Assistant Wildlife Wardens Mr Gopalan Ambalakandiyil and Mr Krishnadas K. Rajan, and Forester Mr Suresh Thenambath for the hospitality and field support. This study was funded by Science & Engineering Research Board (SERB)—DST, New Delhi under Young Scientist Research project: No. SB/YS/LS-86/2013.

***Aetius* O. Pickard-Cambridge, 1896**

Type species. *Aetius decollatus* O. Pickard-Cambridge, 1896 by original designation.

Diagnosis. *Aetius* is most similar to *Serendib* Deeleman-Reinhold, 2001 and *Sphecotypus* O. Pickard-Cambridge, 1895 in having wide, strongly recurved posterior eye row and heavily sclerotized abdomen. It can be distinguished from *Serendib* by the carapace with a posterior protrusion, which projects over the pedicel, subpentagonal carapace with a broad central plateau, which slopes towards the lateral and posterior margins, absence of paired dorsal spines anteriorly on the abdomen, posterior abdomen with tufts of long white hairs, highly sclerotized epigyne, spermathecae I simple and narrow, male palp with straight embolus and baso-retrolateral semi-circular cymbial notch. The genus can be separated from *Sphecotypus* by the absence of a deep constriction behind cephalic region (O. Pickard-Cambridge 1896; Dankittipakul & Singtripop 2013).

***Aetius decollatus* O. Pickard-Cambridge, 1896**

Figs 1–8

Aetius decollatus O. Pickard-Cambridge, 1896: 1006, plate LII, figs 1, 1a–e; Petrunkevitch, 1928: 178; Reimoser, 1934: 491; Majumder & Tikader, 1991: 161, figs 338–342; Deeleman-Reinhold, 2001: 336, figs 496–501; Dankittipakul & Singtripop, 2013: 582.

Type material. Holotype female from Sri Lanka, O. Pickard-Cambridge leg., 1896, deposited in OUMNH, EXAMINED.

Additional material examined. **INDIA: Kerala:** Wayanad, Wayanad Wildlife Sanctuary, Kurichiad Range, 11°45'55.3"N 76°14'57.4"E, 843 m, P.P. Sudhin leg., 16.VI.2014, by hand, 1♂ (CATE090101A); Bathery Range, 11°40'48.3"N, 76°20'38.1"E, 850 m, P.P. Sudhin leg., 17.VI.2015, by hand, 1♀ (CATE090101B). **INDIA: Tamil Nadu:** Coimbatore, Pollachi, Angalakurichi, 10°30'42.5"N, 76°59'21.4"E, 300 m, K.S. Nafin leg., 14 & 28.X.2015, from bark of *Tamarindus indica*, by hand, 5♂, 3♀ (CATE090101C).

Diagnosis. Both males and females of *A. decollatus* can be separated from the only congener, *A. nocturnus* by the following combination of characters: carapace reddish-orange with black cephalic region (carapace in *A. nocturnus* uniformly dark chestnut brown), abdomen with anterior reddish-orange, inverted U-shaped patch (abdomen in *A. nocturnus* without such patch), abdomen with two tufts of long white hairs at the posterior (single tuft in *A. nocturnus*), posterior obtuse prolongation over the pedicel less prominent (prominent in *A. nocturnus*), embolus thick with corkscrew appearance (embolus in *A. nocturnus* thin and spiniform), sperm duct with sharp apical twist (sperm duct in *A. nocturnus* with less prominent apical twist), spermathecae II circular with moderately long spermathecae I (spermathecae II ovate with short spermathecae I in *A. nocturnus*) and funnel-like copulatory openings (*A. nocturnus* with semi-circular copulatory openings) (compare Figs 1A–D, 3D–E, 4B, 5B,F, 8B with Deeleman-Reinhold 2001: figs 503, 504 and Dankittipakul & Singtripop 2013: figs 1–2, 12, 16, 18).

Description. **Male** (CATE090101C) (Figs 1A–C, 2A–C, 3A, E): Measurements: Body length 7.30. Carapace length 3.20, width (at middle) 1.83, carapace index 57.18. Sternum length 1.74, width 1.30, sternum index 74.71. Pedicel length 0.39, width 0.33. Abdomen length 3.71, width (at middle) 1.41, abdominal index 38. Dorsal sclerite length 3.48, width 1.61, dorsal sclerite index 46.26. Epigastric sclerite length 0.97, width 1.25. Ventral sclerite length 1.84, width 1.03. Inframamillary sclerite length 0.46, width 0.72. Eye sizes and interdistances: ALE 0.08, AME 0.12, PLE 0.07, PME 0.09; AME–ALE 0.05, AME–AME 0.15, AME–PME 0.13, PME–PLE 0.27, PME–PME 0.27. Clypeus height at AME 0.29, at ALE 0.21. Length of chelicerae 0.83. Measurements of palp and legs: Palp 2.48 [0.71, 0.34, 0.27, 1.16], Leg I 5.31 [1.47, 0.59, 1.20, 1.20, 0.85], Leg II 5.34 [1.57, 0.62, 1.23, 1.10, 0.82], Leg III 5.03 [1.48, 0.64, 1.20, 1.07, 0.64], Leg IV 6.49 [1.88, 0.65, 1.70, 1.49, 0.77]. Leg formula: 4213. Spination. Palp: femur do 2, patella pl 1 do 1, tibia pl 2 do 1, tarsus pl 1; Legs: Femur I pl 1 do 2, II do 2, III pl 1 do 2, IV pl 1 do 3; Patellae I–IV spineless; Tibiae I–II plv 3 rlv 3, III plv 2 rlv 2, IV plv 3 rlv 3; Metatarsi I–II plv 2 rlv 2, III rl 1 plv 1 rlv 1 vt 1, IV pl 1 rl 2 plv 1 rlv 1 vt 1; Tarsi I–IV spineless.

