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TERMITE FAUNA OF SOUTHERN INDIA

By

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Zoological Survey of India, Calcutta



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INTRODUCTION

General

Termites (Isoptera) are social insects. They are well known destroyers of all types of cellulose materials and are serious pests of agriculture, forestry, constructional timbers in buildings and stored products, and are of considerable economic importance.

In India, the taxonomy of these important insects has received somewhat proper attention only recently. A good amount of work on faunistics and revisionary studies, zoogeography, biology and ecology has been done. With regard to faunistics, the fauna of eastern states of India (Assam, etc.) (Roonwal and Chhotani, 1962 *a*), West Bengal (Maiti, Ph.D. thesis), South Bihar (Mathur and Thapa, 1963), Rajasthan (Roonwal and Bose, 1964), North-Western Himalayas (Chatterjee and Thakur, 1967) and Andaman and Nicobar Islands (Roonwal and Bose, 1970), have been enquired into. Although the first ever taxonomic work on Indian termites was carried out in southern India (König, 1779), a detailed study of the termite fauna of southern India had not been undertaken so far. This part of peninsular India, comprises parts of Andhra and Karnataka states, Tamil Nadu and Kerala states and the centrally administered areas of Pondichery, Karikal, Mahe and Goa.

The present work is the first ever detailed study of the fauna of southern India. For this study, the author has generally confined to collections from the southern-most point (i.e., Kanyakumari) at 8°04'N to 16°N lat. and between 73°30' to 81°12'E long.

Topography and Climate of Southern India

(i) *Topography and soil* :

Southern India or the Indian peninsula is bounded by Bay of Bengal in the East, the Arabian Sea on the West, the Indian Ocean in the South and Satpura and Vindhya Ranges in the North. The farthest point in the South is Kanyakumari, which lies at 8°04'N lat., and 77°36'E long. The peninsula has Western Ghats on the West, which rising steeply from the narrow coastal plains, reach to greater heights of more than 1,200 m above mean sea-level in certain parts and to more than 2,000 m in the South in the Nilgiris, the Anamalai and Cardamom hills, the highest

peak being at an alt. of 2695 m above mean sea-level in the Anamalai Hills. The general slope of the land is towards the East and as such the Eastern Ghats are much lower than the mountains on the Western side. The Deccan Plateau lies at the centre and is generally 300 m high, rising to more than 600 m in southern Deccan. On the East are wide eastern coastal plains with the high Shevaroy, Javadi and Pachmalai hills.

The Western coastal plains have numerous short and rapid flowing streams, some forming lagoons, a characteristic feature of the Malabar Coast. The eastern plains below 16°N have only one large river of importance, the Kaveri, and a few small ones, the Penner, the Palar and the Vagai. These are also fairly fast flowing as they flow towards the sloping plateau. All these rivers are seasonal and depend entirely on the monsoon rains.

The peninsula has been a stable land-mass since the very ancient times, at least the Pre-cambrian and consists of highly metamorphosed rocks like gneisses and schists of the Archaean system.

The deltas in Tamil Nadu and Kerala states are alluvial. The deccan lavas, some rocks in Tamil Nadu and parts of Coromandel Plains have regur soils while the major portion of the Peninsula has red soil found on the Archaean Crystalline rocks.

(ii) *Climate and vegetation*

Southern India has a fairly hot climate. The hottest months are April-May when the maximum temperature varies from 32-40°C in different parts. The coldest months are December-January when the maximum temperature varies between 27-30°C. The Malabar Coast has fairly uniform temperature during the year varying between 28-32°C, in Deccan between 30-40°C and in the south-east between 29-37°C.

Both south-west and north-east monsoons are active in southern India. The south-west monsoon is more active, giving heavy rains in the Malabar Coast and Western Ghats and little in Deccan and eastern coast. The north-east monsoon gives rain in the eastern coastal areas. The average annual rainfall is more than 2500 mm in Malabar Coast and Western Ghats, about 900 mm in Karnataka and south-east Tamil Nadu and about 600 mm in Deccan.

Western Ghats being very wet have tropical evergreen forests. On the eastern side of these ghats are found dry deciduous hill forests and some subtropical evergreen forests in the Shevaroy.

History and Present Position of Termite Fauna of Southern India

(i) *History* :

The first work done on Indian termites is that by König (1779). He made some interesting field observations in southern India on a mound-building termite (referred to as "*Termes fatalis* König", but is probably *Odontotermes redemanni*, vide Roonwal, 1970), *Anacanthotermes viarum* (= *Termes viarum*), *Macrotermes convulsionarius* (= *Termes convulsionarii*) and a nasute termite. The latter termite, along with a collection from Sri Lanka, he named as "*Termes monoceros*" which is now referred to the genus *Hospitalitermes* (Nasutitermitinae). Unfortunately, his specimens from southern India are lost and as the species *Hospitalitermes monoceros* is confined to Sri Lanka, König (1779) very probably had some other nasute termite before him from southern India. He gave drawings and a fairly good description of the mound building termite, a short description and figures of the worker of *Anacanthotermes viarum* and a very short description of *M. convulsionarius*. The latter two species were treated as "species negligenda" by Holmgren and Holmgren (1917). Hagen (1858) in his "Monographie der Termiten" recorded the four species of König from southern India, including *Hospitalitermes monoceros* which is endemic to Sri Lanka and referred the species *convulsionarius* and *viarum* to the genus *Hodotermes* and *fatalis* and *monoceros* to the genus *Termes*. Desneux (1904) in "Genera Insectorum" placed *convulsionarius* and *viarum* in the genus *Hodotermes* (subfamily Calotermitinae) with doubt, *fatalis* in *Termes* (*Termes*) in the sub-family Termitinae, and stated *monoceros* to be restricted to Sri Lanka only. There was no further addition to our knowledge of southern Indian termites till Holmgren described *Eremotermes paradoxalis* (1912) and *Calotermes* (*Neotermes*) *assmuthi* and *Odontotermes* (*Odontotermes*) *bangalorensis* (1913a). Holmgren (1913b) in his studies on the termites of the oriental region, while recognizing his above three species, recorded *Odontotermes fatalis* (Hagen) (= *Termes fatalis*) from southern India with doubt and reported restricted distribution of *Hospitalitermes monoceros* to Sri Lanka. There Holmgren (1913b) did not take into account the species *convulsionarius* König. The species *Odontotermes bangalorensis* has been recently synonymised with *O. obesus* (Rambur) (Krishna, 1965).

While working out a large collection of termites from India, Holmgren and Holmgren (1917) described 20 new species and recorded

another 14 already known ones, referring them to different genera and subgenera, from southern India. Subsequently some of their species have undergone taxonomic changes. The subgenera *Anacanthotermes*, *Neotermes*, *Glyptotermes*, *Euhamitermes*, *Speculitermes*, *Grallatotermes* and *Trinervitermes* have been raised to generic level ; all the species belonging to the different subgenera of *Odontotermes* are now referred to the composite genus *Odontotermes* ; and the *Eutermes* (*Eutermes*), the *Mirotermes* (*Mirotermes*) and the *Capritermes* species are now placed under the genera *Nasutitermes*, *Angulitermes* and *Dicuspiditermes*, respectively. The species *Termes estherae* Desneux is placed under *Macrotermes* ; *Microtermes anandi* is synonymised with *M. obesi* and *Trinervitermes heimi* with *T. biformis* ; and that *Microcerotermes heimi* occurs only in Pakistan and 'Vorderindien' (probably Bombay).

Silvestri (1922) described *Capritermes distortus* which is now placed in the genus *Labiocapritermes* Krishna. Snyder (1933) described *Heterotermes malabaricus* and *Nasutitermes* (*Rotunditermes*) *anamalaiensis* and the imago of *Nasutitermes* (*Nasutitermes*) *fletcheri* (Holmgren and Holmgren) from southern India ; the species *anamalaiensis* and *fletcheri* being now referred to the genus *Nasutitermes*. The same author (1934) described *Microcerotermes cameroni*, *Nasutitermes* (*Nasutitermes*) *brunneus* and *Nasutitermes* (*Hospitalitermes*) *madrasi*, the latter two species being referred to the genera *Nasutitermes* and *Hospitalitermes*, respectively.

Margabandhu (1934) in his catalogue of Indo-Ceylonese termites, recorded 39 species from southern India and added the two more species described by Snyder (1933), in his supplementary list (1935). He followed Holmgren (1911) for classification in his earlier, and Snyder (1933) in his later, publications. Snyder (1949) in the catalogue of world termites, recorded 45 species from southern India.

Rattan Lal and Menon (1953) published a catalogue of the termites of the Indian subregion. They, it appears, did not care to take note of Snyder's (1949) publication, since from their publication proper identity and assignments of the species, are difficult to ascertain. In this connection it may be pointed out that Snyder's (1949) work is the most generally accepted one even today. It has also been pointed out that the species *fletcheri* and *obtusus* described under *Mirotermes* by Holmgren and Holmgren (1917) and later placed under *Termes* by Snyder (1949) belong to *Angulitermes* (Ahmad, 1958 and Mathur and Sen-Sarma, 1961) and that *Trinervitermes rubidus* (Hagen) does not occur in India (Prashad and Sen-Sarma, 1966b)

Also as many as seven known species (*Cryptotermes dudleyi*, *C. havilandi*, *Coptotermes ceylonicus*, *Odontotermes feae*, *O. horni*, *O. redemanni* and *Hypotermes obscuriceps*) have been recorded and another 46 species described from southern India by various workers, since Snyder (1949).

A complete list of the species occurring in southern India and as recorded here in the present work, is given below at the end (Appendix-I)

(ii) *Present position* :

The author examined and studied a large collection of all the castes of the so far known species (except otherwise stated) and the observations are as follows :

Family KALOTERMITIDAE

So far only 14 species under five genera were known from southern India. The present study has revealed the occurrence of 18 species under these five genera, viz., two belonging to genus *Postelectrotermes*, eight to *Neotermes* (including 4 new ones), one to *Glyptotermes*, three to *Procryptotermes* and four to *Cryptotermes*. On examination of the types of *Glyptotermes coorgensis* present in the A.M.N.H., New York and of *G. nigrifrons* Mathur and Sen-Sarma, it has been found that the two species are synonymous.

Family HODOTERMITIDAE

Two species of the genus *Anacanthotermes* were previously known, (viz., *rugifrons* Mathur and Sen-Sarma, and *viarum* (König). On examination of a large collection it has been found that the two species are difficult to be separated.

Family STYLOTERMITIDAE

Only one species i.e., *Stylotermes fletcheri* Holmgren and Holmgren, of this family is known from southern India. This family was described as a subfamily of Rhinotermitidae but has recently been raised to family rank (for discussion vide *infra*)

Family RHINOTERMITIDAE

Only five species of this family are known. *Prorhinotermes flavus* Bugnion and Popoff has been recorded from Mangalore, Western Coast, Karnataka state recently (Bose and Maiti, 1976). The species of the genus *Prorhinotermes* are insular in distribution and the record of the

occurrence of *P. flavus* Bugnion and Popoff, on the Indian mainland, is of interest as it has been collected from a semi-wild habitat.

Family TERMITIDAE

This family comprises of four subfamilies i.e., Apicotermitinae, Termitinae, Macrotermitinae and Nasutitermitinae.

In the present day concept of the subfamily Apicotermitinae (vide infra) only one species of genus *Euhamitermes* i.e., *Euhamitermes indicus* Holmgren and Holmgren was recorded from southern India by Snyder (1949). Since then 8 more species, including *Eurytermes buddha* Bose and Maiti (1966), have been added. Here one more new species, *Speculitermes emersoni*, from a collection of imagos and workers from Kerala, available from the American Museum of Natural History, has been described.

In Termitinae only five species were known from southern India, according to Snyder (1949). The genera *Eremotermes* and *Microcerotermes* (with three species each from southern India) have been transferred to this subfamily (Sands, 1972). Nine more species including *Microcerotermes ganeshi*, described here as new, and a few newly recorded species have been added since Snyder (1949). So, now as many as 20 species are known to occur in this part of the country. It is now known that *Dicuspiditermes incola* is confined to Sri Lanka and that the specimens from India determined as *D. incola* belong to the species, *D. fletcheri*. In the present study the two species i.e., *Dicuspiditermes gravelyi* known from Maharashtra, India and *Pericapritermes ceylonicus* from Sri Lanka, have been recorded from southern India, for the first time. A large collection of *Pericapritermes ceylonicus* from Sri Lanka, present in the American Museum of Natural History, New York, was studied when it was found that this is a very variable species. The specimens referred to this species from southern India are generally larger but fall in the range of variation.

Of Macrotermitinae, Snyder (1949) recorded 14 species. Five more species (including two described by the author in 1975) and three known ones have been recorded afterwards. Of these, *Odontotermes bangalorensis* is a synonym of *O. obesus*, and *O. parvidens* does not occur in southern India. In the present study instead of considering *Macrotermes convulsionarius* König as a synonym of *estherae*, the latter has been put under synonymy of the former. The species *Odontotermes malabaricus* is treated as 'species negligenda', since the collection from

which it was described, on examination has been found to belong to the species *O. ceylonicus* Holmgren in part, and in part to *O. assmuthi* Holmgren. The species *O. meturensis* Roonwal and Chhotani has been found to be synonymous with *O. ceylonicus* which is reported here from Southern India. *O. obesus* and *O. redemanni* have been found to be very close to each other and are difficult to separate, however, they are kept separately as it requires more detailed study.

Snyder (1949) recorded eleven species of Nasutitermitinae from southern India and nine more were added by different workers subsequently. Of these, *Hospitalitermes monocerus* (König) and *Trinervitermes rubidus* (Hagen) are endemic to Sri Lanka, *T. heimi* (Wasmann) has been synonymised with *T. biformis* (Wasmann) and *Nasutitermes processionarius* (Schmitz) has been revalidated (Prashad and Sen-Sarma 1959, 1960, 1966). Thus eighteen species belonging to eight genera were known and the author has described two species new to science in the present work making up a total of twenty species of this subfamily from this part of the country.

Ninetyfive species belonging to five families of termites are now known from southern India (Appendix-I)

Material and Method

Quite a large collection containing various castes of termites, was studied and determined or re-determined during the present study. This comprised types of a large number of southern Indian species present in the National Zoological Collections at the Zoological Survey of India, the Forest Research Institute, Dehra Dun and the American Museum of Natural History, New York, and also collections made by Drs. M. L. Roonwal and O. B. Chhotani and several others, which were available in the Zoological Survey of India and were lying undetermined. Determined collections of certain species present in the American Museum of Natural History, New York, and the Zoological Survey of India, Calcutta, were also examined for ascertaining the status. A list of the collection studied is given below :

Types of southern Indian termites present in (a) National Zoological Collections, Zoological Survey of India, Calcutta ; (b) American Museum of Natural History, New York and (c) Forest Research Institute, Dehra Dun.

A large collection from Karnataka, Tamil Nadu and Kerala states by M.L. Roonwal, during February-March, 1955.

A large collection from Karnataka, Tamil Nadu and Kerala states, by O.B. Chhotani, November, 1962 and February-March, 1969.

A collection from Goa by K.S. Pradhan, April, 1966 and November, 1970.

A collection from Tranquebar, Tamil Nadu, By G. Mathai, January, 1958.

A collection from Pondicherry by A.G.K. Menon, December-February, 1959.

A fairly large collection from Andhra Pradesh by I. Maligi, July-August, 1962.

A collection from Karnataka State by Geeta Bose (self), January, 1971.

A collection from Tamil Nadu State received from Southern Forest Research Centre, Coimbatore.

Some stray collections by different persons from southern India.

A fairly large collection by P. C. Dhar, September, 1960.

Some small collections by Ummerkutty, J. K. Sen and others from Tamil Nadu and Kerala states.

A collection received from Southern Regional Station, Zoological Survey of India, Madras.

Previously determined collections from southern India, present in the Zoological Survey of India, Calcutta and the American Museum of Natural History, New York.

All the new species are illustrated and described in detail and the measurements (in mm) of the known species and their drawings have been provided. Keys for the separation of the genera and species, occurring in southern India, are given for easy identification. Distribution of the different species in southern India, has been given in detail and briefly so for their distribution elsewhere. Distributional maps have been prepared. Biology of the species has been provided wherever possible.

Drawings have been made with the help of camera lucida and the measurements are given in millimetres.

Collecting Localities

Collections made by several workers from the southern-most point of the Indian subcontinent, about 8°N (Kanya Kumari) to 16°N latitude, and as available in the Zoological Survey of India, were examined. The area between 8° – 16°N latitudes lies approximately between 73° 30' and 81° 12'E longitudes and comprises the states of Tamil Nadu and Kerala,

the centrally administered areas of Goa and Pondicherry and parts of the states of Karnataka and Andhra Pradesh. The collections from Karnataka, Tamil Nadu and Kerala states were rather thorough and formed the major bulk. A list of collecting localities with latitudes and longitudes is given in Table 1.

Table 1. List of localities (with latitude and longitude). The localities from where collections were available for study are marked with asterisk.

Locality	Latitude North		Longitude East	
<i>Karnataka state</i>				
* Aryapur, S. Kanara	—	—	—	—
* Anekad Forest (Mercara-Kushalpur Road)	12°	20'	75°	50'
* Baba Budeen (Bababuddin) Hills	—	—	—	—
* Badami	15°	55'	75°	45'
* Bangalore	12°	58'	77°	38'
* Belgaum	15°	52'	74°	34'
* Bellahunisi	15°	10'	76°	10'
* Bermangal about 12 km from Bangalore on road to Mysore	12°	50'	76°	50'
* Bellary	15°	09'	76°	55'
* Between Bellahunisi and Hospet	—	—	—	—
* Between Hadagalli and Harpasagaram	—	—	—	—
* Between Hadagalli and Harpanahalli	—	—	—	—
* Between Mysore and Yelwal	—	—	—	—
* Between Santikoppa and Frazerpett	—	—	—	—
* Bijapur	16°	50'	75°	47'
* Chamundi Hills nr. Mysore	12°	15'	76°	40'
* Chik Ballapur (Chikbillapur)	13°	26'	77°	46'
* Chikmagalur	13°	15'	76°	45'
* Coondapur	13°	35'	74°	40'
* Dandeli (Dandeeli)	15°	10'	74°	35'
* Dharwar	15°	25'	75°	10'
Hagari	—	—	—	—
Hampi Ruins	15°	15'	76°	25'
Hadagalli	15°	00'	75°	55'
Harpanahalli	14°	47'	75°	58'
Hospet	15°	15'	76°	32'
* Krishnarajsagar Dam, 20 km North-West of Mysore	12°	20'	76°	32'
* Janserigoda, Bababuddin Hills Kadur	13°	33'	76°	03'
Kamalapuram	—	—	—	—
* Kolar Forest Div. nr. Kolar	14°	49'	76°	16'

Table 1 (Contd.)

Locality	Latitude North		Longitude East	
Kollegal	12°	09'	77°	09'
* Koremangla Plantation, 32 km North-East of Bangalore	—	—	—	—
* Karwar	14°	48'	74°	11'
Kotturu (Kottur)	14°	49'	76°	16'
Maddur	c 12°	30'	77°	00'
* Makut, Coorg	c 12°	25'	75°	40'
* Mangalore	12°	50'	74°	50'
* Meghalpur nr. Mysore	c 12°	15'	76°	40'
* Mercara	12°	25'	75°	40'
* Metur Dam	—	—	—	—
* Moolkei-Udipi Road	c 13°	12'	74°	45'
* Mysore	12°	15'	76°	40'
* Ramchandra Plantations, 50 km from Bangalore on road to Kolar	—	—	—	—
* Ranganathitu Bird Sanct., 15 km North-East of Mysore	—	—	—	—
Santikoppa, Coorg	—	—	—	—
* Shanbhoganhalli, c 40 km from Bangalore on road to Magdi	12°	55'	77°	15'
* Sidapur, Coorg	12°	15'	75°	50'
Siruguppa (Siriguppa)	c 15°	40'	77°	55'
* Seringapatan (Srirangapatanam)	12°	26'	76°	43'
* Tallagatpur c 18 km from Bangalore on road to Kanakpur	c 12°	50'	77°	30'
* Yelwal Forest, 14 km W of Mysore	—	—	—	—
<i>Andhra Pradesh</i>				
* Dharamwarigud, Eluru	c 16°	40'	81°	09'
* Lake view, Nagarjunsagar, Nalgonda Dist.	—	—	—	—
* Nagarjunkonda, Guntur Dist.	c 16°	40'	79°	15'
* Nandikonda Valley	—	—	—	—
* Vijayapuri, Guntur Dist.	c 16°	40'	79°	15'
* Tiger Valley, Hill Colony	—	—	—	—
<i>Tamil Nadu</i>				
* Anaimalai (Anamalai) Hills	10°	25'	76°	65'
* Between Theni and Kambam	—	—	—	—
* Coimbatore	10°	50'	76°	55'
* Idambaumalai nr. Palni Temple	10°	10'	77°	25'
* Kanya Kumari	8°	04'	77°	36'
* Kanakkanthen, Chingleput Dist.	—	—	—	—
* Karin Kushi, Chingleput Dist.	—	—	—	—
* Kurambapatty Res. Forest nr. Salem	—	—	—	—

Table 1 (Contd.)

Locality	Latitude North		Longitude East	
Krusadai Island off Mandapam Camp	9°	15'	79°	10'
* Madras	13°	05'	80°	15'
* Madurai	9°	58'	78°	10'
* Mahabali	12°	37'	80°	14'
* Mandapam Camp	9°	15'	79°	05'
* Mount Stuart	10°	25'	76°	50'
* Mumdamthorai Tiger Sanctuary approx. 25 km W of Ambasamudrum	c 8°	40'	77°	25'
* Mylar, Kulasekaram Forest Range approx. 50 km North-West of Nagercoil	c 8°	20'	77°	15'
* Nagercoil-Tirunelveli Road (Bet. 11 and 12 mile stones)	c 8°	30'	77°	40'
* North Vellore	12°	15'	79°	05'
* Periyakulam	10°	07'	77°	35'
* Palayankottai (Pallaimcottah)	8°	43'	77°	46'
* Pollachi	10°	39'	77°	03'
* Saidapet	13°	02'	80°	16'
* Salem	11°	35'	78°	10'
* Sanyasimalai Res. Forest, Yercaud	—			—
* Satyenpathi nr. Palayankottai	—			—
* Saranganar Res. Forest, Lower Camp	9°	55'	77°	10'
* Shevaroy Hills	11°	45'	78°	10'
* Tambaram, Madras	13°	05'	80°	15'
Tellkade, Anamalai Hills	—			—
* Thanjavur (Tanjore)	10°	47'	79°	10'
* Top Slip	10°	25'	76°	50'
* Tranquebar	11°	01'	79°	54'
* Tudyalur	11°	00'	76°	55'
* Vanathiparai Res. Forest, Lower Camp	c 9°	30'	77°	20'
Villivakkam, 16 km N. of Madras	—			—
* Wellington, Nilgiri Hills (2000 m alt.)	11°	14'	76°	39'
* Yercaud	11°	45'	78°	10'
<i>Kerala state</i>				
* Beliapatam	11°	55'	75°	24'
* Cannanore	11°	50'	75°	20'
* Chakai, Trivandrum	c 8°	25'	76°	55'
Cochin	9°	55'	76°	15'
Kavalai	—			—
* Konnoth Fr. Range (Wynaad Div.)	—			—

Table 1 (Contd.)

Locality	Latitude North		Longitude East	
* Kuttikanam nr. peermade	c 9°	30'	77°	02'
* Nilambur	11°	20'	76°	15'
* Panchakanam Res. Forest, Periyar Lake area	c 9°	35'	77°	10'
* Pappinamkode, Trivandrum	c 8°	25'	76°	55'
* Pathupadi Forest, Malabar		—		—
* Pirmed (Peermade)	9°	30'	77°	20'
* Periyar Res. Forest	c 10°	00'	76°	52'
* Tellicherry	11°	45'	75°	32'
Quilandy, Malabar		—		—
* Thekkadi (Thekaday)	c 9°	55'	77°	05'
* Trivandrum	9°	35'	77°	10'
* Vandiperiyar	9°	30'	77°	05'
<i>Goa</i>				
* Caisua Fort		—		—
* Calangate		—		—
* Panaji	15°	30'	73°	55'
* Rubber Plantation nr. Welpori		—		—
* Majorda		—		—
* Mangeshi		—		—
* Marmagao	15°	25'	73°	43'
* Nagargaon	15°	25'	73°	43'
<i>Pondicherry, Karikal and Mahe</i>				
* Mannadipet	11°	56'	79°	53'
* Setour (16 km off Karikal)		—		—
* Validiyur (11 km S-W of Karikal)		—		—

Abbreviations Used

The following abbreviations have been used :

alt.,	Altitude
A.M.N.H.,	American Museum of Natural History, New York
coll.,	Collector
det.,	Determined by
ex.,	Extracted from/example
F.R.I.	Forest Research Institute, Dehra Dun
Im.,	Imago
K.,	King
lat.,	Latitude
long.,	Longitude

maj.,	Major
max.,	Maximum
min.,	Minor/Minimum
No.	Number
Ny.,	Nymph
Pw.,	Pseudoworker
Q.,	Queen
S.,	Soldier
sev.,	Several
syn.,	Synonym

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SYSTEMATIC ACCOUNT

Five families of termites have been recorded here from Southern India and are keyed as follows :

Key to the Families

(i) *Imago* :

1(4) Fontanelle absent

2(3) Ocelli present

3(2) Ocelli absent

... Kalotermitidae

... Hodotermitidae

- 4(1) Fontanelle present
 5(8) Fontanelle without plate ; left mandible
 always with 3 marginal teeth
 6(7) Tarsi 4-jointed ... Rhinotermitidae
 7(6) Tarsi 3-jointed ... Stylotermitidae
 8(5) Fontanelle with plate ; left mandible
 with two marginal teeth ... Termitidae
- (ii) *Soldier* :
- 1(4) Fontanelle and fontanelle gland absent ;
 eyes present, large ; mandibles
 with prominent marginal teeth.
 2(3) Antennae long, with 22-23 segments ... Hodotermitidae
 3(2) Antennae short, with 10-18 segments ... Kalotermitidae
 4(1) Fontanelle and fontanelle gland present ;
 eyes absent, if present, small and
 dot-like ; mandibles with or without
 marginal teeth.
 5(8) Pronotum flat
 6(7) Tarsi 4-jointed ... Rhinotermitidae
 7(6) Tarsi 3-jointed ... Stylotermitidae
 8(5) Pronotum saddle-shaped ... Termitidae

Family KALOTERMITIDAE

General Remarks : Since the revision of the family Kalotermitidae by Krishna (1961), this family is now known to have 24 genera, including three with fossil forms. The genera with living forms, at present, are represented by 324 species distributed over various zoogeographical regions. In the Oriental region, the family is represented by 9 genera and 85 species. All these 9 genera with 43 species occur in the Indian subregion. Out of these, 5 genera and 12 species are from southern India.

The recent study has revealed the presence of five new species belonging to the genera *Neotermes* (4 species) and *Procryptotermes* (1 species), bringing up the total to 17 species.

Distribution (Figs. 1 and 2) : Seventeen species belonging to five genera occur in southern India. The genus *Postelectrotermes* is represented by two species. Genus *Neotermes* is fairly commonly distributed and seven species of this genus are recorded here. The genus *Glyptotermes* is represented by only one species, the *Procryptotermes* by three species and the *Cryptotermes* by four species.

The genus *Postelectrotermes* is known from the Oriental, Malagasy, Ethiopian and Palaearctic regions. It is fairly well represented in both the Oriental and Malagasy regions. Out of a total of 14 species, six

species occur in the Oriental region and of these, five are from the Indian subregion. These five species are distributed in Sri Lanka (*militaris*), India (*bhimi* and *nayari*, both in southern India) and Pakistan (*pasniensis* and *pishinensis*). From the distribution of the species in the Oriental region it appears that majority of the species are concentrated in the southern part of the Asian continent. All these species seem to be endemic to their respective areas of distribution.

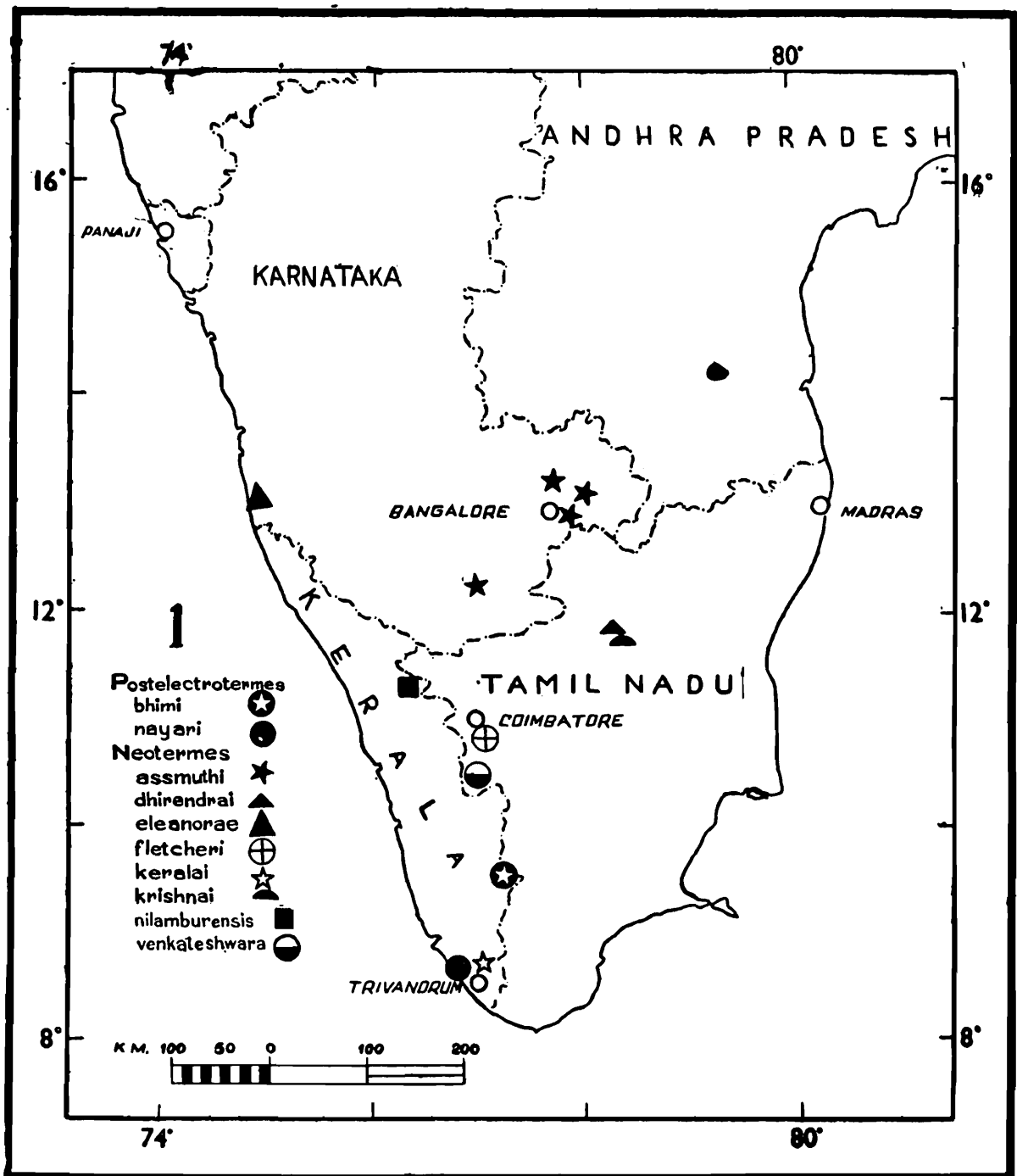


Fig. 1. Map of southern India showing distribution of species of the genera *Postelectotermes* and *Neotermes* (Kalotermitidae).

The genus *Neotermes* is the most common genus of the family Kalotermitidae. As many as 91 species of this genus are known from various zoogeographical regions except the Palaearctic. It is well represented in both the Oriental (34 species) and the Neotropical (21 species) regions. Out of the 34 Oriental species, 20 occur in the Indian subregion and of these, seven are found in southern, eight in eastern, three in northern (1 common with eastern) parts of the Indian subcontinent, one from Andaman and Nicobar Islands (India) and two from

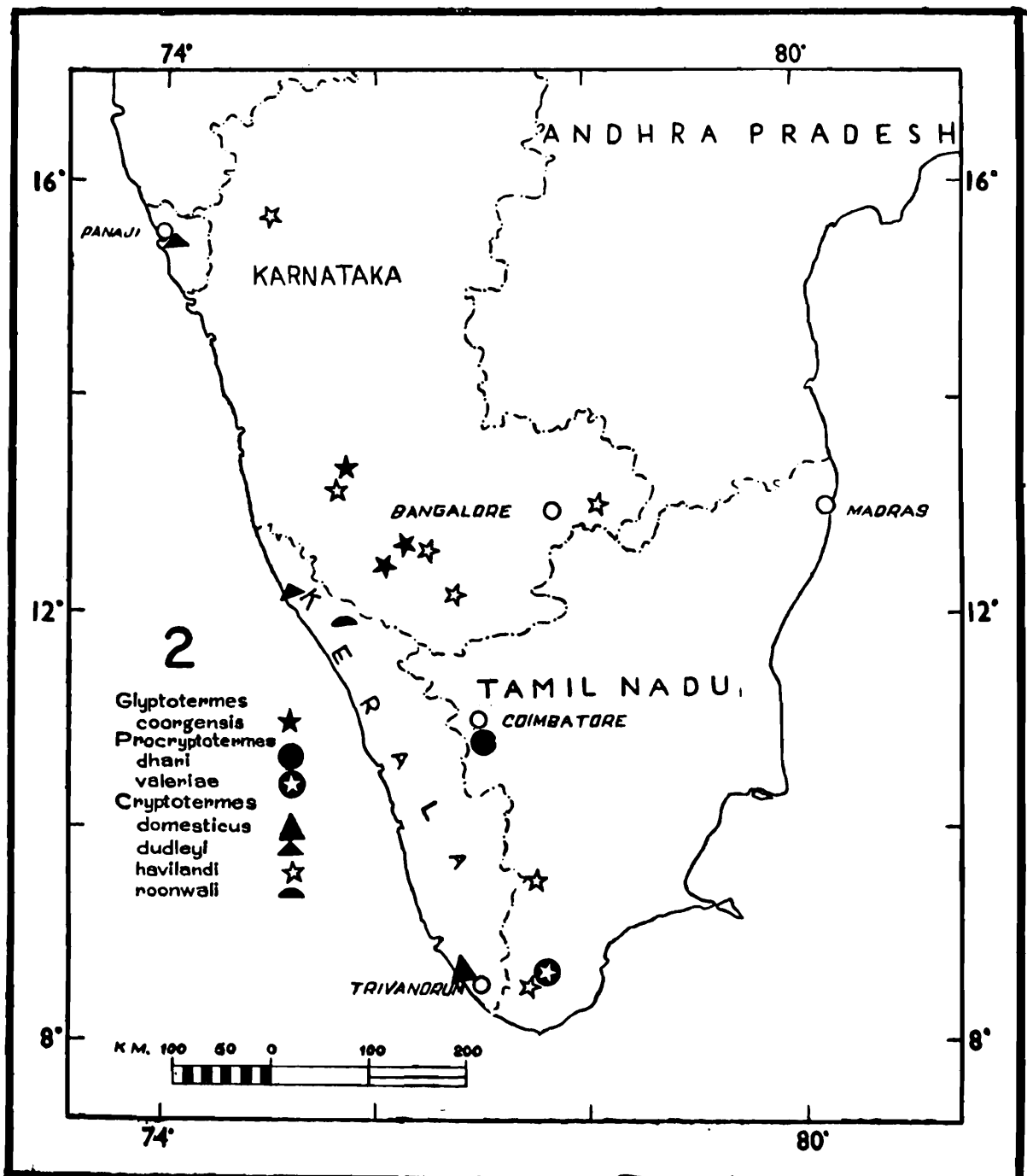


Fig. 2. Map of southern India showing distribution of the species of the genera *Glyptotermes*, *Procryptotermes* and *Cryptotermes* (Kalotermitidae).

Sri Lanka. It appears very strange, that although *Neotermes* species are wood-infesting termites they are mostly confined to certain particular areas. From the distribution pattern and the presence of the probable ancestral genus *Postelectrotermes*, the origin of *Neotermes* seems to be in the Oriental region, as suggested by Chhotani (1975a).

Glyptotermes is represented by 77 species, occurring in all the zoogeographical regions except the Palaearctic and the Nearctic. This genus is also well represented in both the Oriental (26 species) and the Neotropical (25 species), regions. In the Indian subregion only eight species are found and three each of these occur in Bangladesh and Sri Lanka, one in southern India and one in northern India.

Procryptotermes is represented by 10 species. Three of these are from the Oriental region and all these species are confined to southern India.

Cryptotermes species being drywood termites are well distributed in all the zoogeographical regions except the Palaearctic. Some of the species are common to more than one zoogeographical regions. The genus is found predominantly in the Oriental (11 species) and Neotropical (9 species), regions. In the Indian subregion six species are found and four of which are from southern India (one endemic and 3 common with other zoogeographical regions) and one each from Sri Lanka and Pakistan). The reason why many species of this genus occur in more than one zoogeographical regions is, that they are drywood termites and can be easily transported from one place to another in wooden articles, and furniture.

Key to the Genera

(i) *Imago* :

- | | | |
|--|-----|--|
| 1(2) Middle tibia with a thick spine a little above the dorsal apical-tibial spur | ... | <i>Postelectrotermes</i> |
| 2(1) Middle tibia without any spine above dorsal apical-tibial spur | | |
| 3(6) Posterior margin of first marginal tooth of left mandible equal to anterior margin of second marginal | | |
| 4(5) Radial sector with branches to costal margin | ... | <i>Neotermes</i> |
| 5(4) Radial sector without any branch to costal margin | ... | <i>Glyptotermes</i> |
| 6(3) Posterior margin of first marginal tooth of left mandible shorter than anterior margin of second marginal | ... | <i>Procryptotermes</i> / <i>Cryptotermes</i> |

(ii) *Soldier* :

- 1(2) Middle tibia with a thick spine a little above dorsal apical-tibial spur ... *Postelectrotermes*
 2(1) Middle tibia without any spine above dorsal apical-tibial spur
 3(4) Head short, strongly phragmotic ... *Cryptotermes*
 4(3) Head elongate, not phragmotic
 5(6) Head with a distinct ridge between vertex and frons ... *Procryptotermes*
 6(5) Head without any ridge between vertex and frons
 7(8) Head with distinct antero-lateral prominences ... *Glyptotermes*
 8(7) Head without antero-lateral prominences ... *Neotermes*

Genus *Postelectrotermes* Krishna

1961. *Postelectrotermes* Krishna, *Bull. Amer. Mus. Nat. Hist.*, 122(4) : 316, 317, 319-321, 383, 384, 385.

Type-species : *Postelectrotermes praecox* (Hagen)

Fourteen species of the genus *Postelectrotermes* are known from the world. Out of these, six occur in the Oriental region. Five species i.e., *bhimi*, *militaris*, *nayari*, *pasniensis* and *pishinensis* are reported from the Indian subregion, and of these *bhimi* and *nayari* are known from southern India (Fig. 1).

Key to the Species

(i) *Imago* :

The imagos of none of the southern Indian species are known.

(ii) *Soldier* :

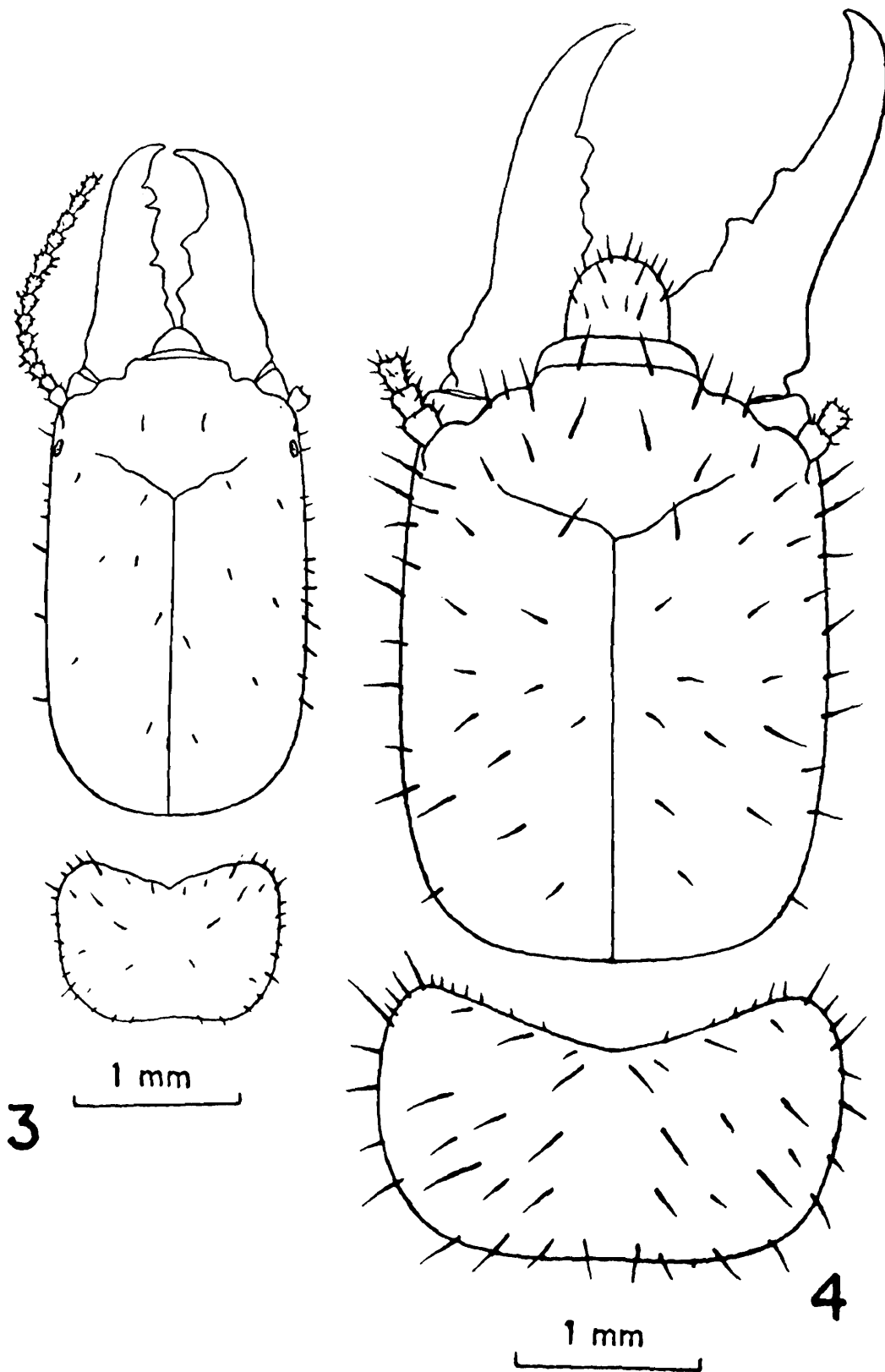
- 1(2) Eyes present as small spots ... *bhimi* Roonwal and Maiti
 2(1) Eyes absent ... *nayari* Roonwal and Verma

1. *Postelectrotermes bhimi* Roonwal and Maiti

(Fig. 3)

- 1965 (Sept.). *Postelectrotermes bhimi* Roonwal & Maiti, *Indian J. Ent.*, 27 : 255-261. S. and Pw. Type locality : Vandiperiyar village, Kottayam District, Kerala State, India.

Material : A vial with a holotype S. (No. 4349/H8), a vial with 2 paratypes (morphotype) Pw. (No. 4350/H8) and a vial with several



Figs. 3 and 4. Head and pronotum, in dorsal view, of soldiers of :
Fig. 3. *Postelectrotermes bhimi* Roonwal and Maiti (Holotype).
Fig. 4. *P. nayari* Roonwal and Verma (Paratype).

paratypes (paramorphotype) Pw. (No. 4351/H8), all from Vandiperiyar, Kottayam District, Kerala State, India, coll. U.P.A.S.I. staff, 16.iii. 1965.

Measurements :

<i>Soldier :</i>	(Holotype)
1. Total body-length c	... 7.80
2. Length of head to base of mandible	... 2.60
3. Max. width of head	... 1.50
4. Length of mandibles	... 1.38
5. Max. length of pronotum	... 0.95
6. Max. width of pronotum	... 1.33

Distribution : INDIA : Southern India : Vandiperiyar village (Kottayam District, Kerala). Elsewhere : Not known.

Biology : Very little is known about the biology of this species, except that it is reported to infest tea plants in southern India.

Remarks : The holotype soldier is measured and the measurements have been found to be somewhat different from those given in the original description.

2. *Postelectrotermes nayari* Roonwal & Verma

(Fig. 4)

1971 (June). *Postelectrotermes nayari* Roonwal and Verma, *Indian Zoologist*, 2 : 83-91. S. and Pw. *Type-locality :* Chakai, Trivandrum, Kerala State, India.

Material : A vial with holotype S. (Z.S.I.Reg. No. 25/H11), Chakai, Trivandrum, Kerala, coll. R.V.Verma, September 1970, ex. unknown wood, and a vial with a morphotype Pw. and a paratype S. (No. 26/H11), other data as in holotype.

Measurements :

<i>Soldier :</i>	Range (2 exs. holotype and paratype)
1. Total body length c	... 11.8—12.4
2. Length of head to base of mandibles	... 3.16—3.30
3. Max. width of head	... 2.30—2.45
4. Length of mandibles	... 2.20—2.25
5. Max. length of pronotum	... 1.15—1.43
6. Max. width of pronotum	... 2.37—2.78

Distribution : INDIA : Southern India : Chakai, Trivandrum (Kerala). Elsewhere : not known.

Biology : Nothing is known about the biology of this species.

Genus *Neotermes* Holmgren

1911. *Calotermes* (*Neotermes*) Holmgren, *K.Sv.Vet. Akad. Handl.*, 46 : 53-54, pl. 2, fig. 9 : pl. 3, figs. 8 and 9.
 1949. *Neotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 21.
 1960. *Neotermes* ; Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (ICAR Monog. 1) : 97, 98, 99, 137-143.
 1961. *Neotermes* ; Krishna, *Bull. Am. Mus. nat. Hist.*, 122 (Art. 4) : 314, 315, 317, 321-325, 383-384, 385, 398, figs. 7-10.

Type species : *Neotermes castaneus* (Burmeister)

Snyder (1949) catalogued eight (i.e., *andamanensis*, *assmuthi*, *bosei*, *fletcheri*, *gardneri*, *greeni*, *militaris* and *militaris* var. *unidentatus*) species and varieties of the genus *Neotermes* from the Indian region. Roonwal and Sen-Sarma (1960), while revising the oriental *Neotermes*, recognise all the species catalogued by Snyder (1949) except *gardneri* and *militaris* var. *unidentatus* which they consider as synonyms of *bosei* and *militaris*, respectively. They have recorded the species *artocarp*i from Burma and described 6 new species and subspecies from India. Krishna (1961) while including six of the species catalogued by Snyder (1949), does not refer *bosei* to any of his 21 living genera, places *militaris* (including probably the var. *unidentatus*) in his new genus *Postelectrotermes* and does not include the new species described by Roonwal & Sen-Sarma (1960) probably because the publication was not available to him at the time of his studies. Roonwal and Verma (1971), Maiti (1975) and Thakur (1978) have recently described *Neotermes keralai*, *N. kalimpongensis* and *N. nilamburensis*, respectively, from India and Akhtar (1975) has added another two species viz., *N. adampurensis* and *N. prosoneratae* from Bangla Desh. Thus so far 18 species were known from the Indian region and of these *assmuthi*, *fletcheri*, *keralai* and *nilamburensis* occur, in southern India. There are 4 other species which are described here as new to science, making a total of 8 species from southern India.

Key to the Species

(i) *Imago* :

The imagos of only 3 species of the South Indian *Neotermes* are known and are keyed as follows :

1(2) Media in hindwing arising from radial sector

near scale ; eye smaller, 0.45 mm in diameter ... *fletcheri* Holmgren and Holmgren

- 2(1) Media in hindwing arising from radial sector from near middle of wing; eye larger, 0.50—0.60 mm in diameter
- 3(4) Media arising from before middle of wing ... *nilamburensis* Thakur
- 4(3) Media arising from near middle of wing
- 5(6) Head width with eyes 1.60—1.70 mm, length to base of mandibles 1.45—1.60 mm ... *eleanorae* sp. n.
- 6(5) Head-width with eyes 1.50 mm, length to base of mandibles 1.45 mm ... *assmuthi* Holmgren
- (ii) *Soldier* :
- 1(2) Pronotum narrower than head ... *fletcheri* Holmgren and Holmgren
- 2(1) Pronotum as wide as or wider than head
- 3(6) Third antennal segment subequal to second; anterior portion of postmentum not swollen, sides straighter, weakly or not bilobed
- 4(5) Head narrower (index width/length 0.62—0.64); mandibles longer (index left mandible-length/head-length 0.54) and straighter on outer margin; postmentum weakly bilobed in anterior portion ... *eleanorae* sp. n.
- 5(4) Head wider (index width/length 0.66—0.75); mandibles shorter (index left mandible-length/head-length 0.50) and incurved on outer margin; postmentum not bilobed in anterior portion ... *keralai* Roonwal and Verma
- 6(3) Third antennal segment longer than second; anterior portion of postmentum swollen, sides convex, prominently bilobed
- 7(10) Pronotum weakly incurved at anterior margin; anterior lobe of club of postmentum wider than posterior lobe
- 8(9) Larger species; Y-suture distinct; antennae 12—15 segmented; pronotum with distinct median notch on anterior margin ... *nilamburensis* Thakur
- 9(8) Smaller species; Y-suture indistinct; antennae 16-segmented; pronotum with indistinct median notch on anterior margin ... *assmuthi* Holmgren
- 10(7) Pronotum strongly incurved at anterior margin; anterior lobe of club of postmentum as wide as or narrower than posterior lobe

- 11(12) Posterior margin of second marginal of left mandible longer ; head thicker (index width/length 0.71—0.73) ... *krishnai* sp. n.
- 12(11) Posterior margin of second marginal of left mandible shorter ; head thinner (index width/length 0.66—0.71)
- 13(14) Third segment of antenna about $1\frac{1}{2}$ times that of second ; club of postmentum more so swollen, sides convex ; anterior margin of pronotum more incurved ... *dhirendrai* sp. n.
- 14(13) Third segment of antenna slightly longer than second ; club of postmentum less swollen, sides straighter ; anterior margin of pronotum less incurved ... *venkateshwara* sp. n.

3. *Neotermes assmuthi* Holmgren

(Figs. 5, 6)

- 1913 (Apr. 21). *Calotermes (Neotermes) assmuthi* Holmgren, *J. Bombay nat. Hist. Soc.*, 22 : 102-103. Im., S., Pw. Type-locality : Bangalore (Karnataka), India.
1949. *Neotermes assmuthi* ; Snyder, *Smiths. misc. Coll.*, 112 : 22.
- 1960 (Jan.) *Neotermes assmuthi* ; Roonwal and Sen-Sarma, *Contr. Syst. Orient. Termites* (ICAR Ent. Monog. 1) : 148-152.
1961. *Neotermes assmuthi* ; Krishna, *Bull. Am. Mus. nat. Hist.*, 122 : 325.

Material : (i) A vial with one Im. and sev. S., Pw., and Ny., Meghalpur (Karnataka State), coll. O. B. Chhotani, 18. xi. 1962, ex. dead portion of a 'Basri' tree. (ii) A vial with 4S., and sev. Pw. and Ny., Tallagattapura, 15 miles from Bangalore (Karnataka State), coll. O. B. Chhotani, 15. xi. 1962, ex. "dead branch of a Banyan tree". (iii) A vial with 2S., and sev. Pw., Shanbhoganhalli, 25 miles from Bangalore on road to Magdi (Karnataka State), coll. O. B. Chhotani, 15. xi. 1962, ex. "heart wood of *Ficus bengalensis*".

Measurements :

- | | |
|--|----------------------|
| (i) <i>Imago</i> : | (1 ex.) |
| 1. Total body-length with wings <i>c</i> | ... Wings incomplete |
| 2. Total body length without wings <i>c</i> | ... 8.10 |
| 3. Length of head to lateral base of mandibles | ... 1.45 |
| 4. Width of head with eyes | ... 1.50 |
| 5. Max. diameter of eye | ... 0.50 |
| 6. Max. diameter of ocellus | ... 0.23 |
| 7. Max. width of pronotum | ... 1.60 |

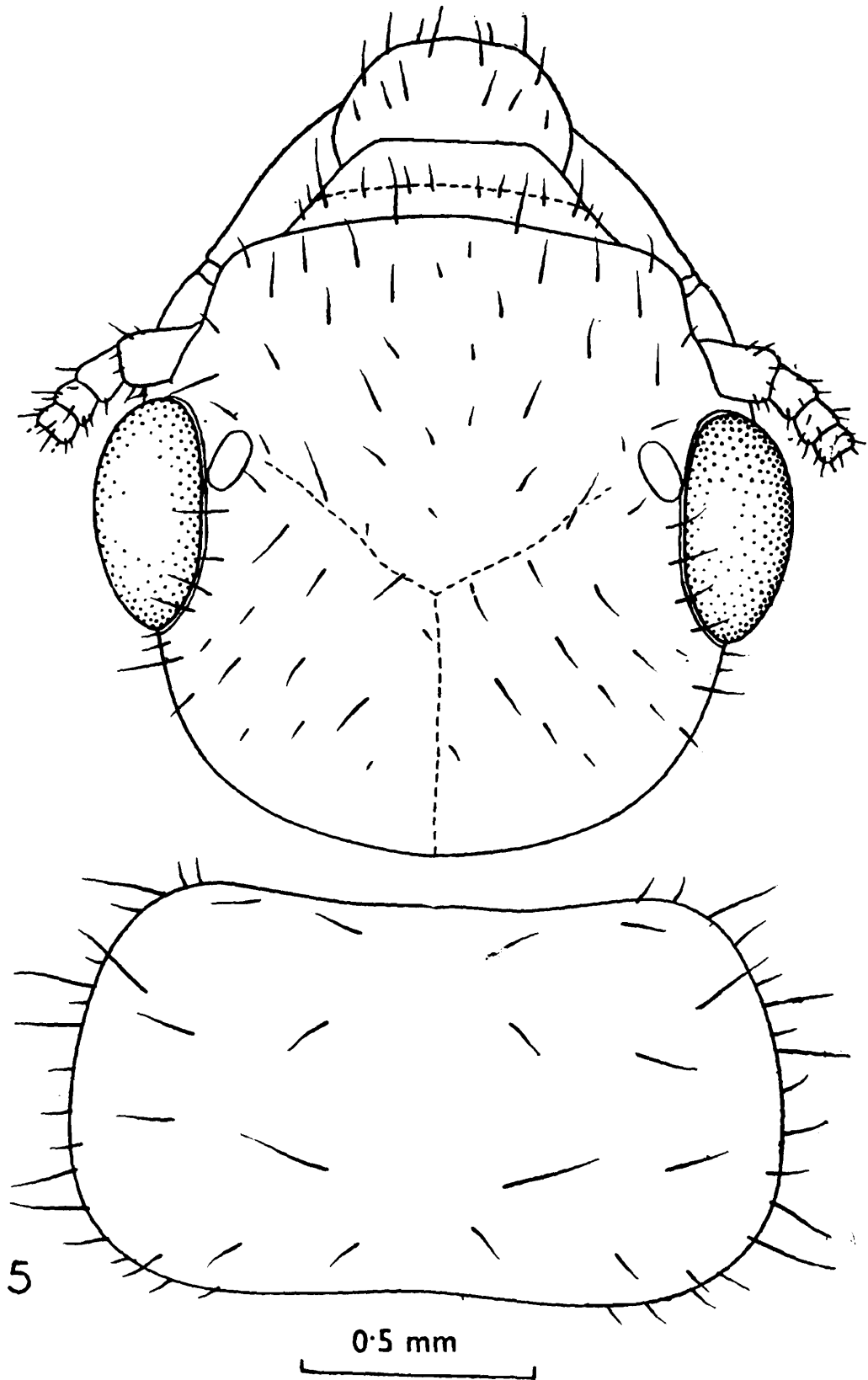


Fig. 5. Head and pronotum, in dorsal view, of *Neotermes assmuthi* Holmgren, Imago.

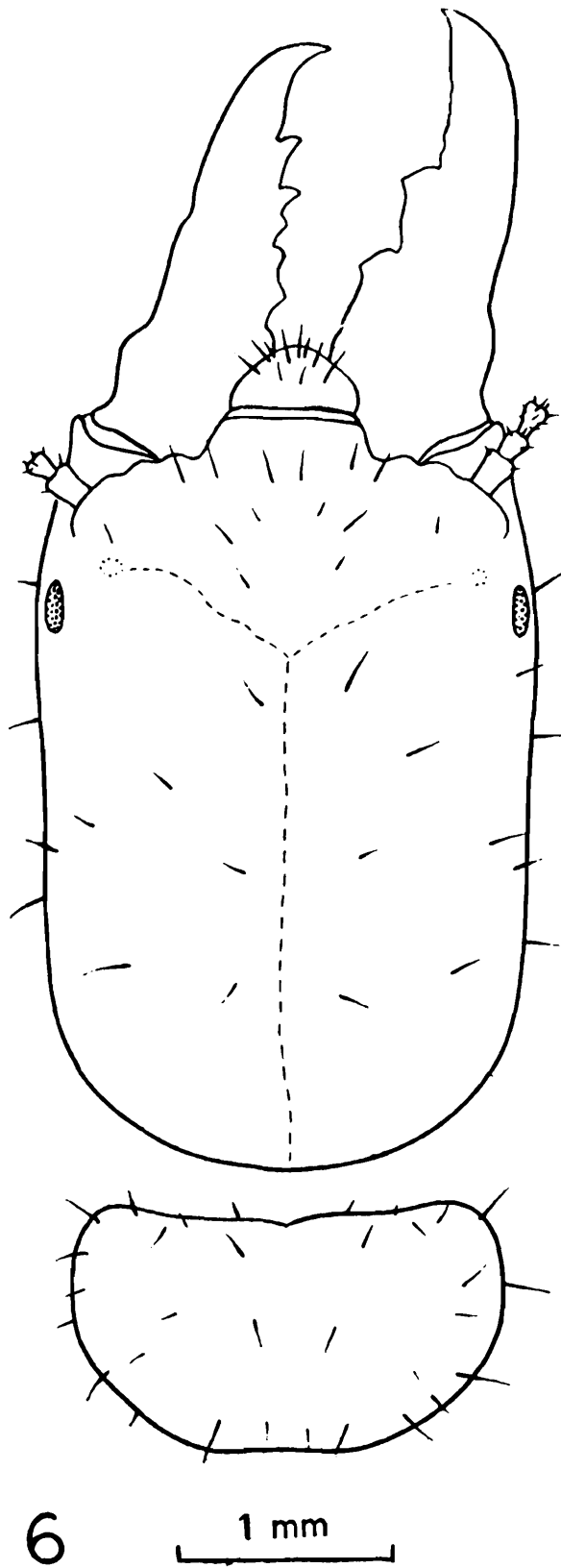


Fig. 6. Head and pronotum, in dorsal view, of *Neotermes assmuthi* Holmgren, Soldier.

(ii) <i>Soldier</i> :	Range (7 exs.)
1. Total body-length <i>c</i>	... 9.60—11.00
2. Length of head to base of mandibles	... 3.02—3.40
3. Max. width of head	... 2.08—2.23
4. Max. diameter of eye	.. 0.23—0.35
5. Max. length of pronotum	... 0.98—1.08
6. Max. width of pronotum	... 1.93—2.18

Distribution : INDIA : Southern India : Karnataka : Bangalore, Shanbhoganhalli, Meghalpura, Tallagatpura. Elsewhere : Not known.

Biology : This species makes long, narrow galleries in the dead portions of "Basri" and "Banyan" trees. The attack also extends to the live portions of the heartwood. The galleries are irregular and are filled with damp faecal pellets which are lumped together in small masses and serve to control the humidity of the nest.

4. *Neotermes dhirendrai** sp. n.

(Figs. 7—14 ; Table 2)

Material : A vial with 1S. and 1 Pw., Salem (Tamil Nadu), coll. O. B. Chhotani (No. 013/14.2.69) ; 14. ii. 69, ex. a mango tree.

Description : 1. IMAGO : Unknown.

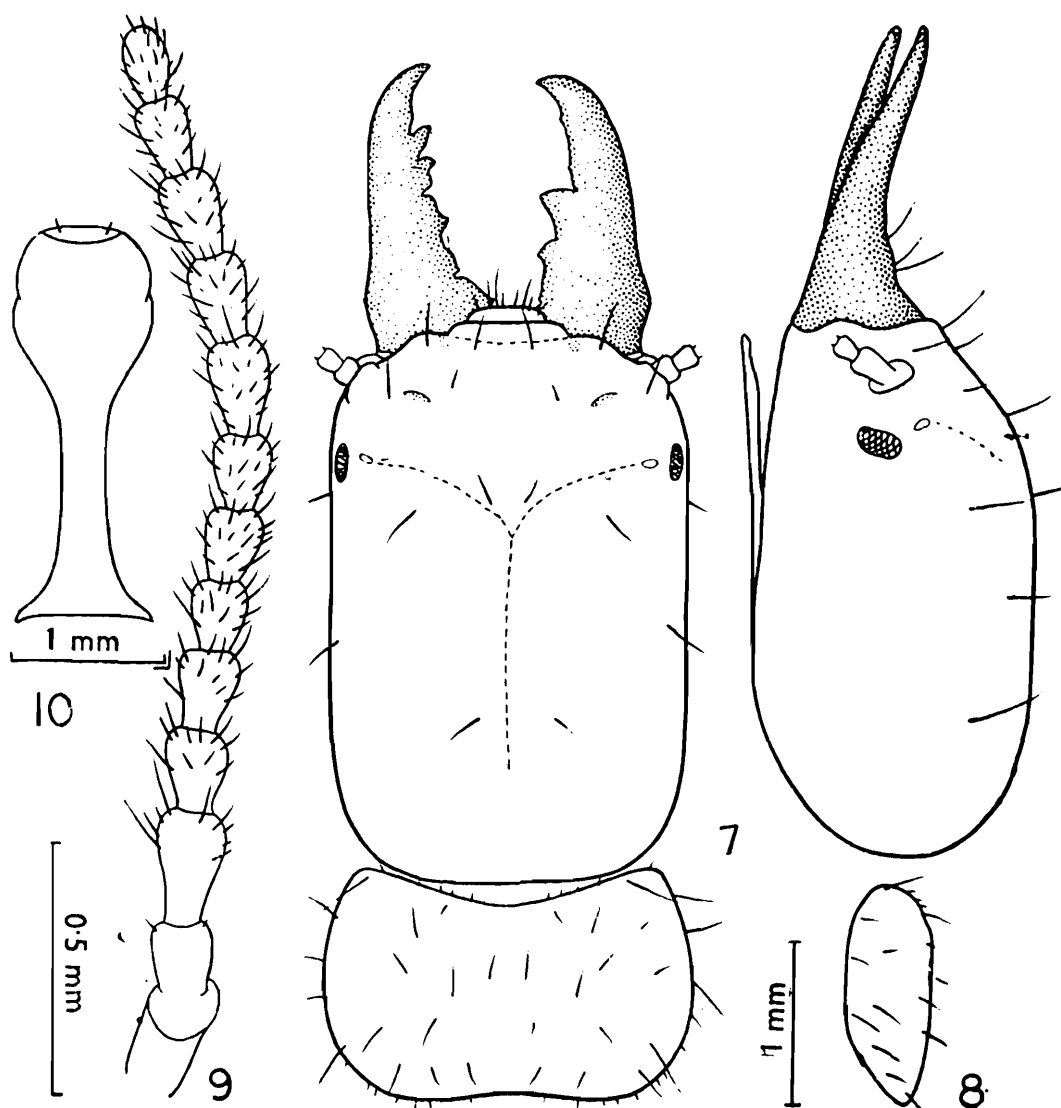
2. SOLDIER (Figs. 7—10 ; Table 2) :

General : Head-capsule mostly reddish brown, posteriorly paler ; clypeus and labrum a little darker ; mandibles basally bright reddish brown, deepening to dark chestnut brown apically ; anteclypeus hyaline ; antennae pale golden brown, segment 3 strongly sclerotized ; thorax, legs and body creamy yellow. Head and body sparsely pilose. Total body-length 11.3 mm.

Head : Head-capsule sub-rectangular, much longer than broad (head-length to base of mandibles 3.30, head-width 2.20 mm) ; sides very slightly divergent in front, posteriorly rounded ; posterior margin slightly incurved ; frons depressed and sloping in front ; Y-suture present. *Ocelli* : Situated at each lateral arm ending as small, whitish spots. *Eyes* : Large, translucent, oval (max. diameter 0.30 mm) ; situated a little below antennae (eye-antennal distance 0.20 mm). *Clypeus* : Post-

* This species is named after late prof. Dhirendra Nath Raychaudhuri under whose able guidance this work was undertaken.

clypeus flat, subrectangular, with 2 pairs of bristles on anterior margin ; anteclypeus a thin, narrow, apilose, strip edging the postclypeus. *Labrum* : Short, tongue-shaped, much broader than long ; apical margin rounded, with long and short setae-like hairs on margin and on body.



Figs. 7-10. *Neotermes dhirendrai* sp. n., Soldier (Holotype).

Fig. 7. Head and pronotum, in dorsal view.

Fig. 8. Ditto, in side view.

Fig. 9. Right antenna.

Fig. 10. Postmentum, in ventral view.

Antennae : With 13+ segments ; segment 1 large, cylindrical, 2 smaller than 1, 3 strongly sclerotized, and one and a half times as long as 2, 4 shorter than 2 and subequal to 5, 6-11 gradually increasing in size, 12 and 13 slenderer than the preceding ones. *Mandibles* : Substraight, incurved apically and with weak basal hump on outer margin, latter very weakly incurved above humps. Left mandible with 7 and right with 2

marginal teeth. *Postmentum*: Long and club-shaped, club bilobed and with a few long and short bristle-like hairs; posterior lobe a little broader than anterior one; waist long and narrow; sides widening out at posterior end; anterior margin substraight and medially hyaline; posterior margin incurved.

Thorax: Pronotum: A little wider than head-capsule; much broader than long (width 2.28, length 1.30 mm), with a few long and short bristle-like hairs on margins and on body; anterior margin shallowly incurved; sides weakly rounded; posterior margin substraight, with a slight medial incurving. *Meso- and Metanotum*: Semicircular, with substraight sides; much shorter than pronotum. *Legs*: Short, stout and sparsely pilose; apical tibial spurs 3 : 3 : 3.

Abdomen: Oblong and pilose. Cerci-2 jointed, 0.15 mm long.

