

## A NEW SPECIES OF THE TRAPDOOR SPIDERS GENUS *IDIOPS* PERTY, 1833 (ARANEAE: IDIOPIDAE) FROM THE WESTERN GHATS, WITH A KEY TO THE *IDIOPS* OF INDIA

Zeeshan A. Mirza<sup>1</sup>, Varun V. Vaze<sup>2</sup> & Rajesh V. Sanap<sup>3</sup>

<sup>1</sup> Post-Graduate Program in Wildlife Biology & Conservation, WCS-India Program, F-21, National Centre for Biological Sciences, Tata Institute of Fundamental Research, GKVK, Bellary Road, Bangalore 560065, India – snakeszeeshan@gmail.com

<sup>2</sup> Biospheres, Eshwari, 52/403, Lakshminagar, Paravati, Pune 411 009, Maharashtra, India – varunvaze@gmail.com

<sup>3</sup> D-5/2, Marol Police Camp, M. M. Road, Andheri (East), Mumbai, 400059, Maharashtra, India. – rajeshvsanap@gmail.com

**Abstract:** A new species of the trapdoor spider genus *Idiops* Perty, *Idiops kaasensis* sp. n., is described from Kaas Plateau in the Satara District (Western Ghats, Maharashtra, India). A key to the known Indian species of the genus is presented.

**Key words:** Araneae, Idiopidae, new species, Kaas Plateau, Satara, Maharashtra, India.

**Una especie nueva de araña del género *Idiops* Perty, 1833 (Araneae: Idiopidae) de los Ghats Occidentales, con una clave para los *Idiops* de la India**

**Resumen:** Se describe una nueva especie de araña de trampilla del género *Idiops* Perty, *Idiops kaasensis* sp. n., procedente de la meseta de Kaas, en el distrito de Satara (Ghats Occidentales, Maharashtra, India). Se presenta una clave para las especies conocidas del género de la India.

**Palabras clave:** Araneae, Idiopidae, especie nueva, meseta de Kaas, Satara, Maharashtra, India.

**Taxonomy / Taxonomía:** *Idiops kaasensis* sp. nov.

### Introduction

The family Idiopidae is represented by 22 genera and 314 species in three subfamilies in the world (Platnick, 2012, Raven, 1985). In India, family Idiopidae is represented by three genera namely: *Heligmomerus* Simon, 1892, *Idiops* Perty, 1833 and *Scalidognathus* Karsch, 1891 and eleven species (Siliwal *et al.*, 2007; Sanap & Mirza, 2011; Mirza & Sanap, 2012). The genus *Idiops* Perty, 1833 is the most widespread trapdoor genus being represented by seven species in India (Mirza & Sanap, 2012; Platnick, 2012; Siliwal *et al.*, 2005; Siliwal *et al.*, 2010). This genus was originally placed under the family Ctenizidae (see Pocock, 1900) but Raven (1985) transferred it to the family Idiopidae. Many members of this genus were described under the genus *Acanthodon* Guérin, 1838 and later transferred to *Idiops* (see Platnick, 2011). Siliwal *et al.* (2005) listed nine species of which Siliwal *et al.* (2010) transferred two species, *I. biharicus* Gravely, 1921 and *I. barkudensis* Gravely, 1915, from *Idiops* to *Heligmomerus*. *Idiops designatus* O.P. Cambridge, 1885 has been included in checklist of Indian spiders (see Siliwal *et al.*, 2005; Keswani *et al.*, 2012) even though the species was described from Murree, Rawalpindi District, Pakistan (O.P. Cambridge, 1885). Considering that there are not published records of this species officially being recorded from India, we prefer not listing it as an Indian species. Recently, Mirza & Sanap (2012) redescribed *Idiops bombayensis* and described a new species, *Idiops rubrolimbatus* from the Western Ghats. Considering all the preceding statements, the present number of species of this genus is seven.

The Western Ghats are known for their rich and endemic fauna being a biodiversity hotspot (Myers *et al.*, 2000). However, the present knowledge of the invertebrate fauna of the Western Ghats is meager, and the region most likely supports a wealth of invertebrate fauna which is still unknown (Mirza & Sanap, 2010). Trapdoor spiders in particular are

poorly documented as they are not easy to find until a dedicated effort is made or their discovery is accidental. During random field visits to document the mygalomorph spiders of the Western Ghats, a species of the trapdoor spider genus *Idiops* was collected which is herein described as new species.

