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Taxonomy/Taxinomie

A new species of scorpion of the genus *Neoscorpions* Vachon, 1980 (Scorpiones: Euscorpionidae) from India

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ARTICLE INFO

Article history:

Received 21 September 2013

Accepted after revision 27 November 2013

Available online 6 February 2014

Keywords:

Scorpion

India

New species

Neoscorpions

Maharashtra

ABSTRACT

A new species of scorpion of the genus *Neoscorpions* Vachon, 1980 is described from Northern Maharashtra. *Neoscorpions maharashtraensis* sp. nov. is a medium-sized scorpion species ranging from 36 to 42 mm. Carapace, mesosoma and metasoma brown, legs and telson yellow; pedipalp in a shade of brown with carinae dark brown to black. Granulation on carapace coarse, with a few smooth patches; on mesosoma, which is restricted to the posterior half. Anterior margin of carapace with a moderately deep “U”-shaped emargination medially lacking elevated edges. Pectines well developed 7/7. Trichobothria on patella ventral 13–16. Pedipalp chela narrow and elongate in males, length-to-width ratio in males is 4.86–5.05.

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1. Introduction

The scorpion family Euscorpionidae comprises 10 genera and 99 species, of which three genera are reported to occur in India [1]. In India, the three genera, *Euscorpions* Vachon, 1980, *Scorpions* Peters, 1862 and *Neoscorpions* Vachon, 1980 show an interesting pattern of distribution. *Euscorpions* and *Scorpions* are distributed in the Himalayas and North East India, with the exception of a single species of the latter genus described from Central India. *Neoscorpions*, on the other hand, is distributed in the Northern Western Ghats of Maharashtra and Gujarat. The genus *Neoscorpions* is most similar in the genus *Scorpions*, but it differs, however, in possessing a higher number of trichobothria

on the external aspect of patella [2]. *Neoscorpions* is presently comprised of three species: *N. deccanensis* Tikader and Bastawade 1983, *N. tenuicauda* Pocock 1894 and *N. sataranensis* Pocock 1900 [3,4]. These three species have been reported from dry deciduous, moist deciduous and semi-evergreen forest of Northern Western Ghats and are abundant above an altitude of 800 m [5]. Bastawade [5] carried out an extensive study on these three species and reported variations in trichobothria placement in the three taxa, but he did not, however, comment on the taxonomic status of the species. The study conducted by Bastawade [5] raises doubts on the validity of *N. deccanensis*, given that the species was described on the basis of differences in trichobothria [4].

During recent arachnological expeditions conducted as part of an ongoing study on documentation of scorpions of India, specimens of a *Neoscorpions* were collected that differ from known species of the genus after detailed comparison with museum material housed in the collection of the Natural History Museum, London, and the

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Fig. 1. (Colour online) *Neoscorpiops maharashtraensis* sp. nov. (BNHS Sc-62) holotype male in life. Photograph by Raman Upadhye.

Bombay Natural History Society, Mumbai. These specimens were collected from outside the Western Ghats, to which this genus was thought to be restricted until now [5]. Based on five specimens collected from two localities neighboring Gautala Wildlife Sanctuary, we here describe a new species of the rock-dwelling scorpion of the genus *Neoscorpiops*.

2. Methods

Specimens were collected and preserved in 70% ethanol and have been deposited in the collection of the Bombay Natural History Society (BNHS, Mumbai). Measurements were taken with a Mitutoyo™ digital calliper with an error of 0.1 and morphological details were recorded using an Olympus™ SZ40. Measurements were taken following Stahnke [6] and are provided in millimetres (mm). Trichobothrial nomenclature follows Vachon [7] and morphological terminologies follow Hjelle