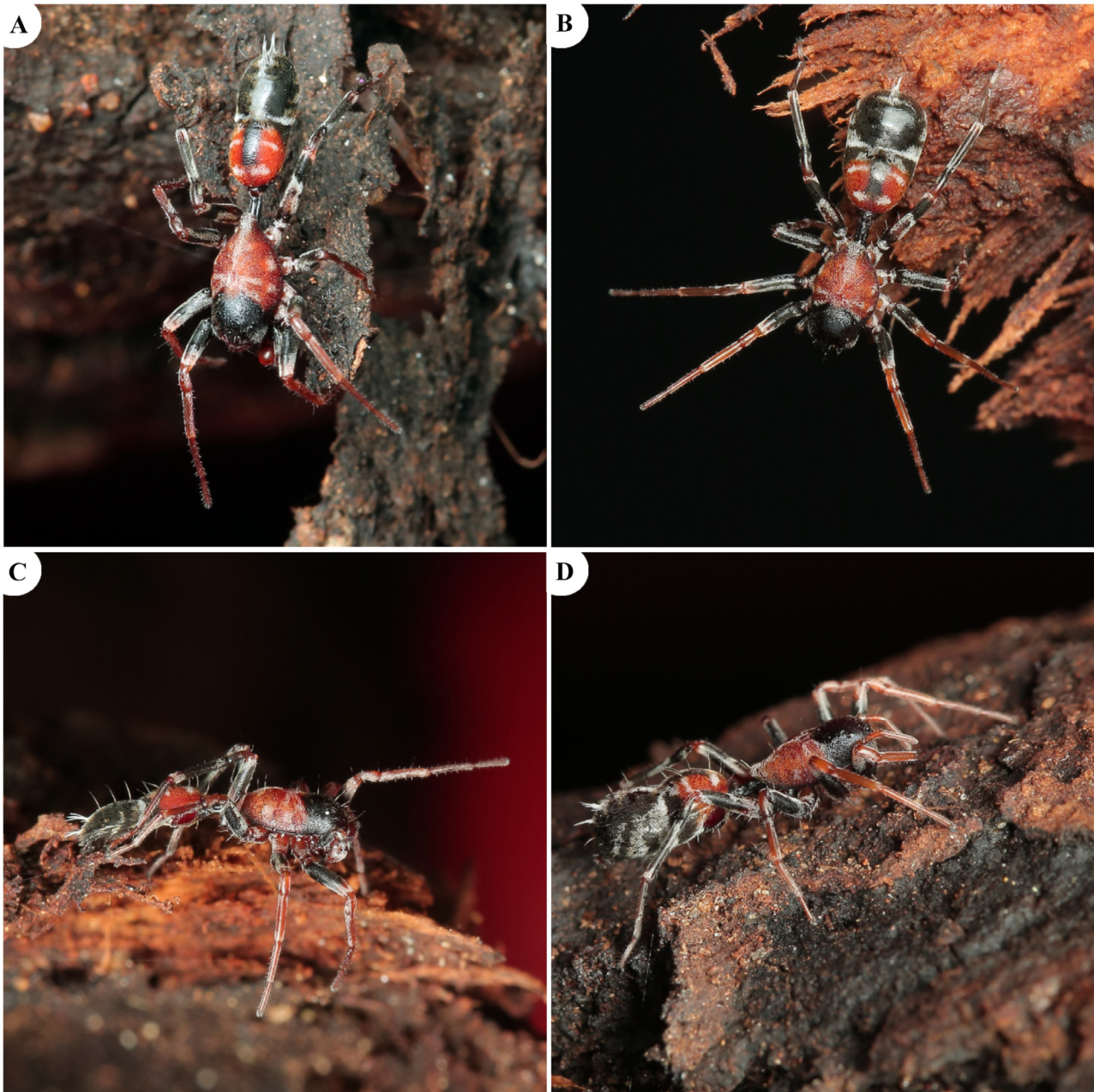


FIGURE 1A–D. Digital photographs of *Aetius decollatus* from Pollachi, Tamil Nadu, India. **A** Male, dorso-lateral view; **B** Female, dorsal view; **C** Male, lateral view; **D** Female, lateral view. Photo credit A–D Karunnappilli S. Nafin.

Carapace sub-pentagonal, widest at midline, rugous, reddish-orange with black cephalic region, suffused with black feathery setae situated on minute elevations; thoracic region with pair of discontinuous transverse white bands medially, white spots laterally at coxae II and III, and median stripe from midpoint to posterior margin, all formed by white feathery setae; carapace narrowed posteriorly, forming extension over pedicel. Eye field black; AER slightly procurved, half the width of the cephalic region; PER strongly recurved; MOQ trapezoid. Fovea broad, forming shallow depression, faint striae radiate from fovea to lateral margins. Chelicerae, maxillae, labium dark reddish-orange. Chelicerae vertical, provided with fringe of stiff serrated setae antero-basally to the fangs; cheliceral promargin with two teeth, distal tooth largest; retromargin with two teeth of equal size lying close to each other. Labium broader than long. Sternum reddish-orange, shield-shaped, with precoxal triangles, covered with numerous colourless and few long black setae; lateral margins contiguous with intercoxal sclerites between all coxae except I and II; intercoxal sclerites fused with pleural bars; posterior sternal margin forming long, narrow, digitiform projection between coxae IV. Abdomen oblong, with medial constriction dorsally and laterally (Figs 2A, C); blackish, with a reddish-orange inverted U-shaped marking anteriorly (Fig. 2A); anterior half with four discontinuous transverse white bands of white feathery setae, fourth one extending ventrally; dorsal scutum covering entire dorsal surface, provided with median longitudinal row of paired long,