### Material and methods

The specimens are deposited at Bombay Natural History Society, Mumbai (BNHS). Measurements of body parts except for the eyes were taken with a Mitutoyo™ Dial Caliper. All measurements are in mm. Spermathecae were dissected and cleaned in clove oil using teasing needles. Specimens were examined using Labomed™ CSM2 stereo-binocular microscope. Specimens were photographed with a Nikon D90 and Nikon 85mm f/3.5 G DX VR AF-S Micro-NIKKOR lens illuminated with two external and one in-built flash. Plates were prepared in Photoshop CS2. Description was compared with available literature by Mirza & Sanap (2012), Pocock (1900) and Tikader (1977). Descriptive style follows Mirza & Sanap (2012).

### Abbreviations:

ALE = anterior lateral eye; AME = anterior median eye; BNHS = Bombay Natural History Society, Mumbai, India; MOQ = median ocular quadrate; PLE = posterior lateral eye; PME = posterior median eye; PLS = posterior later spinnerets; PMS = posterior median spinnerets. Abbreviations used for hair and spines count are d = dorsal, Fe = femur, Mt = metatarsus, p = prolateral, Pa = patella, r = retrolateral, Ta = tarsus, Ti = tibia, v = ventral.

## Taxonomic treatment

### Family Idiopidae Simon, 1889

#### Genus *Idiops* Perty, 1833

*Idiops* Gravely, 1915: 261; Gravely, 1935: 69; Raven, 1985: 138; Dippenaar-Schoeman, 2002: 68; Mirza & Sanap, 2012: 85.

*Acanthodon* Guérin, 1838: 10; Simon, 1892: 91; Pocock, 1900: 161; Tikader, 1977: 306

TYPE SPECIES. *Idiops fuscus* Perty, 1833.

DIAGNOSIS. ALE set far in advance of others making eye group much longer than wide, chelicerae medially normal, dorsal abdomen soft lacking chitinized shield, two rows of cheliceral teeth and posterior sternal sigilla absent (cite).

#### *Idiops kaasensis*, sp. nov.

Fig. 1-12.

**HOLOTYPE.** 1 male (BNHS SP 55). India, Maharashtra, Satara District, Kaas Plateau (17°42'55.88"N, 73°47'51.44"E, elevation ca. 1093m), coll. Nilesh Mane, Zeeshan Mirza, Vishal Deshpande, 17 Jun.2012.

**PARATYPE.** 1 Female (BNHS SP 56), India, Maharashtra, Satara District, Panchagani, (17°55'26.38"N, 73°47'31.19"E, elevation ca. 1241m), coll. Varun Vaze, 12 May 2011.; 1 Female (BNHS SP 57), India, Maharashtra, Satara District, Kaas Plateau (17°42'55.88"N, 73°47'51.44"E, elevation ca. 1093m), coll. Ashish Jadhav & Vishal Deshpande, 17 Jun. 2012.

**DIAGNOSIS.** Males differ from *I. rubrolimbatus*, *I. fossor* and *I. garoensis* in the tibial apophysis consisting a stout, pointed, and bent spur, and a tubercle behind it (vs. tibial apophysis consists of a long spine with a smaller spine below it in *I. rubrolimbatus*, *I. fossor* and *I. garoensis*). Females differ from *I. bombayensis*, *I. rubrolimbatus*, *I. fossor*, *I. garoensis* and *I. madrasensis* in possessing band of spinules on leg coxa. Differs from *I. fortis* and *I. constructor* in possessing spinules on coxa of leg II–IV (vs. spinules present on only leg IV in *I. fortis* and *I. constructor*).

**ETYMOLOGY.** The specific epithet refers to Kaas Plateau, of Satara district in the Indian state of Maharashtra where the type specimens were collected.

#### DESCRIPTION:

**Coloration in life** (Fig. 1). Carapace, femur, patella, tibia and metatarsi dark brown; distal metatarsi and tarsi in a shade of yellowish orange. Abdomen (dorsolaterally) dark mud brown; ventral side is uniformly light yellowish grey.

