

RESEARCH PAPER

The taxonomy of some unusual Microveliinae (Hemiptera: Heteroptera: Veliidae) from India

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Accepted:
29th November 2021

Published online:
31st December 2021

Abstract. Two new genera and three new species of Microveliinae are described from India: *Thirumalaia ocellularis* gen. nov. & sp. nov. from Tamil Nadu, *Eyarinella robusta* gen. nov. & sp. nov. from Kerala and Tamil Nadu, and *Geovelvia fikaceki* sp. nov. from Arunachal Pradesh. A male-based key to the genera of Microveliinae of India and a checklist of Indian species are provided. *Neoalardus typicus* (Distant, 1903) is recorded for the first time from Rajasthan.

Key words. Hemiptera, Heteroptera, Veliidae, checklist, key to genera, new genera, new species, taxonomy, India, Oriental Region

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Introduction

Microveliinae are the most neglected subfamily of the Veliidae. THIRUMALAI (2002) recorded five genera and eleven species from India in its present borders. We include a list of all published names known to us (see Appendix), but the validity of some descriptions is doubtful – or they are simply not given, as in fifteen published names (“sp. nov.”) by GUPTA & SHARMA (2017). Ten Indian species were placed in the genus *Microvelia* Westwood, 1834. A revision and redescriptions of several *Microvelia* species are necessary, as most of them were so inadequately described that subgeneric placement for these species is impossible. Exceptions to the above pattern include two widely distributed, common species, *Microvelia leveillei* (Lethierry, 1877) and *Microvelia douglasi* Scott, 1874, as well as *Microvelia miyamoti* Gupta & Gupta 2008, and also *Microvelia annandalei* Distant, 1909 which LUNDBLAD (1933) has redescribed. However, *Microvelia* is excluded from this study. In *Pseudovelvia* Hoberlandt, 1950, only *P. sexualis* (Paiva, 1917) is well-known, two species are inadequately described (GUPTA & KHANDELWAL 2003, KHANDELWAL 2013), and one of them is a junior primary homonym; fifteen additional names by GUPTA & SHARMA (2017) are not available according to ICZN (1999).

The main result of this paper is that the generic diversity of Microveliinae on the Indian subcontinent is higher than previously expected. We describe two new genera whose long antennae and legs indicate a hygropetric lifestyle, although

this remains to be confirmed by field observations. We further record the terrestrial genus *Geovelvia* Zimmermann, 1984 from India for the first time. In addition, we provide the first records of *Neoalardus typicus* (Distant, 1903) from Rajasthan, a monotypic genus that was previously recorded in India from the Andaman and Nicobar Islands (THIRUMALAI 2002) and from Meghalaya (JEHAMALAR & CHANDRA 2020), and also extends its distribution to Southeast Asia (YANG et al. 1997, ZETTEL 1998).

Material and methods

This taxonomic study is based on 39 specimens that were dry mounted on paper cards. Additional nine paratypes of *Geovelvia fikaceki* sp. nov. are kept in pure ethanol.

List of repositories:

NHMW Natural History Museum, Vienna, Austria;
NMPC National Museum in Prague, Czech Republic;
ZMUC Zoological Museum, University of Copenhagen, Denmark.

Measurements were performed with a Leica Wild M10 binocular microscope at magnifications from 20× to 80× and are given in millimetres. They refer to the maximum length or width of the respective structure. Measurements of body length and width were taken in dorsal view of specimens. Synthlipsis is the dorsal minimum eye distance.

Images: Stacked digital images (Figs 1–8) were taken with a Leica DFC450 camera attached to a Leica Z16APO optics carrier, using Leica Application Suite V3.8. Images were stacked with ZereneStacker 64-bit and processed with



Adobe Photoshop 7.0. Protibial comb index is calculated by length of protibial comb divided by total tibia length.

Drawings of larger body parts (Figs 9–12, 16–21, 25–28) were made by using a camera lucida fixed to a Leica WILD M10 binocular microscope. Drawings of the males' genitalia (Figs 13–15, 22–24, 29–31) were made with an OLYMPUS BX40 microscope with a camera lucida at a magnification of 100–400×.

Taxonomy

Microveliinae China & Usinger, 1949

Key to the genera and subgenera of Microveliinae known from India (males only)

- 1 Mesotibia with grasping comb. 2
- Mesotibia without grasping comb. 3
- 2 Profemur and mesofemur of male strongly incrassate. Both parameres reduced, very small.
..... *Microvelia* subgen. *Dilutovelia* Zettel, 2012
- Profemur and mesofemur not incrassate. Right paramere well developed, larger than left paramere.
..... *Microvelia* subgen. *Picaultia* Distant, 1913
- 3 Protibia without grasping comb (Fig. 7).
..... *Neolardus typicus* (Distant, 1903)
- Protibia with grasping comb (e.g., Figs 10, 26; very small and apical in *Eyarinella* gen. nov., Fig. 18). ... 4
- 4 Antenna short; antennomere I surpassing apex of head by less than half of its length.
..... *Microvelia* Westwood, 1834 (without subgenus)
- Antenna long (only moderately long in *Pseudovelia*); antennomere I surpassing apex of head by more than half of its length (e.g., Figs 9, 16, 25). 5
- 5 Protibial grasping comb short, about 1/6 of tibia length or shorter (e.g., Figs 18, 26). 6
- Protibial grasping comb long, at least 1/4 of tibia length (e.g., Fig. 10). 8
- 6 Body very elongated. ... *Aquulavelia* Thirumalai, 1999
- Body very stout (Figs 3, 5). 7
- 7 Claws subterminal, their apices surpassing apex of tarsus (Fig. 26). Postocular region of head short, shallowly inserted in a weak concavity of the anterior margin of pronotum (Fig. 25). Propleuron unmodified.
..... *Geovelina* Zimmermann, 1984
- Claws preterminal, their apices not reaching apex of tarsus (Fig. 18). Postocular region of head long, deeply inserted in a concavity of the anterior margin of pronotum (Fig. 16). Propleuron with ridge behind eye (Fig. 17). *Eyarinella* gen. nov.
- 8 Antennomere IV distinctly stouter than antennomere III. *Pseudovelina* Hoberlandt, 1950
- Antennomeres III and IV both very slender, filiform (Fig. 1). 9
- 9 Profemur and protibia curved or otherwise modified. Abdominal segments 6 and 7 modified by lobes (both characters reduced in the smallest males). Paramere small and sickle-shaped. *Baptista* Distant, 1903
- Profemur, protibia, and abdominal segments 6 and 7 without such modifications. Paramere prominent, of characteristic shape (Fig. 14). .. *Thirumalaia* gen. nov.

