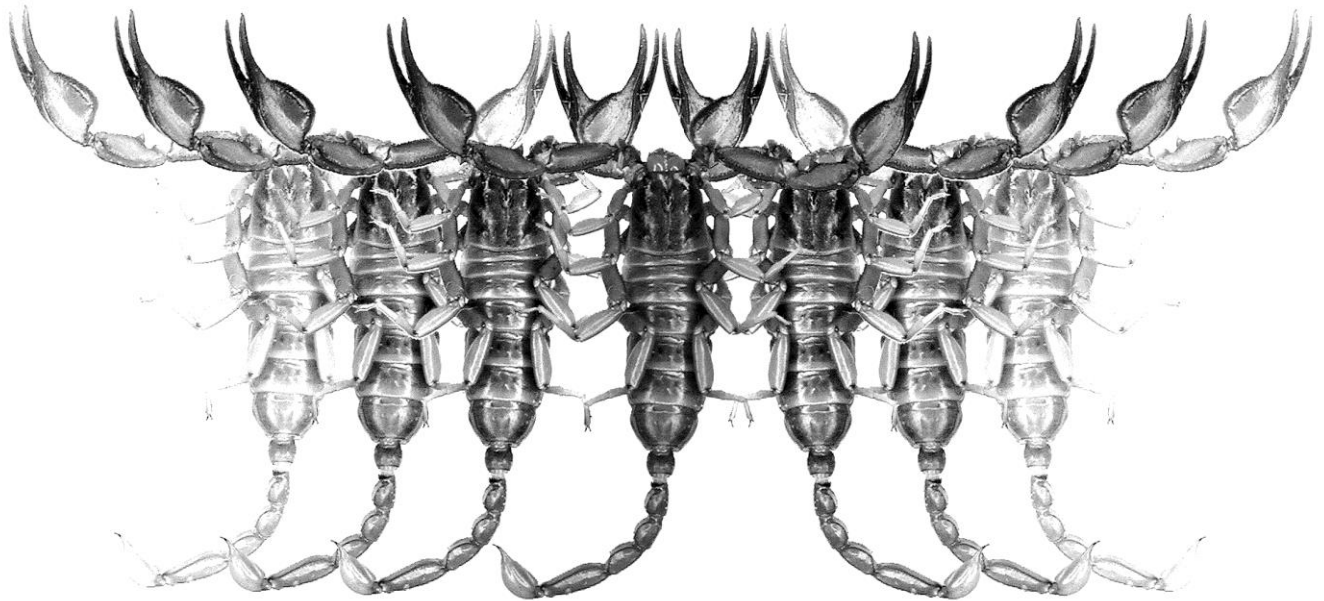


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**A New Species of the Enigmatic Genus *Chiromachetes*
Pocock, 1899 (Scorpiones: Hormuridae) from
Western Ghats, India, with a Key to the Genus**

Zeeshan A. Mirza, Rajesh V. Sanap & Amod M. Zambre

Euscorpius

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A new species of the enigmatic genus *Chiromachetes* Pocock, 1899 (Scorpiones: Hormuridae) from Western Ghats, India, with a key to the genus

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Summary

A new species of hormurid scorpion is described from the Western Ghats of India. *Chiromachetes sahyadriensis* sp. nov. differs from other members of this genus in the following set of characters: medium sized scorpions, total length reaching 62.9 mm, carapace flat, three pairs of lateral eyes, manus length/width ratio in males 4.6–4.8 and 3.4 in females, tarsi of leg ventrally with three spinoid setae at the base of tarsi. Dentate margin of pedipalp manus finger with two rows of granules fused at base. Pectines 8–9 in males, 6–8 in females. Lamellar hook positioned distinctly in basal half of hemispermatophore in proximity to the lamellae.

Introduction

Scorpion fauna of India has largely been under-explored with the notable exception of Tikader & Bastawade's (1983) compilation and the recent revisions and new species descriptions by a few Indian researchers (Mirza et al., 2012, 2014b; Zambre et al., 2014). Recent exploration at several localities has resulted in discovery of several new species from India; however, dedicated efforts to document Indian scorpion fauna are still warranted.

The Western Ghats, a mountain range that runs parallel to the western coast of India for about 1600 km, is a biodiversity hotspot known for endemic and range-restricted biodiversity (Myers et al., 2000; Mirza et al., 2014a). Its scorpion fauna, however, remains poorly documented. In the course of arachnological exploration of this range, specimens of hormurid scorpions were collected from the northern Western Ghats. Hormuridae is a highly complex group and has seen several major changes in its high-level taxonomy (for details, see Javed et al., 2010; Lourenço & Qi, 2006; Monod & Prendini, 2014). Based on the presence of ventral tarsal spines and spinules, as well as on the shape of hemispermatophore, the specimens collected from Maharashtra were assigned to the genus *Chiromachetes*. They, however, differ from all known species of the genus *Chiromachetes* as outlined by Tikader & Bastawade (1983) and Lourenço (1997). A detailed comparison of the specimens from Maharashtra enables us to describe them as a new species.

