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Taxonomic notes on the genus *Epeus* Peckham & Peckham, 1886 (Araneae, Salticidae) from India

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Abstract

This paper provides the re-description of *Epeus albus* Prószynski, 1992, with the first description of its male. Additionally, *Epeus chilapataensis* (Biswas & Biswas, 1992) is synonymised with *E. albus* and a new taxonomic combination is proposed: *Epeus khandalaensis* (Tikader, 1977) **comb. nov.** (ex *Phidippus*). Clarification on the record of *Epeus daiqini* Patoleta, Gardzińska & Żabka, 2020 from India is provided. The current distribution of the genus in India is also mapped.

Key Words

Jumping spiders, India, re-description, synonym, taxonomy, type material

Introduction

Members of the jumping spider genus *Epeus* Peckham & Peckham, 1886, are medium-to-large-sized spiders recorded from subtropical Himalayan valleys, through India, Indochina, southern China, Philippines and Sunda Archipelago (Patoleta et al. 2020; World Spider Catalog 2024). The living specimens of *Epeus* are usually light green or yellow in colour with palpi and legs of various colours (Sebastian and Peter 2009; Prószyński and Deeleman-Reinhold 2012; Mondal et al. 2020). Till now, the genus comprised 22 valid species, of which five have been reported from India: *Epeus albus* Prószynski, 1992; *Epeus chilapataensis* (Biswas & Biswas, 1992); *Epeus daiqini* Patoleta, Gardzińska & Żabka, 2020; *Epeus indicus* Prószyński, 1992; and *Epeus triangulopalpis* Malamel, Nafin, Sudhikumar & Sebastian, 2019 (Caleb and Sankaran 2024; World Spider Catalog 2024). The original description of *E. albus* Prószynski, 1992 was based on the female specimen collected from Orissa (now Odisha). During field surveys conducted in the Southern Western Ghats of India, we collected both male and female specimens of *Epeus albus* and this has led to the realisation that several taxa of this genus in India require re-evaluation. The paper thus aims to provide: (1) first description of the hitherto unknown male of *E. albus* and re-description of the female, based on the fresh materials; (2) update the current taxonomic status of *E. chilapataensis* and *Phidippus khandalaensis* Tikader, 1977; (3) clarify the record of *E. daiqini* Patoleta, Gardzińska & Żabka, 2020 from India; and (4) provide a distribution map of all known Indian *Epeus* spp.

Material and methods

The specimens were preserved in 70% ethanol and are deposited in the National Zoological Collections of the Zoological Survey of India (NZC-ZSI), Kolkata, India. The terminology used in the text and figures follows Patoleta et al. (2020) and leg spination follows the system used by Bosselaers and Jocqué (2000). Specimens were examined under a Leica M205A stereomicroscope and images were taken using a Flexacam C3 camera attached

to the stereomicroscope and processed using extended focus montage LAS X software. All measurements are given in millimetres (mm). Pedipalp and leg measurements are given as follows: total length [femur, patella, tibia, metatarsus (except for palp), tarsus]. The distribution map was prepared using the online mapping software SimpleMappr (Shorthouse 2010).

Abbreviations used in the text and figures are as follows: **ALE** — anterior lateral eye, **AME** — anterior median eye, **CA** — cymbial apophysis, **CD** — copulatory duct, **CO** — copulatory opening, **do** — dorsal, **E** — embolus, **EP** — epigynal pocket, **FD** — fertilisation duct, **MP** — mating plug, **pl** — prolateral, **PLE** — posterior lateral eye, **PME** — posterior median eye, **plv** — prolateral ventral, **rl** — retrolateral, **RTA** — retrolateral tibial apophysis, **rlv** — retrolateral ventral, **v** — ventral.

Taxonomy

Family Salticidae Blackwall, 1841

Genus *Epeus* Peckham & Peckham, 1886

Type species. *Epeus tener* (Simon, 1877)

Diagnosis. Species of this genus can be distinguished from other members of the tribe Plexippini by the high and elevated carapace, male palp with flattened and elongated cymbium, postero-ventrally pointing retrolateral basal apophysis, tegulum with a tongue-like basal process, filiform embolus surrounding the semicircle of tegulum and extending to the distal end of cymbium and the epigyne with a shallow anterior depression and long copulatory ducts forming several loops (Meng et al. 2015; Malamel et al. 2019).

Epeus albus Prószyński, 1992

Figs 1A–H, 2A–E, 3A–F, 4A–F, 5A–F, 7

Epeus albus Prószyński, 1992: 171, figs 20–21, 25.

Lyssomanes chilapataensis Biswas & Biswas, 1992: 386, figs 14–16. New synonymy.

Epeus chilapataensis: Logunov, 2004 (transfer from *Lyssomanes*).

Epeus daiqini Sibi, Gigi & Sudhikumar, 2023: 80, figs 1A–F, 2A–E. Misidentification.

Type material. ***Holotype*** female of *Epeus chilapataensis* from India, West Bengal: Koch Bihar District (now cooch Behar), Chilapata Forest, 09.i.1985, NZC-ZSI-5407/18-B. Biswas-coll. Examined.

