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Five new species of trap-door spiders (Araneae: Mygalomorphae: Idiopidae) from India

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Abstract: The family Idiopidae is dominated by the subfamily Idiopinae with 106 species recorded from the world; 20 species (five species of *Helgimomerus*, 12 species of *Idiops*, and three species of *Scalidognathus*) are reported from India. In this paper, we describe a new species of *Heligmomerus wii* from Dehradun, Uttarakhand and four new species of *Idiops*: *Idiops bonny*, *Idiops reshma*, & *Idiops sally* from Dangs, Gujarat and *Idiops vankhede* from Maharashtra.

Keywords: Description, Gujarat, Idiopidae, Maharashtra, taxonomy, Uttarakhand.

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Competing interests: The authors declare no competing interests.

Author details: M. Siliwal is an arachnologist, have more than 17 years of experience in taxonomy. R. Hippargi is faculty at the Department of Zoology, Walchand College of Arts & Science, Solapur and have been studying spiders for more than a decade. A. Yadav have carried out her PhD on spiders and is currently carrying out independent research on spiders. Prof. D. Kumar is the faculty at the Department of Zoology, M.S. University of Baroda and have guided several students for their PhD on spiders.

Author contribution: All the authors have contributed equally in the preparation of the manuscript; MS, RH & AY were responsible for the collection of specimens and taxonomic description of the species. DK and MS brought fundings for the project.

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INTRODUCTION

The trap-door spider family Idiopidae Simon, 1889 is represented by 407 species under 22 genera in the world (WSC 2020). The subfamily Idiopinae Simon, 1889 (*Heligmomerus* Simon, 1892 and *Idiops* Perty, 1833) is the largest with 106 species and is predominantly found in the Old World (Africa, Asia, Middle-East), except for the genus *Idiops* which has widespread geographic distribution (South America, Southern Africa, northern Africa, Middle-East, India, southeastern Asia) (WSC 2020). Therefore, Idiopinae forms an important model for biogeographic study especially to test the Gondwana hypothesis.

Members of the subfamily Idiopinae can be easily distinguished from the rest of the subfamilies by the anterior lateral eyes being situated close to the clypeal edge, well advanced from the rest of the eye group. Further, *Heligmomerus* can be distinguished by the presence of a dorsal depression on tibia III, whereas in *Idiops,* it is normal (Raven 1985; Siliwal et al. 2010).

In India, Idiopidae is represented by three genera and 24 species, of which 17 species belong to Idiopinae: 12 species of *Idiops* and five species of *Heligmomerus* (WSC 2020). The diversity of Idiopinae is expected to be high in India and it is poorly reported due to the specialized burrowing habit. The burrows are short but thickly lined with silk and have thick lid or door at the entrance of the burrow, which remains closed when the spider is inside. The outer surface of the burrow is covered with dust, soil, and moss or dry vegetation, which makes the burrow highly challenging to notice even when a few centimeters away. A trained paired of eyes are required to spot these highly camouflaged burrows.

Females of the Indian Idiopinae morphologically look alike with distinct size variations (Sanap & Mirza 2015; also see below). Till date, only two types of spermathecae structure are reported from India. In Type I, the receptacle ends in a lobe which resembles a halogen bulb whereas, in Type II, the receptacle ends in a lobe that has a constriction anteriorly and appears like a teat. In this paper we report additional spermathecae structure and term it as Type III. In Type III, receptacles are doll-like with or without lateral lobes, however, males show distinct morphological variations in the first leg especially, the shape of the metatarsi and the tibial apophysis. Therefore, identification of the species is largely based on the males and it is more reliable.

Since 2009, interest in trapdoor spiders has gained momentum amongst aspiring arachnologists and a number of species have been described or redescribed (Sanap & Mirza 2011, 2015; Mirza & Sanap 2012; Mirza et al. 2012; Sen et al. 2012; Gupta et al. 2013). Due to lack of detailed descriptive literature and comparative materials, however, many species have been either misidentified or have undergone taxonomic changes (Siliwal 2009; Siliwal et al. 2010; Siliwal & Raven 2010).

In this paper, we describe five new species, *Heligmomerus wii* sp. nov. from Dehradun, Uttarakhand, *Idiops bonny* sp. nov., *I. reshma* sp. nov. and *I. sally* sp. nov. from Dangs, Gujarat, and *I. vankhede* sp. nov. from Solapur, Maharashtra. *I. vankhede* sp. nov. is described based on both males and females; *H. wii* sp. nov. is described based on the male, whereas, the other species are described based solely on females.

METHODS

All specimens are deposited at the Wildlife Information Liaison Development Society (WILD) Museum at Dehra Dun, Uttarakhand, India. Measurements of body parts except for the eyes were taken with a Mitutoyo™ Vernier Caliper. Eye measurements were done with calibrated ocular micrometer. All measurements are in millimeters. Spermathecae were dissected and cleared in concentrated lactic acid. Total length excludes chelicerae. All illustrations were prepared with the help of a camera lucida attached to a MOTIC™ stereomicroscopes by MS. The taxonomic description style follows Siliwal et al. (2014).

Abbreviations: ALE = anterior lateral eye, AME = anterior median eye, HT = Holotype, MOA = median ocular area, PLE = posterior lateral eye, PME = posterior median eye, PLS = posterior later spinnerets, PMS = posterior median spinnerets, PT = Paratype, WILD = Wildlife Information Liaison Development Society. Abbreviations used for hair and spines count are d = dorsal, fe = femur, mt = metatarsus, p = prolateral pa = patella, pc = preening comb, r = retrolateral, ta = tarsus, ti = tibia, v = ventral.

RESULTS

Taxonomy

Class Arachnida Cuvier, 1812
Order Araneae Clerck, 1757
Family Idiopidae Simon, 1899
Genus *Heligmomerus* Simon, 1892

***Heligmomerus wii* sp. nov.**
(Image 1, Figs. 1–11, Table 1)

urn:lsid:zoobank.org:act:2825E2C9-9EED-4BFB-8040-97BF3ED0A43E

Material examined

Holotype: WILD-16-ARA-1302, 23.vii.2016, male, Wildlife Institute of India main campus (30.284^{0}N & 77.974^{0}E, 591m), Dehradun, Uttarakhand, India, coll. M. Siliwal & G. Mathur.

Paratypes: WILD-16-ARA-1304, 31.vii.2016, one male, same data as holotype; WILD-15-ARA-1294, 22.viii.2015, one male, same locality as holotype, coll. M.V. Nair.

Description

Holotype (male): Total length 11.82, carapace 6.05 long, 5.38 wide; chelicerae 3.34 long; abdomen 5.77 long, 4.18 wide. Spinnerets: PMS, 0.55 long, 0.19 wide, 0.30 apart; PLS, 0.54 basal, 0.31 middle, 0.24 distal; midwidths 0.74, 0.48, 0.32 respectively; 1.09 total length. Morphometry of legs and palp are given in Table 1.

Colour in alcohol: Carapace, chelicerae reddish-brown; sternum pale yellow; maxillae, labium yellowish-brown; legs greenish-brown except for tarsi of all legs and palp, mt I distal ½ mt II-IV complete and tibia of palp greenish-yellow. Abdomen dorsally grayish-brown with pale spots radiating in curved lines; ventrally and ventro-laterally yellowish-gray. Spinnerets pale creamish.

Carapace (Fig. 1): Oval, wart-like tubercles except for striae and very few tubercles on caput. Broad black patch covering anterior half of caput, narrowing down to two parallel lines in posterior half reaching fovea. Unusual gentle recurved depression on caput just before fovea (resembles like depression made by pressing caput by fovea but it is present on all speciemens), it coincides with foveal depression margin to form round rim around fovea. Fovea procurved, deep. Bristles absent.

Eyes (Figs 1–2): Eight in three rows, ALE situated far from AME on clypeal edge; posterior row procurved.

Image 1. *Heligmomerus wii* sp. nov.

Ocular group 1.27 long, 1.39 wide; MOA square, 0.87 wide and 0.71 long. Diameter AME 0.31, PME 0.21, ALE 0.27, PLE 0.33; distance between ALE-AME 0.20, PME-PME 0.25, ALE-PLE 0.37, AME-AME 0.04, PLE-PME, 0.04, ALE-ALE adjacent.

Maxillae (Fig. 3): 1.71 long anteriorly, 2.12 long posteriorly, 1.18 wide; no cuspules; anterior lobe distinct, posterior edge obscured, anterior edge straight.

Labium (Fig. 3): 0.81 long, 0.99 wide, labiosternal groove shallow, slightly procurved, cuspules absent.

Chelicerae (Fig. 3): Eight teeth on promargin and 5 teeth on retromargin; rastellum strong, raised on high triangular mound, with 24 thick, short spines, surrounded with many normal spines; two glabrous bands for length of dorsal surface of chelicerae.

Sternum (Fig. 3): 3.33 long, 2.98 wide, broader between coxae II-III; yellowish-brown, elevated in centre, sloping laterally, covered with short and long black bristles; posterior angle acute.

Sigilla (Fig. 3): Posterior sigilla absent; median pair marginal, 0.16 diameter, 2.06 apart, marginal and anterior pair 0.06 diameter, 1.47 apart, marginal.

Legs (Figs 4–7): All legs cylindrical, not flattened; leg I slightly thicker than rest; femora III clearly wider than rest; metatarsi of all legs longer than tarsi. Tibia I inflated with two prolateral tibial apophysis; distal apophysis possess stout spur with broad base, narrowing abruptly into pointed tip, facing up. Lower apophysis with blunt, smooth surface facing distal spur (Figs 6–7); mt I gently excavated in basal one-third but prolateral process absent (Fig. 5). Ti III slightly excavated dorsally (Fig. 5). Ta I-II slightly swollen. Legs covered with few scattered hairs, bristles and normal pointed spines. Two conspicuous glabrous bands through the length of femora, patellae and tibiae. Leg formula 4123 (Table 1).

