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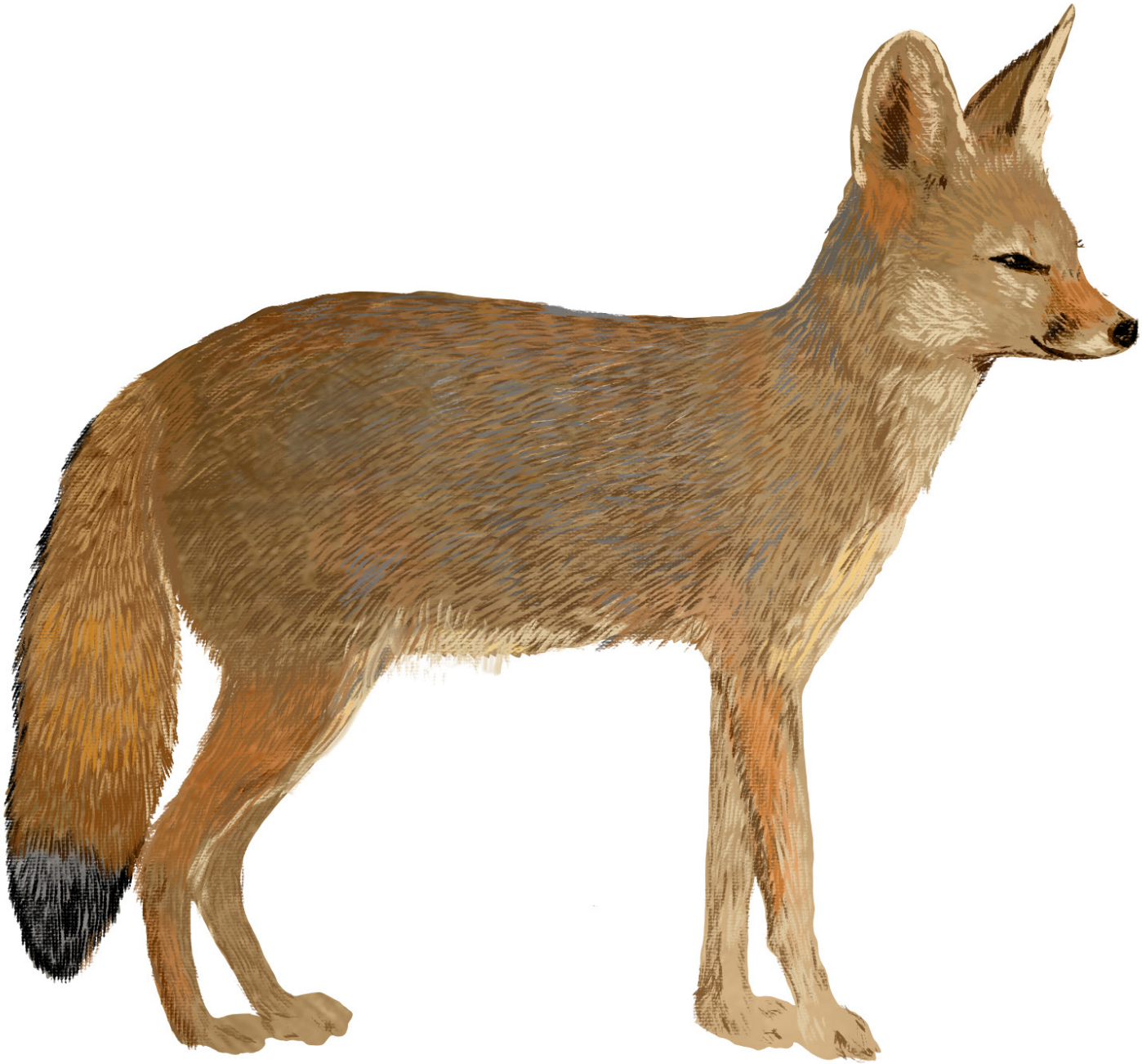

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continued on the back inside cover

Cover: Bengal Fox *Vulpes bengalensis*—digital illustration. © Alagu Raj.

