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Distribution and Zoogeography of Oriental Termitidae (Isoptera)

(With one Table and 8 Figures)

Introduction

Extensive work on the termite fauna of the Oriental zoogeographical region has been carried out by various authorities, adding to our present day knowledge, since EMERSON (1955) gave an account of the distribution, zoogeography and origin of the termites of the world. CHHOTANI (1975) dicussed these aspects of the Oriental Kalotermitidae and (1977 and 1985) of the Oriental Termopsidae, Hodotermitidae, Stylotermitidae and Rhinotermitidae. The present paper dealing with these aspects of the Oriental Termitidae, in the light of WEGENER's hypothesis of Continental Drift, is third and last of the series.

Distribution of Oriental Termitidae

The Oriental zoogeographical region, comprising essentially the tropical Asia, includes the Indian subcontinent, Indo-China, Malaysia, Indonesia, the Philippines, Taiwan and Southern China.

The family Termitidae, in this region, is known by four subfamilies viz., Apicotermitinae, Termitinae, Macrotermitinae and Nasutitermitinae. In all 527 species belonging to 57 genera are so far reported from the region and distributed as follows:

Subfamily Apicotermitinae

GRASSÉ and NOIROT (1954) proposed the name Apicotermitinae to include the genus *Apicotermes* erstwhile placed in the subfamily Termitinae. SANDS (1972), while working on the soldierless termites of Africa, treated Amitermitinae as a junior synonym of Termitinae and assigned the Amitermitine genera to either Apicotermitinae or Termitinae on the basis of his study of the gut structure. He (SANDS, 1972) recognised two branches of this subfamily i.e., the *Apicotermes*-branch, and the *Anoplotermes*-branch. The oriental Apicotermitinae is presently known by 29 species belonging to the genera, *Eurytermes*, *Euhamitermes*, *Speculitermes* and *Doonitermes*, all of which are assigned to the *Anoplotermes*-branch. The genus *Anoplotermes*, according to SANDS (1972) is confined to the Neotropical region and as the reported occurrence of *Anoplotermes shillongensis* by ROONWAL and CHHOTANI (1960), in the Indian region, needs further examination, the genus has not been included in the present work. Due to the controversy in respect of assignment of *Indotermes* ROONWAL & SEN-SARMA to either Termitidae or Indotermitidae, this genus has also not been taken into account.

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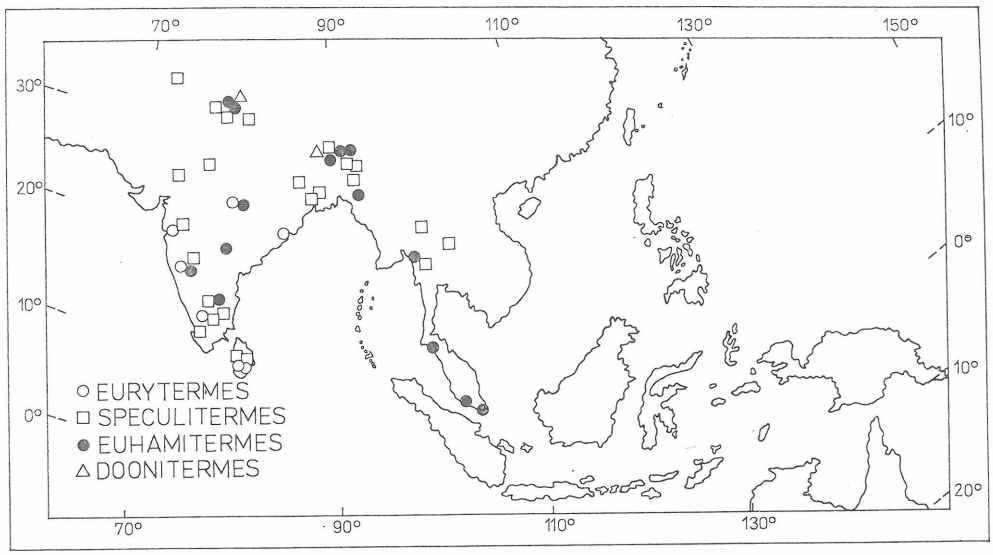

Fig. 1. Map of the Oriental region, showing the distribution of the genera *Eurytermes*, *Speculitermes*, *Euhamitermes* and *Doonitermes* (Subfamily Apicotermitinae).

The genus *Eurytermes* with its six species is endemic to the Indian subregion and is confined to Peninsular India (5 species) and Sri Lanka (one species). *Speculitermes* with 12 species (2 in press) has been reported from India (11 species; 8 endemic and 3 common with other parts), Bhutan, Pakistan, Sri Lanka and Burma (one species each, common with those from India) and Thailand (2 species; one common with India and one endemic); the species of this genus reported from South America have now been assigned to *Ruptitermes* MATHEWS (MATHEWS, 1977; ARAUJO, 1977), as such *Speculitermes* is endemic to the Oriental region. *Euhamitermes*, represented by 9 species, is known from India (6 species; 5 endemic and one common with Bangla Desh), Bhutan (2 endemic species), Bangla Desh (2 species; one common with India and the other i. e., *hamatus* HOLMGREN, with other parts of the region) and Burma, Malaysia, Singapore, Thailand and China (one same species each, i. e., *hamatus*). *Doonitermes* (2 species) is endemic to India and is reported from Uttar Pradesh (Dehra Dun) and West Bengal. All these four genera are endemic to the Oriental region.

