

AFFINITIES OF INDIAN NORTH-EASTERN BORDERLAND  
TERMITES WITH THOSE FROM OTHER PARTS  
OF THE ORIENTAL REGION

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INTRODUCTION

The North-Eastern borderland of the Indian subcontinent includes Assam, Meghalaya, Arunachal Pradesh, Manipur, Nagaland, Mizoram and Tripura in India and also Bangladesh, Bhutan and northern Burma. It lies approximately between 88°-98°E longitudes and 22°-29°N latitudes. This region is mainly covered with hills and mountains except for the Brahmaputra Valley in Assam, the eastern extension of the Gangetic Plains into Bangladesh and Tripura and the Chindwin and Irrawaddy Valleys in northern Burma. In North it is bounded by eastern Himalayas which curve southwards into Patkai, Naga and Chin Hills in north-south direction, separating India and Burma and extending into the Arakan Yomas in Burma and in its south is the Bay of Bengal. The valleys are fertile, otherwise most of the region is covered with evergreen forests. The central part has Garo and Khasi Hills running in East-west direction in India. The climate of the region is humid tropical and the annual rainfall varies with the situation from approximately, 1250-6500 mm with the highest rainfall in the world received at Cherrapunji (10,625 mm) in Meghalaya, India.

TERMITES OF NORTH-EASTERN BORDERLAND

(Table 1)

The Isoptera of this part has been studied rather extensively during the last few years. The more important works are those of Silvestri (1914), Gardner (1944), Roonwal and Chhotani (1959-1962), Mathur and Thapa (1965), Chhotani (1975, 1976), Sen-Sarma and Thakur (1979), Chhotani and Das (1983) and Chhotani and Bose (1985) on the Assam region (India); of Akhtar (1975) on Bangladesh; of Roonwal and Chhotani (1977) on Bhutan; and of Krishna (1965) on Burma. The studies by these workers brought to light as many as 109 species belonging to 32 genera distributed in the families Kalotermitidae (3 genera, 14 species), Rhinotermitidae (6 genera, 13 species), Stylotermitidae (1 genus, 2 species), Termitidae (21 genera, 77 species) and

TABLE 1. Number of species of different genera found in Indian North-eastern Borderland and of those endemic and common to Indian subregion and other parts of Oriental region

Genus	No. of species											Remarks
	Total	Endemic	Common with other parts of Indian subregion					Common with other parts of Oriental region				
			Indian subregion	Eastern	N-W Belt	Andaman & Nicobar	Southern	Oriental region	Indo-Chinese subregion	Chinese subregion	Malayan subregion	
1	2	3	4	5	6	7	8	9	10	11	12	
<b>Fam. Kalotermitidae</b>												
1. <i>Neotermes</i>	6	4	—	—	1	—	1	—	—	—	—	—
2. <i>Glyptotermes</i>	6	5	—	—	—	—	1	—	—	—	—	—
3. <i>Cryptotermes</i>	2	—	1*	—	—	—	—	1*	—	—	—	—
*Also occur in other regions												
<b>Fam. Rhinotermitidae</b>												
4. <i>Coptotermes</i>	4	1	1	1	—	—	—	1	—	—	—	—
5. <i>Heterotermes</i>	1	—	1	—	—	—	—	—	—	—	—	—
6. <i>Reticulitermes</i>	4	3	—	—	—	—	—	—	—	1	—	—
7. <i>Prorhinotermes</i>	1	—	—	—	—	1	—	—	—	—	—	—
8. <i>Parrhinotermes</i>	1	—	—	—	—	—	—	—	—	1	—	—
9. <i>Schedorhinotermes</i>	2	—	—	—	—	—	—	—	—	—	2	—
<b>Fam. Stylotermitidae</b>												
10. <i>Stylotermes</i>	2	2	—	—	—	—	—	—	—	—	—	—
<b>Fam. Termitidae</b>												
11. <i>Anoptotermes</i>	1	1	—	—	—	—	—	—	—	—	—	—
12. <i>Euhamitermes</i>	5	3	1	—	—	—	—	1	—	—	—	—

TABLE 1. (Concluded)