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COMMUNICATION

New records of termite species (Blattodea: Rhinotermitidae, Termitidae) from southern India

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Abstract: There are 133 species of termites so far recorded from southern India and 73 from Kerala. The present study from different habitats in northern Kerala recorded two species new to southern India and one species new to Kerala, taking the total number to 135 for southern India and 76 for Kerala. The newly reported species are *Heterotermes balwanti* Mathur & Chhotani, 1969*, Odontotermes profeae* Akhtar, 1975, and *Microcerotermes annandalei* Silvestri, 1923. *O. profeae* is a new record to the termite fauna of Western Ghats. *O. profeae* and *M. annandalei* are reported for the first time from southern India. *O. profeae* and *M. annandalei* belong to type II feeding group while *H. balwanti* confines to type I feeding group.

Keywords: *Heterotermes balwanti,* Kerala, *Microcerotermes annandalei,* new records, *Odontotermes profeae*, Western Ghats.

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Author contributions: Anushya—field work and identification. Swaran—design of method and analysis.

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INTRODUCTION

Termites are a group of insects that are well known for causing significant harm to woodwork in buildings, agricultural and forest crops, timber and other products of cellulosic origin (Shanbhag & Sundararaj 2013). However, only 12.4% of the described species have been reported as pests (Krishna et al. 2013). Others have only a beneficial role as an integral part of the ecosystem, which is seldom recognized. Identifying the termite species and its feeding preferences in a given area are important considerations for effective and scientific pest management. Thus, taxonomic, ecological, and diversity studies of the pest and other species are equally relevant and a prerequisite to pest management studies.

There are over 3,000 species of termites that have been described, spanning 330 genera worldwide (Krishna et al. 2013). Only 295 species that belong to 52 genera under six families are known from India and 133 species that belong to 37 genera under five families from southern India, of which five genera and 60 species are endemic to southern India (Amina et al. 2013, 2016; Krishna et al. 2013; Rajmohana et al. 2019; Ranjith & Kalleshwaraswami 2021; Joseph et al. 2023). Though taxonomic studies on termites from southern India started way back in 1779 (König 1779) and were enriched by extensive studies of Bose (1984), the scope remains wide open still as evidenced by new species records even in most recent studies like Joseph et al. (2023). The termite fauna of Kerala so far recorded is 73 species under 30 genera and three families, of which two genera and 12 species are endemic to Kerala (Amina et al. 2016, 2020a,b; Mathew & Ipe 2018; Ipe & Mathew 2019; Joseph et al. 2023).

Termites are classified into four feeding groups based on their gut content analysis. Lower termites, mainly the dead wood and grass feeders are included in group I; group II contains higher termites which feed on dead wood, leaf litter and micro epiphytes; group III comprises organic rich soil feeders and group IV includes true soil feeders (Donovan et al. 2001). To which feeding group a termite species belongs, is an indication of its role and importance in the ecosystem and its status as a pest. The present paper discusses part of a taxonomic and ecological study on termites of Northern part of Kerala with three new records of termite species from South India, of which one belongs to feeding group I and two belong to group II.

MATERIALS AND METHODS

Termite samples described in the present paper were collected from different habitats from northern Kerala as part of a detailed study on diversity and seasonality of termites. The specimens were collected using forceps and brush. Samples were preserved in vials containing 70% ethanol and labeled with habitat, collection locality, date and time. Taxonomic observations were made using stereo zoom microscope at 45x magnification. Identification up to species level was made by using Roonwal & Chhotani (1989) and Chhotani (1997). The photomicrographs and measurements were taken by using ZEISS Stemi 305 stereo zoom microscope with Axiocam 208 camera. One sample each of all the species reported are deposited in the National Zoological Collections of the Zoological Survey of India (ZSI), Western Ghats Regional Centre, Kozhikode, Kerala, India. The remaining specimens are kept at the Zoology Museum of Payyanur College, Edat, Kerala, India.

RESULT AND DISCUSSION

Following are the diagnosis of the two species of termites recorded for the first time from southern India and one from the state of Kerala.

