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Review Article

HOST RANGE, PEST STATUS AND DISTRIBUTION OF WOOD DESTROYING TERMITES OF INDIA

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Abstract:

Termites are the major constituents of the forest ecosystem in the tropical and subtropical areas, are well known for their capacity to damage, and destroy wood and wood products of all kinds. An adequate knowledge of pest status and the range of material which termite attack and geographical preference of the termite is essential for appropriate pest control. For this purpose, a review of literature was carried out to understand wood destroying termites of India, their host range, pest status and distribution.

***Keywords*:** Termites, pest status and distribution, Termopsidae, Kalotermitidae, Rhinotermitidae, Stylotermitidae, Termitidae

***Geotags*:** India, Kerala, Orissa, Assam, West Bengal [9.18887, 76.549301 | 23.5237, 87.532196 | 20.13847, 84.060516 | 26.155438, 92.805634]

INTRODUCTION

Wood feeding termites feed on wood and woody litter, including dead branches still attached to trees, and they may live in their feeding galleries which in some cases become colony centres (Eggleton *et al.,* 1997; Wardell, 1987). As a pest, they are capable of causing serious economic damage (Cowie *et al*., 1989) especially in the tropical and sub-tropical regions (Pearce, 1997). Worldwide annually approximately 1.92 billion U.S. dollars are spent to eradicate termite infestation (Edwards and Mill, 1986). Su and Schefferhn (1990) estimated the damage due to subterranean termites in U.S. at around $ 1 billion. In Australia, it is estimated that 20% of Australian homes are infested by termites and the cost for management and damage repairs for termites is greater than 100 million (Australian $) each year (Scholz *et al*., 2010). Where as in China, up to 90% of Chinese homes south of the Yangtze River are affected by termite damage (GEI, 2005; MRP, 2010) and the economic losses from termites exceed $ 1 billion (US) each year. Ten thousand tons of pesticides have been applied in the 13 provinces of southern China for the termite infestation suppression. Japan may be the third largest user of pesticides for structural pest control in the world and the economic losses associated with termite damage is around 800 million (US$) a year (Verma *et al*., 2009). In Malaysia and India, 8-10 million (US$) and 35.12 million are spent towards termite treatment every year (Verma *et al*., 2009). An adequate knowledge of pest status and the range of material which termite attack and geographical preference of the termite is essential for appropriate pest control. For this purpose, a review of literature was carried out to understand the host range, pest status and distribution of wood destroying termites of India.

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DISCUSSION

One of the primary objectives of National Forest Policy, the enhancement of forest productivity by raising large-scale plantations under various forestation programs, is facing alarming pest problems due to the attack root-feeding termites (Sachin Kumar and Thakur, 2011) which results in seeds in the seedbeds failing to germinate seedlings, cuttings etc. In case of transplants, they attack roots of these transplants at the age of 1-4 years. A survey was conducted during 2002 and 2003 in Ranchi, Jharkhand and in West Bengal showed considerable mortality of Gamhar (*Gmelina arborea*) saplings and the main cause was ring-barked taproots of dead saplings had been attacked by termites. Infestation of saplings, which occurred during the summer, started just below or on the surface of the ground and the damage resulted in ring barking of young saplings. Termites that penetrated and excavated the roots and stems, thus inhibiting the translocation of minerals and water (Chattopadhyay, 2005), also damaged saplings. In Central Arid Zone, Jodhapur leguminous trees; *Prosopis cineraria, P. juliflora, Acacia senegal, Acacia nilotica, Acacia tortilis* and *Albizia lebbeck* also showed termites as a major pest at the nursery stage (Parihar and Yadav, 2002). In the case of the Eucalyptus tree, mainly grown for reforestation program,a termite attack can sometimes lead to total loss of seedlings in nurseries (Thakur and Sen-Sarma, 1980). Reports says from different parts of India 80 to 100 per cent Eucalypt seedlings are lost in newly established plantations due to termite attacks if protective measures are not adopted (Roonwal, 1978, Nair and Varma, 1981; Thakur, 1990; Patel and Sahu, 1995).