New taxa

Thirumalaia gen. nov.

(Figs 1, 2, 9–15)

Type species. *Thirumalaia ocularis* sp. nov.

Diagnosis. Body of male moderately stout (Fig. 1), of female much stouter (Fig. 2). Postocular region of head deeply inserted in anterior part of pronotum (Fig. 9). Eyes very large, synthlipsis 0.28–0.34 (Fig. 9). Antenna very long and slender, about two thirds of body length (Figs 1, 2); antennomere I approximately as long as head length (in male longer than in female); relative lengths of antennomeres: IV \cong III > I > II. Pronotum convexly rounded posteriorly (Fig. 9). Lateral evaporatorium situated approximately in middle of metapleuron. Legs long and slender. Claws preterminal. – Male: Propleuron unmodified. Femora unmodified. Protibia unmodified; protibial grasping comb long, about one third of tibia length (Fig. 10). Mesotibia without grasping comb. Claws simple, minimally surpassing apex of tarsus. Abdomen without projections. Segment 8 elongated. Pygophore pear-shaped, narrow at base, with truncated posterior margin (Fig. 13). Proctiger very slender (Fig. 15). Parameres symmetrical, medium-sized, of characteristic shape as shown in Figure 14. – Female: Genitalia situated in a strictly posterior opening of segment 7.

Comparative notes. *Thirumalaia* gen. nov. resembles some species of *Baptista* Distant, 1903 in habitus and shares with this genus some other characters like the long protibial grasping comb, structure of antenna, and a concave anterior margin of the pronotum. Most species of *Baptista*, including those hitherto reported from India, differ from *Thirumalaia* gen. nov. by strong modifications of foreleg and abdominal segments 6–7 of the males (= *Baptista femoralis* group sensu KOVAC & YANG 2000). Four species of *Baptista* from Southeast Asia and Southern China form the *Baptista collaris* group and also lack such modifications (ZETTEL 2004, YE et al. 2014b). However, *Thirumalaia* gen. nov. possesses none of the characters defining this group either (described in detail by ZETTEL 2004). The sexually dimorphic body shape, the enlarged compound eyes, and the characteristic parameres are the most important characteristics of *Thirumalaia* gen. nov. For distinction from other genera see the key. **Etymology.** Dedicated to the memory of the Scientist of the Zoological Survey of India Dr. G. Thirumalai, honouring his significant contribution to the knowledge of Indian water bugs. Gender: feminine.

Thirumalaia ocularis sp. nov.

(Figs 1, 2, 9–15)

Type material. HOLOTYPE: ♂ (apterous) (NHMW), labelled “INDIA: Tamil Nadu, 23.1.1999 \ Nilgiri Hills, 5km E Kundah \ 11°18'N 76°40'E, 1900m \ leg. D. Boukal (80)”. PARATYPES (NHMW, NMPC): 2 ♂♂ 5 ♀♀ (all apterous) (include allotype) with same label data; 1 ♂ (apterous), labelled “India: Tamil Nadu, Nilgiri Hills \ Kotagiri env., Kadashola \ N 11°25' E 76°55', 1500 m \ a.s.l., 7–8.1.1999 \ leg. D. Boukal (74)”; 3 ♂♂ 1 ♀ (all apterous), labelled “INDIA: Tamil Nadu, 12.1.1999 \ Palni Hills 10°16'N 77°33'E \ Perumalmalai, 1600m \ leg. D. Boukal (60)”; 2 ♀♀ (apterous), labelled “INDIA: Tamil Nadu, 11.1.1999 \ Palni Hills 10°14'N 77°29'E \ Kodaikanal, Bear Shola Falls \ 2100m \ leg. D. Boukal (57)”.



Figs 1–4. Habitus of *Thirumalaia ocellaris* gen. nov. & sp. nov. (1 – apterous male, 2 – apterous female), and of *Eyarinella robusta* gen. nov. & sp. nov. (3 – apterous male, 4 – apterous female).

Description of apterous male. Measurements of holotype: Body length 2.62; maximum body width (at metapleura) 0.96. Head length 0.46, width 0.64. Synthlipsis 0.28. Pronotum length 0.53, width 0.86. Lengths of antennomeres, I 0.49, II 0.30, III 0.54, IV 0.54. Lengths of leg segments: profemur 0.81, protibia 0.72, protarsus 0.31, mesofemur 0.99, mesotibia 0.93, mesotarsus 0.20 + 0.31, metafemur 1.09, metatibia 1.36, metatarsus 0.26 + 0.31; protibial comb length 0.25; comb index 0.35. Measurements of paratypes

(n = 6): Body length 2.55–2.64; maximum body width (at metapleura or abdominal segment 4) 0.92–0.98. Head length 0.44–0.46, width 0.64–0.66. Synthlipsis 0.29–0.31. Pronotum length 0.50–0.54, width 0.88–0.92. Protibia length 0.70–0.76; protibial comb length 0.21–0.27; comb index 0.30–0.36.

Colour (Fig. 1): Black. Sides of head yellowish brown. Pronotum anteromedially with a narrow transverse yellow stripe, narrowly interrupted at midline. Acetabula

orange-brown to black. Rostrum yellow, terminal segment black. Antenna dark brown. Legs yellow, apices of femora, protibiae, and tarsi infuscated.

Pilosity: Body covered by a short appressed greyish brown pilosity; pilosity on legs yellowish to whitish. Antenna with two long setae on antennomere I, and one on antennomere II; additionally, with numerous shorter, oblique setae on antennomeres II–IV. Most of body with brown, relatively short to moderately long oblique standing setae (longest on mediotergites). Legs with long whitish standing setae on flexor sides, and with more oblique, shorter, mostly brownish setae on extensor side. Silverish pilosity (Fig. 1) extended on anterior part of pronotum and sides of mediotergite 1; small spots often developed at hind margins of laterotergites and (minute and indistinct) on sides of mediotergites 5–7.