Material and Methods

Specimens in the field were located with the help of ultraviolet light, transferred to plastic jars, and preserved in 70% ethyl alcohol. Photographs were taken with a Canon 70D and a macro lens illuminated with two Canon 430EX-II flash. Specimens were examined using an Olympus SZ42 stereo binocular microscope and measured with digital caliper to the nearest 0.01. After identification, the specimens have been deposited in the research collection at the National Centre for Biological Sciences (NCBS), Bangalore, India. Descriptive terms and abbreviations follow Stahnke (1971) and Sissom et al. (1990). Data for hormurid species and genera are derived from Lourenço (1997), Lourenço & Qi (2006), Monod & Prendini (2014) and Tikader & Bastawade (1983) and the material housed in the NCBS collection.

Systematics

Family Hormuridae Laurie, 1896
Genus *Chiromachetes* Pocock, 1899

Chiromachetes sahyadriensis Mirza, Sanap et
Zambre, sp. nov.
(Figs. 1–8, Table 1)

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Holotype: male NCBS AG-873, INDIA, Maharashtra State: Pune District, Tamhini Ghat, 18.764720°N, 73.

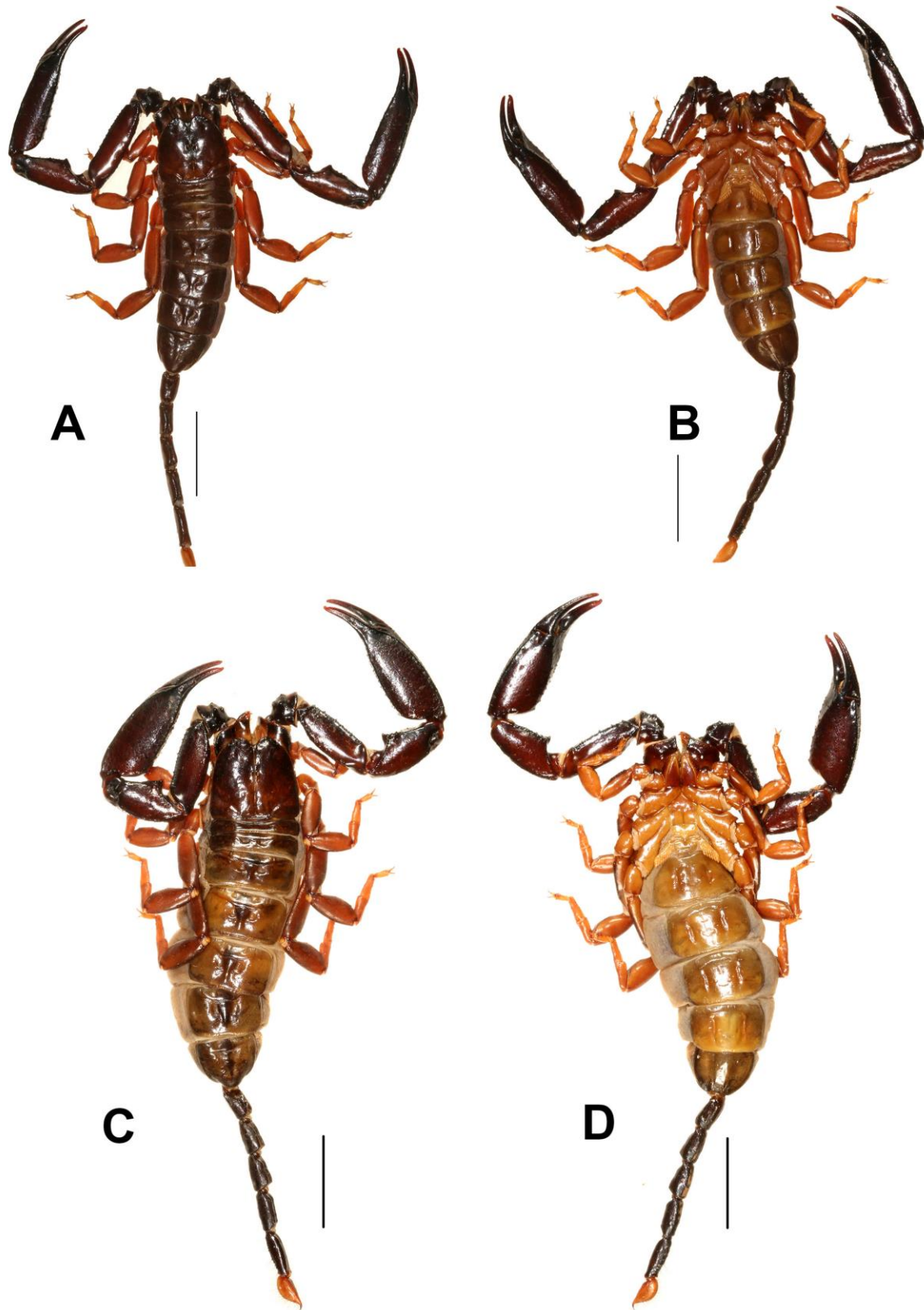


Figure 1: *Chiromachetes sahyadriensis* sp. nov. (A) holotype male NCBS AG-873, dorsal aspect; (B) holotype male NCBS AG-873, ventral aspect; (C) female paratype, dorsal aspect; (D) female paratype, ventral aspect. Scale bar 10 mm.

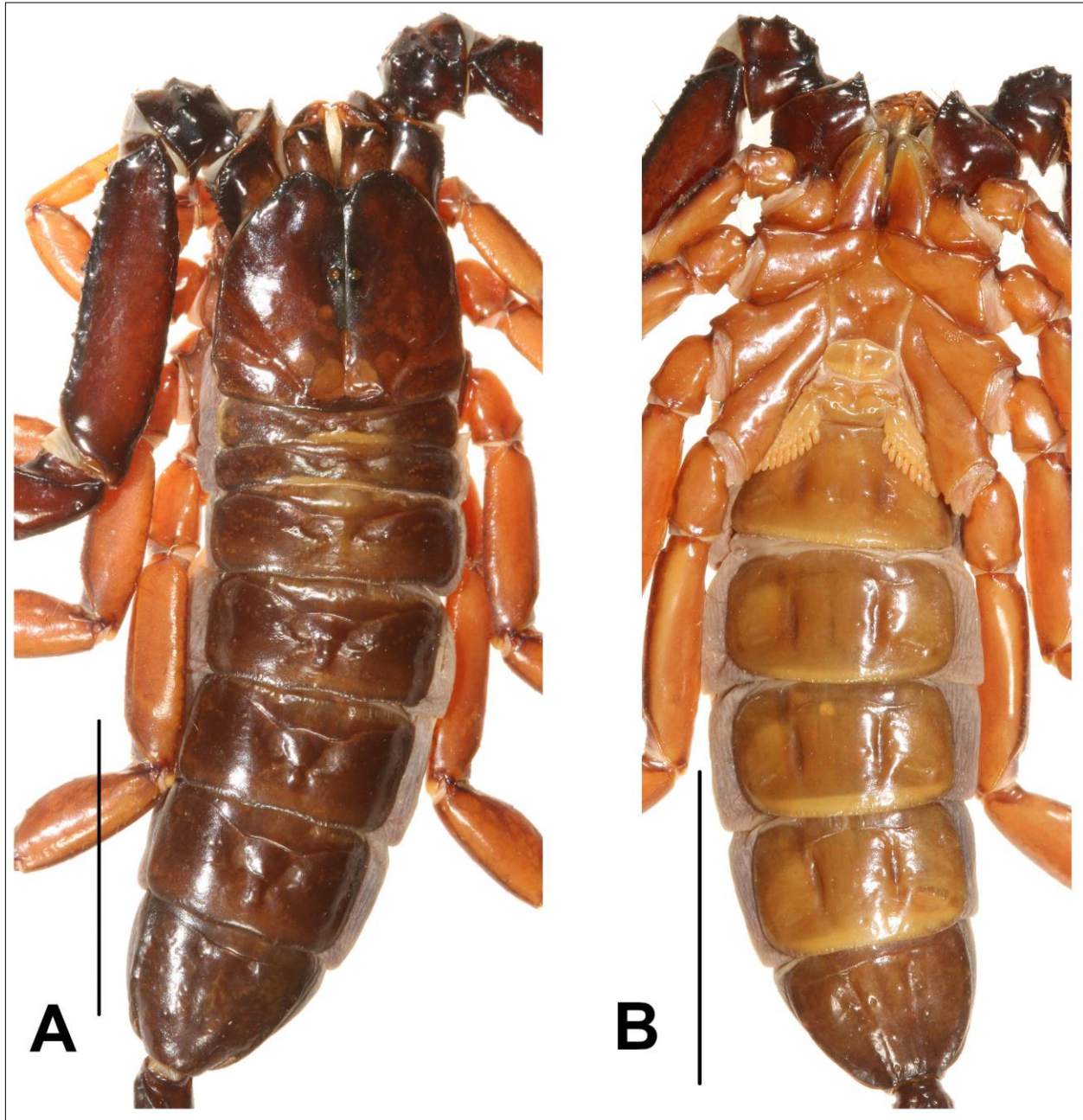


Figure 2: *Chiromachetes sahyadriensis* sp. nov. holotype male NCBS AG-873. (A) carapace and mesosoma; (B) genital operculum and pectines. Scale 10 mm.