Other material examined. **India: Karnataka:** 1♀ & 1♂ (NZC-ZSI-8372/18), Shimoga, Hulikal, 13°72'01.12"N, 75°02'54.13"E, 613 m alt., 05.xii.2022, P.P. Sudhin coll.; 13♀♀ & 1♂ (NZC-ZSI-8373/18), Shimoga, Mookambika Wildlife Sanctuary, 13°42'18.9"N, 75°03'47.7"E, 605 m alt., 07.xii.2022, P.P. Sudhin coll.; **Kerala**: 1♂ (NZC-ZSI-8533/18), Wayanad, Kalpetta, Elstone Tea Estate, 11°36'11.49"N, 76°5'11.96"E, 778 m alt., 20.ix.2021, R. Jwala coll.; **Meghalaya**: 5♀♀ (NZC-ZSI-8849/18), Ri Bhoi, Umsning, 25°45'18.2"N, 91°51'47.2"E, 777 m alt., 16.iii.2023, S. Sen & P.P. Sudhin coll.

Diagnosis. The male copulatory organ of *Epeus albus* Prószyński, 1992 is most similar to that of *Epeus glorius* Żabka, 1985 in having the similar shaped RTA and serrated cymbial apophysis, but it can be distinguished by the following combination of characters: RTA slender and anterodorsally directed (RTA relatively robust and apically directed in *E. glorius*); cymbial apophysis relatively short and posteroventrally directed (long and posteriorly directed in *E. glorius*) (cf. Figs 2A, B, 3A, B with figs 15–16 in Meng et al. (2015)). The female of *E. albus* is most similar to that of *Epeus indicus* Prószyński, 1992 and *Epeus szirakii* Patoleta, Gardzińska & Żabka, 2020 in having the similar epigynal morphology, but it can be distinguished by the following combination of characters: epigyne with large and wide atrium (narrower in *E. indicus*); copulatory openings more widely separated from each other, orientated more anteriorly with well-defined posterior margins (closely arranged, orientated face to face without well-defined posterior margins in *E. indicus*). (cf. Figs 2D, E, 3C–F, 4A–F, 5C, D, with fig. 22 in Prószyński (1992) and figs 6E–F in Patoleta et al. (2020)).

Justification of the synonymy of *E. chilapataensis*. Re-examination of the holotype of *E. chilapataensis* shows that the body colour pattern and epigyne structure are similar to those of *Epeus albus*: pale yellow to white-coloured body without any prominent markings and crescent shaped copulatory openings and the similar course of proximal spermathecal loop (cf. Figs 3E, 5A–C, E with figs 20–21, 25 in Prószyński (1992)). Based on these observations, we consider *E. chilapataensis* a junior synonym of *E. albus*. Prószyński (1992) described *E. albus* from Jajpur-Keonjahr District, Orissa and Biswas and Biswas (1992) described *E. chilapataensis* from Koch Bihar District (now Cooch Behar), West Bengal. Both the species were described from the eastern part of the country from neighbouring states in the same year, but in different months. Prószyński described *E. albus* in October 1992 and Biswas & Biswas described *E. chilapataensis* in November 1992. Here, we are giving preference to the name which was first described. Therefore, the second described species must be a junior synonym of the first.

Description. Male (Figs 1A–C, G, 2A–C, 3A–B): Measurements: Body length 4.87. Carapace length 1.96, width 1.76. Abdomen length 2.85, width 1.33. Ocular area length 1.30, width at AEs 1.55. Eye diameters and interdistances: AME 0.57, ALE 0.26, PME 0.07, PLE 0.26; AME-AME 0.03, ALE-ALE 1.21, AME-PME 0.59, PLE-PLE 1.13, PME-PME 1.21, PME-PLE 0.32. Clypeus height 0.08. Length of chelicera 0.80.