Structures: Body moderately stout (Fig. 1); sides of abdomen subparallel. Head wider than long, anteriorly blunt, posteriorly weakly protruded, in a shallow concavity of the anterior margin of pronotum. Anteclypeus and labrum shiny. Eyes prominent; eye width larger than half of synthlipsis (Fig. 9). Antenna very long and slender; antennomere II slightly slenderer and shorter than I; antennomeres III and IV similar in length and width, or IV slightly longer than III. Rostrum stout, reaching base of mesosternum. Pronotum long (Fig. 9), reaching mediotergite 1 posteriorly; sides of pronotum slightly protruded anteriorly; disc with a shallow transverse groove bearing a row of sensory pores and separating anterior part from posterior lobe; anterior margin with another row of pores; numerous pores scattered over pronotal lobe. Legs long, hardly modified. Profemur (Fig. 10) slightly thicker than meso- and metafemur, not curved. Tibiae and tarsi slender. Protibial comb about one third as long as protibia (Fig. 10). Second tarsomeres on middle and hind leg longer than first. Abdomen moderately wide. All mediotergites transverse (Fig. 1); mediotergite 7 about 1.6 times as wide as long. Abdominal sterna hardly modified. Sterna 5–7 very shallowly impressed along midline. Hind margin of sternum 7 broadly concave. Segment 8 (Fig. 12) subcylindrical, 1.5 times as long as wide; ventrally, posterior and anterior margin strongly concave, dorsally posterior margin with concavity in medial third. Pygophore (Fig. 13) pear-shaped, but with truncated posterior margin, widest at paramere insertion, about 1.6 times as long as wide. Proctiger (Fig. 15) small and slender, posterior part almost round. Parameres (Fig. 14) symmetrical, medium-sized, of characteristic shape.

Description of apterous female. Measurements of allotype: Body length 2.88; maximum body width (at abdominal segment 4) 1.38. Head length 0.51, width 0.68. Synthlipsis 0.34. Pronotum length 0.50, width 0.98. Lengths of antennomeres, I 0.44, II 0.28, III 0.47, IV 0.51. Lengths of leg segments: profemur 0.81, protibia 0.70, protarsus 0.33, mesofemur 0.91, mesotibia 0.95, mesotarsus 0.19 + 0.32, metafemur 1.10, metatibia 1.38, metatarsus 0.27 + 0.34. Measurements of paratypes (n = 7): Body length 2.80–3.00; maximum body width (at abdominal segment 3 or 4) 1.18–1.38. Head length 0.47–0.52, width 0.67–0.70. Synthlipsis 0.31–0.34. Pronotum length 0.50–0.54, width

0.93–0.99.

Colour (Fig. 2): Similar as in male.

Pilosity: Similar as in male. Silvery pilosity on mediotergites and laterotergites on average more extended. Setae on mediotergite 8 similar as on mediotergite 7. Gonocoxa with moderately long, oblique pilosity.

Structures: Body stout (Fig. 2); shape of abdomen ovate. Most characters similar as in male. Antennomere IV slightly longer than 3. Legs unmodified; all femora of similar width; protibia without grasping comb. Mediotergites strongly transverse (Fig. 2). Mediotergite 7 about 1.25 times as long as 6, at anterior margin 2.4 times as wide as long, posteriorly strongly narrowed; posterior margin straight. Mediotergite 8 (Fig. 11) almost semi-circular in shape, directed straight posteriorly. Proctiger knob-shaped, directed posteriorly. Gonocoxa plate-like, not concealed by sternum 7.

Comparative notes. The generic diagnosis distinguishes *Thirumalaia ocularis* sp. nov. from all other Indian Microveliinae except *Microvelia santala* Hafiz & Ribeiro, 1939. This species was described from apterous males collected in Jharkhand (formerly Bihar; HAFIZ & RIBEIRO 1939). It has several similarities with *Thirumalaia ocularis* sp. nov. as it is also a slender species with large eyes, very long appendages, and a long protibial grasping comb (cf. HAFIZ & RIBEIRO 1939), a character combination that does not fit *Microvelia*. Therefore, it may represent a second species of *Thirumalaia*. However, genitalia were not treated in the original description, and therefore we do not transfer *M. santala* to the new genus. *Microvelia santala* clearly differs from *Thirumalaia ocularis* sp. nov. by the greater slenderness of its body and a mediotergite 7 of the male that is longer than broad (cf. HAFIZ & RIBEIRO 1939: p. 426, text-fig. a).

Etymology. The species epithet, Latin adjective *ocularis* (-is, -e), refers to the large, protruding eyes.

Eyarinella gen. nov.

(Figs 3, 4, 16–24)

Type species. *Eyarinella robusta* sp. nov.

Diagnosis. Body stout, ovate (Figs 3, 4). Posterior of head deeply inserted in anterior part of pronotum (Fig. 16). Eyes moderately large (Figs 16, 17). Antenna long and slender, about two thirds of body length; antennomere I (Fig. 16) 0.9 times as long as head length; relative lengths of antennomeres: IV > III \cong I > II. Pronotum convexly rounded posteriorly (Fig. 16). Lateral evaporatorium small, situated in ventral half of metapleuron. Legs stout. Claws preterminal, their apices not reaching apex of tarsus. – Male: Propleuron with a sharp ridge behind eye (Fig. 17), in dorsal view appearing tooth-like. Femora stout (Figs 18, 19), otherwise unmodified. Protibia unmodified; protibial grasping comb extremely short (Fig. 18), restricted to a short ear-shaped spur at apex of tibia. Mesotibia without grasping comb. Pregenital abdomen without projections. Segment 8 moderately elongated (Fig. 21). Pygophore (Fig. 22) distally upcurved and with concave posterior margin. Proctiger (Fig. 23) narrow, tongue-shaped; apex narrowly rounded. Parameres (Fig. 24) symmetrical, curved, very