Family: Rhinotermitidae
Sub-family: Heterotermitinae
1. *Heterotermes balwanti* Mathur & Chhotani, 1969

Material examined: ZSI/WGRC/I.R.-INV.26917, 23.xi.2019, one colony, India: Kerala, Kasargod, Mavilakadappuram, coastline habitat (12.1917^{0}N & 75.1243^{0}E), coll. A.V. Anushya. KU/PNRC/ZL/520, 21.i.2020, one colony, India: Kerala, Kasargod, Valiyaparamba, coastline habitat (12.1394^{0}N & 75.1449^{0}E), coll. A.V. Anushya.

Diagnosis: Soldier (Table 1 and Image 1) – Head capsule creamy white to yellowish-brown in colour and sub-rectangular in shape. Body is whitish and densely hairy. Fontanelle is minute and leading into a small, brownish tube; situated at base of median groove. Eyes and ocelli are absent. Antennae with 12–14 segments in which, segment 3 is longer than 4 (in the present collection, 2 soldiers had 12 segmented and 4 soldiers had 14 segmented antennae). Labrum triangular shaped with a long and pointed hyaline tip and with a pair of long hairs. Mandibles are dark brown, thin and sabre-shaped with weakly incurved apices. Postmentum is long and club-shaped, waist lying below the middle. Pronotum

Image 1. ***Heterotermes balwanti*** **Mathur & Chhotani, 1969; Soldier, dorsal view. © Authors.**

is flat, subreniform, anterior margin outcurved with median emargination and medialy notched, posterior margin with a faint incurving. Worker – Head-capsule sub-squarish, a little broader than length to base of mandibles (length to base of mandibles 0.73–0.85 mm, maximum width 0.7–0.85 mm). Eyes and ocelli are absent. Fontanelle is indistinct. Antennae are 13–14 segmented. Pronotum is flat (length 0.25–0.33 mm, width 0.40–0.55 mm) (modified from Roonwal & Chhotani 1989).

Distribution: India—Odisha, Karnataka (Dharwar), Goa (Krishna et al. 2013), Kerala (Kasargod, present study).

Remarks: *H. balwanti* is listed as a major pest species in India (Krishna et al. 2013; Shanbhag & Sundararaj 2013). The species is endemic to India (Rajmohana et al. 2019) and is reported for the first time from Kerala. From the southern region of India, this species is earlier reported only from the state of Karnataka (Krishna et al. 2013; Ranjith & Kalleshwaraswami 2021). *H. balwanti* belongs to Type I feeding group and it mostly feeds on woodwork in buildings. The species is morphologically similar to *H. malabaricus*, but its smaller size and longer mandibles differs. It is mostly found in the plains of India (Maiti 2006). In the present study it was recorded from coastal plains, feeding on dead wood within the mud tunnel on dried *Cocos nucifera* wood.

Family: Termitidae

Sub-family: Macrotermitinae

2. ***Odontotermes profeae*** **Akhtar, 1975**

Material examined: ZSI/WGRC/I.R.-INV.26918, 28.xii.2019, KU/PNRC/ZL/363, 29.xi.2019 two colonies, India: Kerala, Wayanad, Mananthavady, Grass land (11.7659^{0}N & 75.9830^{0}E), coll. K. Jyothi. KU/PNRC/ZL/451, 24.xii.2019, one colony, India: Kerala, Kasargod, Bedur, Coconut plantation (12.2757^{0}N, 75.2949^{0}E), coll. A.V. Anushya.

Diagnosis: Soldier (Table 2 and Image 2) – Head capsule brownish-yellow to yellowish-brown, sub-rectangular and sides weakly convex. Abdomen is whitish-yellow, pronotum brownish-yellow. Antennae uniformly coloured with 17-segments, segment 3 is shortest. Labrum triangular shaped; with pointed hyaline tip. Mandibles dark brown in colour and are long, stout and slightly incurved at the distal end. Left mandible with a large anteriorly directed tooth situated a little below middle, right mandible with a minute tooth like projection almost at the level of tooth on left mandible. Post-mentum is sub rectangular; sides almost parallel. Pronotum saddle shaped.

Image 2. ***Odontotermes profeae*** **Akhtar, 1975; Soldier, dorsal view. © Authors.**

Table 1. Measurements of soldiers of *Heterotermes balwanti*.