Scopulae: Ta I distinct, in distal two-third, ta II distinct, distal three-fourth, ta III, distinct, in distal one-third, ta IV, very few scopuliform hairs in distal one-fourth. On all ta, scopuliform hairs sparse, restricted to only ventral side.

Spines: More on promarginal and retromarginal sides of legs and palp; normal long spines on all leg parts except for pa III-IV and ti palp, ti III, mt III with thorn-like thick spines. I: ti, p=1+2 tubercles, one with megaspine, r=9; mt, p=3, r=11, ta p=3, r=4. II: ti, r=1; mt, p=3, r=7, v=1; ta, p=2, r=4. III: pa, p=7,d=2; ti, p=7, v=3, r=9, d=50; mt, p=7, d=37, r=3, v=8; ta, p=4, r=3, v=2. IV: pa, p=72, d=23; mt, v=7; ta, p=v=6, r=1. Palp: ti, r=43; ta, d=2.

Trichobothria: Clavate absent; ta I, 15 long filiform; ta II 14 long and short filiform; ta III, 12 long filiform; ta IV, 12 long filiform and six long filiform on palp in centre, ta I-IV trichobothria in triangular area in distal three fourth. Mt I-III, 7–8 long filiform in distal one thirds; mt IV, seven long filiform in distal one-fourth.

Leg coxae: Greenish-yellow, covered with sparse short and long black bristles.

Claws: All legs with paired and unpaired claws. Both (paired as well as unpaired) claws on IV prominent and distinctly larger than rest. Paired claws on leg I-III with unequal bifid tooth, on leg IV single tooth.

Abdomen (Fig. 1): Covered with short black hairs with few long bristle-like hairs posteriorly, cuticle appears leathery and slightly rough. Ventral region uniformly covered with short and few long black hairs.

Spinnerets: PMS digitiform covered with brown hairs; PLS covered with brown hairs, apical segment domed.

Palp (Figs 8–11): Tibia incrassate, ventral 1/3rd excavated into cavity; with band of spines in crecent shape on retrolateral side of cavity, anterior and posterior spines longer than rest. Cymbium truncated dorsally with two lateral processes, two long spines dorsally. Median haematodocha fused with bulb, embolus, long, gently curves retrolaterally, gradually tapering till mid-way and then continues of almost same width and slightly flatten towards tip; embolus distally with two teeth like dentition on retrolateral keel.

Variation male (WILD-16-ARA-1304)

Total length 10.59, carapace: 5.29 long, 4.51 wide, labium: 0.73 long, 1.08 wide, maxillae: 1.24 long in front, 1.78 long in back, 0.94 wide, sternum: 2.97 long, 2.70 wide, abdomen: 5.30 long, 3.47 wide, spinnerets: PLS, 0.57 basal, 0.24 middle, 0.16 apical; midwidths, 0.64, 0.57, 0.36 respectively; 0.97 total length; PMS, 0.47 long, 0.17 wide; distance between PMS–PMS, 0.32. Morphometry of legs and palp are given in Table 1.

Diagnosis

Male of *Heligmomerus wii* sp. nov. closely resembles *H. barkudensis* Gravely, 1921 in the absence of metatarsal process and spines; and it resembles *H. biharicus* (Gravely, 1921) by the presence of a shallow excavation on tibia III. The new species differs from *H. barkudensis* and *H. biharicus* by distal tibial apophysis with spur, broader at base narrowing distally to pointed tip, (see Figs. 6–7) (in *H. barkudensis* spur broader but abruptly narrows in distal half with pointed blunt tip; in *H. biharicus* spur is short, triangular); lower tibial apophysis with blunt, rounded tip, (see figs. 6–7) (same in *H. barkudensis*; in *H. biharicus* it is short and pointed; palp embolus distally with two teeth like dentition on retrolateral keel, (see Fig. 11) (such dentition either absent or unknown on embolus of *H. biharicus* and *H. barkudensis*).

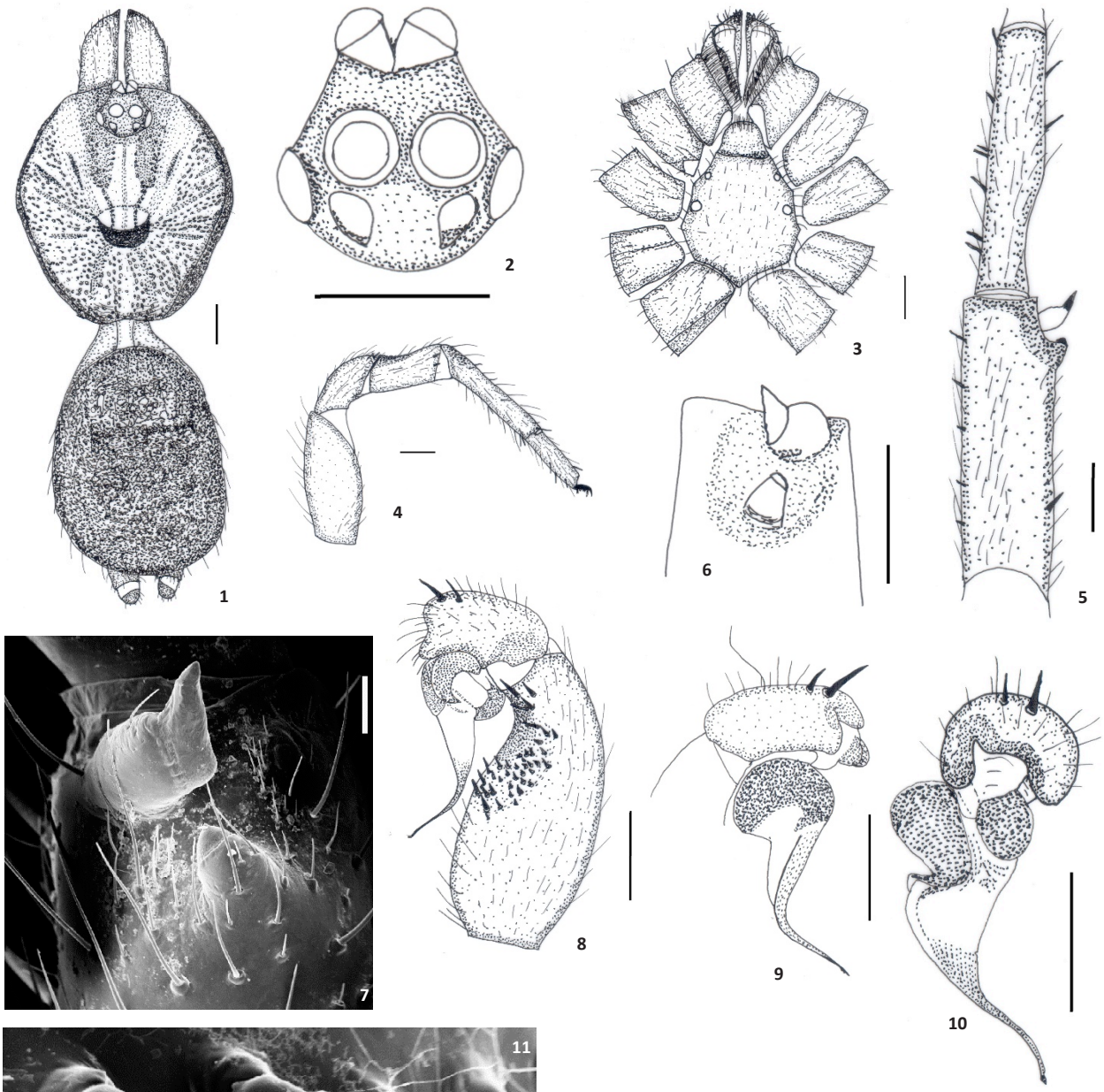

Figure 1–11. *Heligmomerus wii* sp. nov., male (WILD-15-ARA-1302).
1—carapace and abdomen dorsal view, scale 1.0mm | 2—eye, scale 1.0mm | 3—sternum, maxillae, labium, chelicerae, scale 1.0mm | 4—leg III (Fe to ta), lateral view, scale 1.0mm | 5—tibia and metatarsi of leg I, scale 1.0mm | 6—tibial apophysis, scale 1.0mm | 7—tibial apophysis, scale 0.2mm | 8— palp retrolateral view, scale 1.0mm | 9—palp ventral view, scale 1.0mm | 10—palp prolateral view, scale 1.0mm | 11—palp embolus tip, scale 2.0 mm.

Table 1. Morphometry of legs and palp of *Heligmomerus wii* sp. nov. from Dehradun, Uttarakhand, holotype (HT; WILD-16-ARA-1302) and paratype (PT; WILD-16-ARA-1304).

	LEG I		LEG II		LEG III		LEG IV		PALP	
	HT	PT	HT	PT	HT	PT	HT	PT	HT	PT
Femur	5.74	5.15	4.54	4.08	3.56	3.14	5.32	4.56	3.6	3.05
Patella	2.98	2.54	2.34	2.08	2.29	2.08	2.72	2.33	1.69	1.65
Tibia	3.89	3.32	3.18	2.62	1.77	1.81	4.22	3.69	3.19	2.96
Metatarsus	4.11	3.67	3.5	3.02	3.57	3.18	4.74	4.05		
Tarsus	1.54	1.49	1.6	1.52	1.8	1.93	2.77	2.21	1.46	1.21
Total	18.26	16.17	15.16	13.32	12.99	12.14	19.77	16.84	9.94	8.87
Midwidth										
Femur	1.06	0.95	1.04	0.84	1.48	1.14	1.1	0.97	0.67	0.54
Tibia	1.27	1.19	0.86	0.79	0.97	0.88	0.97	0.85	1.29	1.22

Etymology

The species epithet is an acronym for the Wildlife Institute of India, the type locality of the species.