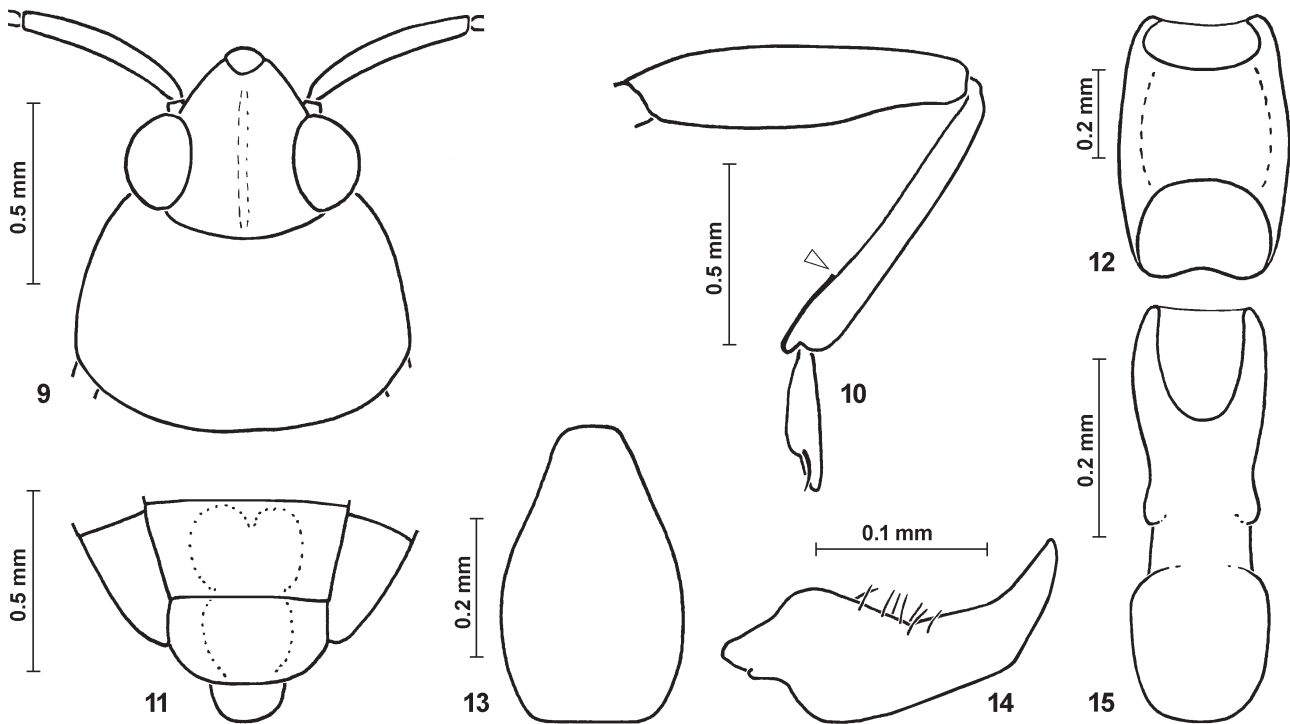


Figs 5–8. Habitus of *Geovelina fikaceki* sp. nov. (5 – apterous male, 6 – apterous female), and *Neoalardus typicus* (Distant, 1903) (7 – apterous male, 8 – apterous female), both specimens from India.

long and slender. – Female: Genitalia situated in a posterior opening of segment 7.

Comparative notes. The stout body distinguishes *Eyarinella* gen. nov. from all other Oriental genera of Microveliinae, except from *Geovelina* and a few species of *Microvelia* (*Microvelia* shows a great variation in body shape). However, in *Microvelia* the antenna is much shorter and stouter,

and the genitalia of females are less protruding. *Geovelina* differs from *Eyarinella* gen. nov. in several characters, e.g., by a short head that is not deeply embedded in a concavity of the pronotum, by large eyes (e.g., Figs 5, 6), and by subterminal claws. The long antenna of *Eyarinella* gen. nov. resembles several genera of Microveliinae with a hygropetric lifestyle, e.g., *Baptista* Distant, 1903, *Aquilavelia*



Figs 9–15. Structural details of *Thirumalaia ocularis* gen. nov. & sp. nov.: 9 – head, first antennomere, and pronotum, dorsal; 10 – foreleg of male (arrow points at proximal end of grasping comb); 11 – abdominal segments 7 and 8, and proctiger of female, dorsal; 12 – abdominal segment 8 of male, ventral; 13 – pygophore of male, ventral; 14 – left paramere, lateral; 15 – proctiger of male, dorsal. Pilosity omitted, except in Fig. 14.

Thirumalai, 1999, and *Thirumalaia* gen. nov. The male of *Eyarinella* gen. nov. possesses the following two unique characters: the sharp ridge anteriorly on propleuron (Fig. 17), and the rudimentary protibial grasping comb (Fig. 18).

Etymology. The generic name is dedicated to Dr. E. Eyarin Jehamalar of the Zoological Survey of India for her numerous valuable publications on Indian water bugs. Gender: feminine.

***Eyarinella robusta* sp. nov.**

(Figs 3, 4, 16–24)

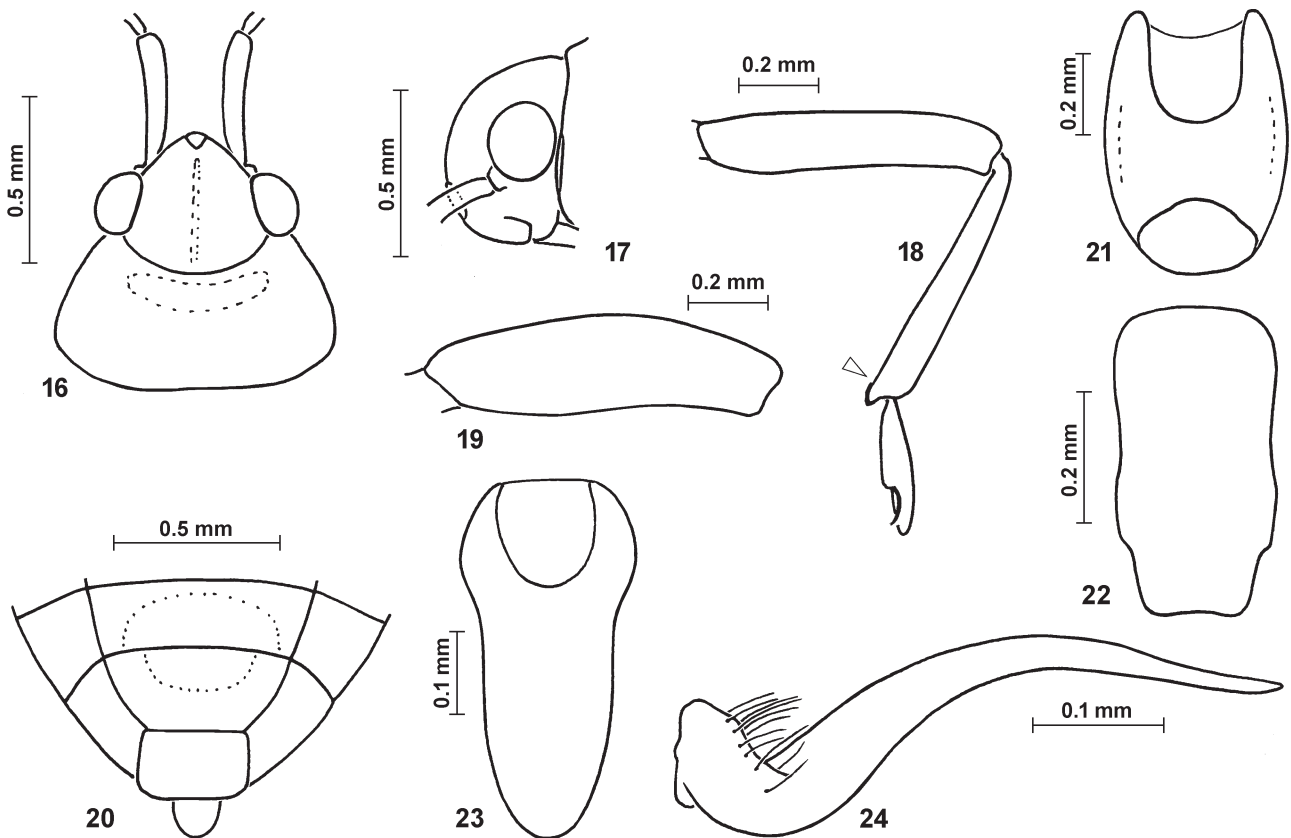
Type material: HOLOTYPE: ♂ (apterous) (NHMW), labelled “INDIA: Kerala, 8.1.1999 \ 10km WSW Munnar, 1200m \ Kallar Valley, 10°03'N 76°59'E \ leg. D. Boukal (52)”. PARATYPES (NHMW): 1 ♂ (apterous) with same label data; 1 ♀ (apterous), labelled “INDIA: Kerala, 7.1.1999 \ 10km WSW Munnar, 1100m \ Kallar Valley, 10°03'N 76°58'E \ leg. D. Boukal (50)”; 1 ♀ (apterous; allotype), labelled “INDIA: Kerala, Kallar Valley \ 10km WSW Munnar, \ 10°03'N 76°58–59'E \ 1100- \, 1200 m a.s.l., 7–8.1.1999 \ leg. D. Boukal (49/52)”; 1 ♀ (apterous), labelled “INDIA: Tamil Nadu, 25.1.1999 \ Shevaroy Hills, Yercaud \ Kiliyur Falls env. \ 11°47'N 78°12'E, 1400m \ leg. D. Boukal (85)”; 1 ♀ (apterous), labelled “S. INDIA, KERALA, Thekkady \ Periyar Lake, 09°34'N 77°10'E \ 900–1000m, 19.-27.IV.1997 \ leg. Dembicky & Pacholátko leg.”

