

A new genus *Gravellyia* with two species of the family Nemesiidae (Araneae: Mygalomorphae) from India

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Abstract — Re-examination of the syntypes of *Damarchus excavatus* Gravelly 1921 raised doubts on its generic allocation. A new genus *Gravellyia* gen. nov. is proposed to accommodate the species. A new combination *Gravellyia excavatus* (Gravelly 1921) comb. nov. is proposed, and a lectotype is designated for the species. Furthermore, a new species *Gravellyia striatus* sp. nov. is described from West Bengal.

Keywords — Arachnida, taxonomy, new species, lectotype, India

Introduction

The mygalomorph spider family Nemesiidae is represented by 406 species in 46 genera globally (World Spider Catalogue 2018). Until recently, only two genera were reported from India, namely *Damarchus* (Thorell 1891) and *Raveniolla* (Zonstein 1987). Zonstein & Marusik (2014) transferred *Damarchus bifidus* (Gravelly 1935) to the genus *Atmetochilus* Simon 1887 adding the genus to the list of Indian spider. Recently, Siliwal et al. (2015) described a new genus, *Damarchilus* Siliwal, Molur & Raven 2015 from northeast India with two new species. The family is currently represented by six species in India (World Spider Catalog 2018).

As part of an ongoing study on Indian mygalomorph spiders, we examined the syntypes of *Damarchus excavatus* Gravelly 1921 housed in the collection of the Zoological Survey of India, Kolkata. In the original description, Gravelly (1921) described this species using both sexes, however only female specimens could be located in the jar that contains over 100 specimens. The specimens differ in several aspect from members of the genus *Damarchus* which raises doubts on placement of the species in the genus *Damarchus* following Raven (1985) & Siliwal et al. (2015). Additionally, specimens collected by one of us (AM) from Chota Nagpur plateau show affinity to *D. excavatus* and allows us to propose a new genus to accommodate *D. excavatus* along with description of a new species. The largest specimen collected by Gravelly in 1919 is here designated as a lectotype for *D. excavatus* in accordance with article 74.1 of the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature 1999).

Material and methods

Specimens were collected and preserved in 70% ethanol and the holotype is deposited in the collection of the National Centre of Biological Sciences, Bangalore. Measurements were taken with a Mitutoyo™ digital caliper. Spermathecae were dissected and cleaned with using needle. Specimens were examined using Olympus SZ40 stereo-binocular microscope. Photographs were taken with a Canon 70D mounted with 100mm macro. Measurements were taken with the software ImageJ (<http://imagej.nih.gov/ij/>). Leg measurements were taken with a digital caliper. All measurements were given in millimeters and with an error of ± 0.01 . LSID for the manuscript is: urn:lsid:zoobank.org:pub:071FAD5B-A73C-425A-8797-4E0E7FCDB386.

Abbreviations: ALE – anterior lateral eye, AME – anterior median eye, MOQ – median ocular quadrate, PLE – posterior lateral eye, PME – posterior median eye, PLS – posterior lateral spinnerets, PMS – posterior median spinnerets, AM – Ayan Mondal, ZM – Zeeshan Mirza, NCBS – National Centre for Biological Sciences, Bangalore, ZSIK – Zoological Survey of India, Kolkata. Abbreviations used for setae and spines count are d – dorsal, fe – femur, mt – metatarsus, p – prolateral, pa – patella, r – retrolateral, ta – tarsus, ti – tibia, v – ventral.