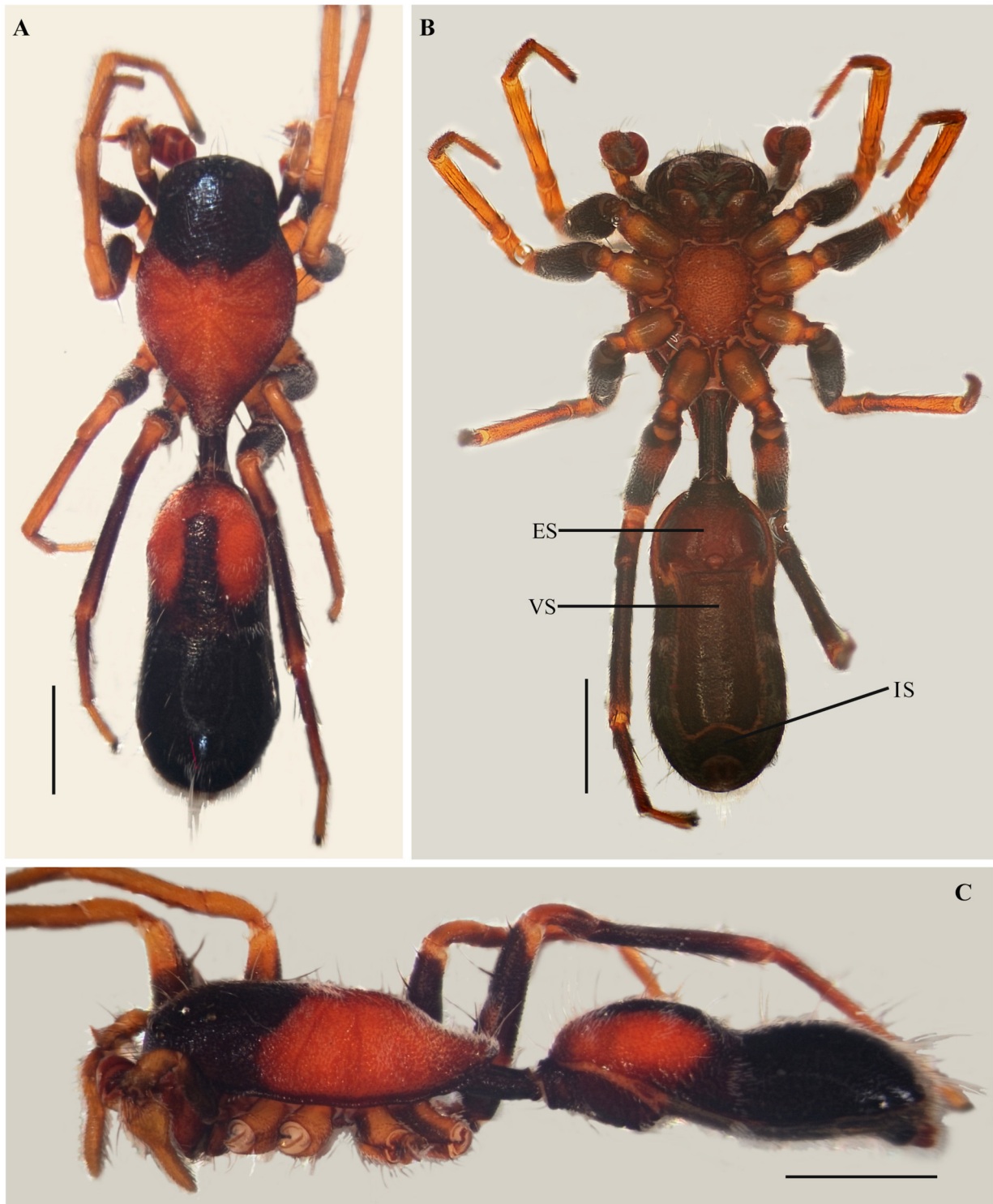


FIGURE 2A–C. *Aetius decollatus*. **A** Male habitus, dorsal view; **B** Same, ventral view; **C** Same, lateral view. Abbreviations: ES—epigastric sclerite, IS—inframamillary sclerite, VS—ventral sclerite. Scale bar: A–C: 1 mm.

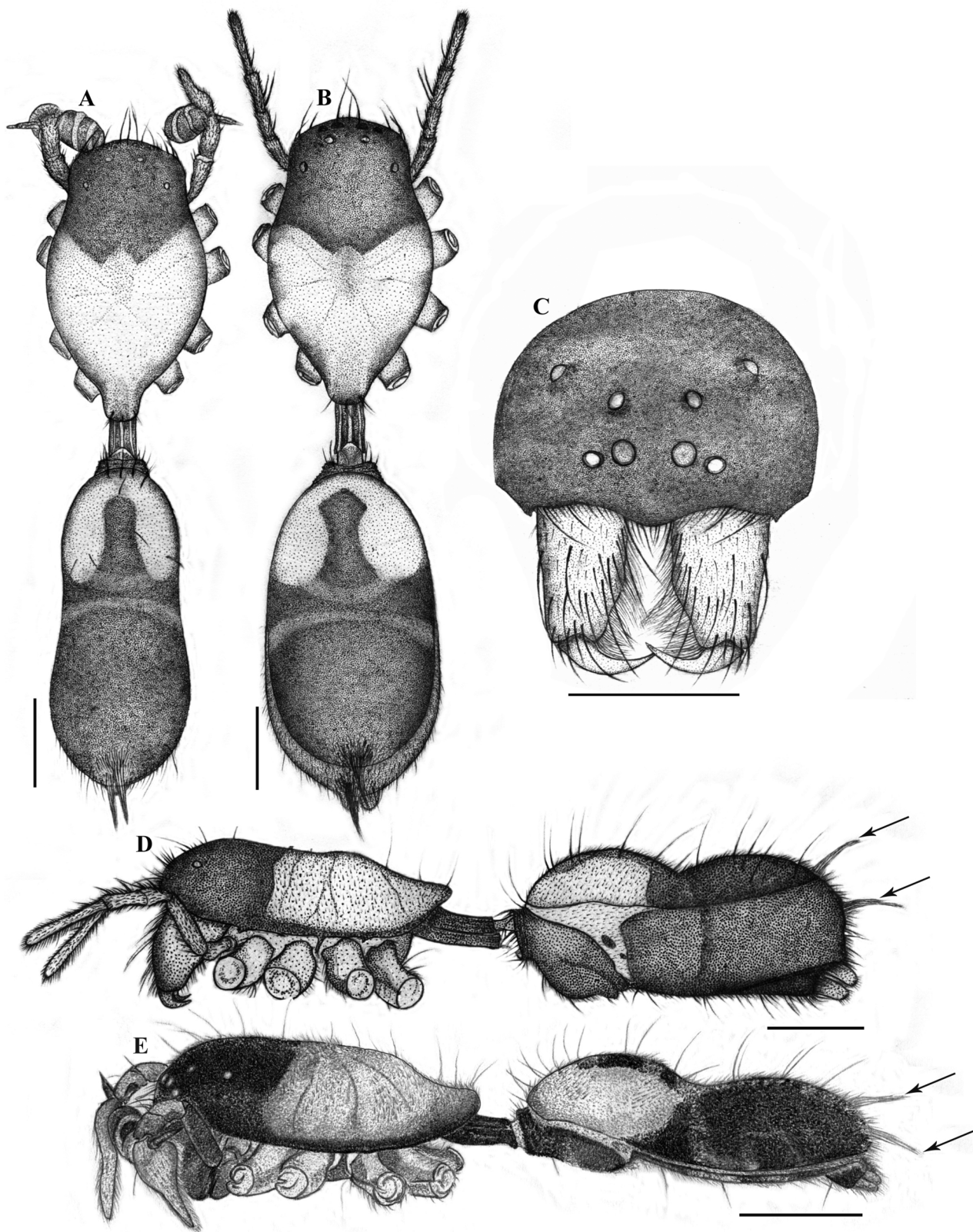


FIGURE 3A–E. *Aetius decollatus*. **A** Male habitus, dorsal view; **B** Female habitus, dorsal view; **C** Female, frontal view; **D** Female habitus, lateral view; **E** Male habitus, lateral view (arrows indicate tufts of long white hairs). Scale bar: A–E: 1 mm.