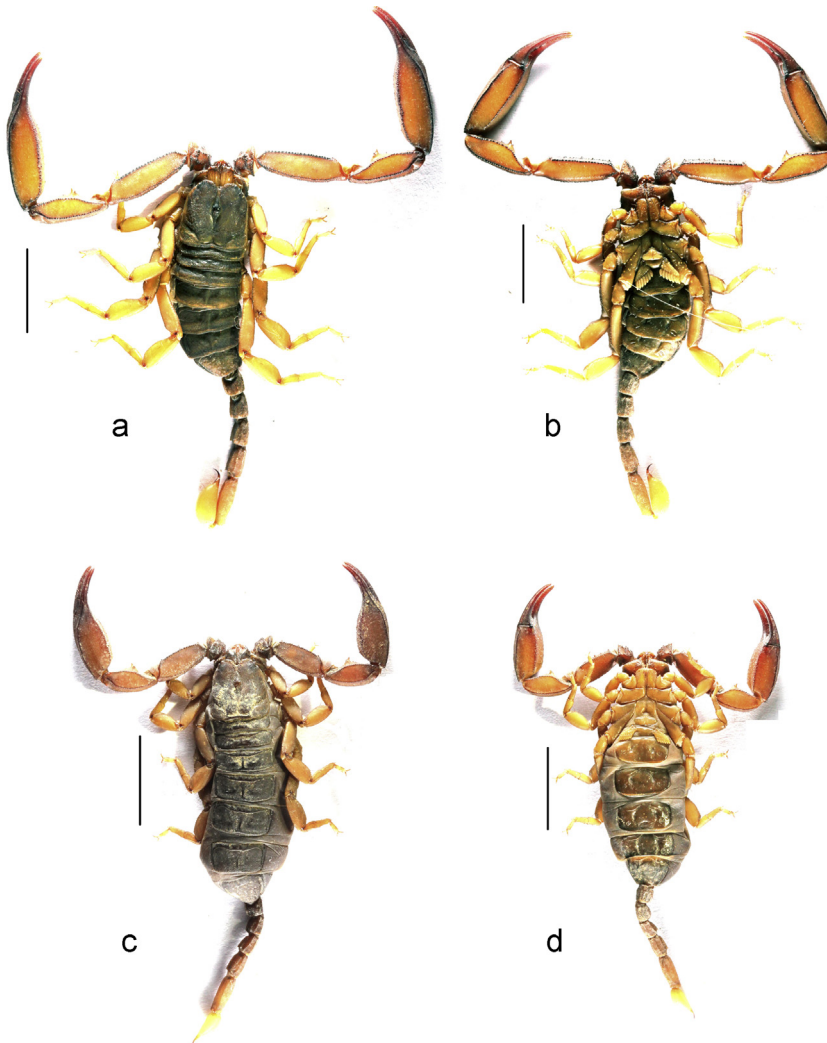


Fig. 2. (Colour online) *Neoscorpiops maharashtraensis* sp. nov. (a) holotype male BNHS Sc-62 dorsal view, (b) holotype male BNHS Sc-62 ventral view, (c) female paratype BNHS Sc-63 dorsal aspect, (d) female paratype BNHS Sc-63 ventral view.

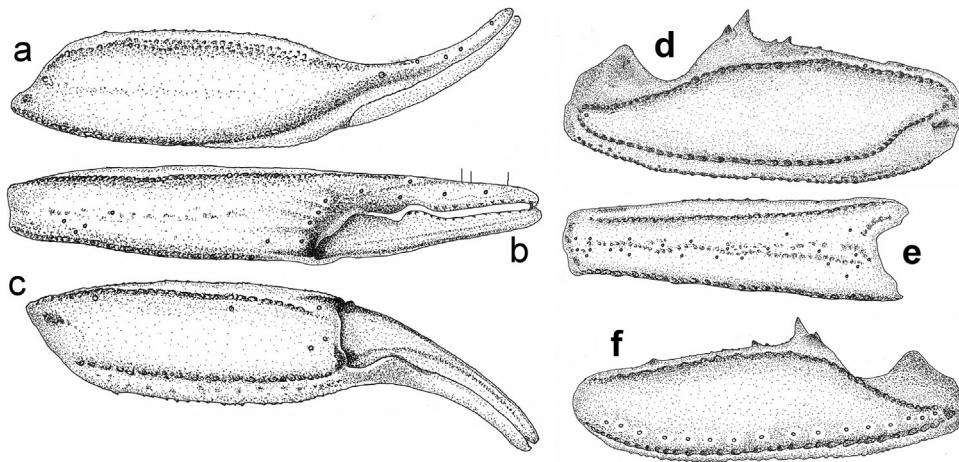


Fig. 3. *Neoscorpions maharashtraensis* sp. nov. (BNHS Sc-62) holotype male pedipalp trichobothrial pattern, (a) manus dorsal view, (b) manus external view (c) manus ventral view, (d) patella dorsal view, (e) patella external view (f) patella ventral view.