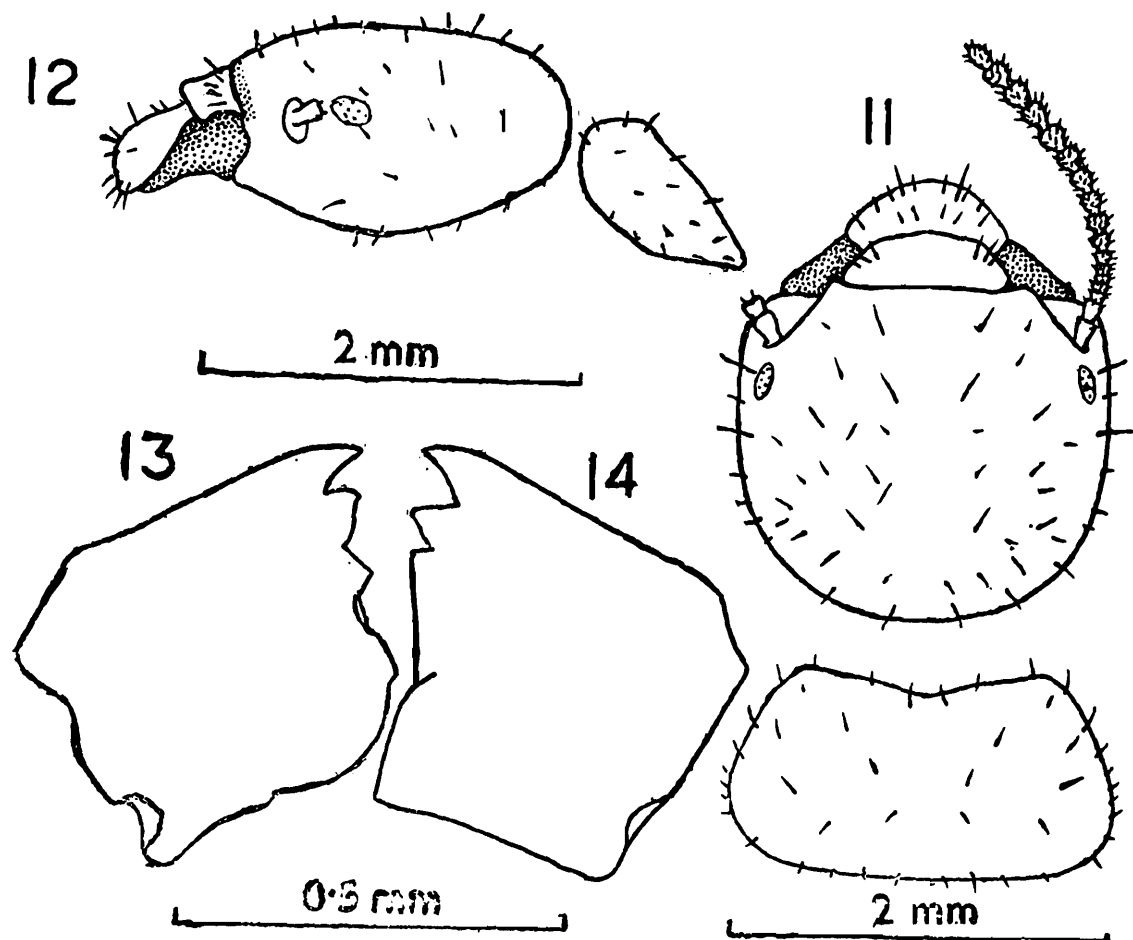
Table 2. Measurements, etc., of *Neotermes dhirendrai* sp. n.

CASTE—Soldier

Body-parts		Holotype
1. Total body-length <i>c</i>	....	11.30
2. Length of head to base of mandibles	....	3.30
3. Max. width of head	....	2.20
4. Max. height of head	....	1.70
5. Head Index I (width/length)	....	0.66
6. Head Index II (height/width)	....	0.77
7. Head Index III (height/length)	....	0.51
8. Max. length of labrum	....	0.28
9. Max. width of labrum	....	0.50
10. Length of mandibles (from upper base of condyle to tip):		
(a) Left mandible	....	1.80
(b) Right mandible	....	1.80
11. Head-mandibular length Index (left-mandible-length/head-length)	....	0.54
12. Max diameter of eye	....	0.30
13. Min. median length of postmentum	....	2.55
14. Width of postmentum at anterior lobe of club	....	0.83
15. Width of postmentum at posterior lobe of club	....	0.88
16. Width of postmentum at waist	....	0.30
17. Max length of pronotum	....	1.30
18. Max. width of pronotum	....	2.28
19. Pronotum-head Index (pronotum width/head-width)	.....	1.04
20. Pronotum Index (length/width)	....	0.57

3. PSEUDOWORKER (Figs. 11—14):

General : Head-capsule pale creamy yellow ; antennae, legs and body pale creamy white ; clypeus and labrum pale brownish ; mandibles basally golden brown, toothed region blackish brown. Head and body fairly densely pilose. Total body-length 8.4 mm.



Figs. 11-14. *Neotermes dhirendrai* sp. n. Pseudoworker (Morphotype).

Fig. 11. Head and pronotum, in dorsal view.

Fig. 12. Ditto, in side view.

Fig. 13. Left mandibles, in dorsal view.

Fig. 14. Ditto, Right mandible.

Head : Head-capsule subrounded ; a little broader than long. *Eyes* : Sub-oval, large, flat and unpigmented ; situated from antennae at about half their long diameter. *Antennae* : 16-segmented, segment 2 longer than 3, 4 shortest, 5-16 increasing in size and broadly oval. *Clypeus* : Postclypeus flat, with 2-3 long bristles on either side ; anteclypeus narrow, apilose, flat. *Labrum* : Broadly tongue-shaped, convexical ; with many long and short hairs on body. *Mandibles* : Subsquamish, each with an apical and two marginal teeth, apical finger-

like, sharp, longer than marginals ; posterior margin of 1st marginal of left mandible equal to anterior margin of 2nd marginal ; posterior margin of 2nd marginal of right mandible equal to molar plate.

Thorax : Pronotum : Flat ; much broader than long ; anterior margin weakly concave ; sides weakly rounded ; posterior margin slightly convexical. *Legs* : Short and pilose ; apical tibial spurs 3 : 3 : 3.

Abdomen : Oblong and pilose. Cerci 2-jointed, 0.15 mm long. Styli single-jointed, 0.19 mm long.

<i>Measurements</i> :	<i>Morphotype</i>
1. Total body-length (without antennae) <i>c</i> ...	8.35
2. Length of head to base of mandibles ...	1.73
3. Max. width of head ...	1.88
4. Max. length of pronotum ...	1.03
5. Max. width of pronotum ...	2.03

Type-specimens : Vide "Material" above, deposited in the National Zoological Collections, Zoological Survey of India, Calcutta, as follows :—

Holotype : Soldier (Z.S.I. Reg. No. 532/H₁₁) ; *Morphotype (Paratype)* : Pseudoworker (Z.S.I. Reg. No. 539/H₁₁).

Distribution : INDIA : Salem, Tamil Nadu (type-locality).

Comparison : *Neotermes dhirendrai* is close to *N. assmuthi* Holmgren and *N. greeni* (Desneux) and can be separated as follows :

From *N. assmuthi* : Soldier : (i) Left mandible with 7 marginal teeth vs 5 in *assmuthi* ; (ii) Anterior lobe of postmentum narrower than posterior one vs broader ; (iii) Pronotum longer both absolutely and in comparison to width.

From *N. greeni* : Soldier : (i) Head-sides weakly diverging in front vs subparallel ; (ii) Segment 3 of antenna about twice as long as 2 vs slightly longer ; (iii) Eyes large and prominent vs smaller ; (iv) Pronotum somewhat rectangular vs semicircular.

Biology : This species makes galleries in dead portions of mango trees.

5. *Neotermes eleanorae** sp. n.

(Figs. 15—21 ; Tables 3—4)

Material : A vial with 9 Im., 3 S., and several Ny. and Pw., Mangalore (Karnataka), coll. O. B. Chhotani (No. 014/23.11.62), 23. xi. 1962, ex. dead branch of mango tree.

*Named in memory of Mrs. Eleanor Emerson who was a respected friend of the author and wife of Prof. Alfred E. Emerson, the world reputed termitologist.

Description : 1. IMAGO (Figs. 15—16 ; Table 3) :

General : Head capsule reddish brown ; clypeus, labrum, basal part of mandibles and antennae bright golden brown ; eyes black ; mandibles apically dark reddish brown ; thorax and body dull golden brown ; wings brownish, hyaline ; legs bright golden yellow. Head and body fairly and legs sparsely, pilose. Total body-length with wings 14.40—16.60 mm.

Table 3. Measurements of *Neotermes eleanorae* sp. n.

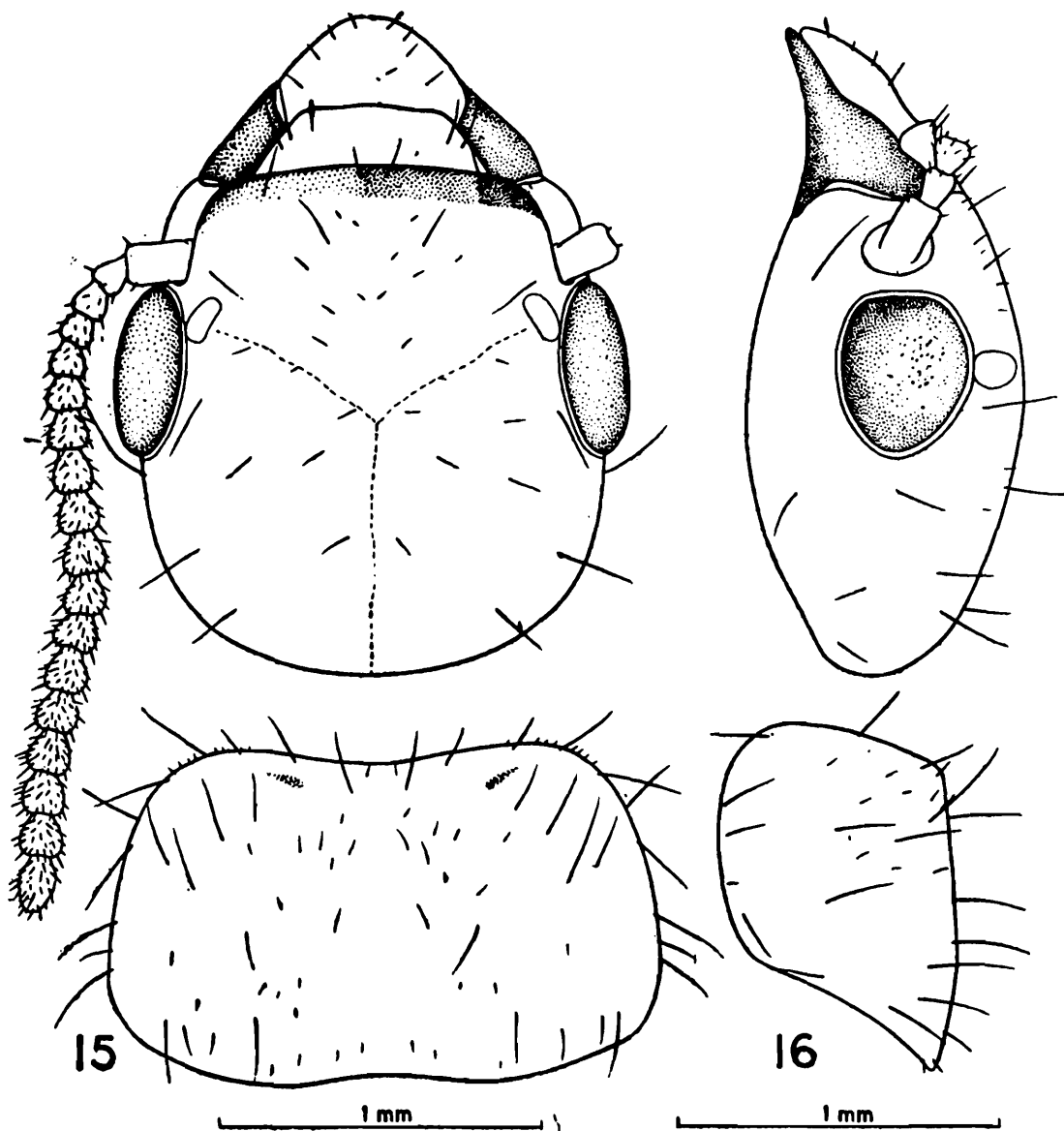
CASTE—Imago

Body-parts	Range (6 exs.)
1. Total body-length with wings	14.40—16.00
2. Total body-length without wings	7.60—9.40
3. Length of head to base of mandibles	1.45—1.65
4. Max. width of head (with eyes)	1.60—1.70
5. Max. height of head	0.80—0.88
6. Max. length of labrum	0.30—0.43
7. Max. width of labrum	0.50—0.55
8. Max. diameter of compound eye (with ocular sclerite)	0.55—0.60
9. Max. diameter of lateral ocellus	0.20—0.23
10. Min. diameter of lateral ocellus	0.18—0.23
11. Min. eye-ocellus distance	0.03
12. Min. eye-antennal distance	0.03
13. Max. length of pronotum	1.00—1.10
14. Max. width of pronotum	1.58—1.88
15. Length of forewing with scale	11.40—13.50
16. Length of forewing scale	1.30—1.53
17. Length of hindwing with scale	10.30—11.70
18. Length of hindwing scale	0.75—1.00

Head : Head capsule subsquarishly oval ; a little broader than long (head-length to base of mandibles 1.45—1.65, head-width including eyes 1.60—1.70 mm) ; sides subparallelly rounded, converging a little anterior to eyes. Y-suture distinct. **Clypeus :** Postclypeus semicircular ; with two pairs of long and a pair of short bristle-like hairs on anterior margin. Anteclypeus trapezoidal, hyaline, and apilose. **Labrum :** Broadly tongue-shaped ; with a few long and short hairs on anterior margin and on body. **Eyes :** Two large, black, compound eyes present, subcircular, anteriorly substraight, situated close to antennae (maximum diameter 0.55—0.60 mm). **Ocelli :** Broadly oval, laterally touching the eyes ; maximum diameter 0.20—0.23, minimum diameter 0.18—0.23 mm. **Antennae :** With 18 segments ; segment 1 long, cylindrical ; 2 shorter than

1 ; 3 shorter than 2 ; 4 shortest ; 5 to penultimate gradually increasing in length and becoming pyriform ; last ovate, shorter than the preceding one. *Mandibles* : Subsquarish ; each with an apical and 2 marginal teeth ; apical sharp and finger-like. Left mandible : 1st marginal with the anterior margin shorter than posterior-one, the latter equal to anterior margin of 2nd. Right mandible : 1st marginal shorter than apical ; 2nd short, with posterior margin long and subequal to molar plate.

Thorax : Pronotum : Flat, subrectangular, with long and short hairs ; generally wider than head including eyes and much broader than long (maximum length 1.00—1.10, maximum width 1.58—1.88 mm).



Figs. 15 and 16. *Neotermes eleanorae* sp. n. Imago (Paramorphotype).

Fig. 15. Head and pronotum, in dorsal view.

Fig. 16. Ditto, in side view.

Legs : Long, hairy ; each tibia with 3 apical spurs ; tarsi 4-segmented, empodium present between the claws.

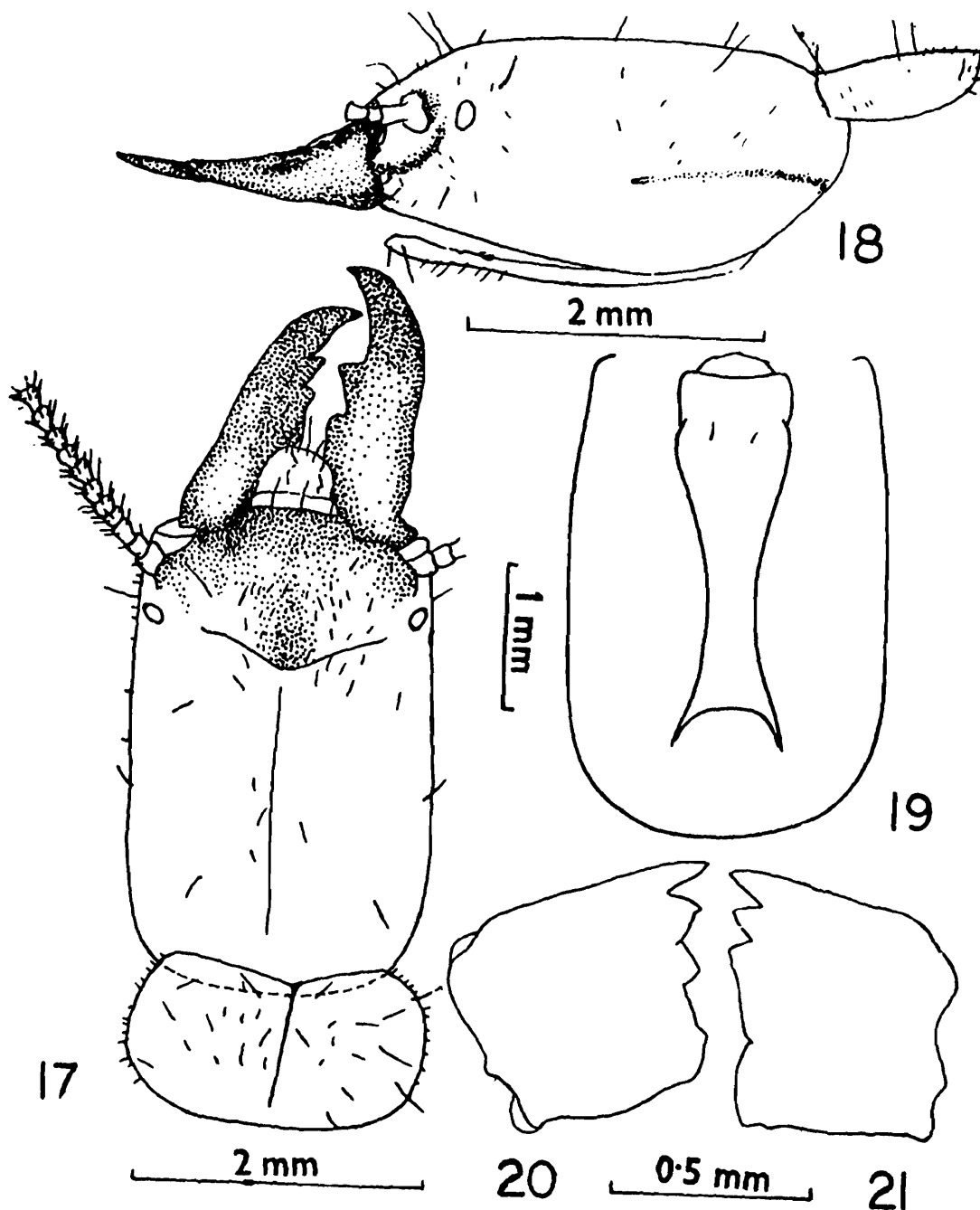
Wings : Wing-membrane pale brownish, transparent ; scale and anterior veins brownish. *Forewing* : Scale large and shield-like ; costa (C) bordering anterior margin ; with a row of small hairs all along its length ; sub-costa (Sc) prominent, running separately up to a short distance outside scale and then joining with costa ; radius (R) prominent, joining C + Sc a little posterior to middle of wing-membrane ; radial sector (Rs) prominent, running up to end of wing-membrane and giving off 5-6 branches to anterior margin from proximal third onwards ; media (M) prominent, running all along and close to Rs and giving off 5-6 branches to Rs in apical half of wing ; cubitus (Cu) weak but well marked, with 9-10 prominent and several faintly marked branches to posterior margin. *Hindwing* : Scale small ; C + Sc fused, bordering anterior margin ; R prominent, meeting C + Sc beyond middle of wing ; Rs running up to tip of wing and with 4-5 branches ; M arising from Rs from middle or a little proximal to middle of wing-membrane and giving off 4-6 short branches to Rs ; Cu basally strong, apically weakly defined, with 8-9 prominent and several weaker branches to posterior margin.

2. SOLDIER (Figs. 17—19 ; Table 4) :

General : Head-capsule yellowish to reddish brown ; clypeus, labrum and antennae yellowish brown ; anteclypeus hyaline ; mandibles basally reddish brown, apically darker ; thorax, legs and body yellowish brown. Head and body fairly pilose. Total length 9.80—10.50 mm.

Head : Head-capsule subrectangular, longer than broad (length of head to base of mandibles 3.25—3.31, width 2.00—2.05 mm) ; sides strongly to weakly convergent anteriorly ; posteriorly rounded ; Y-suture present ; frons sloping in front, somewhat striated. *Eyes* : Oval (maximum diameter 0.23—0.25 mm), lying at a distance of about their long diameter from antennae. *Ocelli* : Present as two small, unpigmented spots at the end of lateral arms of Y-suture. *Antennae* : Broken in all specimens ; 12-13 segments present, segment 1 large, cylindrical, 2 shorter than 1, 3 slender, a little longer than 2, 4 shortest ; from 5 onwards gradually increasing in size and becoming pyriform. *Clypeus* : Postclypeus not well differentiated from frons, with 2 pairs of long, bristle-like hairs and a few short ones on anterior margin. Anteclypeus thin, apilose, hyaline, strip-like. *Labrum* : Broadly tongue-shaped, with 6 pairs of long bristle-like hairs near middle of anterior margin and a few shorter ones on body. *Mandibles* : Stout, curved at apices, with weak basal humps ;

slightly incurved above humps. Left mandible with 5 marginal teeth, 1st marginal bluntly triangular, with a short curved anterior and a long, posterior margin, 2nd like 1st but slightly shorter and curving posteriorly to 3rd, the latter being short and bluntly tipped, 4th and 5th also short



Figs. 17-21. *Neotermea eleanorae* sp. n. Soldier (Holotype) and Pseudoworker (Paramorphotype).

Fig. 17. Head and pronotum of soldier, in dorsal view.

Fig. 18. Ditto, in side view.

Fig. 19. Head of soldier, in ventral view, showing postmentum.

Fig. 20. Left mandible of pseudoworker in dorsal view.

Fig. 21. Ditto, Right mandible.

and bluntly conical. Right mandible with 2 large, marginal teeth. *Postmentum* : Club-shaped, with a thick and large anterior knob and a long stalk below, anterior part divided indistinctly into two lobes, anterior lobe with straighter and posterior-one with slightly convex, sides ; stalk long, slim and narrow ; posterior margin concave.

Table 4. Measurements, etc., of *Neotermes cleanoræ* sp.n.
CASTE—Soldier

Body-parts	Range (2 exs.)	Holotype
1. Total body-length <i>c</i>	9.95—10.50	10.50
2. Length of head to base of mandibles	3.25— 3.31	3.25
3. Max. width of head	2.00— 2.05	2.05
4. Max. height of head	1.60— 1.70	1.60
5. Head Index I (width/length)	0.62— 0.64	0.64
6. Head Index II (height/width)	0.78— 0.82	0.78
7. Head Index III (height/length)	0.49— 0.51	0.49
8. Max. length of labrum	0.23— 0.30	0.30
9. Max. width of labrum	0.52— 0.55	0.55
10. Length of mandibles (from upper base of condyle to tip)		
(a) Left mandible	1.78— 1.80	1.78
(b) Right mandible	1.80	1.80
11. Head-mandibular length Index (left mandible-length/head-length)	0.54	0.54
12. Max. diameter of eye	0.23— 0.25	0.25
13. Min. median length of postmentum	2.25— 2.30	2.30
14. Width of postmentum at anterior lobe of club	0.70— 0.73	0.70
15. Width of postmentum at posterior lobe of club	0.70— 0.73	0.73
16. Width of postmentum at waist	0.28— 0.30	0.30
17. Maximum length of pronotum	0.95— 1.13	0.95
18. Max. width of pronotum	2.03— 2.10	2.03
19. Pronotum-head Index (pronotum-width/head-width)	0.99— 1.00	0.99
20. Pronotum Index (length/width)	0.46— 0.53	0.46

Thorax : Pronotum subrectangular, with a few very long hairs on margins and on body ; sides weakly convex ; anterior margin weakly concave and with a very indistinct notch ; posterior margin substraight. *Mesonotum* : Semi-circular and shorter than pronotum. *Metanotum* : slightly broader than mesonotum and shorter than pronotum. *Legs* : Short, stout and weakly pilose ; apical tibial spurs 3 : 3 : 3.

Abdomen : Oblong and pilose. Cerci 2-segmented, 0.15 mm long. Styli single-jointed, 0.16 mm long.

3. PSEUDOWORKER (Figs. 20-21) :

General : Head pale brownish yellow ; antennae paler. Thorax, legs and body pale creamish yellow. Head and body fairly pilose.

Head : Head-capsule subrounded, almost as long as broad. Eyes unpigmented and oval, spot-like, lying below antennae. Antennae 13 segmented ; segment 1 large, 2 shorter than 1, 3 shortest, 4 and 5 subequal ; 5-12 increasing in size, last slender and ovate. Labrum broadly tongue-shaped. Mandibles as in imago.

Thorax : Pronotum subrectangular with sides weakly curved ; anterior margin concave ; posterior margin substraight. Legs short, pilose ; apical tibial spurs 3 : 3 : 3.

Abdomen : Oval and pilose. Cerci 2-jointed, 0.08 mm long. Styli single-jointed, 0.15 mm long.

Measurements :

	<i>Range</i>
1. Total body-length (without antennae) <i>c</i> ...	4.80—7.00
2. Length of head to base of mandibles ...	1.10—1.63
3. Max. width of head ...	1.15—1.68
4. Max. length of pronotum ...	0.48—0.93
5. Max. width of pronotum ...	0.98—1.80

Type-specimens : The above material is now separated in different vials and deposited in National Zoological Collections, Zoological Survey of India, Calcutta, as follows :—

Holotype : Soldier (Z.S.I. Reg. No. 531/H₁₁).

Morphotypes (Paratypes) : An imago and a pseudoworker (Z.S.I. No. 535/H₁₁).

Paratypes and paramorphotypes (Paratypes) : Two soldiers, six imagos and ten pseudoworkers (Z.S.I. No. 537/H₁₁).

Distribution : India : Southern India : Mangalore (Karnataka), Western Coast (type-locality).

Comparison : The imago of *N. eleanorae* can be separated from that of *N. fletcheri* by its larger eyes (0.55—0.60 vs 0.45 mm) and for media of hindwing arising from radial sector at about middle of wing-membrane (from near scale in *fletcheri*) ; and from that of *N. assmuthi* by its larger head (head-length to base of mandibles 1.45—1.6 vs 1.30 mm ; head-width eyes 1.60—1.66 vs 1.5 mm).

The soldier of this species is differentiated from that of *N. fletcheri*

by slenderer head and mandibles, longer posterior margin of 1st marginal of left mandible and pronotum almost as wide as head (narrower in *fletcheri*); from that of *N. assmuthi* by narrower anterior lobe of the postmentum with straighter sides and more concave anterior margin of pronotum; from that of *N. greeni* by more slender head, subrectangular pronotum (somewhat rounded in *greeni*) and less concave anterior margin of pronotum with weaker medial notch; and from that of *N. dhirendrai*, supra, by smaller eyes (0.23—0.25 vs 0.30 mm), shorter 3rd segment of antenna and straighter mandibles (somewhat hooked at apices in *dhirendrai*).

Biology: This species has been observed making nest in the dead portions of a mango tree at Mangalore. The nest is made up of narrow, inter-communicating galleries filled with faecal pellets.

6. *Neotermes fletcheri* Holmgren and Holmgren

(Figs. 22-23)

1917. (Aug.). *Calotermes (Neotermes) fletcheri* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 : 139. Im., S. and Pw. *Type-locality* : Coimbatore (Tamil Nadu).

1949. *Neotermes fletcheri*; Snyder, *Smiths. misc. Coll.*, 112 : 25.

1960. *Neotermes fletcheri*; Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites (I.C.A.R. Ent. Monog. 1)* : 171-178, 2 pls.

1961. *Neotermes fletcheri*; Krishna, *Bull. Amer. Mus. nat. Hist.*, 122 : 325.

Material: Two vials with sev. Im., S. and Pw., Agricultural College, Coimbatore, Tamil Nadu, coll. O B. Chhotani (Nos. 01 & 4/28.11.62), 28. xi. 62, ex. *Delonix regia* trees.

Measurements :

(i) <i>Imago</i> :		Range (5 exs.)
1. Total body-length with wings <i>c</i>	...	14.70—14.80
2. Total body-length without wings	...	7.70—8.80
3. Length of head to lateral base of mandibles	...	1.40—1.48
4. width of head with eyes	...	1.57—1.63
5. Max. diameter of eye	...	0.50—0.55
6. Max. diameter of ocellus	...	0.17—0.25
7. Max. length of pronotum	...	0.90—0.99
8. Max. width of pronotum	...	1.57—1.65
9. Length of forewing with scale	...	12.00—12.15
10. Length of hindwing with scale	...	11.00—11.20

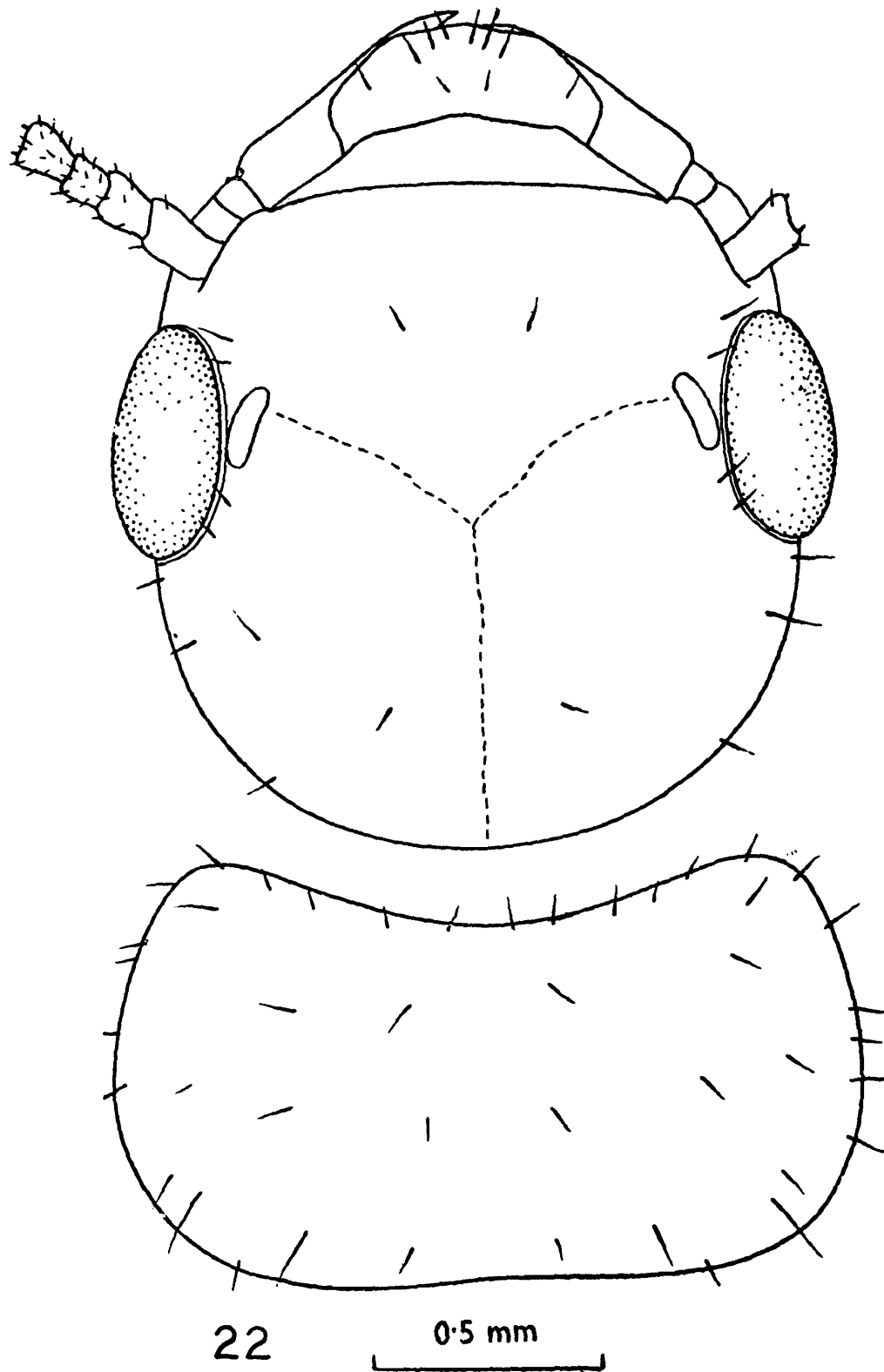


Fig. 22. *Neotermees fletcheri* Holmgren and Holmgren. Imago head and pronotum, in dorsal view.

(ii) <i>Soldier</i> :	Range (6 exs.)
1. Total body-length <i>c</i>	... 10.00—10.50
2. Length of head to base of mandibles	... 3.00— 3.50
3. Max. width of head	... 2.00— 2.40
4. Max. diameter of eye	... 0.22— 0.28
5. Max. length of pronotum	... 1.00— 1.15
6. Max. width of pronotum	... 1.90— 2.20

Distribution : INDIA : Southern India : Coimbatore (Tamil Nadu).
Elsewhere : Not known.

Biology : This species has been collected nesting in '*Delonix regia*' trees at Coimbatore. The attack starts from dead portions of the trees or from the portion of the bark which is cut for making the number on the tree. The nest is in the form of narrow, longitudinal galleries filled with faecal pellets and wood particles. It has also been reported from stem and branches of "*Moringa pterygosperma*" and logs of wood. The imagos have been reported to be present in the nest during September to December.

7. *Neotermes keralai* Roonwal and Verma

(Fig. 24)

1971. *Neotermes keralai* Roonwal and Verma, *Proc. natn. Acad. sci. India*, 41(B) III : 251-256. S. and Pw. Type-locality-Chackai, Trivandrum, Kerala India.

Material : A vial with the holotype soldier (Z.S.I. Reg. No. 23/H_{1,1}) and another with a paratype soldier, a morphotype pseudoworker and 2 paramorphotype nymphs (Z.S.I. Reg. No. 853/H_{1,1}), coll. R. V. Verma, Sept. 1970, ex. unidentified wood.

Measurements :

<i>Soldier</i> :	Range (2 exs.)
1. Total body-length <i>c</i>	... 8.70—9.60
2. Length of head to base of mandibles	... 3.10—3.13
3. Max. width of head	... 2.10—2.28
4. Max. diameter of eye	... 0.20—0.25
5. Max. length of pronotum	... 1.10—1.15
6. Max. width of pronotum	... 2.08—2.43

Distribution : INDIA : Southern India : Chackai, Trivandrum, Kerala, state. Elsewhere : Not known.

Biology : Nothing is known of the biology of this species. It was collected from an unidentified wood.

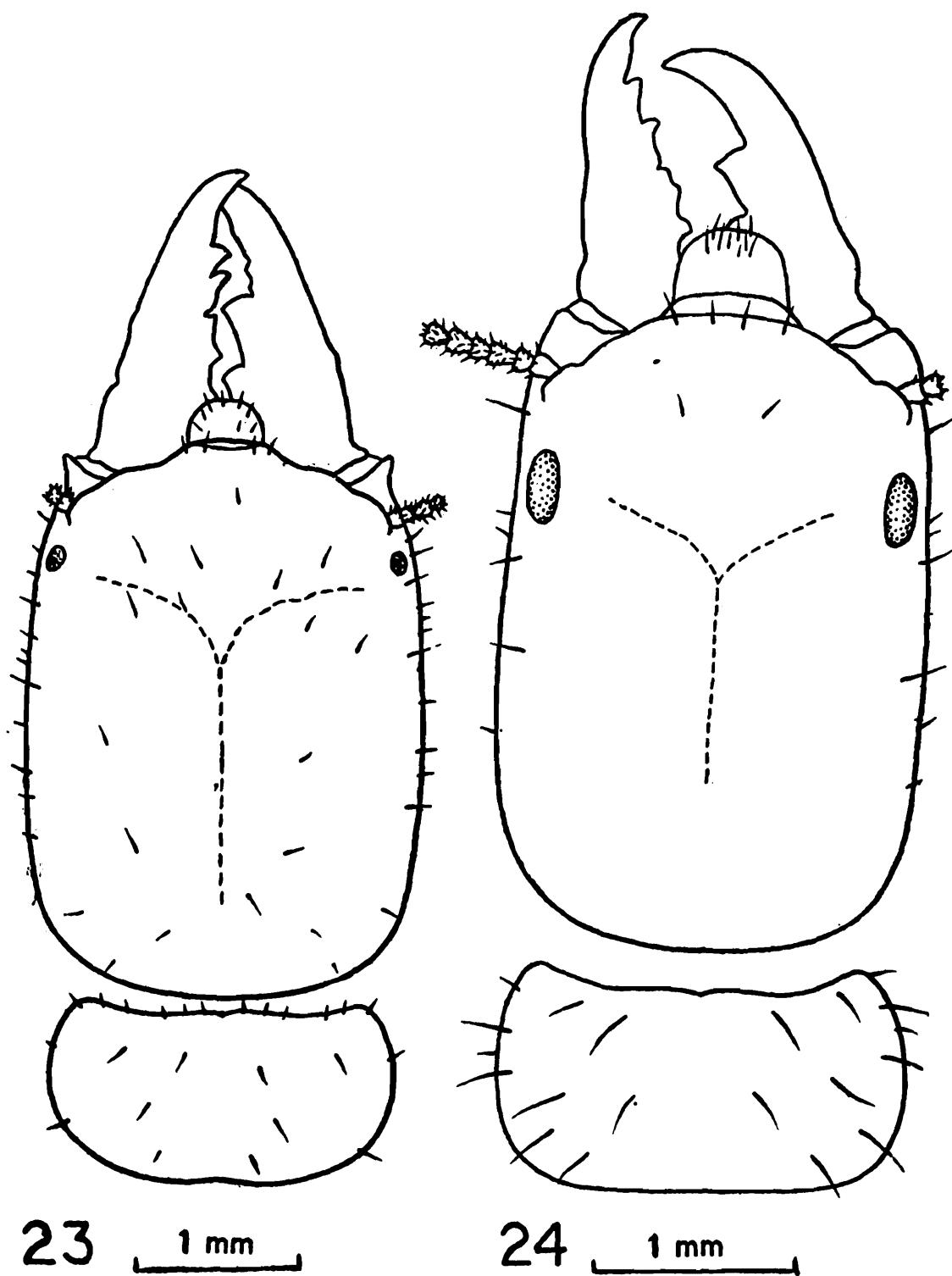


Fig. 23. *Neotermes fletcheri* Holmgren and Holmgren. Soldier head and pronotum, in dorsal view.

Fig. 24. *Neotermes keralai* Roonwal and Verma. Soldier (Holotype), head and pronotum, in dorsal view.

8. *Neotermes krishnai** sp. n.

(Figs. 25—29 ; Table 5)

Material : A vial with 3 S. and sev. Pw., Salem, Tamil Nadu, coll. O. B. Chhotani (No. 06/13.2.69), 13. ii. 1969, ex. "dead portion of a mango tree".

Description : 1. IMAGO : Unknown.

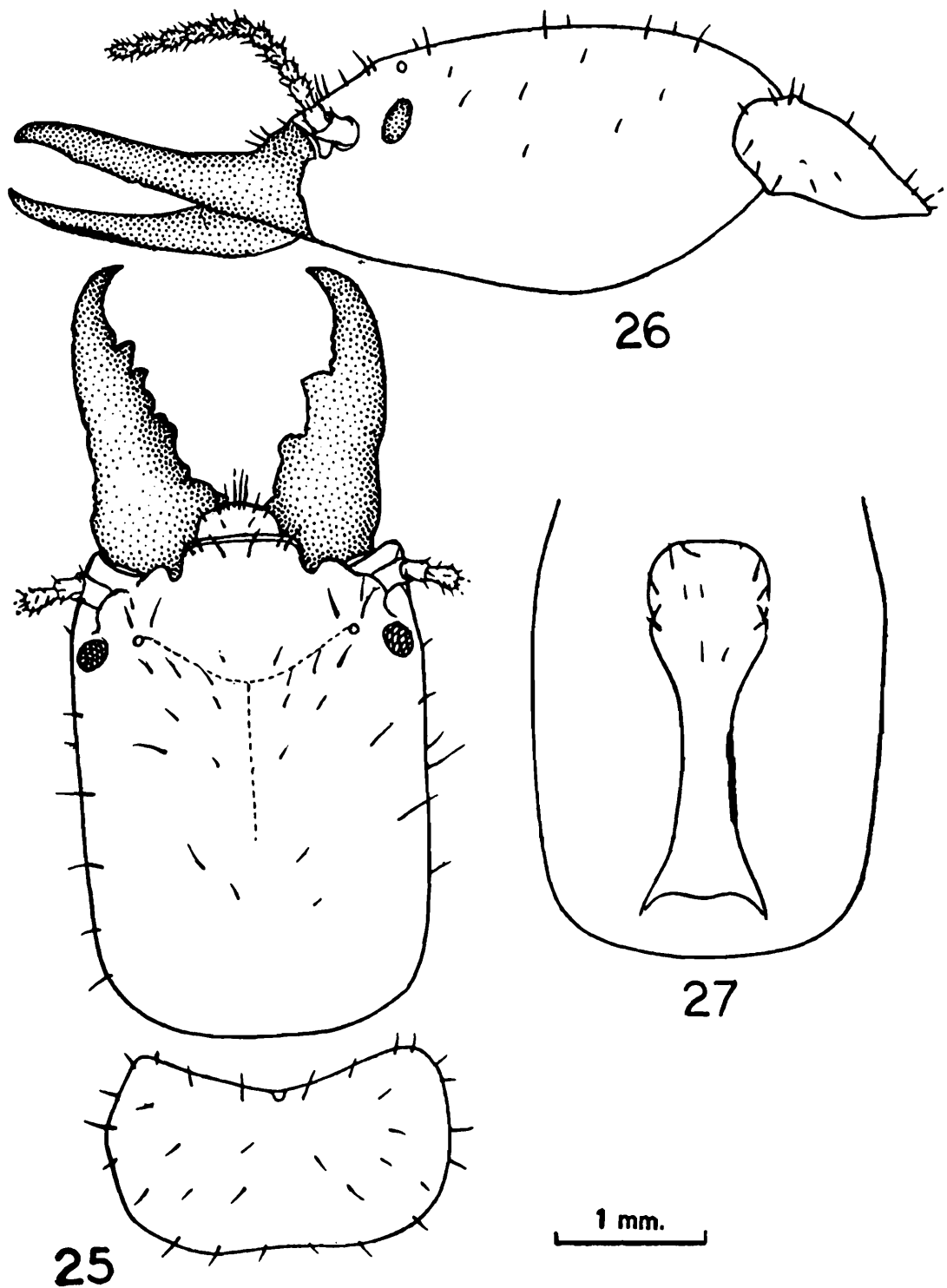
2. SOLDIER (Figs. 25—27 ; Table 5) :

General : Head-capsule dark golden brown, medially a little paler ; clypeus and labrum slightly darker ; mandibles basally pale reddish brown, apically dark chestnut brown ; anteclypeus hyaline ; antennae pale golden yellow, 3rd segment being strongly sclerotized ; thorax, legs and body creamy yellow. Head and body sparsely pilose. Total body-length 9.8—11.5 mm.

Head : Head-capsule subrectangular, much longer than broad (length to lateral base of mandibles 3.20—3.25, width 2.28—2.45 mm) ; sides widening anteriorly near antennae and rounded posteriorly ; frons depressed and sloping in front at an angle of 45 degrees ; Y-suture present. *Eyes* : Translucent and like oval spots, lying a little behind antennae at about their short diameter. *Ocelli* : Minute and appear as white spots at end of lateral arms. *Clypeus* : Postclypeus flat, subrectangular, with 2 pairs of long bristles at anterior margin ; anteclypeus narrow, trapezoidal, strip-like and apilose. *Labrum* : Tongue-shaped and broader than long ; apical margin rounded with a few long and short hairs on body. *Antennae* : 12-segmented ; segment 3 longer than 2 and strongly sclerotized ; remaining shorter than 3 and gradually increasing in size apically ; apical slender and ovate. *Mandibles* : Sub-straight, incurved apically ; each with a strong basal hump on outer margin, the latter incurved just above the hump ; dentition as in figure. Left mandible with 6 and right with 2 marginal teeth. *Postmentum* : Long and club-shaped ; club bilobed, with a few long and short bristles ; anterior lobe as wide as posterior one ; waist long and narrow ; sides widening out near posterior end ; anterior margin substraight, somewhat hyaline medially ; posterior margin incurved.

Thorax : *Pronotum* : As wide as head-capsule ; much wider than long (maximum width 2.13—2.38, maximum length 1.15—1.23 mm) ;

*Named after Prof. K. Krishna, the well known termitologist.



Figs. 25—27. *Neotermes krishnai* sp. n. Soldier (Holotype).

Fig. 25. Head and pronotum, in dorsal view.

Fig. 26. Ditto, in side view.

Fig. 27. Head, in ventral view, showing postmentum.

anterior margin incurved ; sides rounded ; posterior margin semicircular, weakly incurved medially ; with a few long and short, erect bristles on margins and body. *Mesonotum* : Semicircular, much shorter and narrower than pronotum. *Metanotum* : Semicircular, a little broader than mesonotum and narrower than pronotum. *Legs* : Short and stout ; sparsely hairy ; apical tibial spurs 3 : 3 : 3.

Table 5. Measurements, etc. of *Neotermes krishnai* sp.n.

CASTE—Soldier

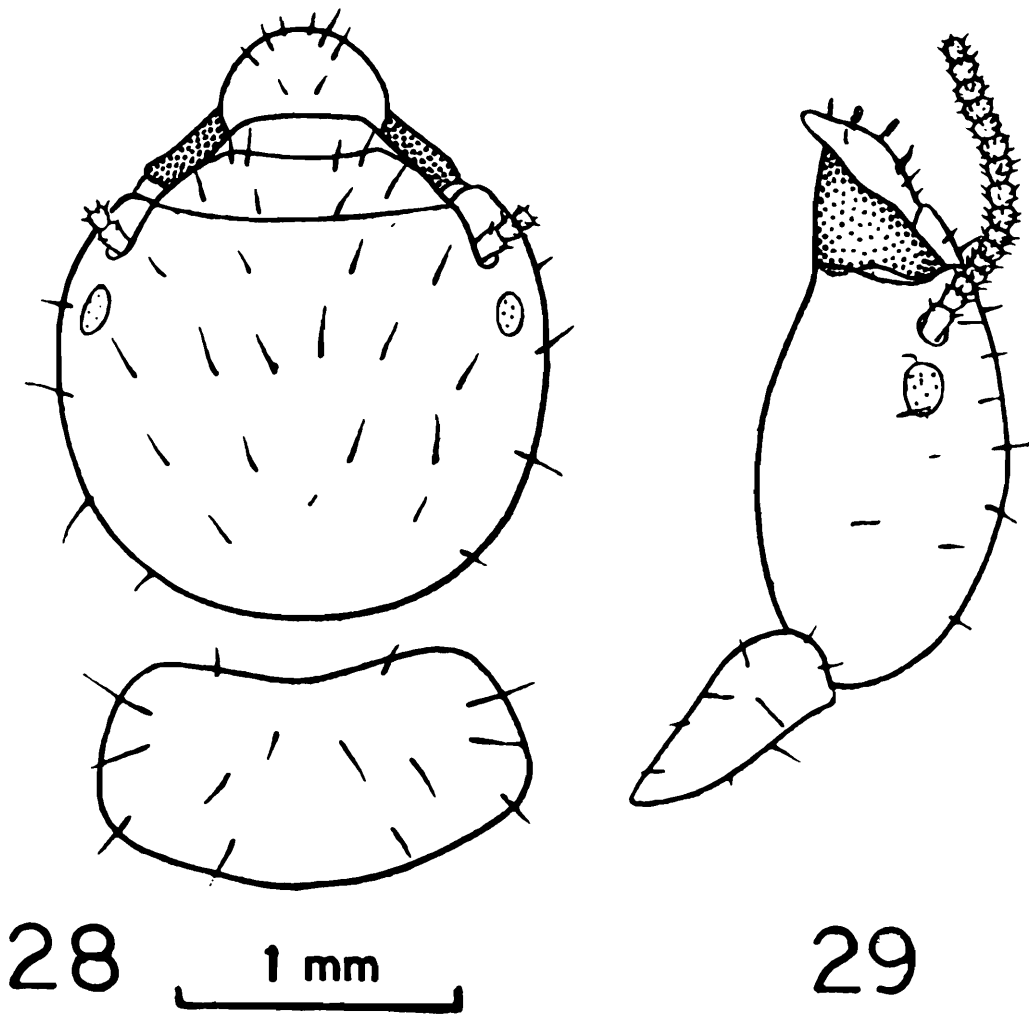
Body parts	Range (3 exs.)	Holotype
1. Total body-length <i>c</i>	9.80—11.50	11.50
2. Length of head to base of mandibles	3.20— 3.35	3.35
3. Max. width of head	2.28— 2.45	2.45
4. Max. height of head	1.70— 1.85	1.85
5. Head Index I (width/length)	0.71— 0.75	0.75
6. Head Index II (height/width)	0.74— 0.76	0.76
7. Head Index III (height/length)	0.52— 0.55	0.55
8. Max. length of labrum	0.20— 0.35	0.20
9. Max. width of labrum	0.53— 0.63	0.63
10. Length of mandibles (from upper base of condyle to tip)		
(a) Left mandible	1.95— 2.00	1.98
(b) Right mandible	1.93— 2.00	1.95
11. Head-mandibular length Index (left mandible-length/head-length)	0.60— 0.62	0.60
12. Max. diameter of eye	0.33— 0.35	0.35
13. Min. median length of postmentum	2.25— 2.45	2.45
14. Width of postmentum at anterior lobe of club	0.80— 0.85	0.85
15. Width of postmentum at posterior lobe of club	0.78— 0.80	0.80
16. Width of postmentum at waist	0.30— 0.33	0.33
17. Max. width of pronotum	2.13— 2.38	2.38
18. Max. length of pronotum	1.15— 1.23	1.23
19. Pronotum-head Index (pronotum width/head-width)	0.93— 1.00	0.97
20. Pronotum Index (length width)	0.49— 0.52	0.51

Abdomen : Oblong and pilose. Cerci 2-jointed ; 0.10 mm long. Styli single-jointed, long and narrow ; 0.15 mm long.

3. PSEUDOWORKER (Figs. 28-29) :

General : Head-capsule creamy yellow ; labrum darker ; mandibles light brown, teeth blackish brown ; thorax and abdomen somewhat paler.

Head: Head-capsule subsquarishly rounded. *Eyes*: Large, translucent, lying just behind antennae. *Clypeus*: Anteclypeus apilose; narrow, subtrapezoidal; postclypeus not well differentiated from frons. *Labrum*: Subsquarishly tongue-shaped, with a few long hairs on anterior margin and body. *Mandibles*: Subsquarish, each with a finger-like apical and two marginal teeth; left mandible with posterior margin of first marginal equal to anterior margin of 2nd; right mandible with posterior margin of 2nd marginal subequal to molar plate. *Antennae*: 15—17 segmented; segment 2 larger than 3, 4 shortest.



Figs. 28 and 29. *Neotermes krishnai* sp. n. Pseudoworker (Paramorphotype).

Fig. 28. Head and pronotum, in dorsal view.

Fig. 29. Ditto, in side view.

Thorax: *Pronotum*: Broadly semicircular, anterior margin concave, sides rounded, posterior margin convex. *Legs*: Short, stout and hairy; apical tibial spurs 3 : 3 : 3.

Abdomen: Oblong. Cerci 2-jointed, 0.1 mm long. Styli single-jointed, 0.15 mm long.

Measurements :

1. Total body-length <i>c</i>	...	5.10—7.00
2. Length of head to base of mandibles	...	1.00—1.70
3. Max. width of head	...	1.18—1.90
4. Max. length of pronotum	...	0.55—0.90
5. Max. width of pronotum	...	1.03—1.75

Type-specimens : All vide 'Material' above, deposited in National Zoological Collections, Zoological Survey of India, Calcutta, as follows :

Holotype : Soldier (Z.S.I. Reg. No. 530/H₁₁).

Morphotype : Pseudoworker (Z.S.I. Reg. No. 534/H₁₁).

Paratype (Soldier) and paramorphotype (pseudoworkers) : 2 soldiers and 2 pseudoworkers (Z.S.I. Reg. No. 533/H₁₁).

Distribution : INDIA : Southern India : Salem, Tamil Nadu (type-locality).

Comparison : *Neotermes krishnai* is close to *N. assmuthi*, and *N. greeni* but can be separated as follows :

From *N. assmuthi* : Soldier : (i) Eyes larger (0.30-0.35 vs 0.20-0.24 mm) ; (ii) Basal humps of mandibles stronger ; (iii) Anterior margin of pronotum strongly concave vs weakly concave.

From *N. greeni* : Soldier : (i) Head sides weakly diverging in front vs substraight ; (ii) Eyes generally large and subrounded vs somewhat smaller and suboval (maximum diameter 0.30—0.35 vs 0.18—0.30 mm) ; (iii) Posterior margin of 2nd marginal tooth of left mandible somewhat longer.

9. *Neotermes nilamburensis* Thakur

(Figs. 30, 31)

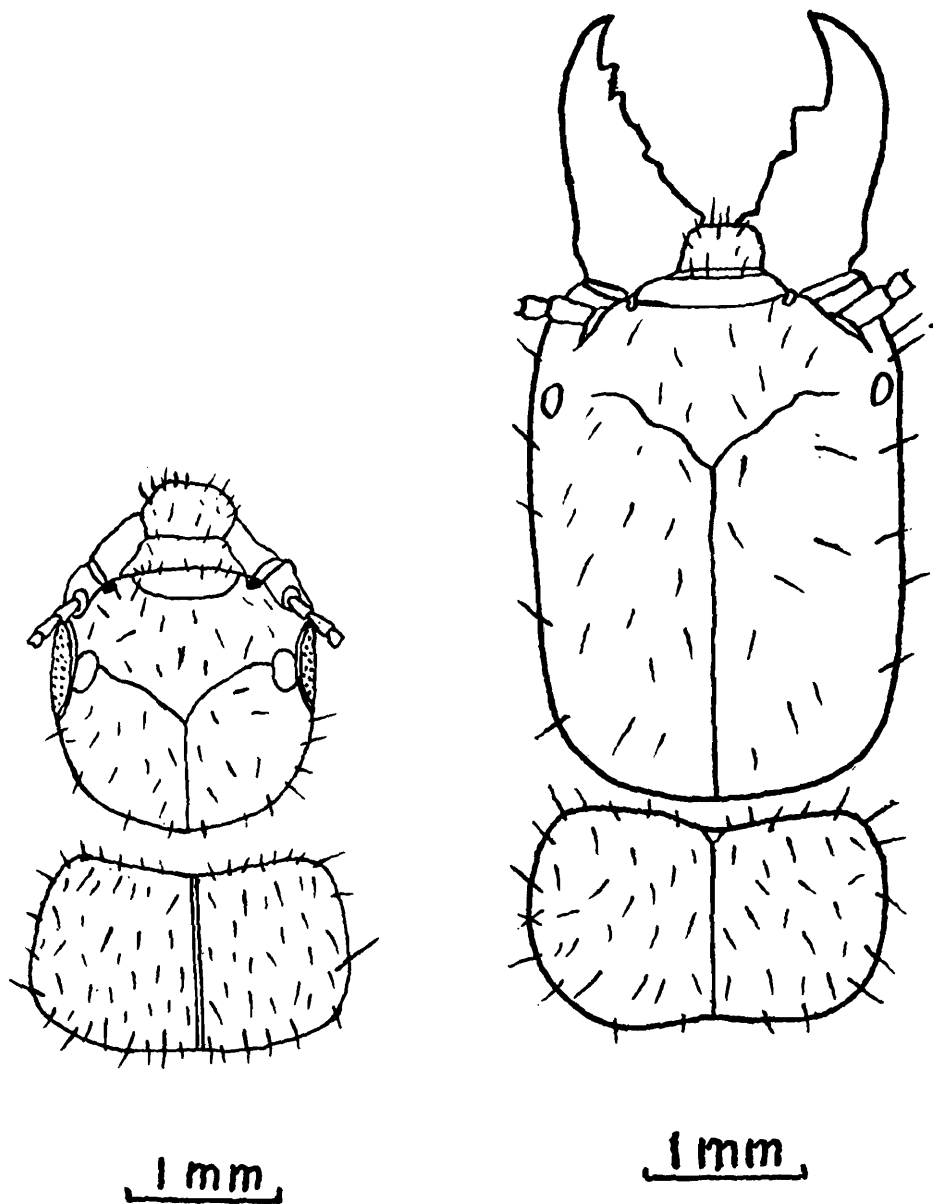
1978. *Neotermes nilamburensis* Thakur, *J. Indian. Acad. Wood. Sci.*, 9(1) : 56—61, Figs. 1(Im.), 2(S.), 3(Pw.). Im., S., Pw. Type-locality : Nilambur, Kerala, India.

Material : One vial with 1 Im. and 2 Pw. (Paramorphotypes) and 2 S. (Paratypes), near Circuit House, Nilambur, Kerala, coll. M. L. Thakur, 21. xii. 1970, ex. Jack Wood tree.

Measurements :

(i) <i>Imago :</i>		1 Im (dealate)
1. Total body-length without wings	...	8.75
2. Length of head to tip of labrum	...	2.00
3. Length of head to base of mandibles	...	1.63
4. Max. width of head with eyes	...	1.73

5. Max. diameter of eye	...	0.55
6. Min. diameter of eye	...	0.50
7. Max. diameter of ocellus	...	0.25
8. Min. diameter of ocellus	...	0.18
9. Max. length of pronotum	...	1.00
10. Max. width of pronotum	...	1.80



30

31

Figs. 30 and 31. *Neotermes nilamburensis* Thakur.
 Fig. 30. Head and pronotum of imago, in dorsal view.
 Fig. 31. Ditto, soldier.

(ii) <i>Soldier</i> :	2 exs. (paratypes)
1. Total body-length <i>c</i>	10.00—10.05
2. Length of head to base of mandibles	3.00—3.30
3. Max. width of head	2.15—2.18
4. Max. length of pronotum	1.15—1.28
5. Max. width of pronotum	2.10—2.15

Distribution : India : Southern India : Nilambur, Kerala.

Biology : This species has been collected from a Jack wood tree.

10. *Neotermes venkateshwara** sp. n.

(Figs. 32—36 ; Table 6)

Material : A vial with 2 S. and several Pw., Top Slip, *c* 2,500 ft. alt. (Z.S.I. Stn. No. 19), Tamil Nadu, coll. O. B. Chhotani, 18 ii. 1969, ex. 'dead branch of an unknown tree'

Description : 1. IMAGO : Unknown.

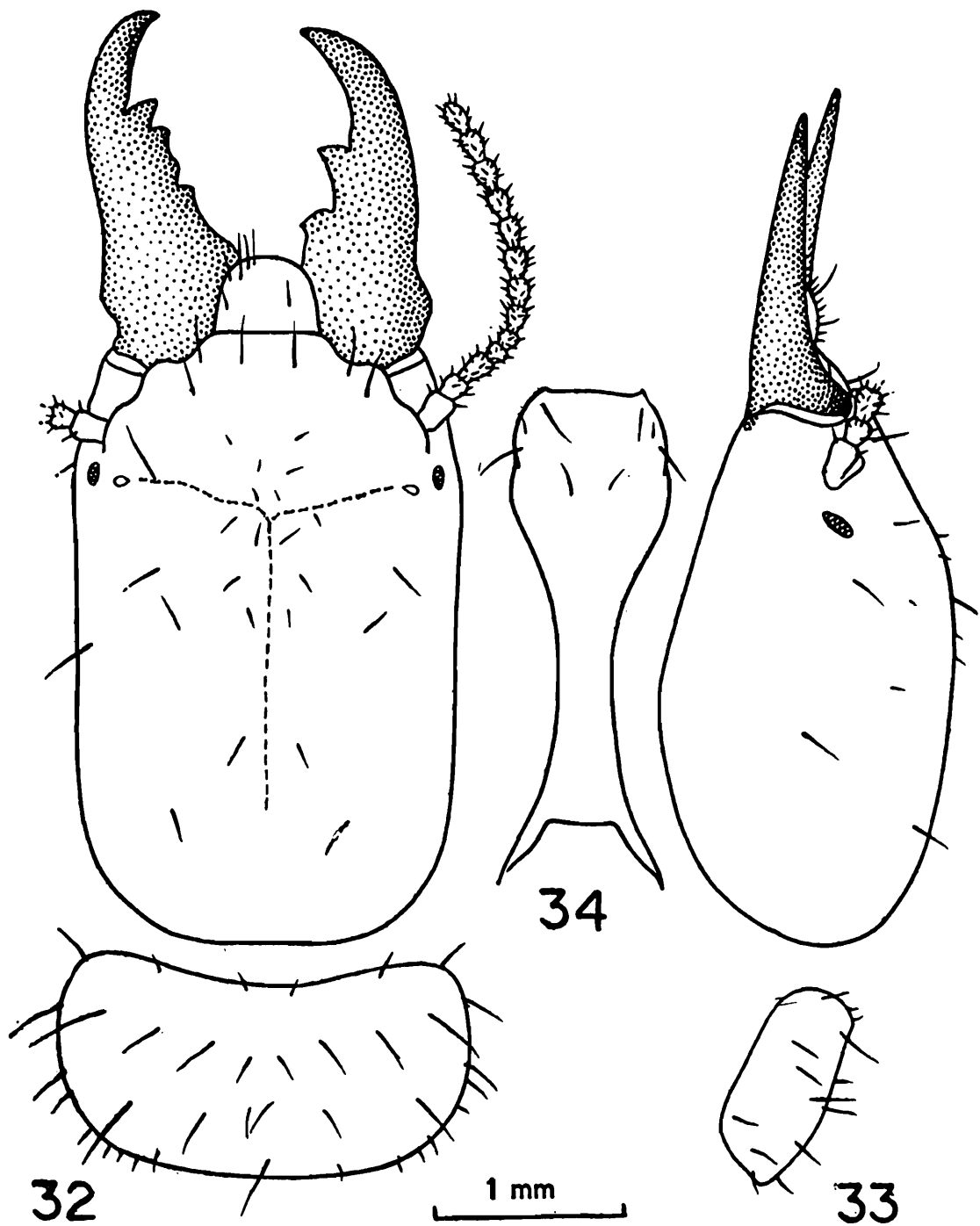
2. SOLDIER (Figs. 32—34 ; Table 6) :

General : Head-capsule dark golden brown, paler posteriorly ; anterior part of head, antennal foveolae, postclypeus and mandibles dark reddish brown ; anteclypeus hyaline ; labrum dark brown ; thorax, legs and rest of body pale golden yellow. Head and body sparsely pilose. Total body-length 9.2—9.8 mm.

Head : Head-capsule subrectangular, parallel sided, much longer than broad (head-length to base of mandibles 2.9—3.3, head-width 2.08—2.20 mm) ; frons depressed and sloping in front at an angle of 45 degrees ; Y-suture present. *Eyes* : Lateral, translucent, oval and appear as unpigmented spots, situated a little below antennal sockets at about the maximum diameter of eye (eye-antennal distance 0.18—0.23, maximum diameter of eye 0.20—0.28 mm). *Ocelli* : Present as small, whitish spots at the end of the lateral arms, one on either side. *Clypeus* : Postclypeus flat, subrectangular, with 2 pairs of bristles at anterior margin ; anteclypeus narrow, strip-like and apilose. *Labrum* : Tongue-shaped, a little broader than long, with a few long setae-like and some shorter hairs on body. *Antennae* : 13-14 segmented ; segment 1 moderately long, cylindrical ; 2 shorter than 1 ; 3 much longer than 2 ; 4 shortest ; 5 to penultimate increasing in size ; last slender and smaller. *Mandibles* : Substraight,

* Named after Lord Venkateshwara.

incurved apically and each with basal hump on outer margin, the latter being a little incurved above hump ; dentition as in figure. Left mandible



Figs. 32—34. *Neotermes venkateshwara* sp. n. Soldier (Holotype).

Fig. 32. Head and pronotum, in dorsal view.

Fig. 33. Ditto, in side view.

Fig. 34. Postmentum, in ventral view.

with 4 marginal teeth. Right mandible with 2 large, marginal teeth. *Postmentum* : Club-shaped, the club being bilobed, with a few pairs of long and short bristles ; posterior lobe of club a little broader than

anterior lobe ; waist long and narrow, sides widening out at base ; anterior margin substraight, somewhat hyaline medially ; posterior margin incurved.