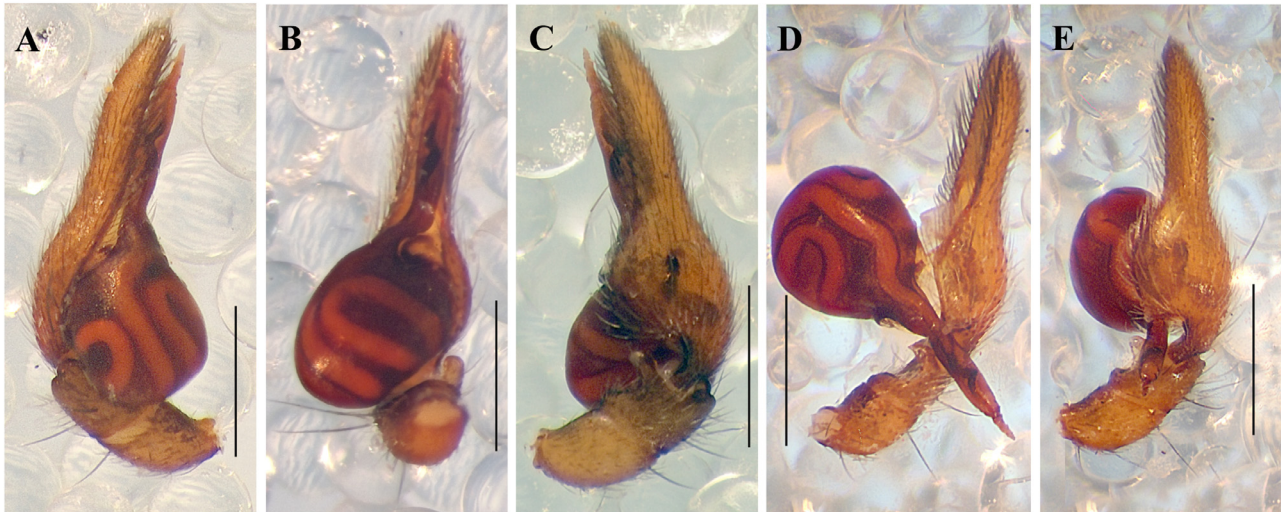


FIGURE 4A–E. *Aetius decollatus*. **A** Male left palp, prolateral view; **B** Same, ventral view; **C** Same, retrolateral view; **D** Expanded palp with twisted bulb showing tegular neck inserted into the cymbial semi-circular notch, ventro-retrolateral view; **E** Same, retrolateral view. Scale bar: A–E: 1 mm.

stiff, spine-like setae that extend over carapace; posterior with two tufts of long white setae, second tuft lying close to spinnerets (Fig. 3E); epigastric sclerite reddish-orange, with short pedicel collar; ventral sclerite heavily sclerotised, situated between epigastric furrow and inframamillary sclerite; inframamillary sclerite short, broad, concave. Spinnerets orange-brown. Leg segments light reddish-orange, with black shades on all femora, and tibia IV; legs with patches of white feathery setae, mostly on femora, leg IV banded with white setae; tarsus II apically with cluster of ventral bristles, tarsi III and IV ventrally with row of paired short spine-like setae (Fig. 5G); tarsi with claw tufts.

Palp (Figs 4A–E, 5A–F). Femur dark, rest of the segments light reddish-orange; tibia with deep ventral depression, with small prolateral elevated ridge, prolaterally with pair of long dark setae; retrolateral tibial apophysis digitiform, curved inwardly (Figs 4B–C, 5C); cymbium elongate distally, with single long dark seta prolaterally, baso-retrolateral excavation forming semi-circular notch (Figs 4C, 5C); tegulum pyriform with prolateral bulge. Part of subtegulum visible apico-retrolaterally; sperm duct with proximal convolutions, with sharp apical twist before entering embolus (Figs 4A–B, 5A–C); embolus thick, straight, corkscrew-like, sclerotised, bluntly pointed, almost reaching apex of cymbium (Figs 4A, C–D, 5A–F).

Redescription. Female (CATE090101C) (Figs 1B–D, 3B, D, 5G, 6A–F, 7A–D, 8A–C): Measurements: Body length 8.83. Carapace length 3.78, width (at midline) 2.18, carapace index 57.67. Sternum length 1.74, width 1.30, sternum index 74.71. Pedicel length 0.58, width 0.41. Abdomen length 4.47, width (at midline) 2.39, abdominal index 53.46. Dorsal sclerite length 3.60, width 1.85, dorsal sclerite index 51.39. Epigastric sclerite length 1.32, width 1.67. Inframamillary sclerite length 1.67, width 1.07. Eye sizes and interdistances: ALE 0.10, AME 0.14, PLE 0.12, PME 0.11; AME–AME 0.20, AME–ALE 0.06, AME–PME 0.19, PME–PME 0.35, PME–PLE 0.43. Clypeus height at AME 0.40, at ALE 0.28. Length of chelicerae 1.17. Measurements of palp and legs: Palp 3.00 [0.84, 0.42, 0.56, 1.18], Leg I 8.57 [2.43, 1.03, 1.96, 1.78, 1.37], Leg II 8.78 [2.59, 1.07, 1.97, 1.81, 1.34], Leg III 8.08 [2.45, 1.02, 1.87, 1.75, 0.99], Leg IV 12.84 [3.58, 1.36, 3.31, 3.05, 1.54]. Leg formula: 4213. Spination. Palp: femur do 1, patella pl 1 do 2, tibia pl 1 do 1 plv 1, tarsus pl 1; Legs: Femur I pl 1 do 1, II do 2, III pl 1 do 2, IV pl 1 do 3; Patellae I–IV spineless; Tibiae I–II plv 3 rlv 3, III plv 2 rlv 2, IV plv 3 rlv 3; Metatarsi I–II plv 2 rlv 2, III rl 1 plv1 rlv 1 vt 1, IV pl 1 rl 2 plv 1 rlv 1 vt 1; Tarsi I–IV spineless.

In all details like male except the following: Carapace slightly concave. Abdomen without lateral constrictions. Dorsal scutum 5/6th abdomen length. First tuft of white setae lying adjacent to the posterior border of dorsal scutum. Ventral sclerite restricted to posterior half of venter.

Epigyne (Figs 7A–D, 8A–C). Epigyne represented by median part of epigastric sclerite, heavily sclerotised, on elevated circular mound. Copulatory openings funnel-like, lying mediolaterally to posterior margin of epigynal plate (Figs 7A, 8A, C). Copulatory ducts short, heavily sclerotised (Figs 7C, 8B). Spermathecae II circular in outline, spermathecae I narrow, straight and moderately long, contiguous medially, without distinct bursae (Figs 7C, 8B). Fertilization ducts short, curved, acuminate, posterior to spermathecae (Figs 7C, 8B).