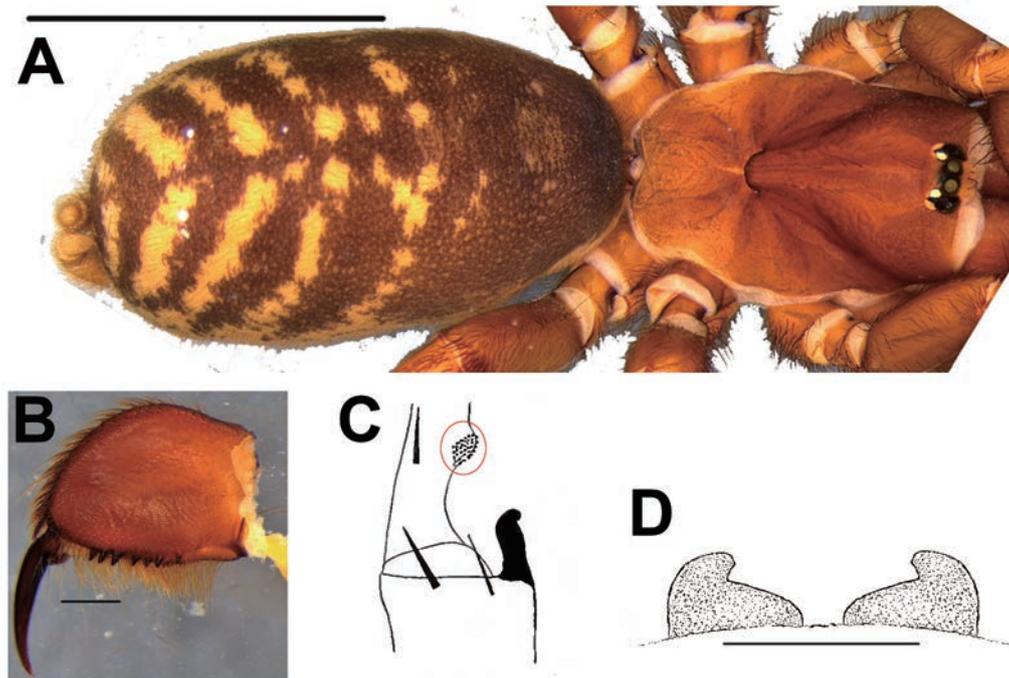


Fig. 1. *Gravellyia excavatus* (Gravely 1921) comb. nov., lectotype ZSIK 1866/18 (except for C). A, habitus, dorsal view; B, chelicerae, prolateral view; C, junction of tibia and metatarsus of male right leg I, showing tibial apophysis with the area in oval showing raised tubercle bearing a cluster of denticles, ventral view (modified after Gravely 1921); D, spermathecae. Scales = 5 mm (A); 1 mm (B); 0.5 mm (D).

Results

Systematics

Family Nemesiidae Simon 1892

Gravellyia gen. nov.

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Type species. *Gravellyia excavatus* (Gravely 1921) **comb. nov.**

Species included. *Gravellyia excavatus* (Gravely 1921) comb. nov., *Gravellyia striatus* sp. nov.

Diagnosis. *Gravellyia* gen. nov. differs from most genera within Nemesiidae in bearing the striped abdomen; strongly procurved fovea (Figs. 1A, 2A, 4); sternal sigilla large, merged and sub-centric (Fig. 3A–B), digitiform distal segment of PLS (Fig. 2C), and the spermathecae in shape of mounds (Figs. 1D, 2D). The new genus shows affinity members of the genus *Atmetochilus* in the shape and placement of the sternal sigilla and strongly procurved fovea. *Gravellyia* gen. nov. differs from other Nemesiidae genera as follows: strongly procurved fovea (vs. fovea straight in *Raveniola*), sternal sigilla large, merged and sub-centric (vs. large, not merged in *Damarchus* and *Damarchilus*); spermathecae in shape of mounds (vs. digitiform in *Atmetochilus*, *Ravenio-*

la, *Damarchus* and *Damarchilus*). Males of *Gravellyia* gen. nov. differs from those of other genera within Nemesiidae in bearing a stout apophysis with an inward bent on tibia I in addition to an excavation on the basal metatarsus I with a raised tubercle bearing a cluster of denticles (Fig. 1C).

Gravellyia gen. nov. differs from *Atmetochilus* with which its distribution range overlaps, as follows: single stout tibial apophysis in *Gravellyia* gen. nov. vs. twin tibial apophysis in *Atmetochilus*, spermathecae in shape of low mounds vs. spermathecae digitiform in *Atmetochilus*, abdomen with striped pattern vs. abdomen lacks striped pattern in *Atmetochilus*.