	Measurement of soldier from present study (n = 4)		Measurement of soldier as per (Roonwal & Chhotani 1989)
	Characters	Soldier (mm)	Soldier (mm)
1	Total body length	3.4–4.2	3.3–4.0
2	Length of head to the base of mandible	1.00–1.15	1.00–1.10
3	Max. width of head	0.71–0.76	0.70–0.75
4	Width at base of mandibles	0.57	-
5	Head index (max. width/length)	0.66–0.71	-
6	Length of mandible	0.84	0.73–0.78
7	Head-mandibular length index (mandible length/head length)	0.73	0.68–0.78
8	Length of postmentum	0.74	0.70–0.88
9	Max. width of postmentum	0.30–0.35	0.30–0.35
10	Min. width of postmentum	0.16–0.19	0.15–0.18
11	Length of pronotum	0.33	0.30–0.35
12	Width of pronotum	0.52	0.50–0.55
13	No. of antennal segments	12–14	12–14

Table 2. Measurements of soldiers of *Odontotermes profeae*.

	Measurement of soldier from present study (n = 4)		Measurement of soldier as per (Chhotani 1997)
	Characters	Soldier (mm)	Soldier (mm)
	Total body length	7.30–7.43	-
1	Length of head to the base of mandible	2.04–2.29	1.96–2.39
2	Max. width of head	1.87–2.06	1.73–2.00
3	Width at base of mandibles	1.21–1.26	1.06–1.26
4	Head index (max. width/length)	0.89	0.837
5	Index (width at mandible-base/ max. width)	0.612	0.681
6	Length of mandible	1.25–1.30	1.19–1.35
7	Head–Mandibular length index (mandible length/head length)	0.57	0.57
8	Tooth distance from tip of mandible	0.56	–
9	Tooth index (tooth distance/ mandibular legth)	0.45	–
10	Length of postmentum	1.27–1.30	1.28–1.58
11	Max. width of postmentum	0.65–0.74	0.64–0.80
12	Min. width of postmentum	0.55–0.60	–
13	Length of pronotum	0.63	0.60–0.77
14	Width of pronotum	1.24–1.30	1.25–1.33
15	No. of antennal segments	17	17

Worker (Image 3 & 4) – Head capsule yellow to brownish-yellow, post-clypeus and labrum paler than head capsule, antennae basally paler and darker distally, body creamy white to yellowish. Body densely and head moderately hairy. Total body length 4.43–5.20 mm. Head capsule sub–squarish, wider than long (length to base of mandible 1.37–1.45 mm and width 1.50–1.60 mm). Fontanelle is present. Antennae with 19 segments, 3rd segment is shortest. Post-clypeus swollen, divided by a longitudinal median grove into two halves (length 0.30 mm and width 0.60–0.65 mm). Mandibles each with a finger like apical teeth; left mandible with three marginal teeth and right mandible with two marginal teeth. Pronotum saddle shaped (length 0.33–0.60 mm, width 0.84–1.00 mm).

Distribution: Bangladesh; India—Manipur, Nagaland (Krishna et al. 2013), Kerala (Wayanad & Kasargod, present study).

Remarks: *O. profeae* is a fungus growing wood/ litter feeder and belongs to Type II feeding group. Genus *Odontotermes* is the dominant representative of wood destroying termites (Shanbhag et al. 2013). The species is similar to both *O. mirganjensis* and *O. singsiti* in size and pointed tip of labrum, but differs in having a wider head. Earlier reports of the species from India were only from the eastern region (Verma 1984; Maiti et al. 2004). It is reported for the first time from Western Ghats and southern India. It was observed in the present study in grasslands and coconut plantations, where it fed on dead wood and was also collected from the soil.