Remarks

We could not provide more robust characters for diagnosis for the new species in the absence of comparative type material of the male sex of both *H. biharicus* and *H. barkudensis.* Apart from all the diagnostic characters mentioned above, the new species is from the Doon Valley, which is geographically about 1,200–2,000 km apart from the type localities of both *H. biharicus* (Sahebganj, Bihar) and *H. barkudaensis* (Barkuda Island, Chilika lake, Odisha). Also, the habitat in Dehradun is Sal dominant and subtemperate with 600–700 m elevation, whereas, Sahebganj is in the Terai region with predominant grassland habitat & Sal forests with elevation ranging from 15–100m and Barkuda Island with a mix shurby vegetation with an elevation lower than 20m and lies in subtropical region. Taking into account the geographical separation and barriers between these three type localities, the species therefore, can be considered a distinct and separate species. More diagnostic characters will be added after examining or procuring fresh male specimens of *H. biharicus* and *H. barkudensis*

Morphometry for the paratype male (WILD-15-ARA-1294) is not provided as some deformities in eyes and sternum were observed. We, however, have used SEM pictures of this specimen to show tibial apophysis on leg I and palp embolus tip as they were identical and intact as in the holotype.

Natural history

All the spiders were found wandering on the road during the night or early morning. The Wildlife Institute of India campus consists of Sal *Shorea robusta* forest patches in different areas. Though we have not been successful in locating an active burrow of this spider, we assume these spiders make burrows in Sal patches. Sal patches have heavy undergrowth during monsoon and post monsoon, whereas, during dry phases of winter and summer a thick layer of leaf litter is present. Therefore, it is difficult to locate these highly camouflaged burrows in the Sal patches. Males were found during the monsoon (July–August).

Genus *Idiops* Perty, 1833

***Idiops bonny* sp. nov.**

(Image 2, Figs. 12–17, Table 2)

urn:lsid:zoobank.org:act:670B72D3-F567-4589-A67C-104614DBD8F6

Material examined

Holotype: WILD-15-ARA-1285, 12.iii.2015, female, Vansda National Park, (20.752^{0}N & 73.483^{0}E, elev. 131m), Dangs, Gujarat, India, coll. R. Solanki, A. Yadav and M. Siliwal.

Paratype: WILD-15-ARA-1286, 12.iii.2015, one female, same data as holotype.

Description

Holotype (female)**:** Total length 29.81, carapace 13.30 long, 11.59 wide; 6.94 long chelicerae; abdomen 16.51 long, 10.69 wide. Spinnerets: PMS, 1.13 long, 0.63 wide, 0.46 apart; PLS, 2.08 basal, 0.90 middle, 0.73 distal; midwidths 1.94, 1.53, 1.03 respectively; 3.71 total length. Morphometry of legs and palp given in Table 2.

Colour in life: Complete spider black.

Colour in alcohol: Carapace, chelicerae, legs reddish-

Image 2. ***Idiops bonny*** **sp. nov.**

Table 2. Morphometry of legs and palp of *Idiops bonny* sp. nov. from Vansda NP, Gujarat, holotype (HT; WILD-15-ARA-1285) and paratype (PT; WILD-15-ARA-1286).

	LEG I		LEG II		LEG III		LEG IV		PALP	
	HT	PT	HT	PT	HT	PT	HT	PT	HT	PT
Femur	8.04	8.19	7.09	7.65	6.17	5.78	8.58	8.55	6.81	6.84
Patella	4.99	5.09	4.78	4.66	4.99	5.1	5.72	5.87	4.46	4.37
Tibia	4.73	4.85	4.19	4.28	3.26	3.44	6.11	6.13	4.41	4.43
Metatarsus	3.95	3.76	3.64	3.41	4.39	4.65	5.81	5.79		
Tarsus	2.26	2.27	2.12	2.29	3.21	3.48	3.25	3.49	4.86	4.83
Total	23.97	24.16	21.82	22.29	22.02	22.45	29.47	29.83	20.54	20.47
Midwidth										
Femur	2.04	2.03	1.93	2.05	2.67	2.71	2.28	2.21	1.53	1.68
Tibia	2.34	2.33	2.16	2.11	2.32	2.39	2.12	2.21	2.08	2.15

brown; carapace with reticulate marking on thoracic region, along striae and towards margin, darker patch on caput, thoracic area lighter than cephalic area; legs lighter below. Legs and palp yellowish-brown, lighter below. Abdomen dorsally grayish-brown mottled with radiating yellow spots, ventrally yellowish-grey.

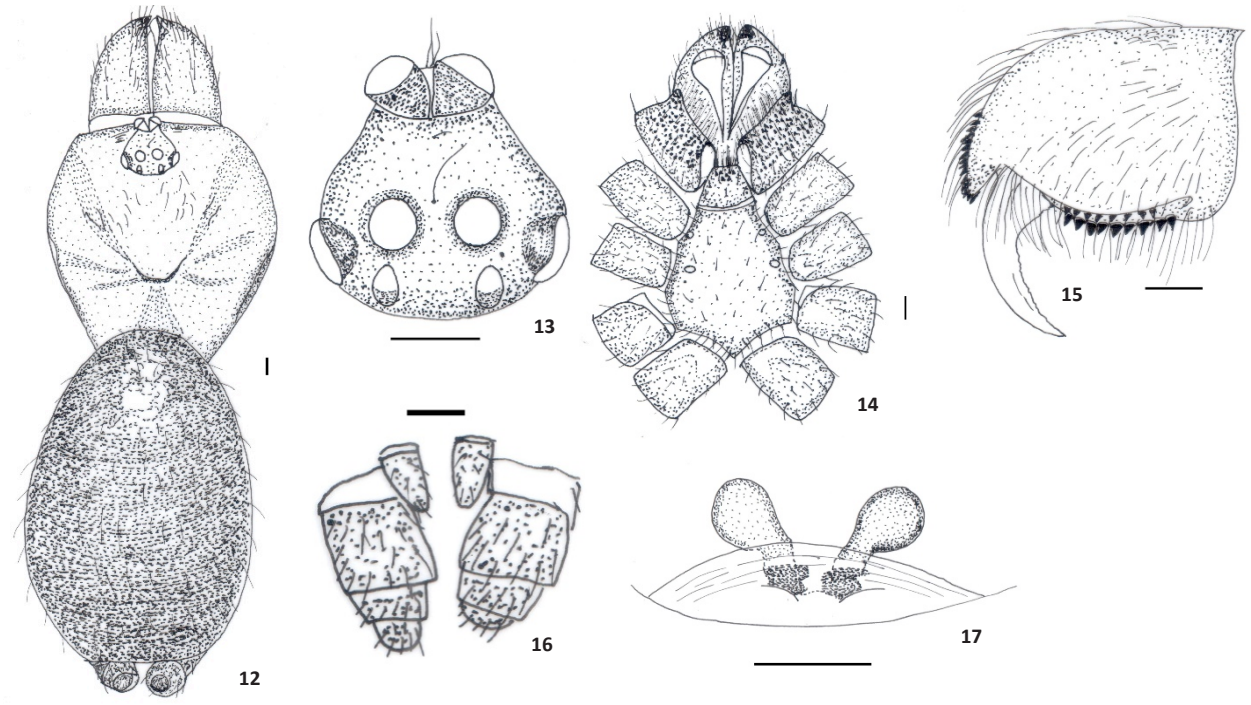

Figure 12–17. ***Idiops bonny*** **sp. nov., male (WILD-15-ARA-1285).**
12—cephalothorax and abdomen, scale 1.0mm | 13—eyes, scale 1.0 mm | 14—sternum, maxillae, chelicerae and labium, scale 1.0mm | 15—chelicerae, scale 1.0mm | 16—spinnerets, scale 1.0mm | 17—spermathecae, scale 1.0mm.

Spinnerets yellowish-brown.

Carapace (Fig. 12): Glabrous, broader anteriorly (widest between legs III) and gradually narrowing posteriorly, striae prominent. Fovea, procurved, deep; caput raised. Anterior ocular area at level of caput and not raised. Bristles: 4 long and 32 short on caput; one long between AME-AME; two long between PME-PME; one long, two short between ALE-ALE, three long and five short on clypeal edge. Clypeus absent. Few short hairs on posterior and anterior margins.

Eyes (Figs 12–13): Eight in three rows, ALE situated far from AME on clypeal edge; posterior row procurved. Ocular group 2.97 long, 2.95 wide; MOA rectangle, 1.59 wide, 1.27 long. Diameter AME 0.48, PME 0.30, ALE 0.63, PLE 0.74; distance between ALE-AME 0.54, AME-AME 0.36, PLE-PME 0.24, PME-PME 0.68, ALE-PLE 1.11, ALE-ALE adjacent.

Maxillae (Fig. 14): 4.05 long anteriorly, 4.68 long posteriorly, 3.14 wide; 167 cuspules of unequal size; anterior lobe distinct, anterior margin straight, posterior margin obscure.

Labium (Fig. 14): 2.19 long, 2.39 wide, labiosternal groove shallow, slightly procurved with seven cuspules anteriorly in two curved rows.

Chelicerae (Figs 15): 10 large, two small teeth on promargin and eight large, two small teeth on retromargin; depression on retrolateral face where fang touches chelicerae; rastellum strong, raised on high triangular mound, with 42 thick, short spines, surrounded by many normal long spines; two glabrous bands for length of dorsal surface of chelicerae.

Sternum (Fig. 14): 7.89 long, 6.67 wide, broader between coxae III; yellowish-brown, elevated in centre, sloping laterally, covered with long black bristles; row of long bristles on margins, posterior angle blunt.

Sigilla (Fig. 14): Posterior sigilla absent; median pair 0.50 diameter, 3.79 apart, 0.42 from margin and anterior pair round, marginal.

Legs: Posterior legs slightly thicker than anterior ones. Femora III and tibiae I and III wider than others. Patellae I-III and palp longer than tarsi. Tibiae to tarsi of legs I-II and palp slightly dorsoventrally flattened, other legs normal. Legs covered with few scattered hairs, bristles and few curved thick thorn-like spines restricted to anterior legs and palp. Two conspicuous glabrous bands for length of femora, patellae and tibiae. Scopulae absent on tarsi of all legs and palp. Leg formula 4132 (Table 2).