Table 6. Measurements, etc. of *Neotermes venkateshwara* sp. n.
CASTE—Soldier

Body parts	Range (2 exs.)	Holotype
1. Total body-length c	9.20--10.1	10.1
2. Length of head to lateral base of mandibles	3.15— 3.30	3.30
3. Max. width of head	2.08— 2.20	2.20
4. Max. height of head	1.50— 1.75	1.75
5. Head Index I (width/length)	0.66— 0.71	0.66
6. Head Index II (height/width)	0.72— 0.79	0.79
7. Head Index III (height/length)	0.51— 0.53	0.53
8. Max. length of labrum	0.28— 0.43	0.43
9. Max. width of labrum	0.55— 0.58	0.55
10. Length of mandibles (from upper base of condyle to tip) :		
(a) Left mandible	1.75— 1.80	1.80
(b) Right mandible	1.70— 1.75	1.75
11. Head-mandibular length Index (left mandible-length/head length)	0.54— 0.60	0.54
12. Max. diameter of eye	0.20— 0.28	0.28
13. Min. median length of postmentum	2.25— 2.40	2.40
14. Width of postmentum at anterior lobe of club	0.68— 0.80	0.80
15. Width of postmentum at posterior lobe of club	0.78— 0.85	0.85
16. Width of postmentum at waist	0.28— 0.30	0.30
17. Max. length of pronotum	1.00— 1.18	1.18
18. Max. width of pronotum	1.98— 2.25	2.25
19. Pronotum-head Index (pronotum-width/head-width)	0.95— 1.01	1.01
20. Pronotum Index (length/width)	0.50— 0.52	0.52

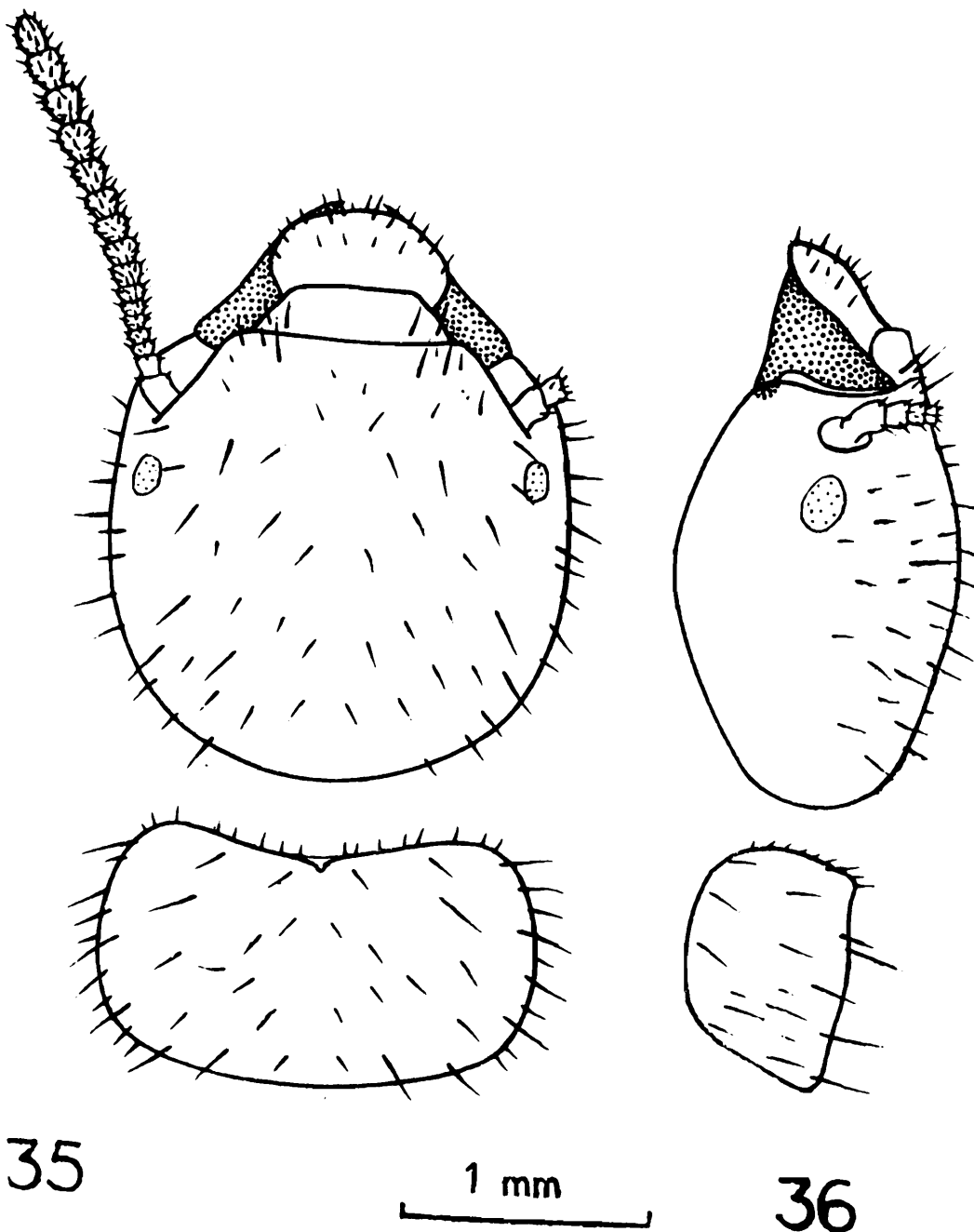
Thorax : Pronotum : Almost as wide as head-capsule ; much broader than long (width 1.98—2.25, length 1.00—1.18 mm) ; anterior margin shallowly concave ; sides rounded ; posterior margin substraight, with a few bristle-like, large hairs on margins and body. *Mesonotum* : Semicircular, much shorter and narrower than pronotum. *Metanotum* : Semicircular, a little broader than mesonotum, narrower than pronotum. *Legs* : Short, stout and sparsely pilose ; apical tibial spurs 3 : 3 : 3.

Abdomen : Oblong, pilose. Cerci short, 2-jointed, 0.18 mm long. Styli single-jointed, 0.15 mm long.

3. PSEUDOWORKER (Figs. 35-36) :

General : Head-capsule pale yellow ; antennae, legs and body pale creamish white ; clypeus and labrum pale brown ; mandibles brownish basally, with the tooth region blackish brown. Head and body fairly densely pilose. Total body-length 8.6—9.10 mm.

Head : Head-capsule broadly rounded, almost as long as broad.



Figs 35 and 36. *Neotermes venkateshwara* sp.n., Pseudoworker.

Fig. 35. Head and pronotum in dorsal view.

Fig. 36. Ditto, in side view.

Eyes : Broadly oval, unpigmented and flat ; about half their long diameter from antennae. *Antennae* : 15-16 segmented ; segment 2 longer than 3 ; 4 shortest ; 5 to penultimate increasing in size ; last oval, smaller than penultimate. *Clypeus* : Postclypeus flat, with 2-3 long bristles on either side ; anteclypeus apilose and flat. *Labrum* : Broadly tongue-shaped. *Mandibles* : Subsquarish. Left mandible with an apical and two marginal teeth ; apical finger-like and longer than marginals ; 1st marginal with anterior margin shorter than the posterior-one, the latter being as long as anterior margin of 2nd. Right mandible with a finger-like apical and 2 marginals ; 1st marginal shorter than apical , 2nd marginal with the posterior margin as long as molar plate.

Thorax Pronotum : Flat, subreniform ; much broader than long ; anterior margin concave, posterior margin weakly convex. *Legs* : Short and pilose ; apical tibial spurs 3 : 3 : 3.

Abdomen : Oblong and hairy. Cerci and styli present.

Measurements :

		Range (5 exs.)
1. Total body-length <i>c</i>	...	8.60—9.10
2. Length of head to base of mandibles	...	1.65—1.80
3. Max. width of head	...	1.70—1.85
4. Max. length of pronotum	...	1.03—1.10
5. Max. width of pronotum	...	2.00—2.10

Type specimens : All *vide* 'Material' above, deposited in the National Zoological Collections, Zoological Survey of India, Calcutta.

Holotype : Soldier, Z.S.I., Reg. No. 529/H₁₁.

Morphotype (paratype) : Pseudoworker, Z.S.I. Reg. No. 536/H₁₁.

Paratype (soldier) and paramorphotype (pseudoworker) : One soldier and 2 pseudoworkers, Z.S.I., Reg. No. 538/H₁₁.

Distribution : INDIA : Southern India : Top Slip (Tamil Nadu), type-locality.

Comparison : The soldier of *Neotermes venkateshwara* can be separated from the other closely related species of the genus as follows :—

From *N. fletcheri* : By pronotum as wide as head-capsule (narrower in *fletcheri*).

From *N. greeni* : By the left mandible with 4 (*vs* 5) marginal teeth and pronotum less concave anteriorly and comparatively weakly rounded at sides.

From *N. assmuthi* : By shorter mandibles both in absolute length

and in comparison to head-length ; 4 (vs 5) marginal teeth on left mandible and the posterior lobe of postmentum wider than the anterior-one (vs narrower).

From *N. dhirendrai* : By 4 marginal teeth on the left mandible of the soldier vs 7 in *dhirendrai* and in the shape of pronotum.

From *N. eleanorae* : By wider head (head-width/head-length to base of mandibles 0.66—0.71 vs 0.63—0.64) and longer inner margin of the left mandible between the apex and the 1st marginal tooth.

Biology : The nest of this species was found in a dead branch of an unidentified tree, fallen on the jungle floor in the evergreen (Shola) forest at Top Slip.

Genus *Glyptotermes* Froggatt

1896. *Glyptotermes* Froggatt, *Proc. Linn. Soc. N.S.W.*, 21 : 518, 543.

1949. *Glyptotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 45, 359.

1960. *Glyptotermes* ; Roonwal and Sen-Sarma, *Contr. Syst. Orient. Termites* (ICAR Monogr. 1) : 97-98.

1961. *Glyptotermes* ; Krishna, *Bull. Am. Mus. nat. Hist.*, 122 : 314, 315, 316, 317, 343-348, 384, 385, 386.

1975. *Glyptotermes* ; Chhotani, *Rec. zool. Surv. India*, 68 : 109-159.

Type species : *Glyptotermes tuberculatus* Froggatt, by subsequent designation.

Snyder (1949) has catalogued five species i.e., *almorensis*, *ceylonicus*, *coorgensis*, *dilatatus* and *minutus* of the genus *Glyptotermes* from the Indian region and Krishna (1961) later on recognised all these. Mathur and Sen-Sarma (1960) described *G. nigrifrons* from Top Slip (Tamil Nadu) and separated it from all the other Indian species of the genus on the basis of the strongly sclerotised 10th abdominal tergite in the soldier. Chhotani (1975b) in his remarks on the species *nigrifrons* says that it is hardly differentiated from *coorgensis* Holmgren and Holmgren and according to him, Krishna in his personal communication informed him that the two species are not separable, but as he had not seen the types of *coorgensis* himself, he kept the species separate. The author examined the types of *coorgensis* and *nigrifrons* while at the A.M.N.H., New York, and has come to the conclusion that these two species are synonymous. Akhtar (1975) had added *arshadi*, *teknafensis* and *ukhiaensis* from Bangla Desh. Thus there are only eight species of the genus known from the Indian region, of which only one i.e., *Glyptotermes coorgensis* Holmgren and Holmgren occurs in southern India, *G. almorensis* Gardner is confined to northern India and *ceylonicus*

Holmgren, *dilatatus* (Bugnion and Popoff) and *minutus* Kemner, to Sri Lanka.

11. *Glyptotermes coorgensis* Holmgren and Holmgren

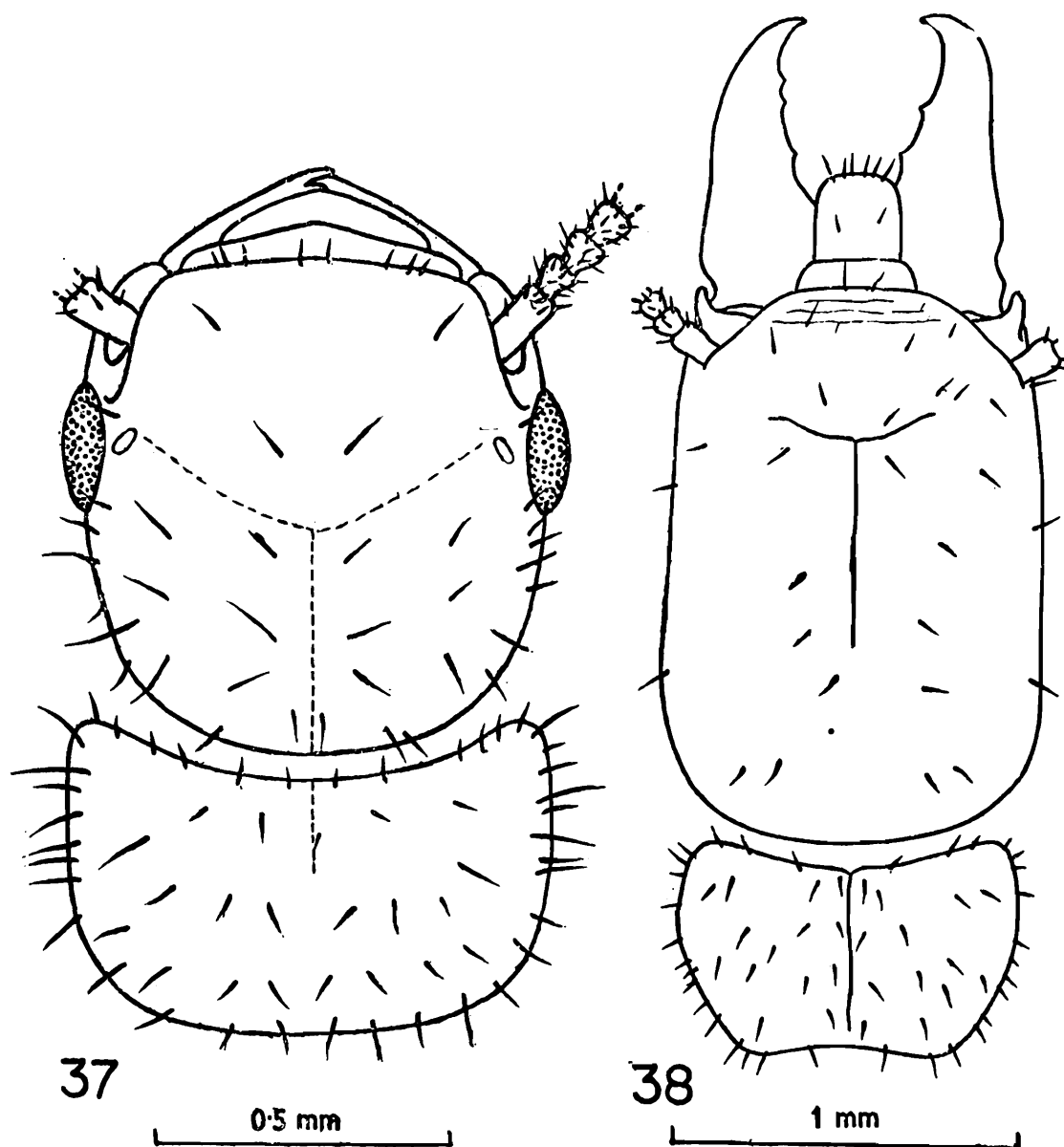
(Figs. 37-40)

1917. *Calotermes* (*Glyptotermes*) *coorgensis* Holmgren and Holmgren, *Mem. Dept. Agric. India*, 5 : 139-140. S. Type-locality : Sidapur, Coorg (Karnataka state), India.

1949. *Glyptotermes coorgensis* ; Snyder, *Smiths. misc. Coll.*, 112 : 49.

1960. *Glyptotermes nigrifrons* Mathur and Sen-Sarma, *Entomologist*, 1960 : 77-85. New synonymy.

1975. *Glyptotermes coorgensis* ; Chhotani, *Rec. zool Surv. India*, 68 : 110, 113, 114, 117, 118, 121, 124, 127-128, 134-142, 155, 156, 157.



Figs. 37 and 38. *Glyptotermes coorgensis* Holmgren and Holmgren

Fig. 37. Head and pronotum of imago, in dorsal view.

Fig. 38. Head and pronotum of soldier, in dorsal view.

Material : In *Z.S.I., Calcutta* : Two vials, Anekad forest Range (Coorg, Karnataka), coll. O.B. Chhotani, 21. xi. 1962, one with Im., S. and Pw., from dead portion of *Ficus religiosa* Linn. tree and the other with S. and Pw., from a dead log of wood on ground ; one vial with a S. and sev. Pw., Janserigoda, Bababudin Hills, Karnataka, coll. O.B. Chhotani, 12. xi. 62, ex 'a dead silver oak' ; one vial with sev. Im. and a Pw., Mylar, Kulasekarum Forest Range (Tamil Nadu), coll. O.B. Chhotani, 28. ii. 1969, ex. dead portion of a tree ; one vial with 2 S. (paratype of *G. nigrifrons* Mathur and Sen-Sarma), Top Slip, nr. Pollachi (Tamil Nadu), coll. R.N. Mathur, 6. i. 1958, ex. 'rotten wood'.

In *A.M.N.H., New York* A cotype S. and Pw. in a vial, Sidapur, Coorg, 16. xi. 1912.

Description : The species was so far known only from soldier until Chhotani (1975b) described the imago from dealates. Wings are described in detail here (Figs. 39, 40).

Wings long, narrow, pale brown and with small, pimple-like markings. Costa, subcosta, radius, radial sector and media thick and strongly chitinised ; cubitus weak. Forewing : Costa running all along anterior margin up to apex ; subcosta coming out independently from scale and meeting costa a little outside scale ; radius also emerging separately from scale and meeting costa at about proximal 1/6th of the wing-length ; radial sector running close to and parallel with costal border up to apex ; media running parallel with radial sector all along wing length and giving off a short branch near apex and a few weak branches to cubitus, which is weak and with a number of branches to posterior border. Hindwing : Scale short, costa as in forewing ; subcosta shorter, otherwise as in forewing ; radius meeting the costal border at about distal 1/4th of wing-membrane ; radial sector as in forewing ; media arising from radial sector outside scale and running parallel with latter ; cubitus as in forewing.

Measurements :

(i) <i>Imago</i> :		Range (5 exs.)
1. Total body-length with wings <i>c</i>	...	6.40 – 6.70
2. Total body-length without wings <i>c</i>	...	4.00—4.70
3. Length of head to base of mandibles	...	0.83—0.90
4. Max. width of head (with eyes)	...	0.85—0.93
5. Max. diameter of compound eye	...	0.25
6. Max. diameter of lateral ocellus	...	0.07
7. Max. length of pronotum	...	0.50—0.57

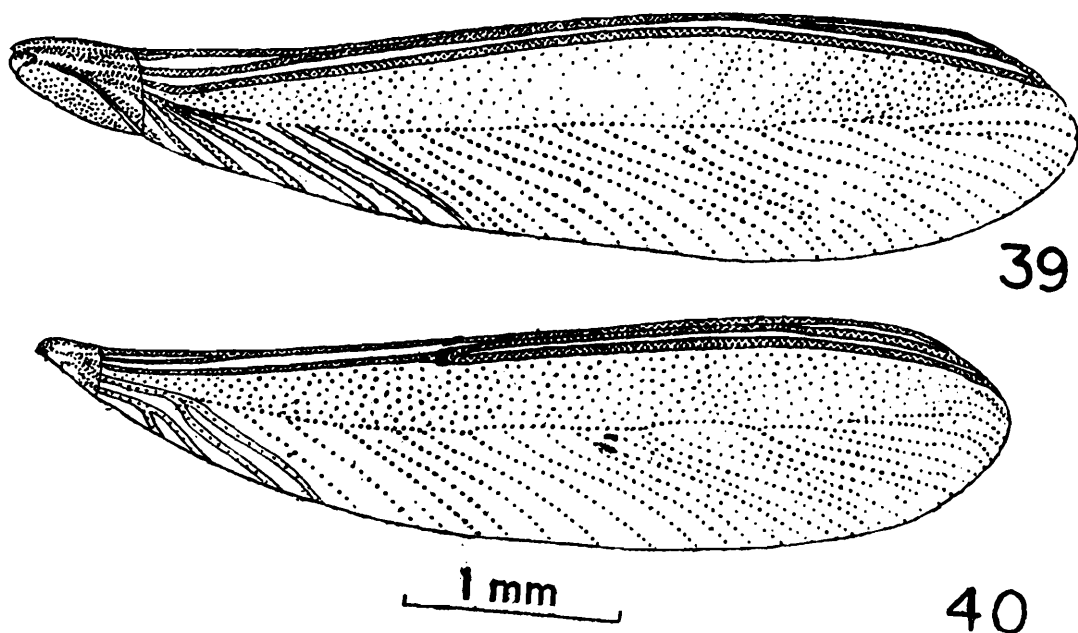
8. Max. width of pronotum	...	0.78—0.83
9. Length of forewing with scale	...	4.90—5.00
10. Length of hindwing with scale	...	4.60—4.75

(ii) *Soldier* : Range (5 exs.)

1. Total body-length <i>c</i>	...	5.30—5.45
2. Head-length to lateral base of mandibles	...	1.45—1.58
3. Maximum width of head	...	1.05—1.10
4. Maximum length of pronotum	...	0.52—0.55
5. Maximum width of pronotum	...	0.98—1.05

Distribution : INDIA : Southern India : Karnataka : Anekad Forest Range (Coorg), Janserigoda (Bababudin Hills, Chikamagalur District) and Sidapur (Coorg), type locality ; Tamil Nadu : Mylar (Kulasekarum Forest Range), Top Slip nr. Pollachi.

Biology : *Glyptotermes coorgensis* is also a wood infesting termite. Its nests have been found in the dead portion of 'Pipal' (*Ficus religiosa* Linn.), Silver oak, and unidentified trees and logs of wood. The nest is in the form of interconnecting, narrow galleries filled in with blackish masses of faecal matter. The infestation extends to the adjoining live tissue of standing trees as well.



Figs. 39 and 40. *Glyptotermes coorgensis* Holmgren and Holmgren, Imago.

Fig. 39. Forewing.

Fig. 40. Hindwing.

The winged forms have been found in the nest during the end of February, hinting at the swarming period during February—March.

Remarks : The species *Glyptotermes nigrifrons* Mathur and Sen-Sarma, has been found to be conspecific with *G. coorgensis* Holmgren and Holmgren as discussed above under the genus.

Genus *Procryptotermes* Holmgren

- 1910(a). *Calotermes (Procryptotermes)* Holmgren, *Zool. Anz.*, 35 : 285 (No description).
 1910(b). *Calotermes (Procryptotermes)* Holmgren, *Trans. Linn. Soc. London (Zool.)*, (2) 14(8) : 139.
 1949. *Procryptotermes*; Snyder *Smiths. misc. Coll.*, 112 : 36.
 1961. *Procryptotermes*; Krishna, *Bull. Am. Mus. nat. Hist.*, 122 (Art. 4) : 314, 315, 316, 317, 376-378, 384, 385, 388, 389.
 1963. *Procryptotermes*; Roonwal and Chhotani, *Biol. Zbl.*, 82 : 365-367.

Type species : *P. fryeri* Holmgren.

The genus *Procryptotermes* Holmgren was hitherto not known from the oriental region until Roonwal and Chhotani (1963) reported it from India and described the species *P. dhari* from Coimbatore (Tamil Nadu).

Thakur (1975) has described *P. hunsurensis* from Karnataka and the author (Bose, 1979) has recently added *P. valeriae* from Tamil Nadu.

Key to the Species

(i) *Imago* ;

- 1(2) Antenna brown, strongly chitinised;
 2nd segment of antenna longer than 3rd ... *valeriae* Bose
 2(1) Antenna paler, weakly chitinised ;
 2nd segment of antenna shorter than 3rd
 3(4) Size smaller : Head-length to base of mandibles 0.95 mm ; Head-width 0.95 mm ... *dhari* Roonwal & Chhotani
 4(3) Size larger : Head-length to base of mandibles 1.05 mm ; Head-width 1.08 mm ... *hunsurensis* Thakur

(ii) *Soldier* :

- 1(2) Right mandible with only a weak crenulation in apical half ; post-mentum stalk long and slender ... *dhari* Roonwal & Chhotani
 2(1) Right mandible with a fairly large tooth in apical half ; postmentum stalk short and broad

- 3(4) Size smaller : Head-length to base of mandibles 1.48-1.54 mm ; mandibles shorter, stronger and more strongly incurved apically ... *valeriae* Bose
- 4(3) Size larger : Head-length to base of mandibles 1.60-1.80 mm ; mandibles longer, thinner and less so incurved apically ... *hunsurensis* Thakur

12. *Procryptotermes dhari* Roonwal & Chhotani

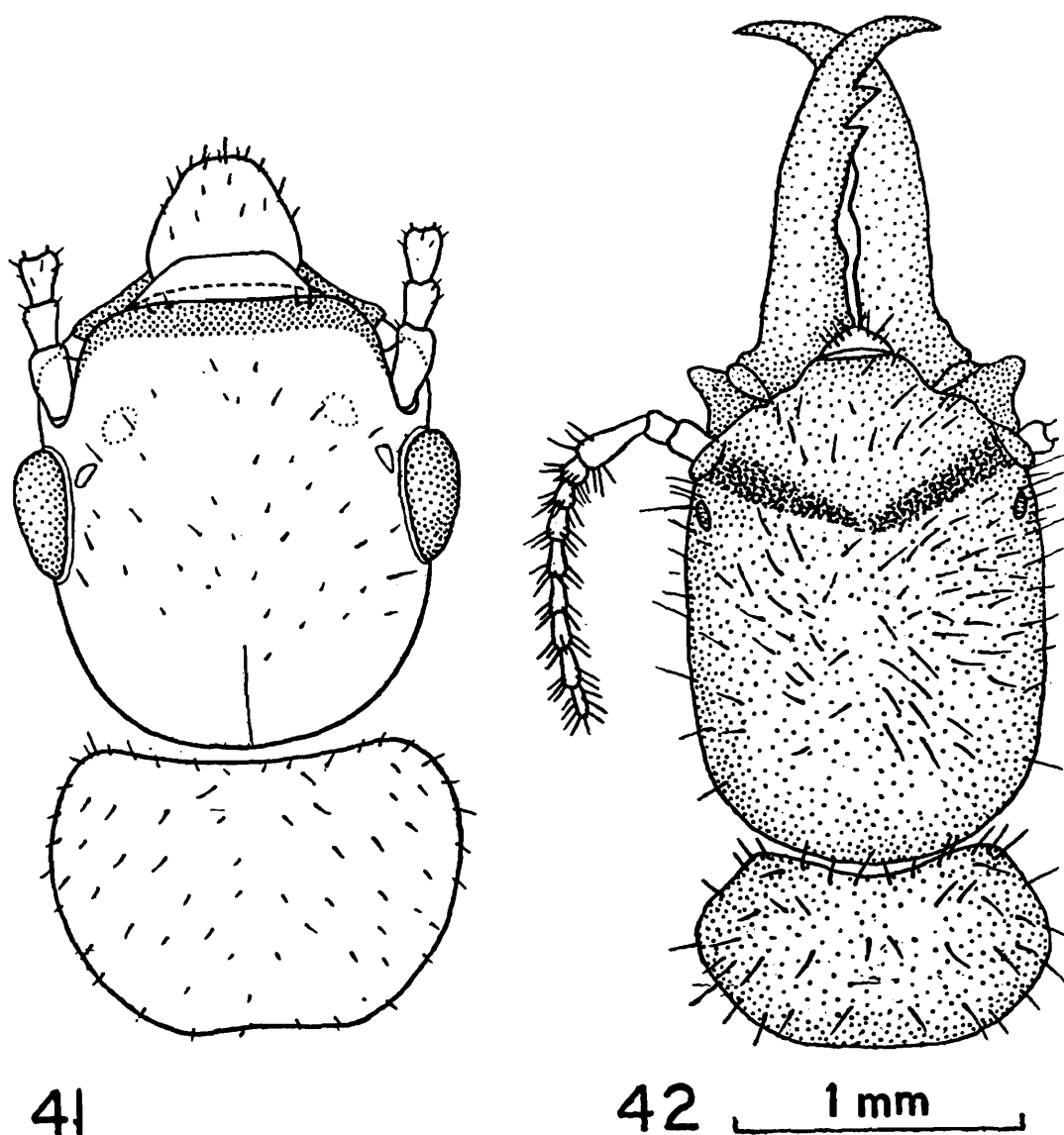
(figs. 41-42)

1963. *Procryptotermes dhari* Roonwal & Chhotani, *Biol. Zbl.*, 82 : 267-273, S., Pw. Type-locality : Coimbatore (Tamil Nadu).
1979. *Procryptotermes dhari* ; Bose, *Bull. zool. Surv. India*, 2(1) : 58-59. Im.

Material : (i) A vial with holotype S. (Z.S.I.No. 2995/H8), a vial with a morphotype Pw. (Z.S.I.No. 2996/H8) and a vial with paratype S. and paramorphotype Pw. (Z.S.I.No. 2997/H8), Coimbatore, coll. P. C. Dhar, 27. ix. 1960. (ii) A vial with dealate Im., S. and Pw., Coimbatore, coll. O.B. Chhotani, 15. ii. 1969, ex. 'damaged branches of *Paltophorum pterocarpum* tree'.

Measurements :

(i) <i>Imago</i> :		Range (1 ex.)
1. Total body length with wings <i>c</i>	...	Wings broken
2. Total body length without wings <i>c</i>	...	4.90
3. Length of head to base of mandibles	...	0.95
4. Max. width of head with eyes	...	0.95
5. Max. diameter of eye	...	0.29
6. Max. diameter of ocellus	...	0.10
7. Max. width of pronotum	...	0.93
(ii) <i>Soldier</i> :		Range (4 exs. paratypes)
1. Total body length <i>c</i>	...	5.35—6.65
2. Length of head to base of mandibles	...	1.58—1.77
3. Max. width of head	...	1.18—1.30
4. Max. diameter of eye	...	0.13—0.14
5. Length of mandibles	...	1.17—1.23
6. Max. length of pronotum	...	0.63
7. Max. width of pronotum	...	1.15



Figs. 41 and 42. *Procryptotermes dhari* Roonwal and Chhotani, Imago (dealate) and soldier.

Fig. 41. Head and pronotum of Imago, in dorsal view,
 Fig. 42. Ditto, soldier.

Distribution : INDIA : Southern India : Coimbatore, type locality (known only from type-locality).

Biology : *Procryptotermes dhari* is not a very common species. It has been found nesting in the dead portions of a *Paltophorum pterocarpum* and an unidentified tree at Coimbatore. The nest is formed of long, narrow galleries and the faecal matter is in the form of dry, small, oval pellets which roll out of the nest from galleries.

13. *Procryptotermes hunsurensis* Thakur
 (Figs. 43-44)

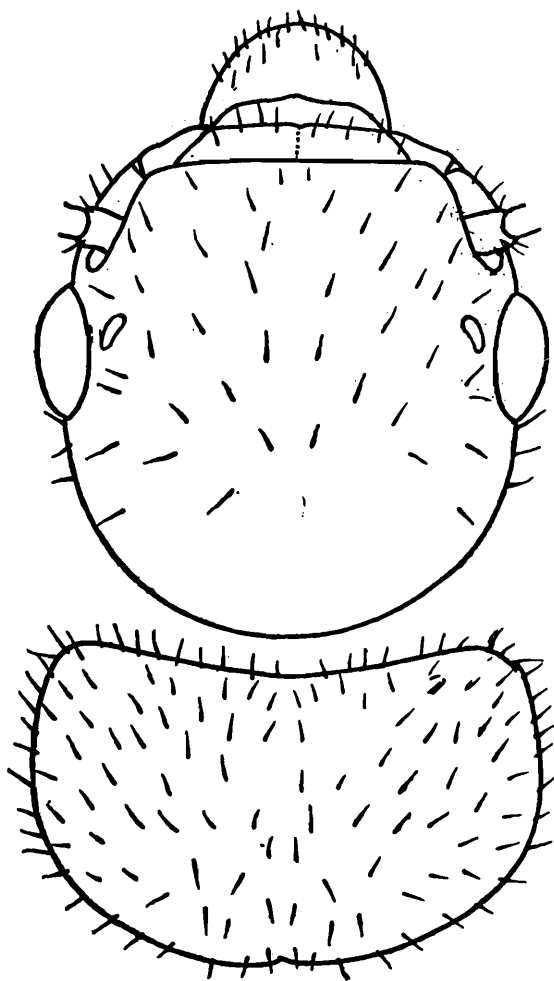
1975. *Procryptotermes hunsurensis* Thakur, *Indian Acad. Wood. Sci. J.*, 6(1) : 29-36. Im., S., Pw. Type-locality : Kalbetta, Hunsur, Karnataka State.

Material : A vial with a S. and a Pw., *Paratype* and *Paramorpho-*
type, Kalbetta, Hunsur, Karnataka, coll. R. C. Jadav, 19. xii. 71.

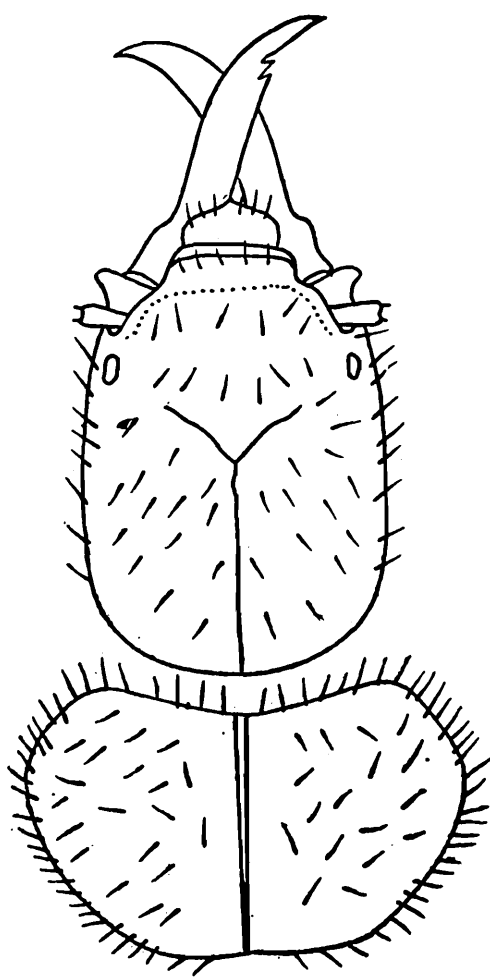
Measurement :

(i) *Imago* (From Thakur, 1975) :

1. Total body-length without wings c	...	5.70
2. Length of head to base of mandibles	...	1.05
3. Max. width of head with eyes	...	1.08
4. Max. diameter of eye	...	0.35
5. Max. diameter of ocellus	...	0.08
6. Max. width of pronotum	...	1.08



43



44

Figs. 43 and 44. *Procryptotermes hunsurensis* Thakur.

Fig. 43. Head and pronotum of imago, in dorsal view.

Fig. 44. Ditto, soldier.

(ii) <i>Soldier</i> :	(1 ex., paratype)
1. Total body length <i>c</i>	... 6.70
2. Length of head to base of mandibles	... 1.65
3. Max. width of head	... 1.28
4. Max. diameter of eye	... 0.15
5. Max. length of pronotum	... 0.83
6. Max. width of pronotum	... 1.20

Distribution : INDIA : Southern India : Hunsur and Sidapur (Karnataka).

14. *Procryptotermes valeriae* Bose

(Figs. 45-46)

1979. *Procryptotermes valeriae* Bose, *Bull. zool. Surv. India*, 2 (1) : 53-58.

Im., S., Pw. Type-locality. Tirunelveli-Nagercoil Road, Tamil Nadu.

Material : Three vials, Nagercoil—Tirunelveli Road, Tamil Nadu, coll. O. B. Chhotani, 27. ii. 1969, with specimens as follows : (i) Holotype S., ZSI No. 543/H₁₁ ; (ii) Morphotype Im., Z.S.I. No. 544/H₁₁ ; (iii) Paratype 8S., 4 Pw., Z.S.I. No. 545/H₁₁.

Measurements :

(i) <i>Imago</i> :	(1 ex., Morphotype)
1. Total body-length with wings <i>c</i>.	... Wings broken
2. Total body-length without wings <i>c</i>.	... 5.90
3. Length of head to base of mandibles	... 1.00
4. Max. width of head with eyes	... 1.00
5. Max. diameter of eye	... 0.30
6. Max. diameter of ocellus	... 0.10
7. Max. width of pronotum	... 1.04
(ii) <i>Soldier</i> :	Range (6 exs.)
1. Total body-length	... 4.95—6.44
2. Length of head to base of mandibles	... 1.48—1.54
3. Max. width of head	... 1.20—1.28
4. Max. diameter of eye	... 0.15—0.18
5. Max. length of pronotum	... 0.70—0.75
6. Max. width of pronotum	... 1.20—1.28

Distribution : INDIA : Southern India : Tirunelveli-Nagercoil Road, Nagercoil District (Tamil Nadu), type-locality.

Biology : *Procryptotermes valeriae* has been found to be nesting in dead branches of 'Banyan' trees. They make small, narrow galleries, flattened at places. The faecal pellets are similar to those of *P. dhari* and do not stick to the gallery walls.

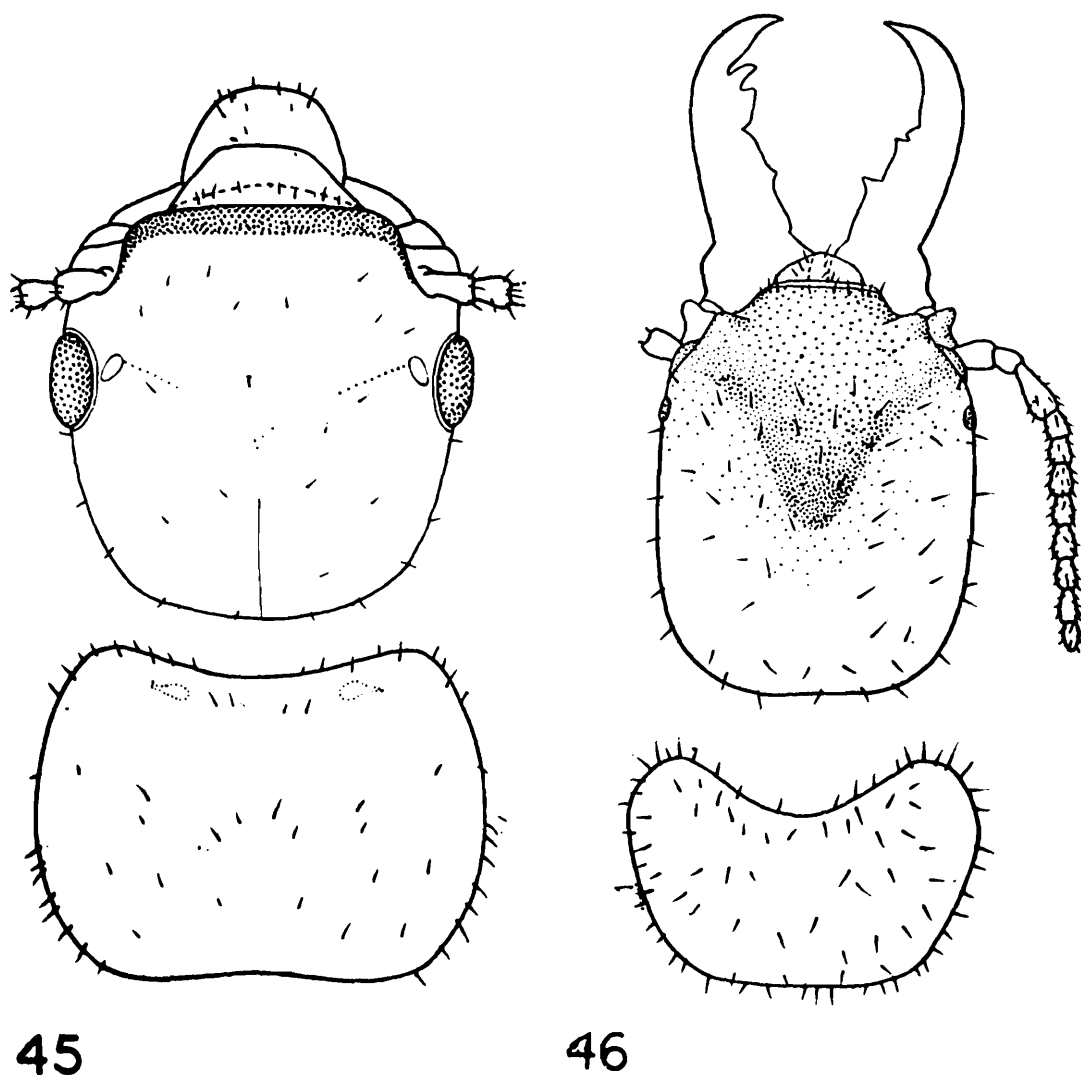


Fig. 45. *Procryptotermes valeriae* Bose, Imago (Morphotype)
Head and pronotum, in dorsal view.
Fig. 46. *Procryptotermes valeriae* Bose, Soldier (Holotype)
Head and pronotum, in dorsal view.

Genus *Cryptotermes* Banks

- 1906. *Cryptotermes* Banks, *Ent. News*, 17(9) : 336.
- 1949. *Cryptotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 38, 359.
- 1961. *Cryptotermes* ; Krishna, *Bull. Am. Mus. nat. Hist.*, 122 (Art.4) : 314, 315, 316, 317, 379-382, 383, 384, 385, 388, 389.
- 1970. *Cryptotermes* ; Chhotani, *Mem. zool. Surv. India*, 15(1) : 1, 2-5, 6-8.

Type species : *Cryptotermes cavifrons* Banks

Snyder (1949) catalogued 4 species (i.e., *bengalensis*, *domesticus*

dudleyi and *perforans*) from the Indian region, *bengalensis* and *domesticus* from India and *dudleyi* and *perforans* from Sri Lanka. *C. dudleyi* Banks has subsequently been recorded from the Indian mainland as well, and *C. bengalensis* Snyder has been treated as a synonym of *C. havilandi* (Sjöstedt) by Chhotani (1970) in his recent work on the revision of the oriental *Cryptotermes* and he has also described *C. roonwali* from southern India. Thus, at present 4 species (viz., *domesticus*, *dudleyi*, *havilandi* and *roonwali*) are known from the Indian mainland and all these occur in southern India.

Key to the Species

(i) *Imago* :

- | | | |
|---|-----|------------------------------|
| 1(2) Ocellus well separated from antenna
(ocellus-antennal distance 0.17-0.19 mm) | ... | <i>dudleyi</i> Banks |
| 2(1) Ocellus closer to antenna (ocellus-
antennal distance generally less than 0.17
mm, rarely 0.17 mm) | | |
| 3(4) Head weakly incurved in region of eyes ;
eyes generally smaller, 0.27-0.30 mm
in diameter | ... | <i>domesticus</i> (Haviland) |
| 4(3) Head substraight in region of eyes ;
eyes generally larger, 0.30-0.34 mm
in diameter | ... | <i>havilandi</i> (Sjöstedt) |

(ii) *Soldier* :

- | | | |
|--|-----|------------------------------|
| 1(2) Head-capsule with prominent ventral
and very weak dorsal tubercles ;
frontal ridge of head strongly projecting
in front medially | ... | <i>domesticus</i> (Haviland) |
| 2(1) Head-capsul with both the tubercles
prominent and large ; frontal ridge not
projecting in front medially | | |
| 3(4) Larger species (head-length to base of
mandibles 1.60-1.67) ; mandibles long,
with prominent dentition (fig. 50) | ... | <i>dudleyi</i> Banks |
| 4(3) Smaller species (head-length to base of
mandibles 1.10-1.33) ; mandibles short,
thick, with weak dentition (figs. 52, 53) | | |
| 5(6) Head larger (length to base of
mandibles 1.20-1.33, width 1.20-1.30 mm) ;
mandibles longer, 0.45-0.48 mm long | ... | <i>havilandi</i> (Sjöstedt) |
| 6(5) Head smaller (length to base of
mandibles 1.10-1.17, width 1.13-1.17 mm) ;
mandibles shorter, 0.30-0.37 mm long | ... | <i>roonwali</i> Chhotani |

15. *Cryptotermes domesticus* (Haviland)

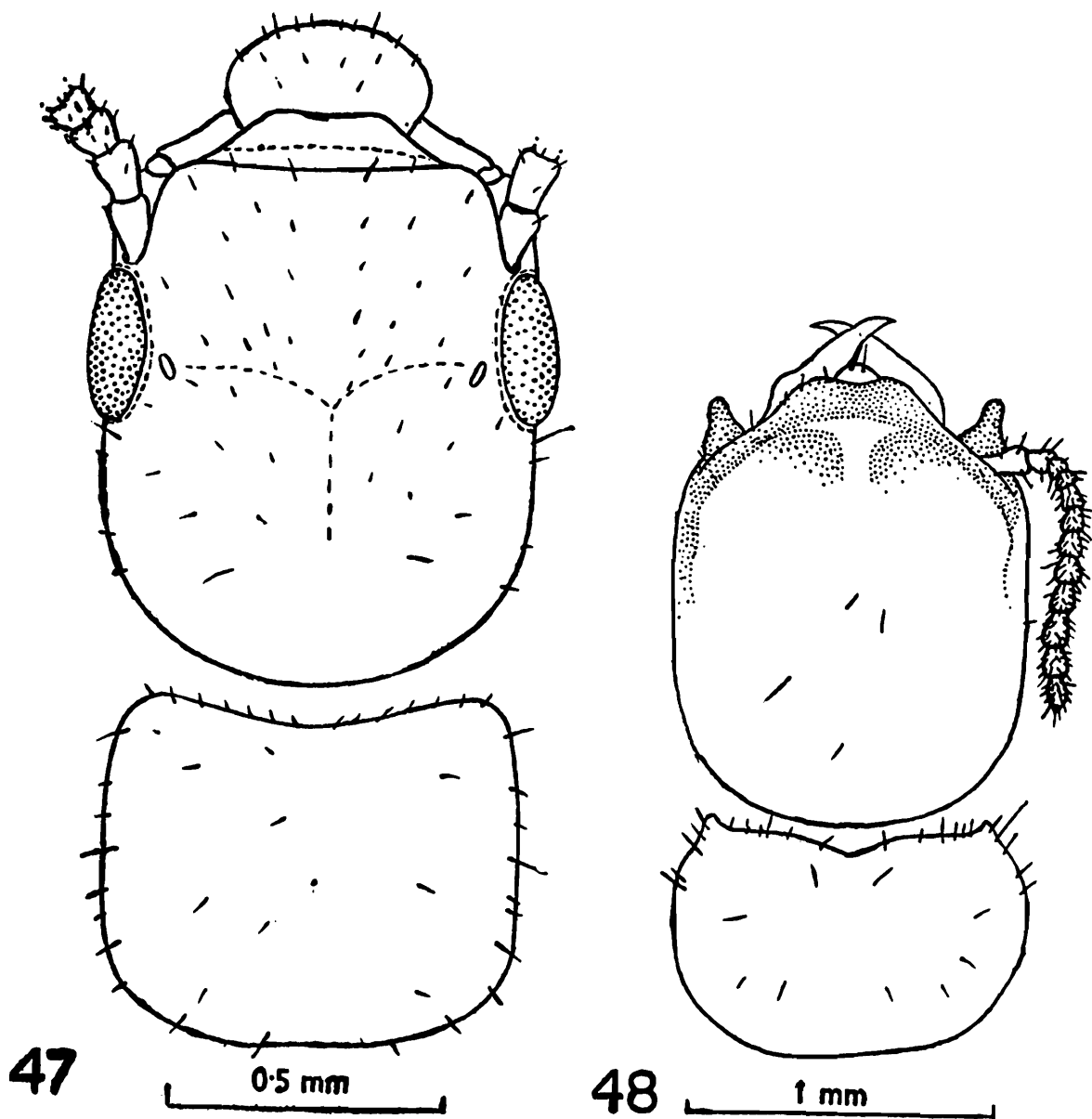
(Fig. 47-48)

1898. *Calotermes domesticus* Haviland, *J. Linn. Soc. Lond.*, 26 (169) : 374, pl. 23, figs. 3-6. Im. and S. Type-localities : Singapore and Sarawak.

1949. *Cryptotermes domesticus* ; Snyder, *Smiths. misc. Coll.*, 112 : 40-41.

1970. *Cryptotermes domesticus* ; Chhotani, *Mem. zool. Surv. India.*, 15(1) : 1, 4, 5, 8, 24-34, 41, 42, 54, 71, 72. (Type-locality restricted to Sarawak).

Material : A vial (Z.S.I. Reg. No. 9901/18) with 2 Im. and several Pw., Trivandrum (Kerala), det. F. Silvestri, ex. "mango-wood boat model."



Figs. 47 and 48. *Cryptotermes domesticus* (Haviland).

Fig. 47. Head and pronotum, in dorsal view, of imago.

Fig. 48. Ditto, soldier. (After Chhotani, 1970)

Measurements :

<i>(i) Imago :</i>	<i>Range (2 exs.)</i>
1. Total body-length with wings	Wings broken
2. Total body-length without wings <i>c</i>	6.33
3. Length of head to base of mandibles	0.93—0.97
4. Width of head with eyes	0.93
5. Max. diameter of eye	0.27—0.29
6. Max. diameter of ocellus	0.09—0.10
7. Max. length of pronotum	0.63—0.66
8. Max. width of pronotum	0.85—0.90
9. Length of forewing scale	0.80—0.83
10. Length of hindwing scale	0.37
 <i>(ii) Soldier (From Chhotani, 1970) :</i>	
1. Total body-length <i>c</i>	4.00—6.00
2. Length of head to base of mandibles	1.20—1.30
3. Length of head upto frontal ridge	1.30—1.60
4. Max. width of head	1.13—1.30
5. Length of mandibles	0.50—0.60
6. Max. length of pronotum	0.73—0.87
7. Max. width of pronotum	1.07—1.27

Distribution : INDIA : Southern India : Trivandrum (Kerala). Elsewhere : Sri Lanka, China, Formosa, Indonesia, Thailand, Japan, Vietnam, many islands in the Pacific and Panama in Central America. For detailed distribution *vide* Chhotani (1970).

Biology : *Cryptotermes domesticus* is a very widely distributed species and occurs in the Oriental, Papuan and Neotropical regions. It is a common termite, damaging wooden structures in buildings, furniture and other wooden articles in houses.

In southern India it has been collected only once from a mango-wood boat model and evidently is not a very common species in India.

16. *Cryptotermes dudleyi* Banks

(Figs. 49-50)

1918. *Cryptotermes dudleyi* Banks, *Bull. Am. Mus. nat. Hist.*, 38 (Art. 17) : 660-661, pl. 51, fig. 3. Im. and S. Type locality : Panama (Central America).
1949. *Cryptotermes dudleyi* ; Snyder, *Smiths. misc. Coll.*, 112 : 41-42.
1970. *Cryptotermes dudleyi* ; Chhotani, *Mem. zool. Surv. India.*, 15(1) : 1, 4, 5, 8, 34-42, 54, 71, 72. Im., S. and Pw.

Material : (i) A vial (Z.S.I. No. 3726/H8) with a soldier, Cannanore (Kerala), coll. B. N. Bhatia, June, 1941, ex. 'Red pine'.
(ii) A vial with a soldier, Nova Goa (Panjim), coll. Froilano de Mello.

Measurements :

(i) *Imago* (From Chhotani, 1970) :

1. Total body-length with wings <i>c</i>	...	8.50—9.33
2. Total body-length without wings <i>c</i>	...	4.55—6.00
3. Length of head to base of mandibles	...	1.00—1.03
4. Width of head with eyes	...	0.97—1.07
5. Max. diameter of eyes	...	0.30—0.33
6. Max. diameter of ocellus	...	0.10—0.13
7. Max. length of pronotum	...	0.62—0.77
8. Max. width of pronotum	...	0.80—1.03
9. Length of forewing	...	7.00—7.50
10. Length of hindwing	...	6.25—6.75

(ii) *Soldier* :

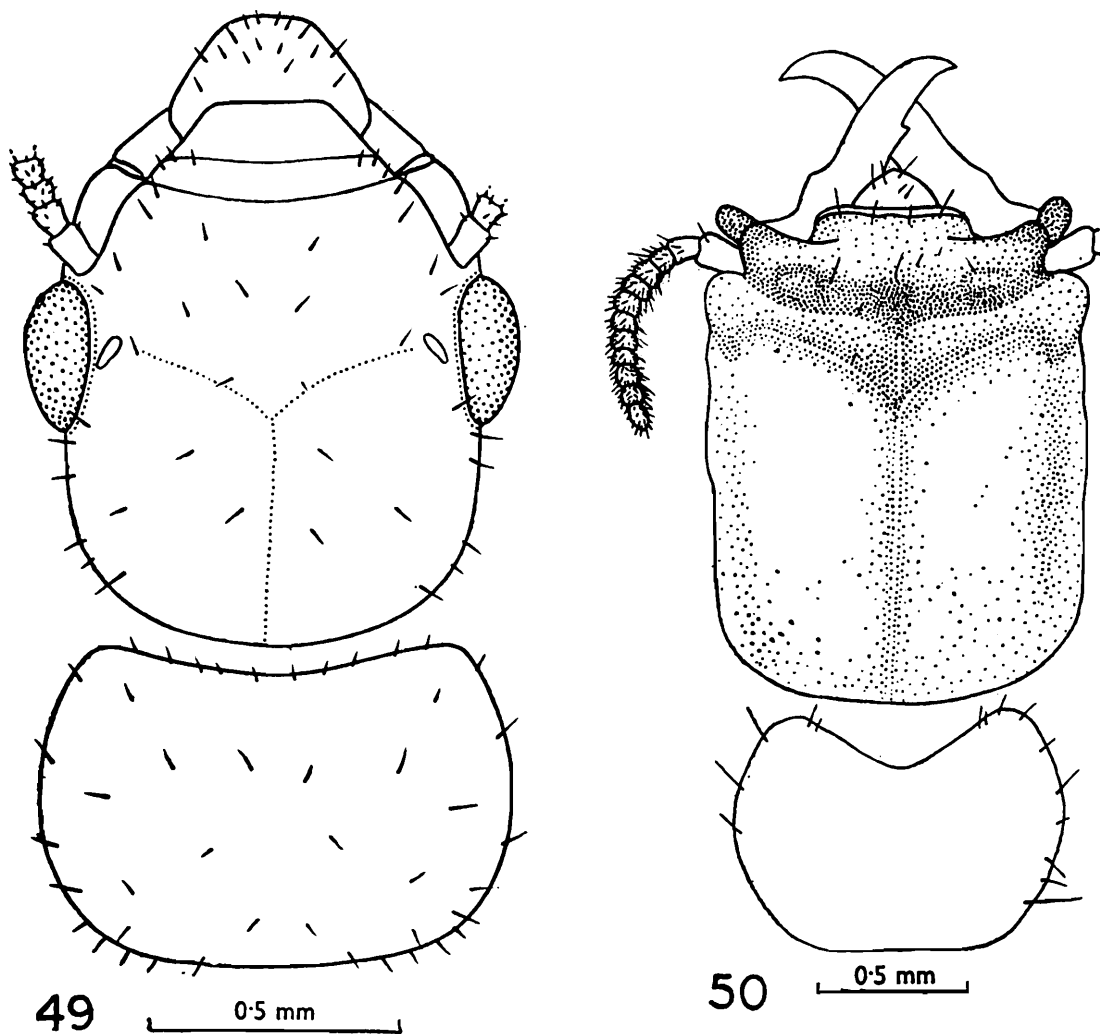
		Range (2 exs.)
1. Total body-length <i>c</i>	...	4.67—5.40
2. Length of head to base of mandibles	...	1.60—1.67
3. Length of head upto frontal ridge	...	1.33—1.40
4. Max. width of head	....	1.27—1.33
5. Length of mandibles	...	0.77—0.80
6. Max. length of pronotum	...	0.80—0.87
7. Max. width of pronotum	...	1.13—1.17

Distribution : INDIA : Southern India : Cannanore (Kerala) ; Panjim (Goa). Elsewhere : India (Orissa, West Bengal and Andaman Islands), Bangladesh, Sri Lanka, Indonesia, Malaysia, Philippines, Australia, New Guinea, Thursday Island, Tanganyika, Zanzibar Island, Panama (type locality), Costa Rica, Trinidad Island and Colombia. For detailed distribution *vide* Chhotani, 1970.

Biology : *Cryptotermes dudleyi* is another common dry-wood termite. It is a serious pest of wooden structures in buildings and other articles. Due to this habit of inhabiting wooden articles this species like some other *Cryptotermes* species has got distributed throughout the tropical regions of the world.

It has also been found in wild state in certain parts of the Oriental region. In southern India it has been collected from red pine at

Cannanore (Kerala) but whether it is from the live tree or dry wood is not certain.



Figs. 49 and 50. *Cryptotermes dudleyi* Banks

Fig. 49. Head and pronotum of imago, in dorsal view (specimen from Calcutta).

Fig. 50. Ditto, soldier.

The nest of this species is in the form of long, narrow galleries flattened at places and are excavated along the fibre of the wood. The faecal pellets are loose and dry, usually found at the base of the infested wood.

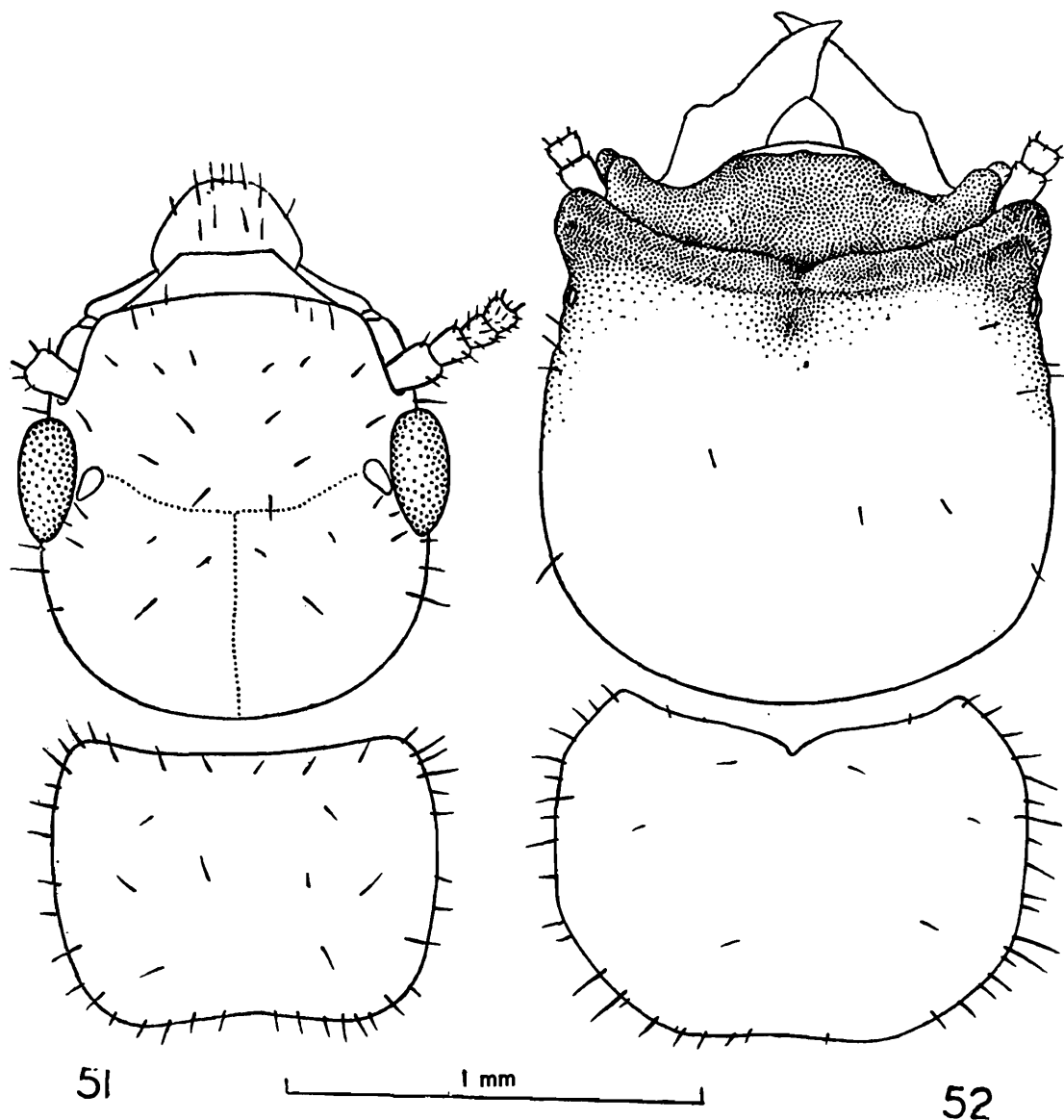
Swarming has been observed in Calcutta during March-June.

17. *Cryptotermes havilandi* (Sjöstedt)
(Figs. 51-52)

1897. *Calotermes domesticus* Sjöstedt, *Ent. Tidskr.*, 18 : 212. Im. Type-localities : Fernando Po ; Boma (Camaroons, Congo). Nom. preoccupied.

1900. *Calotermes havilandi*; Sjöstedt, *K. Sv. Vet. Akad. Handl.*, 34(4): 37, 43-45, 218, 220, pl. 1, figs. C₁₋₃ (Im. and Wing). Im.
 1949. *Cryptotermes havilandi*; Snyder, *Smiths. misc. Coll.*, 112 : 42.
 1970. *Cryptotermes havilandi*; Chhotani, *Mem. zool. Surv. India.*, 15(1) : 1, 4, 5, 8, 34, 42-54, 71, 72 (type-locality restricted to Fernando Po).

Material : Eight vials with Im., S. and Pw., from Tamil Nadu and Karnataka States, all coll. O. B. Chhotani as follows :—



Figs. 51 and 52. *Cryptotermes havilandi* (Sjöstedt).

Fig. 51. Head and pronotum of imago, in dorsal view.

Fig. 52. Ditto, soldier.

The denominator in the Field Collection No. denotes date of collection.

Karnataka : 015/9.11.62, Dharwar ex. 'dead portion of a Ficus sp.' ; 01/10.11.62, Chickmagalur, ex. 'dead portion of a mango tree' ;

016/11.11.62, Chickmagalur, ex. 'dead portion of an unknown tree';
 01/15.11.62, Tallagatpura nr. Bangalore, ex. 'unknown tree';
 010/18.11.62, Meghalpura nr. Mysore, ex. 'dead standing tree';
 024/21.11.62, Anekad Forest Range, ex. 'dead portion of *Ficus religiosa*
 Linn.' Tamil Nadu: 01/24.2.69, Vanathiparai Reserve Forest, Lower
 Camp, ex. "dead portion of a 'Kusum' tree"; 019/28.2.69, Mylar,
 Kulasekrum Res. Forest, ex. 'dead branch of an unknown tree.'

Measurements :

(i) <i>Imago :</i>	Range (5 exs.)
1. Total body-length with wings <i>c</i>	... 8.00—8.80
2. Total body-length without wings <i>c</i>	... 4.65—6.33
3. Length of head to lateral base of mandibles	... 0.93—1.03
4. Width of head with eyes	... 0.90—1.07
5. Max. diameter of eye	... 0.30—0.33
6. Max. diameter of ocellus	... 0.13—0.15
7. Max. length of pronotum	... 0.58—0.77
8. Max. width of pronotum	... 0.85—1.00
9. Length of forewing with scale	... 6.60—8.00
10. Length of hindwing with scale	... 6.30—7.50
(ii) <i>Soldier :</i>	Range (10 exs.)
1. Total body-length <i>c</i>	... 4.00—5.80
2. Length of head to base of mandibles	... 1.20—1.33
3. Length of head upto frontal ridge	... 1.15—1.25
4. Max. width of head	... 1.20—1.30
5. Length of mandibles	... 0.45—0.58
6. Max. length of pronotum	... 0.73—0.83
7. Max. width of pronotum	... 1.07—1.20

Distribution : INDIA : Southern India : Karnataka : Anekad For. Range, Chickmagalur, Dharwar, Meghalpura and Tallagatpura. Tamil Nadu : Vanathiparai Res. Forest and Mylar. Kulasekrum Res. Forest. Elsewhere : It is a very wide spread species. For detailed distribution *vide* Chhotani (1970).

Biology : *Cryptotermes havilandi* (Sjöstedt) is a widely distributed species in the tropical regions. In India it has been collected both in

dead portions of different living trees and in structural timbers in buildings. The nest is in the form of galleries and flat chambers. Inside, the galleries are clear, the faecal pellets are small, oval and roll down and lie at the base of infested wood indicating the infestation. It has been recorded from dead portions of *Ficus* spp., *Mangifera indica*, *Erythrina indica*, *Heritiera minor*, *Gmelina arborea* and several unknown trees.

Remarks : There has been some controversy with regard to the name of this species. Some authorities believe that *C. havilandi* does not occur in India and that this *Cryptotermes* species is *C. bengalensis* Snyder. The author has however, followed Moszkowski (1955) and Chhotani (1963, 1970) as they had compared the types of both these species.

18. *Cryptotermes roonwali* Chhotani

(Fig. 53)

1970 (Dec.). *Cryptotermes roonwali* Chhotani, *Mem. zool. Surv. India*, 15(1) : 61-64. Type-locality : Baliapatam (Kerala, India).

Material : A vial with a holotype S. and morphotype Pw. and another with 4 paratype S., 10 paramorphotype Pw., Baliapatam (Kerala, India), coll. A. H. Khan, 23. viii. 1941, present in F.R.I., Dehra Dun ; and a vial with a paratype S. and paramorphotype Pw. with the same data, present in the Z.S.I., Calcutta.

Measurements :

(i) *Soldier* :

1. Total body-length c	...	4.00—4.70
2. Length of head to base of mandibles	...	1.10—1.17
3. Length of head upto frontal ridge	...	1.13—1.17
4. Max. width of head	...	1.00—1.03
5. Length of mandibles	...	0.30—0.37
6. Max. length of pronotum	...	0.65—0.70
7. Max. width of pronotum	...	1.00

Distribution : Southern India : Baliapatam (North Malabar, Kerala State), type-locality.

Biology This species has been collected from sawn scantlings of *Vateria indica*.

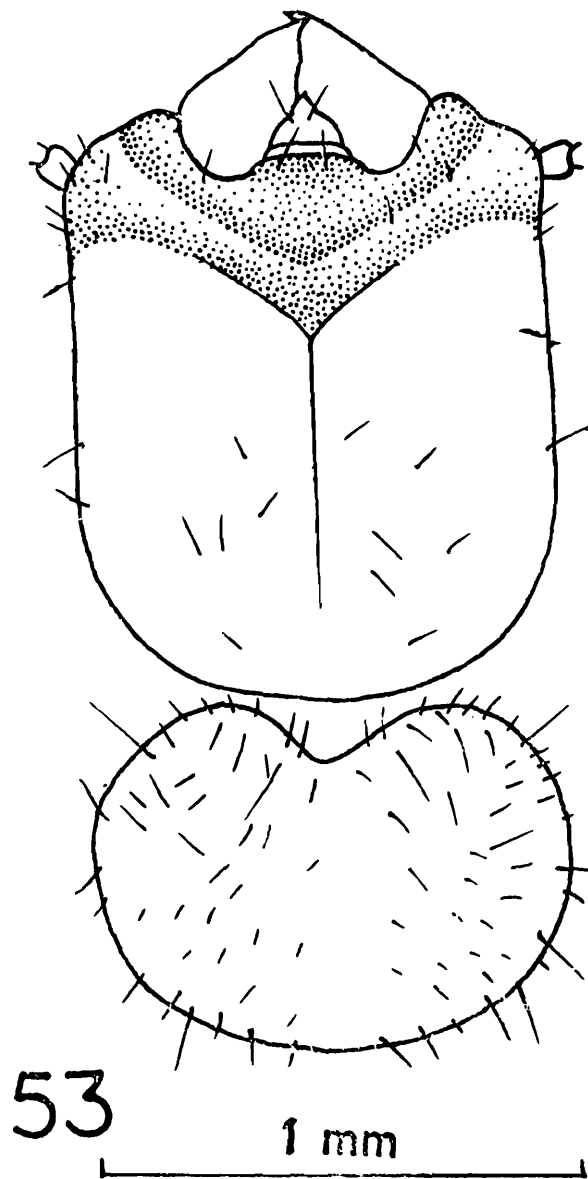


Fig. 53. *Cryptotermes roonwali* Chhotani, Soldier (Paratype).
Head and pronotum, in dorsal view.

Family HODOTERMITIDAE

General Remarks : The family Hodotermitidae, as recognised by Snyder (1949) is comprised of the subfamilies Termopsinae, Porotermitinae, Stolotermitinae and Hodotermitinae. Grassé (1949) separated the first three subfamilies under the family Termopsidae and more recently Roonwal (1970) and Chhotani (1972) have treated it as a distinct family. The Hodotermitidae as such is represented in the Oriental region by the single subfamily Hodotermitinae and the single genus *Anacanthotermes* with two species from the Indian subregion. Of these, *A. viarum* (König) is from southern India. The species *A. rugifrons* Mathur & Sen-Sarma has been found to be synonymous with *viarum* (König).

Distribution (Fig. 54) : The family Hodotermitidae, as discussed above, is represented by the single subfamily Hodotermitinae and 3 genera viz., *Hodotermes*, *Microhodotermes* and *Anacanthotermes*. Of these only *Anacanthotermes* occurs in the Oriental region, the other two genera being restricted to the Palearctic and the Ethiopian regions.