Subfamily Termitinae

This subfamily is represented, in the Oriental region, by 24 genera and 166 species as follows: — The genera *Protohamitermes* and *Orientotermes* (soldierless genera) are recorded by one species each from Sarawak and Sabah; *Prohamitermes* by 3 species, two from Sarawak and Sabah and the third from Singapore, Sarawak and East Sumatra; *Labritermes* by three species from Malaya, Singapore, Sarawak and Sumatra; *Globitermes* by 3 species, one each from Sarawak and East Java and one (i.e., *G. sulphurus* (HAVILAND), a very widely distributed species in the Oriental region) from Malaysia, Kampuchea, Vietnam, Burma, Thailand and China; *Pseudhamitermes* by a single species from Kampuchea; *Amitermes* by 5 species, one from India (common with that from Pakistan), 3 from Pakistan (one common with India and two endemic), 2 from Thailand (one endemic and one i.e., *dentatus* (HAVILAND) common with different

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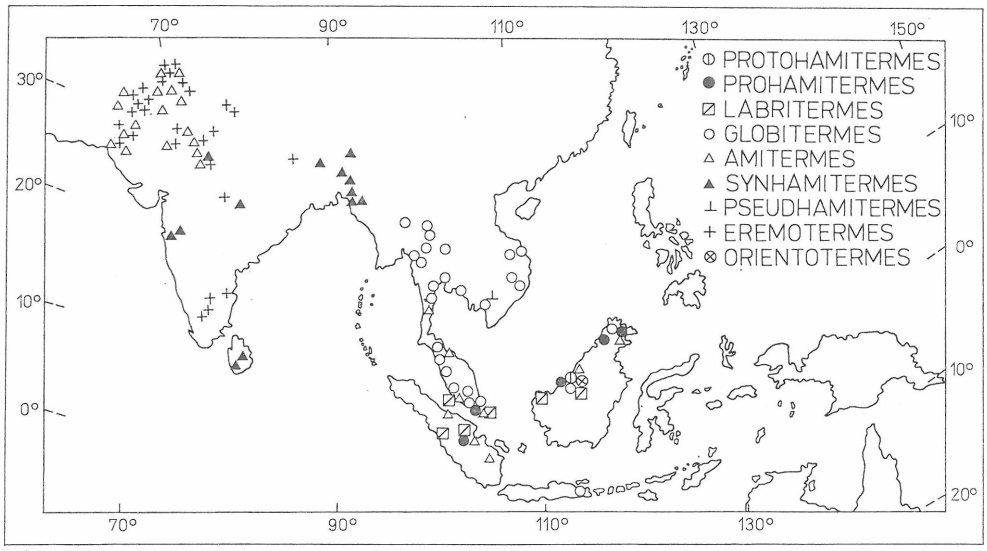

Fig. 2. Map of the Oriental region, showing the distribution of genera *Protohamitermes*, *Prohamitermes*, *Labritermes*, *Globitermes*, *Amitermes*, *Synhamitermes*, *Pseudhamitermes* and *Eremotermes* (Subfamily Termitinae).

parts), the species *dentatus* being widely distributed and reported from Sarawak, Sabah, Malacca, Singapore and Sumatra; *Synhamitermes* by 3 species, one from India and two from Sri Lanka; and *Eremotermes* by 6 species, 5 from India (3 endemic and 2 common with Pakistan) and 3 from Pakistan (one endemic and 2 common with India). The genus *Microcerotermes* is a very wide spread genus in the Oriental region and is represented by 42 species. As many as 18 species are reported from India, 10 from Pakistan, 3 from Sri Lanka, 2 each from Bangla Desh, Burma, the Philippines and China, one from Bhutan, 6 from Thailand, and 8 from Malaysia and Indonesia. Of these, 10 are endemic to India, 7 to Pakistan, 2 each to Sri Lanka and the Philippines, 3 to Thailand and one each to Burma, Salawesi, Durian Archipelago, Madura Island (E. Java), Kalimantan and Sabah. The species *M. beesoni* SNYDER is widely distributed in the Indian subcontinent and *crassus* SNYDER and *distans* (HAVILAND) in other parts of the region. *Angulitermes*, known by 15 species, is reported from India (10 species, 9 endemic and one common with Pakistan), Pakistan (3 species, 2 endemic and one common with India) and Burma (2 endemic species). *Termes* (11 species) is reported by 2 species each endemic to Thailand and Sabah and one each endemic to Sri Lanka and Sarawak, the genus is, however, recorded by 4 species from Thailand, one each (same species) from Burma and China, 3 each from Sabah and Sumatra, 4 from Sarawak and 2 from Singapore.

The *Capritermes*-complex, comprising asymetrically mandibulate genera, is represented by 12 genera and 72 species, thus: *Homallotermes* by 4 species, two from Sarawak and Sabah, one from Malacca, Perak, and Sumatra, one from India and one from China (Hainan Isl., Yunnan, Kwangsi); *Dicuspiditermes* by 16 species, of which 7 endemics occur in India, 2 endemics in Sri Lanka, one in Bangla Desh (common with that from Burma and Thailand), one in Burma (common with that from Bangla Desh and Thailand), two in Thailand (one common with that from Bangla Desh and Burma and one endemic), 3 in Sabah (one endemic and 2 common with other parts), one endemic in Vietnam, one in Malacca, Sarawak, Kalimantan, Sumatra and Singapore

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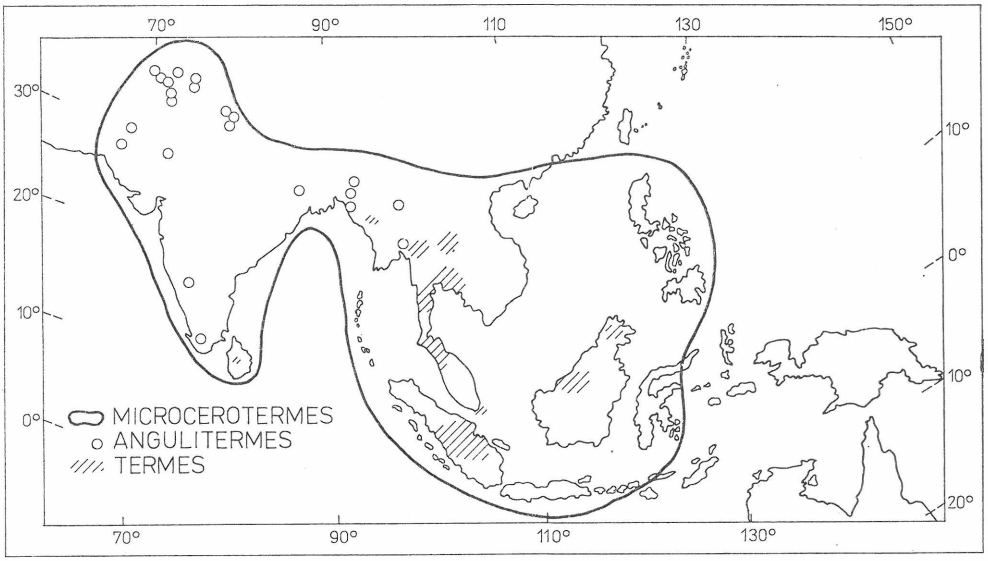

Fig. 3. Map of the Oriental region, showing the distribution of genera *Microcerotermes*, *Angulitermes* and *Termes* (Subfamily Termitinae).