Termites do not only attack saplings, as young and mature trees also face threat from these minute soft bodied insects. Investigation done on incidence of termites in young *Eucalyptus tereticornis* plantations of Jabalpur, Madhya Pradesh showed 16% of the trees infested by termites. Seven *Eucalyptus* species (*Eucalyptus* hybrid [*E. tereticornis*], *E. grandis, E. resinifera, E. camaldulensis, E. brassiana* and *E.* FRI-4 and FRI-5) that were 6-8 yearsold screenedfor termites (*Odontotermes* spp.) in Maharashtra, India were highly susceptible (Meshram and Soni, 2011). Large-scale mortality of *Acacia niloticaand Dalbergiasissoo*in Punjab, and the adjoining states, is due to termites attack (Sharma *et al.,* 2005). Damage by subterranean termite belonging to the family Termitidae in coffee stands (*Coffeaarabica* and *C. canephora*) with shade trees studied in Karnataka by Gowda *et al.* (1995) reports termite species *Odontotermesobesus*, *O. redemanni*, *O. horni*, *Macrotermesestherae* and *Nasutitermesindicola* were damaging coffee plants and 13 species of shade trees. *Odontotermes* spp. were the dominant species, feeding on the bark and living tissues of the plants and attackswere the most severe in exotic shade trees, *Grevillea robusta* and *Erythrina lithosperma*.

Besides damaging living trees, termites can cause irreparable damage to timber laying open and used in the construction of properties by eating wood foundations, structural supports and many other crucial parts of buildings. The timber damage in buildings has been observed in all parts of India. Out of 300 species of termites known so far from India, about 35-40 species have been reported to damage timber in buildings (Sen-Sarma *et al.,* 1975). Roonwal (1955) cited that an entire township of Shri Hargovindapur in Gurdaspur (Punjab) in India was gradually ruined by termite, *Heterotermes indicola* and eventually resembled a bombed-out ghost town. In the entire township 1900 houses were infested by particular termite species and nearly 400 collapsed. Extent of financial loss due to termite damage to buildings in India has not been computed precisely due to the difficulties associated with such computations but as per Rawat (2004), the cost of treatments

as preventive and remedial measures comes to about Rs 28 million annually.

In addition to destroying wood in buildings, termites also damage valuable books, manuscripts and paintings. Inorganic materials such as electrical and telephone cables are reportedly eaten by termites (Henderson and Dunaway, 1999). High reproductive potential and resulting colony size of termites often contribute to their destructive ability (Su and Scheffrahann, 1998). Roonwal and Chhotani (1967) reported 58 species of termites as important wood destroyers. Sen-Sarma *et al.* (1975) in surveying all of India collected 64 species of wood destroying termites, 11 of those beingmajor wood-destroying termites. Roonwal (1979) listed 72 species of wood destroying termites from South East Asia. An overall perusal review revealed that until today, 92 species of wood destroying termites were reported from India (Table 1).

Of the total 337 species of termites known from Indian region, about 92 species are wood destroying termites representing 22 genera under 5 families viz. Termopsidae Holmgren, Kalotermitidae Froggatt, Rhinotermitidae Froggatt, Stylotermitidae Holmgren and Holmgren and Termitidae Westwood. Family Termitidae is the largest among all the wood destroying termite families constituting 41% of all wood destroying termite species followed by Kalotermitidae (33%), Rhinotermitidae (18%), Stylotermitidae (7 %) and Termopsidae by only 1 percent of total wood destroying termite species (Figure 2). The generic composition of all the wood destroying termite species is given in figure 3. It clearly indicates that the genus *Odontotermes* is the largest genus of wood destroying termites (19.57 %) consisting 18 species of wood destroying termite species out of all 92 species followed by genus *Neotermes* (15.22 %) and *Microcerotermes* (8.7 %) in a second and third position respectively.