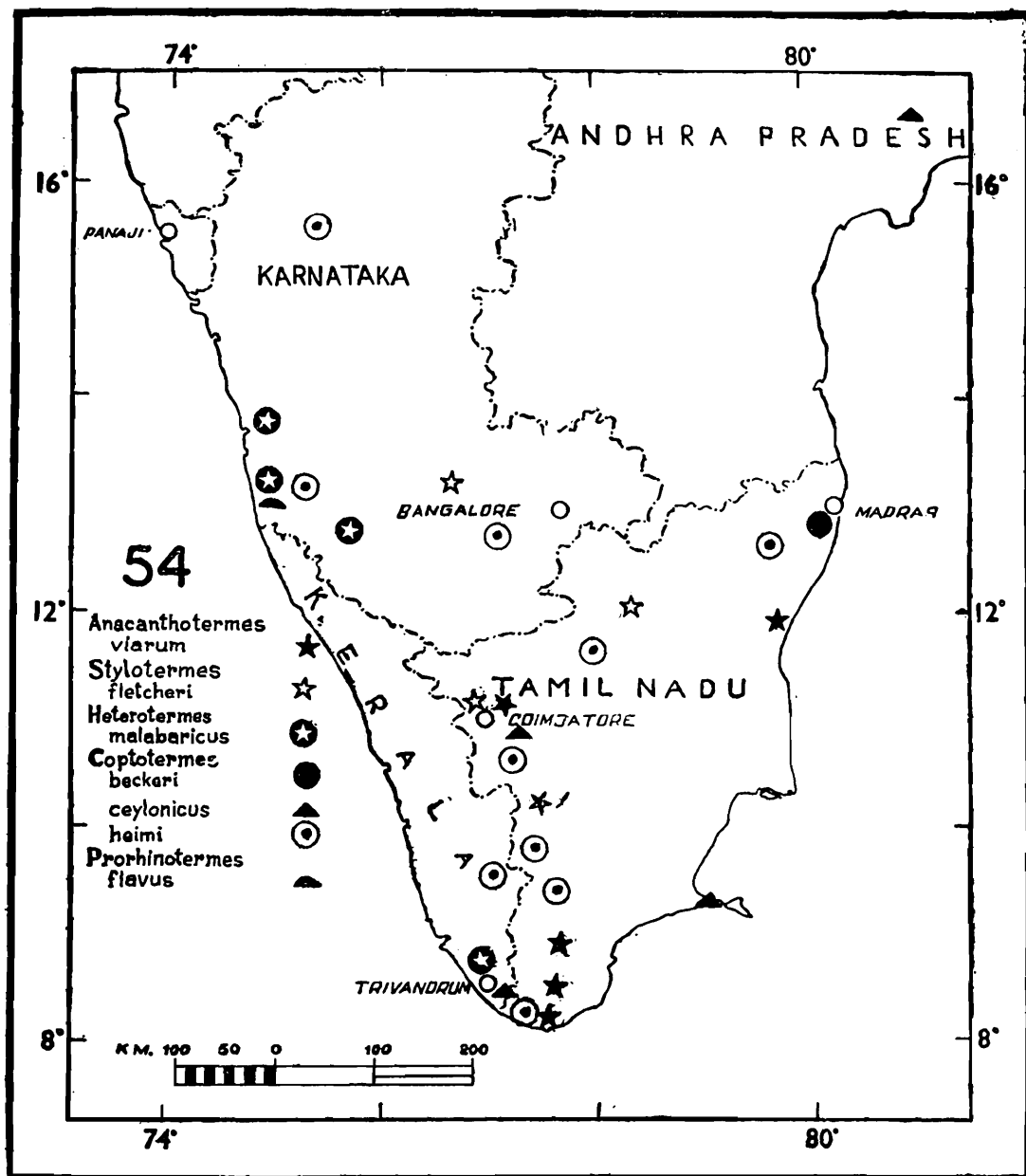


Fig. 54. Map of southern India showing distribution of the genera *Anacanthotermes* (Hodotermitidae), *Stylotermes* (Stylotermitidae) and *Heterotermes*, *Coptotermes* and *Prorhinotermes* (Rhinotermitidae).

The genus *Anacanthotermes* is represented by 12 species (one common with Oriental) in the Palearctic and by 6 species (one common with palearctic) in the Oriental, regions. Of the 6 oriental species two are found in India, one in the dry and desert parts of Rajasthan, India and Pakistan, extending to Afghanistan, and the other in southern India.

Recently, it has also been collected in Sri Lanka by Dr. Krishna of A.M.N.H., New York (personal communication). The genus is not represented in the intermediate parts of the Indian subcontinent, and this discontinuous distribution of the genus is rather difficult to explain.

Subfamily HODOTERMITINAE

Genus *Anacanthotermes* Jacobson

1904. *Hodotermes* (*Anacanthotermes*) Jacobson, *Ann. Mus. Zool. Acad. Imp. Sci. St. Petersburg*, 9 : 86.
 1949. *Anacanthotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 62.

Type species : *Anacanthotermes ochraceus* (Burmeister)

Twelve species of the genus *Anacanthotermes* are known from the world, of which two viz., *macrocephalus* (*Desneux*) and *viarum* (*Koenig*) occur in India. The latter species only is reported from southern India.

19. *Anacanthotermes viarum* (König)

(Figs. 55-56)

1779. *Termes viarum* König, *Beschafft. Berlin Ges. Naturf. Freunde*, 4 : 24, pl. 1, figs. 12—14, W. Type-locality : Tranquebar.
 1917. *Hodotermes* (*Anacanthotermes*) *koenigi* Holmgren and Holmgren, *Mem. Dep. Agric. India (Ent.)*, 5 : 138. Im., S. and W. Type-locality : Coimbatore.
 1949. *Anacanthotermes viarum* ; Snyder, *Smiths. misc. Coll.*, 112 : 63.
 1958. (Nov.) *Anacanthotermes rugifrons* Mathur and Sen-Sarma, *Entomologist*, London, 91 (1146) : 233—241. S. and W. Type-locality : Pallayamcottah, Tinnevely District, Tamil Nadu.

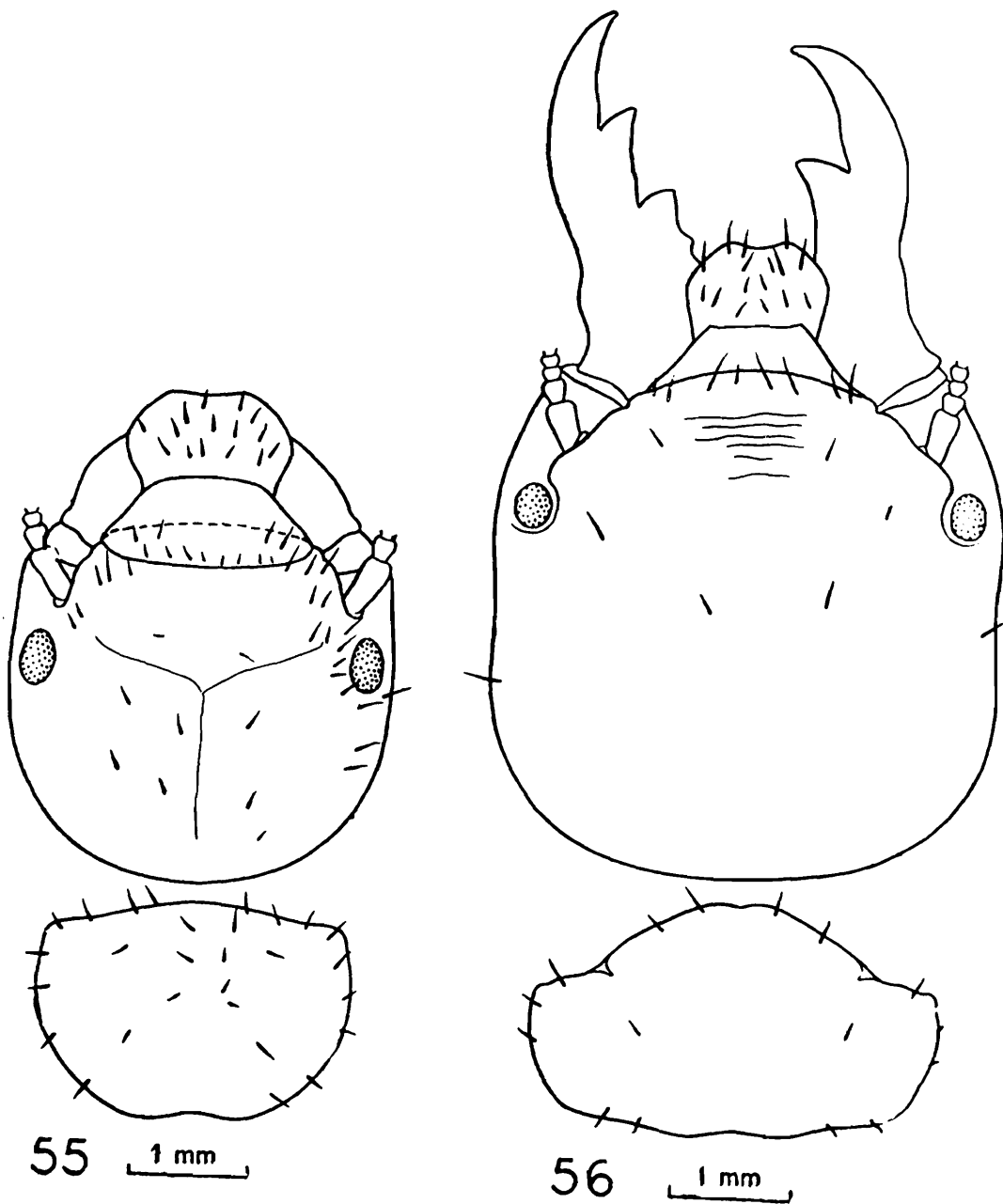
(a) *Material* : Lot. 1. Five vials with Im., S. and W., coll. T.B. Fletcher, October-November, 1913, Coimbatore (Tamil Nadu).

Lot 2. Three vials with S. and W., coll. O.B. Chhotani, February-March, 1969, Tamil Nadu, as follows : The denominator in Field Collection No. denotes the date of collection. 08/27.2.69, several S. and W., Kanyakumari, ex. sandy shore ; 01/2.3.69, several W., Road between Uslempathi and Theni, ex. soil.

Lot 3. (i) Two S. and several W., Kanyakumari, coll. R. K. Kacker, 10.i.1971 ; (ii) several W., Idambaumalai, coll. J. K. Sen, 23.ii.1965.

Lot 4. One vial with a S. and two W., Pallaymcottah, Tinnevely District, Tamil Nadu, coll. R.N.Mathur, 18.i.1958, ex. small mound c 5" in height. Paratypes of *Anacanthotermes rugifrons* Mathur and Sen-Sarma.

Lot 5. One vial with S. and W., Mannadipet, 32 Km (20 miles) S-W of Pondicherry, coll A. G. K. Menon, 9.ii.1958.



Figs. 55 and 56. *Anacanthotermes viarum* König.

Fig. 55. Head and pronotum of imago, in dorsal view.

Fig. 56. Ditto, soldier.

Measurements :

(i) <i>Imago :</i>		<i>Range (7 exs.)</i>
1. Total body-length with wings <i>c</i>	...	27.00—31.50
2. Total body-length without wings <i>c</i>	...	14.70—15.50
3. Length of head to base of mandibles	...	2.70— 3.10
4. Width of head with eyes	...	3.20— 3.40

5. Max. diameter of eye	...	0.68— 0.73
6. Max. length of pronotum	...	1.60— 1.80
7. Max. width of pronotum	...	2.70— 3.10
8. Length of forewing with scale	...	22.80—23.50
9. Length of hindwing with scale	...	22.20—23.00
(ii) <i>Soldier</i> :		Range (10 exs.)
1. Total body-length <i>c</i>	...	13.30—15.10
2. Length of head to base of mandibles	...	3.80— 4.20
3. Max. width of head	...	3.60— 4.10
4. Max. length of pronotum	...	1.40— 1.80
5. Max. width of pronotum	...	2.80— 3.20

Distribution : INDIA : Tamil Nadu : Coimbatore, Idambaumalai, Palayamcottai, Kanyakumari, Tranquebar (type-locality). Pondicherry : Mannadipet.

Remarks : A large collection of soldiers and workers was available to the writer for study and it was observed that *A. rugifrons* Mathur and Sen-Sarma falls in the range of variation of *Anacanthotermes viarum* (König), and so *rugifrons* has been treated as conspecific with *viarum*.

Biology : *Anacanthotermes viarum* is found in the comparatively drier parts of southern India. The insect makes its nest in the soil in the form of galleries and chambers and throws out small heaps (8 – 10 cm high) of granulated earth on to the ground surface. The soldiers and workers go on foraging expeditions during the early part of the evening.

Family STYLOTERMITIDAE

General Remarks : The subfamily Stylotermitinae was raised to family level by Chatterjee and Thakur (1964a). Krishna (1970) and Roonwal (1970) treated it as a subfamily of Rhinotermitidae but more recently Chhotani (1972) has recognised it as a family and Roonwal (1975) has discussed the validity of this family. Here, in the present work, the author has followed the latest view.

Distribution (Fig 54) : The family Stylotermitidae is known by a single genus *Stylotermes* and 31 species. This genus, first discovered in India, has recently been reported from China and from the hilly regions of northern India by a number of species. Eight species of the genus are known from India of which only one occurs in southern India.

Genus *Stylotermes* Holmgren and Holmgren

1917. *Stylotermes* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5(3) : 141-142.
 1949. *Stylotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 75.
 1959. *Stylotermes* ; Mathur and Chhotani, *Zool. Anz.*, 163 : 41-42.

Type species : *Stylotermes fletcheri* Holmgren and Holmgren.

Eight species of the genus *Stylotermes* are known from the Indian subregion of which only one is reported from southern India.

20. *Stylotermes fletcheri* Holmgren and Holmgren

(Figs. 57-58)

1917. *Stylotermes fletcheri* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5(3) : 142-144. Im., S., W. and Ny., Type-locality : Shevaroy Hills, Tamil Nadu.
 1949. *Stylotermes fletcheri* ; Snyder, *Smiths misc. Coll.*, 112 : 75.
 1959. *Stylotermes fletcheri* ; Mathur and Chhotani, *Zool. Anz.*, 163 : 40, 41, 42, 46-53, Im., S. and W.

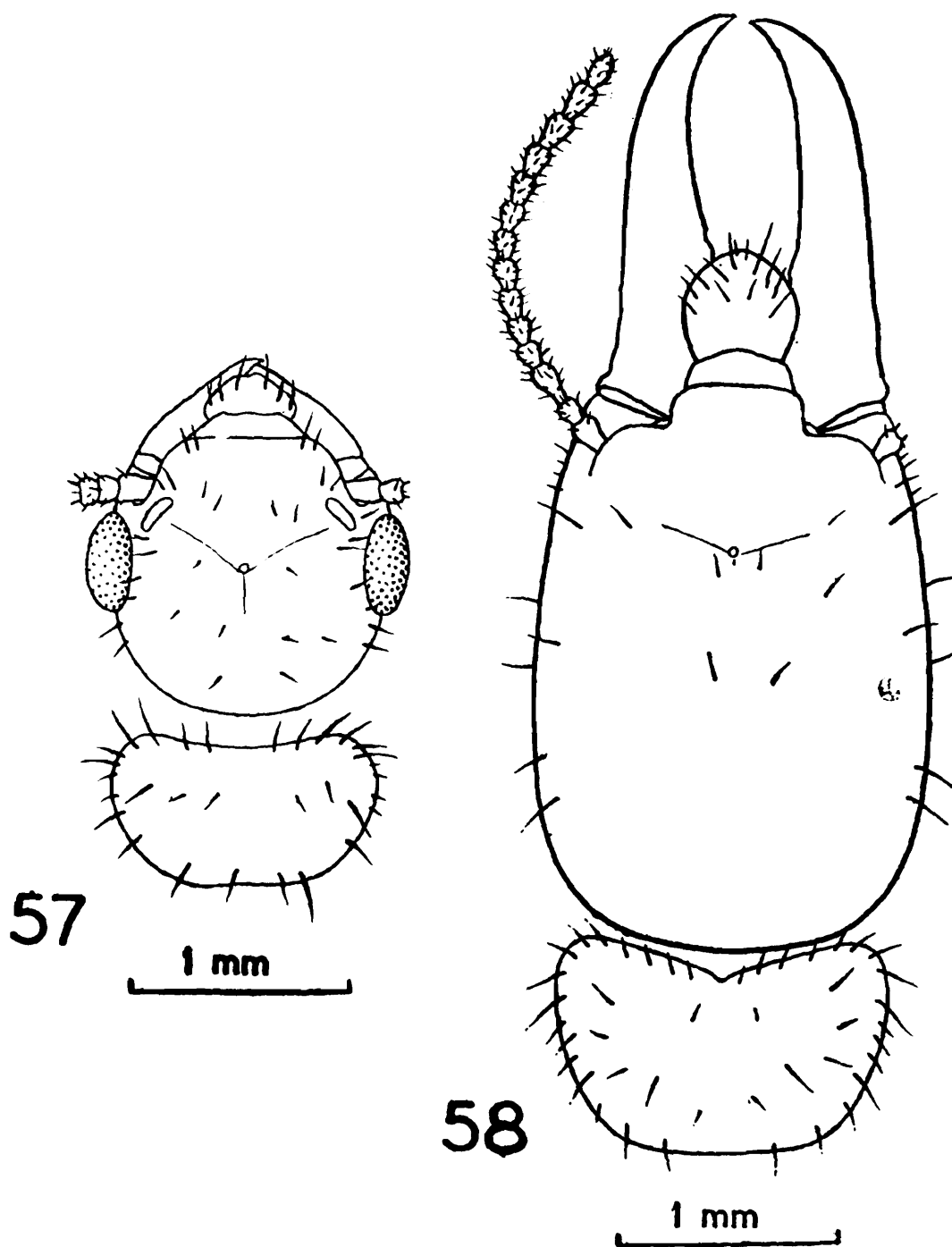
Material : (i) A vial with 3 Im. and a few Ny., cotypes, coll. T. B. Fletcher, 11.x.1912, Coimbatore (Tamil Nadu). (ii) Two vials with Im., S. and W., coll. O. B. Chhotani, Chickmagalur (Karnataka), thus : 01/10.11.62, ex. dead portion of a mango tree ; and 014/12.11.62, ex. dead portion of an unknown tree.

Measurements :

(i) <i>Imago</i> :		Range (5 exs.)
1. Total length with wings <i>c</i>	...	13.00—13.50
2. Total length without wings <i>c</i>	...	7.50— 7.60
3. Length of head to base of mandibles	...	1.23— 1.24
4. Max. width of head (with eyes)	...	1.50— 1.55
5. Max. diameter of eye	...	0.40— 0.42
6. Max. diameter of lateral ocellus	...	0.18— 0.20
7. Max. width of pronotum	...	1.25— 1.29
8. Max. length of pronotum	...	0.76— 0.80
9. Length of forewing with scale	...	10.70—10.80
10. Length of hindwing with scale	...	9.60— 9.70

(ii) Soldier :	Range (5 exs.)
1. Total body-length <i>c</i>	... 8.70— 8.80
2. Length of head to base of mandibles	... 2.35— 2.43
3. Max. width of head	... 1.65— 1.73
4. Max. length of pronotum	... 0.85— 0.93
5. Max. width of pronotum	... 1.43— 1.52

Distribution : INDIA : *Stylotermes fletcheri* is known from Tamil



Figs. 57 and 58. *Stylotermes fletcheri* Holmgren and Holmgren.
 Fig. 57. Head and pronotum of imago, in dorsal view.
 Fig. 58. Ditto, soldier.

Nadu and Karnataka States as follows : Tamil Nadu : Coimbatore, Shevaroy Hills (type-locality). Karnataka : Chickmagalur.

Biology : *Stylotermes fletcheri* H. and H. nests in dead portions of live mango and other trees. The nest extends to the adjoining live tissue also and is made up of longitudinal galleries which are filled with damp, blackish faecal matter. It is comparable with the nests of some of the *Neotermes* species. Winged forms have been collected during October-November from nests but there is no record of swarming.

Family RHINOTERMITIDAE

General Remarks : According to Snyder (1949), the family Rhinotermitidae includes the subfamilies Psammotermitinae, Heterotermitinae, Stylotermitinae, Coptotermitinae, Termitogetoninae and Rhinotermitinae. As mentioned before, the subfamily Stylotermitinae has been considered here as a distinct family. The genus *Prorhinotermes* included in the subfamily Rhinotermitinae has now been referred to the newly created subfamily Prorhinotermitinae by Quennédey and Deligne (1975).

In southern India the family Rhinotermitidae as such is represented by the subfamilies Heterotermitinae, Coptotermitinae and Prorhinotermitinae which include the genera *Heterotermes*, *Coptotermes* and *Prorhinotermes*, respectively. The *Heterotermes* and the *Prorhinotermes* are represented by one species each and the *Coptotermes* by three species.

Distribution (Fig. 54) : The family Rhinotermitidae is distributed in all the zoogeographical regions and is represented by six subfamilies, viz., Psammotermitinae, Heterotermitinae, Coptotermitinae, Termitogetoninae, Prorhinotermitinae and Rhinotermitinae and twelve genera. All these subfamilies and nine genera are represented in the Oriental region and of these only the subfamily Termitogetoninae (with its single genus *Termitogeton*) is endemic to the said region. The remaining four subfamilies and eight genera are common with the other zoogeographical regions. The Psammotermitinae is represented by only two genera, i.e., *Psammotermes* in the Ethiopian, the Palaearctic and the Oriental (recently discovered by Roonwal and Bose, 1960, from Rajasthan) and *Glossotermes* in the Neotropical, regions. The Heterotermitinae is also represented by two genera, i.e., *Heterotermes* (in all the zoogeographical regions except the Papuan islands and the Palaearctic) and the *Reticulitermes* in the Oriental, Palaearctic, Ethiopian and the Nearctic regions. Of the 24 species

of *Heterotermes*, eight occur in the Oriental region and of these only one, fairly well distributed species, is found in southern India. The genus *Reticulitermes* is restricted to the subtemperate areas of the Oriental region and is not represented in southern India. The Coptotermitinae with the single genus *Coptotermes* has 51 species known from all the zoogeographical regions except the Palaearctic and the Nearctic. From the Oriental region 24 species are recorded, of which nine occur in the Indian subregion. Only three species of the genus, i.e., *beckeri*, *ceylonicus* and *heimi* are known from southern India. The Prorhinotermitinae with the single genus *Prorhinotermes* known by 15 species, is represented by only one species, i.e., *P. flavus* which is reported from mainland India recently (Bose & Maiti, 1976). The Rhinotermitinae is represented in the Oriental region by three genera viz., *Macrorhinotermes*, *Parrhinotermes* and *Schedorhinotermes* and 31 species. The genus *Parrhinotermes*, in the Indian subcontinent, is recorded only from Assam and *Schedorhinotermes* from Burma and the Andaman Islands.

Key to the Genera

- (i) *Imago*
- 1(2) Head parallel sided ; paler species ... *Heterotermes*
- 2(1) Head rounded ; darker species
- 3(4) Clypeus greatly enlarged (Fig. 66) ... *Prorhinotermes*
- 4(3) Clypeus short, not greatly enlarged (Figs. 62, 64) ... *Coptotermes*
- (ii) *Soldier* :
- 1(2) Head parallel sided ; labrum with a thin, needle-like, hyaline tip ... *Heterotermes*
- 2(1) Head oval ; labrum tongue-shaped, either with rounded anterior margin or a short pointed tip
- 3(4) Fontanelle large, lying at the front end of head-capsule (Figs. 61, 63, 65) ; labrum with a short pointed tip ... *Coptotermes*
- 4(3) Fontanelle small, lying on head dorsum (Fig. 67) ; labrum with rounded anterior margin ... *Prorhinotermes*

Subfamily HETEROTERMITINAE

Genus *Heterotermes* Froggatt

1896. *Heterotermes* Froggatt, *Proc. Linn. Soc. N.S.W.*, 21 : 518, 550.
1949. *Heterotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 66.

Type species : *Heterotermes platycephalus* Froggatt.

Five species of the genus *Heterotermes* are known from India of which only one is found in southern India.

21. *Heterotermes malabaricus* Snyder

(Figs. 59-60)

1933. *Heterotermes malabaricus* Snyder, *Proc. U.S. natnl. Mus.*, 82 : 4-6. Im. and S. Type-locality : Mangalore, Malabar Coast (Karnataka).
 1949. *Heterotermes malabaricus* ; Snyder, *Smiths. misc. Coll.*, 112 : 68.
 1974. *Heterotermes malabaricus* ; Sen-Sarma, in : *Ecology and Biogeography in India* (Ed. M.S. Mani) : 453.

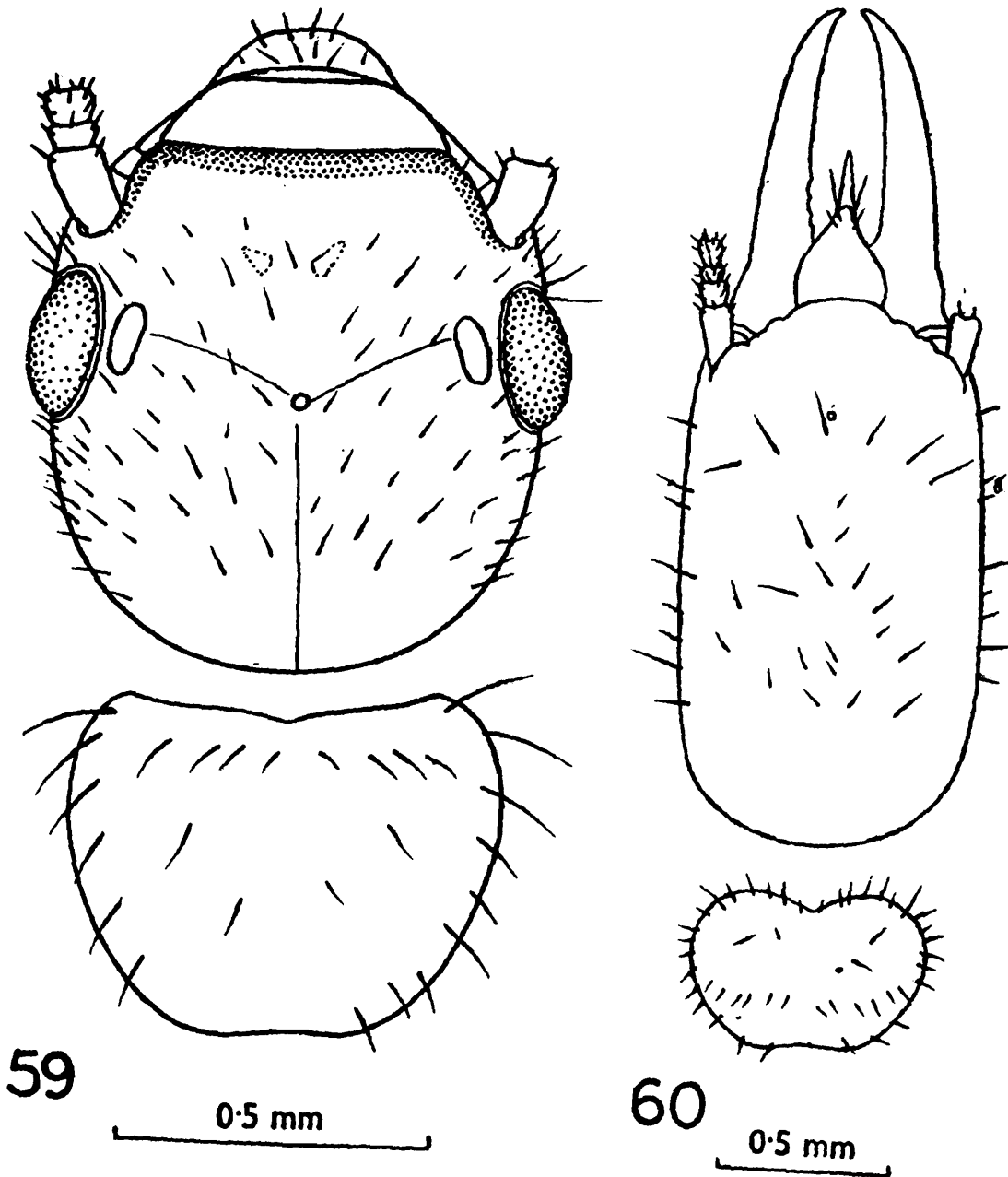
Material : Lot 1. From Karnataka as follows : A vial with two Im., Mangalore, coll. J. C. M. Gardner, 25.v.1930, cotype. Nine vials with S. and W., coll. O. B. Chhotani, thus : 02/21.11.62, Anekad Forest Range, ex. a dead piece of bamboo lying on ground ; 03/21.11.62, Ditto ; 04/23.11.62, Kadri Hills, Mangalore, ex. dead stump of *Casuarina* ; 05/23.11.62, Ditto, ex. under trunk of a cashew tree ; 06/23.11.62, Ditto, ex. dead stump of *Casuarina* ; 08/23.11.62, Ditto ; 016/23.11.62, Ditto, ex. galleries over a log of wood ; 09/23.11.62, Ditto ex. dead wood. A vial with S. and W. coll. Ummerkutty and B. Sinha, 31.xii.1966, Coondapur.

Lot 2. From Kerala as follows : A vial with S. and W., Pappinamkode, Trivandrum environs, coll. not given, 26.xii.1958.

Measurements :

(i) <i>Imago</i> :	Range (2 exs., cotype)
1. Total body-length with wings <i>c</i>	... wings broken
2. Total body-length without wings <i>c</i>	... 5.50—5.53
3. Length of head to base of mandibles	... 0.88—0.89
4. Max. width of head (with eyes)	... 0.83—0.85
5. Max. diameter of compound eye	... 0.23
6. Max. length of pronotum	... 0.53—0.54
7. Max. width of pronotum	... 0.69—0.72
(ii) <i>Soldier</i> :	Range (15 exs.)
1. Total body-length <i>c</i>	... 5.90—6.12
2. Length of head to base of mandibles	... 1.53—1.78
3. Max. width of head	... 0.88—0.93
4. Max. length of pronotum	... 0.43—0.50
5. Max. width of pronotum	... 0.63—0.71

Distribution : INDIA : Southern India : It is a common *Heterotermes* sp. in Peninsular India. According to Sen-Sarma (1974) it is widely distributed in the peninsula. Presently it has been recorded as follows:—Karnataka : Anekad Forest Range, Coondapur, and Mangalore (type locality) ; Kerala : Pappinamkode and Trivandrum environs.



Figs. 59 and 60. *Heterotermes malabaricus* Snyder.

Fig. 59. Head and pronotum of imago (syntype), in dorsal view.

Fig. 60. Ditto, soldier.

Biology : The species of genus *Heterotermes* are great destroyers of wood and wooden articles, paper, cloth, etc. so much so that it has

been recorded that the whole township of Sri Hargobindpur in the Punjab was completely ruined by *Heterotermes indicola*, a very common species of northern India (Roonwal, 1955).

Heterotermes malabaricus which is the only species of this genus in southern India, is very common in the city of Mangalore. The species makes its nest underground and extends it into tree trunks and wooden logs, lying on the ground.

The wood is eaten along the fibre, leaving out thin strands of leftover wood. It is recorded here from pieces of bamboo and stumps of *Casuarina* lying on the jungle ground, from dead portions of the main trunk of a Cashew tree and from dead wood of a number of unidentified species of trees.

Subfamily COPTOTERMITINAE

Genus *Coptotermes* Wasmann

1896. *Termes* (*Coptotermes*) Wasmann, *Ann. Mus. Civ. Stor. Nat. Genova*, 16(36) : 629.
 1949. *Coptotermes* ; Snyder, *Smiths misc. Coll.*, 112 : 75.
 1962. *Coptotermes* ; Roonwal and Chhotani, *Indian Species of Genus Coptotermes*. 3-9 (ICAR Monogr.)

Type species : *Coptotermes gestroi* Wasmann.

Of the nine species of the genus *Coptotermes* known from Indian subregion, three occur in southern India.

Key to Species

(i) *Imago* :

It is very difficult to separate the species on the basis of imago characters which merge with each other. However, a key is provided here which may prove to be of some use in identification of the imagos of two species known from southern India.

- 1(2) Ocellus larger, 0.16—0.19 mm long ; minimum ocellus-antennal distance smaller, 0.08 mm ; antennae with 20-22 segments, segments 3-9 broader than long, 10 or 11 almost round ... *heimi* (Wasmann)
- 2(1) Ocellus smaller, 0.14—0.15 mm long ; minimum ocellus-antennal distance greater, 0.09—0.13 mm ; antennae with 19-23 segments, segments 3-7 broader than long, 8 almost round ... *ceylonicus* Holmgren

(ii) *Soldier* :

- 1(4) Larger species ; head-length to base of mandibles 1.28—1.58 mm
- 2(3) Postmentum somewhat more constricted and gradually narrowing at waist ; head-capsule slender, length to base of mandibles 1.30—1.40 mm ... *ceylonicus* Holmgren
- 3(2) Postmentum less so constricted and somewhat sharply narrowing at waist ; head somewhat thicker, length to base of mandibles 1.28—1.58 mm ... *heimi* (Wasmann)
- 4(1) Smaller species ; head-length to base of mandibles 1.10—1.13mm ... *beckeri* Mathur & Chhotani

21. *Coptotermes beckeri* Mathur and Chhotani

(Fig. 61)

1969. *Coptotermes beckeri* Mathur and Chhotani, *J. Timber Dev. Assoc. India*, 15 : 1—5. S. and W. Type-locality : Madras (Tamil Nadu).

Material : Two paratype S., Madras (Tamil Nadu), coll. G. Becker (No. 199), 5.xi.1956, ex. galleries in the interior of a building.

Measurements :

<i>Soldier</i> :	Range (2 paratype)
1. Total body-length <i>c</i>	... 3.60—3.90
2. Length of head to base of mandibles	... 1.10—1.13
3. Max. width of head	... 0.95
4. Max. length of pronotum	... 0.35
5. Max. width of pronotum	... 0.60—0.63

Distribution : INDIA : Southern India : Tamil Nadu : Madras (type-locality).

Biology : Species of the genus *Coptotermes* are great destroyers of wood in houses and buildings and in forests and timber yards. This species is not common and has been collected only once from galleries in a building at Madras.

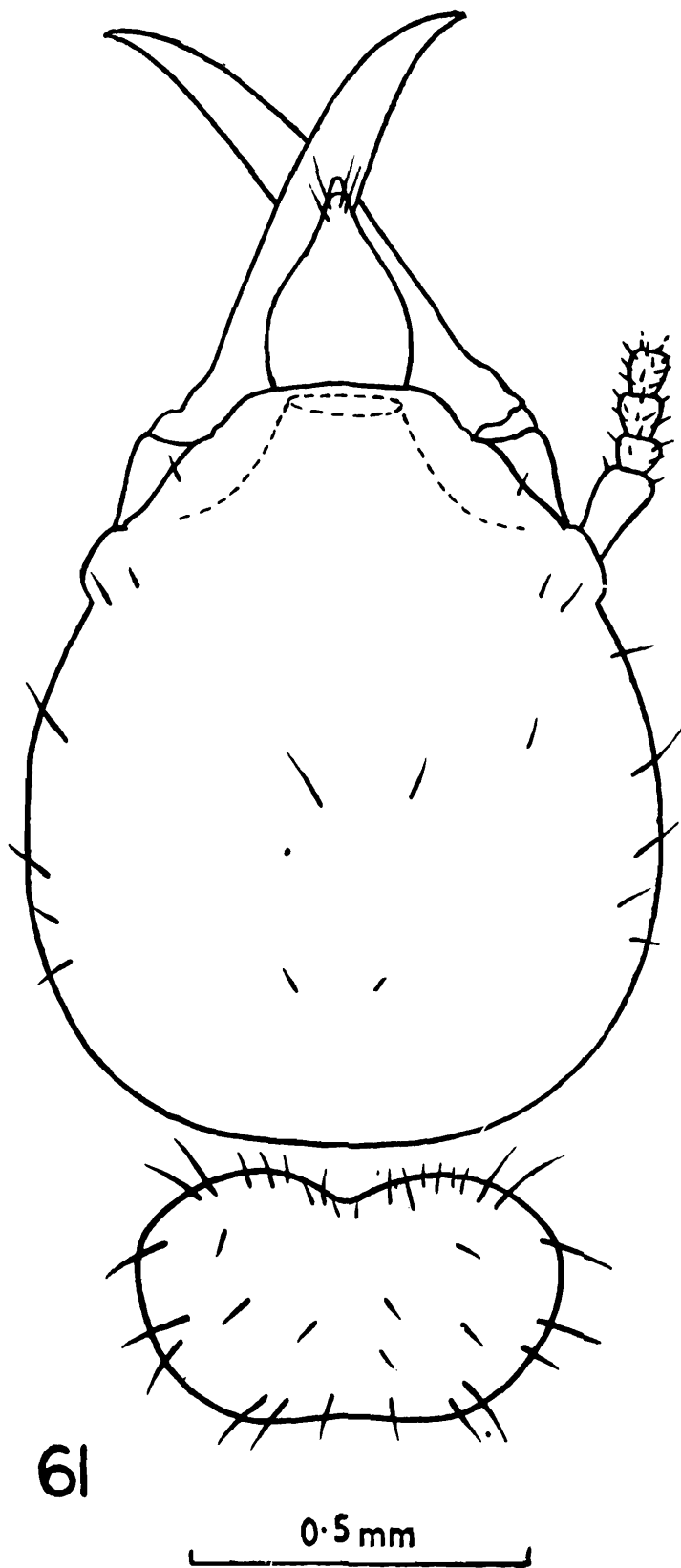


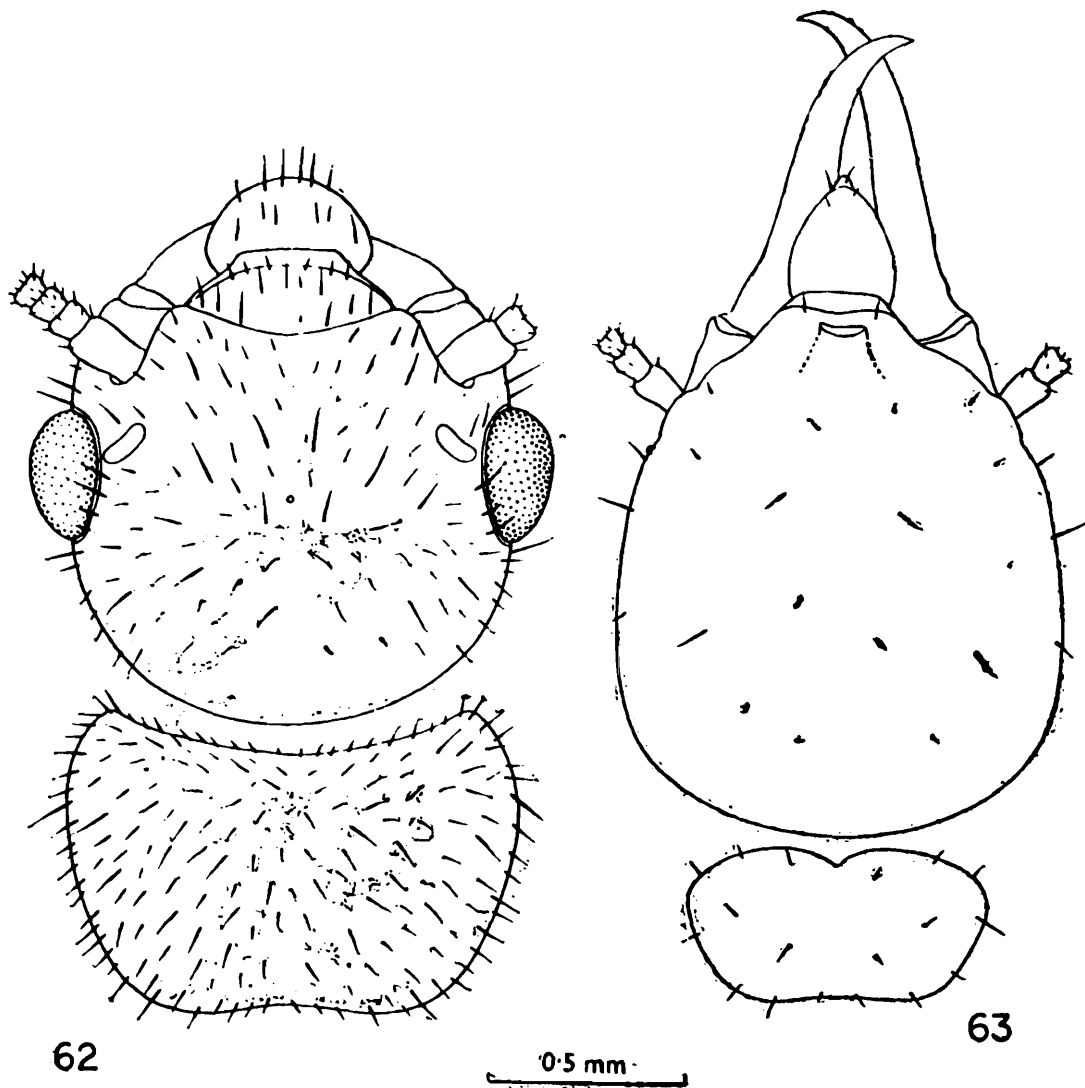
Fig 61. *Coptotermes beckeri* Mathur and Chhotani, Soldier (Paratype), Head and pronotum, in dorsal view.

23. *Coptotermes ceylonicus* Holmgren

(Figs. 62-63)

1911. *Coptotermes ceylonicus* Holmgren, in Escherich's *Termitenleben auf Ceylon* : 192-193, 206, 210. Im. and S. Type-localities : Ceylon : Seenigoda Estate, Ebenda, Peradeniya, Heneratgoda.
1949. *Coptotermes ceylonicus* ; Snyder, *Smiths. misc. Coll.*, 112 : 76.
1962. *Coptotermes ceylonicus* ; Roonwal and Chhotani, *Indian Species of Genus Coptotermes* : 9-17. Im. S. and W. (I.C.A.R. Ent. Monogr. No. 2).

Material : Lot 1. Three vials with S. and W., Coimbatore, Tamil Nadu, as follows :— coll. not given, det. M. L. Roonwal ; coll. T. B. Fletcher, 20.ii.1913 ; coll. J. C. Basuchoudhury, 14.ii.1962, ex. fallen dead log.



Figs. 62 and 63. *Coptotermes ceylonicus* Holmgren.

Fig. 62. Head and pronotum of imago, in dorsal view.

Fig. 63. Ditto, soldier.

Lot 2. One vial with S. and W., Dharamwarigud, Eluru, Andhra Pradesh, coll. not given, 25.ii.1970 and three vials, Trivandrum and environs (Kerala), coll. not given, 27.xi., 7.xii. and 20.xii. 1958.

Measurements :

(i) *Imago* (From specimens from Sri Lanka) :

		Range (5 exs.)
1. Total body-length with wings <i>c</i>	...	wings broken
2. Total body-length without wings <i>c</i>	...	6.60—6.80
3. Length of head to base of mandibles	...	1.05—1.10
4. Max. width of head	...	1.34—1.42
5. Max. diameter of eye	...	0.29—0.36
6. Max. diameter of ocellus	...	0.18
7. Max. length of pronotum	...	0.83—0.86
8. Max. width of pronotum	...	1.15—1.20

(ii) *Soldier* :

		Range (5 exs.)
1. Total body-length <i>c</i>	...	5.10—6.00
2. Length of head to base of mandibles	...	1.30—1.40
3. Max. width of head	...	1.10—1.13
4. Max. length of pronotum	...	0.43—0.48
5. Max. width of pronotum	...	0.75—0.85

Distribution : INDIA : Southern India : Tamil Nadu : Coimbatore, Madras, Mandapam Camp, Krusadai Island ; Andhra Pradesh : Dharamwarigud (Eluru) ; Kerala : Trivandrum and environs. Elsewhere : Sri Lanka, known from several localities ; for details *vide* Roonwal and Chhotani (1962b)

Biology : It is a common wood destroying termite in Sri Lanka and has been reported damaging logs of wood, wooden structures in buildings, packing cases, etc. It is a pest of rubber and tea plantations and is recorded from a number of other living trees. For details *vide* Roonwal and Chhotani (1962b). In southern India, it has been recorded from dead wood only.

24. *Coptotermes heimi* (Wasmann)

(Figs. 64-65)

1902. *Arrhinotermes heimi* Wasmann, *Zool. Jahrb. (Syst.)*, 17(1) : 104, 160, Im. Type-locality : Wallon (Ahmadnagar Dist., Maharashtra).
1949. *Coptotermes heimi* ; Snyder, *Smiths. misc. Coll.*, 112 : 79.
1962. *Coptotermes heimi* ; Roonwal and Chhotani, *Indian Species of Genus Coptotermes* : 9, 38-57. Im., S. and W. (I.C.A.R.Ent. Monogr., No.2).

Material : Lot 1. A vial with a S. and two W., Konnoth Forest Range (Tamil Nadu), coll. M. L. Roonwal (R7/20.2.55), 20.ii.1955, ex. dead unknown tree.

Lot 2. Four vials with S. and W., coll. O. B. Chhotani, Karnataka, Nov. 1962, as follows : 012/6.11.62, Dharwar (University area), ex. nest in heartwood of 'Karanji' tree ; 023/15.11.62, Shanbhoganhalli, ex. heartwood of a *Ficus* sp. tree ; 026/15.11.62, Ditto, ex. dead tree ; 09/23.11.62, Mangalore, ex. galleries and under bark of a living mango tree.

Lot 3. Five vials, coll. O. B. Chhotani, Tamil Nadu, Feb., 1969, as follows : 02/10.2.69, S. and W., Salem, ex. under gunny bags lying on ground in a timber depot (in 5 vials) ; 011/10.2.69, Ditto ; 014/15.2.69, S. and W., Coimbatore, ex. *Tamarindus indica* tree ; 025/19.2.69, Im. S. and W., Top Slip (nr. Pollachi), ex. fallen dead stump of a soft wood tree ; 08/24.2.69, S. and W., Vanathiparai Reserve Forest, ex. 'Kusum' tree ; 04/28.2.69, S. and W., Mylar (Kulasekaram Forest Range), ex. dead stump.

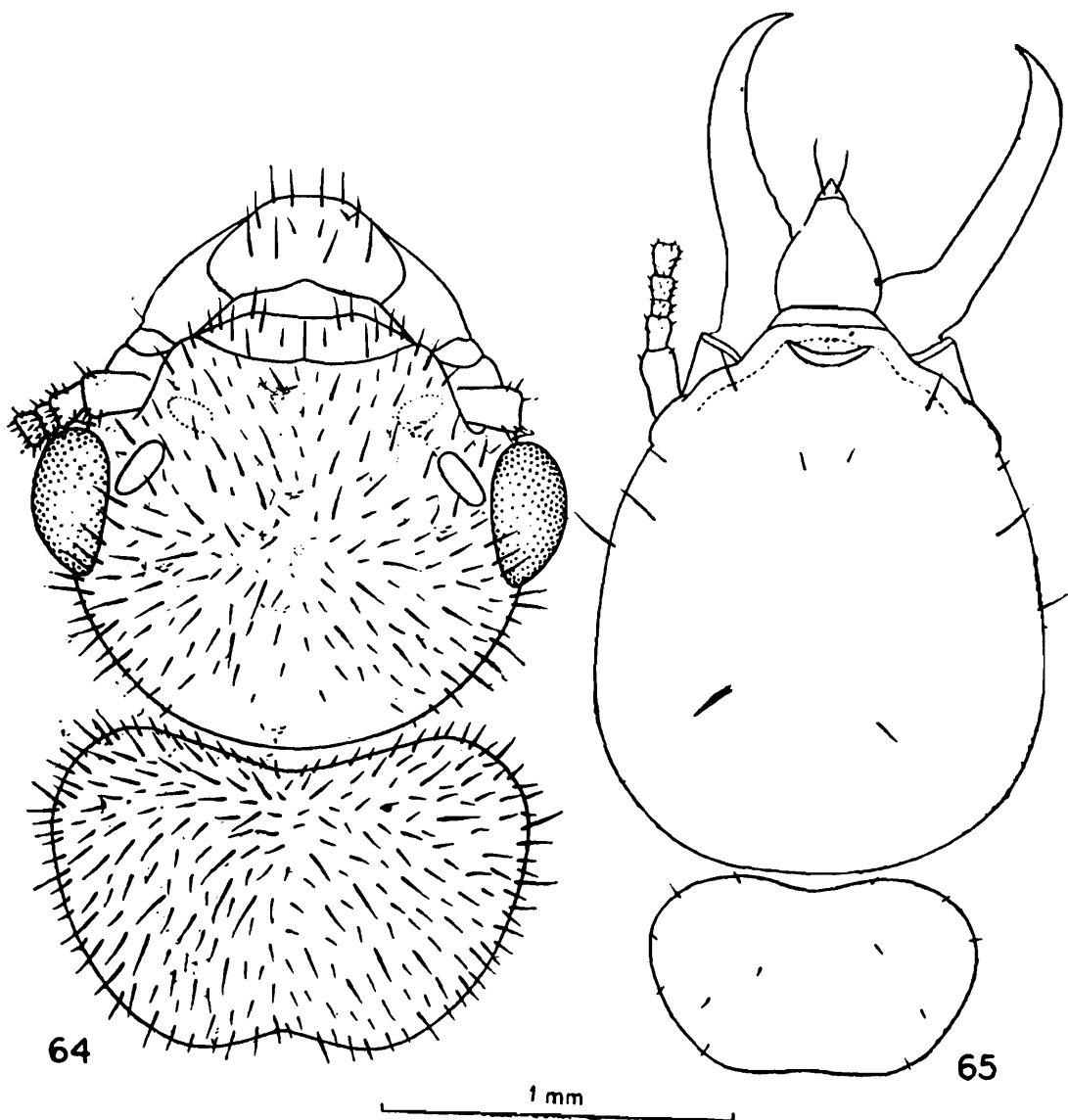
Lot 4. A vial with S. and W. Panchakanam Reserve Forest, Periyar Lake Area, Kerala, coll. O. B. Chhotani (011/5.3.69), ex. dead stump of a tree.

Measurements :

(i) <i>Imago</i> :		Range (6 exs.)
1. Total body-length with wings <i>c</i>	...	12.50—13.70
2. Total body-length without wings <i>c</i>	...	6.90—7.30
3. Length of head to base of mandibles	...	1.13—1.20
4. Max. width of head	...	1.43—1.50
5. Max. diameter of eye	...	0.42—0.45
6. Max. diameter of ocellus	...	0.20—0.23
7. Max. length of pronotum	...	0.83—0.88
8. Max. width of pronotum	...	1.30—1.35
9. Length of forewing with scale	...	10.40—10.90
10. Length of hindwing with scale	...	9.50—10.50
(ii) <i>Soldier</i> :		Range (10 exs.)
1. Total body-length <i>c</i>	...	4.88—7.00
2. Length of head to base of mandibles	...	1.28—1.58
3. Max. width of head	...	1.13—1.28
4. Max. length of pronotum	...	0.50—0.53
5. Max. width of pronotum	...	0.80—0.92

Distribution : INDIA : Southern India : Karnataka : Dharwar, Mangalore, Shanbhoganhalli, Sidapur, Marghalli Estate, Bellahunisi, Kottur, Siriguppa ; Tamil Nadu : Coimbatore, Salem, Top Slip, Saranganar Reserve Forest, Vanathiparai Reserve Forest, and Mylar ; Kerala : Panchakanam Reserve Forest, Periyar Lake area. Elsewhere : Common in India Bangla Desh and Pakistan.

Biology : *Coptotermes heimi* (Wasmann) is a common wood destroying species and is very destructive to wooden structures in houses, timber in timber depots, living and fallen trees in forests, paper, books, electric wires, etc. Roonwal (1959) and Roonwal and Chhotani (1962b) gave a list of plants from which this species has been recorded. In southern India it has been recorded (present account) from *Mangifera*



Figs. 64 and 65. *Coptotermes heimi* (Wasmann),
 Fig. 64. Head and pronotum of imago, in dorsal view.
 Fig. 65. Ditto, soldier.

indica Linn., *Tamarindus indica* Linn. and *Ficus* spp. trees. It is also found damaging jute bags and fallen undetermined trees.

The nests of this termite are found in dead portions of trees, dead wood lying on ground and in soil. The nests are porous, dark brown structures made up of uneaten strands of wood and the excrement of the termite. The whole nest is a network of strands of wood. The swarming of the species has been reported by Roonwal (1959) during March to August.

Subfamily PRORHINOTERMITINAE

Genus *Prorhinotermes* Silvestri

1909. *Prorhinotermes* Silvestri, Isoptera. In Michaelsen's and Hartmeyer's *Die Fauna Südwest-Austral.*, vol. 2 : 286.

1949. *Prorhinotermes* ; Snyder, *Smiths. misc. Coll.* 112 : 85.

Type-species : *Prorhinotermes inopinatus* Silvestri.

Only one species of the genus *Prorhinotermes* is known from India. This happens to be the first record of the genus from the Indian mainland.

25. *Prorhinotermes flavus* (Bugnion and Popoff)

(Figs. 66-67)

1910. *Coptotermes flavus* Bugnion and Popoff, *Mem. Soc. Zool. Fr.*, 23 : 117-120, pl. 2, figs. 14-20. S. and W. Type-locality : Ambalangoda, Sri Lanka.

1911 *Coptotermes flavus* : Bugnion and Ferriere, *Mem. Soc. zool. Fr.*, 24 : 97-106, 2. pls. Im.

1949. *Prorhinotermes flavus* ; Snyder, *Smiths. misc. Coll.*, 112 : 86.

Material : A vial (017/23.11.62) with S. and W., Mangalore (Lalbagh Area), coll. O. B. Chhotani, 23.xi.1962, ex. heartwood of *Ficus bengalensis*.

Measurements :

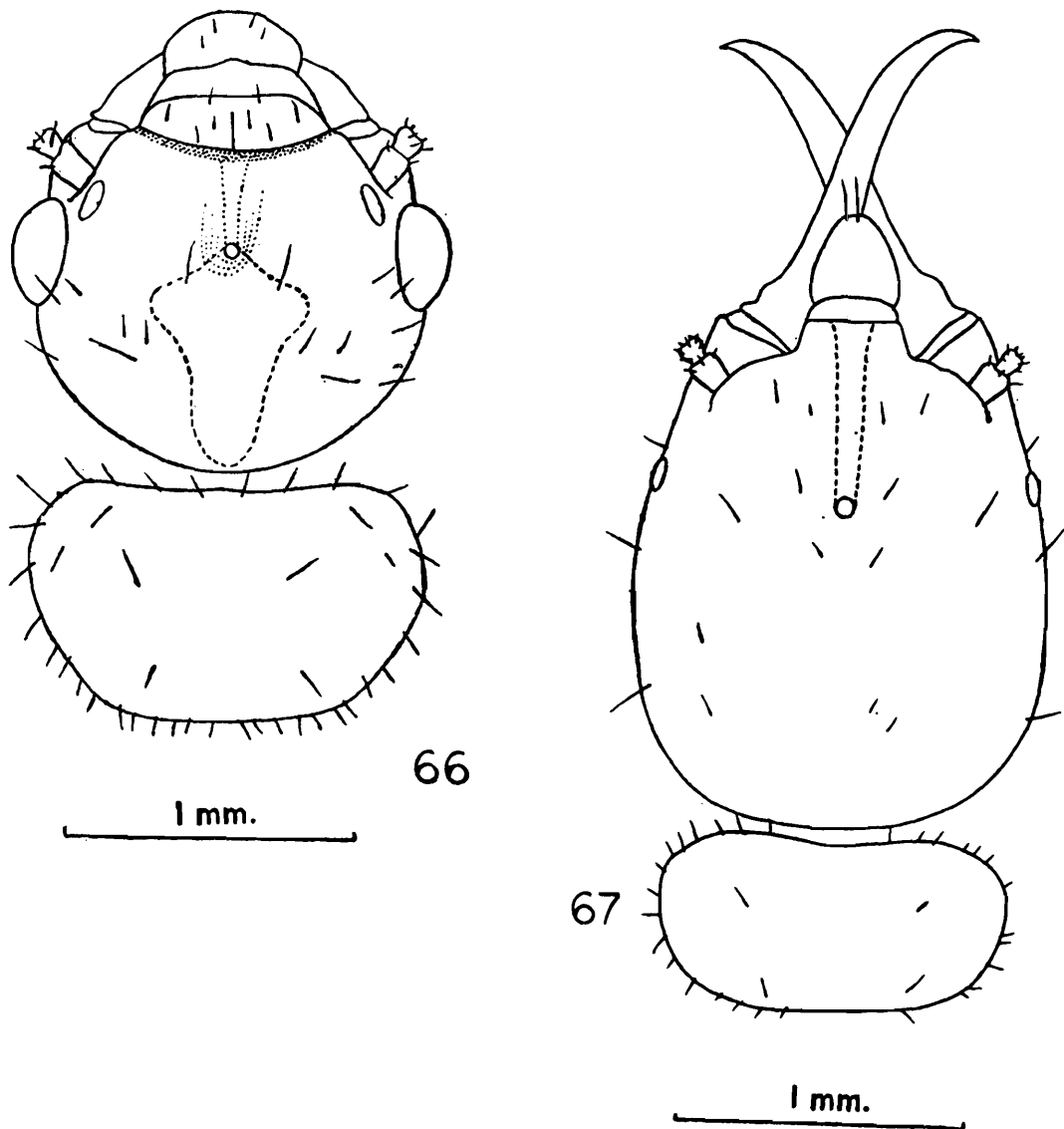
(i) *Imago* (Measurements from literature) :

1. Length with wings	...	11.00
2. Length without wings	...	8.00
3. Length of head	...	1.63
4. Width of head	...	1.41
5. Length of pronotum	... Probably	0.75
	(1.75 as given by Holmgren, 1913b, seems incorrect)	
6. Width of pronotum	...	1.25
7. Length of forewing	...	9.00

(ii) <i>Soldier</i> :		Range (10 exs.)
1. Total body-length <i>c</i>	...	5.00—5.80
2. Length of head to base of mandibles	...	1.55—1.75
3. Max. width of head	...	1.30—1.48
4. Max. length of pronotum	...	0.55—0.68
5. Max. width of pronotum	...	1.05—1.25

Distribution : INDIA : Southern India : Mangalore (Karnataka).
Elsewhere : Andaman Islands (India) and Sri Lanka.

Remarks : Species of the genus *Prorhinotermes* are generally confined to the islands. The species *P. flavus* so far was known only from Ceylon and Andaman Islands. It has been recorded here from Mangalore, a coastal town on the western coast in Karnataka state. This



Figs. 66 and 67. *Prorhinotermes flavus* (Bugnion and Popoff)
Fig. 66. Head and pronotum of imago, in dorsal view.
Fig. 67. Head and pronotum of soldier, in dorsal view.

happens to be the first record of this species from the mainland of India. It has been collected in a semi-wild state nesting in the trunk of a *Ficus bengalensis* tree.

Biology: *Prorhinotermes flavus* constructs its nests in the hollows of trees. The nest is a sponge-like, brownish black carton structure of irregular shape and size and is made up of earth and faecal matter. The insects also make irregular galleries, in the wood and the plants they infest, which are filled with brownish dust. At Mangalore, this species has been collected from a *Ficus bengalensis* which was partly eaten up. In Sri Lanka it has been reported to be nesting in dead trees.

Family TERMITIDAE

General Remarks: The family Termitidae is the largest and includes more than three fourths of the species of termites. According to Snyder (1949), it included the subfamilies Serritermitinae, Amitermitinae, Termitinae, Macrotermitinae and Nasutitermitinae. Grassé and Noirot (1954) erected the subfamily Apicotermitinae with *Apicotermes* as the type-genus and more recently Sands (1972) has treated Amitermitinae as a junior synonym of Termitinae and included two groups of genera viz., the *Apicotermes*-branch and the *Anoplotermes*-branch in the *Apicotermitinae*. The oriental genera *Eurytermes*, *Euhamitermes*, *Speculitermes*, *Doonitermes* and *Indotermes* have been included by Sands (1972) in the *Anoplotermes*-branch along with his 16 newly described ones. It stands to reason to think as to whether the opinion of Sands (1972) should be accepted till the allied Oriental and South American genera are well worked out. But in view of not having a later publication questioning the view point of Sands (1972), the opinion expressed by him in respect of the subfamily status of Apicotermitinae has been adhered to for the present. The subfamily Serritermitinae has been recently raised to the family rank by (Emerson, 1965, Krishna, 1970, and Emerson and Krishna 1975). However, it occurs only in the Neotropical region.

Distribution (Figs. 68-76): Snyder (1949) included 20 genera and 249 species under the subfamily Amitermitinae. Five genera and 91 species were subsequently described under this subfamily. Since then, as has been stated before, Apicotermitinae has been given subfamily status and Amitermitinae treated as a junior synonym of Termitinae. However, this subfamily Apicotermitinae is represented in southern India by the genera *Eurytermes*, *Speculitermes* and *Euhamitermes*,

embracing nine species. The genus *Eurytermes* is endemic to the Indian subregion and includes six species, two of which occur in southern India. The genus *Speculitermes*, according to Snyder (1949) and Roonwal, Chhotani and Bose (1962), is distributed in the Oriental and Neotropical regions. Species of *Speculitermes* in the Neotropical region have now been assigned to genus *Ruptitermes* (gen. n.) by Mathews (1977, Studies on Termites from the Moto Grosso State, Brazil: 100. Acad. Bras. Ciências, Rio de Janeiro). In the Oriental region, this genus is

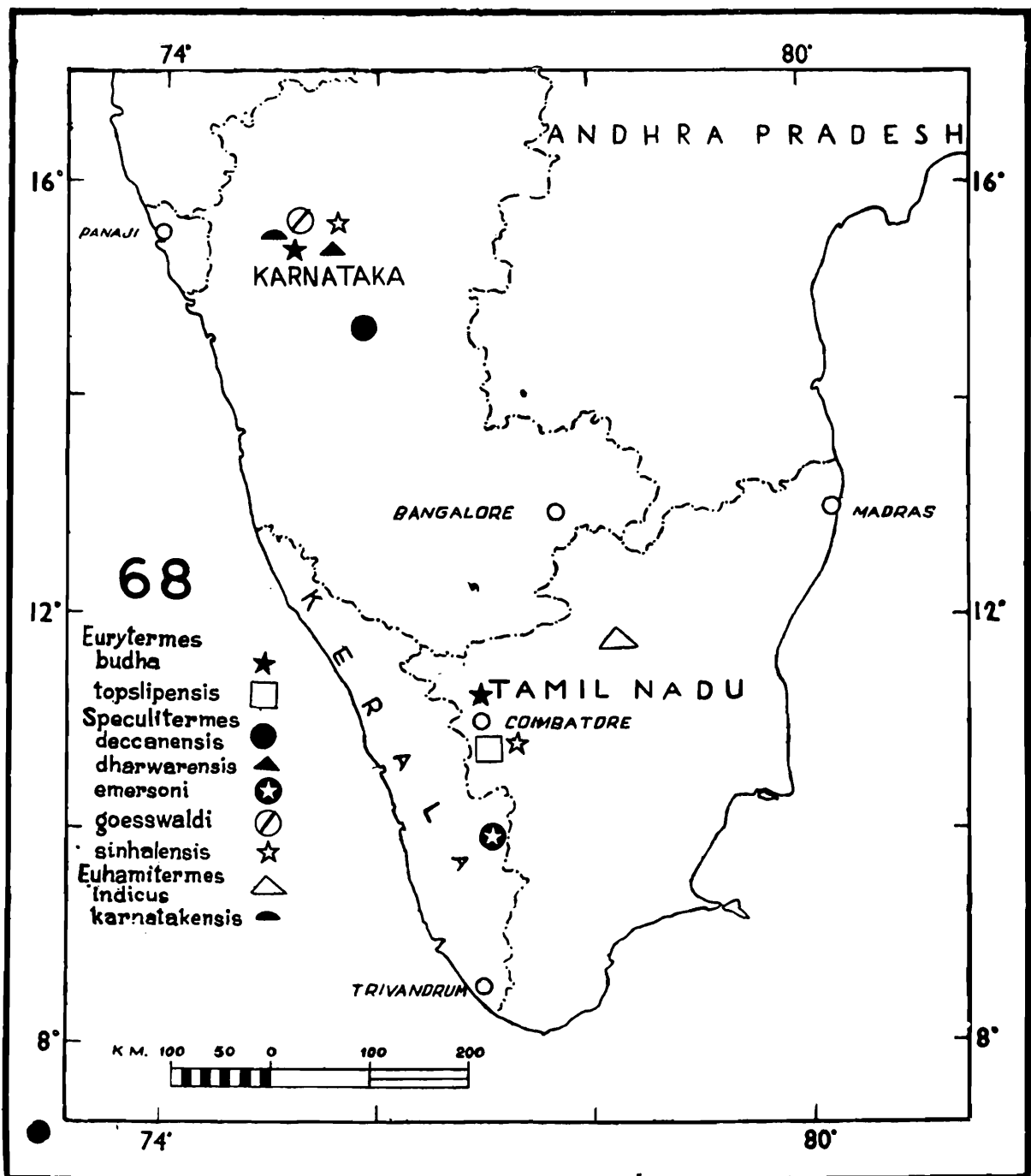


Fig. 68. Map of southern India showing distribution of species of genera *Eurytermes*, *Speculitermes* and *Euhamitermes* (Termitidae : Apicotermitinae).

represented by 11 species and subspecies. Of these, one is from Thailand and 10 are from the Indian subregion including five (one new described here) from southern India. The genus *Euhamitermes* is known only from the Oriental region and comprises 9 species, one of which occurs in the Malayan Peninsula, Singapore, Malacca and Thailand and all the 9 in the Indian subregion. In southern India only two species (*indicus* Holmgren and *karnatakensis* Roonwal and Chhotani) are found.