Family: Termitidae

Sub-family: Termitinae

3. *Microcerotermes annandalei* Silvestri, 1923

Material examined: ZSI/WGRC/I.R.-INV.26919, KU/PNRC/ZL/264, 09.xi.2019, KU/PNRC/ZL/652, 29.ii.2020, three colonies, India: Kerala, Kannur, Puthur, Sacred groove (12.1967^{0}N & 75.2177^{0}E), coconut plantation (12.1979^{0}N & 75.2204^{0}E), coll. A.V. Anushya. KU/PNRC/ZL/122, 02.x.2019, one colony, India: Kerala, Kasargod, Valiyaparamba, coastline habitat (12.1394^{0}N & 75.1449^{0}E), coll. A.V. Anushya. KU/PNRC/ZL/678-679, 03.iii.2020, two colonies, India: Kerala, Kasargod, Bedur, coconut plantation (12.2757^{0}N, 75.2949^{0}E), coll. A.V. Anushya.

Diagnosis: Soldier (Table 3 and Image 5) – Head capsule yellow to brown, sub-rectangular, body creamy white to yellowish. Antennae uniformly pale brown in colour with 13 segments in which segment 3 is shortest. Labrum pale brown, sub-squarish with rounded anterior margin. Fontanelle is small, situated at anterior third of head. Mandibles dark reddish-brown and are short,

Image 3. *Odontotermes profeae* Akhtar, 1975; Worker, dorsal view. © Authors.

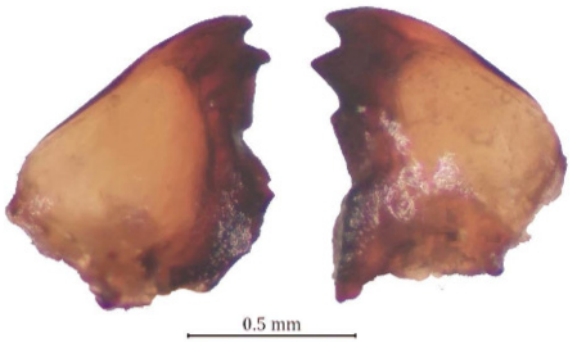

Image 4. *Odontotermes profeae* Akhtar, 1975; Worker, mandible. © Authors.

Image 5. *Microcerotermes annandalei* Silvestri, 1923; Soldier, dorsal view. © Authors.

thick, stout and apices strongly incurved. Mandibles coarsely serrated with a tooth like large serration at below middle. Post-mentum is club shaped with a long, slender waist. Pronotum is saddle shaped; anterior margin with deep notch and posterior margin with weak medial emargination. Worker – Head capsule is squarish (length to base of mandible 0.97–1.05 mm). Post-clypeus swollen, length is more than half of its width. Antennae with 13 segments, segment 3 is shortest. Fontanelle is indistinct. Pronotum saddle shaped (length 0.17–0.27 mm, width 0.50–0.57 mm) (modified from Chhotani 1997).

Distribution: Thailand, Myanmar, Malaysia, India—Bihar, Nagaland, Haryana, Odisha, Tripura, Rajasthan (Krishna et al. 2013), Kerala (Kasargod and Kannur, present study).

Remarks: *M. annandalei* is a wood feeder, belonging to Type II feeding group. It is listed as a minor pest species in India (Krishna et al. 2013; Shanbhag & Sundararaj 2013). The species is added to the list of wood destroying termites of Kerala. It is reported for the first time from Kerala as well as from the whole of southern India. It nests in wooden stumps and logs (Bose & Das 1982). Maiti et al. (2000) reported that the species is mostly found in the soil nest from eastern India. In the present study, it was mostly collected from mud tunnels on dead wood materials as well as live trees like *Areca catechu*.

Heterotermes is a genus that contains several species, some of which are dangerous pests, across the tropical regions (Shanbhag & Sundararaj 2013). Only two species of *Heterotermes* were reported earlier from Kerala and the present record of *H. balwanti* makes it three. In the present study, the species was found feeding on dead wood and it is worth noting that it is already reported as a major pest elsewhere (Krishna et al. 2013; Shanbhag & Sundararaj 2013). *Odontotermes* is the largest and most widely distributed termite genus. With 18 species of wood-destroying termites, it is claimed to be the largest genus of wood destroying termites too (Shanbhag & Sundararaj 2013). Kerala has already been home to 16 species of *Odontotermes,* and this study finds one more (*O. Profeae*) bringing the total to 17. The pest status of *O. profeae* has not yet been recorded; however, it was collected from dead wood and soil in the present study. *Microcerotermes* is also a widely distributed genus and one of the largest wood destroying termite (Roisin & Pesteels 2000; Shanbhag & Sundararaj 2013).