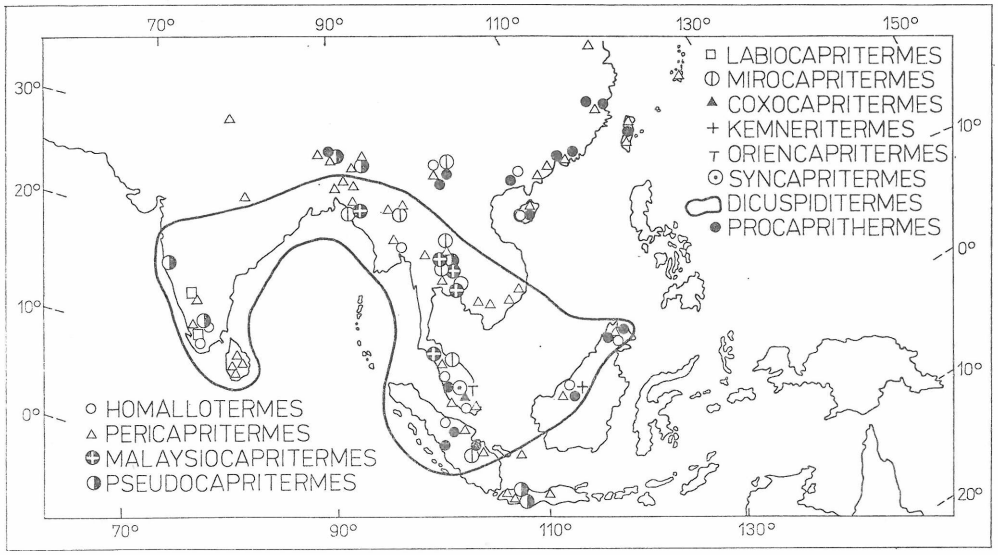

Fig. 4. Map of the Oriental region, showing the distribution of genera *Dicuspiditermes*, *Procapritermes*, *Homallotermes*, *Pericapritermes*, *Labiocapritermes*, *Mirocapritermes*, *Coxocapritermes*, *Kemneritermes*, *Malaysiocapritermes*, *Oriencapritermes*, *Syncapritermes* and *Pseudocapritermes* (Subfamily Termitinae).

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and one in Sumatra and Riouw Archipelago, the species *D. punjabensis* (HOLMGREN and Holmgren) reported from Lyallpur (Pakistan) does not belong to this genus, it is probably an *Angulitermes* sp. but needs further study; and *Pericapritermes* by 18 species, of which 2 are endemic to India and one each endemic to Java, Sumatra, Sabah, the Philippines and Hongkong, the remaining species have somewhat wider range of distribution in the region. The genus *Pseudocapritermes* KEMNER was treated as a synonym of *Procapritermes* HOLMGREN by KRISHNA (1968) but recently AHMAD and AKHTAR (1981) have re-established it and have also described some more genera, assigning some of the species described or recognised by KRISHNA (1968) under the genus *Procapritermes* to either *Pseudocapritermes* or their *Malaysiocapritermes* and *Syncapritermes*. More recently some more species have also been described under *Procapritermes* and these in this contribution have been kept as such until further study. Thus, *Procapritermes* is recognised by 14 species which are known from Bhutan (one species), Malaysia, (Sarawak, Sabah, Selangor and Malacca, 7 species, of these 2 are common with those from Sumatra), Indonesia (Sumatra, 2 species, both common with those from Malaysia) and China (Yunnan, Kwangtung, Fukien, Hongkong, Hainan Island, 6 species, one of which is common with that from Taiwan); *Pseudocapritermes* by 5 species which are reported from India (3 species; 2 endemic and one common with that from Bhutan), Thailand, Java and Bhutan (one species each, the one from Bhutan being common with that from India); *Malaysiocapritermes* by 3 species from Bangla Desh (one species) and Thailand (2 species); and *Syncapritermes* by one species from Selangor, Malaysia. AHMAD and AKHTAR (1981) have added another three monotypic genera i.e., *Coxocapritermes* and *Oriencapritermes* from Kluang Forest, Malaysia and *Kemneritermes* from Sarawak, Malaysia. The *Labiocapritermes* KRISHNA is known by a single species from India and *Mirocapritermes* by 7 species, one from Burma, one from Bangla Desh, 4 from Thailand (3 endemic and one common with that from Sumatra), one from China (Yunnan) and one from Sumatra (common with Thailand).