**Description holotype, BNHS SP 55.** Total length 10.18; carapace 5.28 long, 4.90 wide; chelicerae 2.60 long. Abdomen 5.25 long, 3.66 wide. Spinnerets: PMS, 0.34 long, 0.18 wide, 0.42 apart; PLS, 1.01 total length (0.55 basal, 0.34 middle, 0.12 distal; midwidths 0.72, 0.53, 0.28 respectively), 0.99 apart.

**Carapace** (Fig. 3) with large granules/tubercles throughout; Caput with distinct mound between fovea and eyes. Fovea deep, strongly procurved, U-shaped. A distinct smooth patch anterior to the fovea present bordered anteriorly by a row of granules.

**Eyes** (Fig. 3): ALE situated far in advance of the rest. Posterior row slightly procurved, ocular group 1.22 long, 1.58 wide; diameter AME 0.17, PME 0.11, ALE 0.28, PLE 0.39; distance between ALE–AME 0.34, AME–AME 0.15, PLE–

PME 0.10, PME–PME 0.36; MOQ not square, 0.53 long, 0.66 front width, 0.74 back width.

**Maxillae** (Fig. 4): 1.66 long in front and 2.08 long in back, 1.33; lacking cuspules. Anterior lobe greatly reduced.

**Labium** (Fig. 4): 0.88 long, 0.99 wide, labiosternal groove shallow, cuspules absent.

**Chelicerae:** Nine promarginal teeth and six retromarginal teeth, rastellum conspicuous on a distinct process; 13-14 thick curved spines arranged in two to or three rows.

**Sternum** (Fig. 4): Yellowish brown, with elevated anterior and lateral sides, sloping posteriorly, 2.85 long, 2.27 wide, covered with short black bristles sparsely; posterior angle acute and not separating coxae IV.

**Sigilla** (Fig. 4): Anterior 0.10 in diameter and 1.55 apart situated 0.04 from the margin; middle about 0.12 in diameter and 1.85 apart and 0.06 away from margin; posterior sigilla absent.

**Legs:** Formula 4123, morphometry (femur, patella, tibia, metatarsus, tarsus, total): I: 5.19, 2.40, 3.85, 3.66, 1.5, 16.6. II: 4.83, 1.78, 3.17, 3.44, 1.84, 15.06. III: 3.48, 2.12, 1.85, 2.70, 2.20, 12.35. IV: 5.18, 1.82, 4.13, 3.32, 2.24, 16.69. Palp: 2.44, 1.47, 2.94, –, 1.08, 7.93. Midwidths: femora I – IV=1.00, 0.87, 1.15, 1.12, palp=1.4; tibiae I–IV=1.35, 0.43, 0.80, 1.18, palp=1.48. Ti I, with apophysis with a triangular stout spine below, with a tubercle with a pointed spine. Mt I lacks distinct concavity and also lacks triangular process as seen in *I. bombayensis*.

**Spines:** Curved thick thorn-like or stout spike like spines, Ta I, p = 6, r = 3; Mt I, p = 4, r = 3, v = 4; Ti I, p = 4, r = 6, v = 10; Ta II, p = 1, r = 6; Mt II, p = 5, r = 6, v = 3; Ti II, p = 6, r = 3, v = 8; Pa II, v = 3; Ta III, p = 3, v = 3, Mt III, p = 8, r = 4, v = 6; Ti III, p = 7, r = 5, v = 5; Pa III, p = 8, r = 3; Ta IV, p = 4, r = 2, v = 5, Mt IV, v = 4, Pa IV, p = 16; palp, Ta, 4–5 (1 long a erect), Ti, r = 27 in a semi-circle.

**Leg coxae** (Fig. 4): Coxa IV & II wider than I and III; I & III almost equal in width. Coxa IV longer than the rest.

**Trichobothria:** Clavate trichobothria absent in all legs; only long and short filiform present. Filiform on distal region of Ta & Mt. Ta I, 13–14, Mt I, 7–8 long, Ti I, 5–6 basal region; Ta II, 26/27, Mt II, 8/9, Ti II, 3/4 basal region; Ta III, 27/27, Mt III, 7/8, Ti III, 4/5 basal region; Ta IV, 17/18, Mt IV, 8/9, Ti IV, 5/6 basal region.