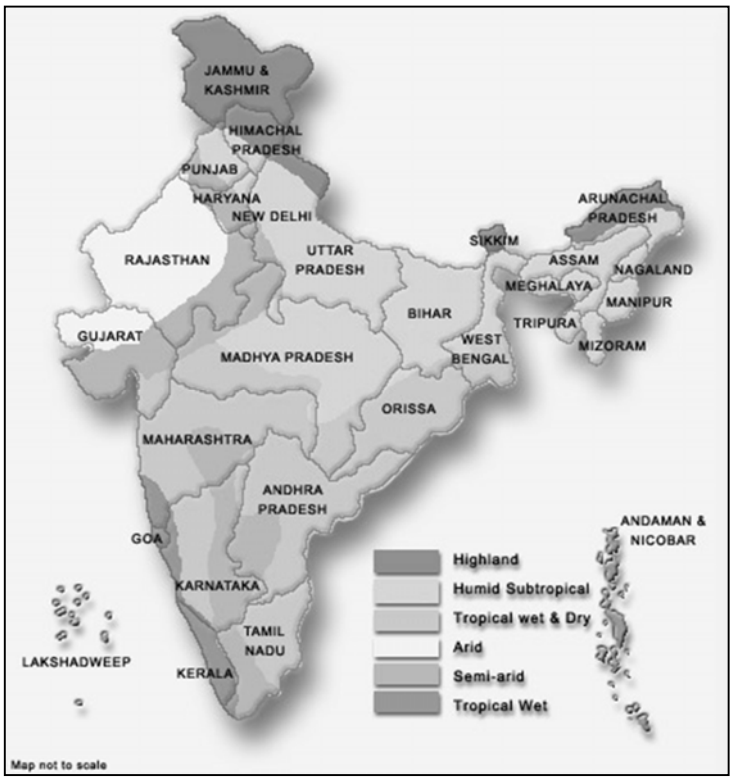

Figure 01. Indian map showing state provinences and the agro ecozones

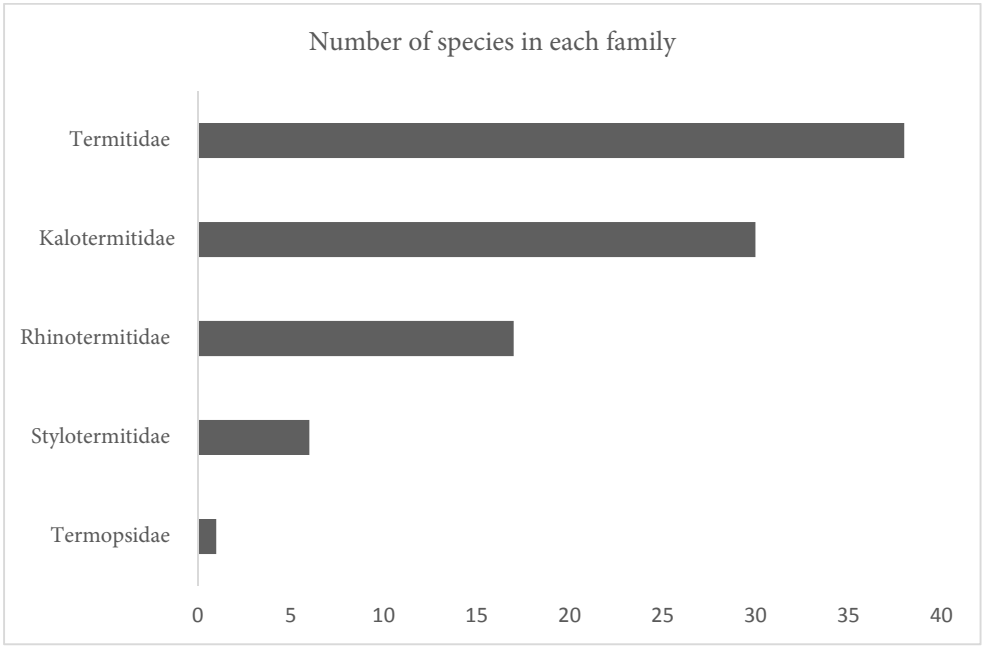

Figure 2. Distribution of wood destroying termites under different families

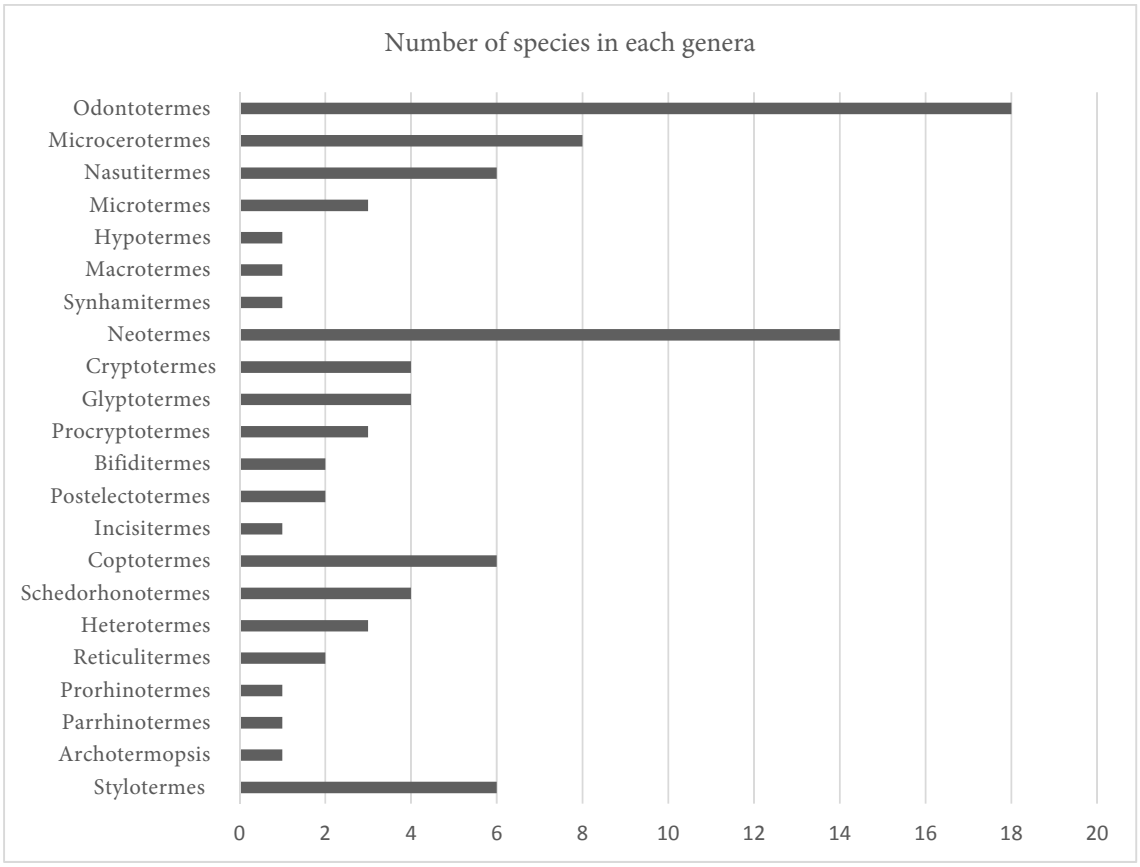

Figure 3. Relative species composition of wood destroying termites under different genera

Table 1. List of wood destroying termites of India

Sl. No.	Species	Distribution	Host	Pest status	Reference
	Family: Termopsidae Holmgren				
	Genus: *Archotermopsis* Desneux				
1.	*A.wroughotoni* Desneux	Himalayas	Rotten wood, dead log of *Cedrusdeodara* and *Pinuswallichiana*	Minor	Sen-Sarma *et al.,* 1975; Bose, 1984; Roonwal and Chhotani, 1989
	Family: Kalotermitidae Froggatt				
	Genus: *Postelectotermes* Krishna				
2.	*P. bhimi* Roonwal & Maiti	Kerala	Tea plantations	Minor	Roonwal and Chhotani, 1989
3.	*P. nayari* Roonwal&Verma	Kerala	*Pterocarpus marsupium*and unidentified tree	Minor	Roonwal and Chhotani, 1989
	Genus: *Neotermes* Holmgren				
4.	*N. assmuthi* Holmgren	Karnataka	*Ficus* sp., *Artocarpus heterophyllus, Mangifera indica*	Minor	Harris, 1961; Sen-Sarma *et al.* 1975; Roonwal, 1979; Bose, 1984; Roonwal and Chhotani, 1989
