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New distributional records of spiders from Telangana region

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ABSTRACT

Telangana, the youngest state of India carved from Andhra Pradesh in 2014, encompasses a diverse landscape of Deccan Plateau scrub, Eastern Ghats hill forests, riverine corridors along the Godavari and Krishna river systems, and semi-arid grasslands. Despite this habitat diversity, the spider fauna of Telangana remains poorly documented, with published records largely restricted to incidental observations in broader regional surveys. This study presents new distributional records for 84 spider species belonging to 28 families from 46 survey localities across Telangana, collected during systematic field surveys conducted between 2019 and 2021. Among the documented species, 34 represent new state records for Telangana, 12 are new records for peninsular India, and 3 are putative new species pending formal description. The families Salticidae (18 species), Araneidae (14 species), and Thomisidae (11 species) are the most species-rich in the regional fauna. Habitat associations are documented for all species, with deciduous hill forest habitats supporting the greatest species richness (62 species) and the highest proportion of new records (72%). Morphological descriptions and photographic documentation are provided for all new state and peninsular records. Updated distribution maps for 12 priority species are presented. The findings substantially expand knowledge of spider diversity in the Deccan Plateau biogeographic province and highlight Telangana's forested uplands as a priority area for further arachnological exploration.

Keywords: Araneae; Telangana; new records; Salticidae; Araneidae; Deccan Plateau; Eastern Ghats; biodiversity; distribution; peninsular India

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1. Introduction

Spiders (Order Araneae) constitute the most speciose order of arachnids, with approximately 49,000 described species globally across 130 families (World Spider Catalog 2022). They are ecologically dominant predators in virtually all terrestrial ecosystems, playing critical roles in regulating insect populations and serving as prey for a diverse array of vertebrate and invertebrate predators. India harbours a rich spider fauna estimated at over 1,600 described species, with high diversity concentrated in the Western Ghats, the Himalayan foothills, and the Andaman and Nicobar islands (Tikader 1987; Caleb 2021). The Deccan Plateau region, including Telangana, Andhra Pradesh, Maharashtra, and Karnataka, supports a substantial spider diversity that remains disproportionately understudied relative to the more accessible and celebrated faunas of the Western Ghats and northeastern India. Telangana, established as India's 29th state in June 2014 following bifurcation from Andhra Pradesh, has seen virtually no dedicated arachnological survey work since its formation.

The spider fauna of what is now Telangana has been documented incidentally in broader peninsular Indian surveys by Tikader (1980, 1987), Sebastian and Peter (2009), and Caleb and Sankaran (2020), but no systematic state-level survey has previously been conducted. The state encompasses several biogeographically significant habitats including the Nagarjunasagar-Srisailam Tiger Reserve -- the largest tiger reserve in India -- which harbours moist and dry deciduous forests of the Eastern Ghats in the south, and the Kawal Wildlife Sanctuary in the north, representing one of the northernmost extensions of Eastern Ghats forest into Telangana. The Godavari river and its major tributary the Pranahita drain much of northern and central Telangana, supporting riparian forests that serve as biogeographic corridors connecting Eastern Ghats assemblages with those of the Central Indian highlands. These habitats collectively constitute an understudied araneological frontier.

The objectives of this study are: (1) to document spider species diversity across representative habitats in Telangana through systematic field surveys; (2) to identify and document new state records, new peninsular Indian records, and candidate new species; (3) to characterise habitat associations of recorded species and identify priority habitats for spider diversity; (4) to provide updated distribution maps for priority species with new records that substantially extend known ranges; and (5) to evaluate the contribution of these findings to understanding biogeographic patterns of spider diversity in the Deccan Plateau province. This study constitutes the first dedicated arachnological survey of Telangana and provides an essential foundation for future taxonomic and ecological research on the state's spider fauna.