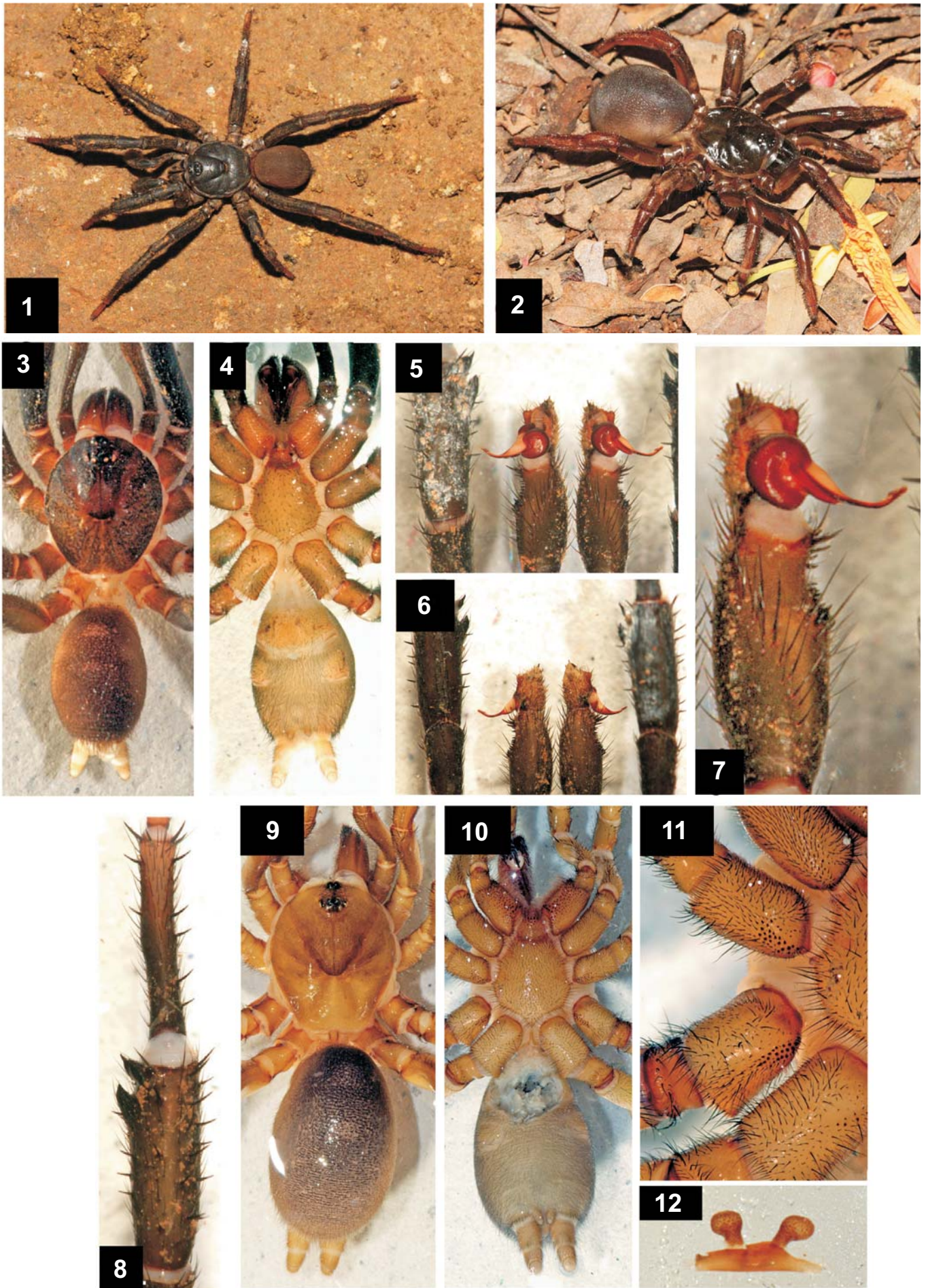
**Claws:** All legs with three claws; Paired claw of leg I–IV with two denticles. Claw of leg IV longer than the rest, claw of leg I & II equal, claw of leg III smallest. Claw tufts absent.

**Abdomen** (Fig. 3–4): Blackish- brown above; covered with short and long black setae. Ventrally yellowish covered with black setae. Brown with black spike-like setae in life.

**Spinnerets:** PMS digitiform covered with brownish hair; PLS, covered with brown hair, apical segment dome-shape (Fig. 4). Middle segment of PLS with many reddish brown spines.