5.	*N. bosei* Snyder	Uttar Pradesh, West Bengal	*Ficus* sp., *Aceroblongum, Pterospermum acerifolium, Toona ciliata*, *Artocarpus lakoocha,Artocarpus heterophyllus, Mangifera indica*	Minor	Roonwal and Chhotani, 1989
6.	*N. buxensis* Roonwal & Sen-Sarma	West Bengal	*Macaranga denticulata*	Minor	Sen-Sarma *et al.,* 1975
7.	*N. dhirendrarai* Bose	Tamil Nadu	*Mangifera indica*	Minor	Bose, 1984
8.	*N. elenorae* Bose	Karnataka	*Mangifera indica*	Minor	Bose, 1984
9.	*N. fletcheri* Holmgren & Holmgren	Tamil Nadu	*Artocarpus heterophyllus, Mangifera indica and Moringa oleifera*	Minor	Sen-Sarma *et al.,* 1975; Roonwal, 1979; Bose, 1984; Roonwal and Chhotani, 1989
10.	*N. greeni* Desneux	Tamil Nadu	*Delonix regia, Moringa pterygosperma*	Minor	Chhotani, 1980
11.	*N. kalimpongensis* Maiti	West Bengal	*Ficus* sp.	Minor	Roonwal and Chhotani, 1989
12.	*N. keralai* Roonwal & Verma	Kerala	Unidentified wood	Minor	Bose, 1984
13.	*N. mangiferae* Roonwal & Sen Sarma	West Bengal	Dead branches of *Mangifera indica* and *Morus alba*	Minor	Sen-Sarma *et al.,* 1975
14.	*N. megaoculatus lakhimpuri* Roonwal &	Assam	*Artocarpus heterophyllus*	Minor	Sen-Sarma *et al.,* 1975

