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Cover: Fish species recorded in the Gowthami-Godavari Estuary, Andhra Pradesh: *Lutjanus johnii* (top left), *Triacanthus biaculeatus* (top right), *Acentrogobius cyanomos*, *Elops machnata*, *Trypauchen vagina*, *Oxyurichthys microlepis*. © Paromita Ray.

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SHORT COMMUNICATION

Eremotermes neoparadoxalis Ahmad, 1955 (Isoptera: Termitidae: Amitermitinae) a new record from Haryana, India

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Abstract: We report a new record of *Eremotermes neoparadoxalis* from Haryana, India. *Eremotermes* Silvestri, 1911 is a highly dispersed genus epitomized by 10 species, six of which have been reported in India, including *E. paradoxalis* in Harayana. Taxonomic descriptions provided with illustrations of general morphology and measurements of body length, head length with and without mandibles, body pigmentation, antennae segments, tibial spur, tarsal segments, head width, and body width. These keys along with photographs are prepared for both soldier and worker castes of *E. neoparadoxalis*.

Keywords: Antennae segments, blattaria, caste, morphological characters, phenotypic characters, pronotum, tarsal segment, tibial spur, termite.

Termites (Order: Blattaria; Infraorder: Isoptera) are highly useful insects in many ecosystems (Engel et al. 2009; Pranesh & Harini 2015; Effowe et al. 2021), where they consume cellulose-rich plant matter and facilitate recycling of waste products (Wood & Sands 1978). They also support the growth of forests and microbes while constructing their mounds (Lee & Wood 1971; Eggleton et al. 2002; Davies et al. 2014). *Eremotermes* (subfamily Amitermitinae) are found in many localities worldwide (Oriental, Ethiopian and Palaearctic zoogeographical regions), and in India they are known from the Oriental Region (Krishna et al. 2013). Ten species of *Eremotermes* are reported globally, of which six occur in India: *dehraduni*, *fletcheri*, *madrasicus*, *neoparadoxalis*, *paradoxalis*, and *sanyuktae*, while three occur in southern India: *paradoxalis*, *madrasicus*, and *fletchreri* (Chhotani 1997; Ranjith & Kalleshwaraswamy 2021), five in Gujarat and Rajasthan: *dehraduni*, *fletcheri*, *neoparadoxalis*, *paradoxalis*, and *sanyuktae* (Rathore & Bhattacharyya 2004), and only *paradoxalis* from Haryana (Poonia 2019). The present report deals with *Eremotermes neoparadoxalis* as a new record trapped from dung cake in Palwal (Hodal), Haryana.

Methods

Surveys were conducted throughout southern Haryana, where most vegetation is in agricultural lands and *Acacia* forest. The sample of *E. neoparadoxalis* was collected from Hodal (Palwal), Haryana, India in July 2020. The area of sample collection is 27.40 °N & 77.36 °E (Figure 1; Image 1). Around 50 individuals of the soldier and worker castes were collected from a dung cake with the help of forceps, and preserved in 70% ethanol (Gupta & Kakkar 2015). For the taxonomic description photographs were captured using an Olympus CX41 microscope and Olympus Camedia C-7070 wide zoom

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Competing interests: The authors declare no competing interests.