**Palp bulb** (Fig. 5–7): Tibia inflated with ventral concavity, crescent-shaped band of 27 spines on retrolateral side of concavity. Tarsus bilobed, one lobe blunt and another digitiform, dorsodistally 4–5 spines. Palp simple, embolus broad at base tapering abruptly at distal end; distal end directed forwards and embolus tip facing upward; terminates in scoop-like structure.

**Description of paratype female, BNHS SP 56.** Total length 17.36; carapace 7.24 long, 6.13 wide; chelicerae 4.30 long.



**Fig. 1-12.** *Idiops kaasensis* sp. nov. 1. holotype male: hábitus; 2. paratype female BNHS SP 56 hábitus. Photo by Zeeshan Mirza; 3-8. holotype male: 3. dorsal aspect; 4. ventral aspect; 5. palp bulb prolateral view; 6. palp bulb retrolateral view. 7. palp bulb prolateral view; 8. tibia and metatarsus of leg I. 9-12. paratype female (BNHS SP 56): 9. dorsal aspect; 10. ventral aspect; 11. close-up of coxae, showing spinules; 12. spermathecae.

Abdomen 10.12 long, 6.34 wide. Spinnerets: PMS, 0.60 long, 0.36 wide, 0.44 apart; PLS, 1.4 total length (0.90 basal, 0.40 middle, 0.10 distal; midwidths 1.10, 0.80, 0.68 respectively).

*Carapace* (Fig. 9): Yellowish brown smooth and glabrous throughout; a few long and short spine like hairs on caput, few lines of depression along interstitial ridges. Caput with distinct mound between fovea and eyes with a slight depression in front of the mound. Fovea deep, procurved, U-shaped.

*Eyes* (Fig. 9): ALE situated far in advance of the rest. Posterior row slightly procurved, ocular group 1.54 long, 1.35 wide; diameter AME 0.19, PME 0.15, ALE 0.26, PLE 0.32; distance between ALE-AME 0.49, AME-AME 0.20, PLE-PME 0.14, PME-PME 0.45, ALE-PLE 0.69; MOQ not square, 0.55 long, 0.45 front width, 0.60 back width. Eye group on a slight elevation.

*Maxillae* (Fig. 10): 1.70 long in front and 2.50 long in back, 1.40; with from 58 cuspules. Cuspules on the prolateral border larger than those on rest of the maxillae. Anterior lobe greatly reduced.

*Labium* (Fig. 10): 0.86 long, 0.90 wide, labiosternal groove shallow, total number of 10 cuspules present at the anterior portion in two rows (four large and rest of the same size arranged in two rows).

*Chelicerae*: Total number of nine promarginal teeth and seven retromarginal teeth, rastellum conspicuous on a distinct process, thick curved spines arranged in two or three rows.

*Sternum* (Fig. 10): Yellowish brown, with elevated anterior and lateral sides, sloping posteriorly, 4.20 long, 3.80 wide, covered with long black hair, a row of these radiating out of the borders, posterior angle acute and not separating coxae IV.

*Sigilla* (Fig. 10): Anterior 0.08 in diameter and 1.90 apart situated 0.04 from the margin; middle about 0.10 in diameter and 2.56 apart and 0.06 away from margin; posterior sigilla absent.

*Legs*: Formula 4123, morphometry (femur, patella, tibia, metatarsus, tarsus, total): I: 4.46, 2.56, 2.20, 1.96, 1.08, 12.26. II: 4.10, 2.40, 1.96, 1.74, 1.10, 11.3. III: 4.70, 2.78, 1.56, 2.34, 1.50, 12.88. IV: 5.24, 3.28, 3.20, 2.38, 1.70, 15.8. Palp: 4.22, 2.48, 2.38, -, 2.36, 11.44. Midwidths: femora I-IV=1.98, 1.12, 1.96, 1.54, palp=1.00; tibiae I-IV=1.24, 1.12, 1.40, 1.38, palp=1.32.

*Spines*: Curved thick thorn-like or stout spike like spines, Ta I, p = 7, r = 8, v = 3, Mt I, p = 18/2 Broken, r = 19, Ti I, p = 8/2 broken, r = 21; Ta II, p = 7, r = 3, v = 8, Mt II, p = 17/2 broken, r = 16/17, Ti II, p = 8/1 broken, v = 1; Ta III, p = 4, v = 5, Mt III, p = 13, r = 7, v = 6, Ti III, p = 4, r = 3, Pa III, p = 10; Ta IV, p = 7, r = 1, v = 6/7, Mt IV, p = 3, v = 4/5, Pa IV, P = 6; palp, Ta, p = 22 r = 24/25, Ti, p = 20, r = 24, Pa, p = 1.