Description of apterous male. Measurements of holotype: Body length 2.52; maximum body width (at abdominal segment 4) 1.05. Head length 0.44, width 0.65. Synthlipsis 0.36. Pronotum length 0.38, width 0.91. Lengths of antennomeres, I 0.44, II 0.34, III 0.48, IV 0.60. Lengths of leg segments: profemur 0.76, protibia 0.72, protarsus 0.34, mesofemur 0.88, mesotibia 0.82, mesotarsus 0.14 + 0.29, metafemur 1.00, metatibia 1.02, metatarsus 0.12 + 0.28; protibial comb length 0.02; comb index 0.03. Measurements of paratypes (n = 1): Body length 2.57; maximum

body width (at abdominal segment 4) 1.08. Head length 0.44, width 0.66. Synthlipsis 0.35. Pronotum length 0.34, width 0.89. Protibia length 0.70; protibial comb length 0.03; comb index 0.03.

Colour (Fig. 3): Dark brown to black. Posterior margin of head and stripes along medial eye margin more or less dark orange; only holotype provided posteriorly with a pair of yellow marks. Pronotum anteromedially with a transverse, broad, yellow stripe, sides and a narrow hind margin more or less orange-brown; sharp edge on propleuron below eye yellow. Mediotergite 1 at middle orange-brown. Narrow lateral margins of laterotergites and sterna pale orange. Sides of segment 8 yellowish. Antenna pale brown. Legs basally pale yellow, apices of femora, bases and apices of tibiae, and apices of tarsi indistinctly infusate.

Pilosity: A short grey appressed pilosity covering body except disc of pronotum. In addition, almost entire body (except sides and venter of head and thorax) with scattered long setae, longest on pronotum and dorsalmost part of metapleuron; those on head and pronotum standing, those on abdomen oblique. Metapleuron densely hirsute. Silverish hairs (Fig. 3) arranged in a pair of large patches laterally on mediotergite 1 and small patches at hind margins of laterotergites 2–6. Antenna with two long setae on antennomere I, and one on antennomere II; all antennomeres with several shorter setae. Legs densely beset with decumbent pilosity; profemur with row of standing setae on flexor side; meso- and metafemur with some longer oblique setae on flexor side subapically; all tibiae with moderately long, oblique setae on extensor sides.



Figs 16–24. Structural details of *Eyarinella robusta* gen. nov. & sp. nov.: 16 – head, first antennomere, and pronotum, dorsal; 17 – head and anterior margin of pronotum, lateral; 18 – foreleg of male (arrow points at proximal end of grasping comb); 19 – metafemur of male; 20 – abdominal segments 6–8, and proctiger of female, dorsal; 21 – abdominal segment 8 of male, ventral; 22 – pygophore of male, ventral; 23 – proctiger of male, dorsal; 24 – left paramere, lateral. Pilosity omitted, except in Fig. 24.

Structures: Head (Fig. 16) short, with pointed apex, posterodorsally deeply inserted in strongly concave anterior margin of pronotum. Eye moderately large (Figs 16, 17), posteriorly touching pronotum. Antenna very long and slender; antennomere I surpassing apex of head by about three fourths of its length (Fig. 16); antennomeres II more slender, III and IV very slender, filiform. Pronotum (Fig. 16) long, anterior margin broadly concave, posterior margin broadly convex, but with a shallow concavity in approximately medial fourth; only there metanotum visible as a narrow transverse line. Pronotum with transverse rows of punctures in front of and behind yellow stripe, and with scattered punctures on disc except on midline. Propleuron with short ridge at anterior margin behind eye (Fig. 17). Legs moderately long, stout; profemur slightly narrower than mesofemur and much narrower than metafemur (Fig. 19). Protibial grasping comb very stout, situated on a small apical spur (Fig. 18). Pregenital abdomen very broad; mediotergites about three times wider than laterotergites; mediotergite 7 ca. 1.5 times longer than 6, about 2.2 times wider than long. Segment 8 (Fig. 21) moderately wide, subcylindrical. Pygophore (Fig. 22) slender, ca. 1.9 times as long as wide, distally upcurved, and with concave posterior margin. Proctiger (Fig. 23) narrow, tongue-shaped, about twice as long as wide, apex narrowly rounded. Parameres (Fig. 24) symmetrical, very long and slender, curved, in resting position surpassing apex of proctiger.

Description of apterous female. Measurements of allotype: Body length 2.69; maximum body width (at abdominal segment 4) 1.34. Head length 0.50, width 0.68. Synthlipsis 0.39. Pronotum length 0.34, width 0.92. Lengths of antennomeres, I 0.47, II 0.35, III 0.47, IV 0.57. Lengths of leg segments: profemur 0.80, protibia 0.74, protarsus 0.38, mesofemur 0.90, mesotibia 0.88, mesotarsus 0.14 + 0.31, metafemur 1.10, metatibia 1.15, metatarsus 0.16 + 0.31. Measurements of paratypes (n = 3): Body length 2.53–2.59; maximum body width (at metapleura) 1.26–1.29. Head length 0.44–0.47, width 0.63–0.66. Synthlipsis 0.35–0.36. Pronotum length 0.31–0.33, width 0.89–0.90.