According to Snyder (1949) the subfamily Termitinae comprises 42

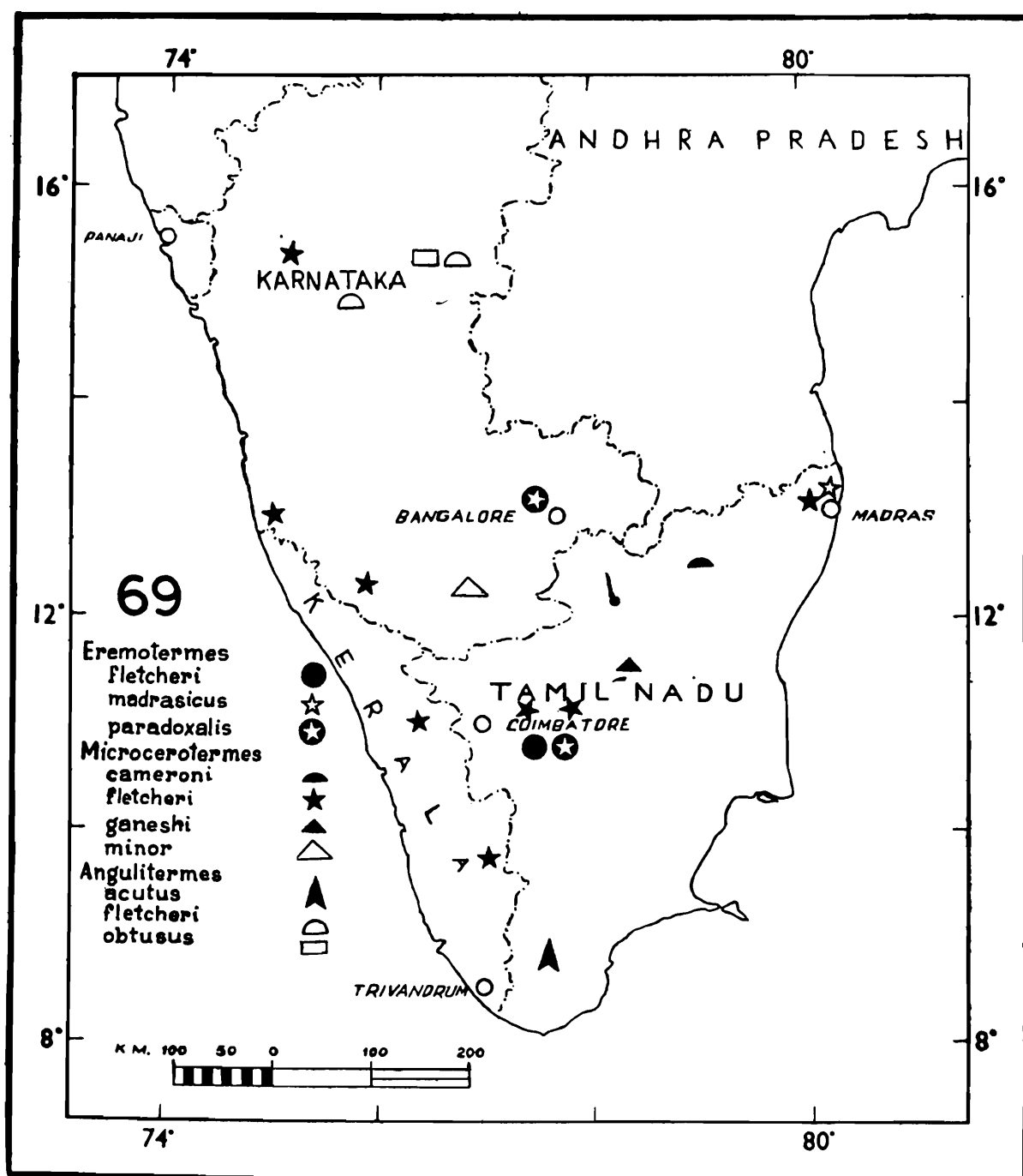


Fig. 69. Map of southern India showing distribution of species of genera *Eremoterme*, *Microcerotermes* and *Angulitermes* (Termitidae : Termitinae).

genera and 283 species, and 19 genera and 117 species were subsequently added. Recently, Sands (1972) has transferred some of these genera to the subfamily Apicotermitinae.

The subfamily Termitinae in southern India is represented by eight genera and 20 species. The genus *Eremotermes* includes 10 species, distributed in the Oriental (6 species, all being from the Indian subregion), Ethiopian (1 species) and Palaeartic (3 species), regions. In

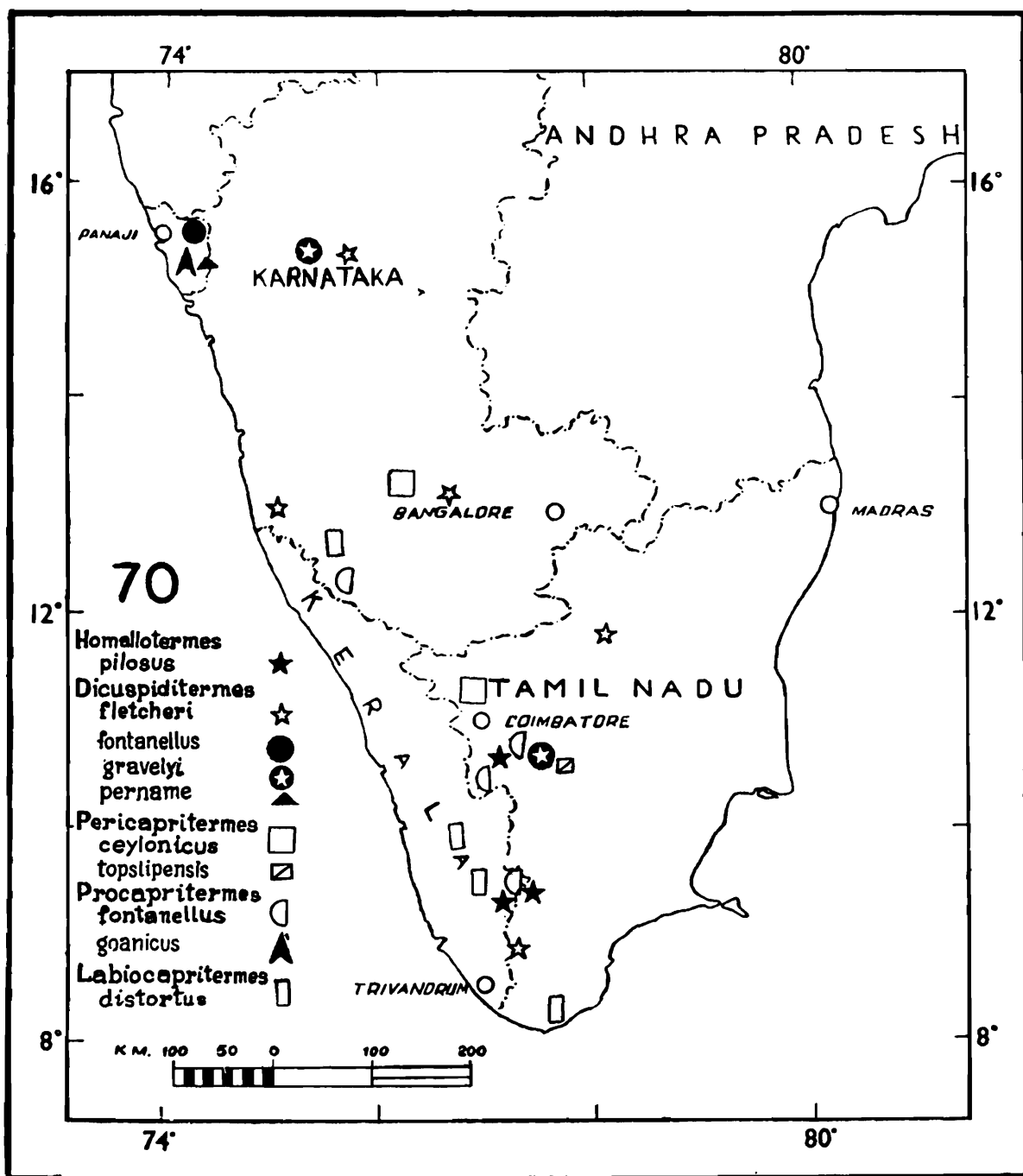


Fig. 70. Map of southern India showing distribution of species of genera *Homalotermes*, *Dicuspiditermes*, *Pericapritermes*, *Procapritermes* and *Labiocapritermes* (Termitidae : Termitinae).

the Indian subregion, this genus has been recorded from the tropical belts of peninsular India, the arid regions of Rajasthan (India) and Pakistan and the western Himalayan region. Only three species of the genus are found in southern India. The genus *Microcerotermes* is cosmopolitan occurring in all the zoogeographical regions except the Nearctic. As many as 111 species of the genus are known, of which 42 (including 28 from Indian subregion) are from the Oriental region. From southern India only 4 species (including one newly described here)

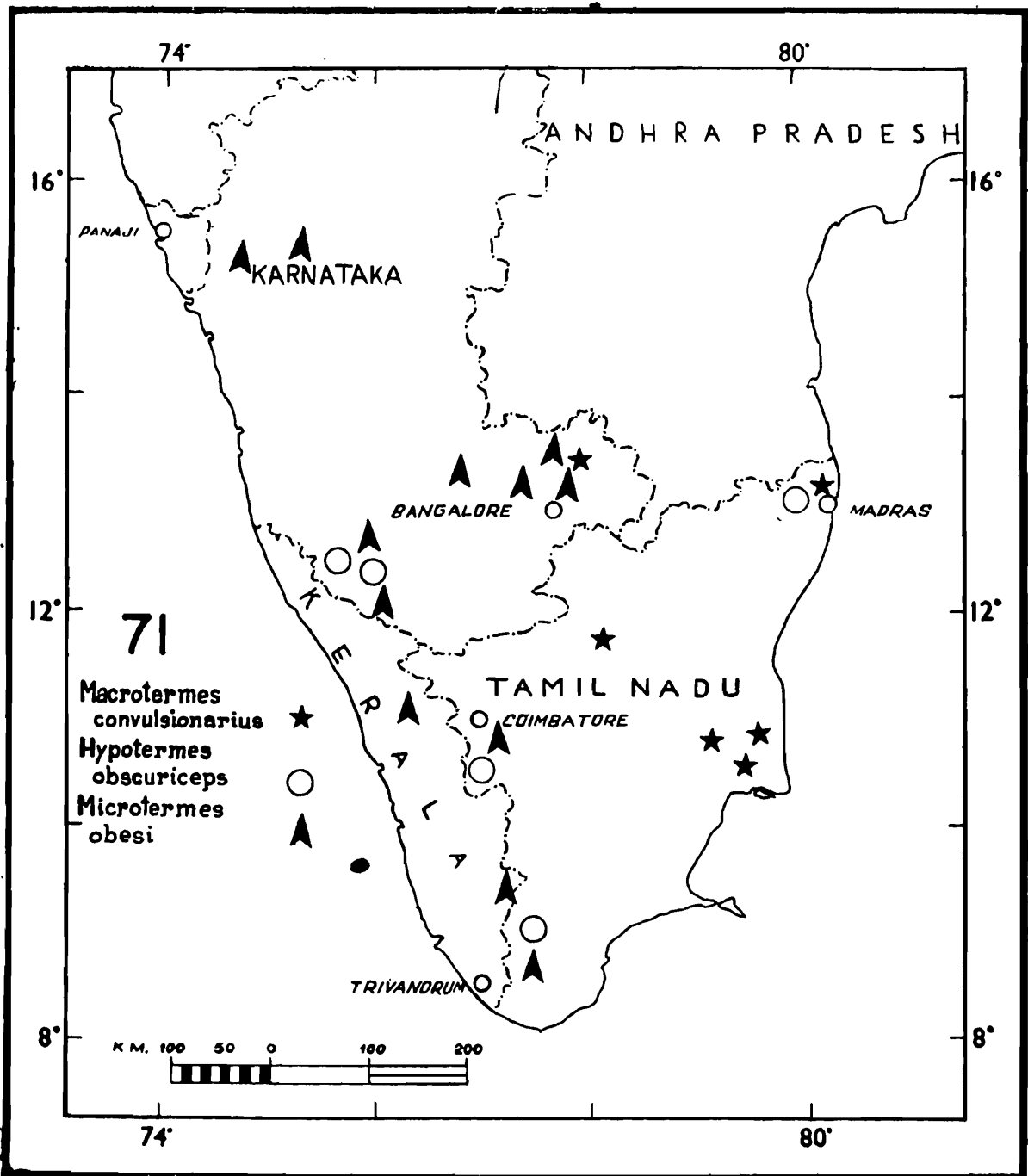


Fig. 71. Map of southern India showing distribution of species of genera *Macrotermes*, *Hypotermes* and *Microtermes* (Termitidae : Macrotermitinae).

are reported. The genus *Angulitermes* is represented in the Ethiopian region by five species, in the Palaearctic by one species and in the Oriental by 15 species. All the Oriental species occur in India, only three of these are found in southern India. The genus *Homalotermes* is endemic to the Oriental region and of the 4 species of the genus one occurs in southern India and the others in the Malayan subregion. The genus *Dicuspitermes* is also an Oriental genus and is represented in southern India by four species out of the 11 known from the Indian

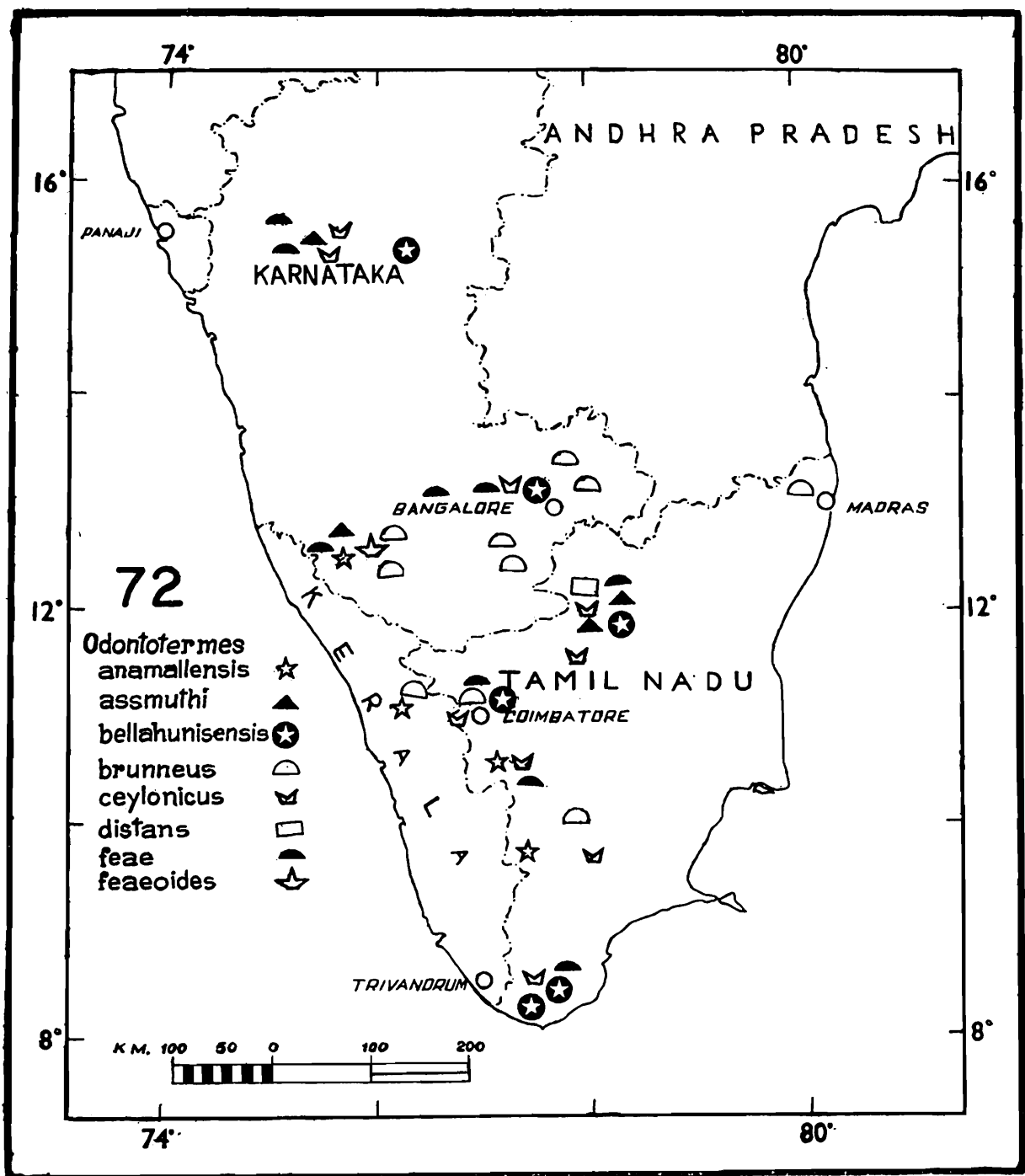


Fig. 72. Map of southern India showing distribution of species of genus *Odontotermes* (Termitidae : Macrotermitinae).

region. The genus *Pericapritermes* occurs in the Oriental and the Ethiopian regions and is represented by only two species in southern India. The genus *Procapritermes* is also endemic to the Oriental region and of the four species known from India, only two are found in southern India. The monotypic genus *Labiocapritermes* is represented by its single species, from southern India.

The subfamily Macrotermitinae is widely distributed in the Ethiopian and the Oriental regions with some elements in the Papuan

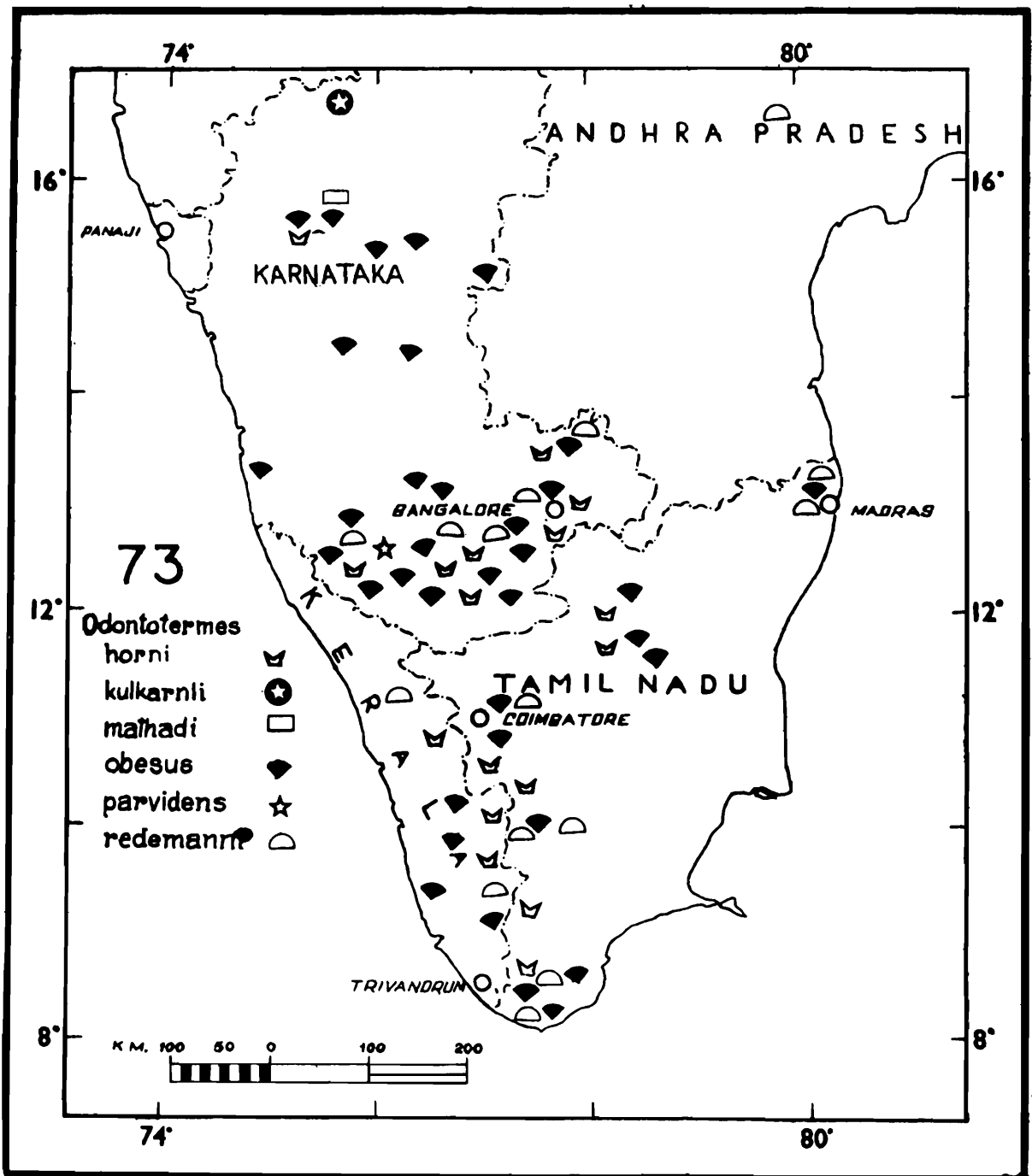


Fig. 73. Map of southern India showing distribution of species of genus *Odontotermes* (Termitidae : Macrotermitinae).

and the Malagasy regions. Ten genera with as many as 253 species, belonging to this subfamily are catalogued by Snyder (1949). He has catalogued the genus *Odontotermes* comprising the subgenera *Odontotermes*, *Hypotermes* and *Euscaiotermes*, but more recently *Hypotermes* has been raised to generic level. Since Snyder (1949), 52 species have been added to Macrotermitinae including 34 from the Oriental region. We have 6 genera and 131 species from this region, and all these 6 genera and 66 species are represented in the Indian subregion. In the present study 4 genera i.e., *Macrotermes* (1 out of the 7 Indian species)

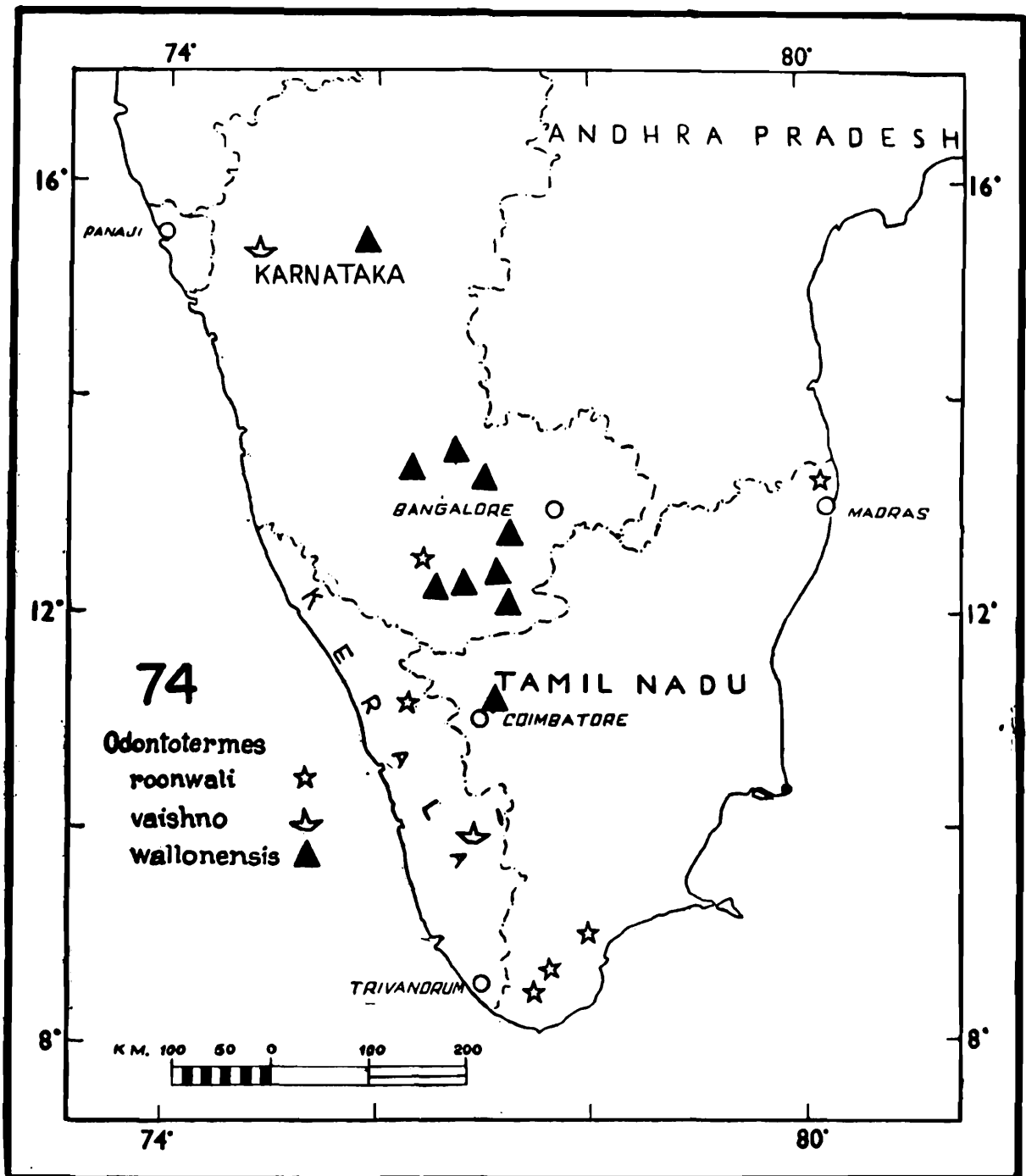


Fig. 74. Map of southern India showing distribution of species of genus *Odontotermes* (Termitidae : Macrotermitinae),

Odontotermes (17 out of 41 species), *Hypotermes* (1 out of 3 species) and *Microtermes* (2 out of 8 species) are reported here from southern India.

In the subfamily Nasutitermitinae, Snyder (1949) catalogued 34 genera and 475 species. After Snyder (1949) 31 genera and 122 species, from all over the world, have been described. From the Indian subregion, 12 genera and 56 species (including two newly described here), are known, out of which six genera and 16 species occur in southern India, as

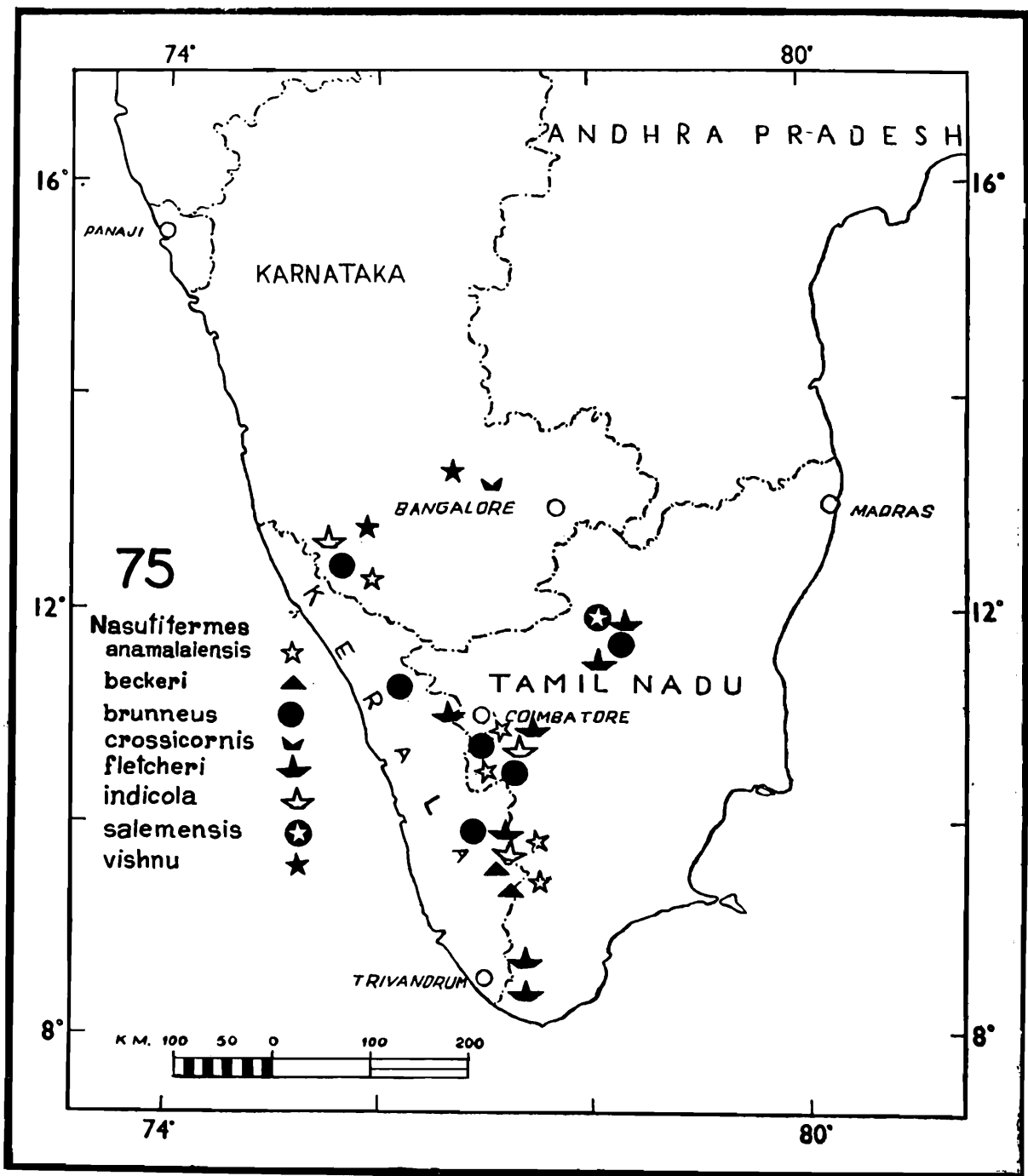


Fig. 75. Map of southern India showing distribution of species of genus *Nasutitermes* (Termitidae : Nasutitermitinae).

follows : *Nasutitermes*, nine out of 31 species known from Indian subregion ; *Grallatotermes* two species, both occurring only in southern

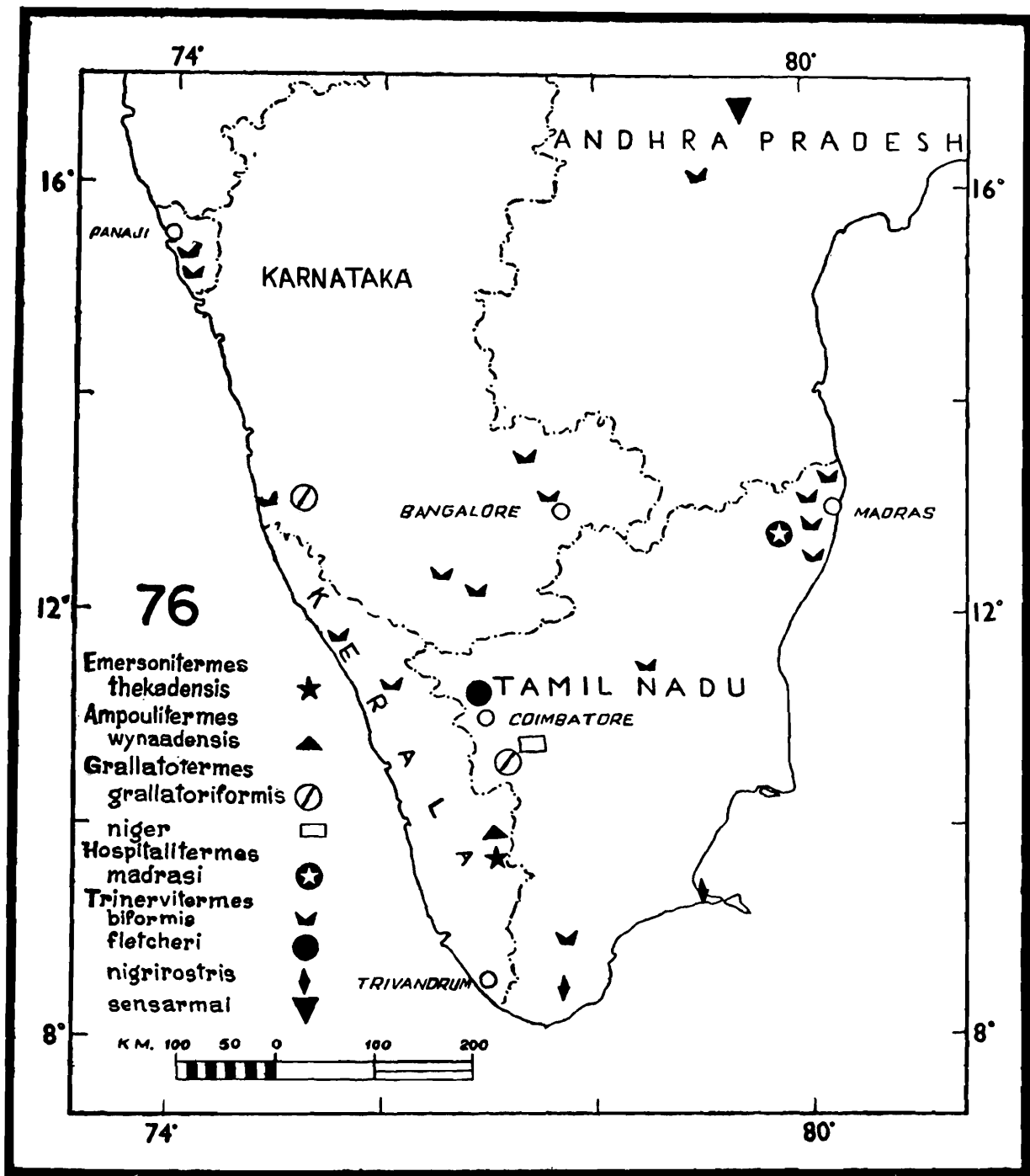


Fig. 76. Map of southern India showing distribution of species of genera *Emersonitermes*, *Ampoulitermes*, *Grallatotermes*, *Hospitalitermes* and *Trinervitermes* (Termitidae : Nasutitermitinae).

India ; *Hospitalitermes* one out of seven species known from the Indian subregion, *Trinervitermes* four out of six species, and *Emersonitermes*, *Alstonitermes*, *Ceylonitermes* and *Ampoulitermes*, one species each.

Key to the Genera

(i) *Imago* :

- 1(20) Posterior margin of 2nd marginal tooth of right mandible straight
- 2(9) Left mandible with a deep cut between 1st and 2nd marginal teeth; labrum longer than wide and with sclerotized transverse band in middle
- 3(4) Right mandible with a small but distinct subsidiary tooth at base of anterior margin of 1st marginal tooth; large forms ... *Macrotermes*
- 4(3) Right mandible without subsidiary tooth; size never very large
- 5(6) Postclypeus much paler than rest of head; antennae with 15-18 segments; smaller species with comparatively long wings ... *Microtermes*
- 6(5) Postclypeus not much paler than rest of head; antennae with 19-20 segments; larger species with comparatively shorter wings
- 7(8) Fontanelle raised; left mandible with a deep cut between 2nd marginal tooth and molar plate ... *Odontotermes*
- 8(7) Fontanelle not raised; left mandible with a shallow cut between 2nd marginal tooth and molar plate ... *Hypotermes*
- 9(2) Left mandible without a deep cut between 1st and 2nd marginal teeth; labrum as long as or shorter than wide and without sclerotized transverse band in middle
- 10(13) Tibial spur arrangement 3 : 2 : 2
- 11(12) Head subsquarish, sides subparallel in front of eyes; left apical tooth as long as 1st marginal ... *Microcerotermes*
- 12(11) Head subcircular, sides convex in front of eyes; left apical tooth longer than 1st marginal ... *Eremotermes*
- 13(10) Tibial spur arrangement 2 : 2 : 2
- 14(15) Apical tooth of left mandible very much reduced ... *Hospitalitermes*
- 15(14) Apical tooth of left mandible well developed
- 16(17) Postclypeus appreciably swollen, only slightly shorter than to nearly half of its width ... *Trinervitermes*
- 17(16) Postclypeus weakly swollen, much shorter than half of its width

- 18(19) Postclypeus much paler than frons ; smaller species, size with wings rarely more than 15.00 mm ; left apical tooth slightly shorter than 1st marginal ... *Nasutitermes*
- 19(18) Postclypeus slightly paler than frons ; larger species, size with wings generally more than 16.00 mm ; left apical tooth distinctly shorter than 1st marginal ... *Grallatitermes*
- 20(1) Posterior margin of 2nd marginal tooth of right mandible incurved
- 21(24) Mandibles subrectangular, posterior margin of 1st left marginal very long and that of 1st right marginal much longer than its anterior margin
- 22(23) Left mandible with angle between apical and 1st marginal obtuse ; smaller species ... *Eurytermes/*
Euhamitermes
- 23(22) Left mandible with angle between apical and 1st marginal fairly acute ; larger species ... *Speculitermes*
- 24(21) Mandibles subsquarish, posterior margin of 1st left marginal comparatively shorter and that of 1st right marginal shorter to slightly longer than its anterior margin
- 25(32) 2nd left marginal large, prominent
- 26(27) Fontanelle large and oval (short diameter 0.05-0.10 mm) ... *Pericapritermes*
- 27(26) Fontanelle usually long, narrow, slit-like or conical (short diameter less than 0.05 mm)
- 28 (29) 2nd right marginal greatly reduced ; left marginals close to each other ... *Angulitermes*
- 29(28) 2nd right marginal fairly prominent ; left marginals widely separated
- 30(31) Posterior margin of 1st right marginal tooth short ; body moderately hairy ... *Homallotermes*
- 31(30) Posterior margin of 1st right marginal tooth long ; body densely hairy ... *Dicuspiditermes*
- 32(25) 2nd left marginal tooth reduced
- 33(34) Postclypeus swollen, length about half of width ; 3rd left marginal much reduced ... *Labiocapritermes*
- 34(33) Postclypeus not swollen, length much less than half of width ; 3rd left marginal weakly to fairly reduced *Procapritermes*

(ii) *Soldier* :

- 1(30) Head not nasutiform ; mandibles large, well developed
- 2(19) Mandibles symmetrical, curved inwards at tips
- 3(4) Dimorphic ; size very large ; labrum with a hyaline tip ... *Macrotermes*
- 4(3) Monomorphic ; size moderate ; labrum without hyaline tip
- 5(10) Postmentum broad ; arched convexically in middle
- 6(9) Mandibles robust ; moderately to fairly large species
- 7(8) Left mandible with a prominent tooth on inner margin ... *Odontotermes*
- 8(7) Left mandible with crenulations on basal part of inner margin ... *Hypotermes*
- 9(6) Mandibles thin and delicate ; small and delicate species ... *Microtermes*
- 10(5) Postmentum narrow, not arched in middle
- 11(12) Inner margin of mandibles serrated ... *Microcerotermes*
- 12(11) Inner margin of mandibles not serrated ; both or left mandible with a prominent tooth
- 13(14) Head with a frontal projection ; mandibles long, slender, weakly to appreciably incurved near about middle on outer margin and slightly incurved apically ... *Eremotermes*
- 14(13) Head without frontal projection ; mandibles thick, stout, weakly incurved near base on outer margin and strongly incurved apically
- 15(16) Head rectangular with sides convex, only a little longer than broad ; mandibles incurved to a long thin tip ... *Speculitermes*
- 16(15) Head rectangular with sides nearly straight, much longer than broad ; mandibles incurved to a thickly pointed tip
- 17(18) Mandibles very broad basally ... *Euhamitermes*
- 18(17) Mandibles comparatively much less broad basally ... *Eurytermes*
- 19(2) Mandibles asymmetrical, twisted
- 20(21) Mandibles slightly asymmetrical, long, slender and rod-like, flattened apically at inner margins ... *Angulitermes*

- 21(20) Mandibles distinctly asymmetrical, right mandible straight, blade like, left weakly to strongly twisted
- 22(23) Antero-lateral corners of head produced into tubercle-like projections in front of and below antennal sockets ... *Dicuspiditermes*
- 23(22) Antero-lateral corners of head not produced into projections
- 24(25) Labrum greatly swollen and enlarged ... *Labiocapritermes*
- 25(24) Labrum not swollen and enlarged
- 26(27) Labrum with anterior margin substraight or faintly convex, with very short antero-lateral points ... *Pericapritermes*
- 27(26) Labrum with anterior margin concave, with very long antero-lateral points
- 28(29) Mandibles thin, left slender and moderately bent in middle ; antennæ with 13 segments ... *Homallotermes*
- 29(28) Mandibles thick, left faintly to deeply bent in middle ; antennæ with 14 segments ... *Procapritermes*
- 30(1) Head nasutiform ; mandibles small, degenerate
- 31(32) Dimorphic ... *Trinervitermes*
- 32(31) Monomorphic
- 33(40) Mandibles without or with small, lateral, spine-like processes ; antennae short ; nasute comparatively long
- 34(35) Nasute very long and slender ; mandibles without any lateral spine-like processes ; head delicate, round, bulb-like ... *Emersonitermes*
- 35(34) Nasute comparatively short, cylindrical or conical ; mandibles without or with short lateral spine like processes ; head round or pear shaped or ampular
- 36(37) Head slender, ampula shaped ; mandibles with blunt apical processes ... *Ampoulitermes*
- 37(36) Head round or pear shaped, mandibles with or without a small spine
- 38(39) Head large ; mandibles with or without spines ... *Nasutitermes*
- 39(38) Head small ; mandibles with no spines or processes ... *Alstonitermes*
- 40(33) Mandibles with a well-developed long, lateral spine-like process ; antennae fairly long ; nasute short
- 41(42) Head not constricted behind antennae ; nasus short and broad ... *Grallatotermes*

- 42(41) Head strongly constricted behind antennae ;
nasus short but slender
- 43(44) Larger species ; head-length including rostrum 1.75—2.00 ; rostrum length 0.65 ;
head-width 1.20—1.32 ... *Hospitalitermes*
- 44(43) Smaller species ; head-length including rostrum 1.15—1.23 ; rostrum length 0.37—0.43 ;
head-width 0.53—0.60 ... *Ceylonitermes*

Subfamily APICOTERMITINAE

Genus *Eurytermes* Wasmann

1902. *Eurytermes* Wasmann, *Zool. Jb.*, 17 : 124.
1949. *Eurytermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 102.
1966. *Eurytermes* ; Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 31 : 82-88.

Type-species : *Eurytermes assmuthi* Wasmann.

The genus *Eurytermes* is endemic to Indian subregion and of the six species two are reported from southern India.

Key to Species

Soldier :

- 1(2) Head divergent anteriorly ; mandibles strongly incurved at apices ; tooth on left mandible sharp and prominent *buddha* Bose and Maiti
- 2(1) Head almost parallel sided ; mandibles weakly incurved apically ; tooth on left mandible obtuse and short *topslipensis* (Chatterjee and Thapa)

26. *Eurytermes buddha* Bose and Maiti

(Fig. 77)

1966. *Eurytermes buddha* Bose and Maiti, *Proc. zool. Soc.*, 19 : 115-119. S. and W. Type-locality : Coimbatore, Tamil Nadu.

Material : Holotype soldier, morphotype worker, and paratype soldier and paramorphotype workers in 3 vials, coimbatore, Tamil Nadu, coll. P.C. Dhar (D6/28.9.60), 28.ix.1960, ex. 'ground at base of a tree'. A paratype soldier and two paramorphotype workers, in a vial, Dharwar, Karnataka, coll. P. C. Dhar (D12/12.9.60), 12.ix.1960, 'under cowdung',

Measurements :

<i>Soldier :</i>	Range (3 exs.)
1. Total body length <i>c</i>	... 4.90—6.10
2. Length of head to base of mandibles	... 1.70—2.00
3. Max. width of head	... 1.03—1.18
4. Length of left mandible	... 0.70—0.85
5. Max. width of pronotum	... 0.63—0.72

Distribution : INDIA : Southern India : Tamil Nadu Coimbatore ; Karnataka : Dharwar.

Biology : *Eurytermes buddha* makes narrow galleries in soil. At Coimbatore it has been collected from such galleries near the base of a tree and at Dharwar from under dry cowdung. In the latter place, species of the genera *Speculitermes*, *Dicuspiditermes* and *Odontotermes* were also found making galleries very close to those of this species.

27. *Eurytermes topslipensis* (Chatterjee and Thapa)

(Fig. 78)

1963. *Beesonitermes topslipensis* Chatterjee and Thapa, *J. Timber Dry. Preser. Assoc. India*, 9 : 21-26. S., W. Type-locality : Mount Stuart, Top Slip, Coimbatore District, Tamil Nadu.
1966. *Eurytermes topslipensis* ; Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 31 : 111-112. S. and W.

Material : A vial with 2 paramorphotype workers, Mount Stuart, Top Slip, Coimbatore District, Tamil Nadu, coll. R. N. Mathur, 16.i.1961, 'in soil'.

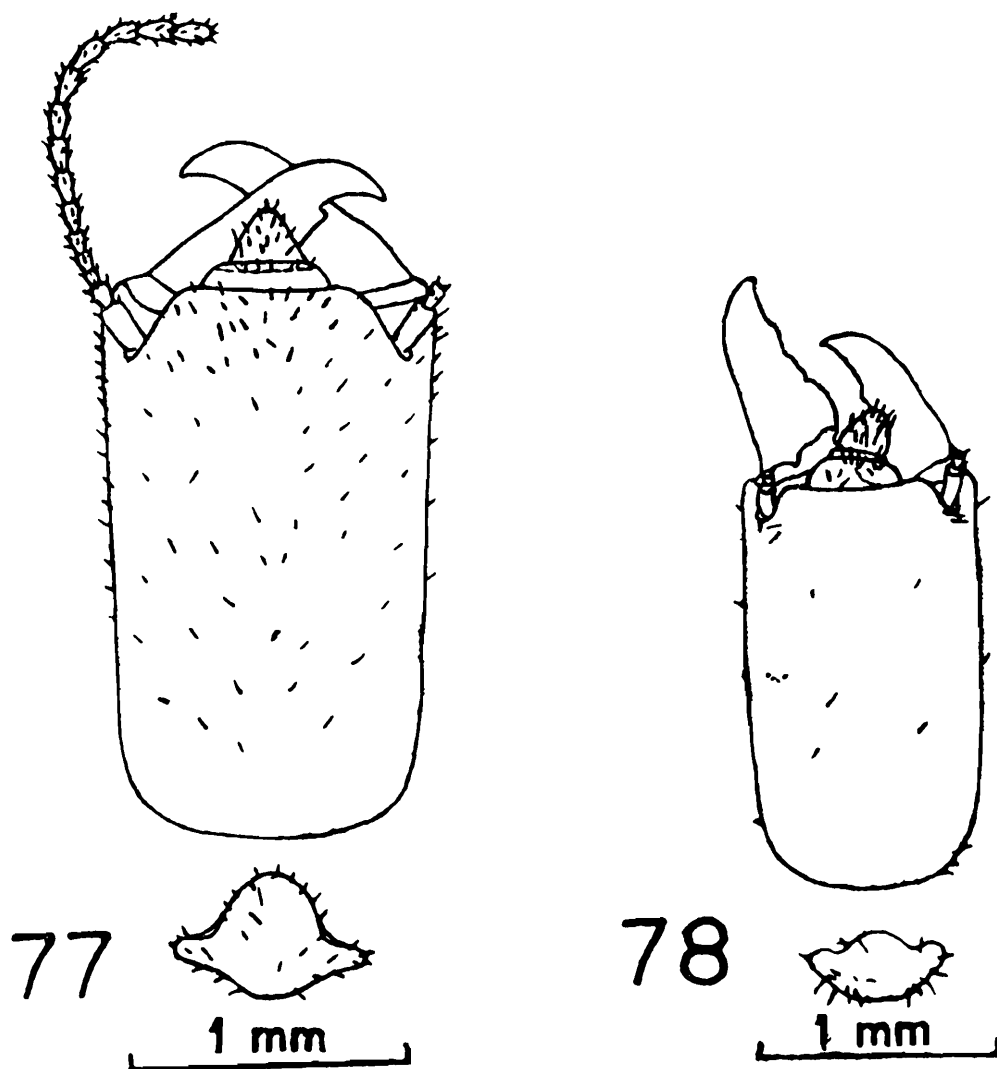
Measurements :

Soldier : (From Chatterjee & Thapa, 1963) :

	Holotype
1. Total body-length <i>c</i>	... 4.07
2. Length of head to base of mandibles	... 1.82
3. Max. width of head	... 1.05
4. Length of left mandible	... 0.87
5. Max. width of pronotum	... 0.65

Distribution : INDIA : Southern India : Tamil Nadu : Mount Stuart, Top Slip, Coimbatore District (type-locality).

Biology : This species has been collected from soil at Mount Stuart, Top Slip.



Figs. 77—78. Head and pronotum of soldiers of :

Fig. 77. *Eurytermes buddha* Bose & Maiti.

Fig. 78. *Eurytermes topslipensis* (Chatterjee & Thapa).

Genus *Speculitermes* Wasmann

1902. *Speculitermes* Wasmann, *Zool. Jb.*, 17 : 161.

1949. *Speculitermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 110.

Type-species : *Speculitermes cyclops* Wasmann.

Of the ten Indian species five are known from southern India. One is known by the imago, soldier and worker castes, three (one new one) by imago and worker and one by worker only.

Key to Species

Imago :

1(2) Mid-dorsal spot minute, rounded

... *sinhalensis* Roonwal
and Sen-Sarma

- 2(1) Mid-dorsal spot large, shape variable
- 3(4) Head larger (head-width including eyes 1.63-1.67 mm); mid-dorsal spot smaller, 0.09-0.13 mm in diameter and irregularly shaped ... *goesswaldi* Roonwal and Chhotani
- 4(3) Head smaller (head-width including eyes 1.40-1.50 mm); mid-dorsal spot larger, 0.17-0.20 mm in diameter and round in shape
- 5(6) Darker species; head blackish brown and larger (width with eyes 1.50 mm); mid-dorsal spot slightly paler than head, 0.17 mm in diameter ... *dharwarensis* Roonwal and Chhotani
- 6(5) Paler species; head brownish and smaller (width with eyes 1.39-1.43 mm); mid-dorsal spot almost whitish, 0.17-0.20 mm in diameter ... *emersoni* sp. n.

28. *Speculitermes deccanensis* Roonwal and Chhotani

(Fig. 79)

1962. *Speculitermes deccanensis deccanensis* Roonwal and Chhotani, *Zool. Anz.*, 168 : 57-61. W. Type-locality : Bababudin Hills, Karnataka.

Material : Holotype and paratype (3) workers, in two vials, Bababudin Hills, Karnataka, coll. T. B. Fletcher.

Measurements :

<i>Worker</i> :	(Range 4 exs.)
1. Total body-length <i>c</i>	... 5.00—5.50
2. Length of head to base of mandibles	... 1.10—1.13
3. Max. width of head	... 1.20—1.25
4. Diameter of mid-dorsal spot	... 0.13
5. Max. width of pronotum	... 0.66

Distribution : INDIA : Southern India : Karnataka : Bababudin Hills.

Biology : The collection from which this species is described is evidently the same as No. (5) described by Holmgren and Holmgren (1917, p. 165) as *Anoplotermes (Speculitermes) cyclops* Wasmann. Collection report reads 'In galleries and chambers in the ground, mostly eight to twelve inches below surface. Many young found, mostly in one large chamber, but no queen could be found'.

29. *Speculitermes dharwarensis* Roonwal and Chhotani

(Fig. 80)

1964. *Speculitermes dharwarensis* Roonwal and Chhotani, *Indian J. Agric. Sci.*, 84 : 120-125. Im. and W. Type-locality : Dharwar, Karnataka.

Material : (i) Holotype imago and morphotype and paramorphotype workers in 3 separate vials, Dharwar, Karnataka, coll. O. B. Chhotani (01/8.11.62), 8.xi.1962, from galleries in soil ; (ii) Three vials with workers only, Dharwar, coll. O. B. Chhotani thus : 012/5.11.62,

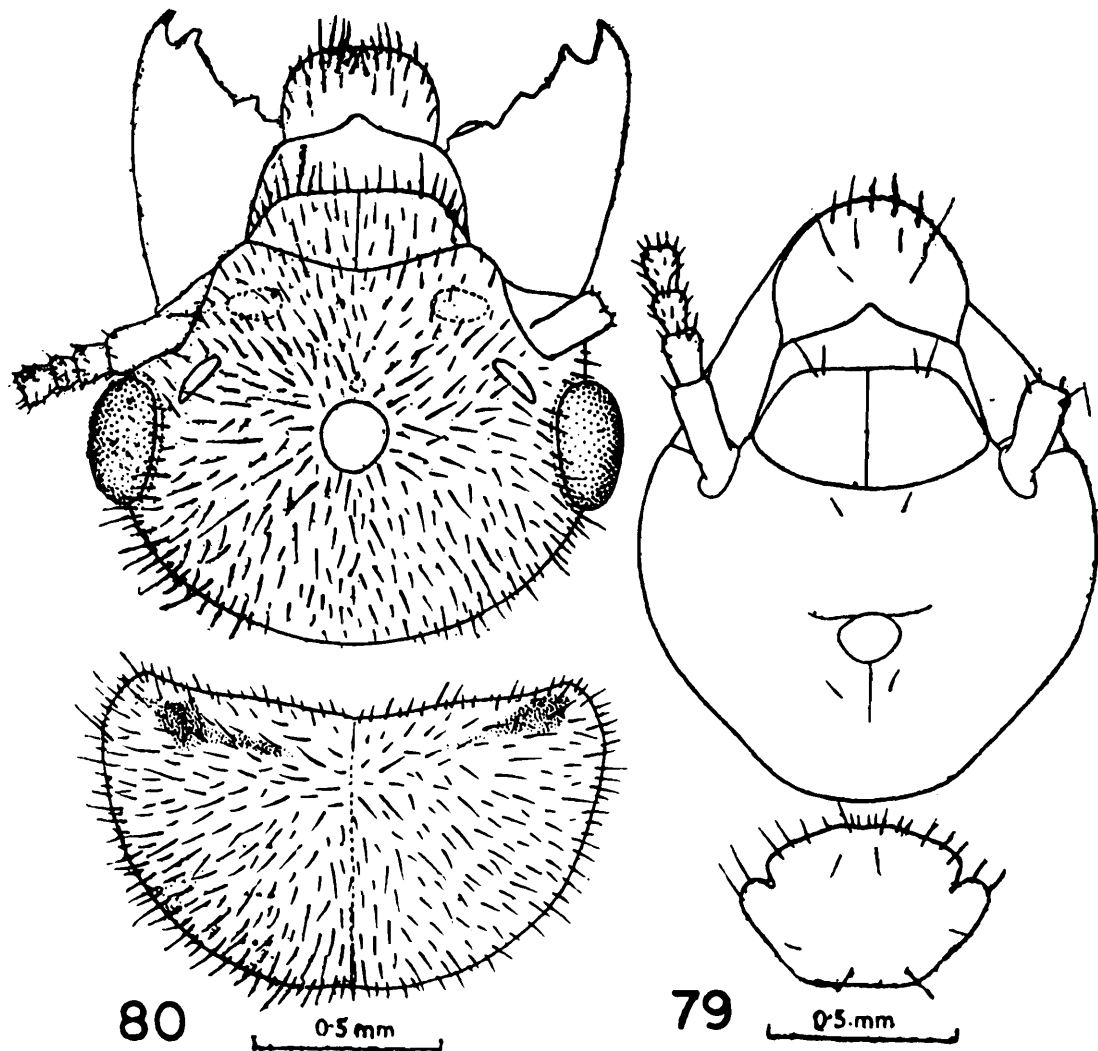


Fig. 79. Head and pronotum of worker (Holotype) of *Speculitermes deccanensis deccanensis* Roonwal & Chhotani.

Fig. 80. Head and pronotum of imago (Holotype) of *Speculitermes dharwarensis* Roonwal & Chhotani.

“from under cowdung and in soil” ; 01/6.11.62, ex. ‘soil, collecting granular soil in the form of small conical heaps of 4-5 cm in height’ ; 012/9.11.62, from soil ; (iii) one vial with workers only, Dharwar, coll. P. C. Dhar (D16/10.9.60), under stone.

Measurements :

(i) <i>Imago</i> :	Holotype
1. Total body-length without wings <i>c</i>	... 7.33
2. Length of head to base of mandibles	... 1.17
3. Max. width of head (with eyes)	... 1.50
4. Max. diameter of mid-dorsal spot	... 0.17
5. Max. diameter of eye	... 0.39
6. Max. diameter of ocellus	... 0.17
7. Min. eye-ocellus distance	... 0.07
8. Max. width of pronotum	... 1.40
(ii) <i>Worker</i> :	Range (5 exs.)
1. Total body-length <i>c</i>	... 4.00—5.40
2. Length of head to base of mandibles	... 0.90—1.00
3. Max. width of head	... 1.10—1.20
4. Diameter of mid-dorsal spot	... 0.11—0.13
5. Max. width of pronotum	... 0.60—0.70

Distribution : INDIA : Southern India : Karnataka : Dharwar (type-locality).

Biology : *Speculitermes dharwarensis* has been reported to have been collected from soil, under cowdung and under stones. It is also found throwing out granular soil in the form of small conical heaps of 4-5 cm in height. Its nests are found close to the nests of *Speculitermes sinhalensis*, *S. goesswaldi* and *Discuspiditermes fletcheri* and it has been collected along with these species.

30. *Speculitermes emersoni* sp. n.

(Figs. 81-82 ; Table 7)

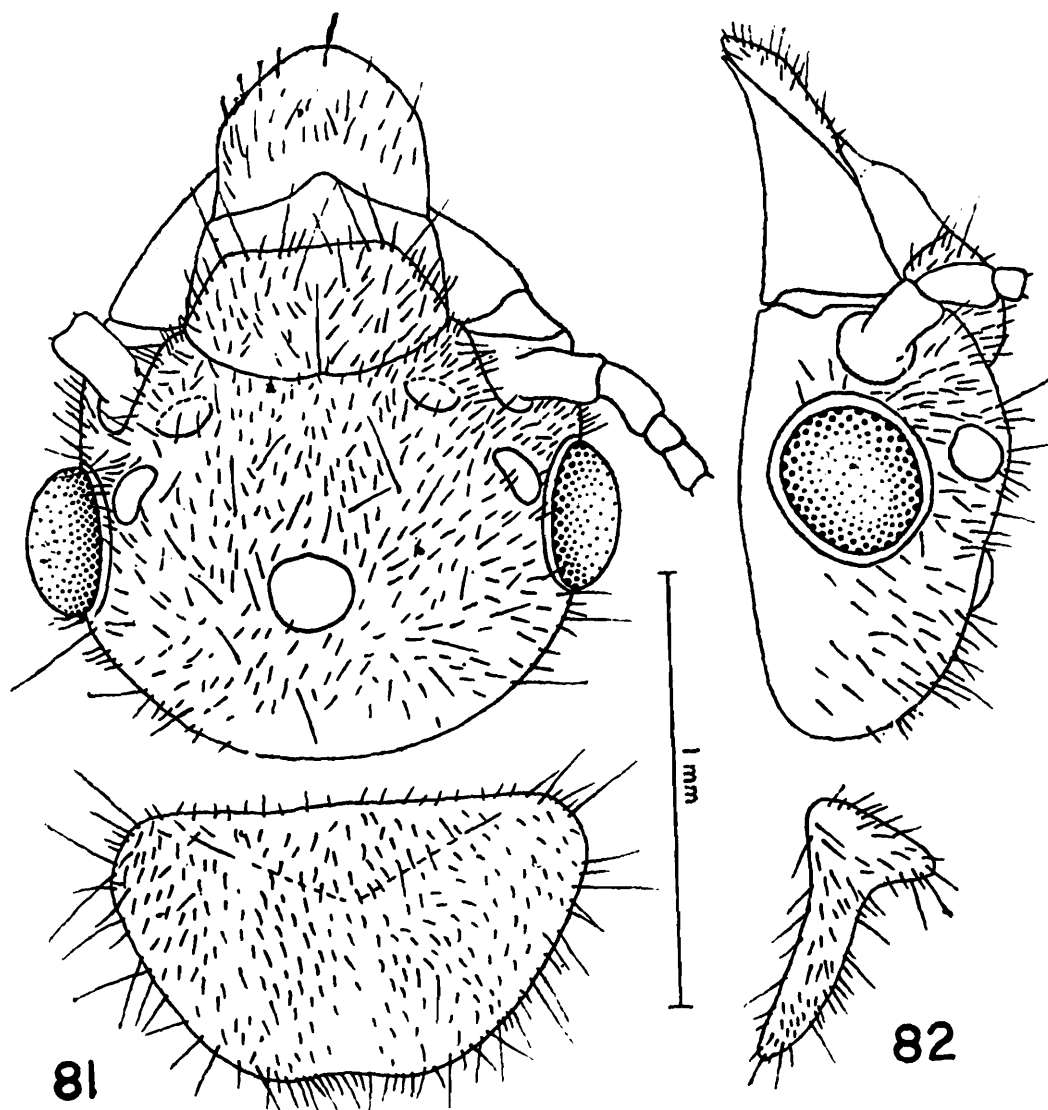
Material : A vial with Im. and W., Thekkadi, Kerala state, coll. A. E. Emerson, 21.x.1960.

Description : 1. IMAGO (Figs. 81-82 ; Table 7) :

General : Head capsule reddish brown ; fontanelle plate or mid-dorsal spot much paler than head ; postclypeus, pronotum and abdominal tergites pale brown ; mandibles yellowish brown, teeth darker ; antennae, legs and abdominal sternites pale golden brown ; wing veins dark chestnut brown, membrane hyaline. Head and body densely pilose. Total length with wings 15.0, without wings 8.0—8.4 mm.

Head : Head-capsule subcircular, with eyes broader than long.

Fontanelle : Fontanelle plate or mid-dorsal spot large, subcircular and raised. *Antennae* : 15-segmented ; segment 3 shortest ; 4 equal to or a little shorter than 2, 3 slightly shorter than 4 ; rest gradually increasing in



Figs. 81—82. *Speculitermes emersoni* sp. n. Imago.

Fig. 81. Head and pronotum, in dorsal view.

Fig. 82. Ditto, in side view.

length. *Eyes* : Subcircular, situated equidistantly from ocellus and lower margin of head. *Ocelli* : Oval, convexical, lying close to eyes ; eye-ocellus distance less than short diameter of ocellus. *Mandibles* : Typically of *Speculitermes*-type.

Thorax : *Pronotum* : Flat ; with an irregular, T-shaped, pale mark on dorsum ; anterior margin straight, weakly raised ; sides converging strongly to a shorter and centrally emarginate posterior margin. *Legs* : Thin and long ; apical tibial spurs 3 : 2 : 2, outer spur on foretibia very small.

Table 7. Measurements of *Speculitermes emersoni* sp.n.

CASTE—Imago

Body parts	Range (5 exs.)	Holotype
1. Total body-length with wings <i>c</i>	15.00 (1 ex.)	15.00
2. Total body-length without wings <i>c</i>	8.00—8.40	8.40
3. Length of head to base of mandibles	0.98—1.05	1.03
4. Length of head to postclypeus	1.10—1.22	1.15
5. Max. width of head with eyes	1.39—1.43	1.39
6. Max. height of head	0.54—0.62	0.58
7. Length of postclypeus	0.34—0.35	0.34
8. Width of postclypeus	0.64—0.68	0.64
9. Length of fontanelle	0.17—0.19	0.19
10. Width of fontanelle	0.17—0.20	0.20
11. Max. diameter of compound eye	0.34—0.35	0.35
12. Distance of eye from lower margin of head	0.07—0.09	0.08
13. Length of ocellus	0.18	0.18
14. Width of ocellus	0.11—0.17	0.15
15. Min. eye-ocellus distance	0.09—0.11	0.09
16. Max. length of pronotum	0.62—0.68	0.63
17. Max. width of pronotum	1.05—1.18	1.10
18. Length of hindtibia	1.70—1.78	1.70
19. Length of forewing with scale	13.10—14.70	13.10
20. Length of forewing scale	0.75—0.80	0.75
21. Length of hindwing with scale	11.40—12.00	11.40
22. Length of hindwing scale	0.53	0.53

Wings : Wing-membrane hyaline with pale brownish tint and covered with small hairs. *Forewing* : Longer than hindwing ; costa and subcosta fused, greatly thickened, running along wing-margin and fringed with a row of fine short hairs ; radius short, fusing with costa-subcosta just outside the scale ; radial sector thick and chitinized, running parallel to costa-subcosta all along wing-length ; media weakly chitinized, emerging as independent vein from scale and giving off 2 to 3 branches near distal end ; cubitus faintly chitinised, giving off 11 to 12 branches to posterior margin. *Hindwing* : Shorter than forewing, costa-subcosta, radius, radial sector and cubitus as in forewing ; media arising from radial sector outside wing scale, otherwise as in forewing.

Abdomen : Elongate ; cerci 2-jointed.

2. SOLDIER : Unknown.

3. WORKER :

General: Head-capsule pale reddish brown; mid-dorsal spot much paler than head; antennæ and postclypeus pale yellowish; pronotum and abdomen pale brown. Head and body sparsely pilose with long, fine, straight hairs.

Head: Head-capsule subcircular, slightly broader than long. *Fontanelle*: Fontanelle plate or mid-dorsal spot large, rounded, raised. *Antennae*: 15-segmented; segment 3 shortest; 4 much shorter than 2; rest gradually increasing in length. *Clypeus*: Postclypeus swollen, about half as long as wide. *Mandibles*: Typically of *Speculitermes*-type.

Thorax: *Pronotum*: Saddle-shaped; anterior margin with a deep notch at the middle; posterior margin shallowly semicircular. *Legs*: Thin and long; apical tibial spurs 2 : 2 : 2; 3rd or outer spur on fore-tibia indistinct.

Measurements :

	(Range 4 exs.)
1. Total body length <i>c</i>	... 4.80—6.04
2. Length of head to base of mandibles	... 0.94—1.09
3. Max. width of head	... 1.16—1.29
4. Length of postclypeus	... 0.26—0.28
5. Width of postclypeus	... 0.56—0.60
6. Diameter of mid-dorsal spot	... 0.13—0.17
7. Max. length of pronotum	... 0.32—0.43
8. Max. width of pronotum	... 0.64—0.69

Type-specimens: Holotype: Im., in A.M.N.H., New York. Paratype (Im.) and *paramorphotype* (W.): in A.M.N.H., New York and in National Zoological Collections, Z.S.I., Calcutta.

Distribution: INDIA: Southern India: Thekkadi, Kerala (type-locality).

Comparison: The imago of *S. emersoni* is close to that of *S. dharwarensis* Roonwal and Chhotani but can be distinguished by its paler and smaller head and paler mid-dorsal spot (as dark as head in *dharwarensis*). The worker of *emersoni* is slenderer, paler and has wider postclypeus in relation to its length.

31. *Speculitermes goesswaldi* Roonwal and Chhotani

(Fig. 83)

1964. *Speculitermes goesswaldi* Roonwal and Chhotani, *Indian J. agric. Sci.*, 34: 126-130. Im. and W. Type-locality: Dharwar.