Spines: More on promarginal and retromarginal sides of legs and palp. I: ti, p=20, r=26; mt, p=33, r=27; ta, p=11, r=10, v=1. II: ti, p=10, v=1; mt, p=21, r=8; ta, p=12, r=5, v=4. III: pa, p=35, d=3, r=1; ti, p=15, r=6; mt,

p=23, r=14, v=4; ta, p=5, r=6, v=3. IV: pa, p=28; ti, v=1; mt, p=6, v=1; ta, p=19, v=3, r=4. Palp: fe, p=3; pa, p=1; ti, p=24, r=31; ta, p=29, r=28, v=4.

Trichobothria. Clavate absent; ta I, 20 long filiform; ta II, 16 long filiform; ta III, 16 long filiform; ta IV, 16 long filiform in two irregular rows almost for length and 24 long filiform in two rows in distal two-third on palp ta. Ta I-III filiform in two inverted V-shape rows basal three-fourth. Mt I, seven long filiform in distal fourth; mt II–IV, 10 long filiform in distal one-fourth.

Leg coxae: Covered with short and long black bristles, spinules absent. Coxa III with glabrous patch in basal three-fourth, rest area sparsely covered with long bristles; coxa IV clearly broader than others, anterior edge curved, ventrally.

Claws: All legs with paired and unpaired claws. Paired claws on legs I-II with unequal bifid tooth, on legs III-IV with equal length bifid tooth; bifid tooth on palp claw. False claw tufts on each side of paired claws.

Abdomen (Fig. 12): Oval, uniformly covered with short and long black hairs. Dorsum with few yellow spots in radiating pattern, cuticle appears leathery and slightly rough; ventrally grayish-brown with few pale spots covered with short black hairs. Epigastric plate sclerotized and glabrous in anterior area.

Spinnerets (Fig. 16): PMS digitiform covered with brown hair; PLS covered with brown hair, apical segment domed.

Spermathecae (Fig. 17): Type I spermathecae. Two receptacles, each facing away from each other; each receptacle posteriorly opens into wide sclerotized slit-like opening, receptacles and slit-opening covered with transparent triangular (inverted) membrane, attached posteriorly with epigastral sclerotized region; each receptacle with slightly wider base, immediately sclerotized leading to large-szied sclerotized cup-shape lobes. Each receptacle covered with spermathecal pores except for the basal 1/4th part.

Variation female (WILD-15-ARA-1286)

Total length 30.88; carapace: 11.46 long, 10.22 wide; labium: 2.00 long, 2.50 wide; cuspules 7. Maxillae: 3.57 long in front, 4.47 long in back, 2.80 wide; cuspules 110. Sternum: 6.85 long, 6.17 wide. Abdomen: 19.42 long, 14.53 wide. Spinnerets: PLS, 1.54 basal, 0.86 middle, 0.70 apical; midwidths, 1.36, 1.19, 0.87 respectively; 3.10 total length; PMS, 1.17 long, 0.60 wide; distance between PMS–PMS, 0.61. Morphometry of legs and palp in Table 2.

Diagnosis

Females of *Idiops bonny* sp. nov. are 40–60% larger in size than other described congeners from India except for *I. fortis* (total length is 32 and carapace length 14). This species differs from females of *I. vankhede* sp. nov., *I. joida*, *I. constructor*, *I. fortis* and *I. oriya* by the absence of spinules on coxae IV; additionally it differs from *I. constructor*, *I. fortis* and *I. oriya* by the leg formula 4132 (whereas it is 4123 in *I. constructor*, *I. fortis* and *I. oriya*) and differs from *I. vankhede* sp. nov. and *I. joida* by ocular area as wide as long (see Fig. 13; distinctly longer than wide in *I. vankhede* sp. nov. and *I. joida*).

Etymology

The species epithet is treated as a noun in apposition, named in honour of Prof. Bonny Pilo, retired dean and head of Zoology Department, The M.S. University of Baroda for being a pioneer in initiating wildlife studies in the department and providing motivation and support to arachnological studies in the department.

Remarks

Basic structure of spermathecal respectale resembles 'Type-I' except for the lobes which are not inflated like a bulb as typically seen in Type-I, this perhaps could be due to the lack of sperms in the spermathecae. It is likely that the female had just nested or didn't mate in the previous season. Cup-shaped depression is relatively less in the paratype specimen.

Natural history

Idiops fortis is the largest *Idiops* recorded so far from India and *Idiops bonny* sp. nov. is the second largest species. It is almost double the size of previously recorded species from India. Interestingly, *I. sally* sp. nov. and *I. bonny* sp. nov. were found in the same area within a radius of 100m, both sharing same habitat and elevation.

The spiders were found inside their trap-door burrows made on mud-bunds inside the forest of Vansda National Park. Burrow entrances had D-shaped lid/door attached on the upper side of burrow, canopy cover ranged from 5–8%, with almost bare ground (maximum 1% ground cover), 70% leaf litter, all burrows were facing east. Burrow diameters ranged from 27–29 mm and depth of the burrows ranged from 106–127 mm and lid thickness was 2mm.

Idiops reshma sp. nov.
(Image 3, Figs. 18–21, Table 3)

urn:lsid:zoobank.org:act:63DC5021-6F11-4F46-86DF-594EB545C4DB

Material examined

Holotype: WILD-15-ARA-1288, 12.iii.2015, female, Saputara Botanical Garden (20.576^{0}N & 73.740^{0}E, 898m), Saputara, Gujarat, India, coll. R. Solanki, M. Siliwal & A. Yadav.

Paratype: WILD-15-ARA-1289, one female, same data as holotype.

Description

Holotype (female): Total length 14.48; carapace 5.31 long, 4.33 wide; long chelicerae; abdomen 9.17 long, 5.88 wide. Spinnerets: PMS, 0.38 long, 0.19 wide, 1.10 apart; PLS, 0.58 basal, 0.34 middle, 0.19 distal; midwidths 0.74, 0.64, 0.42 respectively; 1.11 total length. Morphometry of legs and palp given in Table 3.

Colour in alcohol: Carapace, chelicerae, labium, maxillae, sternum reddish-brown, caput and striae darker. Legs and palp greenish-brown, striae darker, anterior legs darker than posterior ones and lighter ventrally. Abdomen dorsally grayish-brown mottled with faint yellow spots in a curved pattern. Spinnerets yellowish-brown.

Carapace (Fig. 18): Glabrous, broader anteriorly (widest between legs II) and gradually narrowing posteriorly, striae prominent. Fovea, procurved, deep; caput raised. Bristles: Two long and several short hairs on caput; one long between AME-AME; three long, two short between PME-PME; two long, five short between ALE-ALE and carapace edge. Few short hairs on along striae, posterior and anterior margins. Three black patches, one starting between ALE-ALE and going down towards fovea, two on either side of ocular area ending mid-way on caput.

Eyes (Figs 18–19): Eight in three rows, ALE situated far from AME on clypeal edge; posterior row straight. Ocular group 1.30 long, 1.34 wide; MOA square, 0.48

Image 3. *Idiops reshma* sp. nov.

Table 3. Morphometry of legs and palp of *Idiops reshma* sp. nov. from Dangs Gujarat, holotype (HT; WILD-15-ARA-1288) and paratype (PT; WILD-15-ARA-1289).

	LEG I		LEG II		LEG III		LEG IV		PALP	
	HT	PT	HT	PT	HT	PT	HT	PT	HT	PT
Femur	3	2.15	2.6	2.3	2.42	2.15	3.27	2.36	2.88	2.3
Patella	2.08	1.44	1.61	1.06	1.77	1.26	2.43	2.03	1.91	1.63
Tibia	2.19	1.76	1.58	1.45	1.25	1.07	2.48	2.26	2.05	1.7
Metatarsus	1.51	1.06	1.3	1.18	1.63	1.47	2.65	1.96	-	-
Tarsus	1.25	0.82	1.07	0.76	1.24	0.94	1.67	1.07	2.24	1.78
Total	10.03	7.23	8.16	6.75	8.31	6.89	12.5	9.68	9.08	7.41
Midwidth										
Femur	0.77	0.87	0.74	0.75	1.22	1.25	0.98	1.35	0.64	0.80
Tibia	0.94	0.9	0.79	0.72	0.98	0.96	0.84	0.88	0.87	0.98

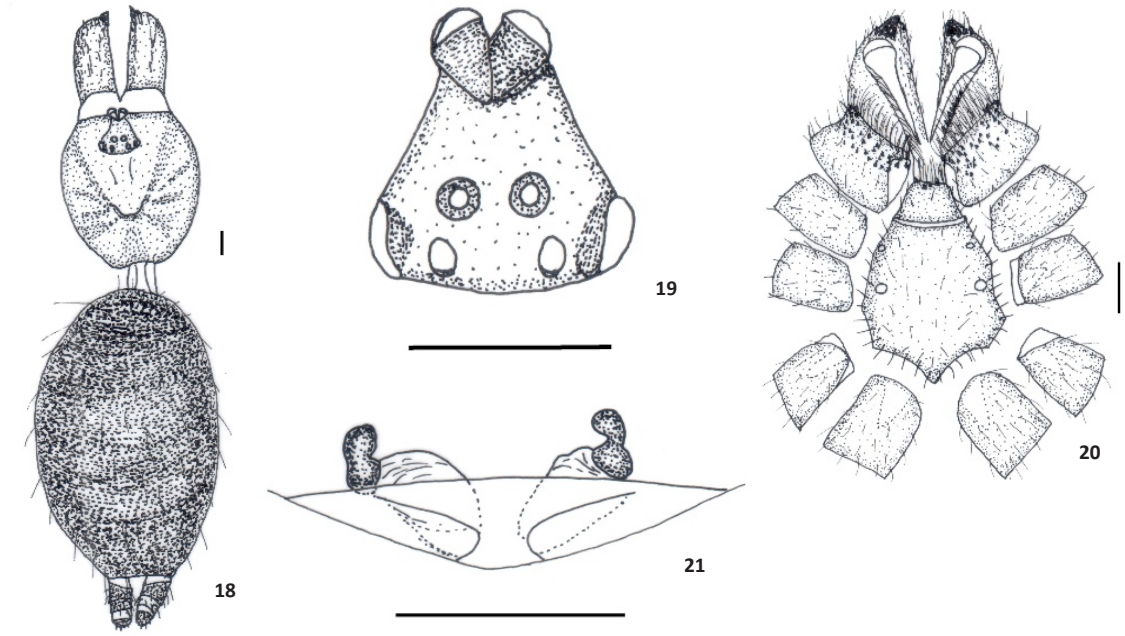

Figure 18–21. *Idiops reshma* sp. nov., female (WILD-15-ARA-1288).
18—cephalothorax and abdomen, scale 1.0mm | 19— eyes, scale 1.0mm | 20—sternum, maxillae, chelicerae and labium, scale 1.0mm | 21—spermathecae, scale 1.0mm.

wide anteriorly, 0.69 posteriorly wide, 0.45 long. Diameter AME 0.22, PME 0.18, ALE 0.24, PLE 0.27; distance between ALE-AME 0.30, AME-AME 0.16, PLE-PME 0.12, PME-PME 0.36, ALE-PLE 0.54, ALE-ALE adjacent.