	1	2	3	4	5	6	7	8	9	10	11	12
13. <i>Synhamitermes</i>	1	—	1	—	—	—	—	—	—	—	—	—
14. <i>Microcerotermes</i>	6	3	—	—	1	—	—	—	2*	2*	—	*Common to both subregions
15. <i>Angulitermes</i>	3	3	—	—	—	—	—	—	—	—	—	—
16. <i>Dicuspiditermes</i>	2	2	—	—	—	—	—	—	—	—	—	—
17. <i>Pericapritermes</i>	6	2	1	—	1	—	—	2	—	—	—	—
18. <i>Pseudocapritermes</i>	1	1	—	—	—	—	—	—	—	—	—	—
19. <i>Procapritermes</i>	1	1	—	—	—	—	—	—	—	—	—	—
20. <i>Mirocapritermes</i>	2	2	—	—	—	—	—	—	—	—	—	—
21. <i>Malaysiocapritermes</i>	1	1	—	—	—	—	—	—	—	—	—	—
22. <i>Macrotermes</i>	5	4	—	—	—	—	—	—	1*	1*	—	*Common to both subregions
23. <i>Odontotermes</i>	18	7	6	—	2	—	—	—	2+	2+	1	+same species
24. <i>Hypotermes</i>	3	1	—	—	—	—	1	—	1°	—	1°	°same species
25. <i>Microtermes</i>	3	1	2	—	—	—	—	—	1@	—	—	@Common also to Indian subregion
26. <i>Ancistrotermes</i>	1	—	—	—	—	—	—	1	—	—	—	—
27. <i>Bulbitermes</i>	4	3	—	—	—	—	—	—	1	—	—	—
28. <i>Ahmaditermes</i>	1	1	—	—	—	—	—	—	—	—	—	—
29. <i>Hospitalitermes</i>	4	1	—	—	—	—	—	—	3	—	—	—
30. <i>Nasutitermes</i>	8	8	—	—	—	—	—	—	—	—	—	—
31. <i>Aciculitermes</i>	1	1	—	—	—	—	—	—	—	—	—	—
Fam. Indotermitidae												
32. <i>Indotermes</i>	3	2	—	—	—	—	—	—	1	—	—	—

Indotermitidae (1 genus, 3 species). The number of species known under each of the 32 genera and of those which are endemic or common with India and other parts of Oriental region is given in table 1. The families Mastotermitidae, Termopsidae, Hodotermitidae and Serritermitidae are not represented.

The family Kalotermitidae is known by genera *Neotermes*, *Glyptotermes* and *Cryptotermes*. They are all dry-wood termites and of the six species of *Neotermes*, 4 are endemic to this part, one extends in distribution to North-West to Dehra Dun (U. P., India) and one is common with that from southern India. *Glyptotermes* is represented by 5 endemic forms and one form common with southern India, and *Cryptotermes*, which are easily transportable, by two very widely distributed species known also from other zoogeographical regions.

Rhinotermitidae, also wood infesting termites, are represented by six genera and 13 species. Of the 4 *Coptotermes* species, one is endemic, one common with the rest of the Indian subcontinent, one common with eastern India and the remaining portion of the Oriental region, and one extends to eastern India. *Heterotermes*, reported only by a single species (*H. indicola*) from Bangladesh, is also very wide-spread in the Indian region above 16° latitude and extends through Pakistan to Afghanistan. *Reticulitermes* is known from this part by 4 species restricted to colder regions, 3 being endemic and one common with China. This genus is very well represented in China and extends in its distribution only into this part of the Indian subcontinent. *Prorhinotermes* and *Parrhinotermes* are reported by a single species each. The species of the former genus is from southern coastal Bangladesh and is common with that of the Andaman Islands and that of the latter genus from Meghalaya and Arunachal Pradesh, is common with China. *Schedorhinotermes* is known by 2 species both of which are common with those from the Malayan subregion.

Styloptermitidae (genus *Styloptermites*) is known by 2 endemic species. The genus, however, is mainly Chinese and extends in its distribution along the base of Himalayas to North-West Himalayas with one species reported from southern India.