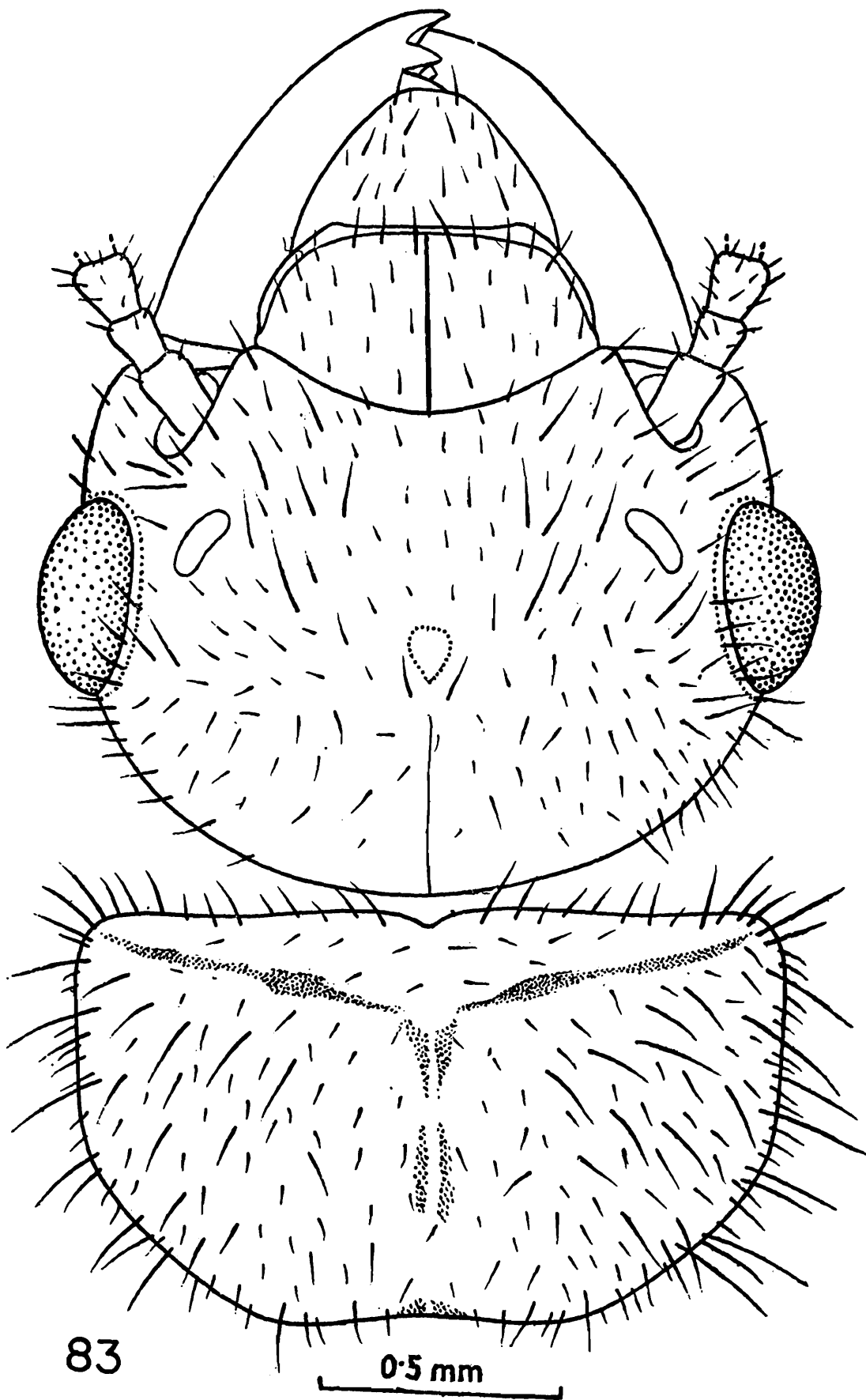


Fig. 83. Head and pronotum of imago of *Speculitermes goesswaldi*
Roonwal & Chhotani

Material : (i) Holotype imago (dealate), morphotype worker and paratype imago and paramorphotype workers, in 3 vials, Dharwar, Karnataka, coll. O. B. Chhotani (016/8.11.1962), 8.xi.1962, ex. 'soil, making galleries'. (ii) A vial with a paratype imago and 5 paramorphotype workers, Dharwar, coll. O. B. Chhotani (012/9.11.62), 9.xi.1962, ex. 'galleries in soil'.

Measurements :

(i) <i>Imago</i> :	Range (3 exs.)
1. Total body-length without wings <i>c</i>	... 8.00—9.50
2. Length of head to base of mandibles	... 1.15—1.20
3. Max. width of head (with eyes)	... 1.63—1.67
4. Max. diameter of mid-dorsal spot	... 0.09—0.19
5. Max. diameter of eye	... 0.40—0.43
6. Max. diameter of ocellus	... 0.13—0.17
7. Min. eye-ocellus distance	... 0.13—0.17
8. Max. width of pronotum	... 1.47—1.60
(ii) <i>Worker</i> :	Range (5 exs.)
1. Total body-length <i>c</i>	... 5.00—6.00
2. Length of head to base of mandibles	... 1.10—1.15
3. Max. width of head	... 1.35—1.40
4. Diameter of mid-dorsal spot	... 0.07—0.09
5. Max. width of pronotum	... 0.80—0.83

Distribution : INDIA : Southern India : Karnataka : Dharwar (type-locality).

Biology : This species has been collected from galleries in soil. Evidently its nests are underground. Dealate imagos have been seen in the nests in November ; the swarming of alates possibly is during September-October.

32. *Speculitermes sinhalensis* Roonwal and Sen-Sarma

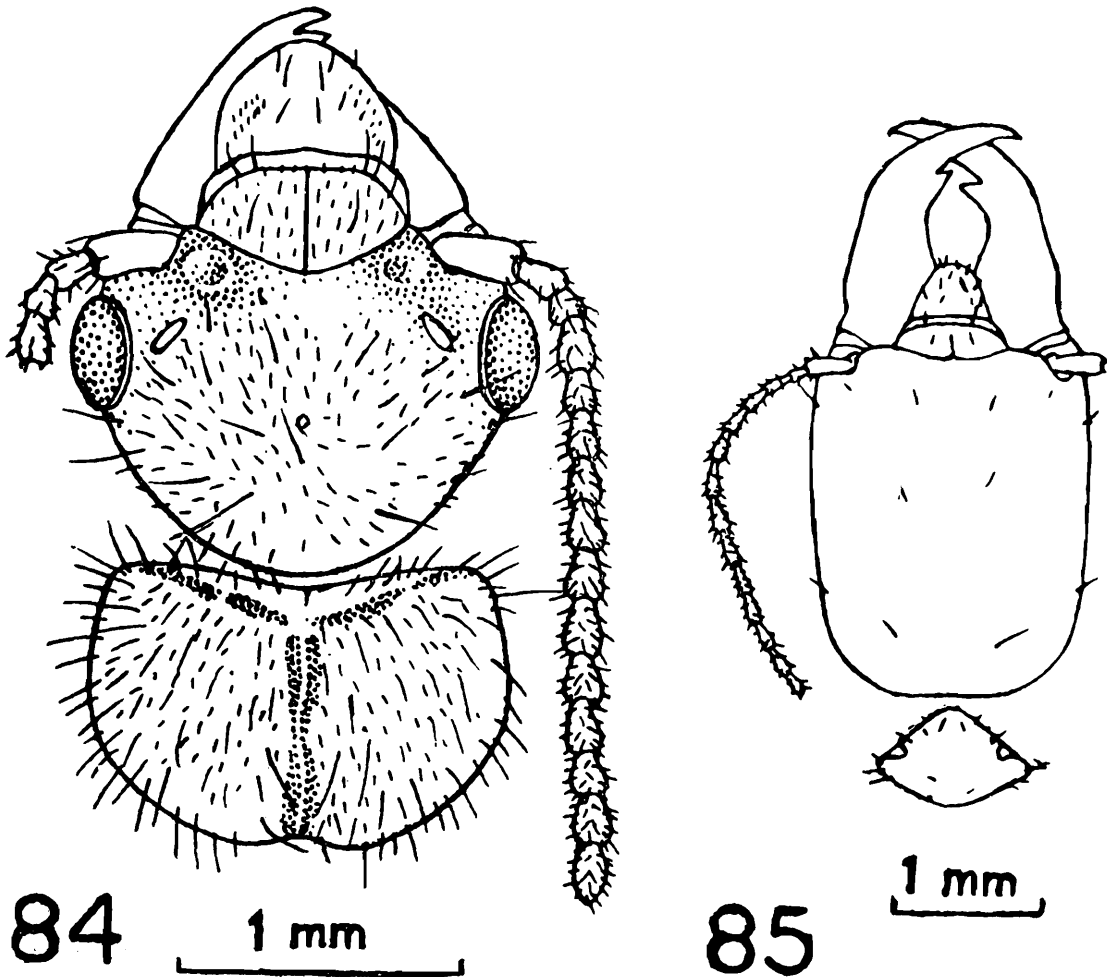
(Figs. 84-85)

1960. *Speculitermes cyclops sinhalensis* Roonwal and Sen-Sarma, *Contr. Syst. Orient. Termites* (Ent. Monogr. 1, I.C.A.R.) : 23-26.

1966. *Speculitermes sinhalensis*; Roonwal and Chhotani, *Biol. Zbl.*, 85 : 186-201.

Material : From Karnataka and Tamil Nadu states, as follows :—
Lot. 1—Dharwar, Karnataka, thus : Two vials with Im., S. and W., coll.

J. C. Uttangi, 12.iv.1959, "coming out of holes in ground", and 18.iii.1960 ; seven vials with S. and W., coll. P. C. Dhar, September, 1960 ; a vial with a Q., a dealate male and W., coll. O. B. Chhotani, 9.xi.1962 ; and several vials with W. only, coll. P. C. Dhar, September, 1960 and O. B. Chhotani, November, 1962.



Figs. 84 and 85. *Speculitermes sinhalensis* Roonwal & Sen-Sarma

Fig. 84. Head and pronotum of imago, in dorsal view.

Fig. 85. Ditto, soldier (Redrawn from Roonwal & Chhotani, 1966c)

Lot 2. Coimbatore, Tamil Nadu, thus : A vial with Im., S. and W., coll. P. Susai Nathan, 11.iv.1960, from black cotton soil ; a vial with S. and W., coll. O. B. Chhotani, 26.xi.1962, from galleries in earth ; and several vials with W. only, coll. P. C. Dhar, September, 1960, and O. B. Chhotani, November, 1962.

Measurements :

		Range (5 exs.)
(i) <i>Imago :</i>		
1. Total body-length with wings <i>c</i>	...	15.00—16.50
2. Total body-length without wings <i>c</i>	...	7.50—9.40
3. Length of head to base of mandibles	...	1.10—1.20
4. Max. width of head	...	1.43—1.63
5. Max. diameter of eye	...	0.37—0.40
6. Max. diameter of ocellus	...	0.17
7. Min. eye-ocellus distance	...	0.09—0.11
8. Max. width of pronotum	...	1.30—1.40
9. Length of forewing	...	13.50—14.50
10. Length of hindwing	...	12.50—13.10
(ii) <i>Soldier :</i>		Range (5 exs.)
1. Total body-length <i>c</i>	...	7.00—8.00
2. Length of head to base of mandibles	...	2.40—2.60
3. Max. width of head	...	1.85—1.93
4. Length of left mandible	...	1.47—1.50
5. Width of pronotum	...	0.95—1.00
(iii) <i>Worker :</i>		Range (5 exs.)
1. Total body-length <i>c</i>	...	5.50—6.00
2. Length of head to base of mandibles	...	1.10—1.15
3. Max. width of head	...	1.30—1.40
4. Diameter of mid-dorsal spot	...	0.07—0.08
5. Max. width of pronotum	...	0.77—0.83

Distribution : INDIA : Southern India : Tamil Nadu : Chitteri, Coimbatore, Shevaroy Hills, Yercaud ; Karnataka : Anekad Forest Range, Bellahunisi, Chickmagalur, Dandeeli, Dharwar, Kamalapuram, Tallagatpura. Elsewhere : Madhya Pradesh (Kanha National Park) and Vavuniya, Sri Lanka, which is the type locality.

Biology : *Speculitermes sinhalensis* occurs in tropical and sub-tropical regions of peninsular India and Sri Lanka. It lives in narrow, subterranean galleries (2-5 mm in diameter) which run up to a depth of 50 cm below the ground level. The galleries have hollow pouches along their course and at the end. There is no discrete nest and the nymphs, young-ones and the dealate queen are found together in galleries in the soil. The soldiers are very rare. Swarming has been recorded during March and April.

Genus *Euhamitermes* Holmgren

1913. *Hamitermes* (*Euhamitermes*) Holmgren, *K. Sv. Vet. Akad. Handl.*, 48 (4) : 38, 89.

1949. *Euhamitermes*; Snyder, *Smiths. misc. Coll.*, 112 : 112.

Type species : *Euhamitermes hamatus* Holmgren.

Only three species of the genus are known from southern India.

Key to Species

Soldier :

- | | | |
|--|-----|---|
| 1(2) Larger species. Head-length to base of mandibles 1.90, head-width 1.14 mm | ... | <i>indicus</i> Holmgren & Holmgren |
| 2(1) Smaller species : Head-length to base of mandibles 1.50-1.75 mm | | |
| 3(4) Head-length to base of mandibles 1.50-1.60 ; head-width 1.07-1.20 mm | ... | <i>karnatakensis</i> Roonwal & Chhotani |
| 4(3) Head-length to base of mandibles 1.75 ; head-width 1.30 | ... | <i>dentatus</i> Thakur & Chatterjee |

33. *Euhamitermes dentatus* Thakur & Chatterjee

(Fig. 86)

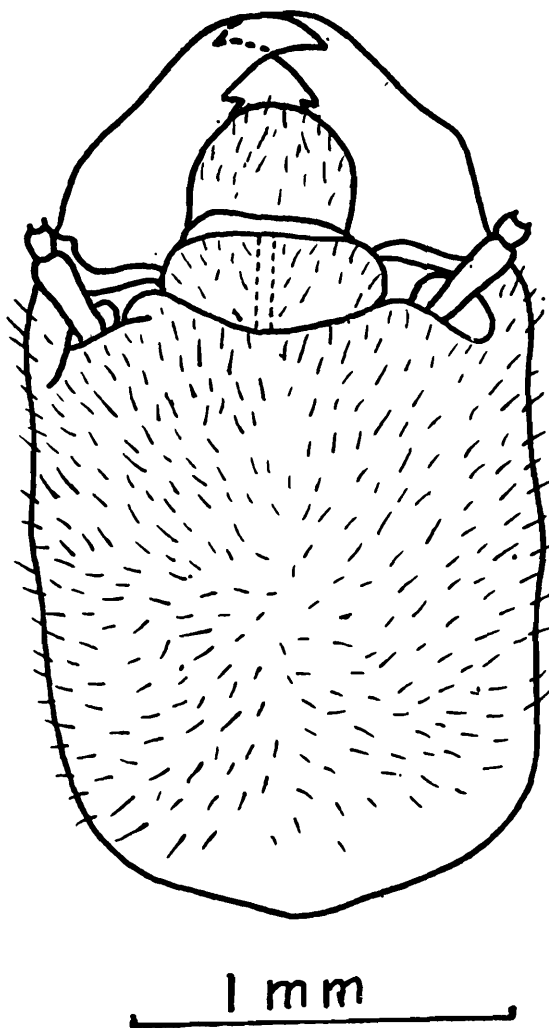
1974. *Euhamitermes dentatus* Thakur and Chatterjee, *J. Indian Acad. Wood. Sci.*, 5(2) : 72-75, Figs. 1(S) & 2(W). S. and W. Type-locality : Satpalli, Compartment No. 266, Lankapalli Block, Annapradipalli Range, Khammam Division, Andhra Pradesh.

Material : (i) One soldier (Holotype) and one W. (morphotype), Satpalli, Lankapalli Block, Annapradipalli Range, Khammam Division, Andhra Pradesh, coll. P. N. Chatterjee, 2.x.'64, in F.R.I., collections, Dehra Dun and (ii) Two paratype (paramorphotype) W. (locality as above), in Z.S.I. collections.

Measurements :

<i>Soldier</i> (From Thakur & Chatterjee, 1974)	Holotype
1. Total body-length <i>c</i>	5.35
2. Length of head to base of mandibles	1.75
3. Max. width of head	1.30
4. Length of left mandible	0.88
5. Max. width of pronotum	0.70

Distribution : INDIA : Southern India : Andhra Pradesh :
Satpalli, Annapradipalli Range, Khammam Division.



86

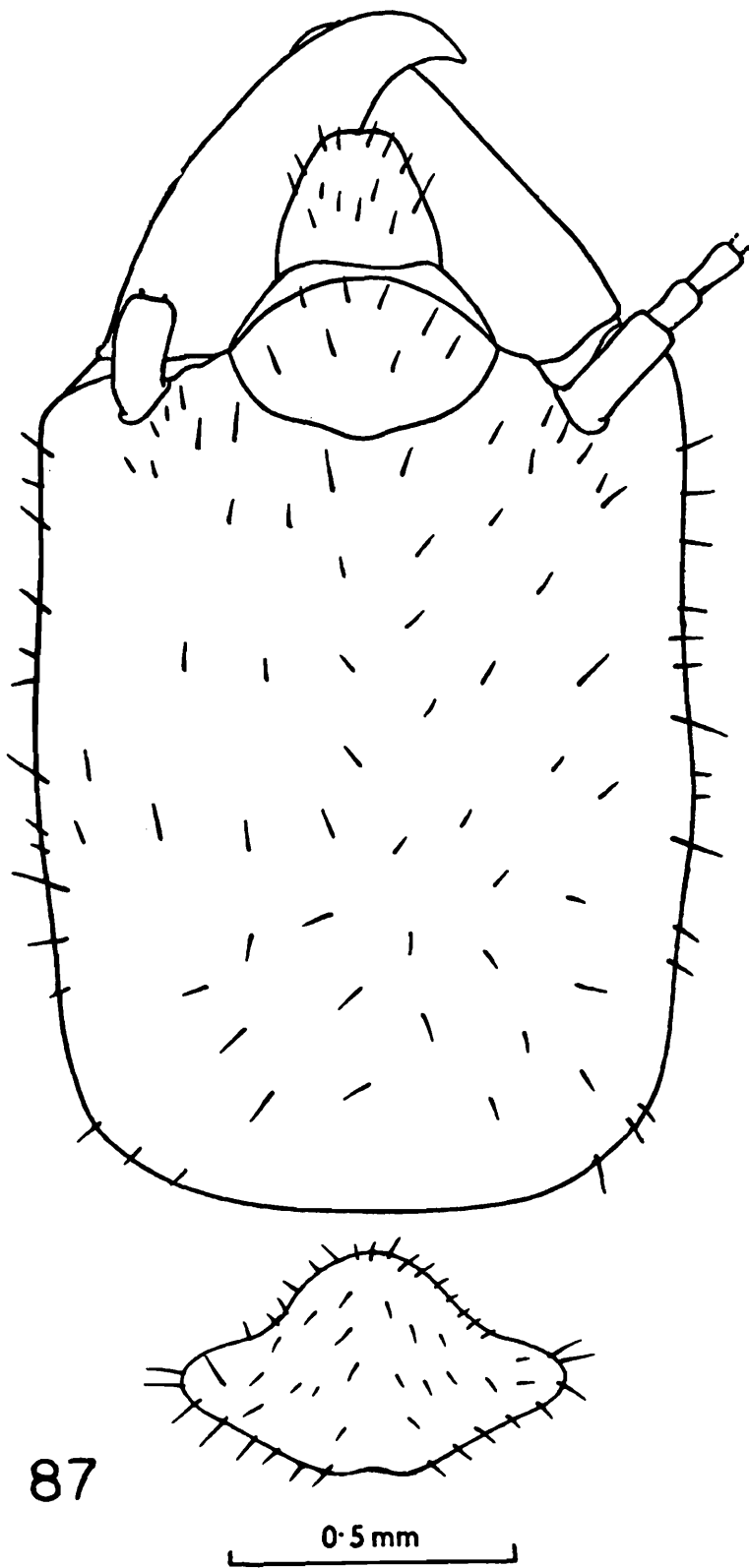
Fig. 86. Head of soldier of *Euhamitermes dentatus* Thakur and Chatterjee

34. *Euhamitermes indicus* Holmgren and Holmgren

1917. *Hamitermes (Euhamitermes) indicus* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 : 165-166. S. and W. Type-locality : Shevaroy Hills, Tamil Nadu.

1949. *Euhamitermes indicus* ; Snyder, *Smiths. misc. Coll.*, 112 : 112.

Material : No material of this species was available for the present study. Therefore, the original measurements of Holmgren and Holmgren (1917) are reproduced below :—



87
Fig. 87. Head and pronotum of soldier (Holotype) of *Euhamitermes karnatakensis* Roonwal & Chhotani

*Measurement :**Soldier :*

“Length of body	...	5.0—5.50
Head with jaws	...	2.51
Head without jaws	...	1.90
Breadth of head	...	1.14
Breadth of pronotum	...	0.71”

Distribution : INDIA : Southern India : Shevaroy Hills, Tamil Nadu.

Biology : It was collected from ‘under a stone amongst dead leaves’ (Holmgren and Holmgren, 1917).

35. *Euhamitermes karnatakensis* Roonwal and Chhotani

(Fig. 87)

1965. *Euhamitermes karnatakensis* Roonwal and Chhotani, *Proc. Zool. Soc.*, 18 : 16-19. S. and W. Type-locality : Dharwar, Karnataka.

Material : Holotype soldier, morphotype worker and paratype soldiers and paramorphotype workers, open ground opposite Karnataka University, Dharwar, Karnataka, coll. O. B. Chhotani, 6. xi. 1962 (017d/6.11.62), ex. ‘mound of an *Odontotermes* sp.’

*Measurements :**Soldier :*

		Range (5 exs.)
1. Total body-length c	...	4.50—5.00
2. Length of head to base of mandibles	...	1.50—1.60
3. Max. width of head	...	1.10—1.20
4. Length of left mandible	...	0.67—0.70
5. Max. width of pronotum	...	0.60—0.67

Distribution : INDIA : Southern India : Karnataka : Dharwar (type-locality).

Biology : This species has been collected from the walls of a mound of *Odontotermes redemanni* (Wasmann), which was completely covered with wild plants. The nest is in the form of an intricate system of long, narrow galleries which are not lined with any coloured matter.

Subfamily TERMITINAE

Genus *Eremotermes* Silvestri

1911. *Eremotermes* Silvestri, *Boll. Lab. Zool. Gen. Agrar. Portici*, 6 : 108.

1949. *Eremotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 131.

1960. *Eremotermes* ; Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (I. C. A. R. Entom. Monogr. 1) : 46-53.

Type-species : *Eremotermes indicatus* Silvestri

Only three species of the genus are reported from southern India.

Key to Species

(i) *Imago* :

The imago caste of only two species is known.

- 1(2) Head-width including eyes
0.83-0.90 mm ; maximum
width of pronotum 0.73-0.80
mm ; larger species ... *fletcheri* Holmgren and Holmgren
- 2(1) Head-width including eyes
0.70-0.80 mm ; maximum
width of pronotum 0.60-0.70
mm ; smaller species ... *paradoxalis* Holmgren

(ii) *Soldier* :

- 1(2) Mandibles almost straight,
outer margin faintly incurved ... *madrasicus* Roonwal and Sen-Sarma
- 2(1) Mandibles curved, outer
margin appreciably incurved
- 3(4) Head-width 0.80-0.85 mm ;
pronotum width 0.50-0.58
mm ; frontal protuberance
weak ; mandibles equal to or
slightly longer than head ;
larger species ... *fletcheri* Holmgren and Holmgren
- 4(3) Head-width 0.68-0.75 mm ;
pronotum width 0.40-0.45
mm ; frontal protuberance
weak to well developed ;
mandibles generally shorter
than head ; smaller species ... *paradoxalis* Holmgren

36. *Eremotermes fletcheri* Holmgren and Holmgren

(Figs. 88-89)

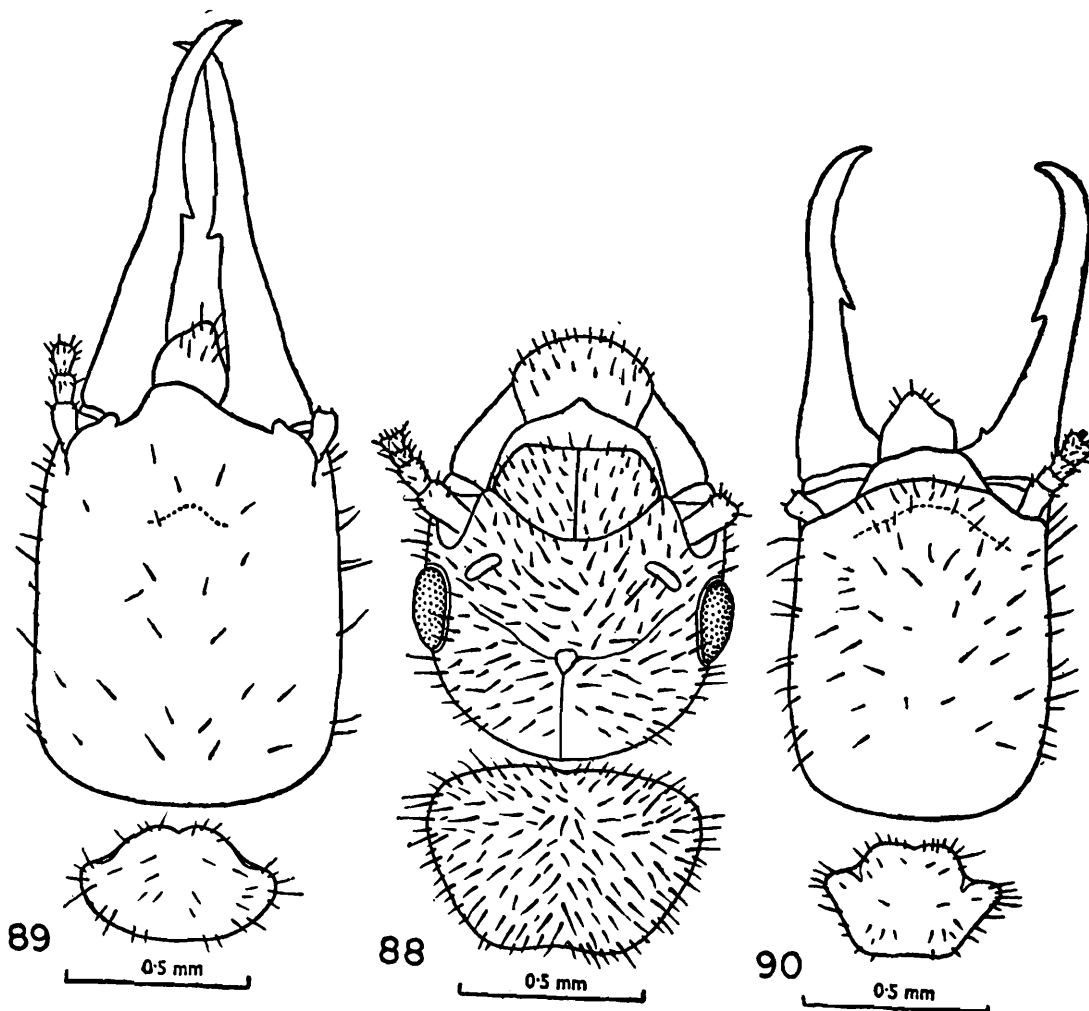
1917. *Eremotermes fletcheri* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5(3) : 167-168. Im., S. and W. Type locality : Coimbatore (Tamil Nadu).
1949. *Eremotermes fletcheri* ; Snyder, *Smith. misc. Coll.*, 112 : 131.
1960. *Eremotermes fletcheri* ; Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (I. C. A. R. Entom., Monogr. 1) : 63-64. Im., S. and W.

Material : Im., S. and W. (maj. and min.), syntypes, in 4 separate vials coll. T. B. Fletcher, 12. v. 1912, Coimbatore (Tamil Nadu), imagos collected while flying in sunshine at 12-30 P. M. and issuing from nest.

Also 2 vials with S. and W. Coimbatore, coll. ?, 6. x. 1912 and ? i. 1914, det. N. Holmgren.

Measurements :

(i) <i>Imago :</i>	Range (3 exs.)
1. Total body-length with wings <i>c</i> ...	8.00—8.40
2. Total body-length without wings <i>c</i> ...	6.00—6.20
3. Length of head to base of mandibles ...	0.78—0.80
4. Max. width of head with eyes ...	0.83—0.85
5. Max. diameter of eye ...	0.20—0.23
6. Max. diameter of ocellus ...	0.08—0.10
7. Max. length of pronotum ...	0.48—0.53
8. Max. width of pronotum ...	0.73—0.80
9. Length of forewing with scale ...	6.40—6.70
10. Length of hindwing with scale ...	5.80—6.00



Figs. 88—90. *Eremoterme fletcheri* Holmgren & Holmgren and *E. madrasicus* Roonwal and Sen-Sarma.

Fig. 88. Head and pronotum, in dorsal view, of imago of *E. fletcheri*.

Fig. 89. Ditto, soldier (Paralectotype).

Fig. 90. Head and pronotum, in dorsal view, of soldier (Paratype) of *E. madrasicus*.

(ii) <i>Soldier</i> :		Range (3 exs.)
1. Total body-length <i>c</i>	...	4.90—5.80
2. Length of head to base of mandibles	...	0.95—1.08
3. Max. width of head	...	0.83—0.85
4. Max. length of pronotum	...	0.23—0.25
5. Max. width of pronotum	...	0.53—0.58

Distribution : INDIA : Southern India : Coimbatore (Tamil Nadu), type locality. Elsewhere : PAKISTAN : Duki (Baluchistan).

Biology : At Coimbatore, this species has been collected while coming out from holes in the ground. The alates were collected at about noon time flying in the sunshine.

37. *Eremotermes madrasicus* Roonwal and Sen-Sarma

(Fig. 90)

1960. *Eremotermes madrasicus* Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (I. C. A. R. Entom. Monogr. 1) : 75-79. S., W. (Maj. and min.). Type-locality : Villivakkam (10 miles North of Madras city, Tamil Nadu).

Material : 2 vials with paratype S. and paramorphotype W. Villivakkam, about 10 miles N. of Madras (Tamil Nadu), coll. M. L. Roonwal, 9. ii. 1955.

Measurements :

<i>Soldier</i> :		Range (2 exs.)
1. Total body-length <i>c</i>	...	3.30—3.50
2. Length of head to base of mandibles	...	0.93
3. Max. width of head	...	0.78
4. Max. length of pronotum	...	0.23—0.26
5. Max. width of pronotum	...	0.45—0.50

Distribution : INDIA : Southern India : Villivakkam (10 miles N. of Madras city, Tamil Nadu).

Biology : The nest of this species is under the surface of ground.

38. *Eremotermes paradoxalis* Holmgren

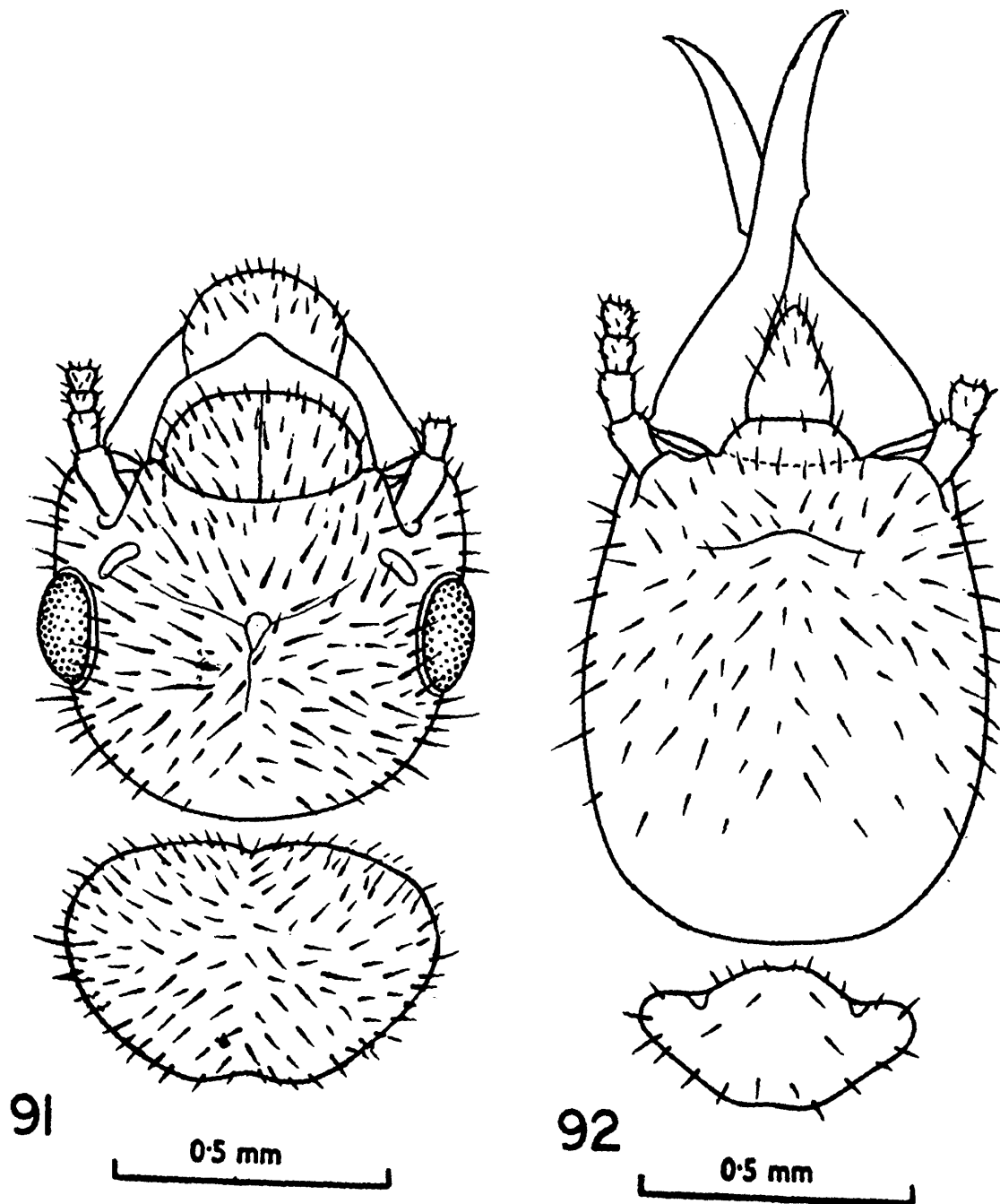
(Figs. 91-92)

1912. *Eremotermes paradoxalis* Holmgren, *K. Sv. Vet. Akad. Handl.*, 48(4) : 95, No description.
1913. *Eremotermes paradoxalis* Holmgren, *J. Bombay nat. Hist. Soc.*, 22(1) : 115-116. S. and W. Type-locality : Bangalore, Karnataka.

1949. *Eremotermes paradoxalis*; Snyder, *Smiths. misc. Coll.*, 112 : 132.

1960. *Eremotermes paradoxalis*; Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (I. C. A. R. Entom. Monogr. 1) : 83-92, Im., S. and W. (maj. and min.).

Material : (i) A vial with five Im., one S., three W., Coimbatore, Tamil Nadu, Coll. T. B. Fletcher, May, 1912, det. N. Holmgren.
(ii) A vial with one W., cotype, Bangalore, Karnataka.



Figs 91 and 92. *Eremotermes paradoxalis* Holmgren

Fig. 91. Head and pronotum of imago, in dorsal view.

Fig. 92. Ditto, soldier.

Measurements :

(i) <i>Imago :</i>		Range (3 exs.)
1. Total body-length with wings <i>c</i>	...	8.00—9.20
2. Total body-length without wings <i>c</i>	...	5.40—5.50
3. Length of head to base of mandibles	...	0.68—0.70
4. Max. width of head with eyes	...	0.75—0.78
5. Max. diameter of eye	...	0.20—0.21
6. Max. diameter of ocellus	...	0.10—0.11
7. Max. length of pronotum	...	0.41—0.43
8. Max. width of pronotum	...	0.65—0.70
9. Length of forewing with scale	...	6.50—8.00
10. Length of hindwing with scale	...	6.00—7.00
(ii) <i>Soldier :</i>		Range (1 ex.)
1. Total body length <i>c</i>	...	3.90
2. Length of head to base of mandibles	...	0.95
3. Max. width of head	...	0.75
4. Max. length of pronotum	...	0.20
5. Max. width of pronotum	...	0.45

Distribution : INDIA : Southern India : Karnataka : Bangalore (type-locality) ; Tamil Nadu : Coimbatore. Elsewhere : India : Bihar (Pusa), Madhya Pradesh (Hoshangabad), Delhi, Panjab (Hoshiarpur), and Rajasthan (Kotah). PAKISTAN : N. W. F. P. (Abbottabad, Kohat), Sind (Dadu, Ketri) and Punjab (Lahore, Lyallpur, Sialkot).

Biology : The nest of *Eremotermes paradoxalis* is found underground. The species has also been recorded nesting in the mounds of *Odontotermes wallonensis* (Wasmann) at Bangalore. Swarming occurs in the evening between 5.30 and 6.00 P. M. during the months of March-July and in November. At Pusa, it has been recorded swarming from small holes in the ground.

GENUS *MICROCEROTERMES* Silvestri

1901. *Microcerotermes* Silvestri, *Bull. Mus. Zool. Anat. Comp. Torino*, 16 (389) : 3.
1949. *Microcerotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 132.
1967. *Microcerotermes* ; Prashad, Thapa and Sen-Sarma, *Indian For. Bull. (N. S.)*, No. 246 : 2-7.

Type-species : *Microcerotermes strunckii* (Sorensen).

This genus is known by four (including one new) species from southern India.

Key to Species

(i) *Imago* :

Imagos of only two species are known.

- | | | |
|--|-----|---|
| 1(2) Eyes oval ; epicranial suture prominent | ... | <i>cameroni</i> Snyder |
| 2(1) Eyes round ; epicranial suture indistinct | ... | <i>fletcheri</i> Holmgren
and Holmgren |

(ii) *Soldier* :

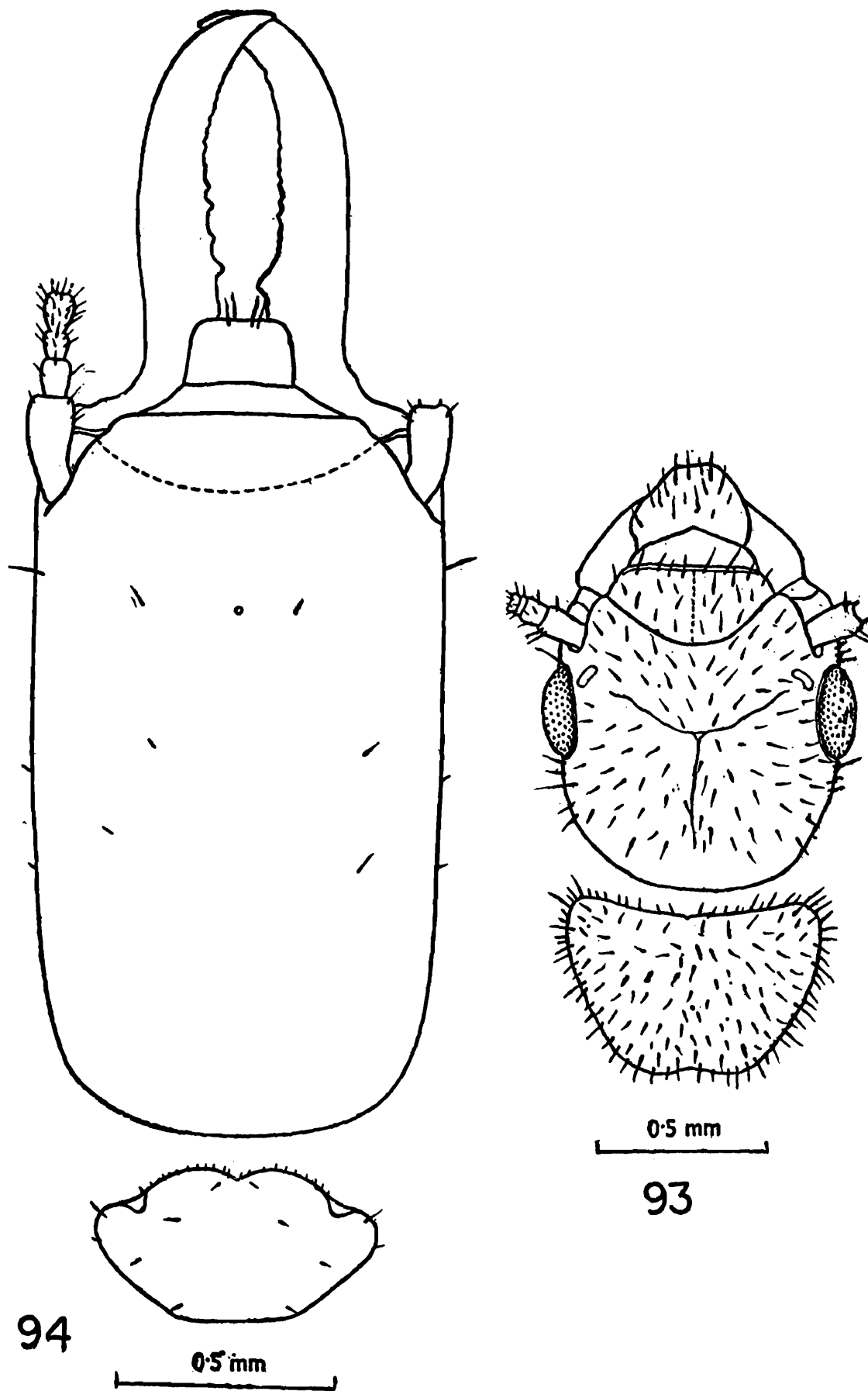
- | | | |
|---|-----|---|
| 1(4) Head-length to base of mandibles
1.12-1.23 mm ; smaller species | | |
| 2(3) Head pale golden brown with the
sides slightly diverging anteriorly ;
mandibles slender and more incurved
at tips | ... | <i>ganeshi</i> sp. n. |
| 3(2) Head dark brown with the sides
straight ; mandibles stouter, less
incurved at tips | ... | <i>minor</i> Holmgren |
| 4(1) Head-length to base of mandibles 1.37-
1.65 mm ; larger species | | |
| 5(6) Head sides weakly diverging in front ;
mandibles shorter, thicker and less
incurved at tips | ... | <i>fletcheri</i> Holmgren
and Holmgren |
| 6(5) Head sides subparallel ; mandibles
larger, thinner and more incurved at
tips | ... | <i>cameroni</i> Snyder |

39. *Microcerotermes cameroni* Snyder

(Figs. 93-94)

1934. *Microcerotermes cameroni* Snyder, *Indian For. Rec.*, 29(11) : 21-22. Im. and S. Type locality : North Vellore.
1949. *Microcerotermes cameroni* ; Snyder, *Smiths. misc. Coll.*, 112 : 135.
1967. *Microcerotermes cameroni* ; Prashad, Thapa and Sen-Sarma, *Indian For. Bull. (N.S.)*, No. 246 : 5, 7, 27-31.

Material : A vial (Z. S. I. No. 4071/H8) with a comorphotype (= paratype) S., North Vellore, Tamil Nadu, May 1912.



Figs. 93 and 94. *Microcerotermes cameroni* Snyder

Fig. 93. Head and pronotum of imago, in dorsal view (redrawn from Prashad, Thapa & Sen-Sarma, 1967).

Fig. 94. Ditto, soldier (Comorphotype).

Measurements :

(i) Imago (measurements from literature) :		
1. Total body-length with wings c	...	— —
2. Total body-length without wings c	...	4.72—5.70
3. Length of head to base of mandibles	...	0.85—0.90
4. Max. width of head with eyes	...	0.85—0.90
5. Max. diameter of compound eye	...	0.22—0.25
6. Max. diameter of lateral ocellus	...	0.07—0.10
7. Min. eye-ocellus distance	...	0.04—0.07
8. Max. width of pronotum	...	0.67—0.72
9. Length of forewing without scale	...	7.00—7.90
10. Length of hindwing without scale	...	6.70
(ii) <i>Soldier</i> (Paratype)		
1. Total body-length c	...	damaged
2. Length of head to base of mandibles	...	1.63
3. Max. width of head	...	0.95
4. Length of left mandible	...	0.95
5. Max. width of pronotum	...	0.58

Distribution : INDIA : Southern India : Tamil Nadu, North Vellore. Kerala : Cochin. Elsewhere : Andhra Pradesh : Waltair.

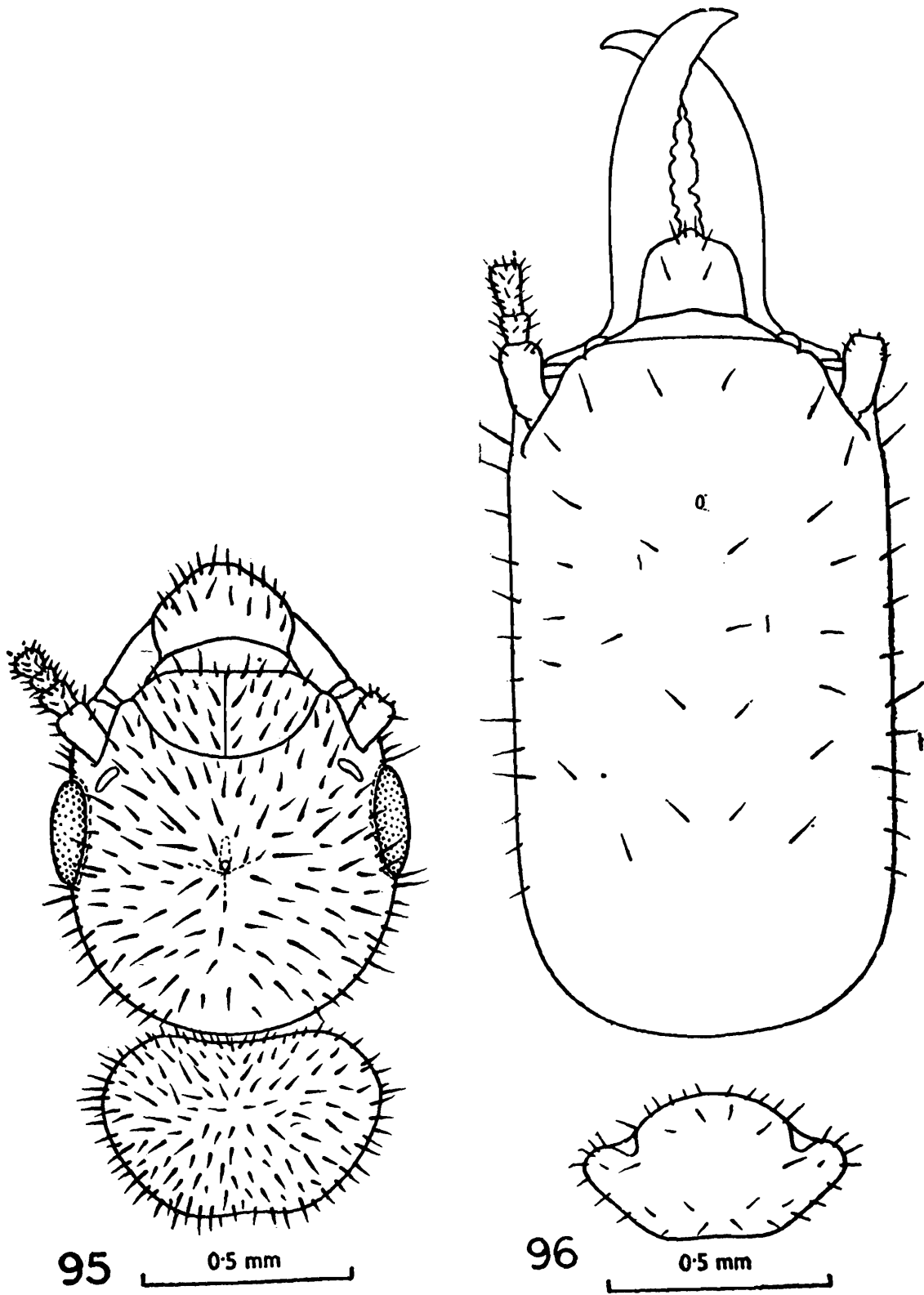
Biology : Nothing is known of the biology of this species.

40. *Microcerotermes fletcheri* Holmgren and Holmgren

(Figs. 95-96 ; Table 8)

1917. *Microcerotermes fletcheri* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 : 170. S. and W. (major and minor). Type-locality : Bababudin Hills, Karnataka.
1949. *Microcerotermes fletcheri* ; Snyder, *Smiths. misc. Coll.*, 112 : 139.
1967. *Microcerotermes fletcheri* ; Prashad, Thapa and Sen-Sarma, *Indian For. Bull. (N.S.)*, No. 246, : 40-42.

Material : From Karnataka, Tamil Nadu and Kerala states as follows : Lot 1. Four vials with S. and W., coll. M. L. Roonwal, February, 1955, thus : R6/11.2.55, Top Slip, Tamil Nadu, ex. woody nest half buried in soil ; R3/15.2.55, Nilambur, Kerala, ex. dried *Terminalia tomentosa* lying on ground ; R8/24.2.55, Makut, Coorg, Karnataka, ex. wood carton nest ; and R5/26.2.55, Ditto, ex. carton nest at base of *Anacardium occidentale*,



Figs. 95 and 96. *Microcerotermes fletcheri* Holmgren & Holmgren

Fig. 95. Head and pronotum of imago in dorsal view.

Fig. 96. Ditto, soldier.

Lot 2. Ten vials with S. and W. (one with king and queen also) coll. O. B. Chhotani, November, 1962 and February, 1969, thus : 01, 03 and 06/23.11.62 (3 vials) Kadri Hill, Mangalore, Karnataka, ex. nest at base of a cashew tree (1 vial) and dead stumps of *Casuarina* (2 vials) ; 01, 02, 03, 04, 07 and 08/24.11.62 (6 vials) Moolkie-Udipi Road, Karnataka, ex. nest at base of unknown tree, under stone, dead branch of tree, small carton nest, dead branch lying on ground and dead stump of palm tree, respectively, the last one with a queen and a king ; 03/16.2.69, Tudiyalur, near Coimbatore, Tamil Nadu, ex. coconut tree ; 01/27.11.62 and 014/18.2.69, Top Slip, Tamil Nadu, and 03/5.3.69, Panchakanam Reserve Forest, Periyar Lake area, Kerala, ex. dead stump of a palm.

Lot 3. Two vials with S. and W. thus : coll. I. Maligi, 22.ix.1961, Tambram, Madras, Tamil Nadu ; and coll. S. K. Patil, 17.ii.1965, Dharwar, Karnataka.

Description : IMAGO : The unknown imago (Fig. 95) of the species is described here for the first time from the queen and king collected from a nest.

General : Head capsule dark chestnut brown ; postclypeus slightly paler ; antennae, labrum and mandibles golden yellow, mandibular teeth

Table 8. Measurements of *Microcerotermes fletcheri* Holmgren and Holmgren
CASTE—Imago

Body parts	Q.	K
1. Total body-length without wings <i>c</i>	24.20	4.40
2. Length of head to base of mandibles	0.80	0.83
3. Max. width of head with eyes	0.83	0.85
4. Max. height of head	0.45	0.45
5. Max. length of labrum	0.15	0.20
6. Max. width of labrum	0.35	0.35
7. Max. diameter of eye	0.24	0.25
8. Min. diameter of eye	0.23	0.23
9. Max. diameter of lateral ocellus	0.10	0.13
10. Min. diameter of lateral ocellus	0.07	0.08
11. Min. eye-ocellus distance	0.05	0.06
12. Min. eye-antennal distance	0.05	0.05
13. Max. length of pronotum	0.40	0.41
14. Max. width of pronotum	0.65	0.70
15. Length of forewing scale	0.40	0.43
16. Length of hindwing scale	0.30	0.35

darker ; eyes blackish ; ocelli translucent ; anteclypeus hyaline ; thorax, wing-scales and abdominal tergites deep yellowish brown ; legs golden yellow. Head and body fairly hairy. Total length without wings 24.2 (Q.), 4.40 (K.) mm.

Head : Head-capsule subsquarish ; head-length subequal to head-width including eyes ; Y-suture faintish. *Fontanelle* : Small, circular. *Antennae* : With 14 segments ; segment 1 large, cylindrical ; 2 cylindrical, shorter than 1 ; 3 shortest ; rest gradually increasing in length ; last (14) ovate, club-shaped. *Eyes* : Subcircular, compound, one on either side. *Ocelli* : Oval, much longer than broad, situated at a distance of less than their short diameter from eyes. *Clypeus* : Divided into an ante- and a postclypeus. Postclypeus slightly swollen, divided into right and left halves by a median suture ; semicircularly differentiated from frons. Anteclypeus subtrapezoidal, with blunt, median, anterior margin. *Labrum* : Broadly tongue-shaped ; much broader than long. *Mandibles* : Of typical *Microcerotermes*-type.

Thorax : *Pronotum* : Strongly hairy, subtrapezoidal ; broader than long ; anterior margin slightly concave ; posterior margin weakly emarginate. *Fore-and hindwings* : Scales triangular, hairy. *Legs* : short, stout, with 3 : 2 : 2 apical tibial spurs ; tarsi 4-jointed.

Abdomen : Oblong, hairy ; cerci 2-jointed, 0.08 mm long.

Measurements :

(i) *Imago* : See table 8.

(ii) <i>Soldier</i> :		Range (15 exs.)
1. Total body-length <i>c</i>	...	4.10—4.50
2. Length of head to base of mandibles	...	1.60—1.68
3. Max. width of head	...	0.85—0.98
4. Max. length of pronotum	...	0.29—0.38
5. Max. width of pronotum	...	0.56—0.68

Distribution : INDIA : Southern India : Karnataka : Bababudin Hills, Makut (Coorg), Mangalore, Moolkie-Udipi Road. Tamil Nadu : Top Slip, Tudiyalur ; Kerala : Nilambur, Panchakanam Reserve Forest (Periyar Lake area). Elsewhere : Ranikhet (Uttar Pradesh).

Biology : This is a carton-nest building termite. The nest is of variable size from the size of a ball to a large foot ball. The nest is generally found in soil near the base of trees. It also nests in the woods left buried in soil and has been reported from dead branches of trees,

dead stumps of coconut palms and Casaurina and some unknown trees as well.

41. *Microcerotermes ganeshi* sp. n.

(Figs. 97—101 ; Table 9)

Material : A vial with 2 soldiers and several workers, Karambapatty Reserve Forest, Salem, Tamil Nadu, coll. O. B. Chhotani (No. 020a/11.2.69), 11. ii. 1969.

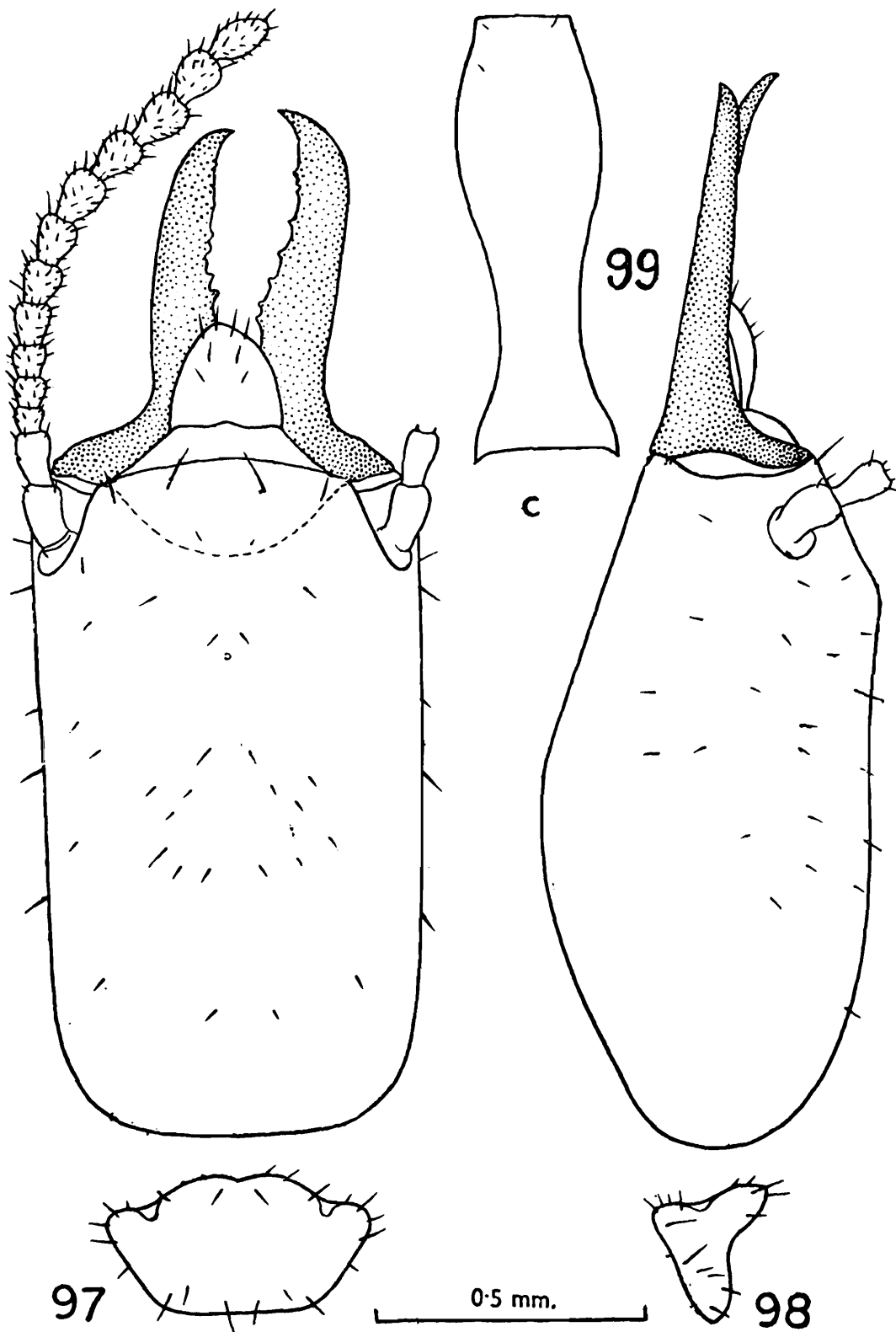
Description : 1. IMAGO : Unknown.
2. SOLDIER (Figs 97—99 ; Table 9).

General : Head-capsule golden yellow but anteriorly and at the bases of antennae, dark reddish brown ; antennae pale yellow, with first segment darker ; labrum dark golden brown ; mandibles and clypeus dark reddish brown ; thorax, legs and body creamy yellow. Head and body sparsely pilose. Total body-length 3.58—4.23 mm.

Head : Head-capsule subrectangular, longer than broad (head-length to base of mandibles 1.20—1.23 ; head-width 0.73—0.78 mm), weakly divergent anteriorly. *Fontanelle* : Small, circular, lying at about anterior one-fourth. *Eyes and ocelli* : Absent. *Antennae* : With 13 segments ; segment 1 large, cylindrical ; 2 shorter than 1 ; 3 shortest ; rest gradually increasing in length ; apical (13) ovate, club-shaped. *Clypeus* : Postclypeus indistinctly differentiated from frons, with a few hairs. Anteclypeus like a broad, hyaline, apilose strip. *Labrum* : Tongue-shaped, a little broader than long ; with a few hairs on anterior margin. *Mandibles* : Sabre-shaped, with prominent serrations running almost up to the tip. Left mandible with one large, pointed serration at about the middle and a number of smaller-ones above it. Right mandible with two somewhat larger serrations a little below the middle and a few smaller-ones above it. *Postmentum* : Club-shaped with waist lying below middle ; width at waist nearly half of maximum width.

Thorax : *Pronotum* : Saddle-shaped, with a few large and small hairs on margins and on surface ; broader than long and narrower than head-capsule. *Meso-and Metanota* : Semicircular ; sparsely pilose. *Legs* : Long, slender, pilose ; with 3 : 2 : 2 apical tibial spurs.

Abdomen : Oblong, pilose ; cerci 2-jointed, 0.05 mm long.



Figs. 97 to 99. *Microcerotermes ganeshi* sp. n., Soldier (Holotype).

Fig. 97. Head and pronotum, in dorsal view.

Fig. 98. Ditto, in side view.

Fig. 99. Postmentum, in ventral view.

Table 9. Measurements etc. of *Microcerotermes ganeshi* sp.n.

CASTE— Soldier

Body parts	Range (2 exs.)	Holotype
1. Total body-length <i>c</i>	3.58—4.23	3.58
2. Length of head to base of mandibles	1.20—1.23	1.20
3. Max. width of head	0.73—0.78	0.73
4. Max. height of head	0.55—0.58	0.55
5. Head index I (width/length)	0.60—0.63	0.60
6. Head index II (height/width)	0.74—0.75	0.75
7. Head Index III (height/length)	0.45—0.47	0.45
8. Max. length of labrum	0.15—0.18	0.18
9. Max. width of labrum	0.18—0.20	0.20
10. Length of mandibles (from upper base of condyle to tip) :		
(a) Left mandible	0.68—0.70	0.68
(b) Right mandible	0.69—0.70	0.69
11. Head-mandibular length Index (left mandible-length/head-length)	0.56—0.57	0.56
12. Min. median length of postmentum	0.70—0.80	0.70
13. Max. width of postmentum	0.28	0.28
14. Width of postmentum at waist	0.13—0.15	0.13
15. Max. length of pronotum	0.25—0.28	0.25
16. Max. width of pronotum	0.45—0.50	0.45
17. Pronotum-head Index (pronotum-width/head-width)	0.61—0.64	0.61
18. Pronotum Index (length/width)	0.55—0.56	0.55

3. WORKER MAJOR (Figs. 100—101) :

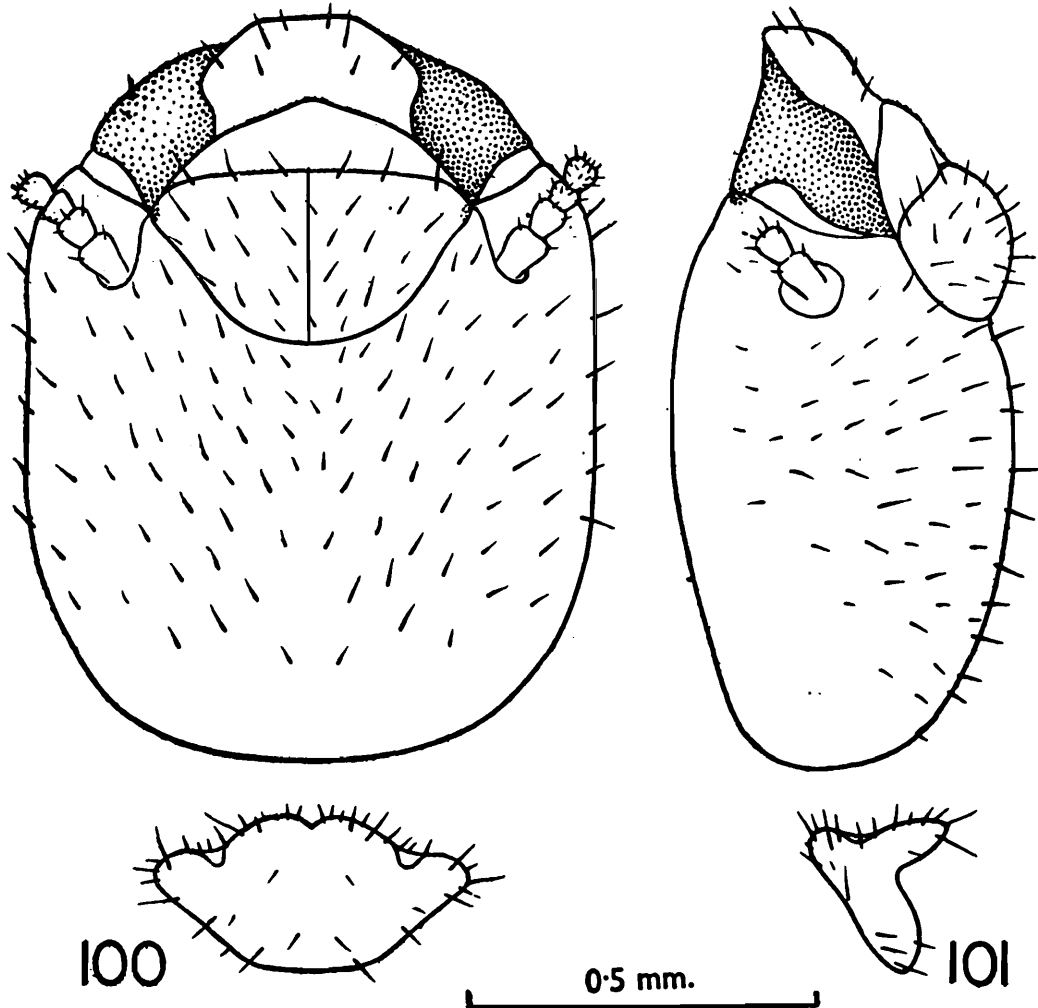
General : Head-capsule pale golden yellow ; mandibles basally yellow, tips and teeth dark reddish brown ; thorax and legs creamy white ; abdomen greyish white. Total body-length *c* 3.35—3.60 mm.

Head : Head-capsule subsquarish, a little longer than broad. *Fontanelle, eyes and ocelli* : Absent. *Antennae* : With 13 segments ; segment 3 shortest ; apical (13) ovate, club-shaped. *Clypeus* : Postclypeus swollen ; semicircularly differentiated from frons. Anteclypeus flat, hyaline, apilose, medially projected in front. *Labrum* : Tongue shaped, with a cluster of stiff hairs near mid-line and tip. *Mandibles* : Typically *Microcerotermes*-type.

Thorax : Pronotum : Small, saddle-shaped ; with bristle-like hairs on

margin and on surface. *Meso-and Metanota* : Semicircular ; pilose.
Legs : Long and slender ; with 3 : 2 : 2 apical tibial spurs.

Abdomen : Oblong, pilose ; cerci 2-jointed, 0.05 mm long.



Figs. 100 and 101. *Microcerotermes ganeshi* sp. n., Worker (Paramorphotype).

Fig. 100. Head and pronotum, in dorsal view.

Fig. 101. Ditto, in side view.

4. WORKER MINOR :

Resembles worker major but is smaller in size.

Measurements :

	Range	
	Worker major (5 exs.)	Worker minor (5 exs.)
1. Total body-length <i>c</i>	3.35—3.58	3.13—3.18
2. Head-length to base of mandibles	0.75—0.85	0.58—0.63
3. Max. width of head	0.76—0.78	0.62—0.68
4. Max. length of pronotum	0.20—0.21	0.20
5. Max. width of pronotum	0.43—0.45	0.40

Type specimens : All deposited in National Zoological Collections, Z. S. I., Calcutta, India. Holotype soldier and two morphotype workers (1 major, 1 minor), Z.S.I. Nos. 8140/H8 and 690/H11 and a paratype soldier and paramorphotype workers, Z.S.I. No. 691/H11, in two different vials. Data as given under 'Material' above.

Distribution. INDIA : Southern India : Tamil Nadu : Salem (Karambapatty Reserve Forest, type-locality).

Comparison : The soldier of *M. ganeshi* comes closest to that of *M. minor* Kemner in size but can be separated from it for its paler head (golden brown vs dark brown), slightly diverging head sides (parallel in *minor*), slenderer and somewhat more incurved mandibles and wider anterior portion of postmentum.

From the soldier of other two species found in southern India i.e., *cameroni* Snyder and *fletcheri* Holmgren and Holmgren, the new species can be easily distinguished by its smaller and slenderer head and thinner mandibles.