Maxillae (Fig. 20): 1.44 long anteriorly, 1.86 long posteriorly, 1.17 wide; 32–35 cuspules; anterior lobe distinct, anterior margin straight, posterior margin obscure.

Labium (Fig. 20): 0.79 long, 1.16 wide, labiosternal groove shallow, slightly procurved with two cuspules anteriorly.

Chelicerae (Figs 20): Five large, four small teeth on promargin, and four large, two small teeth on retromargin; depression on retrolateral face where fang touches chelicerae; rastellum strong, raised on high triangular mound, with 12 thick, short spines, surrounded by many normal long spines; two glabrous bands for length of dorsal surface of chelicerae.

Sternum (Fig. 20): 2.77 long, 2.74 wide, broader between coxae II-III; yellowish-brown, elevated in centre, sloping laterally, covered with long black bristles; row of long bristles on margins, posterior angle acute.

Sigilla (Fig. 20): Posterior sigilla absent; median pair

0.12 diameter, 1.70 apart, 0.13 from margin and anterior pair round, marginal.

Legs: Femora and tibiae III wider than others; all metatarsi longer than respective tarsi. Tarsi of palp and mt and ta of leg II dorsoventrally flattened, other legs normal. Legs covered with few scattered hair, bristles and few curved thick thorn-like spines. Two conspicuous glabrous bands for length of femora, patellae and tibiae. Scopulae absent on tarsi of all legs and palp. Leg formula 4132 (Table 3).

Spines: More on promarginal and retromarginal sides of legs and palp. I: ti, p= r=9; mt, p=14, r=12; ta, p=7, r=6, v=4. II: ti, p=5, r=3; mt, p=13, r=5; ta, p=5, r=6, v=4. III: pa, p=8, r=2; ti, p=3, r=7; mt, p=r=7, v=4; ta, p=1, v=5. IV: pa, p=6; mt, v=7; ta, p=1, v=6, r=2. Palp: ti, p=r=14; ta, p=17, r=19, v=8.

Trichobothria: Clavate absent; ta I, 12-14 long filiform in each of four rows for length in triangular area; ta II-III, 16 long filiform in two rows for length; ta IV, 12 long filiform and 16–20 long filiform in two rows in distal half on palp ta. Mt I, eight long filiform in distal fourth; mt II–IV, 10 long filiform in distal fourth.

Leg coxae: Yellowish-brown, covered with short and long black bristles. Coxa III with glabrous patch in distal three fourth, rest coxae on with small glabrous patch at base; coxa IV clearly broader than others, anterior edge curved.

Claws: All legs with paired and unpaired claws. Both (paired as well as unpaired) claws on leg IV prominent and larger than on other legs. Paired claws with two unequal bifid tooth on legs I–IV; unequal bifid tooth on palp. False claw tufts on each side of paired claws.

Abdomen (Fig. 18): Oval, uniformly covered with short and long black hairs. Dorsum with few mottled with yellow spots in radiating pattern, cuticle appears leathery and slightly rough. The skin is now loosened up because it was in the process of moulting at the time of collection.

Spinnerets: PMS digitiform covered with brown hair; PLS covered with brown hair, apical segment domed.

Spermathecae (Fig. 21): Type III spermathecae. Two receptacles, each receptacle posteriorly opening into wide sclerotized slit-like opening, receptacles and slit opening covered with transparent membrane, attached posteriorly with epigastral screotized region; each receptable wider at base, transparent (except lobes), gradually narrowing down midway leading to screotized lobes, primary lobe divided into two unequal halves with constriction in middle (upper half round resembling head and lower half oval). Overall lobe appear like a doll; densely covered with pores.

Remarks

Upon dissecting the spermathecae of the holotype, two identical sets of spermathecae were found inside the spider. On detailed observation, it was clear that the spider had just moulted a few hours before the collection. It is probable that the spermathecae did not get removed with the exuvia while moulting. The older spermathecae was slightly lighter in colour than the new pair of spermathecae and both pairs fitted well in each other like a pair of hand gloves that fit inside each other.

Variation female (WILD-15-ARA-1289)

Total length 12.07; carapace: 4.72 long, 3.52 wide; labium: 0.95 long, 0.99 wide; cuspules 25. Maxillae: 0.56 long in front, 0.90 long in back, 1.60 wide; cuspules 40. Sternum: 2.74 long, 2.17 wide. Abdomen: 7.35 long, 5.58 wide. Spinnerets: PLS, 0.44 basal, 0.38 middle, 0.24 apical; midwidths, 0.65, 0.59, 0.40 respectively; 1.06 total length; PMS, 0.27 long, 0.10 wide; distance between PMS–PMS, 0.09. Morphometry of legs and palp given in Table 3.

Diagnosis

Females of *Idiops reshma* sp. nov. resemble those of *I. sally* sp. nov. in primary lobe of receptacle with constriction and divided in two unequal halves but differ from the latter species by the absence of the lateral lobe (Fig. 21).

Etymology

The species epithet is treated as a noun in apposition, named in the honour of late (Dr.) Reshma Solanki, who had contributed in the collection of the species. She was a doctorate student of Dr. Dolly Kumar and worked on the spiders of Jambughoda Wildlife Sanctuary, Gujarat.

Natural history

This species was found in a degraded and highly disturbed botanical garden, which was under renovation. A cluster of 7–8 burrows were found at the base of an ornamental plant. Soil was hard and rocky, therefore, the burrows were shallow (less than 50mm deep). All burrows were vertical to the ground, with a 'D'-shaped lid at the entrance and with burrow entrances facing south. Burrows were in an open area with 2% canopy cover, 5% ground cover, and 50% leaf litter. Burrow diameters ranged from 9–11 mm.

Idiops sally sp. nov.
(Image 4, Figs. 22–25, Table 4)

urn:lsid:zoobank.org:act:026CEB00-564C-41F2-95AB-DF234C534D07

Material examined

Holotype: WILD-15-ARA-1287, 12.iii.2015, female, Vansda National Park (20.752^{0}N & 73.483^{0}E, elev. 131m), Dangs, Gujarat, India, coll. R. Solanki, A. Yadav & M. Siliwal.

Description

Holotype (female)**:** Total length 16.57; carapace 7.65 long, 6.18 wide; 3.92 long chelicerae; abdomen 8.92 long, 5.87 wide. Spinnerets: PMS, 0.66 long, 0.28 wide, 0.14 apart; PLS, 0.94 basal, 0.53 middle, 0.47 distal; midwidths 1.11, 0.89, 0.59 respectively; 1.94 total length. Morphometry of legs and palp given in Table 4.

Colour in life: Complete spider is black.

Colour in alcohol: Carapace greenish-brown; chelicerae reddish-brown. Reticulate marking on anterior carapace, two prominent light blackish patch on caput. Legs and palp greenish-brown, lighter below. Abdomen dorsally grayish-brown, ventrally yellowish. Spinnerets yellowish-brown.

Carapace (Fig. 22): Glabrous, broader anteriorly (widest between legs II) and gradually narrowing posteriorly, striae prominent. Fovea, procurved, deep; caput raised. Bristles: one long and two short on caput; one long between AME-AME; one long, five short between PME-PME; one long between AME-ALE; one long, five short between ALE-ALE. Few short hairs on posterior and anterior margins.

Eyes (Figs 23): Eight in three rows, ALE situated far from AME on clypeal edge; posterior row straight. Ocular group 1.79 long, 1.82 wide; MOA rectangular, 0.82 wide, 0.77 long. Diameter AME 0.30, PME 0.18, ALE 0.32, PLE 0.38; distance between ALE-AME 0.45, AME-AME 0.05, PLE-PME 0.03, PME-PME 0.48, ALE-PLE 0.99, ALE-ALE adjacent.

Maxillae (Fig. 24): 2.20 long anteriorly, 2.77 long posteriorly, 1.67 wide; 36 cuspules spread over anterior1/3rd maxillae width; anterior lobe distinct, anterior margin straight, posterior margin obscure.

Labium (Fig. 24): 1.21 long, 1.64 wide, labiosternal

Image 4. *Idiops sally* sp. nov.