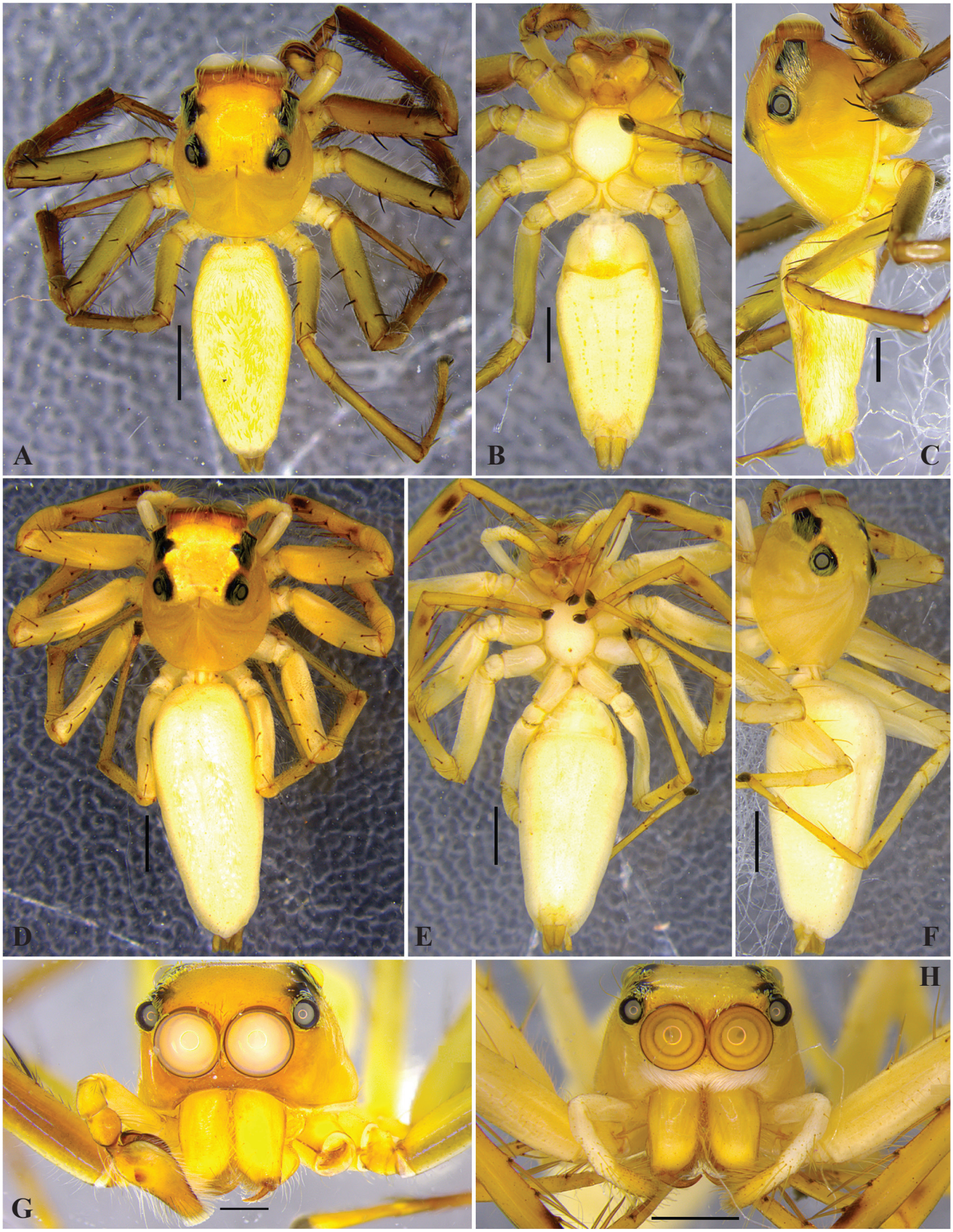

Figure 1. *Epeus albus* Prószyński, 1992. **A.** Male, dorsal view; **B.** Same, ventral view; **C.** Same, lateral view; **D.** Female, dorsal view; **E.** Same, ventral view, **F.** Same, lateral view; **G.** Male, frontal view; **H.** Female, frontal view. Scale bars: 1 mm.