[8]. The hemispermatophore was dissected using teasing needles and was cleaned in clove oil. Diagrams were traced with a Rotring pen. Acronyms used in the manuscript are as follows: BNHS, Bombay Natural History Society, Mumbai; NHM, Natural History Museum, London.

3. Taxonomic treatment

Family: EUSCORPIIDAE Laurie, 1896

Genus: *Neoscorpions* Vachon, 1980

Neoscorpions maharashtraensis sp. nov.

Figs. 1–6

Holotype: adult male (BNHS Sc-62), “Shidi Ghat” near Wadali Village, Tehsil-Sillod, Aurangabad District, Maharashtra, India (20.532180°, 75.87962°, elevation 586 m). Collected by Raman Upadhye, Durgesh Pangarkar & Rushikesh Chippavar on 28 July 2013.

Paratypes: two females (BNHS Sc-63, BNHS Sc-64) same data as holotype; one male BNHS Sc-65 and one

female BNHS Sc-66 from near Ghodegaon, Chalisgaon taluka, Jalgaon District, Maharashtra (20.312799°, 74.862241°, elevation 460 m), collected by Rajesh Sanap & Vishwanath Rathod on 1 August 2013.

Etymology: the new species is named after the Indian state of Maharashtra where the types were collected.

3.1. Diagnosis

A medium-sized scorpion ranging from 36–42 mm, Carapace, mesosoma and metasoma brown, legs and telson yellow; pedipalp in a shade of brown with carinae dark brown to black. Granulation on carapace coarse, with a few smooth patches; on mesosoma restricted to the posterior half. Anterior margin of carapace with a moderately deep “U”-shaped emargination medially lacking elevated edges. Pectines well developed 7/7. Trichobothria on ventral aspect of patella 13–16 in number. Pedipalp chela narrow and elongate in males, length-to-width ratio in males from 4.86 to 5.05.

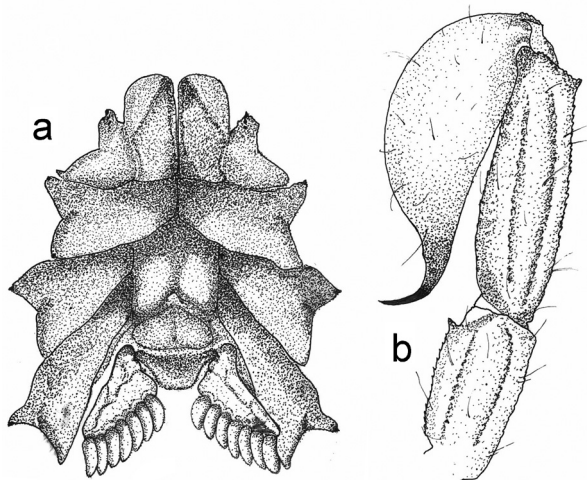


Fig. 4. *Neoscorpions maharashtraensis* sp. nov. (BNHS Sc-62) holotype male (a) ventral aspect of coxapophysis, sternum, genital operculum, pectines, (b) telson, metasomal segment IV and V, lateral view.

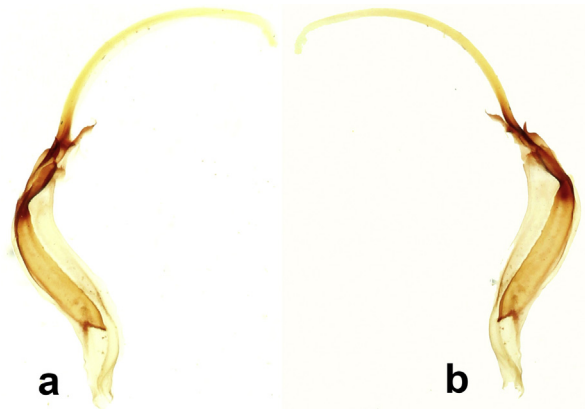


Fig. 5. (Colour online) *Neoscorpions maharashtraensis* sp. nov. (BNHS Sc-62) holotype male hemispermatophore lateral view (a and b).



Fig. 6. (Colour online) *Neoscorpions maharashtraensis* sp. nov. (BNHS Sc-66) paratype female in life. Photograph by Rajesh Sanap.