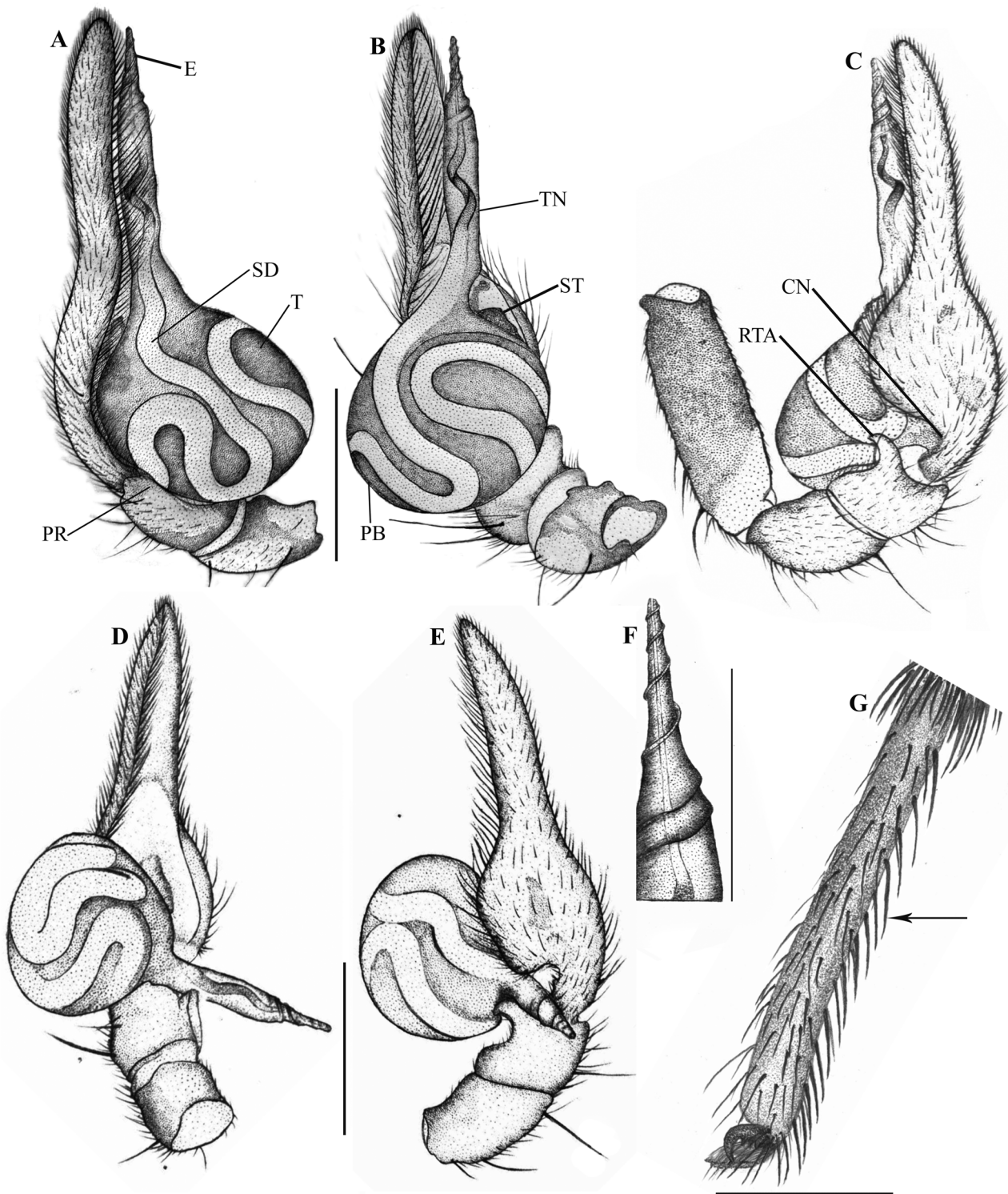


FIGURE 5A–G. *Aetius decollatus*. **A** Male left palp, prolateral view; **B** Same, ventral view; **C** Same, retrolateral view; **D** Expanded palp with twisted bulb showing tegular neck inserted into the cymbial semi-circular notch, ventral view; **E** Same, retrolateral view; **F** Embolus, enlarged, ventral view, **G** Female left tarsus III, lateral view (arrow indicates paired short ventral spine-like setae). Abbreviations: CN—cymbial semi-circular notch, E—embolus, PR—prolateral ridge, PB—prolateral bulge of tegulum, RTA—retrolateral tibial apophysis, SD—sperm duct, ST—subtegulum, T—tegulum, TN—tegular neck. Scale bars: A–E: 1 mm; F: 0.5mm; G: 0.15 mm.