367294°E, 558 m a.s.l., under boulders along a dry stream bed, 8 November 2013, coll. Rajesh Sanap, Varun Vaze, Devavrat Joshi and Zeeshan Mirza.

Paratypes: 2 males (NCBS AG-876–877) and 3 females (NCBS AG-872, 874, 875), same label as holotype.

Diagnosis: Medium-sized scorpions, total length reaching 62.9 mm, carapace flat, three pairs of lateral eyes, manus length/width in males 4.6–4.8 and 3.4 in females; leg tarsi with three very small spinoid setae at the base (Fig. 3D); the ventral tarsal spines in males are stout, unlike those in other related genera. Dentate mar-

Characters	NCBS AG-873	NCBS AG-876	NCBS AG-877	NCBS AG-872	NCBS AG-874	NCBS AG-875
	♂	♂	♂	♀	♀	♀
total length	54.41	48.29	45.58	62.62	50.92	62.92
carapace length	7.72	7.76	6.92	9.21	7.61	8.91
carapace anterior width	4.13	3.98	3.76	4.95	3.91	4.97
carapace posterior width	7.93	7.32	6.93	9.02	7.54	9.29
mesosomal length	22.17	19.62	18.4	29.15	23.84	30.22
Metasoma total length	20.14	20.91	20.26	24.26	19.47	23.79
metasomal seg I length	3.4	2.76	2.97	3.73	3.03	3.78
metasomal seg I width	2.18	1.91	1.73	2.05	1.9	2
metasomal seg II length	3.64	3.1	2.96	3.55	3.03	3.65
metasomal seg II width	1.46	1.24	1.5	1.68	1.67	1.79
metasomal seg III length	3.89	3.78	3.49	3.91	3.12	3.9
metasomal seg III width	1.24	1.36	1.36	1.65	1.45	1.73
metasomal seg IV length	4.16	3.65	3.4	4.34	3.28	4.44
metasomal seg IV width	1.07	1.16	1.15	1.58	1.3	1.59
metasomal seg V length	5.05	4.19	4.06	4.56	3.83	4.37
metasomal seg V width	1.05	1.02	1.01	1.45	1.29	1.41
telson length	4.38	3.43	3.38	4.17	3.18	3.65
femur length	11.4	10.63	9.02	9.86	8.05	9.98
femur width	3.14	3.03	2.76	3.48	3.32	3.64
patella length	10.11	9.56	8.12	9.18	7.75	9.23
patella width	3.53	3.96	3.71	5.05	4.21	4.95
chela length	17.85	18.1	14.21	18.97	15.59	18.51
chela width	3.82	3.77	3.65	5.58	4.49	5.4
movable finger length	6.86	6.4	5.26	7.67	6.61	7.88
pectines L/R	8/9	8/8	8/8	8/7	7/7	6/7

Table 1: Morphometric data for type series of *Chiromachetes sahyadriensis* sp. nov.

-gin of pedipalp chela finger with two rows of granules fused at the base (Fig. 3C). Pectinal teeth number 8–9 in males, 6–8 in females. Lamellar hook positioned distinctly in basal half of hemispermatophore in proximity to the lamellae.

Etymology: The specific epithet refers to the Sahyadri hills synonymous to the Western Ghats where the type locality is situated.

Description of holotype male NCBS AG873 (Figs. 1A–B, Table 1):

Coloration (when alive) (Figs. 6 & 7): Carapace, mesosoma, and metasoma deep brown to black with a beady

gloss. Edges of each segment darker than the central portions. Legs, vesicle, pectines, genital operculum yellow to tan.