Relationship: *Neoscorpions maharashtraensis* sp. nov. can be distinguished from its congeners in bearing the following set of characters:

- (i) carapace, mesosoma and metasoma brown, legs and telson yellow; pedipalp in a shade of brown with carinae dark brown to black (versus overall back with only extremities of leg in a shade of brown in *N. deccanensis* and *N. tenuicauda*);

- (ii) pedipalp manus length-to-width ratio in males is 4.86–5.05 (versus 3.07 in *N. sataraensis* and 3.30 in *N. tenuicauda*);
- (iii) telson bulbous gradually tapering towards aculeus lacking constriction at aculear base (distinctly marked constriction at the base of aculeus in *N. sataraensis*);
- (iv) internal aspect of patella with one large and a small adjacent tubercle (a single large tubercle on internal aspect of patella in *N. sataraensis*, *N. tenuicauda* and *N. deccanensis*);
- (v) anterior margin of carapace with a moderately deep “U”-shaped emargination medially lacking elevated edges (anterior margin of carapace with a deep “U”-shaped emargination medially with elevated edges *N. sataraensis*, *N. tenuicauda* and *N. deccanensis*);
- (vi) dorsolateral carinae on segment II–IV terminate in a short spine (dorsolateral carinae on segment II–IV terminate in a distinctly long, thorn-like spine in *N. sataraensis*, *N. tenuicauda* and *N. deccanensis*).

3.2. Description of holotype male BNHS Sc-62

Morphometric measurements in Table 1.

Colouration: (Figs. 1, 2 and 6, in life) overall in a shade of brown or tan, legs in a lighter shade of brown. Telson creamish yellow. Carinae on pedipalp segments and

Table 1

Morphometric details of the type series of *Neoscorpions maharashtraensis* sp. nov.

Characters	Holotype BNHS Sc-62	Paratype BNHS Sc-63	Paratype BNHS Sc-64	Paratype BNHS Sc-65	Paratype BNHS Sc-66
Sex	Male	Female	Female	Male	Female
Total length	42.49	41.22	36.68	34.05	36.56
Carapace					
Length	8.17	6.67	6.46	6.71	7.37
Anterior width	5.86	3.81	3.48	4.67	4.76
Posterior width	7.92	6.02	5.7	6.34	7.35
Mesosoma length	16.14	21.53	18.06	13.21	15.79
Metasoma I					
Length	2.84	2.01	1.43	1.95	1.67
Width	2.2	1.47	1.51	2.2	1.8
Metasoma II					
Length	2.91	1.93	1.66	1.95	2.05
Width	2.07	1.41	1.49	2.01	1.46
Metasoma III					
Length	3.03	2.1	1.9	2.09	2.45
Width	1.98	1.4	1.21	1.92	1.8
Metasoma IV					
Length	3.74	2.75	2.7	2.99	2.72
Width	1.78	1.38	1.29	1.73	1.62
Metasoma V					
Length	5.66	4.23	4.47	5.15	4.51
Width	1.78	1.18	1.25	1.52	1.2
Depth	1.17	0.85	1.21	1.49	1.52
Telson length	6.18	3.82	4.44	6.9	5.5
Width	2.1	1.38	1.43	1.95	1.55
Femur length	11.02	6.75	6.46	8.82	7.45
Width	3.12	2.44	2.13	2.8	2.97
Patella length	9.39	5.96	6.05	8.32	6.49
Width	3.74	2.95	2.54	2.77	3.22
Manus length	19.09	11.81	11.36	17.39	14.3
Width	3.78	3.49	3.19	3.58	4.09
Depth	2.42	2.29	2.2	2.41	2.95
Movable finger length	7.92	6.32	5.75	7.12	6.59
Pectines	7/7	6/6	7/7	7/7	8/7
Trichobothria on ventral aspect of patella	16	15/13	15	16/16	17/17