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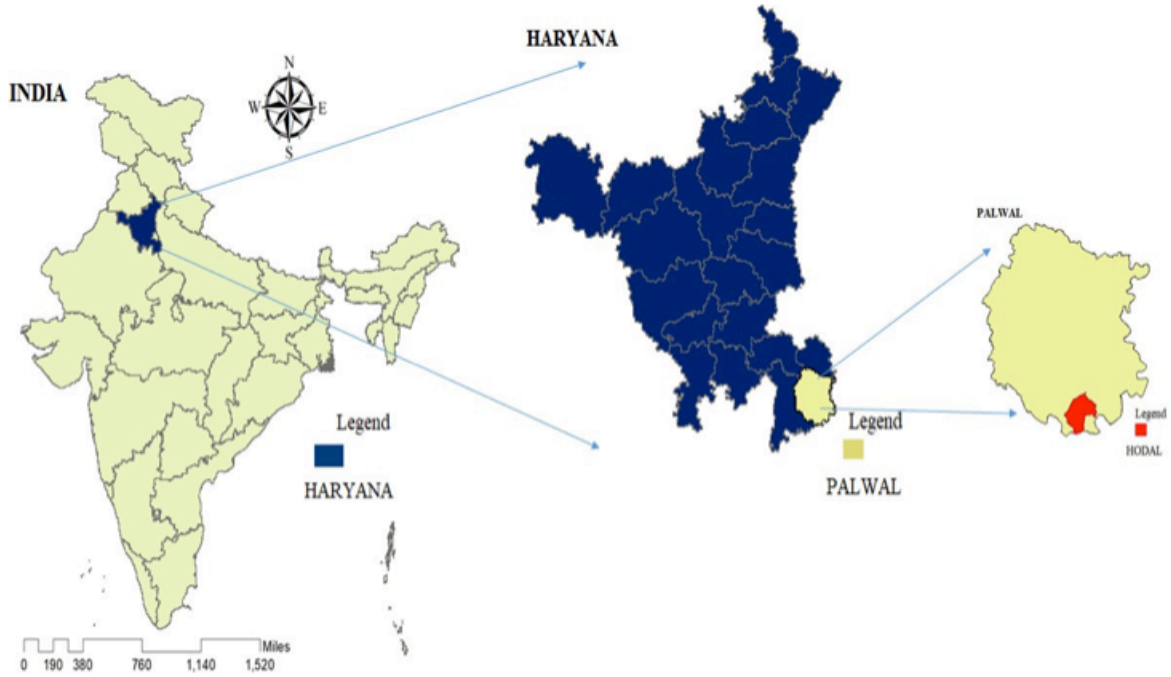

Figure 1. Study site.

digital camera. Termite characterization was done using taxonomic keys (Chhotani 1997; Rathore & Bhattacharyya 2004; Mahapatro et al. 2018) (Table 1).

Phenotypic characters assessed were:

· Head: Shape, color, size, width and length of head with and without mandibles (Table 1)

· Antennae: Number and size of the segments

· Mandible: Shape, length, arrangement of marginal teeth and size (Table 1)

· Labrum: Hyaline tip and its shape

· Legs: Tibial spur and number of tarsi segments

· Body: Color, length and width

Results and Discussion

A total of 37 termite species were reported from Haryana (Poonia 2019). This diversity was hierarchically listed under 11 genera, six subfamilies (Macrotermitinae, Angulitermitinae, Amitermitinae, Coptotermitinae, Heterotermitinae, and Apicotermitinae) and three families (Termitidae, Rhinotermitidae, and Kalotermitidae). *Eremotermes* was previously only represented by *paradoxalis* in Haryana (Krishna et al. 2013; Poonia 2019), and we now include *neoparadoxalis*. This species is mostly found in dry zones (Roonwal & Bose 1978). For the species identification mean and standard deviation were calculated on five individuals of both castes (soldier and worker). Species of the genus *Eremotermes* generally look alike; consequently, differences among species are noticed by different sizes of antennal segments of 3rd, 4th, and 5th in worker castes (Chhotani 1997).

Keys for genus and species of *Eremotermes*

Genus: *Eremotermes* Silvestri (Head with short projected front protuberance. Mandibles thin, long, and somewhat incurved apically) (Image 2)

Species:

1(2) Mandibles comparative to head longer, index mandible-length/head-length 1.12–1.23. Mandibular tooth weak or indistinct .... *neoparadoxalis*

2(1) Mandibles comparative to head shorter, index mandible-length/head-length 0.78–1.07 Mandibular tooth prominent

3(4) Mandibles almost straight; concavity on outer margin of mandibles very weak or absent ..... *madrasicus*

4(3) Mandibles appreciably curved; concavity on outer margin strong

5(6) Larger species: Head-length to base of mandibles 0.94–1.105, head-width 0.81–0.85 mm. Mandible-length equal to or slightly more than head-length, index mandible-length/head-length 1.0– 1.07 ..... *fletcheri*

6(5) Smaller species: Head-length to base of mandibles 0.80–0.95, head-width 0.68–0.80 mm.