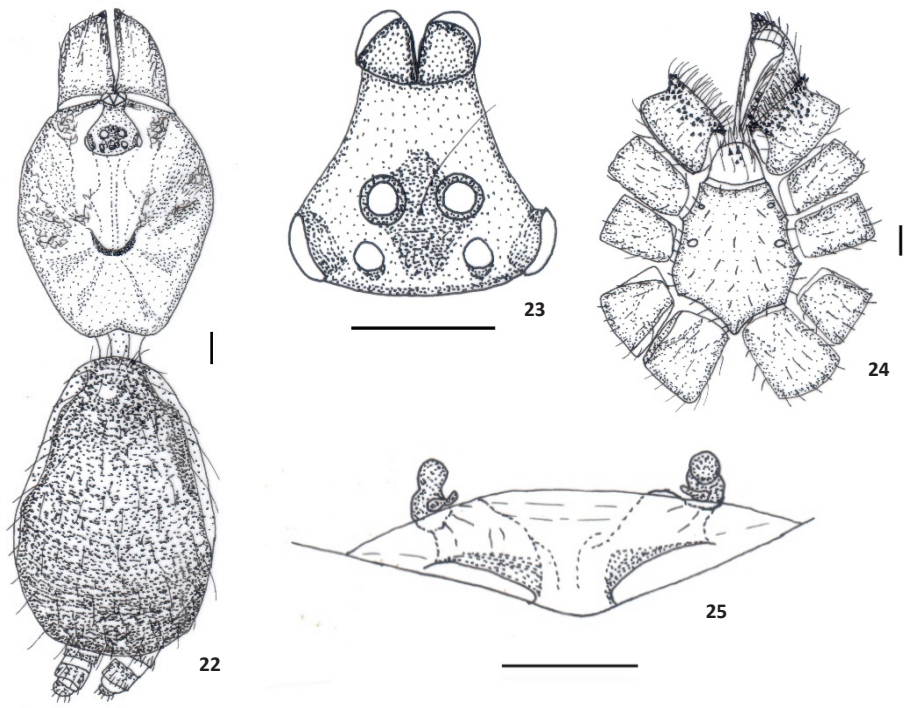

Figure 22–25. ***Idiops sally*** **sp. nov., female (WILD-15-ARA-1287).**
22—cephalothorax and abdomen, scale 1.0mm | 23—eyes, scale 1.0mm | 24—sternum, maxillae, chelicerae and labium, scale 1.0mm | 25—spermathecae, scale 1.0mm.

Table 4. Morphometry of legs and palp of ***Idiops sally*** **sp. nov. from Dangs, Gujarat, holotype (WILD-15-ARA-1287).**

	LEG I	LEG II	LEG III	LEG IV	PALP
Femur	4.78	3.66	3.25	4.39	3.84
Patella	3.17	2.59	2.74	3.36	2.88
Tibia	2.99	2.31	1.97	3.59	3.01
Metatarsus	2.1	1.9	2.22	3.71	
Tarsus	1.39	1.29	1.7	2.01	3
Total	14.43	11.75	11.88	17.06	12.73
Midwidth					
Femur	1.1	1.15	1.73	1.42	0.91
Tibia	1.49	1.12	1.49	1.37	1.44

groove shallow, slightly procurved with two large and one small cuspules anteriorly in two rows.

Chelicerae (Figs 24): Eight large, three very small teeth on promargin and five teeth on retromargin; rastellum strong, raised on high triangular mound, with 14 thick, short spines, surrounded by many normal long and short stiff bristles; two glabrous bands for length of dorsal surface of chelicerae.

Sternum (Fig. 24): 4.79 long, 3.88 wide, broader between coxae III; yellowish-brown, elevated in centre, sloping laterally, covered with long black bristles; row of long bristles on margins, posterior angle acute.

Sigilla (Fig. 24): Posterior sigilla absent; median pair 0.17 diameter, 2.34 apart, 0.19 from margin and anterior pair round, marginal.

Legs: Posterior legs slightly thicker than anterior pairs. Femora and tibiae III wider than others; all metatarsi longer than respective tarsi. Tarsi of palp and mt-ta I slightly dorsoventrally flattened, other legs normal. Legs covered with few scattered hair, bristles; curved thick thorn-like spines only on legs I-II and palp. Two conspicuous glabrous bands for length of femora,

patellae and tibiae. Scopulae absent on tarsi of all legs and palp. Leg formula 4132 (Table 4).

Spines: More on promarginal and retromarginal sides of legs and palp. I: ti, p=12, r=14, v=2; mt, p=19, r=18, v=2; ta, p=6, r=8, v=4. II: ti, p=10, r=1, v=3; mt, p=12, v=2, r=8; ta, p=5, r=3, v=6. III: pa, p=11, r=5; ti, p=7, r=9; mt, p=14, r=12, v=5; ta, r=4, v=5. IV: pa, p=16; ti, v=3; mt, r=2, v=8; ta, p=1, v=5, r=9. Palp: fe, p=2; pa, p=1; ti, p=17, r=16; ta, p=21, r=18, v=4.

Trichobothria: Clavate absent; ta I, 15 long filiform; ta II, 14 long filiform; ta III, 16 long filiform; ta IV, 14 long filiform in two irregular rows for almost length and 16–20 long filiform in two rows in distal half on palp ta. Ta I-III filiform in inverted 'V' shape in basal three-fourth. Mt I, 12 long filiform in distal third; mt II–IV, 10 long filiform in distal fourth to half length.

Leg coxae: Yellowish-brown, covered with short and long black bristles, spinules absent. Coxa III with glabrous patch in basal one third, rest area sparsely covered with long bristles; coxa IV clearly broader than others, anterior edge curved.

Claws: All legs with paired and unpaired claws. Paired claws with equal length bifid tooth on legs I-II, single tooth on leg III, unequal bifid tooth on leg IV; single tooth on palp. False claw tufts on each side of paired claws.

Abdomen (Fig. 22): Oval, uniformly covered with short and long black hairs. Dorsum with few mottled yellow spots in radiating pattern, cuticle appears leathery, slightly wringled and rough. Epigastric plate posteriorly sclerotized and glabrous.

Spinnerets: PMS digitiform covered with brown hairs; PLS covered with brown hairs, apical segment domed.

Spermathecae (Fig. 25). Type III spermathecae. Two receptacles, each opening into wide sclerotized slit-like opening, receptacles and slit opening covered with transparent membrane, attached posteriorly with epigastral sclerotized region; each receptacle wider at base, transparent (except lobes), gradually narrowing down midway leading to sclerotized lobes, primary lobe divided into two unequal halves with constriction in middle (upper half round resembling head and lower half oval) and short hand-like lobe emerging prolaterally at base of main lobe. Overall, lobes appear like lateral view of a praying doll; lobes densely covered with pores.

Remarks

As stated above, previously only two types of lobes of spermathecal reseptacles were reported. This species possesses the third type of lobe having a lateral lobe, which is observed for the first time in this genus.

Diagnosis

The female of *Idiops sally* sp. nov. is distinctly different from all known *Idiops* species from India in the structure of the spermathecae, the bilobed receptacles resemble a praying doll: the main lobe is divided into two unequal halves with a constriction in the middle (upper half round and lower half oval) and short hand-like lobe emerging prolaterally at the base of main lobe (Fig. 25).

Etymology

The species epithet is treated as a noun in apposition, named in honour of the founder of Zoo Outreach Organisation, late Ms. Sally Walker (1944–2019), who dedicated her whole life to the conservation of Indian biodiversity. It is a tribute to her efforts and support to the spider project.

Natural history

Idiops sally sp. nov. was found in the same as habitat as that of *I. bonny* sp. nov. Likein the latter, the burrow entrance had D-shaped lid/door attached on the upper side of the burrow. Burrow diameter was 14mm and depth of the burrow was 70–80 mm. Lid thickness was 12mm. Female was found with egg sac in month of March, which was oval, cup-shape bottom with a flat top, with the female sitting on the top of egg sac along the length to protect it. Dimensions of egg sac was 22.47mm long x 13.68mm wide x 12.12mm high, slightly longer than the female body length.

Idiops vankhede sp. nov.
(Image 5, Figs 26–44, Table 5)

urn:lsid:zoobank.org:act:8FED5FA4-83DF-4724-ACED-73A0A0739B2C

Material examined

Holotype: WILD-10-ARA-821, 24.xii.2010, male, (17.632^{0}N & 75.878^{0}E, 470m), Siddheshwar Van Vihar, Solapur, Maharashtra, India, coll. R. Hippargi.

Paratypes: WILD-10-ARA-871, WILD-10-ARA-859, two females, same data as holotype.

Description

Holotype (male): Total length 10.22. Carapace 5.66 long, 4.70 wide; chelicerae 2.82 long; abdomen 4.56 long, 3.49 wide. Abdomen and spinnerets shrunken because of storage in 100% ethanol. Morphometry of legs and palp given in Table 5.

Colour in alcohol: Carapace, chelicerae reddish-brown. Legs greenish-brown except for tarsi of all legs and palp, mt I distal ½ mt II distal 3/4th, mt III-IV distal ¼ and tibia of palp yellow. Abdomen dorsally grayish-

Image 5. *Idiops vankhede* sp. nov.

Table 5. Morphometry of legs and palp of *Idiops vankhede* sp. nov. from Solapur, Maharashtra, holotype (HT; WILD-10-ARA-821) and paratypes (PT*; WILD-10-ARA-871*, PT; WILD-10-ARA-859).

	LEG I			LEG II			LEG III			LEG IV			PALP		
	HT	PT*	PT	HT	PT*	PT	HT	PT*	PT	HT	PT*	PT	HT	PT*	PT
Femur	6.53	3.43	3.72	5.39	3	3.25	3.74	2.67	2.83	5.56	3.67	3.79	2.8	2.9	3.25
Patella	3.09	2.36	2.35	2.31	2.04	2.03	2.18	2.09	2.36	2.47	2.69	2.7	1.6	2.06	2.05
Tibia	4.41	2.2	2.18	3.68	1.66	1.84	2.18	1.44	1.32	4.5	2.82	2.79	3	2.19	2.24
Metatarsus	5.23	1.94	1.81	4.56	1.66	1.67	4.55	2.01	1.95	5.28	2.83	2.71			
Tarsus	2.79	0.73	1.1	2.12	0.73	1.1	2.04	0.94	1.36	2.54	1.2	1.79	1.37	1.98	2.45
Total	22.05	10.66	11.16	18.06	9.09	9.89	14.69	9.15	9.82	20.35	13.21	13.78	8.77	9.13	9.99
Midwidth															
Femur	0.98	0.89	0.85	0.77	0.81	0.9	1.26	1.53	1.57	1.12	1.33	1.07	0.55	0.63	0.81
Tibia	0.9	1	1.11	0.56	0.95	0.88	0.74	1.1	1.06	0.7	1.01	1.05	1.43	1.03	1.06

brown with faint pale spots radiating in curved lines; ventrally and ventro-laterally yellowish-gray. Spinnerets yellowish-brown.