Colour (Fig. 4): Similar to male, in some specimens slightly darker.

Pilosity: Similar to male, but short pilosity also present on pronotal disk, and very long, erect setae all over dorsum of head and thorax, mediotergites, laterotergites, and sides of sterna. Long pilosity partially rubbed off in some specimens. Patches of silverish pilosity (Fig. 4) laterally on mediotergite 1 more extended than in male; in addition, a larger central part of mediotergites 6 and 7 silverish. Gonocoxa 1 only with short pilosity.

Structures: Head and thorax similar as in male. Pronotum without concavity of hind margin. Propleuron without ridge behind eye. Abdomen wider than in male, but posteriorly more narrowed. Mediotergite 7 (Fig. 20) about 2.1 times as long as wide. Mediotergite 8 flat, wider than

long, directed posteriorly. Proctiger narrow, posteriorly protruded. Gonocoxa 1 flat, base concealed by sternum 7. **Etiology.** The species epithet, the Latin adjective *robustus* (-a, -um), refers to the stout body shape.

***Geovelia fikaceki* sp. nov.**

(Figs 5, 6, 25–31)

Type material: HOLOTYPE: ♂ (apterous) (NMPC), labelled “INDIA, Arunachal Pradesh (15) \ 11 km SSE of Tenga, Eagles \ Nest WL sanctuary, 4.v.2008 \ 27°06'23"N 92°26'02"E 2510m \ Fikáček, Podskalská, Šípek lgt.”; “primary evergreen mountain \ cloud forest with very sparse \ understory vegetation \ sifting: wet leaf litter”. PARATYPES (including allotype female; NMPC, NHMW, ZMUC): 10 ♂♂ 11 ♀♀ (all apterous), same label data (5 ♂♂ 4 ♀♀ in pure ethanol).

Diagnosis. Body small and stout, length 1.88–2.04. Head (Fig. 25) wide, with globular eyes. Pronotum of apterous morph (Fig. 25) moderately short (width / length ca. 3.4), reaching abdominal mediotergite 1; middle of anterior margin moderately concave; middle of hind margin straight or shallowly concave. Grasping comb of male shorter than subapical tibia width (Fig. 26), less than one tenth of tibia length. Apterous morph with shiny spots anteromedially on mediotergites 7 and 8 (in male spot on segment 8 not visible in undissected specimen).

Description of apterous male. Measurements of holotype: Body length 1.88; maximum body width (at laterotergites 3) 0.94. Head length 0.41, width 0.72. Synthlipsis 0.33. Pronotum length 0.22, width 0.74. Lengths of antennomeres, I 0.25, II 0.23, III 0.42, IV 0.49. Lengths of leg segments: profemur 0.62, protibia 0.74, protarsus 0.21, mesofemur 0.66, mesotibia 0.62, mesotarsus 0.09 + 0.19, metafemur 0.72, metatibia 0.83, metatarsus 0.13 + 0.21; protibial comb length 0.07; comb index 0.09. Measurements of paratypes (n = 5): Body length 1.85–1.93; maximum body width (at laterotergites 3) 0.92–0.96. Head length 0.39–0.43, width 0.71–0.74. Synthlipsis 0.33–0.36. Pronotum length 0.20–0.22, width 0.74–0.78. Protibia length 0.74–0.76; protibial comb length 0.06–0.07; comb index 0.08–0.09.

Colour (Fig. 5): Ground colour pale brown, ventrally more yellowish brown. Dorsum of head with paired blackish markings. Pronotum with a transverse black stripe in middle of length. Sutural zones between mediotergites 1–7 black. Sides of thorax with black spots around grooves. Sides of abdomen with elongate blackish stripe. Rostrum yellow with black tip. Antenna and legs pale yellow.

Pilosity: A sparse pale yellow appressed pilosity inconspicuously developed all over body. Stripes along medial eye margins, and at hind margins of pronotum, mediotergites 1–6 and laterotergites 2–6 with variously developed shiny white pilosity (Fig. 5). Erect setae absent, except from antenna.

Structures: Head (Fig. 25) including eyes almost twice as wide as long, with large globular eyes; apex of head rectangularly protruded. Posterior of head only slightly protruded into a shallow concavity of pronotum. Antenna long; antennomere I short, but surpassing apex of head by more than half of its length (Fig. 25); antennomere II slightly shorter and more slender than antennomere

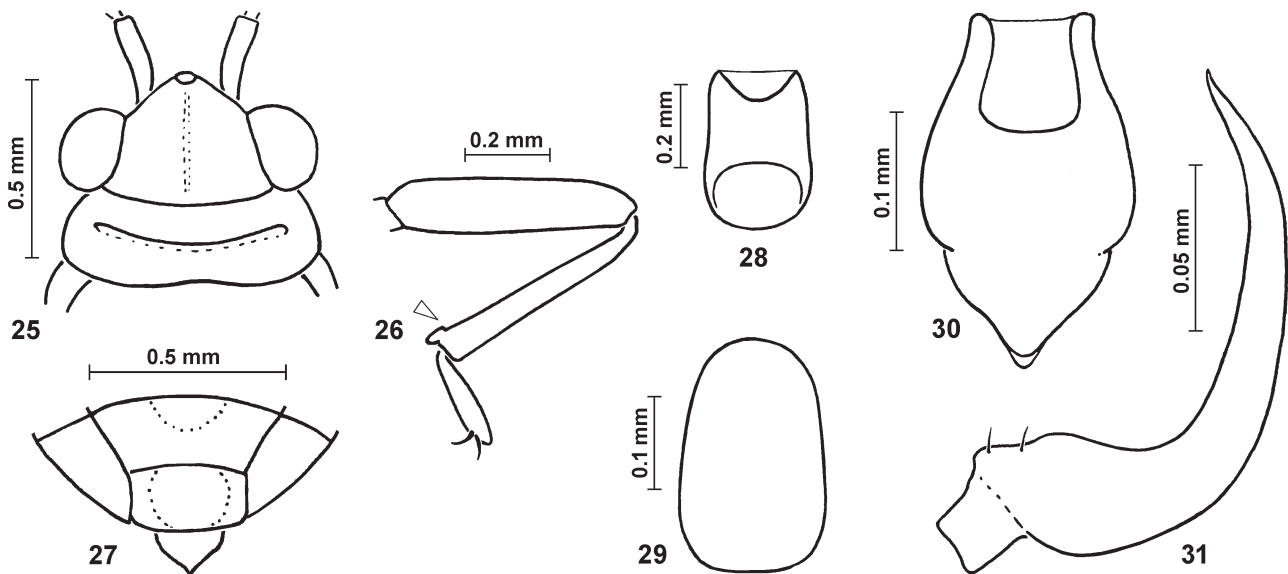
I, but clearly thicker than filiform antennomeres III and IV; antennomere IV longest. Rostrum reaching middle of mesosternum. Pronotum (Fig. 25) moderately short, medially touching mediotergite 1; anterior margin shallowly concave in middle; posterior margin laterally convex, medially straight to very shallowly concave; at midlength with a deep transverse groove beset with numerous sensory pores; another transverse row of pores just behind anterior margin. Legs relatively short; femora moderately stout. Protibial grasping comb very short, occupying less than one tenth of tibia length (Fig. 26). All mediotergites much wider than long, mediotergite 7 more than twice as long as 6, anteromedially with a large shiny area. Sutural zones between mediotergites 1–7 with transverse rows of pores. Laterotergites evenly sloping. All sterna simple, convex. Segment 8 (Fig. 28) about one-and-a-half times longer than wide, dorsally shiny. Genitalia very small. Pygophore unmodified (Fig. 29). Proctiger with pointed apex (Fig. 30). Paramere very slender, sickle-shaped (Fig. 31).