	Sen-Sarma				
15.	*N. microculatus* Roonwal & Sen-Sarma	Uttar Pradesh	Dead wood of *Salix alba*	Minor	Roonwal and Sen Sarma, 1960; Sen Sarma *et al.,* 1975
16.	*N. paratensis* Sen-Sarma & Thakur	Tripura	Standing branches of *Morus alba*	Minor	Sen-Sarma *et al.,* 1975
17.	*N. shimogensis* Thakur	Karnataka	Dead branches of *Mangifera indica*	Minor	Sen-Sarma *et al.,* 1975
	Genus: *Glyptotermes* Froggatt				
18.	*G. almorensis* Gardner	Uttar Pradesh	*Mangifera indica, Celtis australis, Rhododendron arboretum* and *Shorea robusta*	Minor	Roonwal and Chhotani, 1989
19.	*G. coorgensis* Holmgren & Holmgren	Karnataka	*Ficusre ligiosa,* *Grevillea robusta*	Minor	Roonwal and Sen-Sarma *et al.,* 1975; Roonwal, 1979; Bose, 1984; Roonwal and Chhotani, 1989
20.	*G. tripurensis* Thakur	Tripura	Dead branches of *Artocarpus chaplasha*	Minor	Sen-Sarma *et al.,* 1975
21.	*G. ukhiaensis* Akthar	West Bengal	*Syzigium* sp.	Minor	Roonwal and Chhotani, 1989
	Genus: *Incisitermes* Krishna				
22.	*I.didwanaensis* Roonwal & Verma	Rajasthan	Unknown wood	Minor	Roonwal, 1979
	Genus: *Bifiditermes* Krishna				
23.	*B. beesoni* Gardner	Haryana, Uttar Pradesh	*Zizyphus jujuba, Z. mauritiana* and *Mangifera indica*	Minor	Roonwal and Chhotani, 1989
24.	*B. pintoni* Kemner	Orissa	Unknown wood	Minor	Roonwal, 1979
	Genus: *Procryptotermes* Holmgren				
25.	*P. dhari* Roonwal and Chhotani	Tamil Nadu	Dead portions of *Albizia chinensis, Cassia siamea, Ficus palmata* and *Peltophorum pterocarpum*	Minor	Sen Sarma *et al.,* 1975; Bose, 1984
26.	*P. hunsurensis* Thakur	Karnataka	*Albizia chinensis, Cassia siamea* and *Ficus palmata*	Minor	Sen-Sarma *et al.,* 1975
27.	*P. valeriae* Bose	Tamil Nadu	*Ficus* sp.	Minor	Bose, 1984
	Genus: *Cryptotermes* Banks				
28.	*C. bengalensis* Snyder	Assam, Gujarat, Karnataka,	*Adina cordifolia, Artocarpus heterophyllus, Carapamo luccensis, Ficus benghalensis, Ficus palmata,*	Major	Sen-Sarma *et al.,* 1975; Roonwal and Chhotani, 1989

		Madhya Pradesh, Orissa, Tripura, West Bengal	*Mangifera indica, Shorea robusta*and wood works in buildings		
29.	*C. domesticus* Haviland	Kerala	Wood works in buildings	Major	Harris, 1961; Roonwal, 1979; Sen-Sarma *et al.,* 1975; Bose, 1984; Roonwal and Chhotani, 1989
30.	*C. dudeleyi* Banks	Karnataka, Kerala, Goa, Orissa, West Bengal	*Ficus religiosa, Mangifera indica, Erythrina indica, Herticra minor, Gmelina arborea, Carapa moluccensis* and *Heritiera minor*	Major	Harris, 1961; Roonwal, 1979; Sen-Sarma *et al.,* 1975; Bose, 1984; Roonwal and Chhotani, 1989
31.	*C. roonwali* Chhotani	Kerala	*Vateria indica*	Major	Sen-Sarma *et al.,* 1975; Roonwal, 1979; Bose, 1984; Roonwal and Chhotani, 1989
	Family: Rhinotermitidae Froggatt				
	Genus: *Coptotermes* Wasmann				
32.	*C. beckeri* Mathur & Chhotani	Tamil Nadu	Wood works in buildings	Major	Bose, 1984
33.	*C. ceylonicus* Holmgren	Andhra Pradesh, Kerala, Tamil Nadu	*Acacia* sp., *Albizia chinensis, Alerites* sp., *Camellia sinensis, Citrus piradisi,Cocos nucifera, Gliricidia sepium, Madhuca longifolia, Tamarindus indica*, *Theobroma cacao* and *Hevea brasiliensis*	Major	Harris, 1961; Roonwal, 1979; Sen-Sarma *et al.,* 1975; Bose, 1984; Roonwal and Chhotani, 1989
34.	*C. gestroi* Wasmann	Assam	Stump of unidentified wood	Major	Bose, 1999
35.	*C. heimi* Wasmann	Andhra Pradesh, Karnataka, Kerala	*Acacia leucophloea, Butea monosperma, Buchanania latifolia, Dipterocarpus indicus, Eucalyptus* sp., *Ficus* sp., *Mangifera indica, Pterocarpus marsupium, Santalum album, Shorea robusta, Terminalia bellirica, Terminalia crenulata, Mangifera indica, Tamarindus indica*, *Ficus* sp. and wooden material	Major	Harris, 1961; Harris and Nisse, 1971; Roonwal, 1979; Sen-Sarma *et al.,* 1975; Bose, 1984; Roonwal and Chhotani, 1989; Rathore and Bhattacharya, 2004; Premalatha et. al., 2010
36.	*C. kishori* Roonwal & Chhotani	Kerala, Madhya Pradesh, Rajasthan, Tripper, West Bengal	*Azadirachta indica, Bombax ceiba* and *Mangifera indica*	Major	Sen-Sarma *et al.,* 1975
37.	*C. travians* Haviland	Assam, Orissa, West Bengal	Wooden stumps, wood works in buildings	Major	Roonwal and Chhotani, 1989