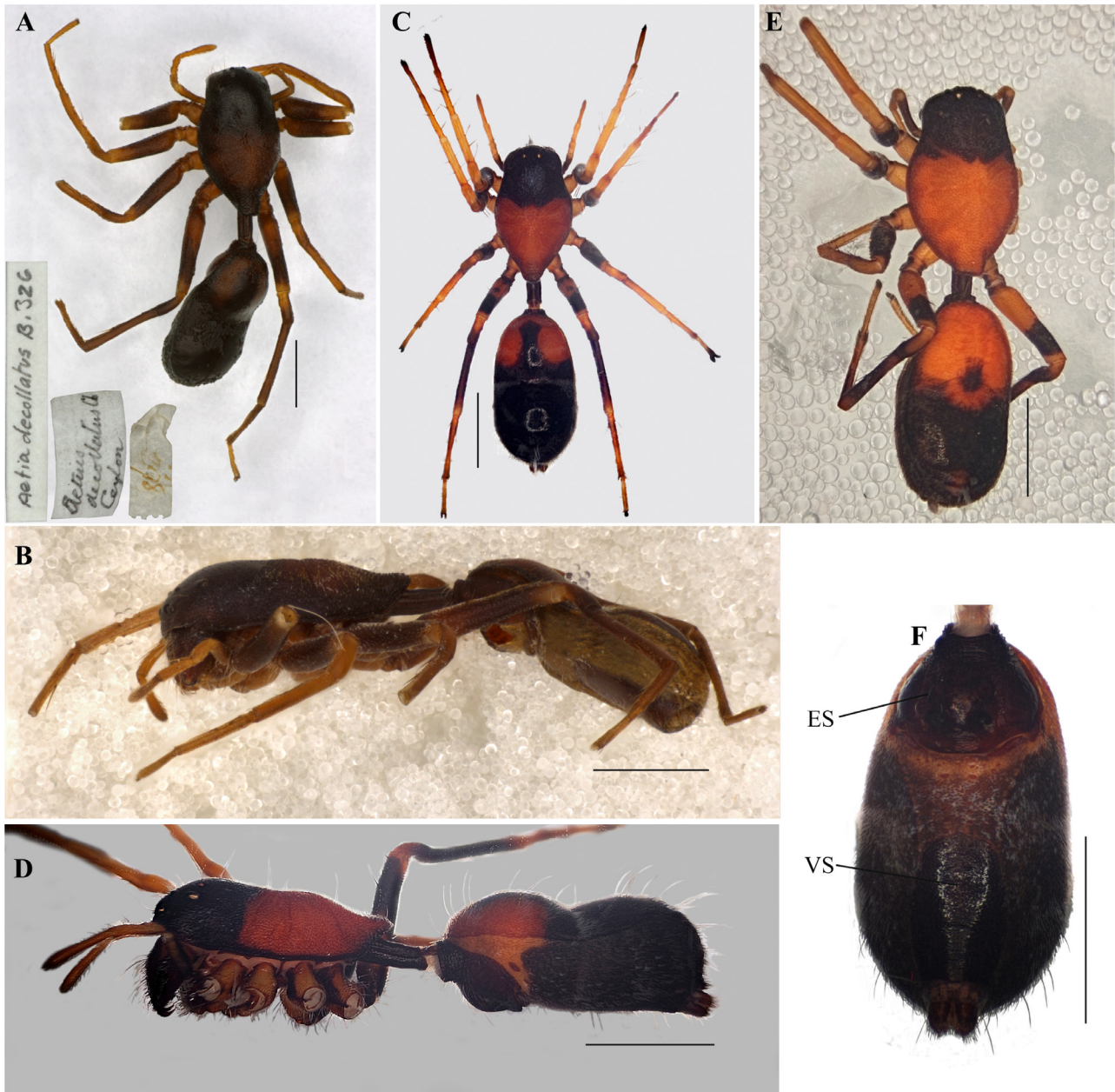


FIGURE 6A–E. *Aetius decollatus*. **A** Holotype female, dorsal view; **B** Same, lateral view; **C** Female habitus (from Pollachi, Tamil Nadu, India), dorsal view; **D** Same, lateral view; **E** Female habitus (from Wayanad Wildlife Sanctuary, Kerala, India), with variation in the anterodorsal reddish-orange pattern, dorsolateral view; **F** Female abdomen, ventral view. Abbreviations: ES—epigastric sclerite, VS—ventral sclerite. Scale bar: A–F: 2 mm. Images A & B by Zoë Simmons.

Female HOLOTYPE (Figs 6A–B, 7D): Same as the fresh female, except the following: Slight variation in body pattern (Figs 6A–B; Majumder & Tikader 1991: fig. 338); O. Pickard-Cambridge (1896) reported a single tuft of long white hairs on the posterior abdomen. However, the holotype specimen was found to lack this tuft, which was probably lost due to the long period of preservation in alcohol. Epigyne (Fig. 7D) structure the same as in the fresh material. For body measurements see Majumder & Tikader (1991).

Variations. Body length: Male: 7.30–8.66 (n=6). Female: 8.33–8.81 (n=3). Variation can also be observed in the colour pattern of the carapace and abdomen. The anterior half of the abdomen of specimens collected from Wayanad Wildlife Sanctuary were prominently reddish-orange in colour, compared to that of the specimens collected from Pollachi, which had reddish-orange inverted U-shaped pattern, even though both have a similar colour pattern on the carapace (Figs 3A–B, 6C–E). The inverted U-pattern also varies, from a perfect U-shape to nearly broad triangular patch. Unlike the holotype, which had a broad transverse band of nearly iridescent greenish scales lying immediately behind the median abdominal constriction (O. Pickard-Cambridge 1896; Majumder & Tikader 1991), all specimens examined here

possess a band of white feathery hairs. The holotype also differed from the specimens examined here by having comparatively broad lateral black carapace margins, and the anterodorsal abdominal reddish-orange pattern that appears as paired curved stripes (Figs 6A,B; see also Majumder & Tikader 1991: fig. 338).