Description of apterous female. Measurements of allotype: Body length 1.90; maximum body width (at laterotergites 3) 0.98. Head length 0.42, width 0.73. Synthlipsis 0.35. Pronotum length 0.20, width 0.76. Lengths of antennomeres, I 0.25, II 0.23, III 0.36, IV 0.47. Lengths of leg segments: profemur 0.55, protibia 0.50, protarsus 0.21, mesofemur 0.62, mesotibia 0.61, mesotarsus 0.09 + 0.15, metafemur 0.77, metatibia 0.83, metatarsus 0.12 + 0.21. Measurements of paratypes (n = 6): Body length 1.98–2.04; maximum body width (at laterotergites 3 or 4) 1.02–1.06. Head length 0.41–0.43, width 0.74–0.78. Synthlipsis 0.34–0.38. Pronotum length 0.20–0.22, width 0.73–0.78.

Colour (Fig. 6), pilosity, and structures almost same as in male. Body slightly broader. Abdomen unmodified. Mediotergite 7 about one third longer than 6 and 8, respectively. Mediotergite 8 directed straight caudad (Fig. 27), with moderately convex hind margin. Gonocoxa plate-like, unmodified, not concealed by sternum 7. Proctiger with pointed apex (Fig. 27).

Notes on *Geovelia* Zimmermann, 1984. Species of *Geovelia* inhabit moist leaf litter in forests (ZIMMERMANN 1984, 2014; ZETTEL 2011). They were described from Nepal (five species, all known only from the apterous morph; ZIMMERMANN 1984, 2014) and Myanmar (one species, known only in macropterous morph; ZETTEL 2011). *Geovelia hirsuta* Ye, Chen & Bu, 2014 was described from Southwestern China (YE et al. 2014a), but has been transferred to a new genus (ZETTEL et al. 2021). *Geovelia fikaceki* sp. nov. is the first record of this genus from India. The altitudinal range of species extends from 350 m a.s.l. (*G. orientalis* Zettel, 2011) to 3200 m a.s.l. (*G. martensi* Zimmermann, 1984).

Species of *Geovelia* can be recognized primarily by the subterminal claws that clearly surpass the tarsal apex; this character is not found in other Oriental Veliidae. Other important characters are a very small and stout body, a short head with very large eyes and long antennae, and a short protibial grasping comb of the male.



Figs 25–31. Structural details of *Geovelina fikaceki* sp. nov.: 25 – head, first antennomere, and pronotum, dorsal; 26 – foreleg of male (arrow points at proximal end of grasping comb); 27 – abdominal segments 7–8, and proctiger of female, dorsal; 28 – abdominal segment 8 of male, ventral; 29 – pygophore of male, ventral; 30 – proctiger of male, dorsal; 31 – left paramere, lateral. Pilosity omitted, except in Fig. 31.

Comparative notes. *Geovelina fikaceki* sp. nov. differs from most species (except *G. riegeri* Zimmermann, 2014) by the protibial grasping comb being shorter than the subapical protibia width (Fig. 26). *Geovelina fikaceki* sp. nov. and *G. riegeri* are very similar in appearance by their stocky body, wide head, and globular eyes (these characters are also present in *G. ilamica* Zimmermann, 1984), but differ strongly in the length of the pronotum: In *G. fikaceki* sp. nov. the pronotum is longer (pronotum width : pronotum length = 3.4) and reaches mediotergite 1 in middle, whereas in *G. riegeri* the pronotum is shorter (pronotum width : pronotum length = 3.6) and leaves the metanotum uncovered in middle (compare measurements and drawings in ZIMMERMANN 2014). The females of *Geovelina fikaceki* sp. nov. are smaller than those of *G. riegeri* (1.90–2.04 vs. 2.20–2.25 mm), whereas the size of males overlaps.

Etymology. We dedicate this species to Dr. Martin Fikáček, coleopterist at the National Museum, Prague, and one of the collectors of this new species.

Collecting circumstances. All examined specimens were collected by sifting accumulations of leaf litter in primary evergreen cloud forest at ca. 2500 m a.s.l., on the southern slope of the Himalaya Mts. (M. Fikáček, pers. comm.).

New records

Neoalardus typicus (Distant, 1903)

(Figs 7, 8)

Material examined (NMPC, NHMW). 1 ♂ (apterous), labelled “N 27° 08' 22" E 076° 20' 38" \ INDIA BOR. OCC. Rajasthan st. \ Alwar distr., Naranimata env., \ 16. 8. 2002, lgt. P. Šrámek”; 1 ♂ (apterous), labelled “N 27° 08' 22" E 076° 20' 38" \ INDIA BOR. OCC. Rajasthan st. \ Alwar distr., Naranimata env., \ 1. 8. 2002, lgt. P. Šrámek”; 2 ♂♂ 1 ♀ (all apterous), labelled “N 27° 08' 22" E 076° 20' 38" \ INDIA BOR. OCC. RAJASTHAN st., Dausa distr. \ Golakabas env., Bhangar \ 16. 8. 2002, lgt. P. Šrámek”; 1 ♀ (apterous), labelled “N 27° 05' 46" E 076° 20' 38" \ INDIA BOR. OCC. Rajasthan st. \ Dausa distr., Golakabas env., \ “Sarsadewi lake”, 400m a.s.l. \ 14. 8. 2002, lgt. P. Šrámek”.