Carapace (Fig. 26): Oval, wart-like tubercles except for anterior striae and anterior caput. Fovea procurved, deep. Bristles absent.

Eyes (Figs 26–27): Eight in three rows, ALE situated far from AME on clypeal edge; posterior row straight. Ocular group 1.10 long, 1.18 wide; MOA square, 0.67 wide and 0.60 long. Diameter AME 0.29, PME 0.17, ALE 0.35, PLE 0.25; distance between ALE-AME 0.24, PME-PME 0.21, ALE-PLE 0.49, AME-AME, PLE-PME, ALE-ALE adjacent.

Maxillae (Fig. 28): 1.64 long anteriorly, 1.97 long posteriorly, 1.10 wide; no cuspules; anterior lobe distinct,

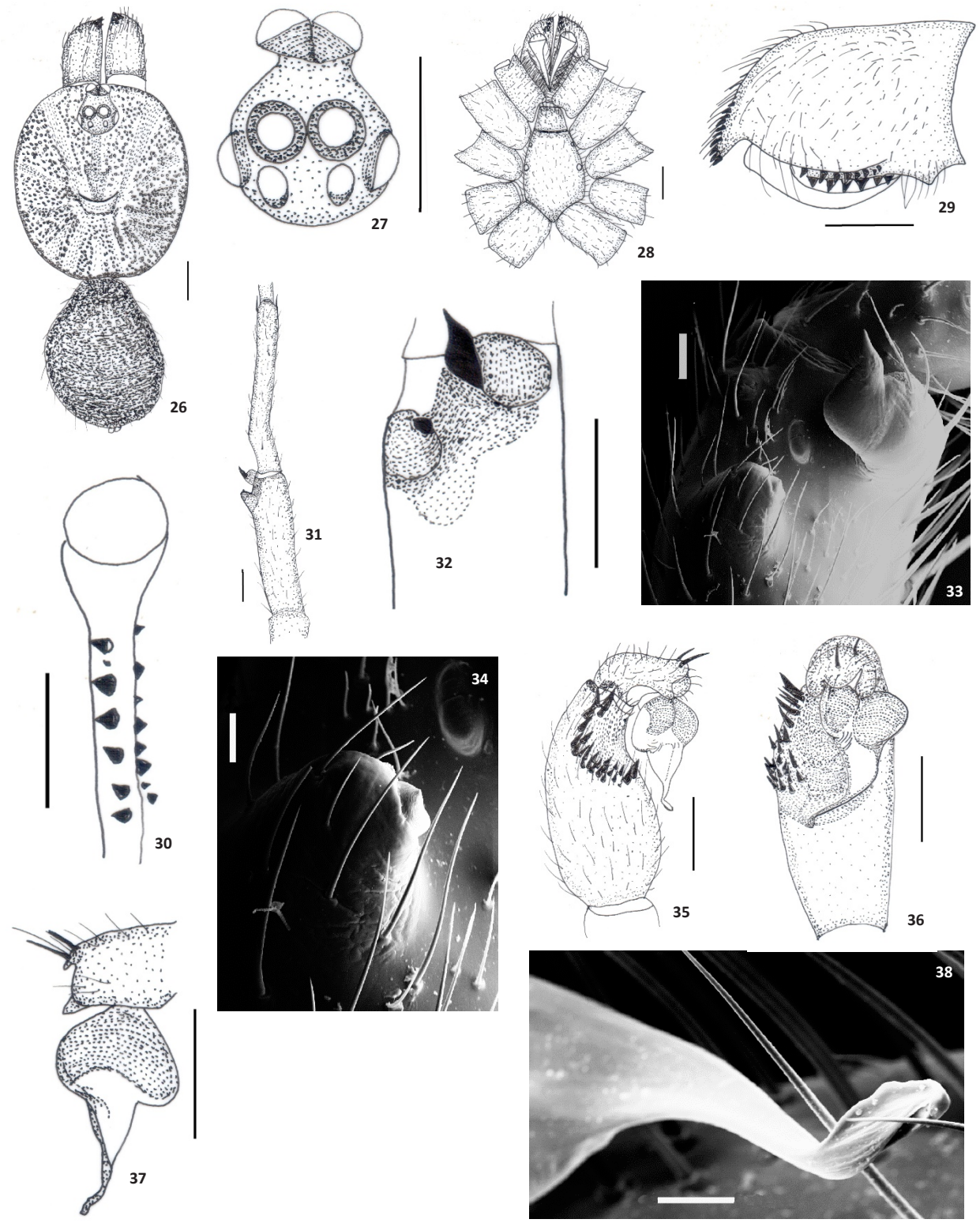

Figure 26–38. ***Idiops vankhede*** **sp. nov., male (WILD-10-ARA-821).**
26—carapace and abdomen, scale 1.0mm | 27—eyes, scale 1.0mm | 28—sternum, maxillae, chelicerae and labium, scale 1.0mm | 29—chelicerae prolateral view, scale 1.0mm | 30—chelicerae teeth, scale 1.0mm | 31—tibia and metatarsi of leg I, scale 1.0mm | 32—tibial apophysis, scale 1.0mm | 33—tibial apophyses, scale 0.2mm |34—tibial lower apophysis, scale 0.1mm | 35—palp prolateral view, scale 1.0mm | 36—palp ventral view, scale 1.0mm | 37—palp retrolateral view, scale 1.0mm | 38—embolus, scale 0.1mm.

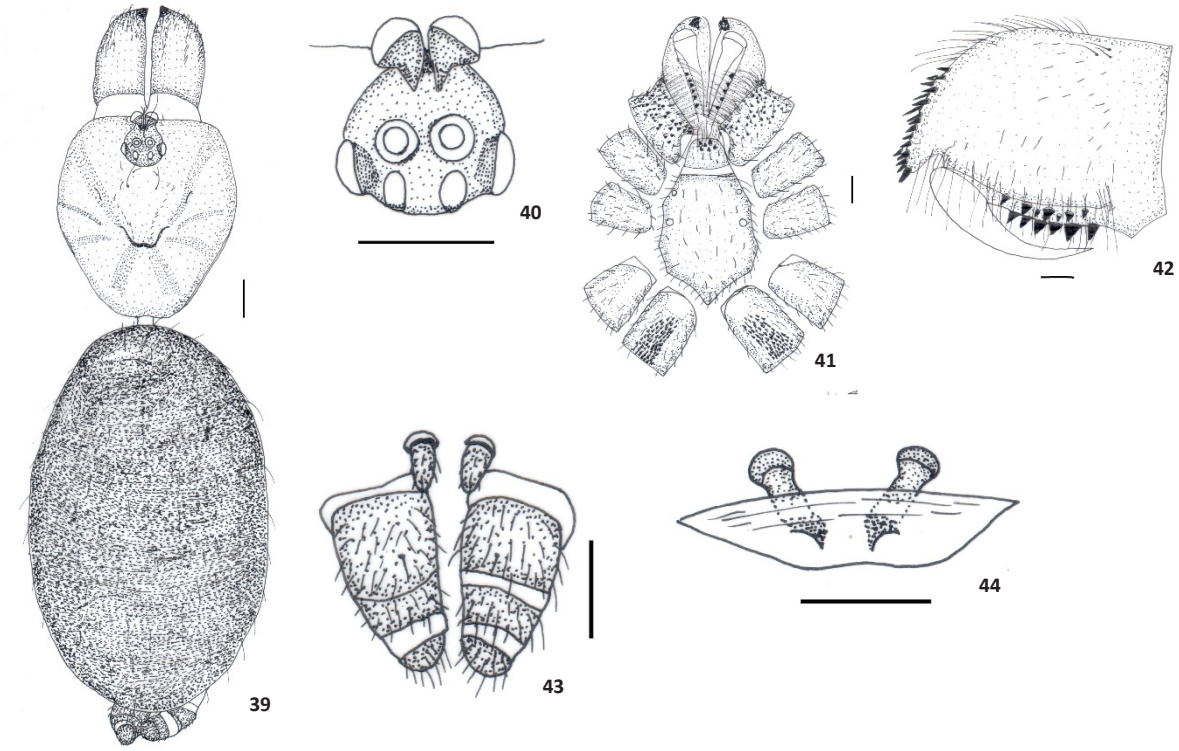

Figure 39–44. ***Idiops vankhede*** **sp. nov., female (WILD-10-ARA-871).**
39—carapace and abdomen, scale 1.0mm | 40—eyes, scale 1.0mm | 41—sternum, maxillae, chelicerae and labium, scale 1.0mm | 42—chelicerae prolateral view, scale 1.0mm | 43—spinnerets, scale 1.0mm | 44—spermathecae, scale 1.0mm.

posterior edge obscured, anterior edge straight.

Labium (Fig. 28): 0.81 long, 0.84 wide, labiosternal groove shallow, slightly procurved, cuspules absent.

Chelicerae (Figs 29–30): Eight teeth on promargin and seven teeth on retromargin; rastellum strong, raised on high triangular mound, with 25 thick, short spines, surrounded with many normal spines; two glabrous bands for length of dorsal surface of chelicerae.

Sternum (Fig. 28): 2.80 long, 1.90 wide, broader between posterior coxae; yellowish-brown, elevated in centre, sloping laterally, covered with short and long black bristles; posterior angle acute.

Sigilla (Fig. 28): Posterior sigilla absent; median pair marginal, 0.60 diameter, 1.69 apart, marginal and anterior pair indistinct.

Legs (Figs 31–34): All legs cylindrical, not flattened, similar in thickness; femora III clearly wider than rest. Tibia I inflated with two distal, prolateral tibial apophyses, distal apophysis facing upward with curved, stout triangular spine narrowing abruptly into lancet-like pointed tip; lower apophysis with wide wedge-like spine, facing opposite direction of the distal spur (Figs 31-34); mt I cylindrical, slightly bent at base, rest straight but not incrassate or excavated (Fig. 31). Legs covered with few scattered hair, bristles and normal pointed spines. Two conspicuous glabrous bands for length of femora, patellae and tibiae. Leg formula 1423 (Table 5).