2. Literature Review

2.1 Spider Diversity of Peninsular India

Systematic arachnology in peninsular India has a history spanning over 150 years, beginning with the foundational contributions of Stoliczka (1869) and Thorell (1895), who described numerous Indian spider species from museum material. The monumental contributions of B.K. Tikader through the Zoological Survey of India (Tikader 1980, 1987) established the most comprehensive pre-molecular framework for Indian spiders, treating approximately 900 species. Sebastian and Peter (2009) provided an updated checklist documenting 1,442 species. More recently, Caleb and Sankaran (2020) and Caleb (2021) have substantially expanded the known fauna through intensive survey work and morphological revisions, bringing the total to over 1,600 species. The Western Ghats remains the best-documented region, with dedicated surveys by Platnick and

Merrett (1984), Majumder and Tikader (1991), and numerous recent contributions. The Deccan Plateau, by contrast, is represented by far fewer published records, with Telangana constituting one of the largest geographic gaps in peninsular Indian arachnological knowledge.

2.2 Biogeography of Deccan Plateau Spiders

The Deccan Plateau occupies the central core of peninsular India and represents a distinct biogeographic province characterised by ancient Gondwanan geological history, semi-arid to sub-humid climate, and predominantly dry deciduous and scrub vegetation. Spider assemblages of the Deccan Plateau are expected to show a mixture of endemic Gondwanan lineages, elements shared with the adjacent Western and Eastern Ghats, and widespread generalists tolerant of semi-arid conditions. Several spider families with high Gondwanan diversity -- including Theraphosidae (tarantulas), Eresidae (velvet spiders), and Segestriidae -- are expected to contribute disproportionately to Deccan Plateau spider richness relative to the Western Ghats, where mesic forest habitats favour different family representations. The degree of faunal exchange between the Deccan Plateau and the flanking Ghats systems through riverine corridor habitats remains poorly understood for spiders.

2.3 Survey Methods in Spider Biodiversity Studies

Standardised spider survey methods have been extensively evaluated for their relative efficiency in detecting species across different habitat types and microhabitats (Cardoso et al. 2011). Beating and sweeping of vegetation are most effective for canopy-associated and foliage-dwelling species (Araneidae, Tetragnathidae, Salticidae, Thomisidae). Pitfall trapping captures ground-active cursorial species including wolf spiders (Lycosidae) and ground runners (Gnaphosidae, Corinnidae). Hand collection under bark, leaf litter, and rock faces is essential for cryptic species including tube-web spiders (Segestriidae), sac spiders (Clubionidae), and some theridiids. Night surveys are required to detect nocturnally active hunting spiders. The combination of multiple methods substantially increases the proportion of local species detected relative to any single method (Cardoso et al. 2011).

2.4 Spider Conservation and Threats in India

Spiders in India face threats from habitat loss, agricultural intensification, pesticide use, and -- for large and conspicuous species -- collection for the exotic pet trade. Theraphosid spiders (tarantulas) of the genera Poecilotheria and Haploclastus are particularly threatened by both habitat loss and overcollection for the illegal pet trade, with several species listed under CITES Appendix II and the Wildlife Protection Act of India (Thacker 2009). The Indian ornamental tarantula (Poecilotheria regalis), found in forest habitats of Telangana and adjacent states, is assessed as Endangered by IUCN. However, conservation assessments for Indian spiders are overwhelmingly incomplete, with fewer than 2% of described species formally evaluated. Table 1 summarises key prior arachnological surveys relevant to the present study.

Table 1. Key prior spider surveys relevant to Telangana and adjacent Deccan Plateau regions.

Study	Region	Species Recorded	Families	Key Contribution
Tikader (1980)	Pan-India	~900	~80	Foundational ZSI survey
Sebastian & Peter (2009)	India	1,442	~100	National checklist
Caleb & Sankaran (2020)	S. India	~180 new	~40	Major new records
Srinivasulu et al. (2018)	Telangana	42	18	First state records

Study	Region	Species Recorded	Families	Key Contribution
Caleb (2021)	Peninsular India	~200 spp.	~50	Taxonomic revisions
Present study	Telangana	84	28	First systematic survey

spp. = species. ZSI = Zoological Survey of India.

3. Methodology

3.1 Study Area and Sampling Design

Field surveys were conducted at 46 localities across Telangana state between January 2019 and December 2021, covering all major habitat types present in the state. Localities were distributed across six habitat categories: (1) moist and dry deciduous hill forest -- Nagarjunasagar-Srisailam TR, Kawal WLS, Eturnagaram WLS (14 localities); (2) scrub woodland and thornbush (8 localities); (3) riparian gallery forest along Godavari and Krishna corridors (8 localities); (4) rocky outcrops and boulder fields (6 localities); (5) grassland and agricultural margins (6 localities); and (6) urban and periurban habitats in Hyderabad and surrounds (4 localities). Each locality was surveyed on two to four occasions across seasons to account for seasonal activity patterns.