*Leg coxae* (Fig. 10 & 11): Coxa IV & II wider than I and III; I & III almost equal in width. Coxa IV longer than the rest. Coxa II & III with band of 21-25 thorn-like spinules, coxa I and IV with 1 & 3 spinules each respectively.

*Trichobothria*: Clavate trichobothria absent in all legs; only long and short filiform present. Filiform on distal region of Ta & Mt. Ta I, 20; Mt I, 13; Ti I, 7-8; Ta II, 25/26, Mt II, 11/12, Ti II, 11/12 basal region; Ta III, 28/30, Mt III, 16/17, Ti III, 12/13; Ta IV, 16/17, Mt IV, 11/12, Ti IV, 13/14; Palp, Ta, 15/16, Ti, 6/7 basal region;

*Claws*: All legs with three claws except palp with single claw bearing a single unequal tooth. Paired claw of leg I & II with signal dentations; claw of leg III with 2 and of leg IV

with 3 dentations. Claw of leg IV longer than the rest, claw of leg I & II equal, claw of leg III smallest. Claw tufts absent.

*Abdomen* (Fig. 9-10): Brown above; covered with short and long black setae. Ventrally greyish covered with black setae.

*Spinnerets*: PMS digitiform covered with brownish hair; PLS, covered with brown hair, apical segment dome-shape (Fig. 10). Middle segment of PLS with many reddish brown spines.

*Spermathecae* (Fig. 12): Globular apical lobe on a stalk, resembling button mushroom.

**Morphometry of female paratype, BNHS SP 57.** Total length 9.54. Carapace 6.70 long, 6.60 wide, chelicerae 2.78 long. Sternum 4.14 long, 3.38 wide. Labium 0.90 long, 0.18 wide. Maxillae 2.57 back length, 1.60 front length, 1.42 wide, 50-60 cuspules.

*Legs* (tarsus, metatarsus, tibia, patella, femur, total): I: 1.08, 1.94, 2.62, 2.60, 4.91, 13.15. II: 1.04, 1.78, 2.18, 2.58, 4.5, 12.08. III: 1.36, 2.22, 1.44, 2.58, 4.36, 11.96. IV: 1.68, 2.78, 3.00, 2.92, 5.43, 15.81. Palp: 2.03, -, 2.64, 2.28, 4.12, 11.07. Midwidths: femora I = 1.02, II = 1.14, III = 1.80, IV = 1.40, palp = 0.96; tibia I = 1.42, II = 1.20, III = 1.44, IV = 1.22, palp = 1.26. Abdomen 8.18 long, 4.64 wide. Spinnerets: PMS, 0.40 long, 0.24 wide and 0.30 apart; PLS, 0.72 basal, 0.30 middle, 0.20 distal, 1.22 total length, midwidths 0.80, 0.79, 0.70, respectively, apart 0.60.

**NATURAL HISTORY:** The male holotype was collected on Kass Plateau in Satara District of Maharashtra (Fig. 13). This and three other males were found directly under boulders on the edge of a forested area. Two trapdoor burrows made from loose soil were found on a mud embankment along the road. Both were inclined at an angle of ca. 50 degrees, while one was empty and the other contained a female (BNHS SP 57). The paratype female BNHS SP 56 was collected ca. 22km in airline distance from Kaas Plateau. This place is located about 25 km northwest of Satara City at an altitude of about 1240 m a.s.l. The region presents itself as a lateritic rock outcrop and is characterized by relatively extreme conditions with highly patchy and temporally variable resources. The average annual precipitation amounts to between 1723 and 1865 mm and is limited to the monsoon season, which is when expansive water-logged areas are created that support a wide range of floral and faunal life. Most of this water subsequently runs off on the thin soil cover, causing drastic habitat changes towards the end of rainy season. Winters and summers are completely dry save for a few monsoon showers towards the end of summer. Temperatures can be as low as 4-6°C in winter and reach 55°C on rock and soil surfaces in summer at air temperatures of up to 45°C (Watve & Thakur, 2006). The plateau is thickly covered with vegetation during the monsoons, most of which dries up during the period of October-May, leaving behind only a few clusters of bushes with dry grass everywhere. The microclimatic conditions vary from almost xeric to water-logged during the course of a year (Watve & Thakur, 2006) and so create an extremely harsh physical environment for all life forms.