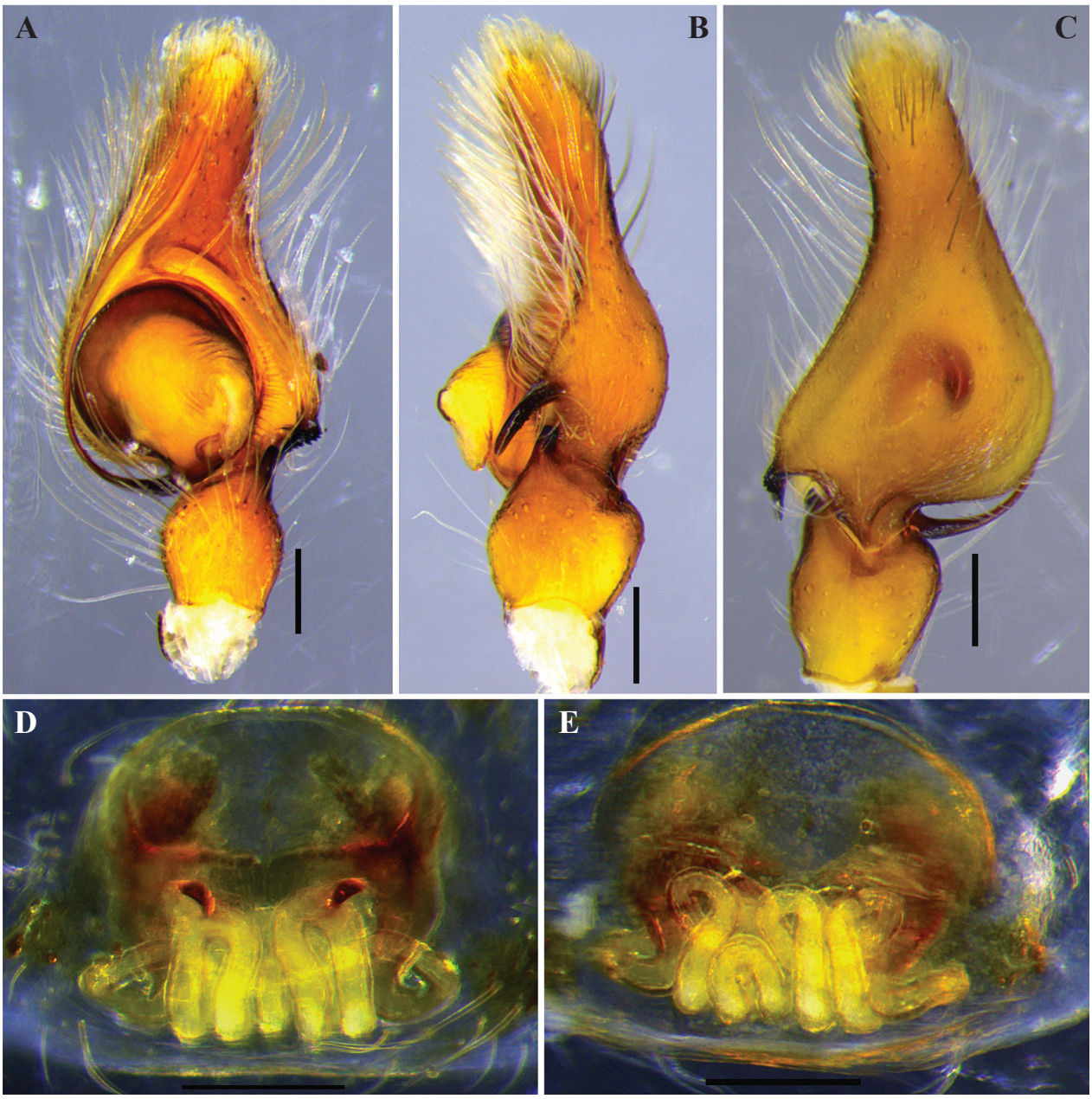

Figure 2. *Epeus albus* Prószyński, 1992. **A.** Left male palp, ventral view; **B.** Same, retrolateral view; **C.** Same dorsal view; **D.** Female epigyne, ventral view; **E.** Vulva, dorsal view. Scale bars: 0.2 mm.

Measurement of palp and legs: palp 2.19 [0.76, 0.31, 0.25, 0.87], leg I 7.90 [2.31, 0.86, 2.29, 1.51, 0.93], II 6.58 [2.12, 0.78, 1.71, 1.28, 0.69], III 7.18 [2.28, 0.59, 1.70, 1.82, 0.79], IV 6.42 [1.86, 0.58, 1.58, 1.78, 0.62]. Leg formula 1324. Leg spination: femur I pl 3 rl 3 do 3, II-III pl 2 rl 2 do 3, IV pl 1 do 3; patella I-IV pl 1 rl 1; tibia I pl 2 plv 4 rlv 4, II pl 1 rl 2 plv 3 rlv 3, III pl 1 rl 2 plv 2 rlv 2, IV pl 2 rl 3; metatarsus I-II pl 2 rl 2 plv 2 rlv 2, III pl 2 rl 2 plv 1 rlv 1 v 1, IV pl 2 rl 3 plv 2 rlv 2; tarsi I-IV spineless. Carapace high and elevated with posterior slope, pale yellow, covered with colourless setae (Fig. 1A); margin of carapace with light brown lines; eye field bright yellow, covered with bright yellow setae (Fig. 1A); AMEs rims light brown, encircled by bright yellow setae (Fig. 1A, G). Clypeus low, light yellow-brown (Fig. 1G). Chelicerae small, vertical, pale yellow, frontal side with long white setae (Fig. 1G); promargin with two teeth and retromargin with one tooth. Endites pale yellow, scopulate, with light brown margins and small anterolateral protuberance (Fig. 1B). Labium yellow, distally pale yellow, covered with setae (Fig. 1B). Sternum sub-pentagonal, whitish-yellow, with pale yellow margins (Fig. 1B). Abdomen nearly cylindrical, posteriorly narrowing, pale white, covered with golden yellow and colourless setae (Fig. 1A). Venter pale white, covered with colourless setae, medially and laterally with a pair of yellowish dotted lines (Fig. 1B). Spinnerets pale yellow, covered with light brown setae (Fig. 1A–C). Legs long and slender, covered with colourless and black setae (Fig. 1A). Legs I–III with pale yellow femora, patellae and tarsi; femora covered