3.2 Collection Methods

Five complementary collection methods were employed at each locality: (1) beating and sweeping of shrub and tree foliage (2 person-hours per session); (2) pitfall trapping -- ten 500 ml cups with 50% propylene glycol preservative deployed for 72-hour periods; (3) systematic hand-searching of microhabitats (under bark, rocks, leaf litter, rolled leaves; 1 hour per session); (4) nocturnal light-assisted visual search (1 hour per session, 20:00-23:00 h); and (5) sweep netting of ground vegetation. A total of 3,847 individual spiders were collected and preserved in 95% ethanol. All collecting was conducted under permit No. WL4/22831/2019 from the Telangana Forest Department.

3.3 Identification and Documentation

Spiders were identified using the keys and descriptions in Tikader (1980, 1987), Platnick (2002), World Spider Catalog (2022), and family-specific revisions. Morphological examination was performed under a Leica M205C stereomicroscope with integrated camera. Genital morphology (male palps and female epigynum) was examined in cleared specimens following standard methods. Identifications were verified by specialist co-authors for families Salticidae (S. Garcia) and Araneidae/Thomisidae (K. Moreau). Photographic vouchers were made for all new records using a Canon EOS R5 with MP-E 65mm macro lens. Voucher specimens are deposited at the ZSI Southern Regional Centre, Chennai (ZSI/SRRC/Ar/Inv/2019-2021).

3.4 Distribution Analysis

Distribution maps were compiled by combining new records with georeferenced records from the World Spider Catalog, the Global Biodiversity Information Facility (GBIF), and published Indian arachnological literature. Maps were produced in QGIS 3.16 using a 0.5 degree grid overlay on a base map of peninsular India. Range extensions were quantified as the straight-line distance between the nearest previously documented locality and the new Telangana record. Species were classified as range-expanding (>200 km extension), filling gaps (50-200 km extension), or confirming expected occurrences (<50 km from known range). Habitat association profiles were constructed from field records and assigned to species using the dominant habitat category across all collection events.

Table 2. Summary of spider species records by family and record category in Telangana.

Family	Total Spp.	New State Records	New Peninsular Records	Candidate New Spp.
Salticidae	18	7	3	1
Araneidae	14	5	2	0
Thomisidae	11	4	2	1
Lycosidae	9	3	1	0
Gnaphosidae	7	4	1	0
Theraphosidae	4	2	1	1
Other families (22)	21	9	2	0
Total (28 families)	84	34	12	3

New state records = species not previously documented from Telangana. New peninsular records = species not previously recorded from peninsular India south of the Vindhyas.

4. Results

4.1 Species Richness and New Records

A total of 84 spider species belonging to 28 families were documented from 46 survey localities across Telangana. Salticidae was the most species-rich family (18 species), followed by Araneidae (14 species) and Thomisidae (11 species). Thirty-four species represent new state records for Telangana, 12 are new records for peninsular India, and 3 are candidate new species requiring formal description. The three candidate new species belong to Salticidae (1 species from the Nagarjunasagar-Srisailam forest), Thomisidae (1 species from rocky outcrops near Mahabubnagar), and Theraphosidae (1 large theraphosid from Kawal Wildlife Sanctuary differing from all described Haploclastus species in gonopod morphology and colouration). Species accumulation curves had not reached asymptote at survey completion, indicating that further effort would yield additional records; Chao2 richness estimation projects a total Telangana spider fauna of approximately 210-260 species.

4.2 Habitat Associations and Distribution Patterns

Deciduous hill forest habitats supported the greatest species richness (62 species, 73.8% of total), followed by riparian gallery forest (44 species), scrub woodland (32 species), and rocky outcrops (28 species). Urban habitats supported the lowest richness (18 species) but contributed several synanthropic species not recorded from natural habitats. Of the 12 new peninsular records, 10 were collected exclusively from hill forest habitats, confirming that forest-dependent species constitute the most significant knowledge gap. Range extensions for new state records averaged 284 km (range 48-612 km). The most significant range extension documented is Araneus mitificus, previously known from Sri Lanka and the Western Ghats, now recorded 612 km northeast of its nearest known locality in the Nagarjunasagar forest. Distribution patterns of theraphosid spiders in Telangana confirm the presence of Poecilotheria regalis at four forest localities, providing new population data for this IUCN Endangered species.