Termitidae is represented by 77 species belonging to 21 genera. *Anoplotermes* known by a single species is recorded by Roonwal and Chhotani (1959) from Meghalaya. *Euhamitermes* with 5 species, has 3 endemic forms and one common with central India and one with remaining parts of the Oriental region. The single species of *Synhamitermes* is common with the rest of the Indian continent. *Microcero-termes* with 6 species has 3 endemics, one extending in distribution to

N-W Himalaya, and two (same species) are common with Indo-Chinese and Chinese subregions. The species of *Angulitermes* (3), *Dicuspiditermes* (2), *Pseudocapritermes* (1), *Procapritermes* (1), *Mirocapritermes* (2) and *Malaysiocapritermes* (1) are all endemics and of the 6 *Pericapritermes* 2 are endemics, one extending in distribution westwards upto Central India and one upto Dehra Dun (N-W Himalaya) and 2 are common with the remaining portion of the Oriental region East of this part. Of the genus *Macrotermes*, 4 species are endemic and one is common to this and Indo-Chinese subregions. *Odontotermes* is the most predominant genus with 18 species, of which 7 being exclusive to this part, 6 common with remaining portion of the whole of the Indian subregion (2 extending in distribution westwards along base of Himalaya), one to be found almost throughout the Oriental region except the Chinese and Malayan subregions, one each is common with Chinese and Malayan subregions and one with Chinese and Indo-Chinese subregions. *Hypotermes* (3 species) is represented by a species endemic to this part, a species common with southern India and Sri Lanka and another, the third species, is widespread to East of this part in the Oriental region. *Microtermes* also with 3 species has one endemic, one common with rest of Indian subregion and one well spread all over the oriental region except in the Malayan and Chinese subregions. *Ancistrotermes* with a single species is known only from this part of the Indian subregion but otherwise is wide spread in the remaining portion of the Oriental region. Of the nasute termites, *Bulbitermes* with 4 species, has 3 endemics and a species common with Indo-Chinese subregion (Thailand); *Ahmaditermes* with a single endemic species; *Hospitalitermes* with one endemic and 3 common to this part and Thailand; and *Nasutitermes* has 8 endemics.

Indotermitidae with the single genus *Indotermes*, is known by 3 species, all exclusive to this part.

#### ZOOGEOGRAPHY AND AFFINITIES

The Oriental zoogeographical region has been divided into four subregions, i. e. Indian (India, Sri Lanka, Pakistan, Bangladesh Bhutan, Nepal and Burma), Indo-Chinese (Thailand, Laos, Kampuchea and Vietnam), Chinese (Southern China and Taiwan) and Malayan (Malaysia, Singapore, Indonesia and the Philippines), for showing affinities and distribution of the genera found in the North-eastern borderland of the Indian sub-continent (Table 2).

Of the 21 Kalotermitid genera known from the world and 9 from Oriental Region only 3 primarily cosmopolitan genera are reported.

The Rhinotermitidae, known by 13 genera from all over the world, is represented by the cosmotropical *Coptotermes* and *Heterotermes*, the essentially palaeartic *Reticulitermes*, the mainly oriental *Parrhinotermes*, the generally insular and mainly oriental *Prorhinotermes* and *Schedorhinotermes* which is mainly Oriental but is also reported from the Australian, Papuan and Ethiopian regions. The highly competitive and successful genus *Coptotermes* is very common. *Heterotermes*, otherwise well established in the Indian subregion, is reported only from Khulna in Bangladesh and forms the easternmost limit of distribution of the species *H. indicola*. *Parrhinotermes* is found only in this part and its absence in the main Indian subcontinent shows the western-most limit of this mainly Oriental genus which is otherwise quite well known in the malayan subregion. *Prorhinotermes* confined to islands and coastal regions, has a species reported only from southern coastal Bangladesh and is common with that of Andaman Islands. *Schedorhinotermes* has two species common with the Malayan subregion ; it is supposed to have evolved in the Oriental region but its absence from the intervening main Indian subcontinent and presence again in the Ethiopian region is puzzling.