Subfamily Macrotermitinae

The subfamily Macrotermitinae, comprising fungus growing termites, is represented in the Oriental region by 6 genera including 131 species. Some of the species build huge, earthen mounds. The distribution of this subfamily in the Oriental region is as follows:

The genus *Macrotermes*, in the Oriental region, is known by 21 species, of which one each is endemic to Bangla Desh, Burma and Thailand, 3 to Sabah and 5 to China. It is, however, reported by 3 species from India, one each from Bhutan and Sri Lanka, 2 from Bangla Desh, 4 from Burma, 6 each from Thailand and China, 8 from Malaysia, 3 each (same species) from Indonesia, Vietnam and Kampuchea and 4 from Singapore. The species *M. annandalei* (SILVESTRI), *carbonarius* HAGEN, *gilvus* (HAGEN) and *malaccensis* (HAVILAND) are much wider in distribution in the region. *Odontotermes* is the most widely distributed genus of the subfamily in the Oriental region and is represented by 91 species, of which 45 occur in the Indian subcontinent (20 exclusively in India, 3 each in Bangla Desh and Sri Lanka, one in Pakistan and 2 in Burma, the remaining being common to different parts in the subcontinent). The species *O. obesus* (RAMBUR) is wide spread throughout the Indian subcontinent and *O. redemanni* (WASMANN) in Sri Lanka and southern and eastern India; they are both serious pests of several crops. Three species found in the Indian subregion extend in their distribution to far East also, they are *O. feae* (WASMANN), *O. formosanus* (SHIRAKI) and *O. proformosanus* AHMAD. Fortysix species are known from the remaining parts of the Oriental region, of which 6 are endemic to Sumatra, 4 to Sulawesi and adjoining islands, 3 each to Java, Thailand and Malay Archipelago, 4 to Sabah, one to Kalimantan, 8 to China

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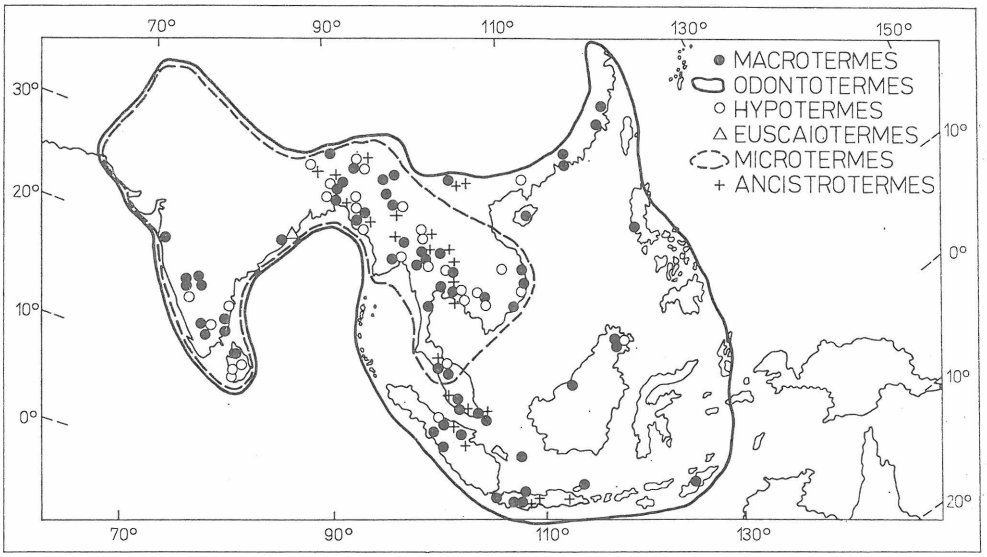

Fig. 5. Map of the Oriental region, showing the distribution of genera *Macrotermes*, *Odontotermes*, *Hypotermes*, *Euscaiotermes*, *Microtermes* and *Ancistrotermes* (Subfamily Macrotermitinae).

and one to the Philippines. Nine species have been recorded from a number of places in Malaysia and Indonesia, one is common to China and Vietnam, one to China, Thailand, Vietnam and Kampuchea and two to Malaysia and Thailand. The species *O. dives* (HAGEN) is very widely distributed in the Malayan, Indonesian and the Philippine Islands. *Hypotermes* is represented by 6 species, with 3 from India (one endemic, one common with Sri Lanka and one with Bangla Desh, Burma, Sabah and Thailand), 2 from Sri Lanka (one endemic and one common with India), one from Sumatra (endemic), two from Thailand (one common with India, Bangla Desh and Burma and one with Kampuchea and Vietnam), one from Sabah (common with other parts) and one each (same species) from Vietnam and Kampuchea (common with that from Thailand). *Euscaiotermes* is known by a single species from Orissa (Barkuda Isl., Chilka Lake), India. It has been collected only once and there are no further records of the occurrence of this genus. The genus *Ancistrotermes* was hitherto known only from Africa until AKHTAR and HUSSAIN (1980) transferred the species *Microtermes pakistanicus* AHMAD to this genus on the basis of study of the enteric valve armature. The species *Microtermes dimorphus* TSAI & CHEN, *insperatus* KEMNER and *jacobsoni* HOLMGREN, which are close to *pakistanicus*, also probably belong to this genus, as such four species of *Ancistrotermes* are taken into account to occur in the Oriental region. Of these four, *pakistanicus* has a very wide distribution and is reported from India, Bangla Desh, Burma, Thailand, Malacca, Singapore, Sumatra and Java, *dimorphus* from China (Kwangsi, Yunnan), *insperatus* from Java, Sumatra, Malaysia (Malacca, Johore, Selangor) and Singapore and *jacobsoni* from Java, Sumatra and Malacca. *Microtermes* is known by 8 species, of these 2 are endemic to India and one each to Sri Lanka, Pakistan and Sumatra. Of the remaining three species, one i.e., *M. obesi* HOLMGREN has a very wide range of distribution and is recorded from India, Pakistan, Bangla Desh, Bhutan, Sri Lanka, Burma, Thailand, Kampuchea and Vietnam. It is also a major pest of cereal crops, sugarcane, fruit trees, cotton, vegetables, etc. in the Indian subcontinent, the second i.e., *M. mycophagus* (DESNEUX) is common to drier

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parts in India and Pakistan and is a serious pest of cotton, "Bajra" and fruit trees and the third i.e., *M. unicolor* SNYDER is common to India, Pakistan and Bangla Desh.