	Genus: *Heterotermes* Foggatt				
38.	*H. balawanti* Mathur & Chhotani	Orissa, Karnataka	Wood works in buildings	Major	Sen-Sarma *et al.,* 1975
39.	*H. indicola* Wasmann	Jammu and Kashmir, Maharashtra, Uttar Pradesh	*Abies pindrow, Alnus nitida, Artocarpus lakoocha, Bombax ceiba, Carapa* sp. *Dalbergia sissoo, Flacourtia ramontchi, Lyonia ovalifolia, Pinus roxburghii, Pinus wallichiana, Quercus leucotrichophora, Terminalia alata,* wooden stumps, wood works in buildings	Major	Roonwal and Chhotani, 1989
40.	*H. malabaricus* Snyder	Andhra Pradesh, Karnataka, Kerala	*Eucalyptus* sp., *Ficus* sp., *Manihot glaziovii, Swietenia marcophylla, Shorea robusta, Anacardium occidentale,*Bamboo poles and stumps of Casuarina.	Major	Harris, 1961; Roonwal, 1979; Sen-Sarma *et al.,* 1975; Bose, 1984; Roonwal and Chhotani, 1989
	Genus:*Reticulitermes* Holmgren				
41.	*R. assamensis* Gardner	Arunachal Pradesh, Assam, Sikkim, West Bengal	Unidentified dead wood, *Pinus longifolia*	Minor	Roonwal and Chhotani, 1989; Maiti, 1983
42.	*R. saraswati* Roonwal & Chhotani	Meghalaya	Unknown	Minor	Roonwal, 1979
	Genus:*Parrhinotermes* Holmgren				
43.	*P khasiikhasii* Roonwa l& Sen-Sarma	Arunachal Pradesh, Meghalaya	Unknown	Minor	Roonwal, 1979
	Genus:*Schedorhonotermes* Silvestri				
44.	*S. elenorae* Roonwal & Bose	Andaman and Nicobar islands	Unknown	Minor	Roonwal, 1979
45.	*S. longirostris* Brauer	Andaman and Nicobar islands	Unknown	Minor	Roonwal, 1979
46.	*S. medioobscurus* Holmgren	Andaman and Nicobar islands	Unknown	Minor	Roonwal, 1979
47.	*S. tiwarii* Roonwal & Thakur	Andaman and Nicobar islands	Unknown	Minor	Roonwal, 1979

	Genus: *Prorhinotermes* Silvestri				
48.	*P. flavus* Bungion & Popoff	Karnataka	*Ficus benghalensis*	Minor	Bose, 1984
	Family : Stylotermitidae Holmgren and Holmgren				
	Genus: *Stylotermes* Holmgren and Holmgren				
49.	*S. beesoni* Thakur	Tripura	*Ficus* sp.	Minor	Sen-Sarma *et al.,* 1975
50.	*S. bengalensis* Mathur & Chhotani	Uttar Pradesh, Sub Himalayas, West Bengal	*Alnus nitida, Morus laevigata* and *Quercus* sp.	Minor	Sen-Sarma *et al.,* 1975
51.	*S. chakratensis* Mathur & Thapa	Sub Himalayas	Unknown	Minor	Roonwal, 1979
52.	*S. dunensis* Thakur	Uttar Pradesh	*Acer oblongum*	Minor	Sen-Sarma *et al.,* 1975
53.	*S. faveous* Chatterjee & Thakur	Himachal Pradesh	*Alnus nitida*	Minor	
54.	*S. fletcheri* Holmgren and Holmgren	Karnataka, Tamil Nadu	*Alnus nitida, Morus alba, M. laevigata, Quercus leucotrichophora, Rhododendron arboreum* and dead portions of *Mangifera indica*	Minor	Sen-Sarma *et al.,* 1975; Roonwal, 1979; Bose, 1984; Roonwal and Chhotani, 1989
	Family: Termitidae Westwood				
	Genus: *Synhamitermes* Holmgren				
55.	*S. quadriceps* Wasmann	Assam, Daman, Goa, Kerala, Maharashtra, Madhya Pradesh, Rajasthan, Tripura, West Bengal	*Madhuca longifolia*and *Pterocarpus marsupium*	Minor	Sen Sarma *et al.,* 1975
	Genus: *Microcerotermes* Silvestri				
56.	*M. annandalei* Silvestri	Rajasthan	Unknown	Minor	Roonwal, 1979
57.	*M. beesoni* Snyder	Assam, Delhi, Haryana, Madhya Pradesh, Orissa, Punjab, Uttar Pradesh, West Bengal	Roots of *Lyonia ovalifolia,* Roots of Unknown tree species	Minor	Sen-Sarma *et al.,* 1975; Sachin Kumar and Thakur, 2010
58.	*M. cameroni* Snyder	Andhra Pradesh, Karnataka, Kerala, Tamil Nadu	*Eucalyptus, Cassia fistula, Acacia catechu, Shorea robusta, Tectona grandis* and *Pterocarpus marsupium*	Minor	Roonwal, 1979; Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997