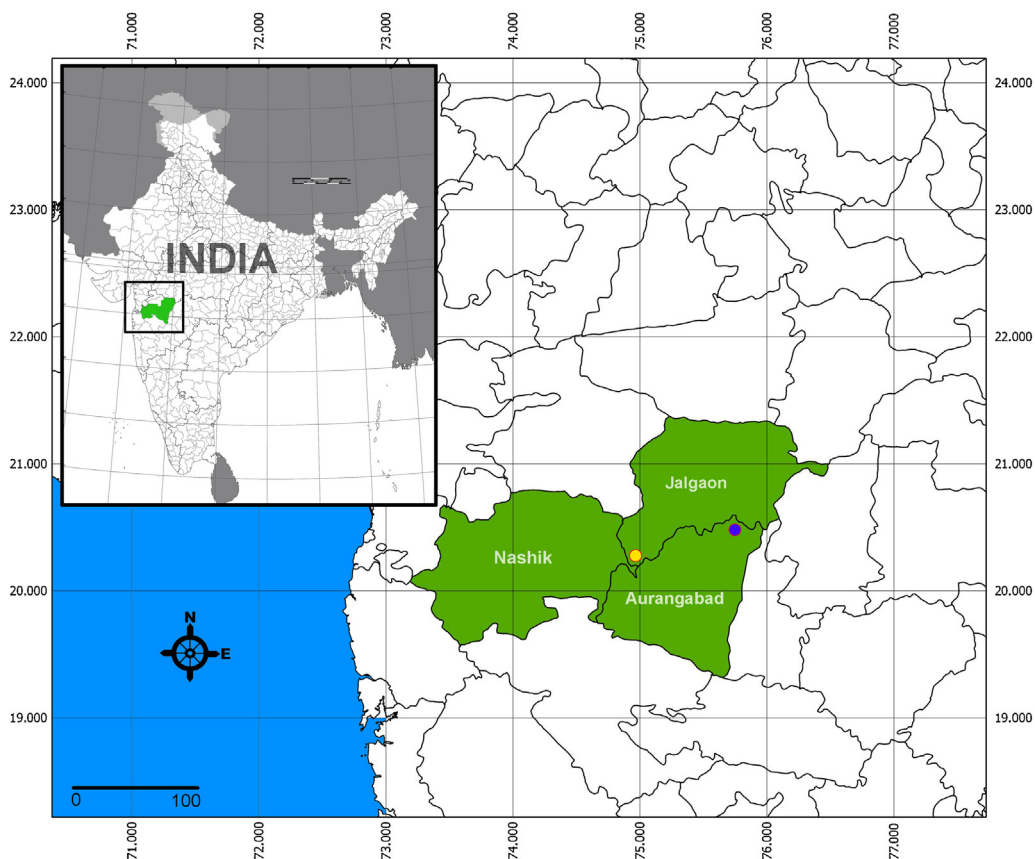


Fig. 7. (Colour online) Map showing type locality of *Neoscorpions maharashtraensis* sp. nov., blue circle represents “Shidi Ghat” in Aurangabad district and yellow circle represents Ghodegaon in Jalgaon district in the Indian state of Maharashtra.

fingers of manus dark brown to black. Ocular region (median as well as lateral) black. Metasomal segment V paler than the preceding segments. Colouration more faded and paler in preservative. Legs and telson almost yellow. Chelicerae in the shade of tan with dark brown reticulation throughout.

Prosoma: carapace anterior margin with a moderately deep “U”-shaped emargination medially. Carapacial carinae absent; coarsely granular throughout with a few smooth patches. Three pairs of lateral eyes; anterior lateral eye placed well in advance of the median and posterior lateral eyes.

Mesosoma: mesosomal tergites I–VI with an obsolete median carinae and with two lateral smooth pits in the anterior portion; anterior half of tergites I–VI smooth, lacking granulation, posterior half coarsely granular. Tergite VII granular throughout, with two pairs of granular lateral carinae and lacking median carinae. Intercarinal spaces on tergite VII coarsely granular. Sternites III–VI lacking granulation, but not smooth and glossy; sternite VII granular throughout. Pectines well developed, 7/7 in number without fulcra (Fig. 4).

Metasoma: metasomal segment I bearing 10 carinae (paired ventral, ventrolateral, intermedian, dorsolateral and dorsal carinae), II–IV with eight carinae lacking intermedian carinae; segment V with five carinae (single

ventral, paired ventrolateral and paired dorsolateral carinae). Dorsolateral carinae on segment II–IV terminating in a short spine. All carinae poorly developed; dorsal furrow on each metasomal segment well developed, shallow on segment V. Long setae sparsely arranged on each metasomal segment. Telson smooth, at least 6.5 times as the aculeus and lacks carinae (Fig. 4). Cheliceral dentition characteristic of sub-family. Pedipalp femur and patella pentacarinata, all carinae granular. Pedipalp patella with two large and a few small spinoid protrusions on the internal aspect. Trichobothrial pattern C, neobothriotaxic (Fig. 3) [7]; patella with 24 external trichobothria and 16 ventral trichobothria. Movable finger of manus with two rows of granules with 12 large granules including the terminal one on the outer row. Leg tarsi I–II with five spinules on its ventral aspect, III–IV with seven spinules on its ventral aspect, these between two thorn-like spurs. Pro- and retro-lateral pedal spurs well developed.