Mandible-length generally less than head length, index mandible-length/head-length 0.78–0.98
7(8) Frontal protuberance prominent and frons very steeply inclined in front. Head thick, height/width index 0.81–0.93. Mandibles strongly incurved at apices ..... *dehraduni*
8(7) Frontal protuberance a little weaker and frons somewhat less so steeply inclined in front. Head thinner, height/width index 0.66–0.87. Mandibles weakly incurved at apices ..... *paradoxalis*

Species: *neoparadoxalis* (Mandibles with weak tooth and comparatively longer than the head)

***Eremotermes neoparadoxalis* Ahmad**

1955. Ahmad, Biologia, Lahore, 1(2): 252–253. S only. Holotype: S, in PU, Lahore. Type-locality: Shahdadpur, Sind, Pakistan.

1969. Roonwal and Bose, Rec. Zool. Surv. India, 61(3 & 4): 440, 446.

1974. Akhtar, Pakistan J. Zool., 6(1 & 2): 103. 1976. Akhtar, Pakistan J. Zool., 8(2): 163–165.

1977. Roonwal, In: Natural Resources of Rajasthan (Ed Roonwal): 375: 3.

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This species is a small-sized termite. Body length is ranged in between 3.5–4.1 in soldier caste and 3.4–3.8 in worker caste (Table 1). Diagnostic features, measurements, distribution and remarks of the soldier and worker castes of *E. neoparadoxalis* (Image 2) were described as follows:

Diagnostic features:

Soldier caste: Head capsule is light yellow, rectangular to oval-shaped. Body is yellowish-white and mandibles are reddish-brown. Mandibles are sabre-shaped, less incurved, pointed and strongly incurved outer marginally. There is a minute tooth present little behind the middle on both the mandibles. Pronotum is saddle-shaped where labrum is smaller and pointed in shape (Image 2).

Worker Caste: Head capsule is straw-colored and sub-square shaped whereas body is paler. Mandibles are similar as imago caste (Image 2). Pronotum is saddle-shaped; its anterior margin weakly or generally not notched and posterior margin straight.

Measurements (Table 1) (mm):

More description:

Soldier: Tarsal segments: 4, Tibial spur ratio: 3:2:2, Antennae segments: 14, 3rd shortest and sub-equal to or a little longer than 4; 5 longer and broader than 4 (Image 2).

Worker: Tarsal segments: 4, Tibial spur ratio: 3:2:2, Antennae: 14 segmented; segment 3, 4, 5 sub-equal (Image 2).

Distribution: India: Haryana (Nuh), Delhi, Gujarat (Dangs, Banaskantha, Valsad, Sabarkantha), Rajasthan (Bikaner, Jaisalmer, Barmer, Jodhpur, Jaipur) and Pakistan.

Image 1. Location of sample collected site. © Bhanupriya.

Table 1. Morphometric analysis of termite's body parts (in mm) *Eremotermes neoparadoxalis*.

	Parameters (mm)	Soldier		Worker	
		Range	Mean±SD	Range	Mean±SD
1	Total body length	3.5–4.1	3.84±0.215	3.4–3.8	3.64±0.16
2	Head length without mandibles	0.7–0.85	0.77±0.06	0.5–0.65	0.56±0.058
3	Head + mandibles length	1.6–1.9	1.75±0.109	0.7–0.9	0.81±0.08
4	Mandibles length	0.8–0.9	0.86±0.04	0.2–0.35	0.27±0.06
5	Tooth distance	0.3–0.37	0.33±0.027	-	-
6	Head width	0.6–0.9	0.73±0.107	0.65–0.75	0.69±0.037
7	Body width	0.6–0.75	0.67±0.06	0.6–0.8	0.7±0.07