Carapace: Brown throughout with dark blackish brown reticulations throughout; anterior border, region near lateral eyes, and median eyes almost black (Fig. 2A). Smooth with a beady gloss with the exception of a few small sparse granules overall. Anterior margin with a moderately deep U-shaped indentation. Carapace horizontal, median eyes not on elevated tubercle. Lateral ocular tubercle with three eyes, first and the second lateral eyes are placed at a distance from the third lateral eye (Fig. 3B). Carapace lacks carinae. Lateral margins of carapace parallel posteriorly for more than half of its length. Cheliceral fixed finger with median and a basal

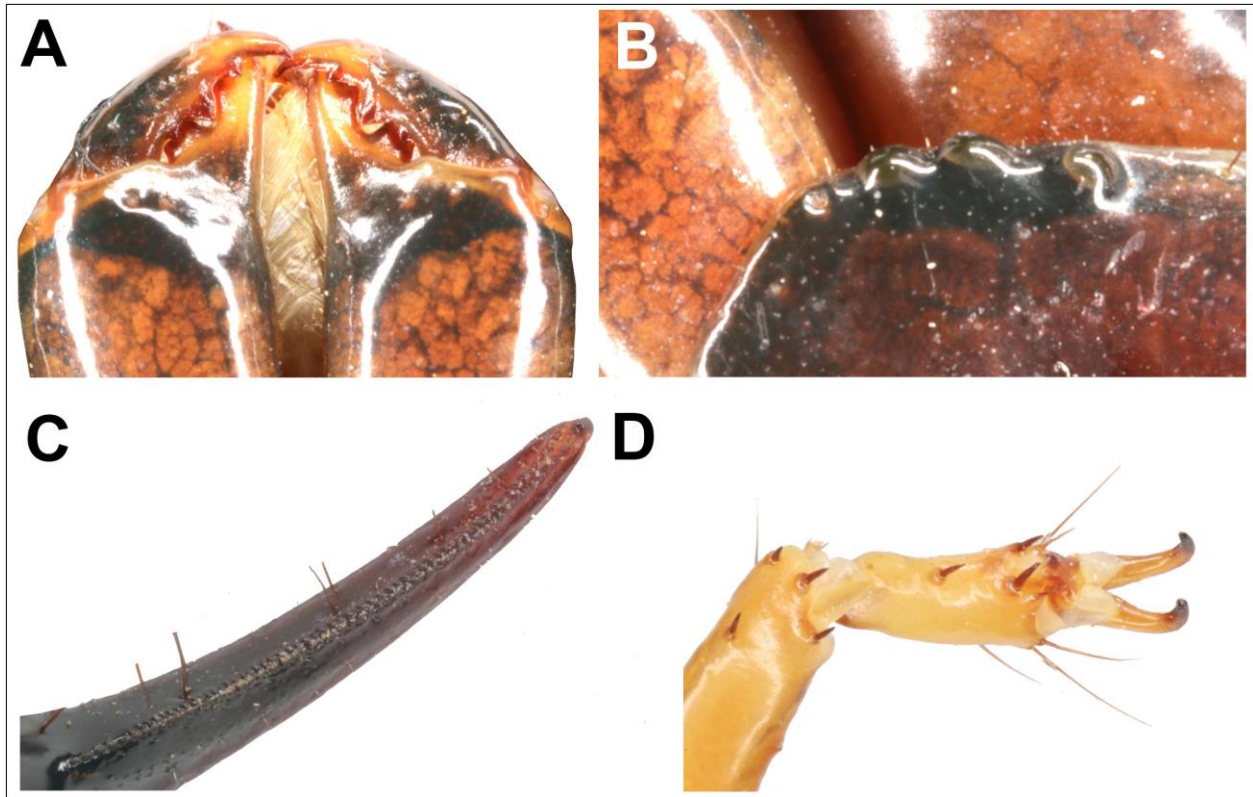


Figure 3: *Chiromachetes sahyadriensis* sp. nov. holotype male NCBS AG-873. (A) chelicerae; (B) lateral eyes; (C), dentition on movable finger, (D) tarsi IV.

bifid denticle; cheliceral movable finger dorsal edge with four denticles: distal denticle, one subdistal, one median, and one basal (Fig. 3A).

Mesosoma: Tergites tan-brown overall with dark reticulations; sternites paler, almost tan except for the last sternite, which is darker. Sternum, genital operculum and pectines pale yellow; legs tan with a brownish tinge. All segments smooth, lacking carinae. Each segment medially with a longitudinal elevation. Sternum pentagonal with a median longitudinal furrow. Genital operculum sub-pentagonal; basal piece with a median furrow (Fig. 2B). Pectines well developed, their teeth 8/9 in number, with fulcra; lamellae indistinct.

Legs: Two apical spinoid setae and one median spinoid seta present on tarsi of all legs; the ventral tarsal spines are stout, unlike those in other related genera; tarsi with three very small spinules at the base (Fig. 3D).

Pedipalp: Manus with five carinae, patella and femur each with four carinae. Patella and femur smooth throughout, with beady gloss, manus lacking beady smooth gloss but smooth throughout. Prolateral aspect of patella with a large spine-like protrusion along with a few blunt spines along the anterior ridge. Trichobothrial pattern of type C (Figs. 5). Trichobothrium *Db* present on the external aspect of manus and not on dorsal aspect; *dt* positioned on the internal aspect of the fixed finger;

patellar trichobothrium *est* located on ventral side of the external surface.