Description. Medium sized spiders in relation to members of this family adults ranging from 12–13mm in total length excluding chelicerae length. All legs bearing three claws, superior tarsal claws with a single row of dentition. Scopulae thin, present on all tarsi. Two pairs of spinnerets and the posterior lateral spinneret long. Apical segment of posterior lateral spinnerets digitiform, entire, no pseudosegmentation seen (Fig. 2C). Metatarsi of all legs lacking distal preening combs. Chelicerae with 7–8 promarginal teeth in a row of teeth and with 14–16 basosomal teeth (Figs. 1B, 2B). Rastellum present in form of thick bristles. Maxillary cuspules present, absent on labium. Labio-sternal collar well developed. Sternum sub-rectangular and the posterior edge not separating coxa IV (Fig. 3A–B). Carapace smooth, with short black bristles sparsely scattered, caput high, fovea

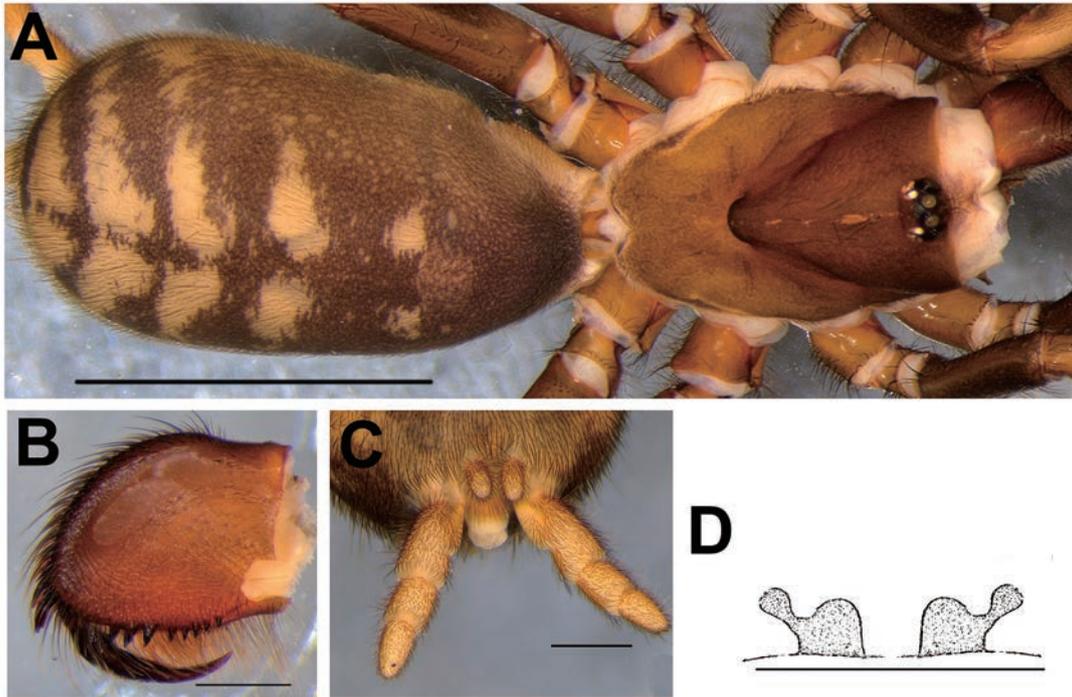


Fig. 2. *Gravelyia striatus* sp. nov., holotype NCBS AU710. A, habitus dorsal view; B, chelicerae prolateral view; C, spinnerets; D, spermathecae. Scales = 5 mm (A); 1 mm (B–C); 0.5 mm (D).

strongly procurved (Figs. 1A, 2A). Eye tubercles present. Spermathecae consists of mounds with or without lateral receptacles (Figs. 1D & 2D). Spines present on all legs. Anterior pair of legs bear fewer spines. On male leg I, tibial apophysis stout with an abrupt inward bent in addition to an excavation on the basal metatarsus I with a raised tubercle bearing a cluster of denticles (Fig. 1C).

Etymology. The proposed generic name is a patronym honoring the late F. H. Gravely (1885–1965) for his contribution to the study of Indian arachnids, especially mygalomorph spiders. The gender of the proposed name is masculine.

Distribution. Presently known from Odisha, West Bengal and Tripura, India.