59.	*M. crassus* Snyder	Tripura	Dry stems of *Dalbergia* sp., *Shorea robusta* and green culms of bamboo	Minor	Sen-Sarma *et al.,* 1975
60.	*M. flecheri* Holmgren & Holmgren	Karnataka	*Cocos nucifera, Vateria indica* and bamboo wooden poles	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
61.	*M. heimi* Wasmann	Karnataka, Maharashtra	Dried roots of bamboo	Minor	Sen-Sarma *et al.,* 1975
62.	*M. labioangulatus* Sen-Sarma & Thakur	Andhra Pradesh, Tripura, Uttar Pradesh	*Eucalyptus* sp.	Minor	Sen Sarma *et al.,* 1975
63.	*M. minor* Holmgren	Karnataka	*Eucalyptus citriodora*	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
	Genus:*Macrotermes* Holmgren				
64.	*M. khajuriai* Roonwal & Chhotani	Assam, Tripura	Rotten stumps of unknown species	Minor	Sen-Sarma *et al.,* 1975
	Genus: *Odontotermes* Holmgren				
65.	*O. anamallensis* Holmgren & Holmgren	Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Tamil Nadu	Wooden beams in buildings	Minor	Sen-Sarma *et al.,* 1975
66.	*O. assmuthi* Holmgren	Karnataka, Kerala	*Ficus benghalensis, Vateria indica*	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
67.	*O. bellahunisensis* Holmgren & Holmgren	Andhra Pradesh, Karnataka	*Cocos nucifera, Eucalyptus* sp., and *Tectona grandis*	Minor	Roonwal, 1979; Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
68.	*O. bhagwatii* Chatterjee & Thakur	Karnataka	*Abies pindrow* and *Pinus roxburghii*	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
69.	*O. bruneus* Hagen	Karnataka	*Pterocarpus marsupium, Santalum album, Tectona grandis* and *Dalbergia sissoo*.	Minor	Harris, 1961, Sen Sarma *et al.,*1975; Bose, 1984; Chhotani, 1997 ; Sachin Kumar and Thakur, 2010
70.	*O. ceylonicus* Wasmann	Karnataka, Kerala, Tamil Nadu	*Ficus* sp.	Minor	Roonwal, 1979
71.	*O. distanus* Holmgren & Holmgren	Tamil Nadu	*Mangifera indica, Shorea robusta, Engelhardtia spicata, Pinus roxburghii, Shorea robusta, Syzygium nudiflora,* *Schima wallichii, Carica papaya*	Minor	Sen Sarma *et al.,* 1975 ; Sachin kumar and Thakur, 2010