Metasoma: smooth throughout, lacking granulation and carinae on segments I–IV. Ventrolateral carinae on segments II–IV present merely as depressed ridges. Segment V with ventrolateral carinae present, composed of rounded and spine-like granules. Anal arch with sparsely placed spine-like tubercles. Each segment dorsally with a shallow median furrow. Ventrally with sensory pits as in the genus *Liocheles*. All segments laterally compressed. Telson bulbous, hirsute ventrally. Aculeus short, nearly one-fourth the length of vesicle.

Hemispermaphore: lamelliform with a complex capsule; distal lamella slender and long. Lamina length twice that of the capsule region and trunk. A single lamellar hook arising from above the transverse ridge; hook short, curved and pointing upwards. Lamella arising from the posterior lobe is clearly apart from the lamellar hook, vertical in orientation. Lamellar hook positioned distinctly in basal half of hemispermaphore in proximity to the lamellae.

Variation. The species exhibits a high degree of sexual dimorphism, especially in the length and robustness of the pedipalp manus. Manus length/width in males 4.6–4.8 and 3.4 in females. Females are darker in coloration

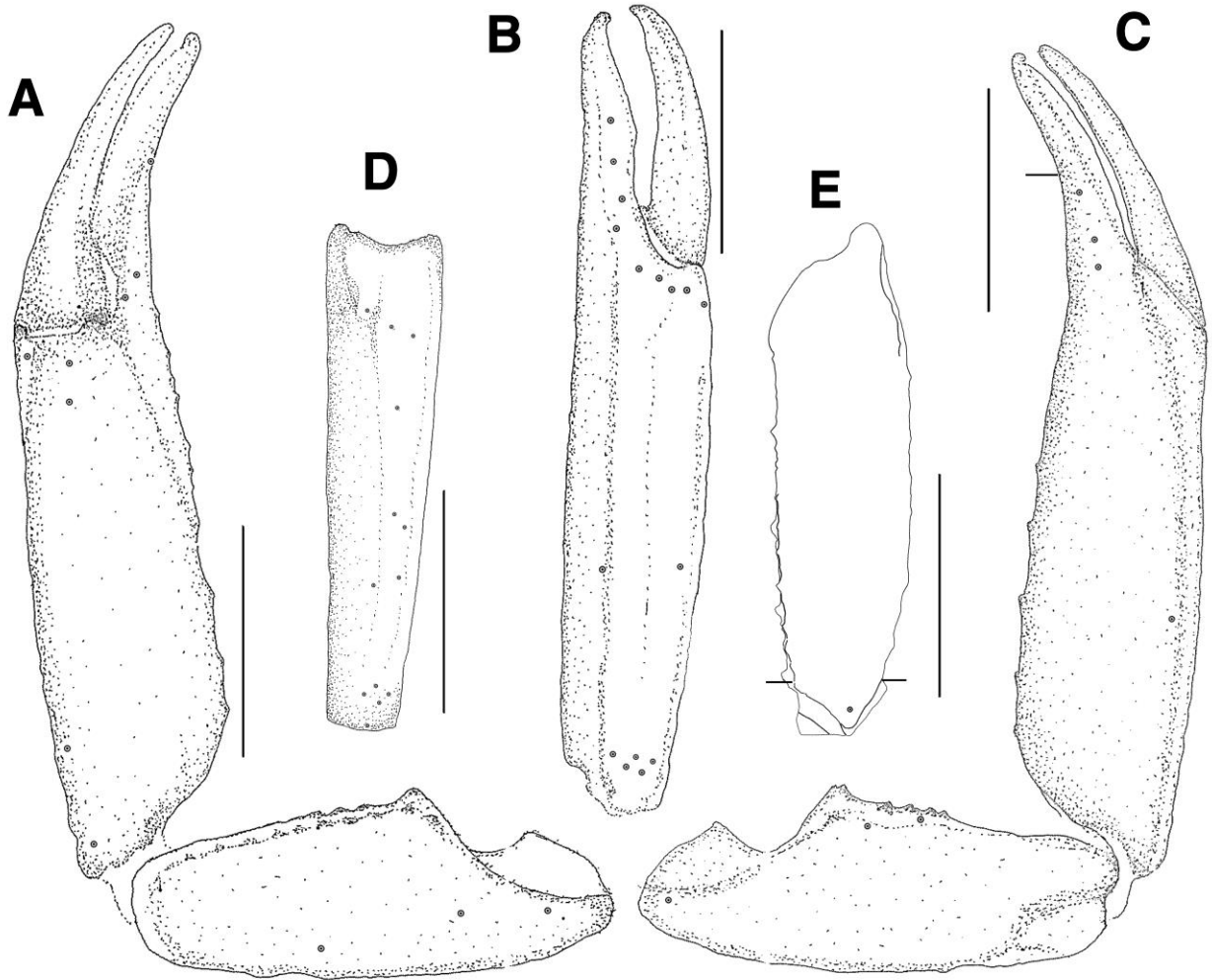


Figure 4: Pedipalp of *Chiromachetes sahyadriensis* sp. nov. holotype male NCBS AG-873. (A) manus external view, (B) manus and patella dorsal view; (C) manus and patella ventral view; (D) patella external view; (E) femur dorsal view. Scale bar A–C, 10 mm, D & E, 5 mm.

as opposed to the males, and the leg coloration in males is much lighter. Tarsal spines in males are thick and long whereas they are short and thin in females. For other details see Table 1.

Ecological Notes

The new species is presently known only from the type locality where it occurs under boulders along forest streams (Fig. 8). The type locality lies close to the Tamhini Wildlife Sanctuary, which supports similar habitats and it is likely that the new species is also distributed in the adjoining protected areas. The type specimens were collected within an hour at around 2200 hours with the aid of a flashlight. Most individuals were found sitting at the entrance of small slit-like burrows under boulders with their pedipalp chelae exposed.

Several of these burrows had remains of conspecific pedipalps around the entrance indicating that the species might be highly cannibalistic. This is further attested by the fact that specimens maintained in captivity preferentially fed on smaller individuals of the same species leaving pieces of pedipalps (Devavrat Joshi, pers. comm.).

Discussion

Scorpions of the family Hormuridae appear to be widespread across India but occupy narrow and highly specific niches. This makes their detection difficult in general biodiversity surveys. This can be attested from the discovery of the new species and the fact that other members of this genus are known only from the type specimens and/or type locality. This trend is not just re-