Gravelyia excavatus (Gravely 1921) **comb. nov.**
(Figs. 1A–D, 3A)

Damarchus excavatus Gravely 1921: 402; Zonstein & Marusik 2014: 274

Lectotype (here designated). Adult female, ZSIK 1866/18 collected from Barkuda Island, Chilka Lake, Ganjam District, Madras Presidency, now in Odisha, India (ca. 20°10'10.99"N, 86°29'43.84"E elevation 4m). Collected by F. H. Gravely between 3rd–19th August, 1919.

Diagnosis. *Gravelyia excavatus* comb. nov. differs from *G. striatus* sp. nov. in bearing chevron markings that are

thin and nearly cover the entire dorsum (Fig. 1A) vs. thick blotched markings in *G. striatus* sp. nov. (Fig. 2A) The spermathecae is in shape of two fused mounds, one with a higher rounded peak (Figs. 1D) vs. small mounds with a diagonal bud like receptacle on the outer edge of the mound in *G. striatus* sp. nov. (Figs. 2D).

Description of lectotype female ZSIK 1866/18 (Fig. 1). Lectotype in general good condition with an exposed ventral cavity from a dissection to retrieve spermathecae. The abdomen on its venter has lost its pigmentation and internal tissue is visible, likely an artifact of preservation for a long time.

Carapace 4.53 long, 3.02 wide (L/W ratio 1.2), chelicerae 3.27 long, 2.66 high. Sternum 1.75 long, 1.32 wide (L/W 1.2). Abdomen 7.75 long, 4.36 wide (L/W 1.4). Spinnerets: PMS, 0.7 long, 0.1 wide, 0.2 apart; PLS, 1.00 basal, 0.5 middle, 0.7 distal; apart 0.7.

Colouration (Fig. 1): Carapace, legs, sternum and teguments is a shade of yellowish brown; abdomen dorsally dark brown with five pair of chevron markings. The markings are like stripes and are thin and nearly cover the entire dorsum. Spinnerets and abdomen ventrally pale.

Carapace (Fig. 1A): Distinctly raised caput. Fovea strongly procurved. Carapace smooth overall with a few black bristles scattered throughout.

Eyes (Fig. 1A): Ratio of ocular quadrant width to length 2.03. ALE largest, other eyes equal. Eye diameter: ALE, 0.38; AME, 0.21; PLE, 0.23; PME, 0.14. Distances between

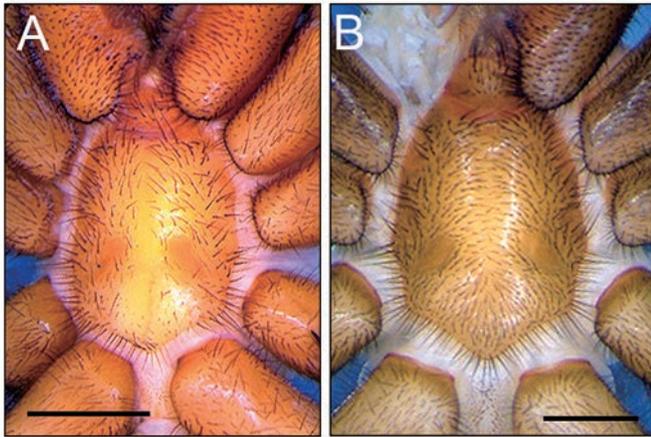


Fig. 3. Sternum of *Gravellyia* gen. nov. A, *Gravellyia excavatus* comb. nov.; B, *Gravellyia striatus* sp. nov. Scales = 1 mm.

the eyes: AME-AME, 0.13; PME-PLE, 0.07; AME-ALE, 0.12; PME-PME, 0.45; ALE-PLE, 0.06. Ocular quadrate, 0.56 long, 1.14 wide. MOQ: length, 0.39; front width, 0.43; back width, 0.73.

Maxilla: Front length 0.91, back length 1.29 and 0.62 wide. Anterior maxillary lobe moderately developed. Prolateral face of maxilla smooth, glabrous, with a few long black setae scattered below the maxillary suture. Cuspules: 12–15 in anterior corner.

Labium: 0.03 long, 0.44 wide lacking cuspules. Labio-sternal collar distinct and well developed.

Chelicera (Figs. 1B): Basal oral fringe of chelicerae lacking modified setae. Promarginal teeth 7 with a 16 basosomal teeth restricted to the basal oral fringe.