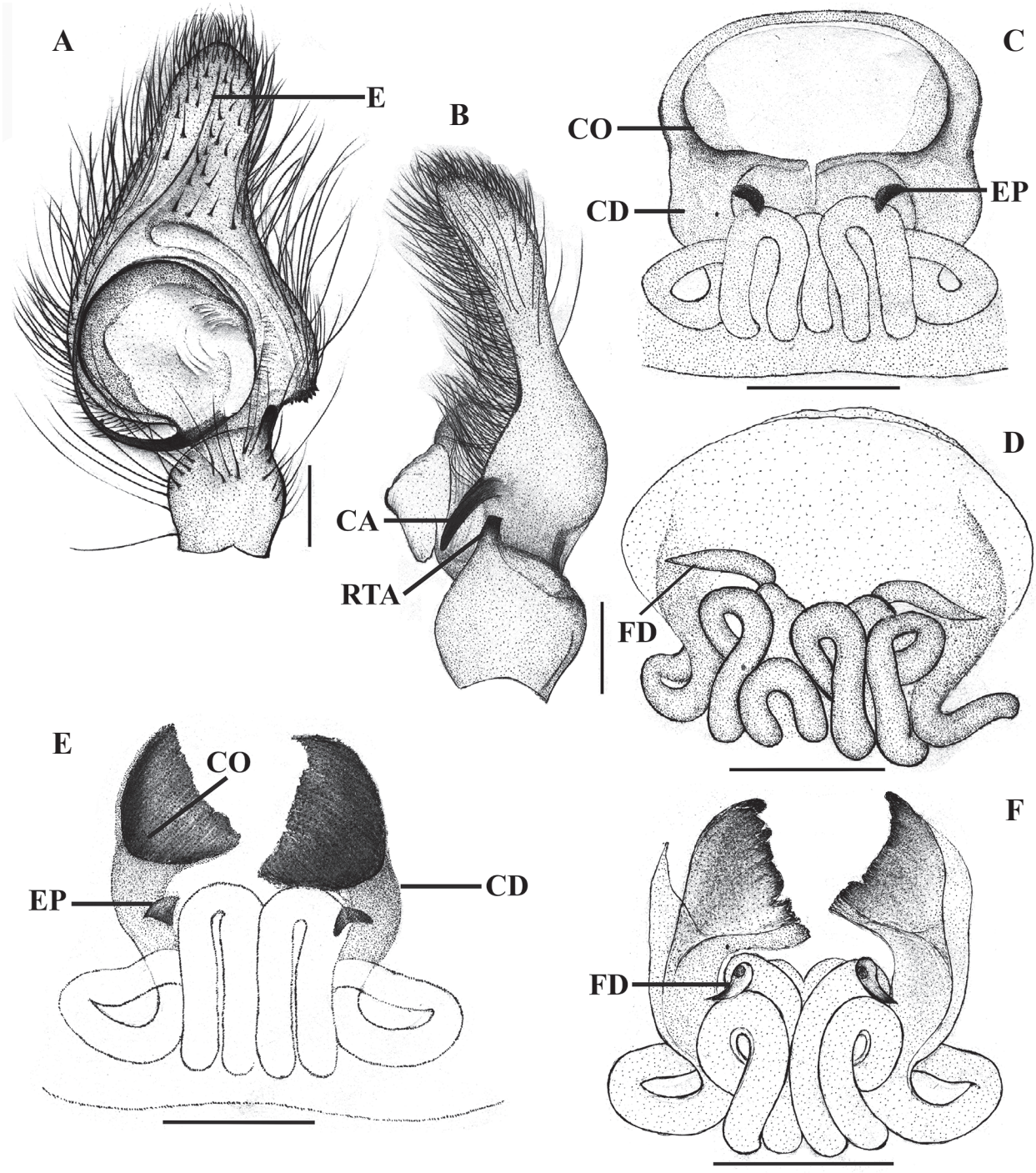

Figure 3. *Epeus albus* Prószyński, 1992. (**A–D**) and holotype female of *Epeus chilapataensis* (Biswas & Biswas, 1992) (**E–F**). **A.** Left male palp, ventral view; **B.** Same, retrolateral view; **C, E.** Female epigyne, ventral view; **D, F.** Vulva, dorsal view. Scale bars: 0.2 mm.

with light brown longitudinal bands on their prolateral and retrolateral sides; tibiae and metatarsi light yellowish-brown; tibia III and metatarsus III lighter in colour. Legs IV light yellowish-brown, with pale yellow femur and tarsus. Palp pale yellow to light yellowish-brown (Fig. 2A–C); RTA short, stout, anterodorsally directed with truncated tip (Figs 2B, 3B); cymbium nearly triangular, covered with white and black setae (Fig. 2A); cymbial apophysis long and slender, its outer margin serrated (Figs 2B, 3B); tegulum with much developed tongue-like flap (Figs 2A, 3A); embolus very thin and long, originating almost at eight o'clock position and extending to the distal end of cymbium (Figs 2A and 3A).

Female (Figs 1D–F, H, 2D, E, 3C–F, 4A–F, 5A–F) (Description based on newly-collected material): Measurements: Body length 7.57. Carapace length 3.06, width 2.22. Abdomen length 4.30, width 1.97. Ocular area length 1.57, width at AEs 1.88. Eye diameters and interdistances:

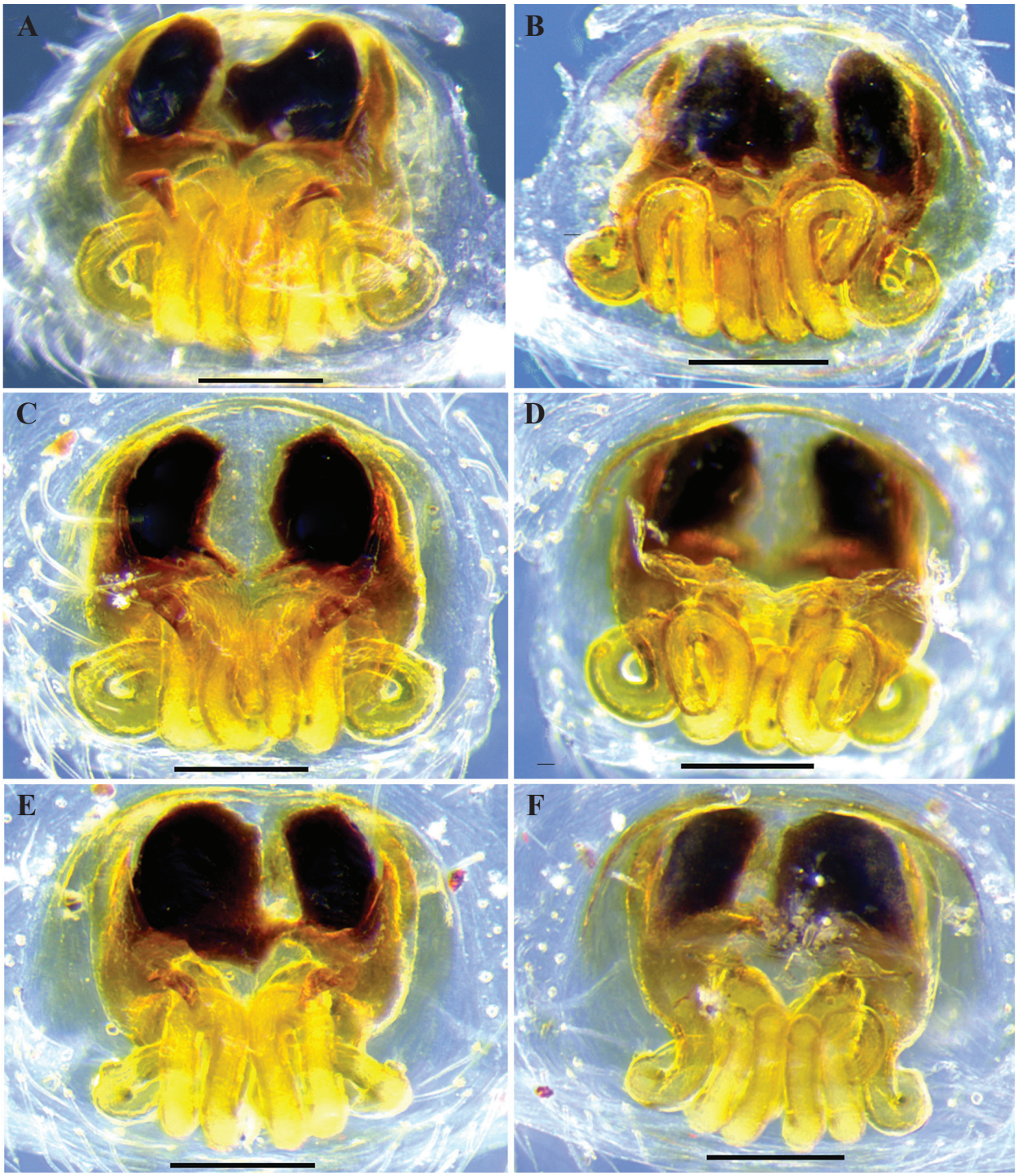

Figure 4. *Epeus albus* Prószyński, 1992, copulatory organs of the freshly-collected females showing variations. **A, C, E.** Female epigynum, ventral view; **B, D, F.** Vulvae, dorsal view. Scale bars: 0.2 mm.

AME 0.71, ALE 0.29, PME 0.07, PLE 0.29; AME-AME 0.03, ALE-ALE 1.34, AME-PME 0.63, PLE-PLE 1.34, PME-PME 1.44, PME-PLE 0.40. Clypeus height 0.16. Length of chelicera 0.93. Measurement of palp and legs: palp 2.46 [0.78, 0.34, 0.43, 0.91], leg I 7.67 [2.32, 0.92, 2.25, 1.43, 0.75], II 7.33 [2.29, 0.91, 1.95, 1.36, 0.82], III 8.17 [2.65, 0.68, 2.03, 1.97, 0.84], IV 7.52 [2.18, 0.62, 1.99, 2.02, 0.71]. Leg formula 3142. Leg spination: femur I pl 3 rl 3 do 3, II pl 2 rl 2 do 3, III pl 2 do 3, IV do 3; patella III-IV pl 1 rl 1; tibia I-II plv 4 rlv 4, III-IV pl 1 rl 3 plv 1 rlv 1; metatarsus I-II plv 2 rlv 2, III pl 2 rl 2 plv 2 rlv 2 v 1, IV pl 2 rl 2 plv 2 rlv 2; tarsi I-IV spineless. In all details mostly as male, except for the following: elongate and robust than male (Fig. 1D); clypeus pale yellow, densely covered with white setae (Fig. 1H); endites distal tip without anterolateral protuberance (Fig. 1E); abdomen covered with colourless and white setae, venter without any prominent markings (Fig. 1D, E). Epigyne wider than