Subfamily Nasutitermitinae

The Nasutitermitinae is the most highly evolved subfamily and is widely distributed in tropical parts of the world. It is postulated that the nasute soldier has evolved in two phyletic lines i.e., the *Procornitermes*-line and the *Paracornitermes*-line (AHMAD, 1950) and genera belonging to both the phyletic lines of evolution occur in the Oriental region. To the former line, the Oriental genera *Hirtitermes*, *Longipeditermes*, *Bulbitermes*, *Ceylonitermes*, *Hospitalitermes*, *Lacessititermes*, *Havilanditermes*, *Nasutitermes* and *Trinervitermes* are assigned (SEN-SARMA, 1968). The genera *Thailanditermes* SEN-SARMA and *Fletcheritermes* SEN-SARMA, assigned by SEN-SARMA (1968) to this line, are treated synonymous with *Lacessititermes* and *Nasutitermes*, respectively (KRISHNA, 1970). The genus *Ahmaditermes* AKHTAR described later (1975) also belongs to this line. To the latter line of evolution i.e., the *Paracornitermes*-line, the genera *Grallatotermes*, *Leucopitermes*, *Emersonitermes*, *Ceylonitermellus*, *Aciculitermes* and *Oriensubulitermes* are assigned by SEN-SARMA (1968). The genera *Subulioiditermes*, *Eleanoritermes*, *Malaysiotermes*, *Proaciculitermes* and *Aciculioiditermes* described by AHMAD (1968), and *Alstonitermes* by THAKUR (1975) are also assigned to this line. *Grallatotermes* (*Grallatotermes*-complex of SEN-SARMA, 1966) has, however, been assigned to the *Procornitermes*-line by KRISHNA (1970) and *Ampoulitermes* MATHUR and THAPA, not taken into account by SEN-SARMA (1968), is assigned to this line by KRISHNA (1970). Thus 23 genera are known from the Oriental region and as many as 201 species are so far reported from this region. The distribution of these genera is as follows:

Hirtitermes (3 species) is reported from Sarawak (one species), Kalimantan (one species) and Sumatra (one species) and *Longipeditermes* (2 species) from Malaysia

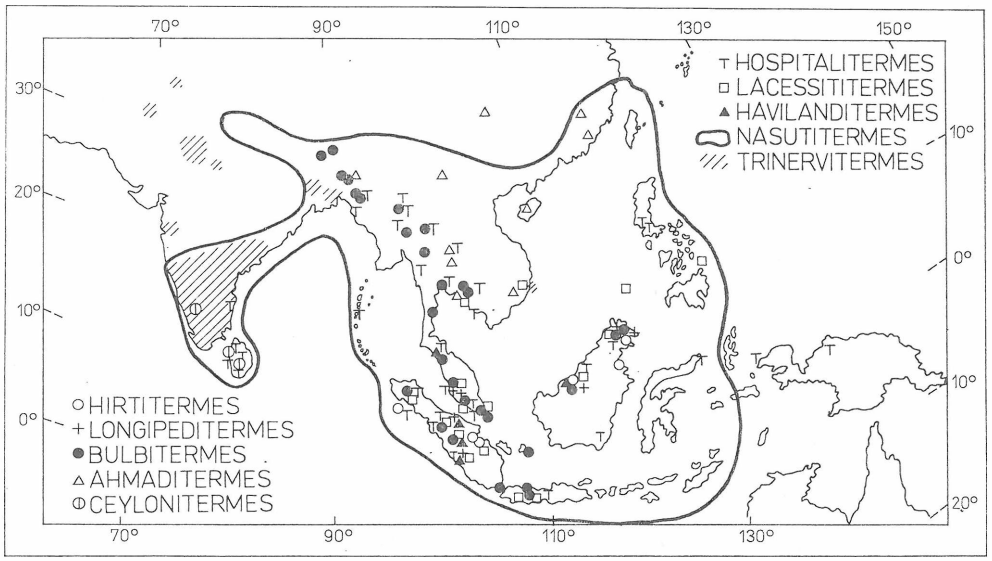

Fig. 6. Map of the Oriental region, showing the distribution of genera *Hirtitermes*, *Longipeditermes*, *Bulbitermes*, *Ahmaditermes*, *Ceylonitermes*, *Hospitalitermes*, *Lacessititermes*, *Havilanditermes*, *Nasutitermes* and *Trinervitermes* (Subfamily Nasutitermitinae).

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(Sarawak, Sabah, Malacca; 2 species) and Sumatra (one species; common with Malaysia). *Bulbitermes*, with its 25 species, is distributed quite widely from eastern India and Bangla Desh through to the remaining parts of the Oriental region except the Philippines and Taiwan. One species each of this genus is endemic to Bangla Desh, Thailand, Singapore, Sabah, Durian Archipelago and Peutjang Island near western tip of Java, two each to Sarawak and Sabah and Sumatra and 4 to Java. The remaining species are common to different parts. *Ahmaditermes*, closely allied to *Bulbitermes*, is represented by 4 species, one from Bangla Desh, 2 from Thailand (one common with China and one with Vietnam), 2 from China (one endemic and one common with Thailand) and one from Vietnam (common with that from Thailand). *Ceylonitermes* is known by two species, one from Sri Lanka and one from Southern India. *Hospalitermes* is another quite widely distributed genus in the region and as many as 24 species are reported. Of these one each is endemic to Southern India, Sri Lanka, Andaman Islands, Burma, Thailand, Java, Kalimantan, Sulawesi, Molluccas, West Irian and the Philippines, and 4 to Sumatra. The remaining individual species are known from a number of places. Other than endemic species, 3 each are reported from Burma, Thailand, Singapore and Malaysia, 5 from Sumatra, one each from Kampuchea, Vietnam, Java, Kalimantan and the Philippines and 3 from Sarawak. *Lacessititermes*, reported by 17 species, is known by 4 species from Sarawak [3 endemic and one common with that from Sumatra, 3 more species are reported from Borneo (Kalimantan) but it is not known whether they are from Sarawak region or from the Indonesian part of the Island, of these 3 species, two are again endemic and one is common with Malacca], 3 from Sumatra (one endemic, one common with Malacca and one with Sarawak), 2 from Singapore (one endemic and one common with Malacca), 3 from Malacca (one each common with Singapore, Kalimantan and Sumatra), one each endemic from Sabah, Java, Thailand and Vietnam and two endemics from the Philippines. *Havilanditermes* is known by 2 species, one from Sarawak, Sabah and Sumatra and the other from Thailand. *Nasutitermes* is a very well established and widely distributed genus in the tropics. In the Oriental region, with the exception of Pakistan, it is known by 89 species. Most of the species are endemic to particular parts of the region or the Islands but a few species e.g., *acutus* (HOLMGREN), *havilandi* (DESNEUX), *longinasus* (HOLMGREN), *luzonicus* (OSHIMA), *matangensiformis* (HOLMGREN) and *matangensis* (HAVILAND) are known from somewhat wider ranges, the latter two species, however, are very widely distributed in the Oriental region. As many as 30 species are reported from the Indian subcontinent, 8 from southern China (Yunnan, Kwangtung, Fukien and Hainan Island), 3 from Taiwan of which one is common with that from China, 18 from the Philippines of which one is common with Kalimantan and Sulawesi, 9 from Thailand (3 endemics and others common with other parts), 9 from Sarawak (mostly common with those from Malaya and other Indonesian Islands), 11 from Sabah (5 endemic, others common with other parts), 5 from Java (2 endemic and 3 common with other parts), 6 from Sumatra (2 endemic, one common with Java and 3 with many other parts), 9 from Malay Peninsula (2 endemic, and others common with different parts), two each endemics from Sulawesi and Boeton Islands, one from Saleier and Djampea Islands and one endemic from Timor. *Trinervitermes*, reported by 6 species, is known from India by 4 species (one species i.e., *T. biformis* is quite widely distributed and is also reported from Pakistan and Sri Lanka, one is known from Uttar Pradesh and the other two from southern India), from Sri Lanka by 2 species (one endemic and one common with that from India and Pakistan), from Pakistan by one species (common with India and Sri Lanka) and from Indo-China by one species (not recorded ever since BATHELIER, 1927, reported it from Indo-China). *Grallatotermes* (*Grallatotermes*-complex of SEN-SARMA) is known by 4 species, two from southern India and two from