			and wooden pole		
72.	*O. feae* Wasmann	Kerala	Crop orchards and forest trees such as *Butea monosperma, Dalbergia latifolia, Dipterocarpus indicus, Garuga pinnata, Gmelina arborea, Madhuca longifolia*,*Pterocarpus marsupium, Syzygium cumini, Tectona grandis, Terminalia crenulata* and *Eucalyptus* sp	Major	Harris, 1961; Sen-Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
73.	*O. giriensis* Roonwal & Chhotani	Arunachal Pradesh, Manipur, Meghalaya, Orissa Tripura, Uttar Pradesh	*Celtis australis* and *Dalbergia sissoo*	Minor	Sen-Sarma *et al.,* 1975; Sachin Kumar and Thakur, 2010
74.	*O. gurdaspurensis* Holmgren & Holmgren	Jammu and Kashmir	*Pinusroxburghii, Pinuswallichiana*and *Eucalyptus* sp.	Minor	Sen-Sarma *et al.,* 1975; Sachin Kumar and Thakur, 2010
75.	*O. horai* Roonwal & Chhotani	Madhya Pradesh, Meghalaya, Nagaland, Uttar Pradesh, West Bengal	*Dalbergia sissoo* a nd *Shorea robusta*	Minor	Sen-Sarma *et al.,* 1975
76.	*O. horni* Wasmann	Andhra Pradesh and Karnataka	*Eucalyptus* sp. and *Hevea brasiliensis*	Major	Harris, 1961; Sen Sarma *et al.,*1975; Bose, 1984; Chhotani, 1997
77.	*O. kapuri* Roonwal & Chhotani	Meghalaya, Tripura, West Bengal	Wood logs of unknown species	Minor	Sen-Sarma *et al.,* 1975
78.	*O. microdentatus* Roonwal & Sen-Sarma	Andhra Pradesh, Karnataka, Madhya Pradesh, Uttar Pradesh	*Shorea robusta, Terminalia alata, Pterocarpus marsupium, Pinus roxburghii* and *Eucalyptus* sp.	Minor	Sen-Sarma *et al.,* 1975
79.	*O. obesus* Rambur	South India	*Abies pindrow, Bamboo* sp. *Cassia fistula Calophyllum* sp., *Eucalyptus* sp., *Ficus benghalensis, Garuga pinnata, Pinus wallichiana*and *Shorea robusta*	Major	Harris, 1961; Sen Sarma *et al.,*1975; Bose, 1984; Chhotani, 1997 ; Sachin Kumar and Thakur, 2010
80.	*O. parvidens* Holmgren & Holmgren	Northern estern India	*Eucalyptus citriodora* and *E. tereticornis*	Minor	Roonwal, 1979
81.	*O. redemanni* Wasmann	Andhra Pradesh, Karnataka	*Acacia* sp., *Shorea robusta, Mangifera indica, Artocarpus hirsutus, Cassia siamea, Dalbergia latifolia, Pterocarpus marsupium, Terminalia coriacea, Ficus*	Major	Harris, 1961; Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997 ; Sachin Kumar and Thakur, 2010

			religiosa		
82.	*O. wallonensis* Wasmann	Karnataka	*Boswellia serrata Eucalyptus* sp., *Pterocarpus marsupium, Pterocarpus santalinus, Cassia siamea, Dalbergia latifolia, Syzygium cumini* and *Tectonagrandis*	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
	Genus: Hypotermes Holmgren				
83.	*H. obscuricep* Wasmann	Southern and north eastern India	Rotten stumps of *Gmelina arborea,* Barkof *Tectona grandis*, *Albizia* sp.	Minor	Sen-Sarma *et al.,* 1975
	Genus: *Microtermes* Wasmann				
84.	*M. incertoides* Holmgren	Andhra Pradesh, Karnataka, Tamil Nadu	*Butea monosperma, Ficus benghalensis, Madhuca longifolia, M. latifolia, Emblica officinalis, Pterocarpus marsupium, Shorea robusta, Tectona grandis, Terminalia bellirica* and *T. alata*	Minor	Sen Sarma *et al.,* 1975; Chhotani, 1997
85.	*M. mycophagus* Desneux	Rajasthan, Delhi, Haryana, Punjab	*Dalbergia sissoo, Ficus religiosa, Mangifera indica, Morus alba*, *Platanus orientalis* and Inside lying wood	Minor	Sen Sarma *et al.,* 1975; Sachin Kumar and Thakur, 2010
86.	*M. obesi* Holmgren	Karnataka, Tamil Nadu, Kerala	*Gliricidia* sp., *Bombax ceiba, Nyctanthes arboritis, Eucalyptus* sp., *Ficus* sp., *Tamarindus indica, Tectona grandis, Anthocephalus chinensis, Dalbergia sisso, Gmelina arborea* and *Shorea robusta*	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997; Sachin Kumar and Thakur, 2010
	Genus: *Nasutitermes* Dudely				
87.	*N. anamallensis* Snyder	Karnataka	*Albizia* sp.	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
88.	*N. brunneus* Snyder	Karnataka, Tamil Nadu, Kerala	*Pterocarpus marsupium, Vateria indica* and *Tectona grandis*	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
89.	*N. crassicornsis* Holmgren & Holmgren	Karnataka	Unidentified wood log	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
90.	*N. fletcheri* Holmgren & Holmgren	Tamil Nadu	Fallen log of *Alstonia scholaris*	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
91.	*N. indicola* Holmgren & Holmgren	Karnataka	Stump of *Vateria indica*	Minor	Sen Sarma *et al.,* 1975; Bose, 1984; Chhotani, 1997
92.	*N. jalpaigurensis* Prasad & Sen Sarma	West Bengal, Tripura	*Vitex peduncularis*	Minor	Sen-Sarma *et al.,* 1975

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