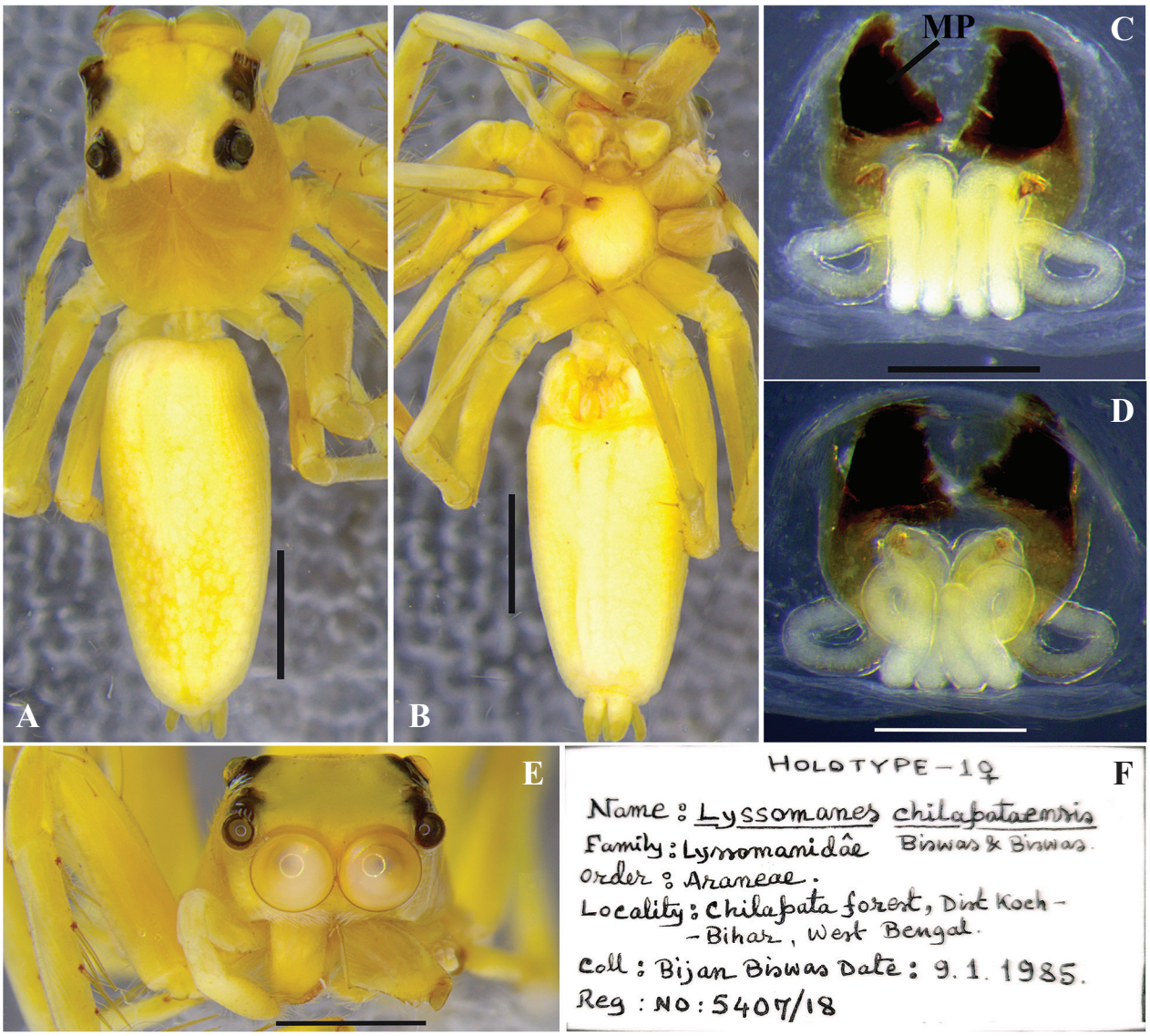

Figure 5. *Epeus albus* Prószyński, 1992 (the holotype of *Epeus chilapataensis* (Biswas & Biswas, 1992). **A.** Female, dorsal view; **B.** Same, ventral view; **C.** Female epigyne, ventral view; **D.** Vulva, dorsal view; **E.** Female, frontal view; **F.** Original label. Scale bars: 1 mm (**A, B, E**); 0.2 mm (**C, D**).

long, with a pair of small epigynal pockets, atrium ovoid (Figs 2D, 3C); copulatory openings widely separated, crescent-like, with closely-arranged posterior margins (Figs 2D, 3C); copulatory ducts very long with several loops, finally entering the spermathecal reservoir posteriorly (Figs 2E, 3D); fertilisation ducts long, orientated laterally, positioned at the anterior region of spermathecae (Figs 2E, 3D).

Distribution. India: Karnataka (new locality record), Kerala (new locality record), Meghalaya (new locality record), Odisha, West Bengal (Fig. 7).

Variations. Body length: Male: 4.87–7.83 (n = 3). Female: 4.89–9.58 (n = 19).

Remarks. Mating plugs were found covering the copulatory openings of the holotype female of *E. chilapataensis* (Biswas & Biswas, 1992) and of several other females examined from Karnataka and Meghalaya (Figs 3E, F, 4A–F, 5C, D).

The record of *Epeus daiqini* Patoleta, Gardzińska & Żabka, 2020 from India was based on the male and female specimens collected from Pathanamthitta, Kerala (Sibi et al. 2023). However, illustrations of the male and female copulatory organs provided by Sibi et al. (2023) do not match those of the type specimens of *E. daiqini*: the male palp with serrated cymbial apophysis (absent in the holotype male of *E. daiqini*); relatively short and less coiled copulatory ducts (long and strongly coiled in the paratype female of *E. daiqini*) (cf. figs 3E–G and 4G–H in Patoleta et al. (2020) with figs 1D–F and 2D–E in Sibi et al. (2023)). Their genital morphology is similar to those of freshly-collected male and female specimens of *E. albus* (cf. Figs 2A–E, 3A–D, 4A–F with figs 1D–F and 2D, E in Sibi et al. (2023)). Based on these observations, it is apparent that the species is misidentified by Sibi et al. (2023) and it belongs to *E. albus*.

***Epeus khandalaensis* (Tikader, 1977), comb. nov.**

Figs 6A–D, 7

Phidippus khandalaensis Tikader, 1977: 98, figs 6–8.

Type material. ***Holotype*** female of *Phidippus khandalaensis* from India, Maharashtra: Poona District, Khandala Rest House, Khandala Ghat, 04.xii.1963, NZC-ZSI-5391/18-B.K. Tikader-coll. Examined.