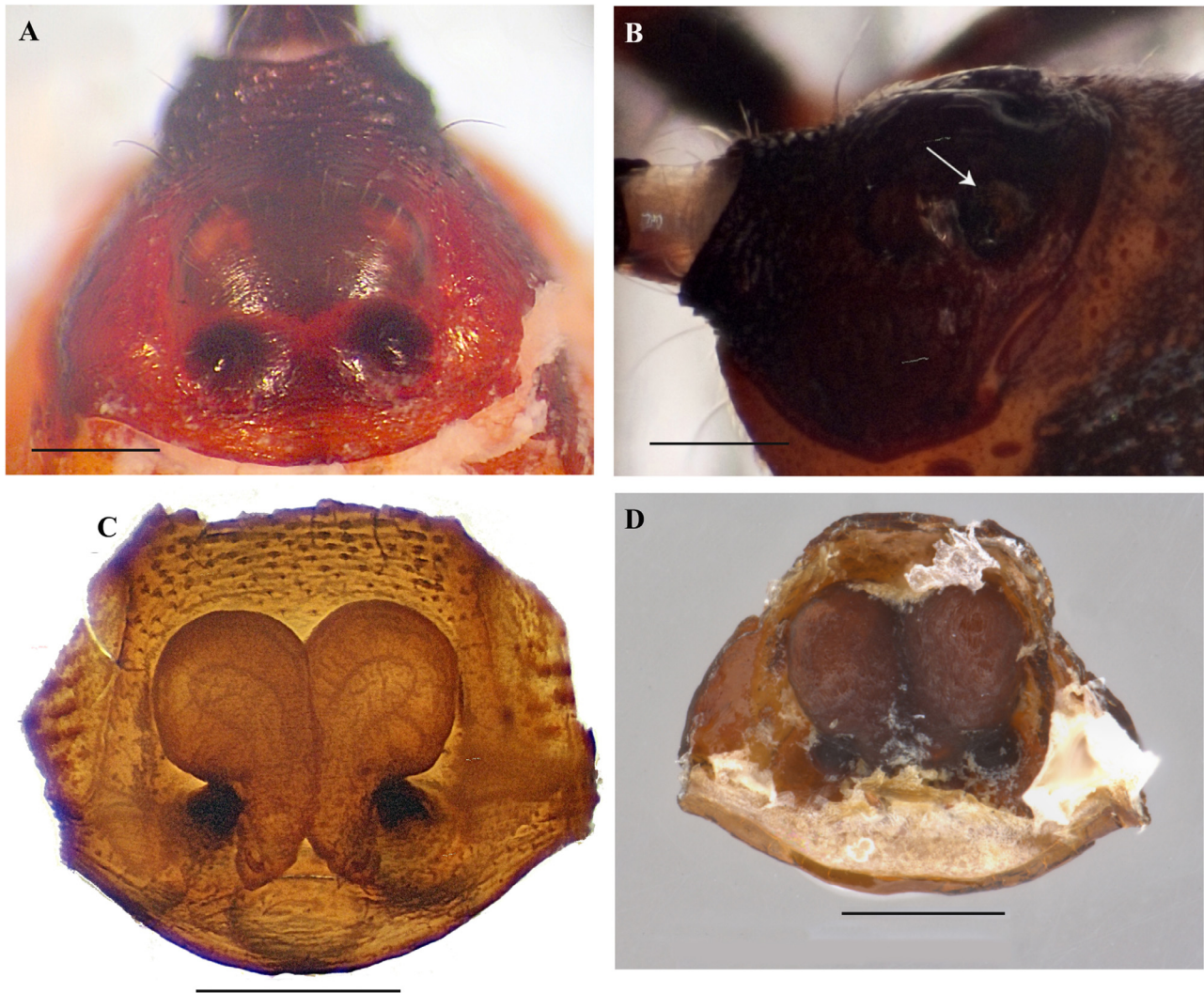


FIGURE 7A–D. *Aetius decollatus*. **A** Epigastric sclerite and epigyne, ventral view; **B** Epigyne showing mating plug (arrow) in the right copulatory opening; **C** Epigyne cleared, dorsal view; **D** Epigyne (holotype), dorsal view. Scale bar: A–D: 0.5 mm. Image D by Zoë Simmons.

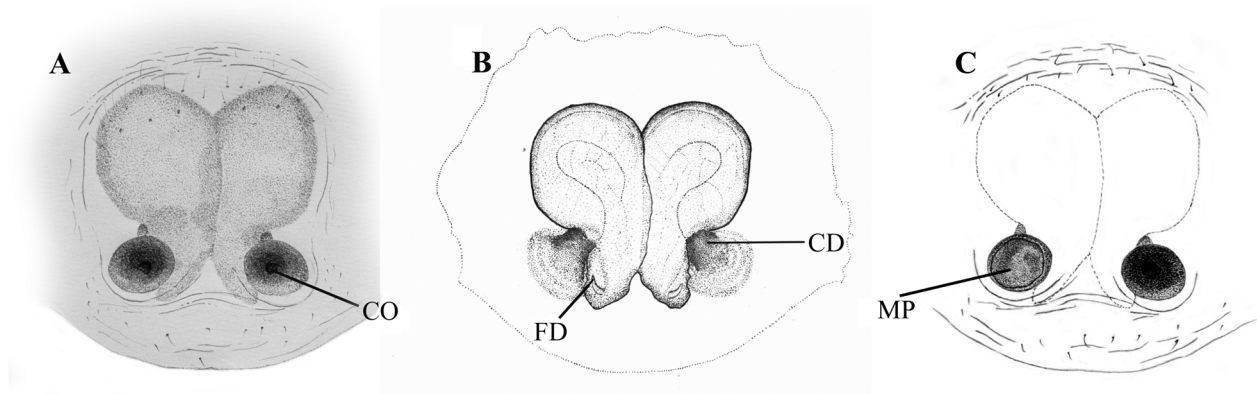


FIGURE 8A–C. *Aetius decollatus*. **A** Epigyne, ventral view; **B** Same, dorsal view; **C** Same, with mating plug in the right copulatory opening, ventral view. Abbreviations: CD—copulatory duct, CO—copulatory opening, FD—fertilisation duct, MP—mating plug. Scale bar: A–C: 0.5 mm.

Cymbial semi-circular notch (Figs 4C–E, 5C–E). The males of the *Aetius* spp. are characterised by the presence of a cymbial semi-circular notch of unknown function, which is located baso-retrolaterally on the cymbium, facing opposite to the retrolateral tibial apophysis (Figs 4C–E, 5C–E; Dankittipakul & Singtripop 2013: figs 14–15); this structure is only known from the genus *Aetius* (Dankittipakul & Singtripop 2013). While studying the male specimens, we observed that one of the male specimens (CATE090101C) had both the palps in an expanded state, with the bulb twisted towards the retrolateral side in such a way that the tegular neck was inserted into the cymbial semi-circular notch (Figs 4D–E, 5D–E). It was also observed that once inserted into the cymbial semi-circular notch, the tegular neck was flanked on its opposite side by the inwardly curved retrolateral tibial apophysis, preventing further free movements of the bulb (Figs 4D–E, 5D–E). Orientation change in the palpal bulb towards the retrolateral side has already been recorded in various genera of the subfamily Castianeirinae (Raven 2015; Murthappa *et al.* 2016). However, none of these genera were known to have cymbial modifications as seen in *Aetius* spp., indicating that the cymbial semi-circular notch might be derived feature for increasing the male efficacy in mating.

Note. Mating plugs are known to occur in many spider families and are supposedly functioning as paternity protection or sperm leakage prevention or sperm desiccation prevention mechanism (Uhl *et al.* 2010; Herberstein *et al.* 2012). Mating plugs are reported in 10 genera and 12 species of the Corinnidae, including species of *Castianeira* Keyserling, 1879, *Copa* Simon, 1886 and *Myrmecium* Latreille, 1824 belonging to the Castianeirinae (Uhl *et al.* 2010; Marusik *et al.* 2015). A mating plug was found blocking the right copulatory opening of one of the females of *A. decollatus* studied (Figs 7B, 8C). The plug is probably made of an amorphous material (secretory mating plug) of unknown origin. The plug was dissolved in 10% Potassium Hydroxide while clearing the epigyne. The frequency of occurrence of mating plugs in the species could not be accessed due to the low number of females collected.



FIGURE 9A–B. *Aetius decollatus*. View of the collection sites of fresh materials: **A** Wayanad Wildlife Sanctuary, Kerala; **B** Pollachi, Tamil Nadu. Photo credit A–B by Karunnappilli S. Nafin.

Habitat. *Aetius decollatus* is known from moist deciduous forests of Kerala and the bark of *Tamarindus indica* trees in Tamil Nadu (Figs 9A–B).

Natural history. *A. decollatus* specimens collected from Tamil Nadu State were found to live in sympatry with the worker ants of *Tetraoponera rufonigra* Jerdon, 1851, a large arboreal ant species that nests in the barks of dead and living trees (Majumder & Tikader 1991). Both the adults and juveniles have bi-coloured appearance similar to the worker ants, indicating that these spiders may be batesian mimics of *T. rufonigra* (K.S. Nafin, in preparation).

Distribution. India (Kerala [new record]), Tamil Nadu (Reimoser 1934) and Sri Lanka (O. Pickard-Cambridge 1896) (Fig. 10).