Sternum (Figs. 3A): Sub-rectangular in its shape, with long black setae sparsely present. Posterior edge pointed fairly separating coxae IV. Pedicel not clearly seen.

Sigilla (Figs. 3A): Posterior sigilla large, sub-central. Anterior and median sigilla marginal.

Leg: Leg formula 4123. Leg lengths (ta, mt, ti, pa, fe, total): leg I 1.6, 2.1, 2.9, 2.0, 3.8, 12.4; leg II 1.5, 2.0, 2.2, 1.8, 3.4, 10.9; leg III 1.7, 1.6, 1.2, 1.5, 2.4, 8.4; leg IV 1.6, 2.6, 2.8, 2.4, 3.7, 13.1; palp 1.6, -, 1.1, 1.2, 2.7, 6.6. Spines: leg I, mt, v 6; leg II, mt, v 7, p 1, ti, v 2, pa, v 3; leg III, mt, r 4, p 4, v 4, d 3, ti r 2, v 2; leg IV, mt, r 1, p 2, v 6, ti, r 2.

Scopulae: Present on tarsi of all legs including the palp. Scopulae not dense.

Claws: Inferior tarsal claw present on all legs; absent on palpal tarsi. Superior tarsal claws on all legs with four basal teeth; single claw on palp.

Abdomen pilosity (Fig. 1A): Dorsal and ventral cuticle covered with fine layer of short brown setae.

Spinnerets: Two pairs, pale yellowish, covered with sparsely placed short black setae. Distal segment of PLS digitiform.

Spermathecae (Fig. 1D): Two elongate stalks with bulbous receptacles at their tips which are bent inwards.

***Gravellyia striatus* sp. nov.**

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(Figs. 2A–D, 3B, 4)

Holotype. Adult female, NCBS AU710 collected from Mukutmanipur, Bankura District, West Bengal, India (22°57'28.61"N, 86°45'10.43"E elevation 137 m). Collected by Anirban Patra on 5th May, 2017.

Paratype. Adult female, NCBS AU711 collected from Biharinath Hill, Bankura District, West Bengal, India (23°34'54.3"N, 86°56'43.7"E; elevation 151m). Collected by Ayan Mondal on 15th July, 2017.

Diagnosis. *G. striatus* sp. nov. differs from *Gravellyia excavatus* comb. nov. in bearing chevron markings that are thick blotched (Fig. 2A) vs. thin and nearly cover the entire dorsum in *Gravellyia excavatus* comb. nov. (Fig. 1A). The spermathecae is in shape of small mounds with a diagonal bud like receptacle on the outer edge of the mound in *G. striatus* sp. nov. (Fig. 2D) vs. two fused mounds, one with a higher rounded peak in *Gravellyia excavatus* comb. nov. (Fig. 1D).

Etymology. The specific epithet refers to the striped abdomen of the new species

Description of holotype female NCBS AU710 (Fig. 1). Holotype in general good condition with an exposed ventral cavity from a dissection to retrieve spermathecae.

Carapace 4.6 long, 3.2 wide (L/W ration 1.2), chelicerae 2.6 long, 2.2 high. Sternum 2.9 long, 2.0 wide (L/W 1.2). Abdomen 8.0 long, 4.0 wide (L/W 1.4). Spinnerets: PMS, 0.5 long, 0.2 wide, 0.2 apart; PLS, 0.91 basal, 0.5 middle, 0.8 distal; apart 0.6.

Colouration (Fig. 2A): Carapace, legs, sternum and teguments is a shade of yellowish brown; abdomen dorsally dark brown with five pair of broad chevron markings. The markings are like blotched stripes and are thick and the anterior two pairs only cover the dorsum and do not extend to the lateral aspect. The posterior stripes nearly cover the entire



Fig. 4. *Gravellyia striatus* sp. nov., habitus.