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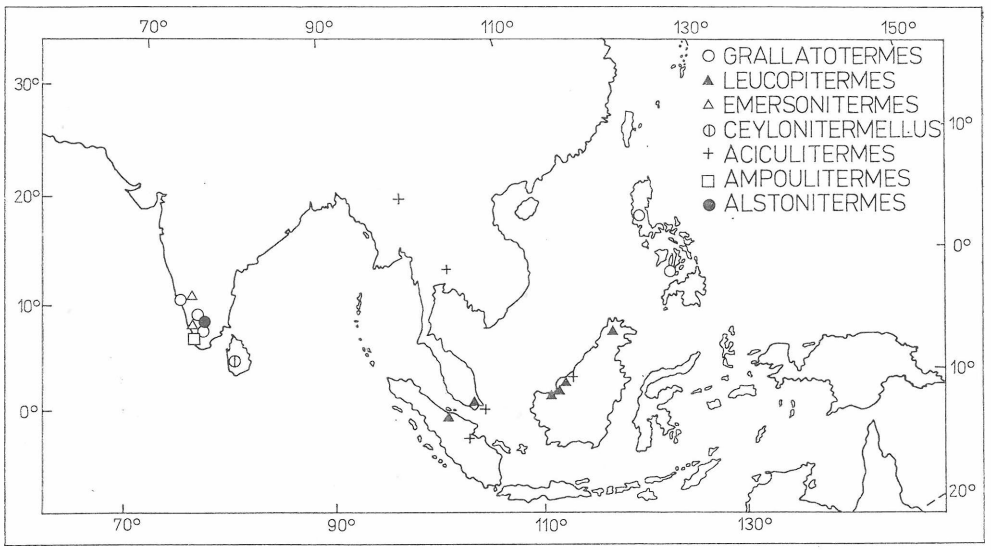

Fig. 7. Map of the Oriental region, showing the distribution of genera *Grallatotermes*, *Leucopitermes*, *Emersonitermes*, *Ceylonitermellus*, *Aciculitermes*, *Ampoulitermes* and *Alstonitermes* (Subfamily Nasutitermitinae).

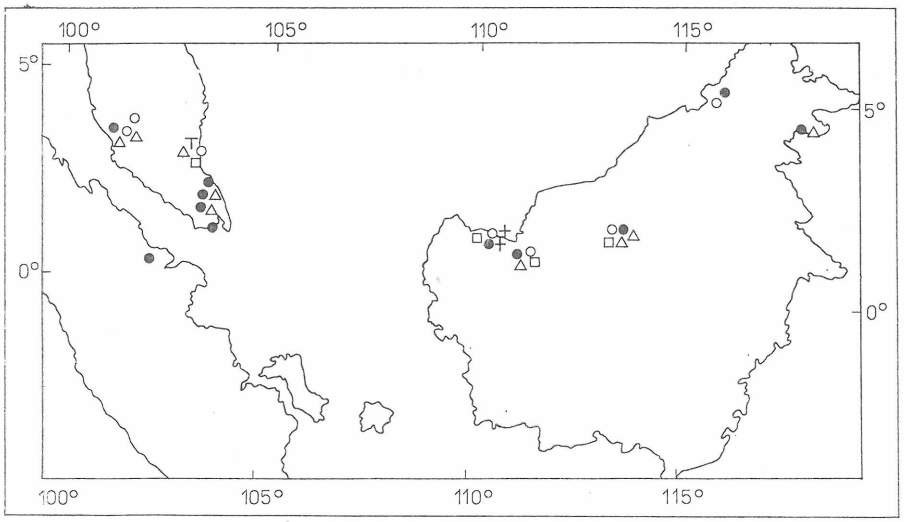

Fig. 8. Map of a part of the Malayan subregion in the Oriental region, showing the distribution of genera *Oriensubulitermes*, *Subulioiditermes*, *Eleanoritermes*, *Malaysiotermes*, *Proaciculitermes* and *Aciculioiditermes* (Subfamily Nasutitermitinae).