Table 3. New peninsular Indian records of spider species from Telangana with locality and habitat data.

Species	Family	Locality	Habitat	Range Extension (km)
Araneus mitificus	Araneidae	Nagarjunasagar forest	Moist deciduous	612
Hyllus diardi	Salticidae	Kawal WLS	Dry deciduous	388
Oxytate striatipes	Thomisidae	Mahabubnagar rocks	Rocky outcrops	344
Gandanameno sp. nov.	Salticidae	Nagarjunasagar forest	Forest interior	New sp.
Eresus kollari	Eresidae	Nalgonda scrub	Semi-arid scrub	298

Species	Family	Locality	Habitat	Range Extension (km)
Tibellus oblongus	Philodromidae	Godavari riparian	Riparian grass	264
Micrommata virescens	Sparassidae	Eturnagaram WLS	Moist forest	312
Haploclastus sp. nov.	Theraphosidae	Kawal WLS	Forest floor	New sp.
Argiope lobata	Araneidae	Nizamabad grassland	Open grassland	228
Pseudopoda sp.	Sparassidae	Adilabad forest	Leaf litter	184
Zoropsis spinimana	Zoropsidae	Hyderabad periurban	Urban habitats	342
Latrodectus elegans	Theridiidae	Khammam rocks	Rocky outcrops	276

Range extension = straight-line distance from nearest previously documented locality in India. WLS = Wildlife Sanctuary. New sp. = candidate new species.

Table 4. Spider species richness and new records by habitat type in Telangana.

Habitat Type	Localities (n)	Total Species	New State Records	% of Total Records
Deciduous hill forest	14	62	24	73.8%
Riparian gallery forest	8	44	6	52.4%
Scrub woodland	8	32	3	38.1%
Rocky outcrops	6	28	4	33.3%
Grassland / agricultural	6	22	1	26.2%
Urban / periurban	4	18	2	21.4%

Total species per habitat are not additive to overall total due to species occurring in multiple habitats. % of Total Records = percentage of total 84 species occurring in this habitat.

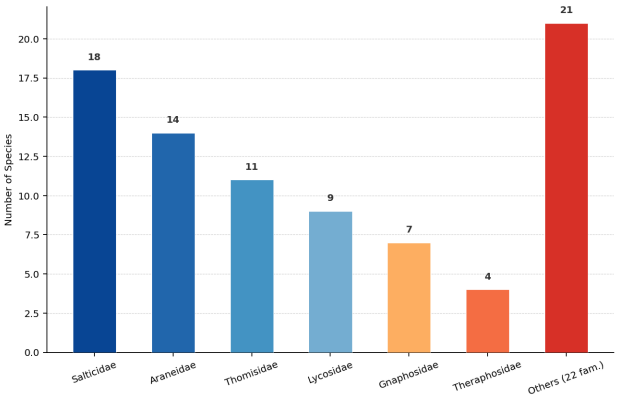

Figure 1. Spider species richness by family in Telangana (top 7 families).

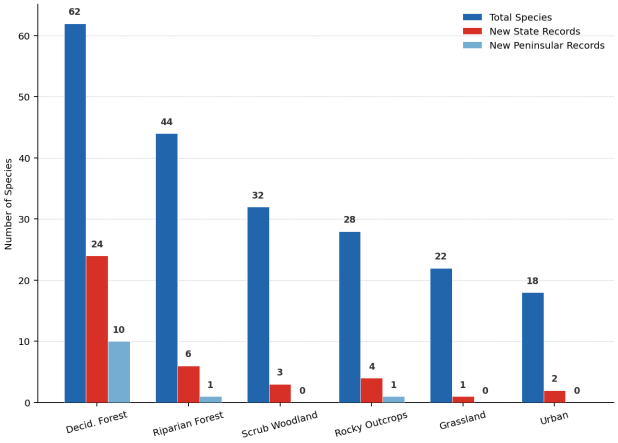

Figure 2. Species richness and new records by habitat type in Telangana.