Biology : The species has been collected from a twig in an *Odontotermes* mound.

42. *Microcerotermes minor* Holmgren

(Fig. 102)

1914. *Microcerotermes heimi f. minor* Holmgren, *Zool. Jb.*, 36 : 285, S. and W. Type-locality : Ilupalama, Ceylon.

1949. *Microcerotermes heimi f. minor* ; Snyder, *Smiths. misc. Coll.*, 112 : 140.

1967. *Microcerotermes minor* ; Prashad, Thapa and Sen-Sarma, *Indian For. Bull. (N. S.)*, No. 246 : 48—50.

Material : A vial with a soldier and two workers, Chamundi Hills, Mysore, Karnataka, coll. M. L. Roonwal, 2.iii. 1955, det. M. L. Roonwal and P. K. Sen-Sarma, ex. "root of *Eucalyptus citriodora*".

Measurements :

<i>Soldier</i> :		Range (1 ex.)
1. Total body-length <i>c</i>	...	4.00
2. Length of head to base of mandibles	...	1.18
3. Max. width of head	...	0.75
4. Length of left mandible	...	0.70
5. Max. width of pronotum	...	0.48

Distribution : INDIA : Southern India : Karnataka : Chamundi Hills, Mysore. CEYLON : Illuppalama (type-locality).

Biology : It has been collected from roots of *Eucalyptus citriodora*.

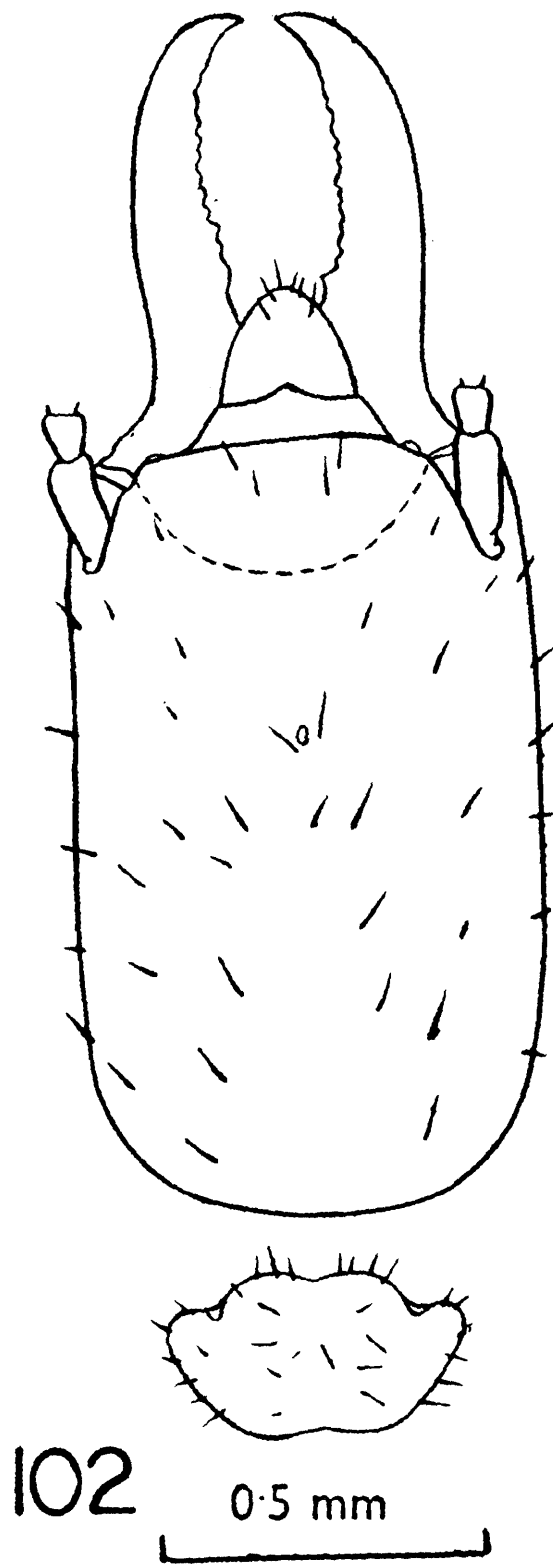


Fig. 102. Head and pronotum of soldier of *Microcerotermes minor* Holmgren, in dorsal view.

Genus *Angulitermes* Sjöstedt1924. *Angulitermes* Sjöstedt, *Rev. zool. Afr.*, 12 : 257.1949. *Angulitermes*; Snyder, *Smiths. misc. Coll.*, 112 : 174.Type-species : *Angulitermes frontalis* (Silvestri).

Only three species of the genus are found in southern India and are known by soldier caste only.

Key to Species

Soldier :

- | | | |
|---|-----|--|
| 1(2) Frontal protuberance long
and acutely conical | ... | <i>fletcheri</i> Holmgren and Holmgren |
| 2(1) Frontal protuberance short
and obtusely conical | | |
| 3(4) Labrum with strongly in-
curved anterior margin | ... | <i>obtusus</i> Holmgren and Holmgren |
| 4(3) Labrum with weakly
incurved anterior margin | ... | <i>acutus</i> Mathur and Sen-Sarma |

43. *Angulitermes acutus* Mathur and Sen-Sarma

(Fig. 103)

1961. *Angulitermes acutus* Mathur and Sen-Sarma, *Ann. Mag. nat. Hist.*, (13)3(31) : 401—406. S. and W. Type-locality : Pallaymcottah, Tinnevely District, Tamil Nadu.

Material : (A) *In Forest Research Institute, Dehra Dun* : A vial with a paratype S., Pallyamcottah, Tamil Nadu, coll. R. N. Mathur, 17.i. 1958, ex. "under root of *Phoenix*". (B) *In Zoological Survey of India, Calcutta* : A vial with 2 paramorphotype W., data same as under 'A' above.

Measurements :

<i>Soldier</i> :		(1 ex., paratype)
1. Total body-length <i>c</i>	...	3.95
2. Length of head to base of mandibles	...	1.25
3. Max. width of head	...	1.00
4. Max. length of pronotum	...	0.20
5. Max. width of pronotum	...	0.50

Distribution : INDIA : Southern India : Tamil Nadu : Pallayamcottah.

Biology : This species has been collected from soil under roots of *Phoenix* sp.

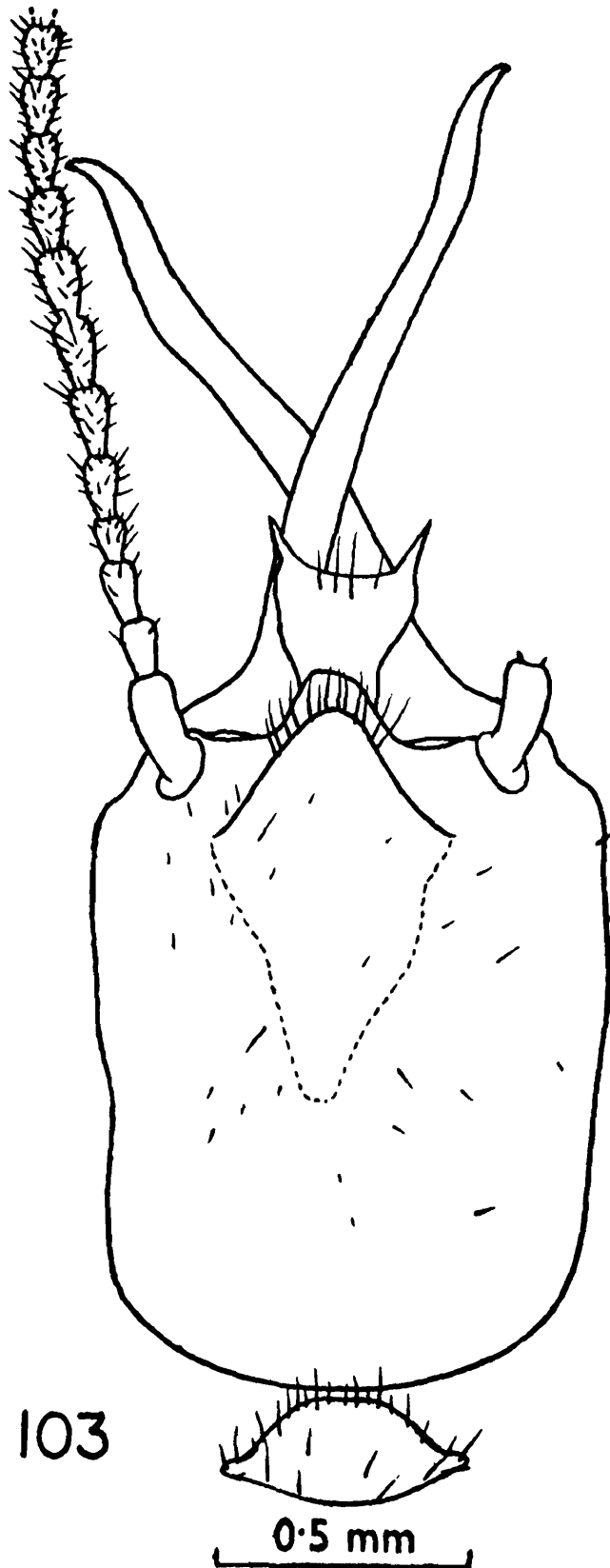


Fig. 103. Head and pronotum of soldier of *Angulitermes acutus* Mathur and Sen-Sarma-Paratype.

44. *Angulitermes fletcheri* (Holmgren and Holmgren)

(Fig. 104)

1917. *Mirotermes fletcheri* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 : 168-169. S. and W. Type-localities : Hampi Ruins, Hospet Taluq and Hadagalli (Bellary District, Karnataka).
1949. *Termes fletcheri* ; Snyder, *Smiths. misc. Coll.*, 112 : 180.
1961. *Angulitermes fletcheri* ; Mathur and Sen-Sarma, *Ann. Mag. nat. Hist.*, (13) 3 (31) : 406.
1971. *Angulitermes fletcheri* ; Roonwal and Chhotani, *Rec. zool. Surv. India*, 63 (1-4) : 209, 210, 218.

Material : A vial with a soldier and two workers, syntypes, Hadagalli, Bellary Dist., Karnataka, Coll. T.B. Fletcher, 2.v. 1912.

Measurements :

<i>Soldier</i> :		(1 ex., syntype)
1. Total body-length c	...	4.7
2. Length of head to base of mandibles	...	1.23
3. Max. width of head	...	0.98
4. Max. length of pronotum	...	0.19
5. Max. width of pronotum	...	0.45

Distribution : INDIA : Southern India : Karnataka : Hampi ruins, Hospet Taluq and Hadagalli.

Biology : *Angulitermes fletcheri* is a soil inhabiting species and has been collected under stones and in galleries in the soil. The ratio of soldiers to workers is 1 : 10.

45. *Angulitermes obtusus* (Holmgren and Holmgren)

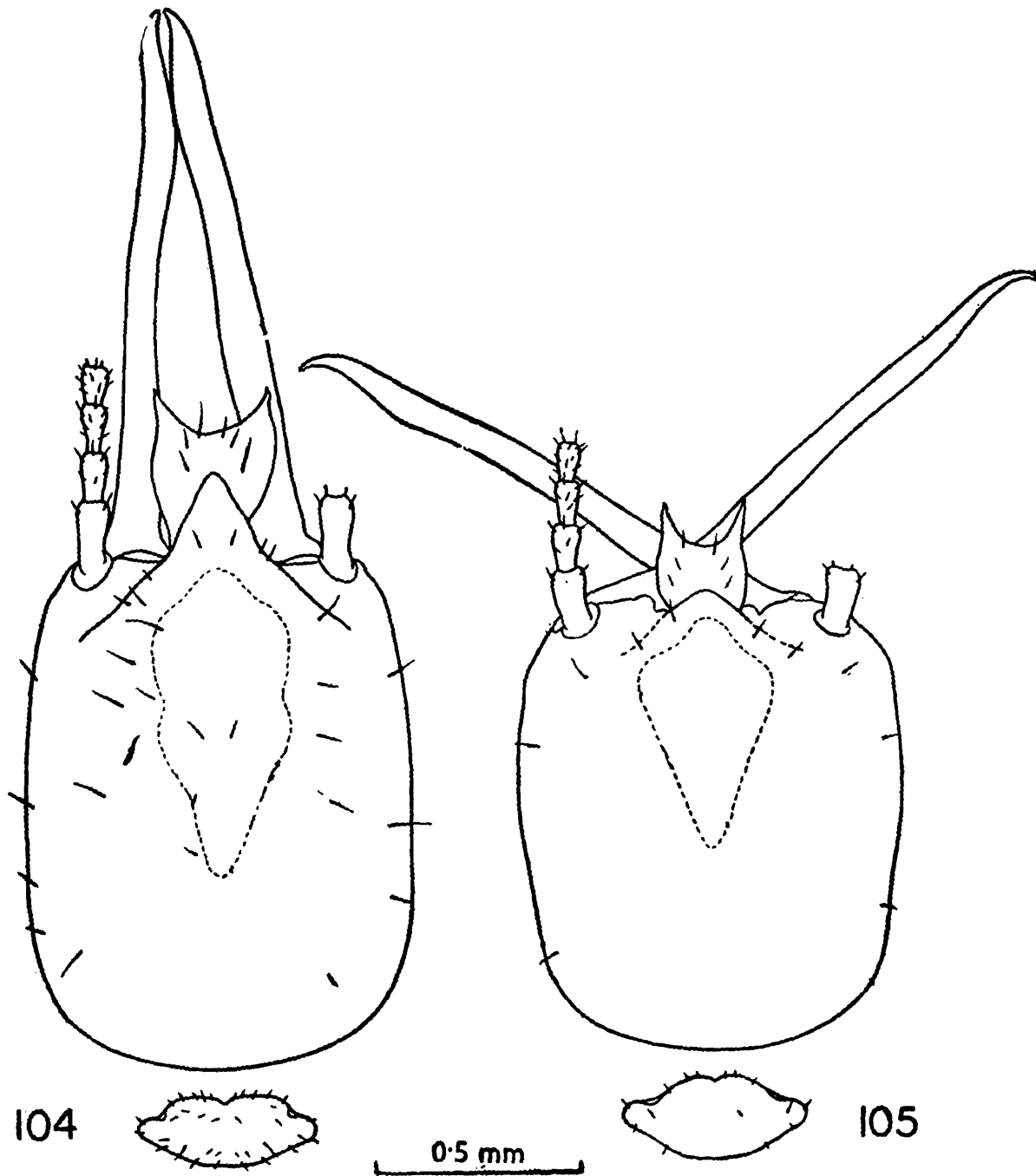
(Fig. 105)

1917. *Mirotermes obtusus* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 : 168. S. and W. Type-locality : Hospet (Bellary District, Karnataka).
1949. *Termes obtusus* ; Snyder, *Smiths. misc. Coll.*, 112 : 184.
1958. *Angulitermes obtusus* ; Ahmad, *Biologia*, 4 : 182.
1971. *Angulitermes obtusus* ; Roonwal and Chhotani, *Rec. zool. Surv. India*, 63 (1-4) : 209, 210, 218.

Material : A vial with 2 S. and 2 W., syntypes, Hospet (Bellary Dist. Karnataka), coll. T. B. Fletcher, 29. vii. 1962.

Measurements :

<i>Soldier :</i>	Range (2 exs., cotype)
1. Total body-length <i>c</i>	... 4.20—4.80
2. Length of head to base of mandibles	... 1.12—1.13
3. Max. width of head	... 0.92—0.93
4. Max. length of pronotum	... 0.18—0.19
5. Max. width of pronotum	... 0.48—0.50



Figs. 104 and 105. Head and pronotum, in dorsal view, of soldiers of *Angulitermes* spp.

Fig. 104. *A. fletcheri* (Holmgren & Holmgren)-Syntype.

Fig. 105. *A. obtusus* (Holmgren & Holmgren)-Syntype.

Distribution : INDIA : Southern India : Karnataka : Hospet.

Biology : This species nests in the soil. Holmgren and Holmgren (1917) provided the biological notes as "Found in soil between surface and a depth of about one foot when digging up a nest of *Termes convolutionarius*. Proportion of soldier is about ten percent."

Genus *Homalotermes* John

1925, *Homalotermes* John, *Treubia*, 6 : 412-413.

1949. *Homalotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 191.

1968. *Homalotermes* ; Krishna, *Bull. Amer. Mus. nat. Hist.*, 138 (Art. 5) : 284-286.

Type species : *Homalotermes foraminifer* (Haviland)

Only one species of the genus is known from southern India.

46. *Homalotermes pilosus* (Mathur and Thapa)

(Fig. 106)

1962. *Microcapritermes pilosus* Mathur and Thapa, *Indian Forester*, 88 : 370-375. S. and W. Type-locality : Top Slip, Tamil Nadu.

1968. *Homalotermes pilosus* ; Krishna, *Bull. Amer. Mus. nat. Hist.*, 138 (Art. 5) : 284-285.

Material : A vial with a paratype S. and paramorphotype W., Top Slip, Tamil Nadu, coll. R. N. Mathur, 16.i. 1960. ex "under soil at base of unknown tree" ; and 5 vials with S. and W, coll. O. B. Chhotani, ex "soil", as follows : Kuttikanam nr. Peermade, c 300 m alt., 3.iii. 1969 (3 vials) and Panchakanam Reserve Forest, Periyar Lake area, 5.iii. 1969 (2 vials).

Measurements :

Soldier :

	<i>Range (3 exs.)</i>
1. Total body-length c	... 3.20—3.50
2. Length of head to base of mandibles	... 0.85—0.90
3. Max. width of head	... 0.62—0.68
4. Max. length of pronotum	... 0.11—0.18
5. Max. width of pronotum	... 0.34—0.36

Distribution : INDIA : Southern India : Tamil Nadu : Top Slip ; Kerala : Kuttikanam nr. Peermade and Panchakanam Reserve Forest.

Biology : This is a soil inhabiting termite. The nest consists of narrow galleries below the ground surface near trees and plants.

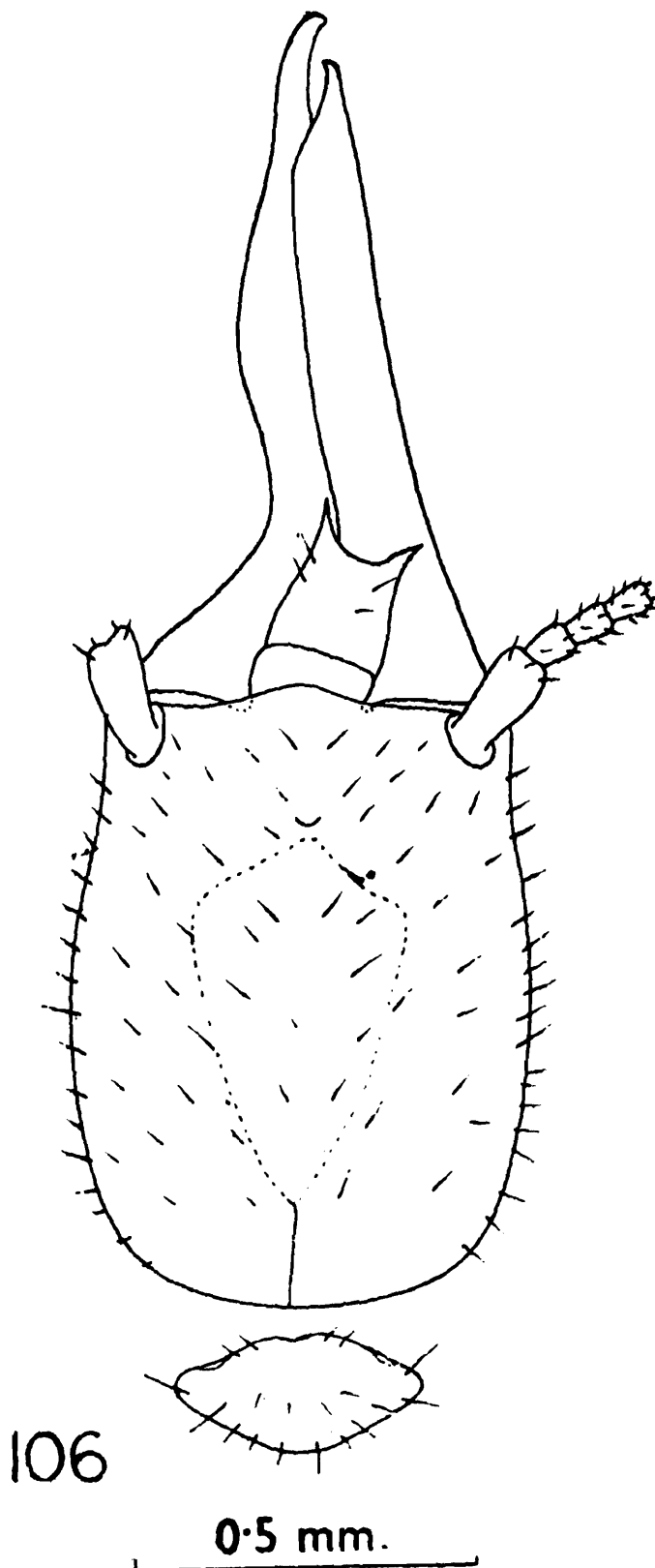


Fig. 106. Head and pronotum, in dorsal view, of soldier (paratype) of *Homalotermes pilosus* (Mathur & Thapa).

Genus *Dicuspiditermes* Krishna1965. *Dicuspiditermes* Krishna, *Amer. Mus. Novit.*, No. 2210 : 16-18.1968. *Dicuspiditermes* ; Krishna, *Bull. Amer. Mus. nat. Hist.*, 138 (Art. 5) : 286-290.Type species : *Dicuspiditermes obtusus* (Silvestri).

Four species of this genus are known from southern India.

Key to Species

Soldier :

- 1(4) Mandibles shorter than head length
- 2(3) Smaller species : Head-length 1.88-2.05 ; Head-width 1.15-1.35 ... *fontanellus* Thakur & Chatterjee
- 3(2) Larger species ; Head-length 2.10-2.25 ; Head-width 1.30-1.50 ... *pername* Thakur & Chatterjee
- 4(1) Mandibles longer than head length
- 5(6) Head-capsule smaller : Head-length 1.85-2.13 ; Head-width 1.18-1.24 ... *gravelyi* (Silvestri)
- 6(5) Head-capsule larger : Head-length 2.10-2.55 ; Head-width 1.38-1.55 ... *fletcheri* (Holmg. & Holmg.)

47. *Dicuspiditermes fletcheri* (Holmgren and Holmgren)

(Fig. 107)

1917. *Capritermes fletcheri* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 : 169. S. and W. Type-localities : Pathupadi Forest, Malabar, Kerala ; Annamalai Hills, Tamil Nadu and Bababuddin Hills, Karnataka. (Specimens from Annamalai Hills are *Procapritermes fontanellus* (Mathur and Thapa)1949. *Capritermes fletcheri* ; Snyder, *Smiths. misc. Coll.*, 112 : 193.1965. *Dicuspiditermes fletcheri* ; Krishna, *Am. Mus. Novit.*, No. 2210 : 18.1968. *Dicuspiditermes fletcheri* ; Krishna, *Bull. Amer. Mus. nat. Hist.*, 138 (Art. 5) : 290.

Material : Lot 1. A vial with a S. and a W., syntypes, Bababuddin Hills, coll. T. B. Fletcher, 12. xi. 1912, ex. "galleries and chamber 2" - 10" below soil at roots of coffee".

Lot 2. Twelve vials with S. and W., coll. O. B. Chhotani, November, 1962, Karnataka state, thus : 02, 010 and 013/5.11.62, 09 and

023/6.11.62, 016/8.11.62 and 05/9.11.62 (7 vials), Dharwar, ex. "under cowdung and in soil" ; 04, 05 and 09/11.11.62 (3 vials), Bababuddin Hills, ex. "under stones and in soil" : and 05 and 010/23.11.62 (two vials), Mangalore (Lal Bagh Area), ex "under logs of wood lying on ground".

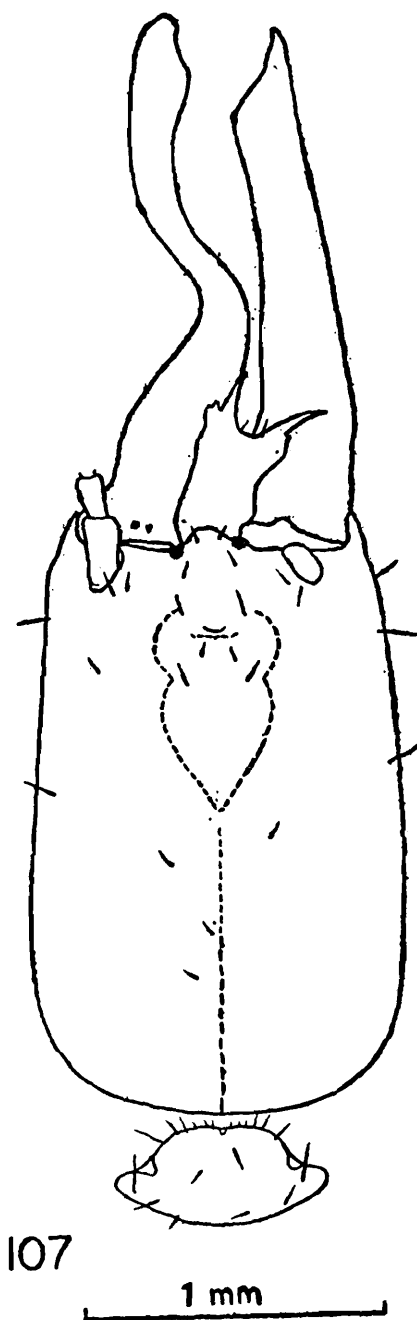


Fig. 107. Head and pronotum, in dorsal view, of soldier of *Dicuspitermes fletcheri* (Holmgren & Holmgren).

Lot 3. Two vials, Yercaud, Tamil Nadu, coll. O. B. Chhotani, February, 1969, thus : A vial (021/12.2.69) with S. and W., ex "under leaves" ; and a vial (029/13.2.69) with S. and W and Ny., ex. "soil and *Eucalyptus* roots" ; and a vial with S. and W., Mumdamthorai Tiger Sanctuary, nr. Ambasumudrum, coll. O. B. Chhotani, 1. iii. 1969, ex. soil.

Lot 4. A vial with S. and W., Bababuddin Hills, Karnataka, coll. T. B. Fletcher, det. K. and N. Holmgren "*Capritermes incola* Wasm."

Measurements :

<i>Soldier :</i>		Range (6 exs.)
1. Total body-length c	...	6.50—7.00
2. Length of head to base of mandibles	...	2.10—2.25
3. Max. width of head	...	1.38—1.42
4. Max. length of pronotum	...	0.28—0.38
5. Max. width of pronotum	...	0.78—0.80

Distribution : INDIA : Southern India : Karnataka : Bababudin Hills, Dharwar, Mangalore ; Tamil Nadu : Mumdamthorai Tiger Sanctuary nr. Ambasamudram, Yercaud ; Kerala : Pathupadi Forest, Malabar.

Biology : This species makes nests under the ground surface. The nests are in the form of narrow galleries and small chambers. It has also been collected from under dung, leaves and logs of wood lying on the ground and from the roots of *Eucalyptus* trees and of coffee plants.

48. *Dicuspitermes fontanellus* Thakur and Chatterjee

(Fig. 108)

1971. *Dicuspitermes fontanellus* Thakur and Chatterjee, *Zool. Anz.*, 187(1/2) : 72—77.

Material : A vial with a paratype S. and W., Satida mixed forest, Sangeum Forest Range, South Goa Forest Divn., Goa, coll. M. L. Thakur, 27.xii. 65, ex. 'underneath stones'.

Measurements :

<i>Soldier :</i>		(1 ex., paratype)
1. Total body-length	...	5.00
2. Length of head to base of mandibles	...	1.85
3. Max. width of head	...	1.28
4. Max. length of pronotum	...	0.30
5. Max. width of pronotum	...	0.73

Distribution : INDIA : Goa : Sangeum Forest Range, South Goa (type-locality).

Biology : The specimens of this species were found under stones, evidently it nests in soil.

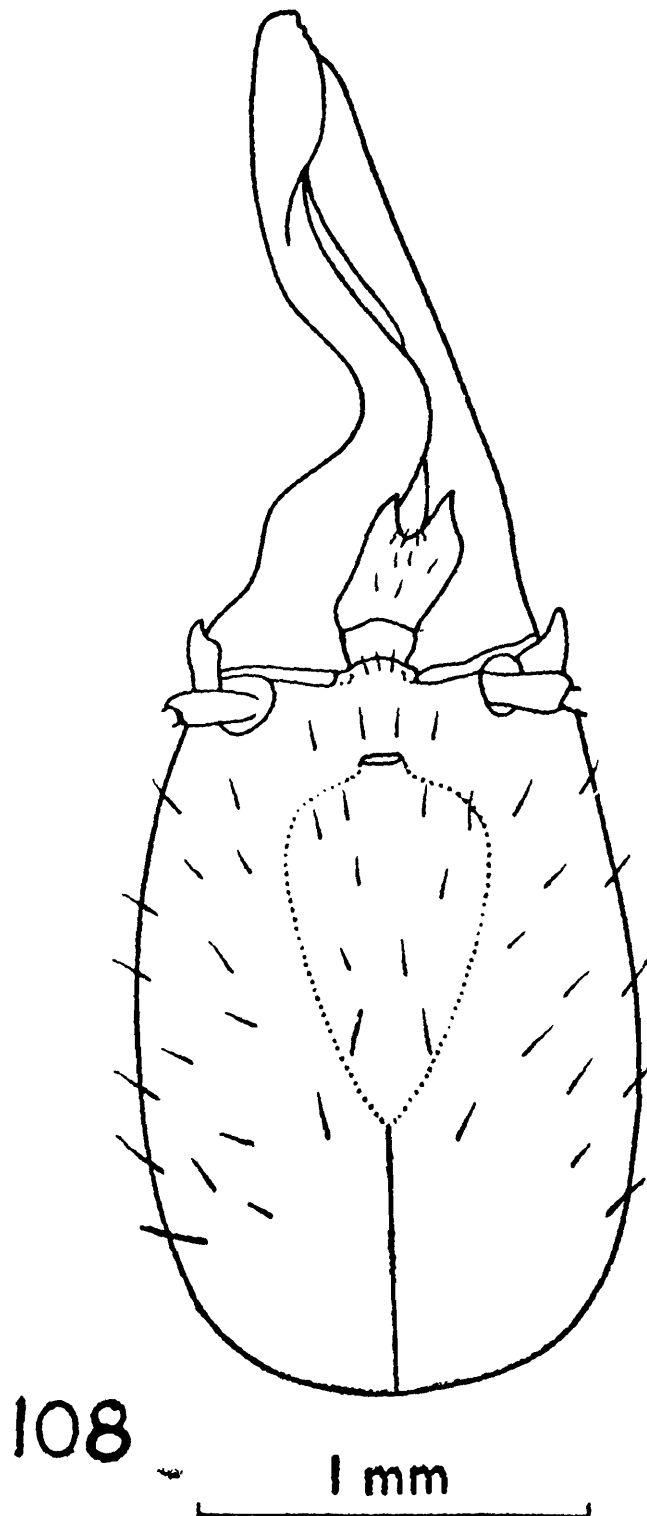


Fig. 108. Head, in dorsal view, of soldier of *Dicuspitermes fontanellus* Thakur & Chatterjee.

49. *Dicuspiditermes gravelyi* (Silvestri)

(Fig. 108a)

1922. *Capritermes gravelyi* Silvestri, *Rec. Indian Mus.*, 24 : 535—537. S. and W.

Type-locality : Kas, Satara District. Maharashtra.

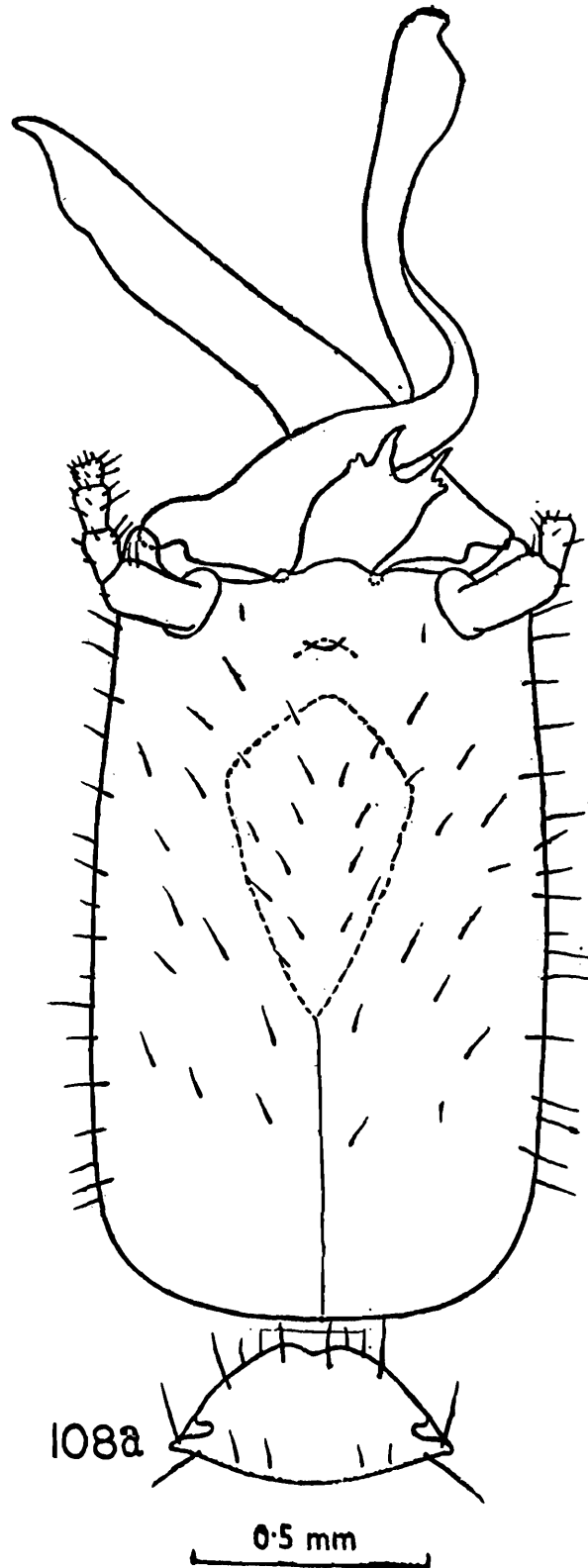
1949. *Capritermes gravelyi* ; Snyder, *Smiths. misc. Coll.*, 112 : 194.

Fig. 108a. Head and pronotum, in dorsal view, of soldier of *Dicuspiditermes gravelyi* (Silvestri)

1965. *Dicuspiditermes gravelyi*; Krishna, *Amer. Mus. Novit.*, No. 2210 : 18.

1968. *Dicuspiditermes gravelyi*: Krishna, *Bull. Amer. Mus. Nat. Hist.*, 138(Art. 5) : 290.

Material : Two vials (Nos. 018/5.11.62 and 013/8.11.62) with one soldier and two workers each, Dharwar, Karnataka, coll. O. B. Chhotani, 5 and 8.xi.1962, ex. under cowdung, in soil.

One vial (No. 08/17.2.69) with S. and W., Top Slip, Tamil Nadu, coll. O. B. Chhotani, 17.ii.1969, ex. under cowdung.

Measurements :

<i>Soldier</i> :		(Range, 4 exs.)
1. Total body-length <i>c</i>	...	5.30—5.60
2. Length of head to base of mandibles	...	1.85—1.90
3. Max. width of head	...	1.20—1.24
4. Max. length of pronotum	...	0.31—0.33
5. Max. width of pronotum	...	0.65—0.75

Distribution : INDIA : Southern India : Tamil Nadu : Top Slip ; Karnataka : Dharwar. Elsewhere : Maharashtra : Satara District : Kas (type-locality), Helvak and Vela (Koyna Valley), and E. side of Koyna Valley.

Biology : This species is a soil inhabiting one and has been collected from under cowdung lying on the ground.

50. *Dicuspiditermes pername* Thakur and Chatterjee

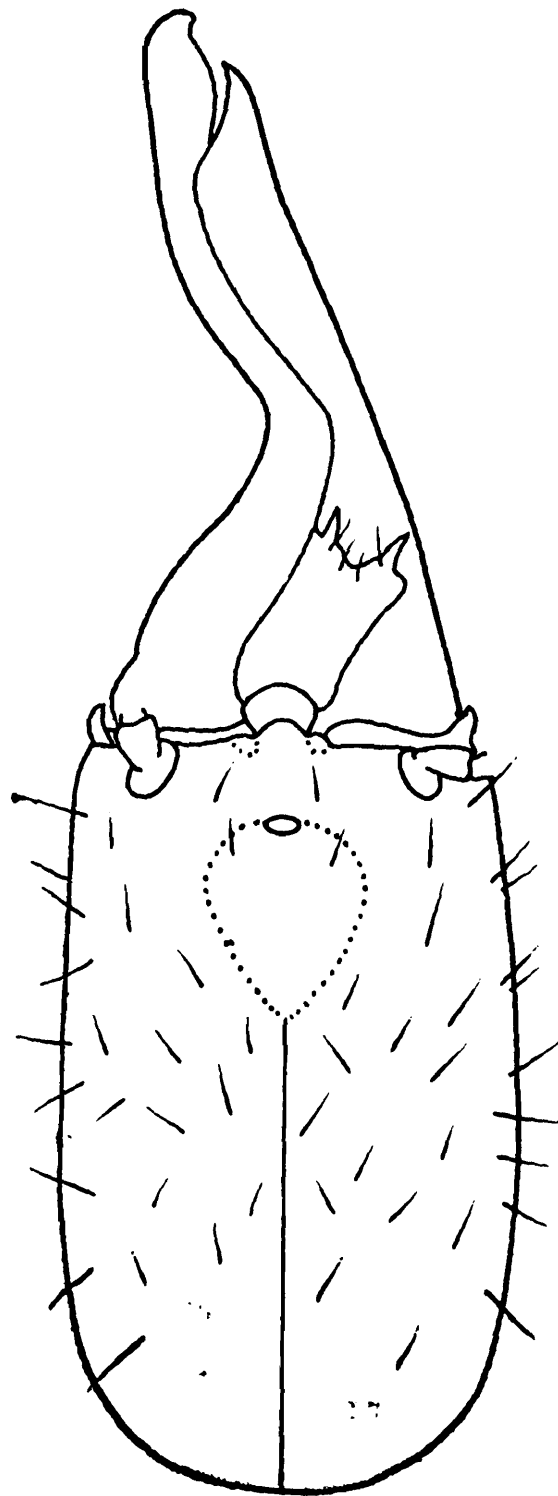
(Fig. 109)

1971. *Dicuspiditermes pername* Thakur and Chatterjee, *Zool. Anz.*, 187(1/2) : 77—81.

Material : A vial with 2 paratype S. and 2 paratype W., Goa, Mopa village, Pername Forest Range, Goa Forest Div., coll. P. K. Sen-Sarma, 17.xii.65, ex. under soil.

Measurements :

<i>Soldier</i> :		Range (2 exs., paratype)
1. Total body-length <i>c</i>	...	6.00—6.20
2. Length of head to base of mandibles	...	2.08—2.20
3. Max. width of head	...	1.33—1.45
4. Max. length of pronotum	...	0.38—0.40
5. Max. width of pronotum	...	0.78



109

1 mm

Fig. 109. Head, in dorsal view, of soldier of *Dicuspiditermes pername* Thakur & Chatterjee.

Distribution : INDIA : Goa, Mopa village, Pername Range.

Biology : This species was found under soil.

Genus *Pericapritermes* Silvestri

1914. *Pericapritermes* Silvestri, *Boll. Lab. Zool. Gen. Agr. Portici*, 9 : 134.

1949. *Pericapritermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 198.

1968. *Pericapritermes* ; Krishna, *Bull. Amer. Mus. Nat. Hist.*, 138 (Art. 5) : 290—294.

Type-species : *Pericapritermes urgens* Silvestri

Key to Species

Soldier :

- | | | | |
|------|--|-----|--|
| 1(2) | Size larger : Head-length to base of mandibles
2.62—2.78 ; head relatively narrower | ... | <i>P. ceylonicus</i> |
| 2(1) | Size smaller : Head-length to base of mandibles
2.50—2.60 ; head relatively wider | ... | (Holmgren)
<i>P. topslipensis</i>
Thakur |

51. *Pericapritermes ceylonicus* (Holmgren)

(Fig. 110)

1911. *Capritermes ceylonicus* Holmgren, in Escherich's *Termitenleben auf Ceylon* : 204. Q., S. and W. Type-locality : Peradeniya, Sri Lanka.

1949. *Capritermes ceylonicus* ; Snyder, *Smiths. misc. Coll.*, 112 : 193.

1968. *Pericapritermes ceylonicus* ; Krishna, *Bull. Amer. Mus. nat. Hist.*, 138(Art. 5) : 294.

Material : A vial with S. and W., Bababuddin Hills, Karnataka state, coll. O. B. Chhotani (01/11.11.62), 11.xi.1962, under stone ; and a vial with a S. and W., Wellington, Nilgiri Hills, Tamil Nadu, coll J. K. Sen, 4.iii.1965, under stone.

Measurements :

(i) *Imago* (From Holmgren, 1913 b) :

- | | | | |
|----|--|-----|-----------|
| 1. | Total body-length with wings <i>c</i> | ... | 10.00 |
| 2. | Total body-length without wings <i>c</i> | ... | 4.50 |
| 3. | Head-length | ... | 1.14—1.18 |
| 4. | Head-width | ... | 1.14—1.18 |
| 5. | Width of pronotum | ... | 0.95—1.03 |
| 6. | Length of pronotum | ... | 0.57 |
| 7. | Length of forewing | ... | 8.00 |

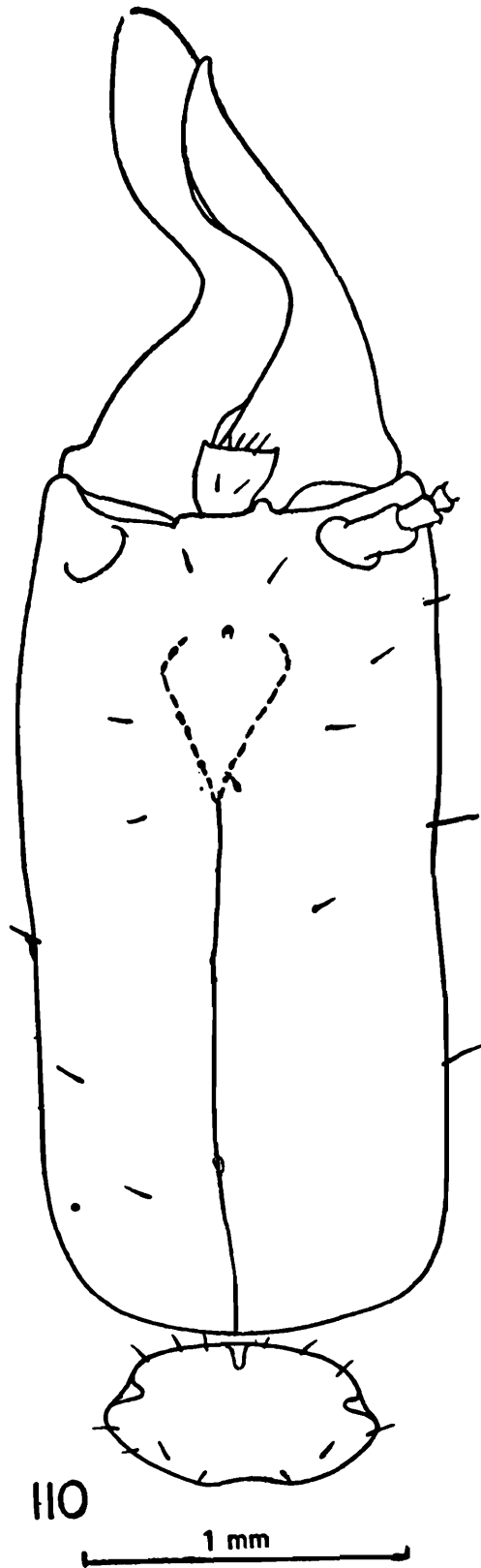


Fig. 110. Head and pronotum of soldier of *Pericapritermes ceylonicus* (Holmgren), in dorsal view.

(ii) <i>Soldier</i> :		Range (8 exs.)
1. Total body-length <i>c</i>	...	7.00—8.00
2. Head-length to base of mandibles	...	2.62—2.78
3. Max. width of head	...	1.32—1.41
4. Max. length of pronotum	...	0.40—0.46
5. Max. width of pronotum	...	0.83—0.88

Distribution : INDIA : Southern India : Karnataka : Bababuddin Hills ; Tamil Nadu : Wellington, Nilgiri Hills. Elsewhere : Ceylon, widely distributed.

Biology : This is also a soil inhabiting termite and has been collected from under stones.

Remarks : The soldier of this species, from India, has much larger head and somewhat incurved sides of head. In the first instance, the author thought it to belong to a new species but on examination of a large collection of this species, at the A.M.N.H., New York, kindly put at author's disposal by Dr. Krishna, it was found that there exists great variation in size and the shape of the head of the soldier.

52. *Pericapritermes topslipensis* Thakur

(Fig. 111)

1976. *Pericapritermes topslipensis* Thakur, *J. Timb. Dev. Assoc. India*, 22(2) : 11-14, pl.1(S.) & 2(W.). S. and W. Type-locality : Top Slip, Tamil Nadu.

Material : A vial with a paratype S. and paramorphotype W., Top Slip, South Coimbatore Forest Division, Tamil Nadu, coll. M. L. Thakur, 12.xii.'70, ex. under soil.

Measurements :

<i>Soldier</i> :		Paratype (1 ex.)
1. Total body-length <i>c</i>	...	6.48
2. Head-length to base of mandibles	...	2.50
3. Max. width of head	...	1.35
4. Max. length of pronotum	...	0.35
5. Max. width of pronotum	...	0.95

Distribution : INDIA : Tamil Nadu : Top Slip, South Coimbatore Forest Division (type-locality).

Biology : This species was found under soil,

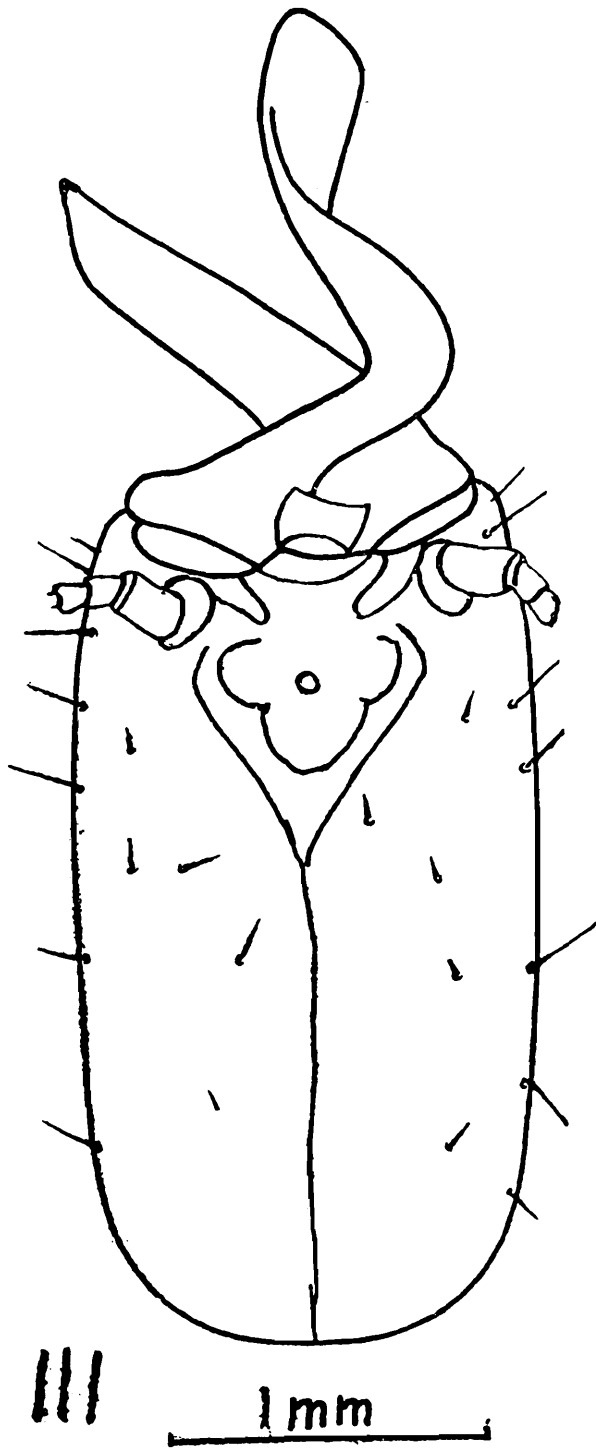


Fig. 111. Head of soldier of *Pericapritermes toplipensis* Thakur, in dorsal view.

Genus *Procapritermes* Holmgren

1912. *Procapritermes* Holmgren, *K. Sv. Vet. Akad. Handl.*, 48(4) : 97, 113, 114, 119.
1949. *Procapritermes*; Snyder, *Smiths. misc. Coll.*, 112 : 190.
1968. *Procapritermes*; Krishna, *Bull. Amer. Mus. nat. Hist.*, 138 (Art. 5) : 294—304.

Type-species : *Procapritermes setiger* (Haviland)

Two species of this genus are known from southern India.

Key to Species

Soldier :

- 1(2) Larger species ; fontanelle gland larger ;
segment 2 of antenna longer than 3 ;
index head-height/width 0.87—0.94 ... *fontanellus* Mathur & Thapa
- 2(1) Smaller species ; fontanelle gland com-
paratively smaller ; segment 2 subequal
to 3 ; index head-height/width 0.70-0.81 ... *goanicus* Thakur & Chatterjee

53. *Procapritermes fontanellus* (Mathur and Thapa)

(Fig. 112)

1961. *Pseudocapritermes fontanellus* Mathur and Thapa, *J. Timb. Dry. & Pres. Assoc.*, 7 : 3-7. S. and W. Type-locality : Top Slip (Tamil Nadu).
1968. *Procapritermes fontanellus* ; Krishna, *Bull. Amer. Mus. nat. Hist.*, 138(Art. 5) : 303.

Material : Lot 1. (i) A vial with 2 paratype S. and 2 paramorphotype W., Top Slip, Tamil Nadu, coll. R. N. Mathur, 15.i.1960, ex. 'soil at base of an unknown tree' ; (ii) 4 vials, (Nos. 011, 013, 014, 018/20.xi.62), with several S. and W., Mercara Reserve Forest, Mercara, Coorg, Karnataka, coll. O. B. Chhotani, 20.xi.1962, ex. galleries in soil under a tree, under leaves on soil, under stone and at base of a dead tree, respectively ; (iii) A vial with 2 S., Makut, Coorg, coll. M. L. Roonwal (No. R9/26.2.55), 26.ii.1955, ex. soil under rotten log of *Anacardium occidentale* ; (iv) A vial (No. 03/3.3.69) with S. and W., Kuttikanam, Peermade, Kerala, coll. O. B. Chhotani, 3.iii.1969. ex. soil.

Lot 2. A vial with a soldier and a few workers (cotypes of *Capritermes fletcheri* Holmgren and Holmgren), Anamalai Hills, coll. T. B. Fletcher, 22.i.1912, ex. 'colony in dead log.'

Measurements :

<i>Soldier</i> :		(Range 6 exs.)
1. Total body-length <i>c</i>	...	4.20—4.70
2. Length of head to base of mandibles	...	1.58—1.68
3. Max. width of head	...	0.95—1.00
4. Max. length of pronotum	...	0.23—0.28
5. Max. width of pronotum	...	0.50—0.60

Distribution : INDIA : Southern India : Karnataka : Makut (Coorg), Mercara Reserve Forest (Mercara) ; Tamil Nadu : Anamalai Hills, Top Slip ; Kerala : Kuttikanam near Peermade.

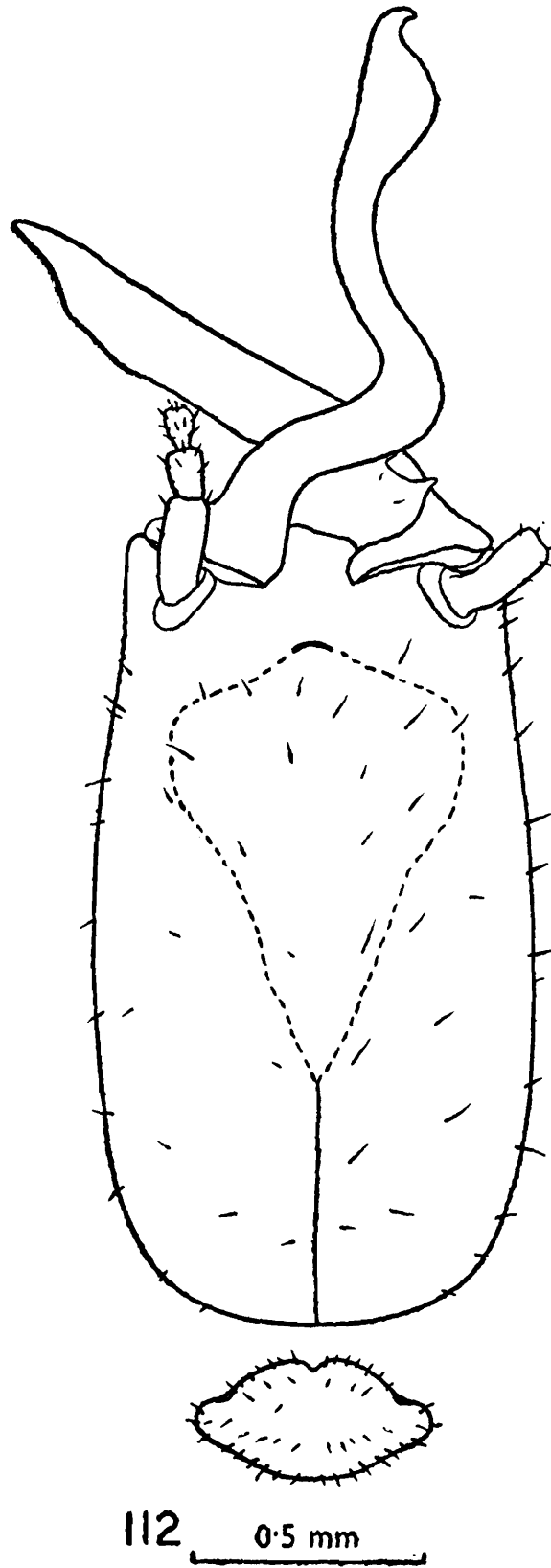


Fig. 112. Head and pronotum of soldier of *Procaperitermes fontanellus* (Mathur & Thapa), in dorsal view.

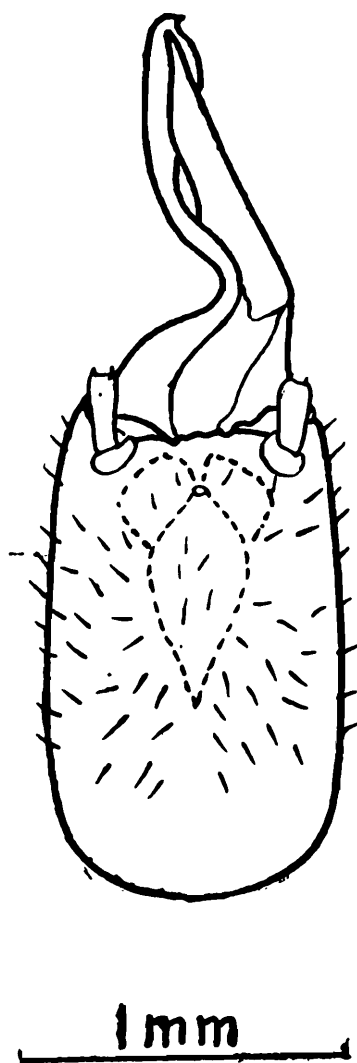
Biology : The nest of this species is in the form of narrow galleries in soil and the insects have been collected from under stones, leaves and logs of wood and from soil near bases of different trees.

54. *Procapritermes goanicus* (Thakur and Chatterjee)

(Fig. 113)

1969. *Pseudocapritermes goanicus* Thakur and Chatterjee, *Oriental Insects*, 3 : 189-192. S. and W. Type-locality : Moleum Forest Range, South Goa Forest Div., Goa.

Material : A vial with a paratype S. and a paramorphotype W., Moleum For. Range, Goa, coll. M. L. Thakur, 20.xii.1965.



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Fig. 113. Head and pronotum, in dorsal view, of soldier of *Procapritermes goanicus* Thakur & Chatterjee

Measurements :

<i>Soldier :</i>		Paratype (1 ex.)
1. Total body-length <i>c</i>	...	4.00
2. Length of head to base of mandibles	...	1.45
3. Max. width of head	...	0.90
4. Max. length of pronotum	...	0.18
5. Max. width of pronotum	...	0.45

Distribution : INDIA : Southern India : Goa : Moleum Forest Range, South Goa Forest Division.

Genus *Labiocapritermes* Krishna

1968. *Labiocapritermes* Krishna, *Bull. Amer. Mus. Nat. Hist.*, 138(Art. 5) : 304-305.

Type-species : *Labiocapritermes distortus* (Silvestri)

55. *Labiocapritermes distortus* (Silvestri)

(Fig. 114—115)

1922. *Capritermes distortus* Silvestri, *Rec. Indian. Mus.*, 24 : 541-543. Im., S. and W. Type-locality : Kavalai, Kerala.

1949. *Capritermes distortus* ; Snyder, *Smiths. misc. Coll.*, 112 : 193.

1968. *Labiocapritermes distortus* ; Krishna, *Bull. Amer. Mus. nat. Hist.*, 138(Art.) : 304-305.

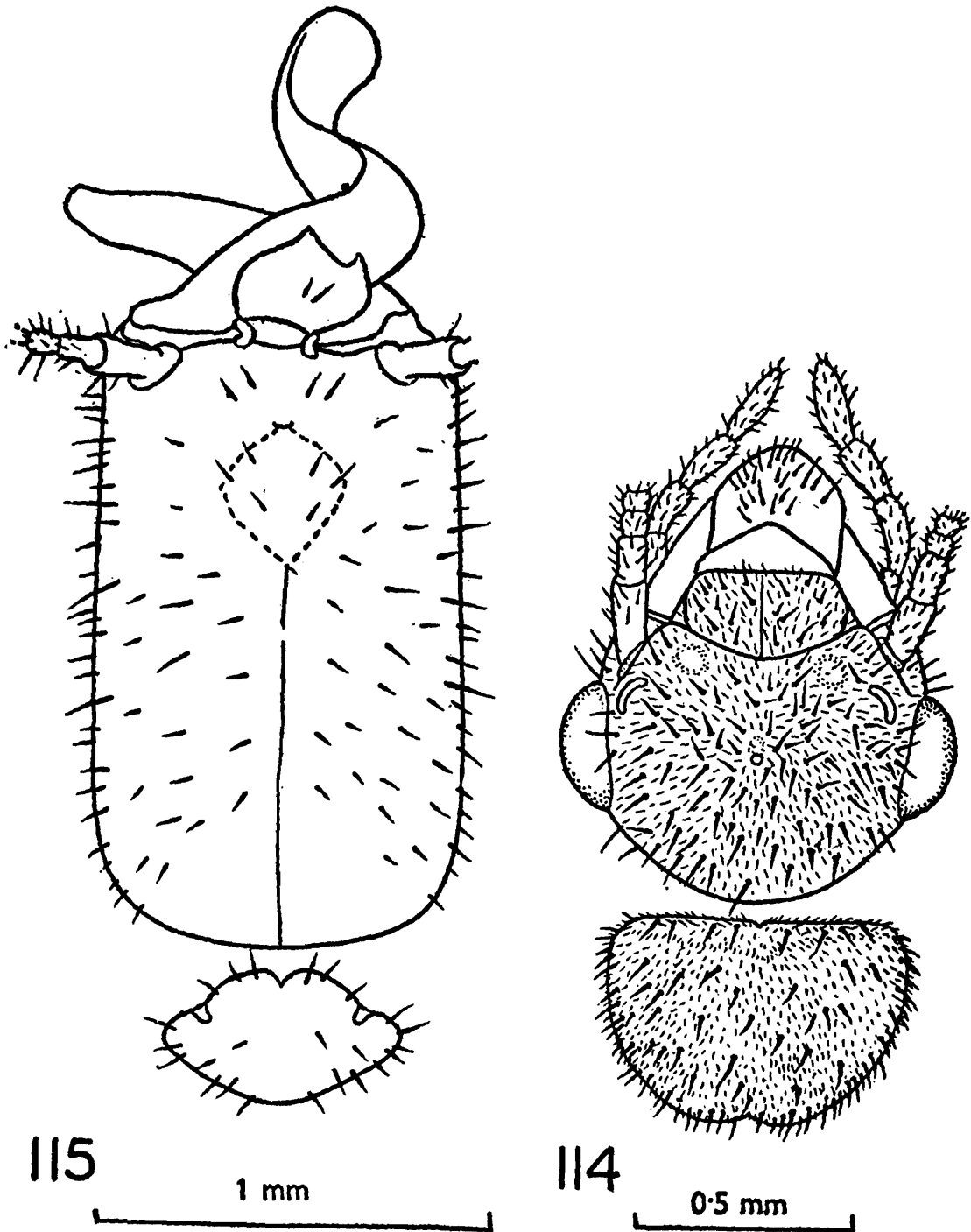
Material : Seven vials with S. and W., coll. O. B. Chhotani, as follows :—(i) 02/28.2.69, Mylar, Kulasekarum Forest Range, c 305 m alt., Tamil Nadu, 28.ii.1969, ex. soil ; (ii) 09/3.3.69, Kuttikanam, Peermade, Kerala, 3.iii.1969, ex. soil ; (iii)—(vii) Nos. 05, 06, 08, 0.10 and 0.12/5.3.69, Panchakanam Reserve Forest, Periyar Lake Area, Kerala, 5.iii.1969, ex. soil ; and (viii) a vial with S. and W. Makut, Coorg, Karnataka, coll. M. L. Roonwal (R 12/24.2.55), 24.ii.1955, ex. 'soil under dung'.

Measurements :

(i) *Imago* : (From Silvestri, 1922) :

1. Total body-length with wings <i>c</i>	...	10.00
2. Total body-length without wings <i>c</i>	...	6.00
3. Length of head	...	0.81
4. Width of head between eyes	...	0.84
5. Long diameter of ocellus	...	0.28
6. Length of forewing	...	8.50

(ii) <i>Soldier</i> :		(Range 5 exs.)
1. Total body-length <i>c</i>	...	4.30—4.80
2. Head-length to base of mandibles	...	1.50—1.70
3. Max. width of head	...	0.85—0.95
4. Max. length of pronotum	...	0.28—0.33
5. Max. width of pronotum	...	0.55—0.60



Figs. 114 and 115. *Labiocapritermes distortus* (Silvestri)

Fig. 114. Head and pronotum of imago, in dorsal view (after Krishna 1968).

Fig. 115. Head and pronotum of soldier, in dorsal view,

Distribution : INDIA : Southern India : Tamil Nadu : Mylar (Kulasekarum Forest Range); Kerala : Kavalai and Kuttikanam nr. Peermade; and Karnataka : Makut (Coorg).

Biology : The nests of this species are found in soil in the form of narrow galleries.

Subfamily MACROTERMITINAE

Genus *Macrotermes* Holmgren

1909. *Termes* (*Macrotermes*) Holmgren, *K. Sv. Vet. Akad. Handl.*, 44(3) : 193. (No description)
 1910. *Termes* (*Macrotermes*) Holmgren, *Zool. Anz.*, 35 : 285. (No description)
 1912. *Termes* (*Macrotermes*) Holmgren, *K. Sv. Vet. Akad. Handl.*, 48(4) : 29.
 1949. *Macrotermes*; Snyder, *Smiths. misc. Coll.*, 112 : 208.

Type-species : *Macrotermes lilljeborgi* (Sjödstedt)

Only one species of the genus is known from southern India.

56. *Macrotermes convulsionarius* (Köing)

(Figs. 116—118)

1779. *Termes convulsionarii* König, *Beschaft, Berlin. Ges. Naturf. Freunde*, 4 : 24. Type-locality; Thanjavur, Tamil Nadu.
 1908. *Termes estherae* Desneux, *Ann. Soc. Ent. Belg.*, 51(12) : 390. Im., S. (maj. & min.) & W.
 1949. *Macrotermes estherae*; Snyder, *Smiths. misc. Coll.*, 112 : 211.

Material : Eight vials from Tamil Nadu, Pondicherry and Karnataka states as follows : Lot 1. Four vials, coll. I. Maligi, Christian College compound, Tambaram, Madras, Tamil Nadu, 22.ix.1961, thus : 3 vials with S. and W. and one vial with Im., S. and W. A vial with S. and W. Salem, Tamil Nadu, coll. O. B. Chhotani (No. 036/11.2.69), 11.ii.1969, making 7-8 cm. high heaps of granular soil. Lot. 2. A vial with S. and W. Kolar Forest Division, Karnataka, coll. M. L. Roonwal (R 7/5.3.55), 5.iii.1955, ex. heap of earth. Lot. 3. Two vials with S. and W., Pondicherry state, coll. G. Mathai, thus : Setour, 16 km. W. of Karikal and Vilidiyur, 11 km. SW of Karikal.