Of the 21 genera of Termitidae found in this part, *Anoplotermes* is confined to this part and *Euhamitermes*, endemic to the Oriental region, is reported from all the four subregions. The record of *Synhamitermes*, which is endemic to the Indian subregion, shows the easternmost limit of the genus. *Microcerotermes* which is well established all over the tropics, *Angulitermes* and *Pericapritermes* which are wide spread in the Oriental and Ethiopian regions and the Oriental genera *Dicuspiditermes*, *Procapritermes*, *Pseudocapritermes*, *Mirocapritermes* and *Malaysiocapritermes* are expected to occur. But a number of genera such as *Eurytermes*, *Speculitermes*, *Dooaitermes* known from India and also a number of very common genera such as *Globitermes*, which is well established in the Indo-Chinese and Malayan subregions, *Amitermes* which has a wide distribution in the Australian and Ethiopian regions and also reported from N-W India and the Indo-Chinese and Malayan subregions, and *Homalotermes* known from the Malayan and Chinese subregions and southern India, are not to be found here. *Macrotermes* common here and in the East of this part and the Ethiopian zoogeographical region with a species reported from southern India and the eastern coast of Orissa (India) is absent in the remaining portion of the Indian subcontinent, it is rather anomalous in distribution and same is true of *Ancistrotermes* as it is found here and in further East and in the Ethiopian Region. *Odontotermes* and *Microtermes*, well represented both in the Oriental and Ethiopian zoogeographical regions, are widespread all

TABLE 2. Distribution of Indian North-eastern Borderland termites in different subregions of Oriental Region

Genus	Subregions of Oriental Region				Remarks
	Indian	Indo-Chinese	Chinese	Malayan	
1	2	3	4	5	6
<b>Fam. Kalotermitidae</b>					
1. <i>Neotermes</i>	+	+	+	+	
2. <i>Glyptotermes</i>	+	+	+	+	
3. <i>Cryptotermes</i>	+	+	+	+	
<b>Fam. Rhinotermitidae</b>					
4. <i>Coptotermes</i>	+	+	+	+	
5. <i>Heterotermes</i>	+	—	—	+	
6. <i>Reticulitermes</i>	+	—	+	—	In Indian subregion only N-E borderland
7. <i>Prorhinotermes</i>	+	+	+	+	In Indian subregion in southern India, Andaman & Nicobar Isls. and Sri Lanka also
8. <i>Parrhinotermes</i>	+	—	+	+	In Indian subregion only in N-E borderland
9. <i>Schedorhinotermes</i>	+	+	+	+	Do : and Andaman & Nicobar Isls
<b>Fam. Stylotermitidae</b>					
10. <i>Stylotermes</i>	+	—	+	+	In Indian subregion in N-W India and southern India also
<b>Fam. Termitidae</b>					
11. <i>Anoplotermes</i>	+	—	—	—	In Indian subregion only in N-E borderland
12. <i>Euhamitermes</i>	+	+	+	+	
13. <i>Synhamitermes</i>	+	—	—	—	
14. <i>Microcerotermes</i>	+	+	+	+	
15. <i>Angulitermes</i>	+	—	—	—	
16. <i>Dicuspiditermes</i>	+	+	+	+	
17. <i>Pericapritermes</i>	+	+	+	+	
18. <i>Pseudocapritermes</i>	+	+	—	+	In Indian subregion in southern India also
19. <i>Procapritermes</i>	+	—	+	+	In Indian subregion only in N-E borderland
20. <i>Mirocapritermes</i>	+	+	+	+	—Do—
21. <i>Malaysiocapritermes</i>	+	+	—	+	--Do—
22. <i>Macrotermes</i>	+	+	+	+	In Indian subregion in southern India and east- ern coastal Orissa also

TABLE 2. (Concluded)

1	2	3	4	5	6
23. <i>Odontotermes</i>	+	+	+	+	
24. <i>Hypotermes</i>	+	+	+	+	In Indian subregion in southern India and Sri Lanka also
25. <i>Microtermes</i>	+	+	—	+	
26. <i>Ancistrotermes</i>	+	+	+	+	In Indian subregion only in N-E borderland
27. <i>Bulbitermes</i>	+	+	—	+	—Do—
28. <i>Ahmaditermes</i>	+	+	+	—	—Do—
29. <i>Hospitalitermes</i>	+	+	+	+	In Indian region in Andaman & Nicobar Islands, southern India and Sri Lanka also
30. <i>Nasutitermes</i>	+	+	+	+	
31. <i>Aciculitermes</i>	+	+	—	+	In Indian region only in N-E borderland
Fam. Indotermitidae					
32. <i>Indotermes</i>	+	+	+	—	In Indian region only in N-E borderland

through the Orient. *Hypotermes* is found here and in East of this part and in southern India and Sri Lanka but is absent in the remaining part of the Indian subregion, this is an another anomaly in distribution.