Table 3. Measurements of soldiers of Microcerotermes annandalei.

	Measurement of soldier from present study (n = 4)		Measurement of soldier as per (Chhotani 1997)
	Characters	Soldier (mm)	Soldier (mm)
1	Total body length	4.26–4.75	4.08–5.5
2	Length of head to the base of mandible	1.61–1.94	1.57–1.90
3	Max. width of head	0.92–1.19	0.91–1.09
4	Width at base of mandibles	0.62	–
5	Index (width at base of mandible/ max. width)	0.66	–
6	Head index (width/length)	0.57–0.61	0.56–0.60
7	Length of mandible	0.89–1.05	0.90–1.18
8	Head–mandibular length index (mandible length/head length)	0.54–0.55	0.51–0.60
9	Length of postmentum	1.08	0.92–1.19
10	Max. width of postmentum	0.32	0.32–0.33
11	Min. width of postmentum	0.22	0.17–0.27
12	Length of pronotum	0.31	0.30–0.41
13	Width of pronotum	0.66	0.55–0.73
14	No. of antennal segments	13	13

So far, six species have been found in Kerala, (Krishna et al. 2013; Ranjith & Kalleshwaraswami 2021) and the current report makes it seven. The present species, *M. annandalei* is a wood feeding termite with minor pest status and was collected from the mud tunnels on both dead wood and live trees. Of the newly recorded species, *H. balwanti* belongs to feeding group I and the other two species (*O. profeae* & *M. annandalei*) belong to feeding group II.

CONCLUSION

The present study contributes three new species records to the termite fauna of Kerala, in which two species are new to southern India and one species is new to the Western Ghats. The present report updates termite diversity of southern India to 135 species and Kerala to 76 species. The new documentation also adds to the list of wood feeding termite species of Kerala.

REFERENCES

Akhtar, M.S. (1975). Taxonomy and zoogeography of the termites (Isoptera) of Bangladesh. Bulletin of the Department of Zoology, University of the Punjab 7: 1–199.

Amina, P., K. Rajmohana, C. Bijoy, C. Radhakrishnan & N. Saha (2013). First record of the Srilankan Processional Termite, *Hospitalitermes monoceros* (Konig) (Termitidae: Nasutitermitinae) from India. *Halteres* 4: 48–52.

Amina, P., K. Rajmohana, K.V. Bhavana & P.P. Rabeeha (2016). New records of Termite species from Kerala (Isoptera: Termitidae). *Journal of Threatened Taxa* 8(11): 9334–9338. https://doi.org/10.11609/jott.3067.8.11.9334-9338

Amina, P., K. Rajmohana, K.P. Dinesh, G. Asha, P.A. Sinu & J. Mathew (2020a). Two new species of an Indian endemic genus *Krishnacapritermes* Chhotani (Isoptera: Termitidae) from the Kerala part of the Western Ghats, India. *Oriental Insects* 54(4): 496–513. https://doi.org/10.1080/00305316.2019.1683091

Amina, P., K. Rajmohana & S.C. Aliyas (2020b). A new species and a new record of *Dicuspiditermes* Krishna (Blattodea: Isoptera: Termitidae) from the Kerala part of Western Ghats, India. *Oriental Insects* 55(5): 1–12. https://doi.org/10.1080/00305316.2020.1844815

Bose, G. (1984). Termite fauna of Southern India. *Records of the Zoological Survey of India* 49: 1–270.

Bose, G. & B.C. Das (1982). Termite Fauna of Orissa State, Eastern India. *Records of Zoological Survey of India* 80: 197–213.

Chhotani, O.B. (1997). *The Fauna of India and the Adjacent Countries: Isoptera (Termites): (Family: Termitidae) – Vol.2.* Zoological Survey of India, Calcutta, xx + 800 pp.

Donovan, S.E., P. Eggleton & D.E. Bignell (2001). Gut content analysis and a new feeding group classification of termites. *Ecological Entomology* 26: 356–366.