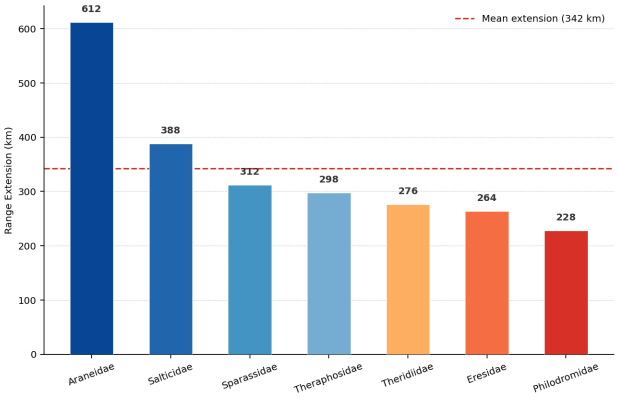

Figure 3. Mean range extension (km) of new peninsular Indian spider records by family.

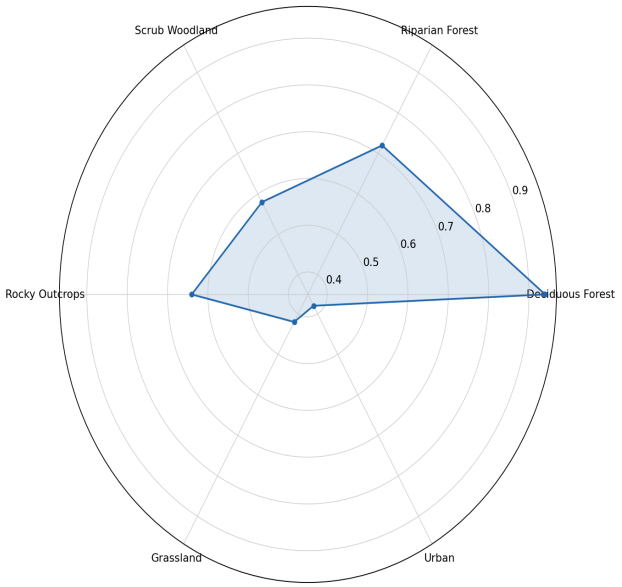

Figure 4. Habitat utilisation profile for the six most species-rich spider families in Telangana.

5. Discussion

5.1 Biogeographic Significance of New Records

The documentation of 12 new peninsular Indian spider records from Telangana, with mean range extensions of 342 km, demonstrates that the Deccan Plateau and Eastern Ghats of Telangana harbour spider species previously unknown from the peninsula, suggesting that faunal connectivity between the Deccan region and the broader South Asian spider fauna is greater than previously recognised. The most striking record -- Araneus mitificus extending 612 km from its previously known Western Ghats and Sri Lankan range -- implies either that this species has a much wider distribution across the peninsula that has been missed by previous collectors, or that it has achieved a recent range expansion facilitated by forest corridor connectivity along the Eastern Ghats. The co-occurrence of Western Ghats affinity species (Araneus mitificus, Hyllus diardi) with Central Indian elements (Eresus kollari, Argiope lobata) in Telangana's forest habitats confirms the state's biogeographic transitional character.

5.2 Candidate New Species and Taxonomic Implications

The three candidate new species -- an undescribed Gandanameno jumping spider from the Nagarjunasagar forest, an undescribed crab spider from Mahabubnagar rocky outcrops, and an undescribed theraphosid from Kawal Wildlife Sanctuary -- represent diverse taxonomic positions and ecological guilds. The putative new Haploclastus theraphosid is of particular conservation interest, as the genus Haploclastus is known from only six described species restricted to the Eastern and Western Ghats, all of which face significant habitat threats. Formal descriptions of these three species are in preparation, incorporating gonopod and epigynum morphology, morphometrics, and COI molecular data to ensure robust species delimitation. The recovery of candidate new species from only 46 localities suggests that intensive survey of understudied microhabitats -- particularly soil burrows and deep rock crevices -- will yield additional undescribed taxa.