Distribution. *Neoalardus typicus* was described from West Malaysia (DISTANT 1903). YANG et al. (1997) recorded it from Singapore. ZETTEL (1998) gave a redescription of *N. typicus* and some new country records (China, Laos, Indonesia). THIRUMALAI (2002) listed *N. typicus* only for the “Andaman & Nicobar Islands”, but ANDERSEN (1982: fig. 615: map) already indicated that this species occurs in continental India. The species has recently been recorded from Meghalaya (JEHAMALAR & CHANDRA 2020). The new record extends the known distribution far westwards.

Acknowledgements

We thank the following scientists whose collecting efforts enabled this research paper: David Boukal, Luboš Dembický, Martin Fikáček, Petr Pacholátko, Hana Podskalská, Petr Šípek, and Petr Šrámek. We are grateful Petr Kment (NMPC) for leaving reference specimens to NHMW, and to Tran Anh Duc and an anonymous reviewer for useful comments on the manuscript.

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Appendix:
Checklist of Microveliinae known from India
 (from THIRUMALAI 2002, GUPTA & KHANDELWAL 2005, and this paper).

Available names

<i>Aquulavelia occulta</i> Thirumalai, 1999	Arunachal Pradesh (THIRUMALAI 1999)
<i>Baptisa angulata</i> Andersen, 1989	Karnataka (ANDERSEN 1989)
<i>Baptista sushmae</i> Gupta & Khandelwal, 2005	Rajasthan, Uttar Pradesh, Madhya Pradesh, Himachal Pradesh (GUPTA & KHANDELWAL 2005)
<i>Eyarinella robusta</i> Zettel & Laciny, sp. nov.	Kerala, Tamil Nadu (this study)
<i>Geovelia fikaceki</i> Zettel & Laciny, sp. nov.	Arunachal Pradesh (this study)
<i>Microvelia (Dilutovelia) leveillei</i> (Lethierry, 1877)	Andaman and Nicobar Islands, Bihar, Chhattisgarh, Delhi, Karnataka, Maharashtra, Meghalaya, Odisha, Punjab, Tamil Nadu, Tripura, West Bengal (THIRUMALAI 2002, JEHAMALAR & CHANDRA 2016)
<i>Microvelia (incertae sedis) andersoni</i> Gupta & Khandelwal, 2002 ¹⁾	unknown (GUPTA & KHANDELWAL 2002a)
<i>Microvelia (incertae sedis) annandalei</i> Distant, 1909	West Bengal (DISTANT 1909), Tamil Nadu (THIRUMALAI 1989)
<i>Microvelia (incertae sedis) atromaculata</i> Paiva, 1919	Meghalaya (PAIVA 1919)
<i>Microvelia (incertae sedis) javadiensis</i> Thirumalai, 1989 ²⁾	Tamil Nadu (THIRUMALAI 1989)
<i>Microvelia (incertae sedis) lineatipes</i> Paiva, 1919	Meghalaya (PAIVA 1919)
<i>Microvelia (incertae sedis) lundbladi</i> Gupta & Khandelwal, 2002	Uttarakhand (GUPTA & KHANDELWAL 2002b)
<i>Microvelia (incertae sedis) santala</i> Hafiz & Ribeiro, 1939 ³⁾	Jharkhand (HAFIZ & RIBEIRO 1939), Tamil Nadu (THIRUMALAI 2002)
<i>Microvelia (Picaultia) douglasi</i> Scott, 1874	Andaman and Nicobar Islands, Arunachal Pradesh, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal (THIRUMALAI 2002, JEHAMALAR & CHANDRA 2016)
<i>Microvelia (Picaultia) miyamoti</i> Gupta & Gupta, 2008	Himachal Pradesh, Uttar Pradesh (GUPTA & GUPTA 2008)
<i>Neolardus typicus</i> (Distant, 1903)	Andaman and Nicobar Islands (THIRUMALAI 2002), Meghalaya (JEHAMALAR & CHANDRA 2020), Rajasthan (this study), southern India (ANDERSEN 1982)
<i>Pseudovelia (Pseudovelia) lingula</i> Gupta & Khandelwal, 2003	Kerala (GUPTA & KHANDELWAL 2003)
<i>Pseudovelia (Pseudovelia) polthemi</i> Khandelwal, 2013 ⁴⁾	Uttar Pradesh (KHANDELWAL 2013)
<i>Pseudovelia (Pseudovelia) sexualis</i> (Paiva, 1917)	Assam, Karnataka (PAIVA 1917)
<i>Thirumalaia ocularis</i> Zettel & Laciny, sp. nov. ⁵⁾	Tamil Nadu (this study)

Unavailable names

<i>Baptista fingeri</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)
<i>Baptista sushmae</i> Gupta & Sharma, 2017 ^{4,5)}	“India” (GUPTA & SHARMA 2017)
<i>Baptista tridigita</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)
<i>Lathriovelia pronota</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)
<i>Microvelia (incertae sedis) aashishi</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)
<i>Microvelia (incertae sedis) anderson</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)
<i>Microvelia (incertae sedis) femandi</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)
<i>Microvelia (incertae sedis) lundbladi</i> Gupta & Sharma, 2017 ^{4,5)}	“India” (GUPTA & SHARMA 2017)
<i>Microvelia (incertae sedis) miyamoto</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)
<i>Pseudovelia (Pseudovelia) bajjali</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)
<i>Pseudovelia (Pseudovelia) hungerfordi</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)
<i>Pseudovelia (Pseudovelia) lingual</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)
<i>Pseudovelia (Pseudovelia) longitarsa</i> Gupta & Sharma, 2017 ^{4,5)}	“India, China” (GUPTA & SHARMA 2017)
<i>Pseudovelia (Pseudovelia) matsuda</i> Gupta & Sharma, 2017 ⁵⁾	“India” (GUPTA & SHARMA 2017)

¹⁾ The availability and validity of this name are uncertain, as we failed to trace this paper by all available means.

²⁾ *Microvelia javadiensis* seems closely related to *M. petraeus* Andersen, Yang & Zettel, 2002, but no subgenus has yet been erected for these two species.

³⁾ See comparative notes of *Thirumalaia ocularis* sp. nov.

⁴⁾ Junior primary homonym. As validity of the taxon is uncertain, we refrain from replacing it with a new substitute name.

⁵⁾ Nomen nudum, no description given, no distribution given except India.