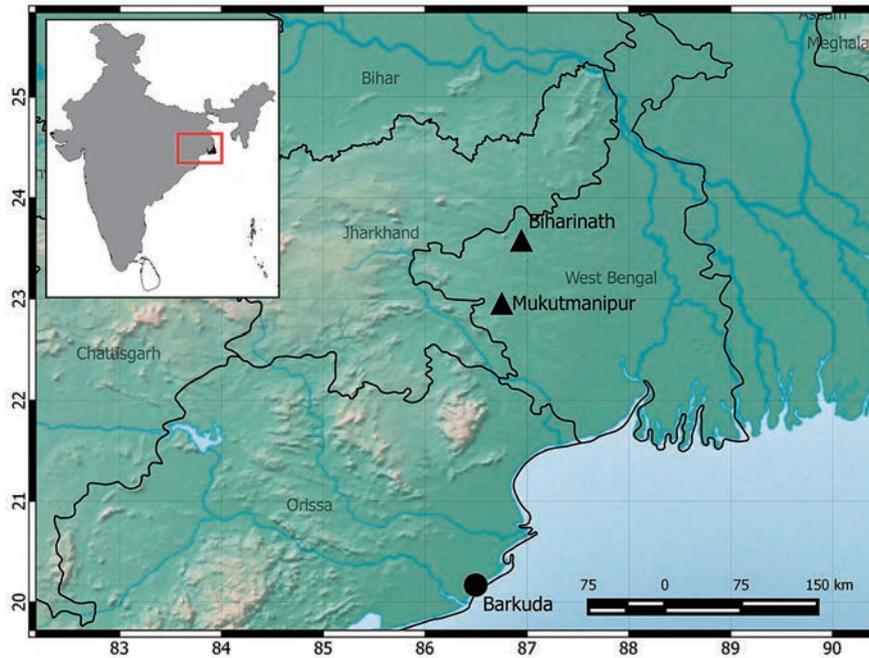


Fig. 5. Map showing distribution of the two species of the genus *Gravelia* gen. nov. Triangles - *Gravelia striatus* sp. nov.; circle - *Gravelia excavatus* comb. nov.

dorsum extending to the lateral aspect. Spinnerets and abdomen ventrally pale.

Carapace (Fig. 2A): Distinctly raised caput. Fovea strongly procurved. Carapace smooth overall with a few black bristles scattered throughout.

Eyes (Fig. 2A): Ratio of ocular quadrant width to length 2.03. ALE largest, other eyes equal. Eye diameter: ALE, 0.27; AME, 0.17; PLE, 0.22; PME, 0.12. Distances between the eyes: AME-AME, 0.09; PME-PLP, 0.04; AME-ALE, 0.11; PME-PME, 0.41; ALE-PLP, 0.11. Ocular quadrates, 0.53 long, 0.88 wide. MOQ: length, 0.36; front width, 0.43; back width, 0.63.

Maxilla: Front length 1.4, back length 1.79 and 0.9 wide. Anterior maxillary lobe moderately developed. Prolateral face of maxilla smooth, glabrous, with a few long black setae scattered below the maxillary suture. Cuspules: 15 in anterior corner.

Labium: 0.6 long, 0.7 wide lacking cuspules. Labio-sternal collar distinct and well developed.

Chelicera (Fig. 2B): Basal oral fringe of chelicerae lacking modified setae. Promarginal teeth 8 with a 16 basosomal teeth restricted to the basal oral fringe.

Sternum (Fig. 3B): Sub-rectangular in its shape, with long black setae sparsely present. Posterior edge pointed fairly separating coxae IV. Pedicel not clearly seen.

Sigilla (Fig. 3B): Posterior sigilla large, sub-central. Anterior and median sigilla marginal.

Leg: Leg formula 1423. Leg lengths (ta, mt, ti, pa, fe, total): leg I 1.2, 1.7, 2.3, 2.0, 3.0, 10.2; leg II 1.1, 1.8, 1.5, 1.3, 2.3, 8; leg III 0.9, 1.1, 1.0, 1.1, 2.1, 6.2; leg IV 1.2, 1.9, 2.0, 1.6, 2.5, 9.2; palp 1.2, -, 1.3, 1.0, 2.0, 5.5. Spines: leg I, mt,

v 7, r 1, ti, r 3; leg II, mt, v 6, r 2; leg III, mt, p 4, v 2, d 8, ti r 2, p 2; leg IV, mt, r 1, p 3, ti, r 2.

Scopulae: Present on tarsi of all legs including the palp. Scopulae not dense.

Claws: Inferior tarsal claw present on all legs; absent on palpal tarsi. Superior tarsal claws on all legs with four basal teeth; single claw on palp.