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the Philippines; *Aciculitermes* by 2 (one from Sarawak, Sumatra and Singapore and one from Burma and Thailand); *Ceylonitermellus* by one from Sri Lanka; *Emersonitermes* by one from southern India; *Leucopitermes* by one from Malay Peninsula, Sumatra and Sarawak; *Subulioiditermes* by 3, one from Malay Peninsula and Sarawak, one from Sabah and one from Sarawak; *Eleanoritermes* by one from Sarawak; *Malaysiotermes* by one from Malay Peninsula; *Proaciculitermes* by 4, two from Malay Peninsula, one from North Borneo and Malay Peninsula and one from Malay Peninsula and Sarawak; *Aciculioiditermes* by 3, one from Sarawak and Malay Peninsula and two others from Sarawak only; *Oriensubulitermes* by 3, one from Malaya, Sabah and Sarawak and two from Sarawak only; and *Ampoulitermes* and *Alstonitermes* by one species each from southern India.

Zoogeography of Oriental Termitidae

The family Termitidae is known by 192 genera (Apicotermitinae, 37; Termitinae, 77; Macrotermitinae, 13; and Nasutitermitinae, 65) from all over the world. Of these 57 (i. e., 29.68 percent) genera (Apicotermitinae, 4; Termitinae, 24; Macrotermitinae, 6; and Nasutitermitinae, 23) are reported from the Oriental region. Fortytwo genera are endemic to the region and the remaining 15 are common to more than one zoogeographical regions, the distribution of the number of species of the common genera, in different regions, is given in Table 1.

Subfamily Apicotermitinae

Of the 37 genera of this subfamily only 4 viz., *Eurytermes*, *Speculitermes*, *Euhamitermes* and *Doonitermes*, occur in the Oriental region and are endemic to the region. *Eurytermes* and *Doonitermes* are found in the Indian subregion, *Speculitermes* in the Indian and the Indo-Chinese subregions and *Euhamitermes* all over the region. All the 29 species of these four genera, except 2 of *Speculitermes* from Thailand (one endemic and one common) and one of *Euhamitermes* which is known from Malaysia, Singapore, Thailand and China also, occur in the Indian subregion. The subfamily, however, is known from the Ethiopian by 30 and from the Neotropical by 3 genera, showing thereby that it is mainly an Ethiopian subfamily. A large number of soldierless genera are reported in this subfamily, there are 16 such genera from the Ethiopian and 3 from the Neotropical, regions. The *Speculitermes* from the Oriental region was also so far supposed to be a soldier-less genus and of the 12 known species, the soldier caste is reported only in 2 species, evidently it is very rare. There is also a possibility that more than one genus may be involved and a further detailed study of all the species is very much called for.

Subfamily Termitinae

This subfamily is known by 77 genera, of which 24 (i.e., 17 percent) occur in the Oriental region. With the exception of *Amitermes*, *Eremotermes*, *Microcerotermes*, *Synhamitermes**, *Angulitermes*, *Termes* and *Pericapritermes*, all the genera are endemic to the region. The *Amitermes* is represented in all the other zoogeographical regions except Papuan and Malagasy; *Eremotermes* and *Angulitermes* in Ethiopian and Palaearctic; *Microcerotermes* in all except Palaearctic; and *Pericapritermes* in Ethiopian and Papuan, regions also. Of the endemic genera, *Protohamitermes*, *Orientotermes*, *Prohamitermes*, *Labritermes*, *Coxocapritermes*, *Kemneritermes*, *Malaysiocapritermes*, *Oriencapritermes* and *Syncapritermes* are confined to Malayan subregion; *Pseudhamitermes*

* The Neotropical species *Synhamitermes brevicorniger* (SILVESTRI) needs a thorough examination, it probably belongs to some other genus.

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to Indo-China (Kampuchea); *Globitermes* mainly to Malayan and Indo-Chinese subregions, one species, however extends as far as Burma; *Homallotermes* to Indian, Malayan and Chinese subregions; and *Labiocapritermes* to Indian subregion (southern India) alone. *Dicuspiditermes, Procapritermes, Pseudocapritermes* and *Mirocapritermes* are found all over the Oriental region.

Amitermes is known in the Australian and Ethiopian regions, by 57 and 33 species respectively, out of a total of 114 species. According to EMERSON (1955) the origin of this genus is obscure and the speciation of the genus in the Etiopian, Neotropical and Australian regions is in response to ecological conditions. The abundance of species in Australia, particularly in Western Australia, shows the extent of speciation there (GAY, 1968). The more primitive relatives of this genus are, however, found in the Oriental region. *Eremotermes, Angulitermes* and *Pericapritermes* have a better representation in the Oriental region, while *Microcerotermes* is equally abundant (36.2 per cent) in the Oriental and Ethiopian regions, and *Termes* is more abundant (47.06 per cent) in the Australian region. The genus *Microcerotermes* has adjusted very well in humid and dry tropical and subtropical parts of the world, but as it is equally abundant in Ethiopian and Oriental regions, it probably originated in either of these regions and then got dispersed. *Termes* even though is abundant in Australia, but its origin seems to be obscure as its primitive relatives are Ethiopian (EMERSON, 1955).

From the Oriental region, *Amitermes* is reported from all over except Taiwan and China; *Synhamitermes, Eremotermes* and *Angulitermes* from the Indian subregion only; and *Microcerotermes, Termes* and *Pericapritermes* from all over the region.

Subfamily Macrotermitinae

This subfamily of fungus-growing termites has its origin in the Ethiopian region. The genera *Macrotermes, Odontotermes, Ancistrotermes* and *Microtermes* got dispersed to the Oriental region after their origin in that region; where as *Macrotermes* although is better represented in the Oriental than in the Ethiopian region but this probably is due to speciation in response to distribution and isolation in different parts of the region. *Odontotermes* is almost equally represented in the Oriental and Ethiopian regions while *Microtermes* and *Ancistrotermes* have better representation in the Ethiopian region. The fossil records of *Macrotermes, Odontotermes* and *Microtermes*, in the Pleistocene of Africa show the origin of these genera in the Tertiary. In all, 13 genera of the subfamily are known, of which 6 occur in the Oriental region. Other than the Oriental and the Ethiopian zoogeographical region, this subfamily is represented only in the Malagasy region by the genus *Microtermes*, the establishment of which to the region is difficult to explain as the other more primitive genera have not been found there.