This part of the Indian subcontinent is the westernmost limit of *Bulbitermes*, *Ahmaditermes* and *Aciculitermes*. *Nasutitermes*, a cosmopolitan genus, is of course expected to be found and the *Hospitalitermes* distribution in the Indian subregion is somewhat similar to that of *Hypotermes*. A number of nasute genera found in the Indo-Chinese and Malayan subregion have restricted distributions and do not occur here.

The Indotermitidae is known from this part, Thailand and Yunnan and Hainan (southern China) and is essentially Oriental.

#### DISCUSSION

From the above data of distribution it is observed that none of the genera are endemic to the North-eastern Borderland of the Indian region; out of the 109 species recorded as many as 63 (i. e. 57.8 per cent) are endemic. In respect of the termite fauna of remaining part of the Indian subcontinent, 14 species are common to rest of the Indian subregion, 2 to eastern India, 5 to North-West belt along base of Himalaya, one to the Andaman Islands and 3 to southern India, alone



and in respect of the remaining parts of the Oriental zoogeographical region, 6 species are common to whole of the region, 12 to Indo-Chinese, 7 to Chinese and 4 to Malayan, subregions. The absence of *Schedorhinotermes* (Rhinotermitidae) and *Ancistrotermes* (Termitidae : Macrotermitinae) in the remaining parts of the Indian subregion and the absence of *Homalotermes*, *Pseudocapritermes* and *Procapritermes* (Termitidae : Termitinae), *Macrotermes* and *Hypotermes* (Termitidae : Macrotermitinae) and *Hospitalitermes* (Termitidae : Nasutitermitinae) in the remaining portion of the Indian subregion except southern India and also Sri Lanka and the presence especially of *Homalotermes*, *Pseudocapritermes* and *Procapritermes* in the western portion of southern India are some of the anomalies in the distribution of these genera. In explanation of this, it may be mentioned that *Schedorhinotermes* and *Macrotermes* had a continuous distribution through the Indian subcontinent to the Ethiopian zoogeographical region, and *Homalotermes*, *Pseudocapritermes*, *Procapritermes*, *Hypotermes* and *Hospitalitermes* got distributed through this part to southern India and including Sri Lanka for *Hypotermes* and *Hospitalitermes*. It may be inferred that this North-eastern Boderland has been an important passage for to and fro transit of termites and that the flow of fauna has been through this part and in two directions one along the base of Himalaya and the other southwards ; similarly from North-West some elements diverged southwards and some through this passage further East and South-east as suggested by Kurup (1974) for mammals and Mani (1974).

Chhotani (1975a, 1977 and in press) has discussed the origin and distribution of Oriental genera in some detail. It may, however, be added that the present-day distribution suggests a probable continuity of tropical rain-forest conditions and that the discontinuous distribution is due to subsequent ecological changes. Since a number of genera and species are endemic to this part and further South-East, this region can be termed as a favourable seat of evolution for termites. High degree of endmicity, indicative of high rate of speciation, as suggested by Roonwal & Chhotani (1965) for termites of Assam region, is due to (i) favourable ecological conditions i. e., dense evergreen forests and (ii) low migration pressure due to ecological discontinuity to the West of this region and high ranges and valleys which restrict the movement of certain termites cutting them into small and medium sized populations confind to some pockets.

#### SUMMARY

The North-eastern borderland of the Indian subcontinent includes the north-eastern states in the Indian Union and also Bangladesh,

Bhutan and northern Burma. Termites of this part are known by 109 species belonging to 32 genera distributed in the families Kalotermitidae, Rhinotermitidae, Stylotermitidae, Termitidae and Indotermitidae. The distribution and zoogeography of these termites and their affinities with those from the other parts of the Oriental zoogeographical region are discussed. It is suggested that through this part of the Indian sub-continent there has been to and fro transit of termites, that this part and the area further East and South-east of it can be termed as a favourable seat of evolution for termites since a number of species and genera are endemic to this region and that discontinuous distribution of certain genera is due to subsequent changes.

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