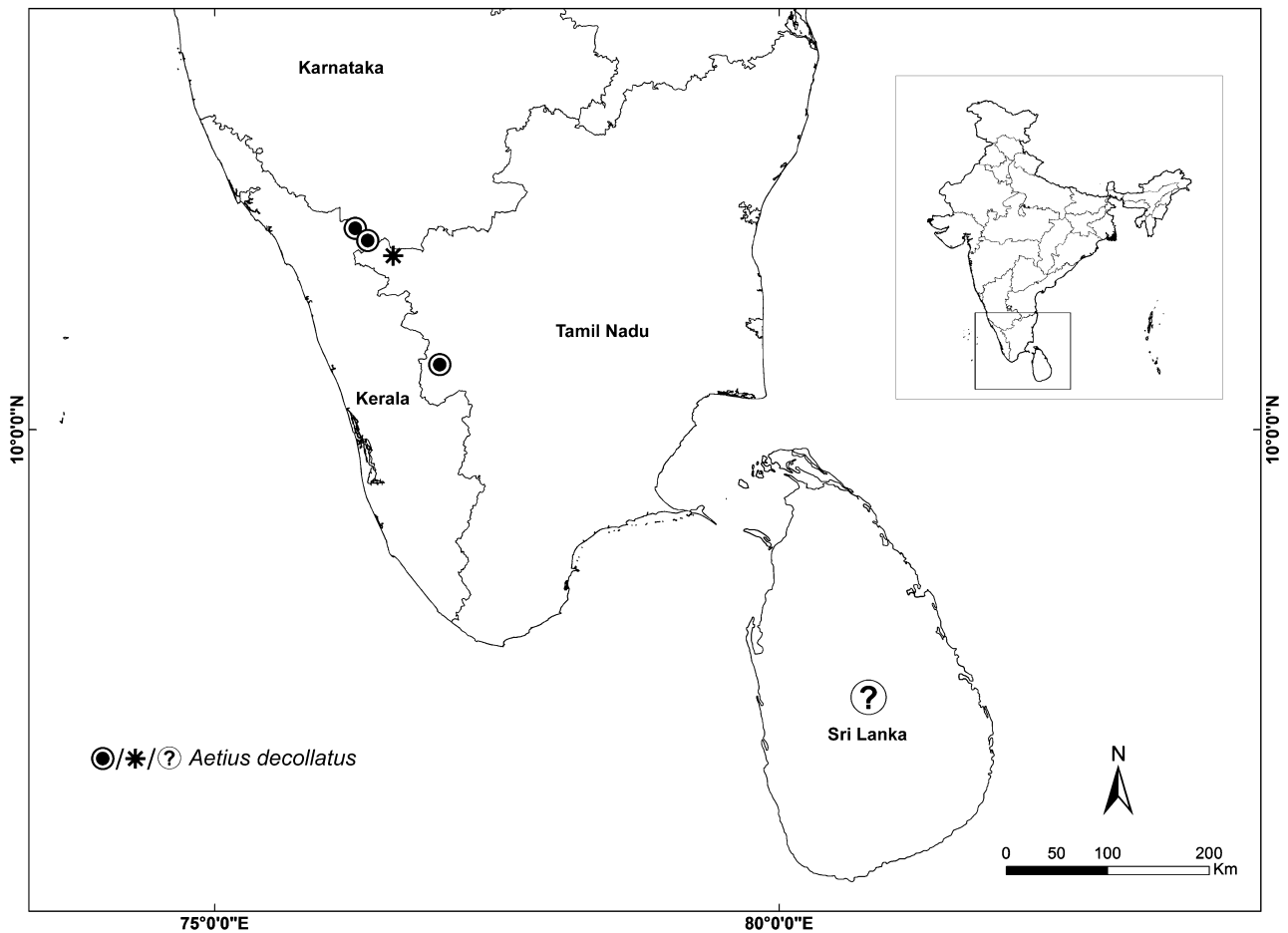


FIGURE 10. Map showing the current collecting records of *Aetius decollatus*. ⊙—new record, */?—records from literature, question mark indicates that type locality in Sri Lanka is unknown.

References

- Bosselaers, J. & Jocqué, R. (2000) Studies in Corinnidae: transfer of four genera and description of the female of *Lessertina mutica* Lawrence 1942. *Tropical Zoology*, 13, 305–325.
<http://dx.doi.org/10.1080/03946975.2000.10531138>
- Dankittipakul, P. & Singtripop, T. (2013) First description of the male of the little-known ant mimicking spider genus *Aetius* O. Pickard-Cambridge (Araneae: Corinnidae). *Revue Suisse de Zoologie*, 120, 575–583.
- Deeleman-Reinhold, C.L. (2001) *Forest spiders of South East Asia: with a revision of the sac and ground spiders (Araneae: Clubionidae, Corinnidae, Liocranidae, Gnaphosidae, Prodidomidae and Trochanteriidae)*. Brill, Leiden, 591 pp.
- Herberstein, M.E., Wignall, A.E., Nessler, S.H., Harmer, A.M.T. & Schneider, J.M. (2012) How effective and persistent are fragments of male genitalia as mating plugs? *Behavioral Ecology*, 23, 1140–1145.
<http://dx.doi.org/10.1093/beheco/ars088>
- Majumder, S.C. & Tikader, B.K. (1991) Studies on some spiders of the family Clubionidae from India. *Records of the Zoological Survey of India, Occasional Paper*, 102, 1–175.
- Murthappa, P.S., Prajapati, D.A., Sankaran, P.M. & Sebastian, P.A. (2016) 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. *Zootaxa*, 4103 (6), 526–536.
<http://dx.doi.org/10.11646/zootaxa.4103.6.3>
- Marusik, Y.M., Omelko, M.M. & Koponen, S. (2015) A redescription of the ant mimicking spider *Myrmecium gounellei* (Araneae: Corinnidae, Castianeirinae), with notes on the genus. *Zootaxa*, 3985 (2), 296–300.
<http://dx.doi.org/10.11646/zootaxa.3985.2.9>
- Pickard-Cambridge, O. (1896) On some new and little known spiders (Araneidae). *Proceedings of the Zoological Society of London*, 1896, 1006–1012.
- Petrunkovitch, A. (1928) Systema Araneorum. *Transactions of the Connecticut Academy of Arts and Sciences*, 29, 1–270.
- Raven, R.J. (2015) A revision of ant-mimicking spiders of the family Corinnidae (Araneae) in the Western Pacific. *Zootaxa*,

3958 (1), 1–258.

<http://dx.doi.org/10.11646/zootaxa.3958.1.1>

Reimoser, E. (1934) Araneae aus Süd-Indien. *Revue Suisse de Zoologie*, 41, 465–511.

<http://dx.doi.org/10.5962/bhl.part.155628>

Reiskind, J. (1969) The spider subfamily Castianeirinae of North and Central America (Araneae, Clubionidae). *Bulletin of the Museum of Comparative Zoology*, 138, 163–325.

Uhl, G., Nessler, S.H. & Schneider, J.M. (2010) Securing paternity in spiders? A review on occurrence and effects of mating plugs and male genital mutilation. *Genetica*, 138, 75–104.

<http://dx.doi.org/10.1007/s10709-009-9388-5>