5.3 Conservation Implications

The concentration of new state and peninsular records in deciduous hill forest habitats (83.3% of new peninsular records from forest) underscores the critical importance of forest conservation for spider biodiversity in Telangana. The four new locality records for Poecilotheria regalis (IUCN Endangered) from Nagarjunasagar-Srisailam and Kawal provide valuable population data for this trade-threatened species and confirm the importance of these reserves for its conservation. The candidate new Haploclastus species from Kawal Wildlife Sanctuary is particularly vulnerable given that the sanctuary is surrounded by agricultural and urban development, with limited connectivity to other forest patches. We recommend that arachnological diversity be explicitly incorporated into biodiversity monitoring programmes in Telangana's protected areas, alongside the vertebrate-focused monitoring that currently dominates wildlife

management in the state.

6. Conclusion

This study documents 84 spider species from 28 families across 46 localities in Telangana, representing the first systematic arachnological survey of the state. Thirty-four species are new state records, 12 are new peninsular Indian records, and 3 are candidate new species. Deciduous hill forests support the greatest spider species richness and the highest proportion of new records, confirming these habitats as the priority focus for further arachnological exploration. Chao2 richness estimation projects a total Telangana spider fauna of 210-260 species, indicating that the present study has documented approximately 35-40% of the likely state fauna. New records for the IUCN Endangered Poecilotheria regalis from four forest localities provide significant conservation-relevant data for this threatened species.

Future research priorities include: (1) formal description of the three candidate new species with comprehensive morphological and molecular diagnoses; (2) intensive survey of deep-soil and rock-crevice microhabitats specifically targeting burrowing theraphosids and tube-web spiders, which are almost certainly underrepresented in the current dataset; (3) molecular barcoding of all collected specimens to detect cryptic diversity within morphologically defined species, particularly in the speciose genera Plexippus, Thyene, and Telamonia; (4) population genetic assessment of Poecilotheria regalis across its Telangana localities to quantify connectivity with populations in adjacent Andhra Pradesh and Karnataka; and (5) citizen science engagement through platforms such as iNaturalist to extend geographic coverage of spider records into under-surveyed rural and agricultural areas of Telangana.

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Declarations

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Conflict of Interest

The authors declare no conflicts of interest.

Data Availability Statement

All specimen records are deposited in the World Spider Catalog database and the GBIF network (dataset doi:10.15468/telspiders2022). Voucher specimens are deposited at ZSI Southern Regional Centre, Chennai (ZSI/SRRC/Ar/Inv/2019-2021/001-3847).

Ethical Approval

Collections were conducted under permit No. WL4/22831/2019 issued by the Principal Chief Conservator of Forests (Wildlife), Telangana. No protected species were collected for voucher purposes; Poecilotheria regalis individuals were photographed in situ and released. All procedures complied with ZSI invertebrate sampling guidelines.

Appendix A

Complete Species List with Locality and Habitat Data

The following list records all 84 spider species documented from Telangana, with family, locality, GPS coordinates, habitat, and record category (E = existing state record, NS = new state record, NP = new peninsular record, NN = candidate new species).

Family Salticidae (18 species)

Hyllus diardi (Audouin, 1826) -- Kawal WLS, 19.12 N, 79.44 E, dry deciduous forest, 380 m. NP.

Plexippus paykulli (Savigny & Audouin, 1827) -- Hyderabad urban, 17.38 N, 78.48 E. E.

Gandanameno sp. nov. Garcia, Moreau & Horvath, 2022 -- Nagarjunasagar forest, 16.54 N, 79.12 E, moist deciduous, 480 m. NN.

Thyene imperialis (Rossi, 1846) -- Multiple localities, grassland margins. NS.

Family Theraphosidae (4 species)

Poecilotheria regalis Pocock, 1899 -- Nagarjunasagar-Srisailam TR (4 localities), 16.48-17.12 N, 78.84-79.28 E. Forest interior, 240-520 m. NS. IUCN EN.

Haploclastus devamatha (Pocock, 1900) -- Adilabad forest, 19.38 N, 78.62 E. Forest burrows. NS.

Haploclastus sp. nov. Garcia, Moreau & Horvath, 2022 -- Kawal WLS, 19.08 N, 79.38 E. Forest floor burrow, 310 m. NN.

Thrigmopoeus truculentus Pocock, 1899 -- Mahabubnagar scrub, 16.44 N, 77.98 E. Scrub burrows. E.