Macrotermes, Odontotermes, Hypotermes and *Ancistrotermes* are reported from all over the Oriental region, *Microtermes* from all over except China and Taiwan and *Euscaiotermes* from the Indian subregion only. THAKUR (1976) has discussed the zoogeography of the Indian *Odontotermes*.

Subfamily Nasutitermitinae

Nasutitermitinae is represented by 23 genera (33.38 per cent), in the Oriental region out of 65 from all over the world. Except *Nasutitermes, Grallatotermes, Hospitalitermes* and *Trinervitermes* all the genera are endemic to the region. *Hirtitermes, Longipeditermes, Leucopitermes, Subulioiditermes, Eleanoritermes, Malaysiotermes, Proaciculitermes, Aciculioiditermes* and *Oriensubulitermes* are reported only from the Malayan subregion; *Ceylonitermes, Ceylonitermellus, Emersonitermes* and *Alstonitermes* from the

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Table 1
Distributional pattern of number of species of the genera common to the Oriental and other zoogeographical regions

Genus	Oriental	Australian	Papuan	Ethiopian	Malagasy	Palaearctic	Nearctic	Neotropical	Total
Subfamily: Termitinae									
Amitermes	5	57	—	33	—	4	8	7	114
Synhamitermes	3	—	—	—	—	—	—	1*	4
Eremotermes	6	—	—	2	—	2	—	—	10
Microcerotermes	42 (one common with Palaearctic)	11	5	42	5	5 (one common with Oriental)	—	7	116
Angulitermes	15	—	—	8	—	—	—	—	23
Termes	11	24	1	8	1	—	—	8	53
Pericapritermes	18	—	1	12	—	—	—	—	31
Subfamily: Macrotermitinae									
Macrotermes	21	—	—	12	—	—	—	—	33
Odontotermes	91	—	—	85	—	—	—	—	176
Ancistrotermes	4	—	—	8	—	—	—	—	12
Microtermes	8	—	—	36 (one doubtful and common with Malagasy)	6 (one doubtful and one common with Ethiopian)	—	—	—	49
Subfamily: Nasutitermitinae									
Nasutitermes	89	17	16	30	11	—	1 (common with Neotropical)	73	236
Grallatotermes	4	—	2	1	—	—	—	—	7
Hospitalitermes	24	—	1	—	—	—	—	—	25
Trinervitermes	6	—	—	13	—	—	—	—	19

* See foot note on page 416

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Indian subregion; *Lacessititermes* and *Havilanditermes* from the Indo-Chinese and Malayan subregions; *Grallatotermes* from the Indian and Malayan subregions; *Trinervitermes* from the Indian and Indo-Chinese subregions; *Bulbitermes* and *Aciculitermes* from all over except Taiwan and China; *Ahmaditermes* from all over except the Malayan subregion; and *Hospitalitermes* and *Nasutitermes* from all over the Oriental region.

Nasutitermes is a cosmotropical genus and is known from all the regions except the Palaearctic. From Nearctic, however, it is reported by a single species which is common with that from the Neotropical region. *Grallatotermes* is known from the Oriental, Papuan and Ethiopian; *Hospitalitermes* mainly from Oriental, with a single species from Papuan; and *Trinervitermes* from Ethiopian and Oriental, regions.

The subfamily seems to have originated in the Neotropical as its most primitive genera are found to occur there only, after the drifting of the continents. EMERSON (1955) has discussed the dispersal of nasute genera from the New World to the Old. A number of endemic genera got evolved in different zoogeographical regions after the dispersal. From the present day distributional records, it appears that *Nasutitermes* got evolved in the Neotropical; *Grallatotermes* and *Hospitalitermes* in the Oriental; and *Trinervitermes* in the Ethiopian, regions.

Zusammenfassung

An Termitidae sind in der zoogeographischen Region des Orients 527 Arten in 57 Gattungen der Unterfamilien Apicoterminae (4 Gattungen, 29 Arten), Termitinae (24 Gattungen, 166 Arten), Macrotermitinae (6 Gattungen, 131 Arten), und Nasutitermitinae (23 Gattungen, 201 Arten) bekannt. Die Verbreitung der orientalischen Gattungen in den verschiedenen Teilen der Region sowie ihre Zoogeographie und Herkunft werden im Hinblick auf WEGENERS Kontinentalverschiebungstheorie diskutiert. Ein Verbreitungsschema der Arten, die auch in anderen zoogeographischen Regionen auftreten, wird in Tabelle 1 vorgelegt. Karten, die die Verbreitung der Gattungen in der Region des Orients zeigen, sind beigefügt.

Summary

Termitidae are known in the Oriental zoogeographical region by 527 species under 57 genera of the subfamilies Apicoterminae (4 genera, 29 species), Termitinae (24 genera, 166 species), Macrotermitinae (6 genera, 131 species) and Nasutitermitinae (23 genera, 201 species). The distribution of the oriental genera in different parts of the region and their zoogeography and origin in the light of WEGENER's Hypothesis of Continental Drift, have been discussed. Distribution pattern of the number of species of the genera, found also in other zoogeographical regions, is given in table 1. Distributional maps, showing the genetic distribution in the Oriental region, are provided.

Резюме

В зоогеографическом крае Востока из Termitidae известны 527 видов из 57 родов подсемейств Apicoterminae (4 рода, 29 видов), Termitinae (24 рода, 166 видов), Macrotermitinae (6 родов, 131 вид) и Nasutitermitinae (23 родов, 201 вид). Распространение восточных родов в разных районах края, а также и зоогеография и происхождение обсуждаются с учетом теории перемещения континентов, разработанной Вегенером. В табл. I приводится схема распространения видов, встречающихся и в других зоогеографических краях. Прилагаются карты, показывающие распространение родов в крае Востока.

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