Scopula: Ta II–IV distinct, hairs sparse, restricted to only ventral side, for most length. Ta I with few scopuliform hairs.

Spines: More on promarginal and retromarginal sides of legs and palp; normal long spines on all leg parts except for ti palp and pa III-IV with thorn-like thick spines. I: ti, p=2 tubercles, one with megaspine, v=7; mt, p=1, r=3. II: pa v=2; ti, v=10; mt, p=1, r=1. III: pa, p=11, r=2; ti, p=5, r=2; mt, p=v=4, r=3. IV: pa, p=10; ti, v=10; mt, v=6; ta, p=1. Palp: ti, r=25-26; ta, d=2-3.

Trichobothria: Clavate absent; ta I, 18 long filiform; ta II 20 long and short filiform; ta III, 20 long filiform; ta IV, 13 long filiform and seven long filiform on palp in centre, ta I-IV trichobothria in two zig-zag rows in distal three fourth. Mt I-II, 10 long filiform in distal one thirds; mt III, nine long filiform in distal one thirds; mt IV, seven long filiform in distal one-fourth.

Leg coxae: Greenish-yellow, covered with short and long black bristles. Coxae IV with short spinules in triangular area in distal three fourth, rest sparsely covered with long bristles.

Claws: All legs with paired and unpaired claws. Both (paired as well as unpaired) claws on IV prominent and

distinctly larger than rest. Paired claws with 7–8 teeth on leg I, 6–7 teeth on leg II, one unequal bifid tooth on leg III-IV.

Abdomen (Fig. 26). Covered with short black hairs with few long bristle-like hairs posteriorly, cuticle appears leathery and slightly rough. Ventrally uniformly covered with short and few long black hairs.

Spinnerets: PMS digitiform covered with brown hair; PLS covered with brown hair, apical segment domed.

Palp (Figs 35–38): Tibia incrassate, ventral 1/3rd excavated into cavity; with band of spines in crescent shape on retrolateral side of cavity. Cymbium truncated dorsally with two lateral processes. Median haematodocha fused with bulb, embolus gradually tapering and bend 45° midway, slightly flattened just before tip.

Paratype female (WILD-10-ARA-871): Total length 16.20; carapace 5.78 long, 5.18 wide; 3.37 long chelicerae; abdomen 10.42 long, 6.43 wide. Spinnerets: PMS, 0.49 long, 0.18 wide, 0.22 apart; PLS, 0.73 basal, 0.39 middle, 0.24 distal; midwidths 0.98, 0.75, 0.54 respectively; 0.89 total length. Morphometry of legs and palp given in Table 5.

Colour in alcohol: Carapace, chelicerae, reddish-brown. Legs and palp yellowish-brown, lighter below. Abdomen dorsally grayish-brown, ventrally yellowish. Spinnerets yellowish-brown.

Carapace (Fig. 39): Glabrous, broader anteriorly (widest between legs II) and gradually narrowing posteriorly, striae prominent. Fovea, procurved, deep; caput raised. Bristles: two long and two short on caput; one long between AME-AME; one long, four short between PME-PME; one long between ALE-ALE. Few short hairs on posterior and anterior margins.

Eyes (Figs 39–40): Eight in three rows, ALE situated far from AME on clypeal edge; posterior row procurved. Ocular group 1.41 long, 1.26 wide; MOA square, 0.64 wide, 0.64 long. Diameter AME 0.25, PME 0.13, ALE 0.30, PLE 0.38; distance between ALE-AME 0.30, AME-AME 0.05, PLE-PME 0.04, PME-PME 0.16, ALE-PLE 0.40, ALE-ALE adjacent.

Maxillae (Fig. 41): 1.77 long anteriorly, 2.19 long posteriorly, 1.27 wide; 56 cuspules; anterior lobe distinct, anterior margin straight, posterior margin obscure.

Labium (Fig. 41): 0.87 long, 1.09 wide, labiosternal groove shallow, slightly procurved with six cuspules anteriorly in two rows.

Chelicerae (Fig. 42): Five large, two small teeth on promargin and six teeth on retromargin; depression on retrolateral face where fang touches chelicerae; rastellum strong, raised on high triangular mound, with 16 thick, short spines, surrounded by many normal long spines; two glabrous bands for length of dorsal surface of chelicerae.

Sternum (Fig. 41): 3.92 long, 2.84 wide, broader between posterior coxae; yellowish-brown, elevated in centre, sloping laterally, covered with long black bristles; row of long bristles on margins, posterior angle acute.

Sigilla (Fig. 41): Posterior sigilla absent; median pair 0.11 diameter, 1.96 apart, 0.10 from margin and anterior pair round, marginal.

Legs: Femora and tibiae III wider than others; all metatarsi longer than respective tarsi. Tarsi of palp and mt-ta I-II dorsoventrally flattened, other legs normal. Legs covered with few scattered hair, bristles; curved thick thorn-like spines only on palp and legs I-II. Two conspicuous glabrous bands for length of femora, patellae and tibiae. Scopula absent on tarsi of all legs and palp. Leg formula 4132 (Table 5).

Spines: More on promarginal and retromarginal sides of legs and palp. I: ti, p=19, d=8, r=26; mt, p=17, r=20; ta, p=8, r=7. II: ti, p=12, r=14, d=11; mt, p=16, r=13; ta, p=7, r=5, v=1. III: pa, p=11, r=3; ti, p=r=6; mt, p=r=7, v=6; ta, p=5, r=6. IV: pa, p=17; mt, p=2, v=6; ta, p=8, v=4, r=1. Palp: fe, p=1; pa, p=1; ti, p=24, r=25; ta, p=23, r=26, v=2.

Trichobothria: Clavate absent; ta I, 16 long filiform; ta II, 16 long filiform; ta III, 20 long filiform; ta IV, 12 long filiform and 16-20 long filiform in two rows in distal half on palp ta. Ta I-III filiform in inverted 'V' shape two rows in basal three fourth. Mt I, 8 long filiform in distal fourth; mt II–IV, 10 long filiform in distal fourth.

Leg coxae: Yellowish-brown, covered with short and long black bristles. Coxa III with glabrous patch in distal three fourth, rest area sparsely covered with long bristles; coxa IV clearly broader than others, anterior edge curved, ventrally, broad patch of thorn-like spinules in distal 3/4th, others covered with long bristles.

Claws: All legs with paired and unpaired claws. Both (paired as well as unpaired) claws on leg IV prominent and larger than on other legs. Paired claws with two unequal size teeth on legs I– IV; bifid tooth on palp. False claw tufts on each side of paired claws.

Abdomen (Fig. 39): Oval, uniformly covered with short and long black hairs. Dorsum with few mottled with yellow spots in radiating pattern, cuticle appears leathery and slightly rough.

Spinnerets (Fig. 43): PMS digitiform covered with brown hair; PLS covered with brown hair, apical segment domed.

Spermathecae (Fig. 44): Type I spermathecae. Two receptacles, each receptacles posteriorly opening into wide sclerotized slit-like opening, receptacles and slit opening covered with partially sclerotized membrane,

attached posteriorly with epigastral screotized region; each receptable wider at base, transparent (except lobes), gradually narrowing down, midway screotized and leading to lobes. Each receptacle covered with pores in distal half.

Variation female (WILD-10-ARA-859)

Total length 14.62; carapace: 5.87 long, 5.10 wide; Labium: 0.99 long, 1.07 wide; cuspules 7. Maxillae: 1.72 long in front, 2.21 long in back, 1.31 wide; cuspules 60. Sternum: 3.59 long, 2.98 wide. Abdomen: 8.75 long, 6.07 wide. Spinnerets: PLS, 0.72 basal, 0.33 middle, 0.22 apical; midwidths, 0.72, 0.33, 0.22 respectively; 1.27 total length; PMS, 0.48 long, 0.22 wide; distance between PMS–PMS, 0.19. Morphometry of legs and palp given in Table 5.

Diagnosis

The male of *Idiops vankhede* sp. nov. closely resemble those of *I. bombayensis* Siliwal et al., 2005, *I. constructor* (Pocock, 1900), and *I. mettupalayam* Ganeshkumar & Siliwal, 2013 in having a triangular spine on tibial spur of leg I but can be distinguished from those of other *Idiops* species by having prolateral metatarsi I normal without any excavation, see Fig. 31 (like *I. joida* Gupta et al., 2013 and *I. pylorus* Schwendinger, 1991) and slightly bent at base, see Fig. 31 (in *I. joida* slender; in *I. pylorus* bent in basal 1/3rd); the male differs from that of *I. joida* by leg formula 1423 (leg formula in *I. joida* is 4123). Females of *Idiops vankhede* sp. nov. resemble those of *I. joida*, *I. constructor*, *I. fortis*, and *I. oriya* in having a band of spinules on coxae IV and with *I. joida* by having tibia III distinctly longer than wide but differing from the rest of the species by the subequal legs II and III (in *I. joida* leg III longer than leg II; *I. constructor* and *I. fortis,* leg I and leg IV subsequal in length and tibia III is as long as wide; *I. oriya,* tibia III slightly longer than wide and leg II is longer than leg III).

Etymology

The species epithet is treated as a noun in apposition, named in honour of the Indian arachnologist, Dr. Ganesh Vankhede for his efforts to popularize Indian arachnology.

Natural history

The Siddheshwar Van Vihar, Solapur consists of grassland mixed with thorn forest (Type 6, subgroup 6A/C1) (Champion & Seth 1968). Both sexes were collected from their trap-door burrows made verticle on ground consisting of soft, dark brown laterite soil covered with a fine layer of humus under shrubs and trees. Burrows were like typical Indian idiopid group: burrow's entrance had D-shaped lid/door attached on the side of burrow. Burrow diameters ranged from 16 to 18 mm and depth of the burrows ranged from 105 to 110 mm. The lids of the trap-door burrows were thick (2mm), cork-like and, as spiders were found during the dry season, they had extra silk lining extensions below the lid inside the burrow.

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