Thus species thriving in this habitat are unique and some of them are endemic to this region and are under heavy pressure from anthropogenic activities (Giri & Bauer, 2008). Attempts should be made to retain the uniqueness of the habitat which supports a variety of flora and fauna.

**Fig. 13.** Map showing the type locality of the new species in the Western Ghats, India.



**Key to indian *Idiops* Perty, 1833 (modified after Pocock, 1900)**

- |   |                         |  |                         |
|---|-------------------------|--|-------------------------|
| 1a male.....  | 2                       | 8b spermathecae with two stalks on sclerotized leaf-like structure .....                           | 9                       |
| 1b female .....   | 7                       | 9a spermathecae with two stalks on sclerotized leaf-like structure resembles a conical flask ..... | <i>I. rubrolimbatus</i> |
| 2a prolateral tibial apophysis consists of a stout, pointed, and bent spur, and a tubercle behind it.....   | 3                       | 9b spermathecae with two stalks on sclerotized leaf-like structure resembles maracas .....         | <i>I. madrasensis</i>   |
| 2b prolateral tibial apophysis consists of a long spine with a smaller spine below it.....  | 5                       | 10a coxa of leg II–IV with a band of spinules .....  | <i>I. kaasensis</i>     |
| 3a concavity and conical spur on mt I absent .....  | <i>I. kaasensis</i>     | 10b coxa of only leg IV with a band of spinules.....   | 11                      |
| 3b concavity and conical spur on mt I present.....  | 4                       | 11a eyes of posterior line almost equally spaced.....  | <i>I. fortis</i>        |
| 4a fourth leg clearly longer than the first leg .....   | <i>I. bombayensis</i>   | 11b eyes of posterior line unequally spaced.....   | <i>I. constructor</i>   |
| 4b fourth and first leg almost equal.....   | <i>I. constructor</i>   |  |                         |
| 5a 1st leg longest.....   | <i>I. garoensis</i>     |  |                         |
| 5b IVth leg longest .....   | 6                       |  |                         |
| 6a embolus tip faces forward and toward the retrolateral face, strong concavity in basal half of Mt I.....  | <i>I. fossor</i>        |  |                         |
| 6b embolus tip faces outward and toward the retrolateral face, moderate concavity on Mt that exceeds half the length of the segment.....  | <i>I. rubrolimbatus</i> |  |                         |
| 7a band of spinules absent on coxa of legs .....  | 8                       |  |                         |
| 7b band of spinules present on coxa of legs.....  | 10                      |  |                         |
| 8a spermathecae with globular apical lobe on stalk, resembling button mushroom. Carapace sloping gradually in front, caput clearly humped; spermathecal stalk bent at an angle of 40 degree; overall dark brownish in color ..... | <i>I. bombayensis</i>   |  |                         |

**Acknowledgements**

The Gerry Martin Project is thanked for logistic support to ZM. Field work in Satara would not have been possible without Vishal Deshpande; who provided all possible help and warm hospitality. Special thanks to Rahul Khot for help with registration of specimens at the Bombay Natural History Society (Mumbai). Ashish Jadhav and Nilesh Mane provided valuable assistance in the field for which ZM wishes to thank them. VV acknowledges Sagar Kore and Sachin Gaikwad for their help. RS & ZM wish to thank Agarwal Janseva Charitable Trust for help to procure microscope. Special thanks to David Ortiz and an anonymous reviewer for their constructive comments.