Justification of the transfer. Tikader (1977) described this species, based on a female specimen collected from Poona, Maharashtra. The ZSI collection has a single glass bottle for this species, containing a female specimen (labelled as 'holotype') in good conditions with detached abdomen and broken legs. The genitalia of the female was dissected, but was not found inside the bottle and is perhaps lost. The general morphology shows that this species shares the features of *Epeus* Peckham & Peckham, 1886: carapace high and elevated, AME much larger than ALE and the latter slightly behind AME (Patoleta et al. 2020) and the abdomen dorsally with indistinct black markings and white spots (Fig. 6A–C). Based on these observations, we are provisionally transferring it to *Epeus*.

Distribution. India: Maharashtra (Fig. 7).

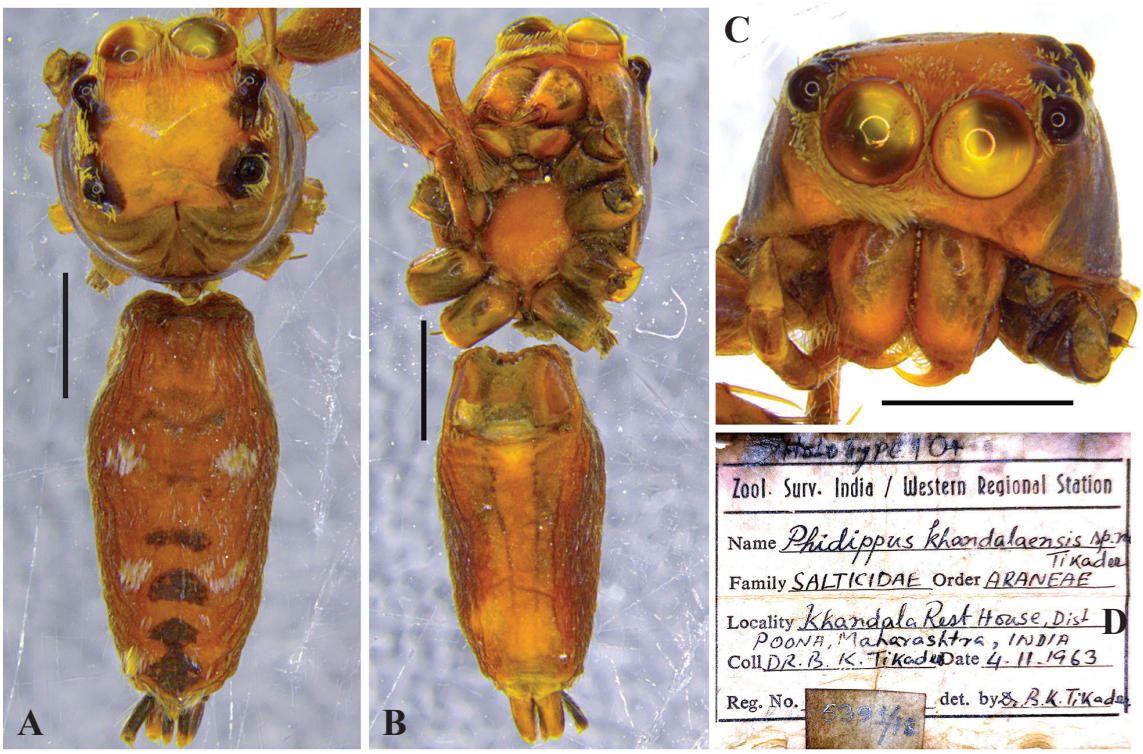

Figure 6. *Epeus khandalaensis* (Tikader, 1977) comb. nov. **A.** Holotype female, dorsal view; **B.** Same, ventral view; **C.** Female, frontal view; **D.** Original label. Scale bars: 1 mm.

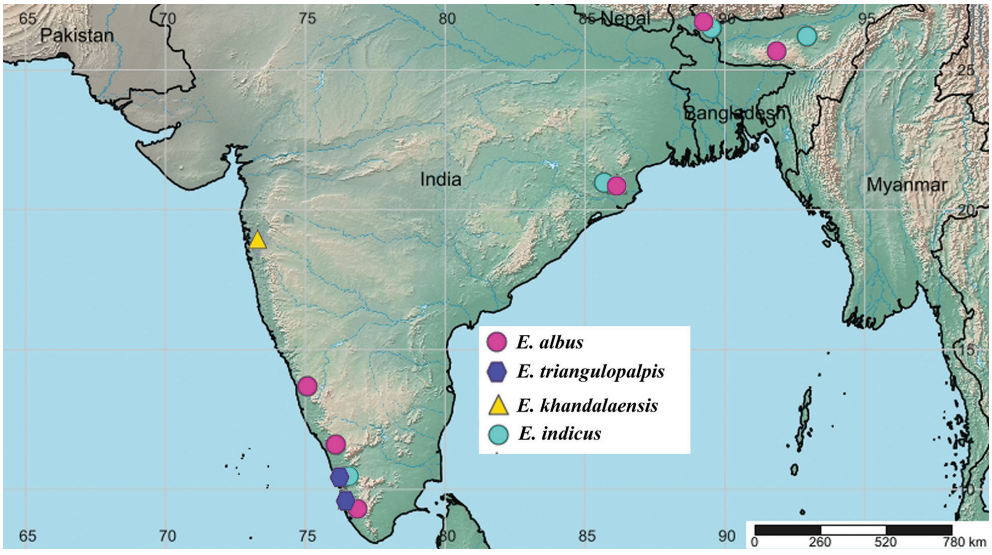

Figure 7. Map showing the distributional records of *Epeus* species in India.

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