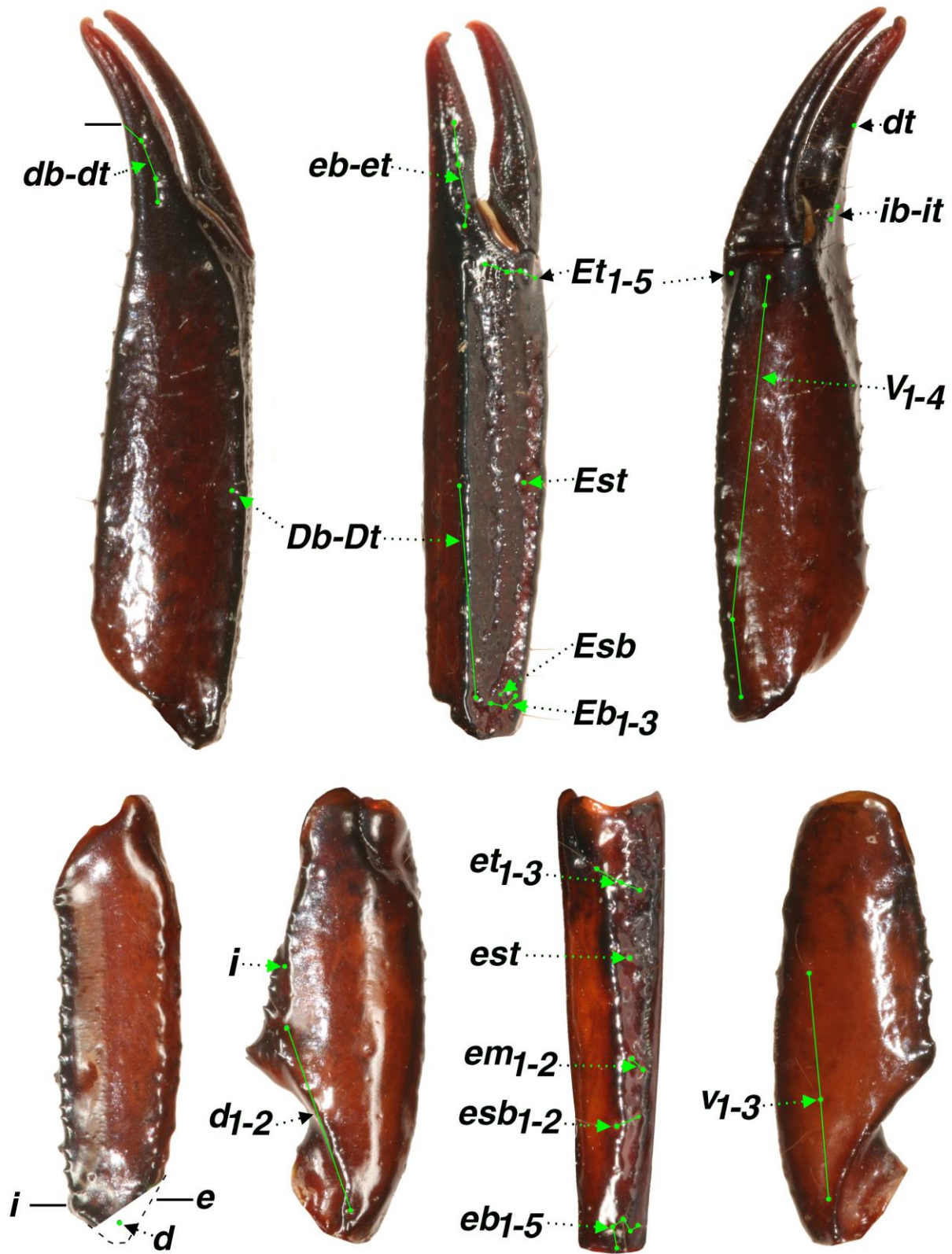


Figure 5: Annotated trichobothrial pattern of *Chiromachetes sahyadriensis* sp. nov. holotype male NCBS AG-873.



Figures 6–7: *Chiromachetes sahyadriensis* sp. nov., holotype male (top) NCBS AG-873 and paratype female (bottom).

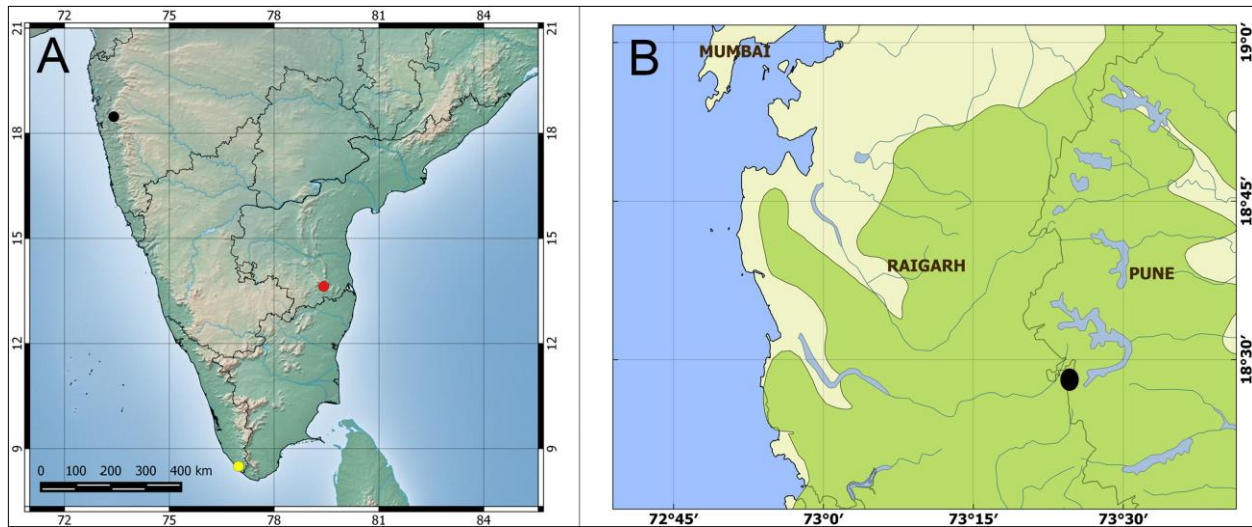


Figure 8: Map showing type locality of the new scorpion species. (A) Distribution of the genus *Chiromachetes* in peninsular India: black, *C. sahyadriensis*; red, *C. tirupati*; yellow, *C. fergusonii*; (B) The type locality of *C. sahyadriensis* near Mulshi Dam (black circle).

stricted to the genus *Chiromachetes* but also to other hormurid genera such as *Iomachus* and *Liocheles*, which are likely to be widespread across India but are not yet well studied (Mirza, pers. observ.). It is hoped that dedicated surveys across their potential range would yield more undescribed species of the genus *Chiromachetes* as well as other hormurid scorpions from India.

A key to the genus *Chiromachetes* (modified after Lourenço, 1997)

- 1. Pectinal teeth count in males 5–6, in females 3–4. *C. tirupati* Lourenço, 1997
 Pectinal teeth count 6–11..... 2
- 2. Manus length/width ratio in males 4.6–4.8, in females 3.4; pectinal teeth count in males 8–9, in females 6–8 *C. sahyadriensis* **sp.n.**
 Manus length/width ratio in males and females 3.6, pectinal teeth count 9–11, in females 7–8
 *C. fergusonii* Pocock, 1899

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