Abdomen pilosity: Dorsal and ventral cuticle covered with fine layer of short brown setae.

Spinnerets (Fig. 2C): Two pairs, pale yellowish, covered with sparsely placed short black setae. Distal segment of PLS digitiform.

Spermathecae (Fig. 2D): Two small mounds with a diagonal bud like receptacle on the outer edge of the mound.

Male. Unknown.

Natural history. Type specimens were collected from two localities which are characterized by a dry deciduous forest on the Chota Nagpur Plateau, (Figs. 5, 6A–B). Most burrows of this species were found on slopes of mud escarpments. Burrows may be constructed beside a stone. It makes relatively long burrows, decorating the entrance of the burrow with soil attached together by fine web to form ring-like ridge surrounding the burrow opening. Sometimes burrows are completely closed by a thin layer of soil after heavy rain. Perhaps this is due to during rain flowing clay covers burrow opening. Burrows were not found in open place, but were under a tree or shrub. We found at least 17 burrows of juveniles in the three months from July to September occupying an area of one square foot. Attempts were made to locate males during the same months, but none could be found.

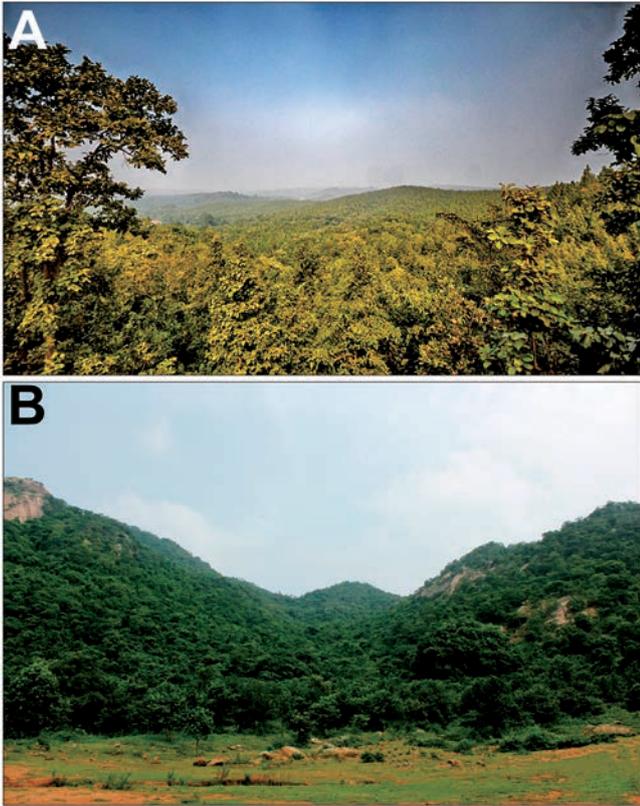


Fig. 6. Habitat of *Gravellyia striatus* sp. nov. in West Bengal. A, Mukutmanipur; B, Biharinath Hill.

Discussion

Member of the family Nemesiidae are poorly studied in India, evident from the low number of species recorded. Description of yet another genus warrants dedicated surveys to document diversity of mygalomorph spider across India. *Gravellyia* gen. nov. is currently known from Odisha, West Bengal (present work) and Tripura (ZM personal observation) hinting that the new genus might have a wide range across eastern and north-eastern India and may be represented by additional undescribed species. Representatives of the genus might also occur in Bangladesh as specimens examined from Tripura were found in the area close to the borders of India and Bangladesh.

The genus *Damarchilus* was described by using female specimens and the characters of male remain unknown. This genus was erected on the basis of characters that are too nebulous or overlapping with *Damarchus*. It is hoped that the genus is re-diagnosed to show if it is distinct from the latter upon discovery of males.

There have been several notable contributions towards documentation of mygalomorph spiders that include description of several new genera and species (Mirza et al. 2012, 2014, 2017; Siliwal et al. 2011). Most of these contributions are largely centered on species occurring in biodiversity hotspots like the Western Ghats, Northeast India and other areas throughout remain unexplored. Discovery of a new genus from areas outside

biodiversity hotspots emphasizes the need to draw attention towards unexplored and unprotected landscapes.

Acknowledgments

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