Joseph, E., P. Amina, S.B.S. Thomas, N. Jayan & J. Mathew (2023). A new species of termite, *Prorhinotermes cotym* (Blattodea: Isoptera: Rhinotermitidae: Prorhinotermitinae), from the Kerala part of the Western Ghats, India. *International Journal of Tropical Insect Science* 43(5): 1733–1740.

Ipe, C. & J. Mathew (2019). New species of termite *Ceylonitermes paulosus* sp. nov. (Blattodea: Isoptera: Termitidae: Nasutitermitinae) from Kerala, India. *Journal of Insect Biodiversity* 11(1): 24–30. https://doi.org/10.12976/jib/2019.11.1.3

König, J.G. (1779). Naturgeschichte der sogenannten weissen Ameise. *Beschaftigungen Der Berlinischen Gesellschaft Naturforschender Freunde* 4: 1–28.

Krishna, K., D.A. Grimaldi, V. Krishna & M.S. Engel (2013). Treatise on the Isoptera of the world. Bulletin of the American Museum of Natural History no. 377. http://digitallibrary.amnh.org/handle/2246/6430

Maiti, P.K., N. Saha & P.H. Roy (2000). Insecta: Isoptera. State Fauna Series (Fauna of Tripura). Zoological Survey of India 7(2): 295–308.

Maiti, P.K., N. Saha & P.H. Roy (2004). Fauna of Manipur: Insecta: Isoptera. State Fauna Series. Zoological Survey of India 10(2): 153–164.

Maiti, P.K. (2006). A taxonomic monograph on the world species of termites of the family Rhinotermitidae (Isoptera: Insecta). *Memoirs of the Zoological Survey of India* 20(4): 1–272.

Mathew, J. & C. Ipe (2018). New species of termite *Pericapritermes travancorensis* sp. nov. (Isoptera: Termitidae: Termitinae) from India. *Journal of Threatened Taxa* 10(11): 12582–12588. https://doi.org/10.11609/jott.3389.10.11.12582-12588

Mathur, R.N. & O.B. Chhotani (1969). Two new termites of the genera *Coptotermes* Wasmann and *Heterotermes* Froggatt (Rhinotermitidae) from India. *Journal of the Timber Development Association of India* 15(4): 1–10.

Rajmohana, K., J. Basak, A. Poovoli, R. Sengupta, B. Baraik & K. Chandra (2019). *Taxonomy of Termites in India: A Beginner's Manual.* ENVIS Centre on Biodiversity (Fauna), Zoological Survey of India, Kolkata, 71 pp.

Ranjith, M. & C.M. Kalleshwaraswamy (2021). Termites (Blattodea: Isoptera) of southern India: current knowledge on distribution and systematic checklist. *Journal of Threatened Taxa* 13(6): 18598–18613. https://doi.org/10.11609/jott.5781.13.6.18598-18613

Roonwal, M.L. & O.B. Chhotani (1989). *The fauna of India and*

adjacent countries. Isoptera (Termites). (Introduction and families Termopsidae, Hodotermitidae, Kalotermitidae, Rhinotermitidae, Stylotermitidae and Indotermitidae). Vol. 1. Zoological Survey of India, Calcutta, viii + 672 pp.

Roisin, Y. & J.M. Pasteels (2000). The genus Microcerotermes (Isoptera: Termitidae) in New Guinea and the Solomon Islands. *Invertebrate Taxonomy* 14(2): 137–174. https://doi.org/10.1071/IT99005

Shanbhag, R. & R. Sundararaj (2013). Host range, pest status and distribution of wood destroying termites of India. *Journal of Tropical Asian Entomol*ogy 2(1): 12–27.

Shanbhag, R., R. Sundararaj & S.I. Ahmad (2013). Wood Destroying Termites (Insecta: Isoptera) of India and their Economic Importance. *Animal Diversity, Natural history and Conservation* 2: 69–102.

Silvestri, F. (1923). The fauna of an island in the Chilika Lake III. The termites of Barkuda Island. *Records of the Indian Museum* 25(2): 221–232.

Verma, S.C. (1984). On a collection of termites (Isoptera: Insecta) from Nagaland, north-east India. *Indian Journal of Forestry* 7(1): 81–82.

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