Hemispermataphore: lamelliform; pedicel 1.2 long and 0.3 wide. Trunk 1.4 long and 0.6 at its widest distal end. Capsule well developed with a single hook-like sperm duct; lamina 4 mm long and 0.1 mm wide at base curled at distal end (Fig. 5).

Variation: apart from morphometric values and trichobothria on ventral aspect of patella, the type series



Fig. 8. (Colour online.) Type locality “Shidi Ghat” of *Neoscorpions maharashtraensis* sp. nov. Photograph by Raman Upadhye.

differ from the holotype in the following aspects, especially the female specimens: (i) distinctly darker in colouration and (ii) markedly short and stout pedipalp segments.

Natural history notes: the types were collected from under boulders along streams during the monsoon season from two localities Shidi Ghat located east of Gautala Wildlife Sanctuary and Ghodegaon to the west of Gautala Wildlife Sanctuary spread over the Satmal Hill range (Fig. 7). The forest of the type locality is of tropical dry deciduous and is contiguous with Gautala Wildlife Sanctuary (Fig. 8). Based on the collection localities, it is likely that this species is distributed in three districts of the Maharashtra State: Aurangabad, Jalgaon, and Nashik. These scorpions are really fast and sting at the slightest provocation unlike their congeners. A few specimens were found in rock crevices as typical of members of this genus. Local residents at the collection site of the holotype mentioned that the species is frequently seen during monsoons and rarely during the dry months of the year. The presence of the genus *Neoscorpions* outside of Western Ghats further provides hints of the presence of this genus or perhaps in the adjoining hill ranges, like Satpura and Ajanta hill ranges.

4. Discussion

The genus *Neoscorpions* was described as a sub-genus of *Scorpions*, and later Lourenço [9] raised the sub-family Scorpionsinae to family level Scorpionidae, and also raised *Neoscorpions* to the generic level. Soleglad and Sissom [10] downgraded it to a sub-family level and placed Scorpionidae in the synonymy of Euscorpionidae. With the present description of *N. maharashtraensis* sp. nov., members of the genus *Neoscorpions* appear to be distributed in high altitude areas (> 180 m), irrespective of the forest type and precipitation. Based on this, we presume that the genus is likely to be more widespread and may also occur

in the Satpura hills in addition to Western Ghats and Satmal hills. The presence of *Neoscorpions* in Satpura hills will be of great interest, as this would put forth the argument of the Satpura hills serving as a past gateway for Himalayan biota to migrate to the Western Ghats. Several species of birds and butterflies are distributed only in the Himalayas, Satpura, and the Western Ghats, which further supported the gateway hypothesis. In a similar manner, *Euscorpions* and *Scorpions* are distributed in the Himalayas and North East India with a single species in Satpura hills of the latter genus; however, genus *Neoscorpions* is present in the Western Ghats and possibly Satpura hills. These are however assumptions and a detailed study with the help of molecular markers across relevant taxa will help shed light on this argument.

Disclosure of interest

The authors have not supplied their declaration of conflict of interest.

Acknowledgments

ZM & RS were able to visit the Natural History Museum, London through a travel grant from the Newby Trust Limited to ZM. Rahul Khot (BNHS) kindly helped with registration number for the type. For logistic support, we acknowledge The Gerry Martin Project. The following people are thanked for help: for lab facilities Krushnamegh Kunte (NCBS), K.S. Krishnan (NCBS) and for permission to examine comparative material Janet Beccaloni (NHM, London). RS & RU wish to thank Vishwanath Rathode, Durgesh Pangarkar & Rushikesh Chippavar for warm hospitality and assistance during fieldwork. RU acknowledges help from Laxmikant Shinde for their help for lab work, Kulbhushan Naik and Mangesh Dehedkar for their kind help during field work and study.

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