## References

- GIRI, V.B. & A.M. BAUER 2008. A new ground-dwelling *Hemidactylus* (Squamata: Gekkonidae) from Maharashtra, with a key to the *Hemidactylus* of India. *Zootaxa*, **1700**: 21-34.
- CAMBRIDGE, O. P. 1885. Arachnida, Araneidea. In: *Scientific results of the second Yarkand Mission; based upon the collections and notes of the late Ferdinand Stoliczka*, PH.D. Pp. 1878-1891.
- DIPPENAAR-SCHOEMAN, A. S. 2002. *Baboon and Trapdoor spiders of Southern Africa: An Identification Manual*. Plant Protection Research Institute Handbook No. 13, Agriculture Research Council, Pretoria, 128 pp.
- GRAVELY, F. H., 1915. Notes on Indian mygalomorph Spiders. *Records of Indian Museum, Calcutta*, **11**: 257-287.
- GRAVELY, F. H., 1935. Notes on Indian mygalomorph spiders. II. *Records of Indian Museum, Calcutta*, **37**: 69-84.
- KESWANI, S., P. HADOLE & A. RAJORIA 2012. Checklist of Spiders (Arachnida: Araneae) From India-2012. *Indian Journal of Arachnology*, **1**(1): 1-129.
- MIRZA, Z. A. & R. SANAP 2010. Description of a new species of scorpion of the genus *Lychas* C. L. Koch, 1845 (Scorpiones: Buthidae) from Maharashtra, India. *Journal of Threatened Taxa*, **2**(4): 789-796.
- MIRZA, Z. A. & R. SANAP 2012. A new species of the genus *Idiops* and notes on *Idiops bombayensis* Siliwal et al. 2005 (Araneae: Idiopidae) from Northern Western Ghats of Maharashtra, India. *Journal of Arachnology*, **40**: 85-95.
- MYERS, N., R. A. MITTERMEIER, C. G. MITTERMEIER, G. A. B. DA FONSECA & J. KENT 2000. Biodiversity hotspot for conservation priorities. *Nature*, **403**: 853-858.
- PERTY, M. 1833. Arachnides Brasilienses. In: De Spix, J.B. & Martius F.P. (eds). *Delectus Animalium Articulorum quae in itinere per Braziliam ann. 1817 et 1820 colligerunt. Monachii* 191-209.
- PLATNICK, N. I. 2011. *The World Spider Catalog, version 11.5*. *American Museum of Natural History*, online at <http://research.amnh.org/iz/spiders/catalog/IDIOPIDAE.html> (Date of access 27 April 2011).
- POCOCK, R. I. 1900. *The Fauna of British India, Including Ceylon and Burma. Arachnida*. Taylor and Francis, London. 279 pp.
- RAVEN, R. J. 1985. The spider infraorder Mygalomorphae (Araneae): cladistics and systematics. *Bulletin of the American Museum of Natural History*, **182**: 1-180.
- ROEWER, C. F. 1942. *Katalog der Araneae von 1758 bis 1940*. Paul Budy, Bremen. Pp. 1-1040.
- SANAP, R. V. & Z. A. MIRZA 2011. Two new trapdoor spider species of the genus *Scalidognathus* Karsch, 1891 (Araneae: Idiopidae) from the Southern Western Ghats of India. *Acta Zoologica Lituanica*, **21**(2): 96-102.
- SILIWAL, M., S. MOLUR & B.K. BISWAS 2005. Indian spiders (Arachnida: Araneae): Updated checklist 2005. *Zoos' Print Journal*, **20**: 1999-2049.
- SILIWAL, M., N.V. NAIR, S. MOLUR & R. RAVEN 2009. First record of the trapdoor spider genus *Conothele* (Araneae, Ctenizidae) from India, with a description of two new species. *The Journal of Arachnology*, **37**: 1-9.
- SILIWAL, M., S. MOLUR & R. RAVEN 2010. Transfer of two Indian *Idiops* spp. to the genus *Heligmomerus* Simon, 1892 (Araneae: Idiopidae) with redescription of *H. barkudensis* (Gravely, 1921). *Journal of Threatened Taxa*, **2**(6): 940-947.
- SILIWAL, M., N. GUPTA, R. SANAP, Z.A. MIRZA & R. RAVEN 2011. First record of the genus *Tigidia* Simon, 1892 (Araneae, Barychelidae) from India with description of three new species from the Western Ghats. *Journal of Threatened Taxa*, **3**(12): 2229-2241.
- SIMON, E. 1892. *Histoire naturelle des araignées*. Librairie Encyclopédique de Roret, Paris 1: 1-256pp.
- TIKADER, B. K. 1977. Studies on some mygalomorph spiders of the families Ctenizidae and Theraphosidae from India. *Journal Bombay Natural History Society*, **74**: 306-319.
- WATVE, A. & S. THAKUR 2006. Ecological studies of lateritic plateau habitats. In: Pandey, HN & Barik, SK (Eds) *Northern Western Ghats. Ecology and conservation of plants and ecosystems in India*. NEHU, 22-28.