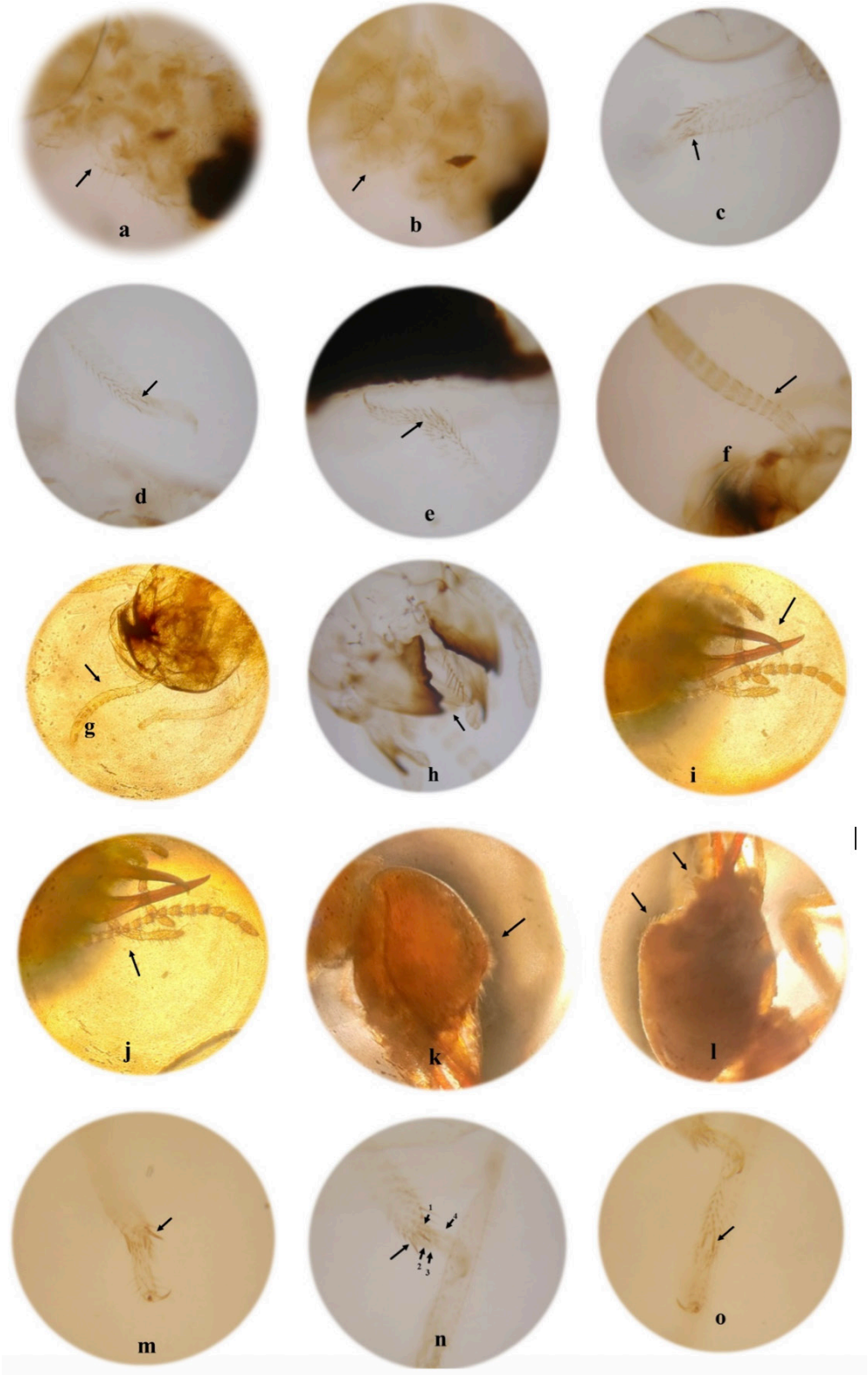

Image 2. Worker caste: a—Pronotum: saddle-shaped | b—Dorsal view of pronotum | c—Foreleg with three tibial spur | d—Mid leg with two tibial spur | e—Hind-leg with two tibial spur | f & g—14 segmented antennae, with 3rd, 4th, and 5th segments are sub-equal in sized and 3+4 = 2nd segment | h—shape of the mandibles;
Soldier caste: i—Mandible with prominent tooth and tooth distance | j—Antennae 14-segmented with 4th short segment | k—Dorsal view of head | l—Head with frontal protuberance and a pointed labrum | m—Foreleg with three tibial spur | n—Mid leg with two tibial spur and tarsal segments (4) | o—Hind-leg with two tibial spur. © Bhanupriya.

Remarks: In India, this species is relatively rare but generally found in Gujarat and Rajasthan. As a new record, this species is stated first time from the study site Palwal (Hodal), Haryana. This is a soil-borne species, commonly collected from damaged wooden structures, dung cake and forests as well as harvested fields (Sharma et al. 1975; Chhotani 1997; Saha & Basak 2011). The present record of this species is collected from dung cake.

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