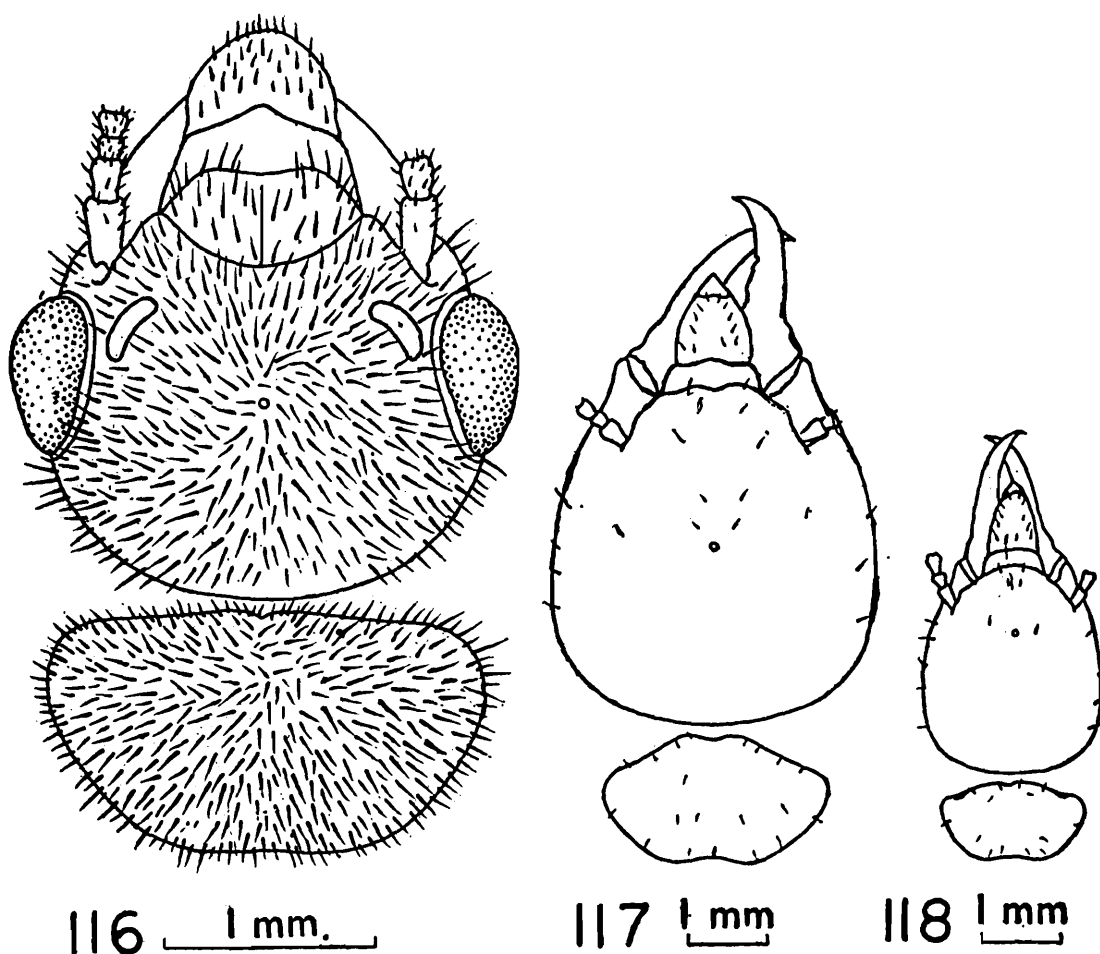
Measurements :

(i) <i>Imago</i> :		(1 ex.)
1. Total body-length without wings <i>c</i>	...	11.40
2. Length of head to base of mandibles	...	2.10
3. Max. width of head with eyes	...	2.90
4. Max. diameter of eye	...	0.83
5. Max. diameter of ocellus	...	0.35

6. Min. eye-ocellus distance	...	0.18
7. Max. length of pronotum	...	1.30
8. Max. width of pronotum	...	2.60

<i>Soldier</i> :		Major (2 exs.)	Minor (3 exs.)
1. Total body-length <i>c</i>	...	11.10—12.90	7.20—7.90
2. Length of head to base of mandibles	...	4.30—6.60	2.20—2.70
3. Max. width of head	...	3.90—4.13	1.88—2.35
4. Max. length of pronotum	...	1.45—1.50	0.88—1.05
5. Max. width of pronotum	...	2.60—2.93	1.48—1.72

Distribution : INDIA : Southern India : Tamil Nadu : Coimbatore, Madras, Madurai, Salem, Thanjavur (type locality), Top Slip ; Kerala : Pathanchathal (Southern Forest Div., Tranvancore) ; Karnataka : Bijapur,



Figs. 116 to 118. *Macrotermes convulsionarius* Koenig.

Fig. 116. Head and pronotum, in dorsal view, of imago.

Fig. 117. Ditto, soldier major.

Fig. 118. Ditto, soldier minor.

Kaladji, Kolar Forest Div., Hadagalli, Harpanahalli, Hospet, Magala ; Pondicherry ; Setour, Vilidiyur. It is also known from Sri Lanka (John, 1925.)

Biology : *M. convulsionarius* makes large nests under the ground surface. Above ground, it is reported to have been making 'rounded bosses of bare red mud' (Holmgren and Holmgren, 1917) at Hospet. At Salem, it has been found making small pinnacles of granular soil of 7-8 cm height.

Under the ground, it makes communicating galleries and chambers running horizontally. The fungus combs are reported to be small, having convolutions like that of a human ear.

The workers and soldiers go foraging in a file and make some sort of rattling noise when disturbed.

Remarks : Köning (1779) reported this species from Thanjavur (=Tanjore), Tamil Nadu. He gave a fairly good account of his field observations and a very brief description of the species. From the description alone it is impossible to identify this species but the observation of its habits definitely confirm that his description related to a *Macrotermes* species. There has been some controversy with regard to the name of the species as Desneux (1908) described it again as *estherae*. Holmgren and Holmgren (1917) state 'the description of *H. convulsionarius* is so incomplete as not to allow of any exact determination. Therefore, I consider it safest not to trouble about *convulsionarius* and to disregard this "species negligenda" once for all' and referred the specimens of this species to *estherae* (Desneux). Snyder (1949), in his catalogue, has followed Holmgren and Holmgren (1917). However, Hagen (1858), Bugnion (1913), Fletcher in Holmgren and Holmgren (1917) and John (1925) treat the name *convulsionarius* as valid. The writer agrees with this latter view, since König (1779) gave a description of the species, though very briefly, for his observations and description were definitely meant for a *Macrotermes* species and also for the reason that this is the only species of the genus known from southern India.

Genus *Odontotermes* Holmgren

- 1911. *Termes* (*Odontotermes*) Holmgren, K. Sv. Vet. Akad. Handl., 46 : 11 (No description).
- 1912. *Odontotermes* Holmgren, K. Sv. Vet. Akad. Handl., 48 : 35-40.
- 1949. *Odontotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 218.
- 1981. *Odontotermes* ; Thakur, *Indian For. Rec. (N. S.) Ent.*, 14(2) : 7-13.

Type-species : *Odontotermes vulgaris* (Haviland).

This is the most common genus. It is represented by 17 species in southern India and which are dealt with here.

Key to Species

(i) *Imago* :

- | | | |
|--|-----|--|
| 1(2) Postclypeus less than half of its width
[Head and body chestnut brown, ocelli large
(max. diameter:0.20 mm), segments 3 and 4
of antenna subequal] | ... | <i>distans</i> Holmgren
and Holmgren |
| 2(1) Postclypeus never less than half of its width | | |
| 3(6) Head-width including eyes 2.20—2.37 mm ;
pronotum-width 2.10—2.25 mm ; smaller
species | | |
| 4(5) Eyes smaller(max. diameter 0.50—0.58 mm) ;
ocelli oval (max. diameter 0.22—0.27 ; min.
diameter 0.19—0.20 mm) ; min. eye-ocellus
distance more, 0.19—0.30 mm | ... | <i>assmuthi</i> Holmgren |
| 5(4) Eyes larger (max. diameter 0.60—0.63 mm) ;
ocelli subcircular (max. diameter 0.23—0.25
min. diameter 0.20—0.23 mm) ; min. eye-
ocellus distance less, 0.13—0.15 mm | ... | <i>bellahunisensis</i>
Holmgren and
Holmgren |
| 6(3) Head-width including eyes 2.53—3.00 mm ;
pronotum width 2.20—2.66 mm ; larger
species | | |
| 7(8) Eyes larger (max. diameter 0.83—0.98 mm)
and strongly bulging out (Fig. 140) ; ocelli
large, long diameter 0.37—0.45 mm | ... | <i>wallonensis</i>
(Wasmann) |
| 8(7) Eyes medium sized (max. diameter 0.60—0.80
mm) and less prominently bulging out (Figs.
134, 136) ; ocelli small, long diameter
0.23—0.33 mm | | |
| 9(12) Min. eye-ocellus distance much less than
the max. diameter of ocellus | | |
| 10(11) Min. eye-ocellus distance half or a little less
than half of short diameter of ocellus | ... | <i>obesus</i> (Rambur)/
<i>redemanni</i> (Was-
mann) |
| 11(10) Min. eye-ocellus distance more than half of
short diameter of ocellus | ... | <i>brunneus</i> (Hagen) |
| 12(9) Min. eye-ocellus distance nearly equal to or
a little more than max. diameter of ocellus | | |

- 13(14) Head light castaneous brown ; pale area around fontanelle large ; paler species ... *ceylonicus* (Wasmann)
- 14(13) Head dark castaneous brown ; pale area around fontanelle small ; darker species
- 15(16) Wings hairy only near distal tip ; forewings long, length 23.0-24.0 mm ; head-width including eyes 2.68-2.80 mm ... *horni* (Wasmann)
- 16(15) Wings hairy on distal half ; forewings shorter, length 21.0 mm ; head-width including eyes 2.60-2.85 mm ... *feae* (Wasmann)
- (ii) *Soldier* :
- For proper association of imagos, with soldiers and workers, which are more commonly available, characters of imagos have been added in this key to soldiers, in whichever case the imago caste is known.
- 1(18) Tooth on left mandible situated near about distal third
- 2(11) Head-capsule roundly oval, sides fairly convex
- 3(8) Mandibles long and thin ; mandible-head index (i.e., mandible-length/head length) 0.59-0.70
- 4(5) Tooth of left mandible forwardly placed, left mandibular tooth index (i.e., tooth distance/length of mandible) 0.21-0.25 ... *roonwali* Bose
- 5(4) Tooth of left mandible backwardly placed, left mandibular tooth index above 0.30
- 6(7) Mandibles thin and slender (Fig. 139) ; smaller species ; head-length 1.05-1.14, head-width 0.89-0.98 ... *vaishno* Bose
- 7(6) Mandibles thicker and stouter ; larger species ; head length 1.15-1.48, head-width 0.98-1.18 (Imago : Head-width with eyes 2.70-2.87 ; diameter of eye 0.70-0.88 ; long diameter of ocellus 0.35-0.45 ; eye-

- ocellus distance about half of or little less than half of short diameter of ocellus, 0.07-0.14 mm) ... *obesus* (Rambur)/
redemanni (Wasmann)
- 8(3) Mandibles short and stout ; mandible-head index 0.49-0.57
- 9(10) Head-length to base of mandibles 1.20-1.25, head-width 1.08-1.10 mm ; smaller species ; mandibles comparatively longer, mandible-head index 0.52-0.57 (Imago : Smaller, head-width with eyes 2.20-2.25 ; diameter of eye 0.60-0.63 ; long diameter of ocellus 0.23-0.25 ; eye-ocellus distance more than half of short diameter of ocellus, 0.13-0.15 mm) ... *belahunisensis*
Holmgren and
Holmgren
- 10(9) Head-length to base of mandibles 1.83-1.87, head-width 1.43-1.53 mm ; larger species ; mandibles comparatively shorter, mandible-head index 0.49-0.52 ... *mathadi* Roonwal &
Chhotani
- 11(2) Head-capsule weakly oval to subrectangular, sides substraight to weakly convex
- 12(15) Mandibles strongly incurved in distal half (Figs. 124, 141)
- 13(14) Head-length to base of mandibles 1.75-2.03 mm ; larger species (Imago : Head-width with eyes 2.81 mm ; eye-ocellus distance more than half of short diameter of ocellus ; postclypeus dark brown, nearly of same colour as head) ... *brunneus* (Hagen)
- 14(13) Head-length to base of mandibles 1.53-1.68 mm ; smaller species (Imago : Head-width with eyes 2.75-3.23 ; diameter of eye 0.83-0.98 ; long diameter of ocellus 0.37-0.45 ; eye-ocellus distance less than short diameter of ocellus) ... *wallonensis*
(Wasmann)

- 15(12) Mandibles weakly incurved near distal tip (Figs. 119, 121, 126, 128, 129, 131, 132)
- 16(17) Mandibles thick and stout (Fig. 121) (Imago : Smaller and darker, head-width with eyes 2.20-2.30 ; diameter of eye 0.50—0.58 ; long diameter of ocellus 0.22—0.27 ; eye-ocellus distance equal to or more than long diameter of ocellus, 0.19-0.30 mm) ... *assmuthi* Holmgren
- 17(16) Mandibles thin and long (Fig. 132) ... *kulkarnii* Roonwal and Chhotani
- 18(1) Tooth on left mandible situated at about middle or on basal half
- 19(22) Head-length to base of mandibles more than 2.50 mm ; larger species
- 20(21) Head sides convex, appreciably converging in front ; left mandibular tooth lying near middle (Fig. 128) (Imago : Head-width with eyes 2.60-2.85 ; diameter of eye 0.60-0.70 ; long diameter of ocellus 0.30-0.33 ; eye-ocellus distance little shorter than long diameter of ocellus, 0.20-0.23 mm ; wings hairy on distal half) ... *feae* (Wasmann)
- 21(20) Head sides straighter, weakly converging in front ; left mandibular tooth lying a little below middle (Fig. 131) (Imago : Head-width with eyes 2.68-2.80 ; diameter of eye 0.75 ; long diameter of ocellus 0.30 ; eye-ocellus distance little shorter than long diameter of ocellus, 0.25 mm ; wings hairy near distal tip) ... *horni* (Wasmann)
- 22(19) Head-length to base of mandibles less than 2.50 mm ; smaller species
- 23(24) Tooth of left mandible lying at middle ; head subrectangular, sides substraight (Fig. 126) (Imago : Head-width with eyes 2.50-2.66 ; diameter of eye 0.60-0.70 ; long diameter of ocellus

- 0.23-0.30 ; eye-ocellus distance equal to short diameter of ocellus, 0.20 mm) ... *ceylonicus* (Wasmann)
- 24(23) Tooth of left mandible lying a little above middle ; head subrectangularly oval, sides weakly convex (Figs. 119, 129)
- 25(26) Antennae with 16 segments, segment 4 shortest ; labrum with a single pair of long bristles near tip ... *feaeoides* Holmgren and Holmgren
- 26(25) Antennae with 17 segments, segment 3 shortest ; labrum with 4 pairs of long bristles near tip ... *anamallensis* Holmgren and Holmgren

Note on *Odontotermes parvidens* Holmgren & Holmgren

Odontotermes parvidens was described from soldiers and workers by Holmgren & Holmgren (1917) from collections from South India (on road from Mysore and Mercara), Assam, Bengal and Panjab and later reported from several localities in Northern and North-Eastern India, Pakistan, Bangla Desh and Bhutan, by various authorities (Roonwal & Pant, 1953 ; Ahmad, 1955 ; Mathur & Sen-Sarma, 1958 ; Mathur & Thapa, 1962 ; Chatterjee & Thakur, 1967, Roonwal & Chhotani, 1962a, 1977 ; Akhtar, 1974, 1975). There are no records of the occurrence of this species from southern India except that of Holmgren & Holmgren, 1917. The collection from Southern India from which the authors reported the species is not traceable, but some extensive collections made by a number of termitologists in southern India and even from areas between Mysore and Mercara were available to the author for the present study. No material belonging to this species was found to be present in the collection and as such it is felt that the species *parvidens* as we know it today does not occur in southern India and that the collection from between Mysore and Mercara before the authors of this species, evidently belonged to some other closely allied species. As such this species is not taken into account here.

Thakur (1981) in his recent revision of the genus *Odontotermes* has treated *parvidens* as a synonym of *O. distans* Holmgren & Holmgren which was described from Shevaroy Hills in Southern India from the

imago caste. He found that the imago of *parvidens* as described by Mathur and Sen-Sarma (1958) from Dehra Dun matches very well with the syntype imago of *distans* from Shavaroy Hills. As the imagos of a number of species of this genus are very close to each other, and as no associated soldiers and workers of *distans* matching the soldiers and workers of *O. parvidens* as we know today have been collected from southern India and even from either Shevaroy Hills or from between Mysore and Mercara, the author feels that it is not right to treat *parvidens* as a synonym of *distans* and it is inferred that the species *parvidens* occurs only in the northern parts of the subcontinent while *distans* is from southern India.

57. *Odontotermes anamallensis* Holmgren and Holmgren
(Fig. 119)

1917. *Odontotermes (Odontotermes) anamallensis* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5(3) : 157-158, S. and W. Type-locality : Anamalai Hills, Tamil Nadu, India.
1949. *Odontotermes (Odontotermes) anamallensis* ; Snyder, *Smiths. misc. Coll.*, 112 : 219.

(a) *Material* : From Tamil Nadu, Karnataka and Kerala, states as follows :

Lot 1. A vial with workers only Anamalai Hills, Tamil Nadu, coll. T. B. Fletcher, Jan. 1912 (Probably syntypes).

Lot 2. Five vials, with S. and W., coll. M.L. Roonwal, February, 1955, thus : R5/15.2.55 and R5/17.2.55 (2 vials), Nilambur, Kerala, ex. dried cowdung and under leaves, respectively; R5 and R6/24.2.55 and R5/25.2.55 (3 vials), Makut, Coorg, Karnataka, ex. rotten billets of *Carallia integrata* (3 vials), moist rotten billet and lump of earth in hollow of felled tree, respectively.

Lot 3. Three vials, with S. and W. coll. O. B. Chhotani, February, 1969, thus 028 and 030/18.2.69, Top slip, Tamil Nadu ex. earthen layers and sheaths over unknown trees and 037/23.2.69, Suranganar Res. Forest, nr. Lower Camp, Tamil Nadu.

Measurements :

<i>Soldier</i> :		Range (5 exs.)
1. Total body-length <i>c</i>	...	6.10—6.40
2. Length of head to base of mandibles	...	2.25—2.30
3. Max. width of head	...	1.75—1.85
4. Max. length of pronotum	...	0.73—0.80
5. Max. width of pronotum	...	1.30—1.40

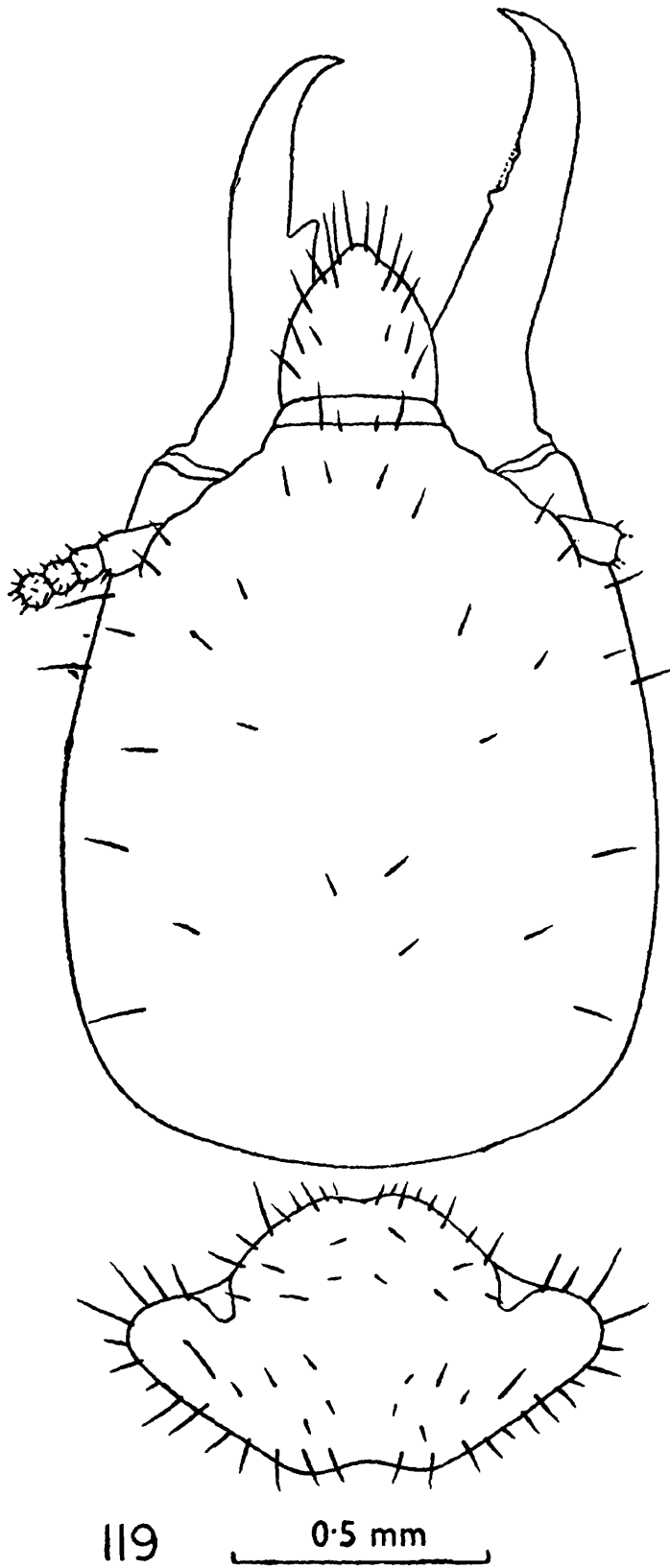


Fig. 119. Head and pronotum, in dorsal view, of soldier of *Odontotermes anamallensis* Holmgren and Holmgren.

Distribution : INDIA : Southern India : Tamil Nadu : Anamalai Hills, Top Slip, Suranganar Reserve Forest (nr. Lower Camp) ; Kerala : Nilambur ; Karnataka : Makut (Coorg).

Biology : Nothing much is known about the biology and nesting habits of this species. Its nests are most probably found underground. Above the ground it has been found feeding on dead and damp woods lying in a jungle and on bark of some unknown trees.

58. *Odontotermes assmuthi* Holmgren

(Figs. 120-121)

1913. *Odontotermes (Odontotermes) assmuthi* Holmgren, *J. Bombay nat. Hist. Soc.*, 22(1) : 112-113. S. and W. (maj. and min.) Type locality : Borivili Jungle, Bombay.

1949. *Odontotermes (Odontotermes) assmuthi* ; Snyder, *Smiths. misc. Coll.*, 112 : 220.

Material : From Tamil Nadu and Karnataka states, as follows :

Lot 1. Three vials with S. and W., coll. O. B. Chhotani, 5-8. xi. 1962, Dharwar, Karnataka, thus : 04/5.11.62, ex. galleries over an unknown tree ; 015/5.11.62, under dead leaves ; 06/8.11.62, under cowdung ; and 025/12.2.69, Yercaud, Tamil Nadu, c 1500 m alt., 12.ii. 1969, ex. dead pieces of wood.

Lot 2. A vial with S. and W., coll. T. B. Fletcher, Yercaud, Tamil Nadu, det. Holmgren and Holmgren '*Odontotermes malabaricus*' (syntypes of *O. malabaricus*).

Lot 3. A vial with Im., S. and W., Karwar, Karnataka, coll. T. R. Bell, June, 1943.

Measurements :

(i) <i>Imago</i>		Range (5 exs.)
1. Total body-length with wings <i>c</i>	...	24.00
2. Total body-length without wings <i>c</i>	...	12.00—14.10
3. Length of head to base of mandibles	...	1.68—1.70
4. Max. width of head including eyes	...	2.21—2.30
5. Max. diameter of eye	...	0.55—0.58
6. Max. diameter of ocelli	...	0.22—0.23
7. Min. eye-ocellus distance	...	0.25—0.30
8. Max. length of pronotum	...	1.10—1.20
9. Max. width of pronotum	...	2.10—2.18
10. Length of forewing with scale	...	18.70
11. Length of hindwing with scale	...	18.00

(ii) <i>Soldier</i> :	Range (6 exs.)
1. Total body-length c	... 4.30—4.75
2. Length of head to base of mandibles	... 1.52—1.68
3. Max. width of head	... 1.18—1.25
4. Max. length of pronotum	... 0.45—0.54
5. Max. width of pronotum	... 0.76—0.88

Distribution : INDIA : Southern India : Karnataka State : Dharwar, Mercara ; Tamil Nadu : Shevaroy Hills, Yercaud. Elsewhere : It is a common species and is known to occur almost all over the country ; it is recorded from Panjab, Uttar Pradesh, Bihar, Madhya Pradesh and Maharashtra states.

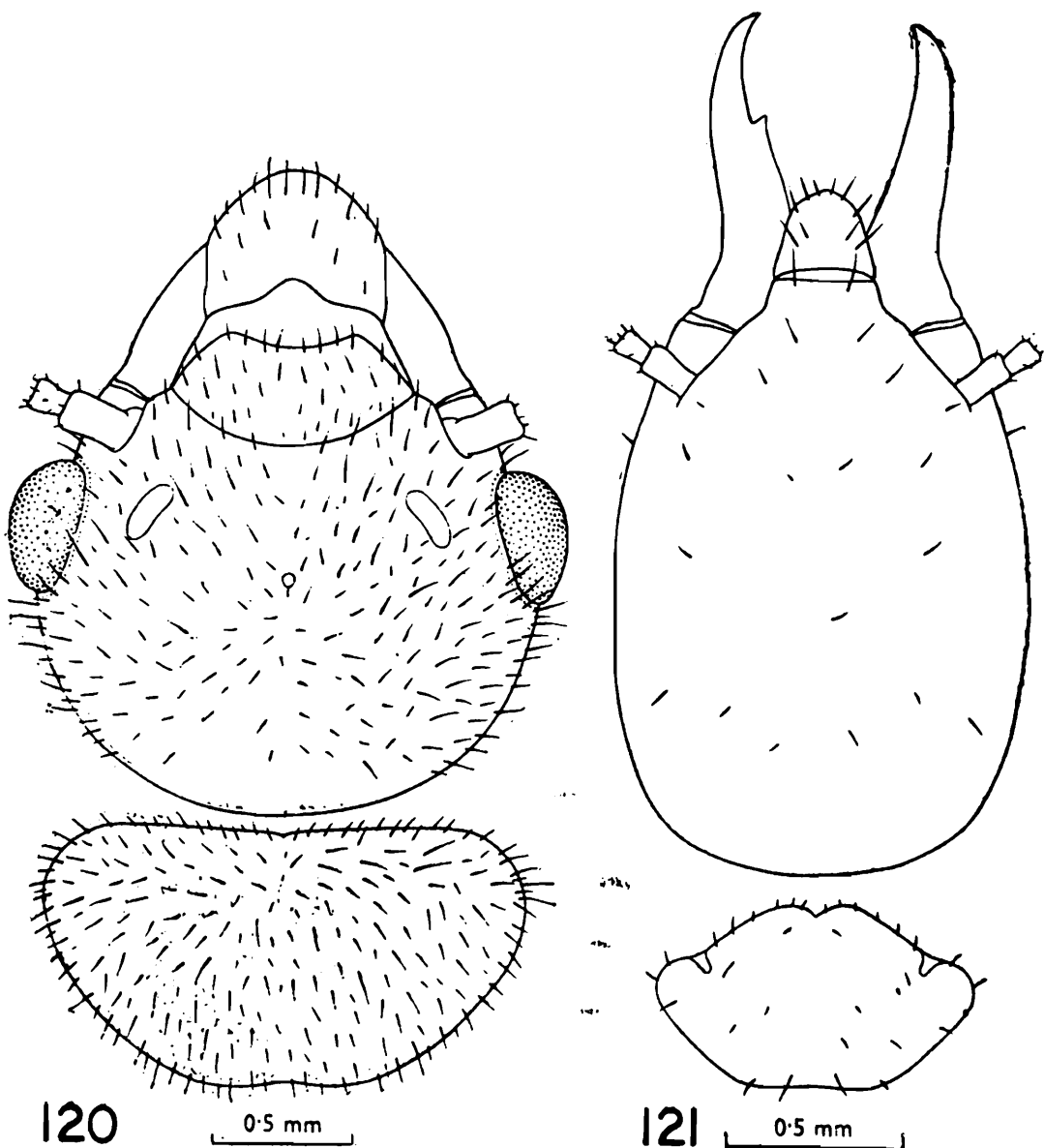


Fig. 120-121. *Odontotermes assmuthi* Holmgren

Fig. 120. Head and pronotum of imago, in dorsal view.

Fig. 121. Ditto, soldier.

Biology: The nests of this species are found underground and also in the mounds of other *Odontotermes* species. The nest is rather diffused with narrow galleries. It makes galleries of earth over the surface of ground, under dry leaves lying on ground and on tree trunks. It feeds on dead wood, dried up cowdung, barks of standing trees and logs. It is also a serious pest of sugarcane. Swarming is reported in the afternoon during the months of June and July and in early hours in August.

59. *Odontotermes bellahunisensis* Holmgren and Holmgren
(Figs. 122-123)

1917. *Odontotermes (Cyclotermes) bellahunisensis* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5(3): 150-151, Im., S. and W. Type-locality: Bellahunisi, Bellary District, Karnataka.
1949. *Odontotermes (Odontotermes) bellahunisensis*; Snyder, *Smiths. misc. Coll.*, 112: 221.
1961. *Odontotermes bellahunisensis bellahunisensis*; Roonwal and Bose, *J. Bombay nat. Hist. Soc.*, 58(3): 580-594.

Material: Lot 1. Three vials from Bellahunisi, Bellary Dist, Karnataka, coll. T. B. Fletcher, 30, viii. 1912, with types, as follows: (i) Lectotype S.; (ii) Paralectotype S. (5) and (iii) Paralectomorphotype Im. (2) and W. (5).

Lot 2. Two vials with S. and W. from Tamil Nadu as follow: (i) Madras, coll. P. P., 25. v. 1961 and (ii) Coimbatore (Southern Forest Res. Centre), coll. J. C. Basuchowdhury, 19. iii. 1968.

Lot 3. Seven vials from Tamil Nadu, coll. O. B. Chhotani, Feb., 1969, as follows: 03/11.2.69, 01/12.2.69 and 012/13.2.69 (3 vials), Salem, ex. twigs, soil, and cowdung, respectively; 017/11.2.69, Kurambapatty Res. Forest, Salem, from under stone; 010/27.2.69, Kanyakumari, from soil; 011/28.2.69, Mylar, Kulasekarum Forest Range; and 012/22.2.69, Periyakulam, from galleries over a cocoanut palm.

Measurements:

(i) <i>Imago</i> :		(Range 2 exs.)
1. Total body-length (without wings) <i>c</i>	...	11.60—12.30
2. Length of head to base of mandibles	...	1.75 — 1.80
3. Max. width of head with eyes	....	2.20— 2.25
4. Max. diameter of eye	...	0.60 — 0.63
5. Max. diameter of ocellus	....	0.23— 0.25
6. Min. eye-ocellus distance	...	0.13— 0.15

7. Max. length of pronotum	...	1.15— 1.23
8. Max. width of pronotum	...	2.10— 2.25
9. Length of forewing scale	...	1.10— 1.13
10. Length of hindwing scale	..	1.00— 1.03

(ii) <i>Soldier</i> :		Range (5 exs.)
1. Total body-length <i>c</i>	...	4.15—4.25
2. Length of head to base of mandibles	...	1.20—1.25
3. Max. width of head	...	1.03—1.15
4. Max. length of pronotum	...	0.50—0.53
5. Max. width of pronotum	...	0.80—0.86

Distribution : INDIA : Southern India : Karnataka : Bellahunisi, Bangalore ; Tamil Nadu : Coimbatore, Kanyakumari, Kurambapatty

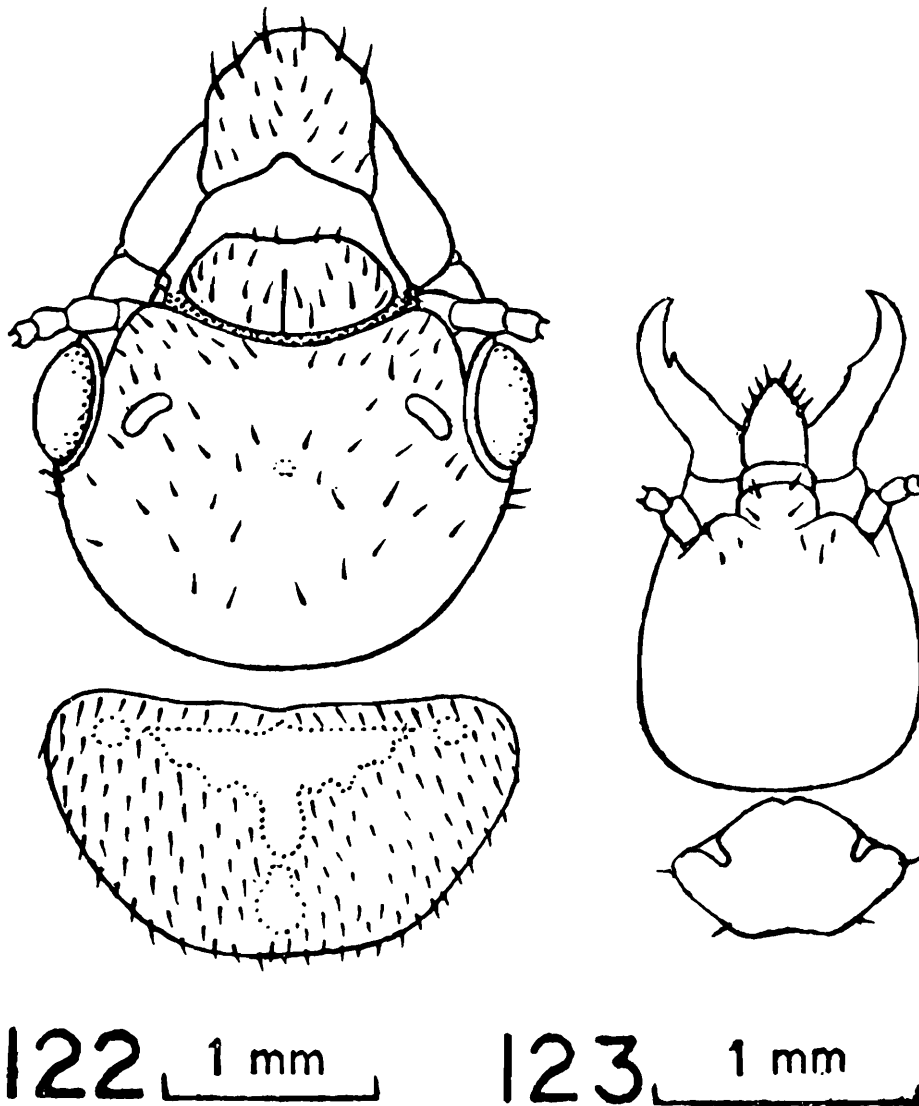


Fig. 122-123. *Odontotermes bellahunisensis* Holmgren & Holmgren
 Fig. 122. Head and pronotum of imago, in dorsal view.
 Fig. 123. Ditto, soldier.

Reserve Forest (Salem), Madras, Mylar (Kulasekaram Reserve Forest), Periyakulam, Salem.

Biology: This species does not construct any mound on the ground surface. The nest is underneath the ground and it has been observed issuing from holes in the ground. It has also been collected from under cowdung and stones, while making earthen galleries over cocoanut palm trees and from twigs.

60. *Odontotermes brunneus* (Hagen)

(Fig. 124)

1858. *Termes brunneus* Hagen, *Linn. Ent.*, 12 : 133-136. Im. and S. Type-locality : Bengal.

1949. *Odontotermes (Odontotermes) brunneus* ; Snyder, *Smiths. misc. Coll.*, 112 : 223.

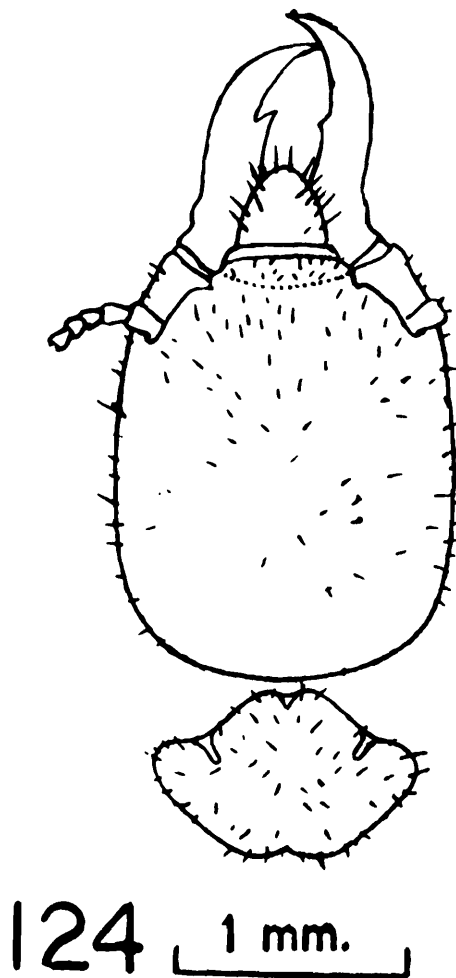


Fig. 124. Head and pronotum of soldier of *Odontotermes brunneus* (Hagen) (Redrawn from Roonwal & Bose, 1964)

Material : From Karnataka and Tamil Nadu, states as follows :—
 Lot. 1. Five vials with S. and W., coll. M. L. Roonwal, Feb./Mar. 1955, thus : R5/13.2.55, Coimbatore, Tamil Nadu, ex. mound ; R12/2.3.55, Krishnarajasagar Dam, 20 Km N-W of Mysore, Karnataka, ex. mound ; R11/3.3.55, Yelwal Forest, 14 km W of Mysore, Karnataka, from soil under dry cowdung ; R2/5.3.55, Chikbillapur, Kolar Forest Div., Karnataka, from soil under cowdung ; and R16/5.3.55, Koremangla Casuarina Plantation, about 32 km N-E of Bangalore, Karnataka.

Lot 2. Five vials with S. and W., coll. O. B. Chhotani, thus : 033 and 034/14.11.62 (2 vials), Bermangal, 32 km from Bangalore on Bangalore-Mysore Road, Karnataka, under stones ; 021/18.11.62, Meghalpura, Karnataka, from earthen galleries over *Acacia* tree ; 018 and 025/22.2.69 (2 vials), Periyakulam, Tamil Nadu, from dry palm leaves and layers of earth on a cocoanut.

Measurements :

(i) *Imago* (From Holmgren, 1913 b) :

1. Total body-length with wings <i>c</i>	...	29.00
2. Total body-length without wings <i>c</i>	...	12.00—14.00
3. Length of head (probably up to tip of labrum)	...	3.34
4. Width of head	...	2.81
5. Width of pronotum	...	2.00
6. Length of pronotum	...	1.25

(ii) *Soldier* :

		Range (5 exs.)
1. Total body-length <i>c</i>	...	5.60—6.20
2. Length of head to base of mandibles	...	1.73—1.88
3. Max. width of head	...	1.40—1.50
4. Max. length of pronotum	...	0.68—0.73
5. Max width of pronotum	..	1.13—1.18

Distribution : INDIA : Southern India : Karnataka : Bermangal (about 32 km from Bangalore on road to Mysore), Chikbillapur (Kolar Forest Div.), Koremangla Plantation (32 km N-E of Bangalore), Krishnarajasagar Dam (20 km N-W of Mysore), Yelwal Forest (14 km W of Mysore) ; Tamil Nadu : Coimbatore, Madras, Periyakulam. Elsewhere : North India, Bombay, Bengal, Poona, and Rajkot (Gujarat).

Biology : It is a mound building termite and its mounds are reported from Poona, Coimbatore, Mysore and Rajkot. The mounds are subconical to dome-shaped structures of 75-150 cm height. Inside

there are rounded chambers with sponge-like fungus combs and chimney like shafts and the nest extends below to a depth which is equal to its height above the ground level. The royal chamber is a flat, oval, saucer-shaped structure, lying either in the middle of the mound or below or above the ground level. More than one queen have been recorded in some mounds. Assmuth (in Holmgreen, 1912) observed 3 royal chambers in a mound at Poona and Roonwal (1973) found 3 queens in a single royal chamber at Rajkot. The fungus combs are brownish grey, granular, and sponge-like structures of varying sizes. Roonwal (1973) has described the mound and its structure in detail.

This termite has also been collected from soil under cowdung and while feeding on *Acacia* bark and palm leaves lying on ground.

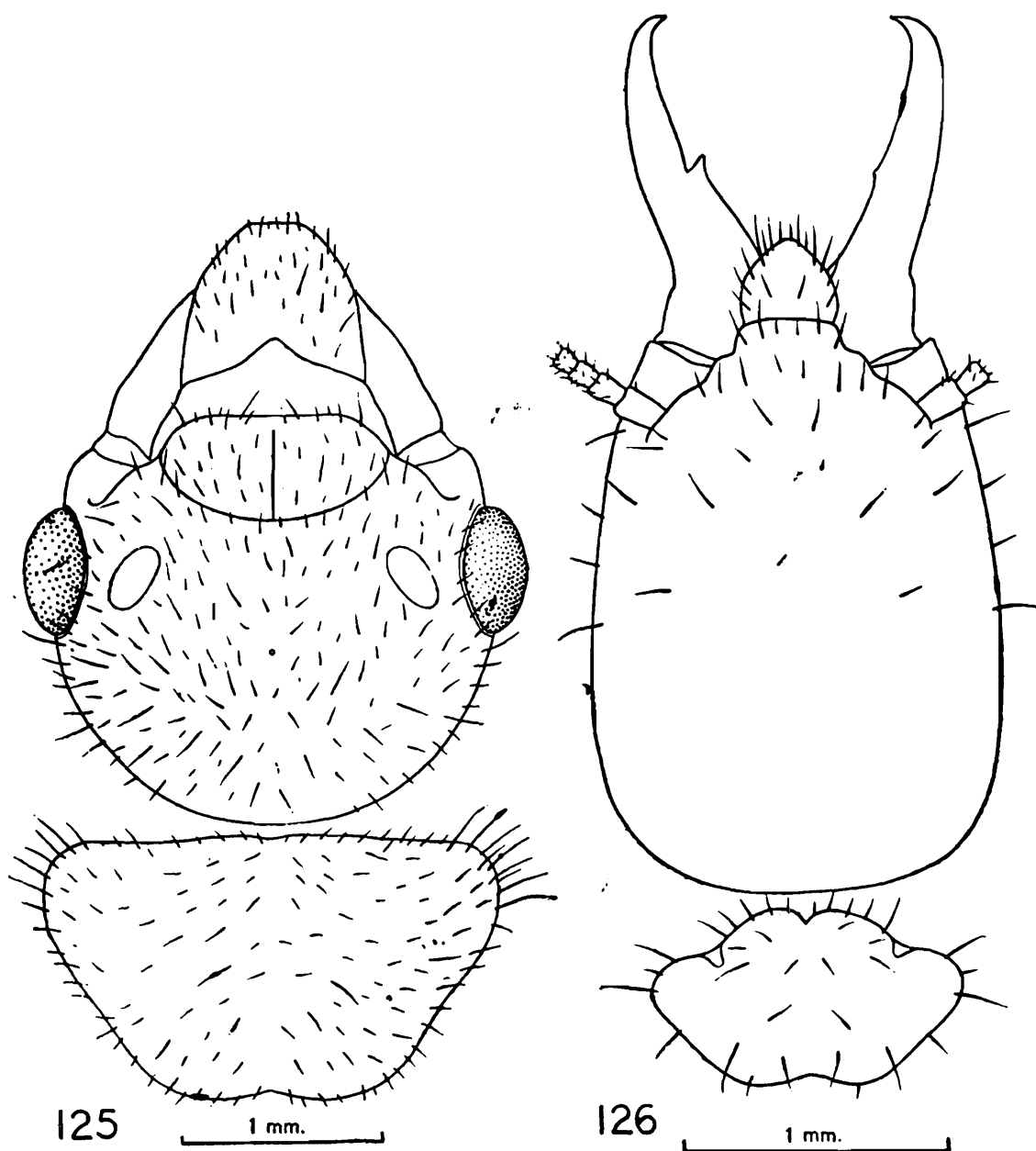
61. *Odontotermes ceylonicus* (Wasmann)

(Figs. 125-126)

1902. *Termes ceylonicus* Wasmann, *Zool. Jb. (Syst.)*, 17(1) : 112-113. S. and W. Type localities : Nalanda, Bentota and Bandrawella in Sri Lanka.
 1940. *Odontotermes (Odontotermes) ceylonicus* : Snyder, *Smiths. misc. Coll.*, 112 : 225.
 1959. *Odontotermes meturensis* Roonwal and Chhotani, *Sci. & Cult*, 25(5) : 325-326. Type-locality : Metur Dam, Tamil Nadu. New synonymy.

Material : From Karnataka, Tamil Nadu and Kerala, states as follows :—Lot 1. Holotype S. morphotype W. and paratype S. and W. of *meturensis* Roonwal and Chhotani, Metur Dam, Tamil Nadu, coll. T. G. Vazirani, Feb., 1952, ex. a log of wood lying on ground ; a paratype S. of *O. meturensis*, Bangalore, coll. K. S. S. Sastry, June, 1956, ex. 'the root region of *Poinciana regia* Bojer' and a paratype S. of *O. meturensis*, Bangalore, coll. K. S. S. Sastry, July, 1956. A vial with Im. S. and W., Bangalore, coll. N. Annandale, 17.x. 1910. 'issuing from holes in the ground at dusk, det. F. Silvestri '*Termes ceylonicus* Wasm. var. and det. Roonwal and Chhotani, 1964, '*Odontotermes meturensis* Roonwal and Chhotani', redet. here '*Odontotermes ceylonicus* Wasmann'.

Lot 2. Five vials with S. and W., coll. M. L. Roonwal, Feb.-Mar., 1955, thus : R9/11.2.55, Anamalai Hills, Tamil Nadu, under cowdung ; R6/15.2.55, R8/16.2.55, R10/16.2.55 and R12/17.2.55 (4 vials), Nilambur Kerala ; R6/3.2.55, Chamundi Hills, 14 km off Mysore, Karnataka, from soil under stone and Bangalore, Karnataka (2 vials), from bark of *Mangifera indica*, and bark of an unknown tree.



Figs. 125-126. *Odontotermes ceylonicus* (Wasmann)

Fig. 125. Head and pronotum of imago, in dorsal view.

Fig. 126. Ditto, soldier.

Lot 3. Three vials with S. and W., Trivandrum, Kerala, coll. ?, 29. xi. 1958, and a vial with S. and W. Coimbatore, Tamil Nadu, coll. Dhanuskhoti, 30. vii. 1962, from Bamboo.

Lot 4. Fifteen vials with S. and W., coll. O.B. Chhotani, Nov. 1962, and Feb.-Mar., 1969, thus : Karnataka : 020/6.11.62, Ramachandra plantation, 50 km from Bangalore on road to Kolar, from stem of a mango tree ; 015/15.11.62, Shanbhoganhali, 40 km from Bangalore on road to Magdi, from galleries in between two stones. Tamil Nadu :

012/11.2.69, Kurambapatty Reserve Forest, Salem, under layers of earth over *Eucalyptus* tree ; 014 and 17/12.2.69 (2 vials), Yercaud ; 021,036,044/18.2.69 and 07/19.2.69 (4 vials), Top Slip, under layers of earth over trees ; 012/22.2.69, Periyakulam, from galleries over a cocoanut palm ; 05/24.2.69, Vanathiparai Reserve Forest, Lower Camp, from galleries over teak tree and 02/2.3.69, between Theni and Kumbum, from log of cocoanut.

Measurements :

(i) <i>Imago :</i>	Range (3 exs.)
1. Total body-length (without wings) <i>c</i>	... 12.50—13.15
2. Length of head to base of mandibles	... 1.90— 2.00
3. Max. width of head with eyes	... 2.50— 2.66
4. Max. diameter of eye	... 0.60— 0.70
5. Max. diameter of ocellus	... 0.23— 0.30
6. Min. eye-ocellus distance	... 0.20
7. Max. length of pronotum	... 1.47— 1.50
8. Max. width of pronotum	... 2.33
(ii) <i>Soldier :</i>	Range (10 exs.)
1. Total body-length <i>c</i>	... 5.10—7.4
2. Length of head to base of mandibles	... 1.68—2.10
3. Max. width of head	... 1.28—1.55
4. Max. length of pronotum	... 0.55—0.70
5. Max. width of pronotum	... 0.95—1.20

Distribution : INDIA : Southern India : It is fairly widely distributed in southern India as follows : Tamil Nadu : Anamalai Hills, Coimbatore, Mylar (Kulasekarum Res. Forest), Kurambapatty Reserve Forest (Salem), Vanathiparai Reserve Forest (Lower Camp) and Yercaud (Shevaroy Hills) ; Karnataka : Bangalore, Dandeeli, Dharwar, Chamundi Hills (Mysore), Ramachandra Plantations (50 km from Bangalore on road to Kolar), and Shanbhoganhalli (40 km from Bangalore on road to Magdi) ; Kerala : Nilambur. Elsewhere : It is a common species in Sri Lanka.

Biology : The nests of *O. ceylonicus* are underground and for foraging, the species makes covered runways and lays sheats of earth over tree trunks, feeding on bark. It has also been collected from under stones, cowdung, dead logs and pieces of wood lying on ground and from the root region of certain plants. In Sri Lanka, it has been collected along with several other species and its nests and chambers have

been found in the mounds of *Hypoterme obscuriceps*. It is also an important species infesting buildings in Sri Lanka. Swarming has been observed in the months of October, from ground through small holes, at dusk.

Remarks : *Odontotermes ceylonicus* is a very variable species. The shape and size of the head of the soldier is so variable that one tends to put different collections to different species. This is probably the reason that led Roonwal and Chhotani (1959) to describe *O. meturensis* from some specimens from Bangalore and Metur Dam and Silvestri to determine a few specimens from Bangalore, in the Z. S. I. collection, as a variety of *O. ceylonicus*. The author had the opportunity to examine a large collection of *ceylonicus* from India and Sri Lanka and also the types of *O. meturensis*, and could not separate the two species.

62. *Odontotermes distans* Holmgren and Holmgren

1917. *Odontotermes (Cyclotermes) distans* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 : 52. Im. Type-locality : Kadiar Rock, Shevaroy Hills, Tamil Nadu.

1949. *Odontotermes distans* ; Snyder, *Smiths. misc. Coll.*, 112 : 225.

Material : Material of this species was not available for study ; the original measurements of imago, as given by Holmgren and Holmgren (1917) are, therefore, reproduced here.

Measurements :

Imago (From Holmgren & Holmgren, 1917) :

Length with wings	...	27.00 mm
Length without wings	...	13.00 mm
Length of forewing	...	24.00 mm
Breadth of head	...	(?) 2.02 mm
Breadth of pronotum	...	2.43 mm
Length of pronotum	...	1.29 mm

Distribution : INDIA : Southern India : Kadiar Rocks, Shevaroy Hills, Tamil Nadu.

Biology : Nothing is known about the biology of this species.

63. *Odontotermes feae* (Wasmann)

(Figs. 127-128)

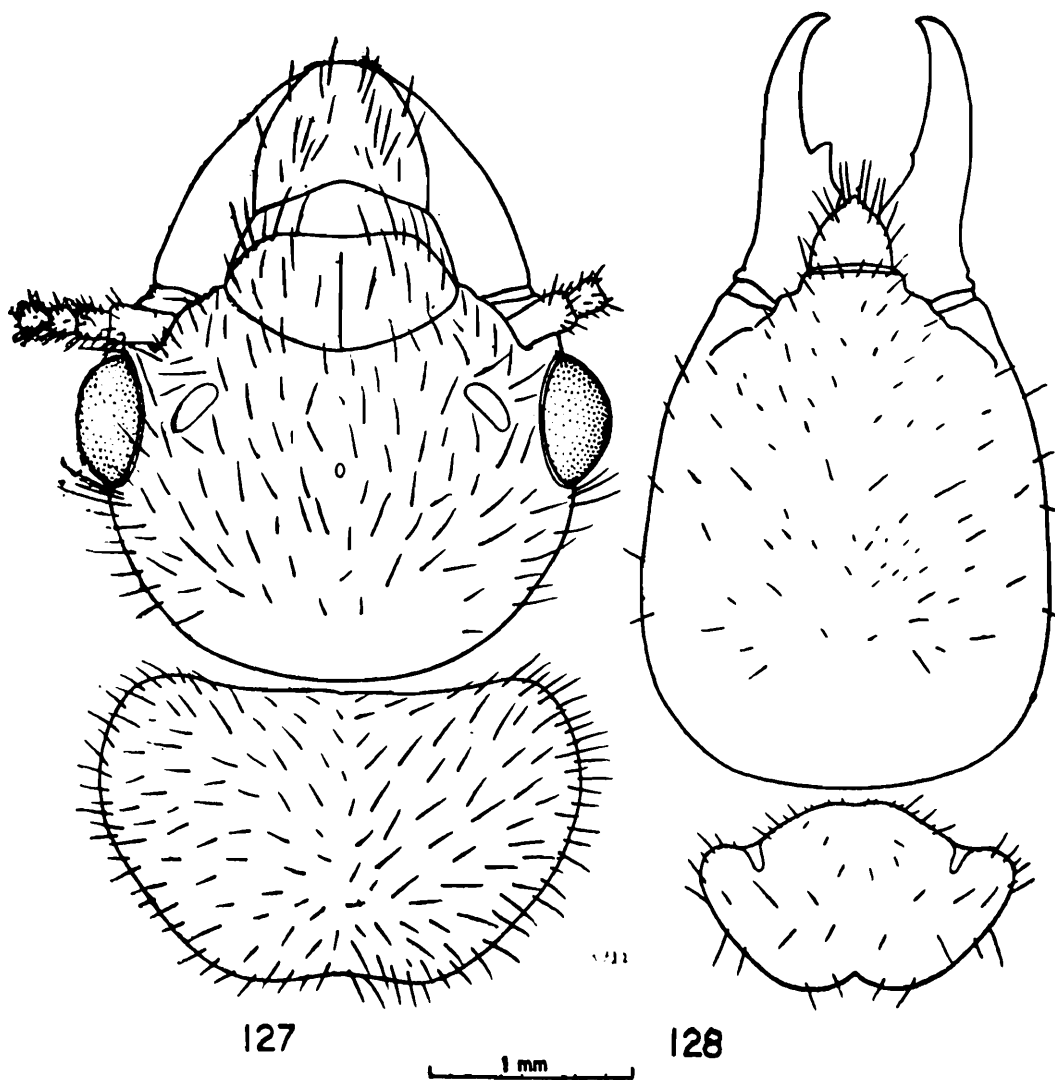
1896. *Termes feae* Wasmann, *Ann. Mus. Civ. Stor, nat. Geneva*, (2) 16 : 625-626. S. and W. Type-locality : Carin Cheba, Burma.

1949. *Odontotermes (Odontotermes) feae* ; Snyder, *Smiths. misc. Coll.* 112 : 226-227.

Material : From Karnataka and Tamil Nadu, states as follows :—
 Lot 1. A vial with S. and W., Dharwar, coll. T. B. Fletcher, Feb., 1912, det. K. and N. Holmgren.

Lot 2. Seven vials with S. and W., Karnataka state, coll. O. B. Chhotani, 6. xi. 1962, thus : 010,011 and 015/6.11.62 (3 vials), Dharwar, ex. galleries over grass on ground, under leaves and on stem of 'Karanji' tree, respectively ; 06/8.11.62, and 08/8.11.62, Dharwar, ex. base of 'Karanji' tree and under cowdung and soil, respectively ; and 011/11.11.62, Attigundi village, Bababuddin Hills, under fallen leaves.

Lot 3. Five vials with S. and W., Tamil Nadu state, coll. O. B. Chhotani, February, 1969, thus : 06,012,022 and 030/18.2.69 (4 vials), Sirkarpadi Tunnel Entry, Top Slip, ex. rotten wood, rotten bamboo,



Figs. 127-128. *Odontotermes feae* (Wasmann)
 Fig. 127. Head and pronotum of imago, in dorsal view (from Barkuda Isl., Chilka Lake, Orissa).
 Fig. 128. Ditto, soldier (from southern India).

earthen layers of earth over a tree and under layers of earth over a small plant, respectively ; and 017/28.2.69, Mylar, Kulasekaram Res. Forest, ex. dead wood.

Measurements :

(i) <i>Imago</i> (From specimens from Orissa) :	<i>Range</i> (2 exs.)
1. Total body-length without wings <i>c</i> ...	11.00 (king)
2. Length of head to base of mandibles ...	1.93—1.95
3. Max. width of head ...	2.60—2.80
4. Max. diameter of eye ...	0.60—0.63
5. Max. diameter of ocellus ...	0.30—0.33
6. Min. eye-ocellus distance ...	0.20—0.23
7. Max. length of pronotum ...	1.38—1.50
8. Max. width of pronotum ...	2.48—2.60
(i) <i>Soldier</i> :	<i>Range</i> (5 exs.)
1. Total body-length <i>c</i> ...	7.30—7.60
2. Length of head to base of mandibles ...	2.50—2.60
3. Max. width of head ...	2.05—2.20
4. Max. length of pronotum ...	0.90—0.96
5. Max. width of pronotum ...	1.58—1.65

Distribution : INDIA : Southern India : Karnataka state : Bababuddin Hills, Bangalore, Belgaum, Mercara, Margalli, Dandeli, Dharwar ; Tamil Nadu : Coimbatore, Mylar, Shevaroy Hills, Top Slip. Otherwise : It is a widely distributed species in India, Bangla Desh, Burma, Thailand and Vietnam.

Biology : It is a common earth dwelling termite attacking dead wood, timbers in houses and *Eucalyptus* seedlings. The nests in the ground are large and massive and cover an area of 1.5—2.5 m in diameter. Sometimes, it has been observed to construct regular mounds (Roonwal and Chhotani, 1962c, 1966b ; Ahmad, 1965). For foraging it makes covered galleries and sheats of earth over trees and soil. Swarming of this species has been observed in June and September in Orissa and in November in Bombay (Roonwal, 1970).

64. *Odontotermes feaeoides* Holmgren and Holmgren
(Fig. 129)

1917. *Odontotermes (Odontotermes) feaeoides* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5(3) : 156-157. S. and W. Type-locality : Marghalli, Coorg, Karnataka.
1949. *Odontotermes (Odontotermes) feaeoides* ; Snyder, *Smiths. misc. Coll.*, 112 : 227.

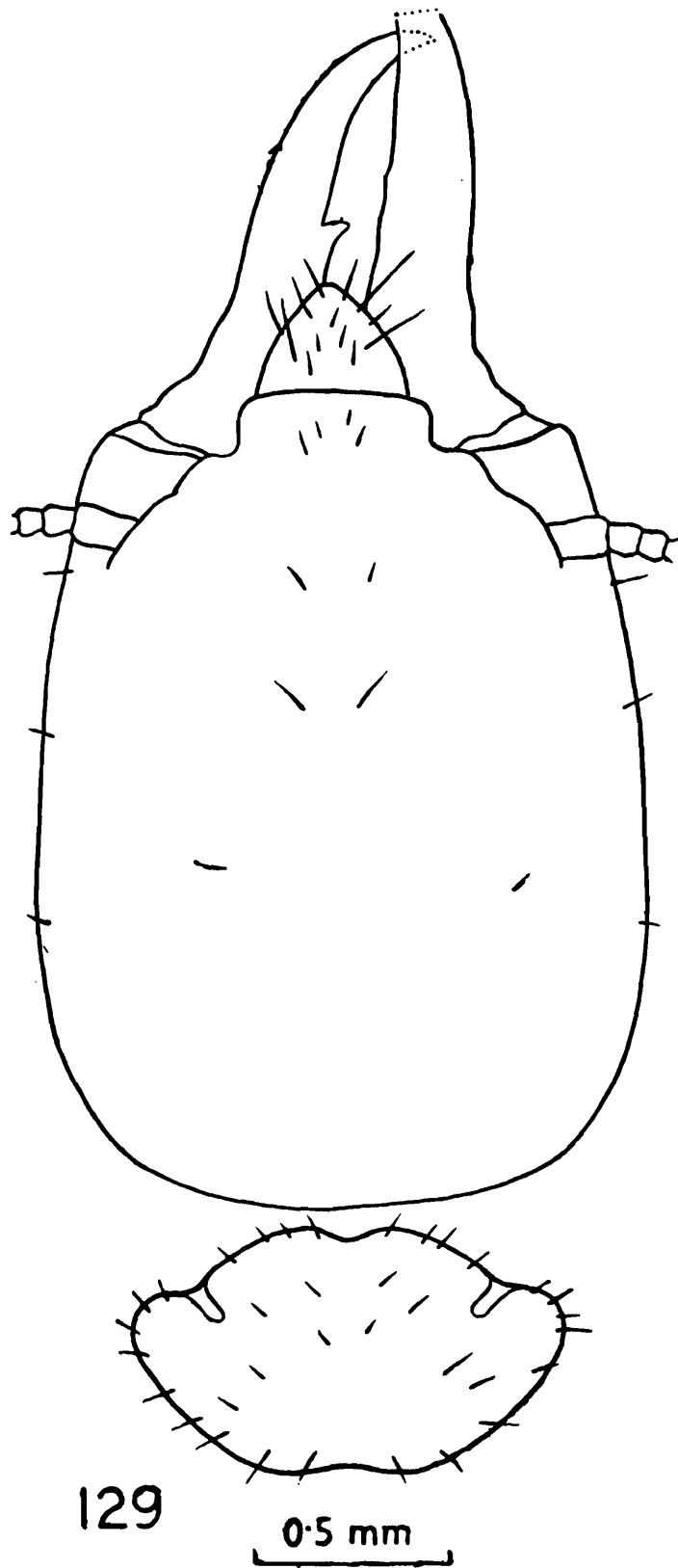


Fig. 129. Head and pronotum of soldier of *Odontotermes feaeoides* Holmgren & Holmgren.

Material : A vial, with a S. and four W., syntypes, Margalli Estate, Sidapur, Coorg, coll. T. B. Fletcher, 18. xi. 1912.

Measurements :

<i>Soldier</i>	(1 ex. syntype)
1. Total body-length <i>c</i>	... 6.10
2. Length of head to base of mandibles	... 2.00
3. Max. width of head	... 1.58
4. Max. length of pronotum	... 0.68
5. Max. width of pronotum	... 1.10

Distribution : INDIA : Southern India : Karnataka : Sidapur (Margalli Estate, Coorg).

Biology : The species seems to be quite rare and has not been collected since it was described. It is reported to have been collected from 'under log lying on ground amongst coffee'. The soldier is reported to emit a transparent stricky substance.

65. *Odontotermes horni* (Wasmann)

(Figs. 130-131)

1902. *Termes horni* Wasmann, *Zool. Jb.*, 17(1) : 111. S. and W. Type-locality : Nalanda, Sri Lanka.

1949. *Odontotermes (Odontotermes) horni* ; Snyder, *Smiths. misc. Coll.*, 112 : 229.

Material : From Tamil Nadu, Kerala and Karnataka, states as follows : Lot 1. Six vials with S. and W., coll. M. L. Roonwal, February-March, 1955, thus : R8/11.2.55, Top Slip (Tamil Nadu), under dry cowdung on ground ; R8/17.2.55, Nilambur (Kerala), attacking bark of standing *Bombax malabaricum* under mud plastering ; R9/20.2.55, Konnoth Forest Range (Wynaad Div., Kerala), under dried up cowdung ; R7/2.3.55, Chamundi Hills, Mysore (Karnataka), from ground under cowdung ; R5/5.3.55, Chikbillapur Range, Kolar For. Div. (Karnataka), from soil under roots of *Eucalyptus* sp. and R3/7.3.55, Lal Bagh, Bangalore (Karnataka), in soil under mud plastering in grass fields.

Lot 2. Two vials with S. and W., thus : coll. P. C. Dhar, Dharwar (Karnataka), 12. ix. 1960, under cowdung in soil ; and coll. R. Raghunathan, Coimbatore (Tamil Nadu), 4. ix. 1963.

Lot 3. Fourteen vials with S. and W., Karnataka state, coll. O. B. Chhotani, November, 1962, thus : 04/6.11.62 and 025/8.11.62, Dharwar, from hollowed stem of 'Karanji' tree and under cowdung, respectively ; 01, 4, 5, 6, 8 and 12/14.11.62, Ramaçhandra Plantations,

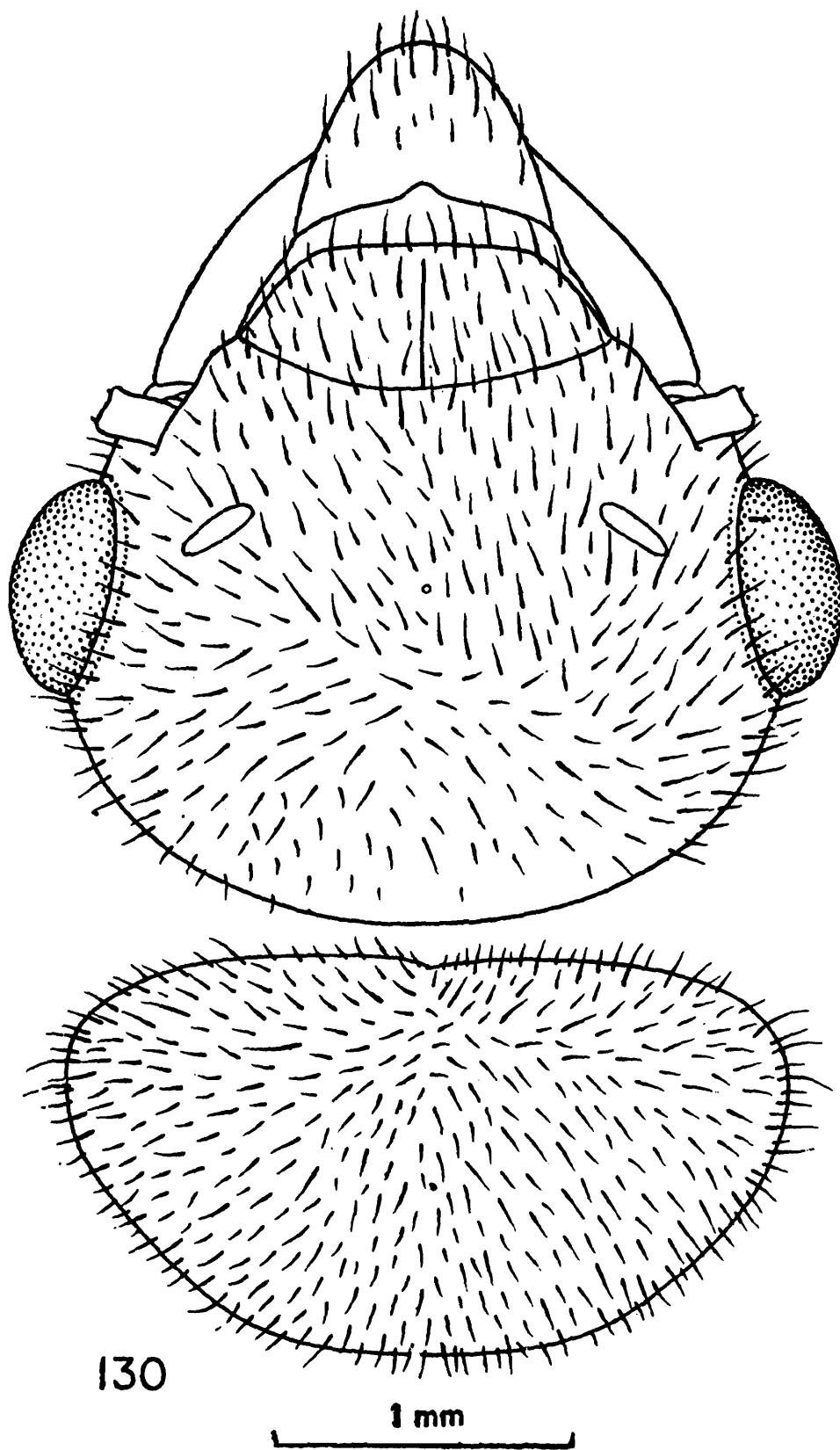


Fig. 130. Head and pronotum of imago of *Odontotermes horni* (Wasmann).

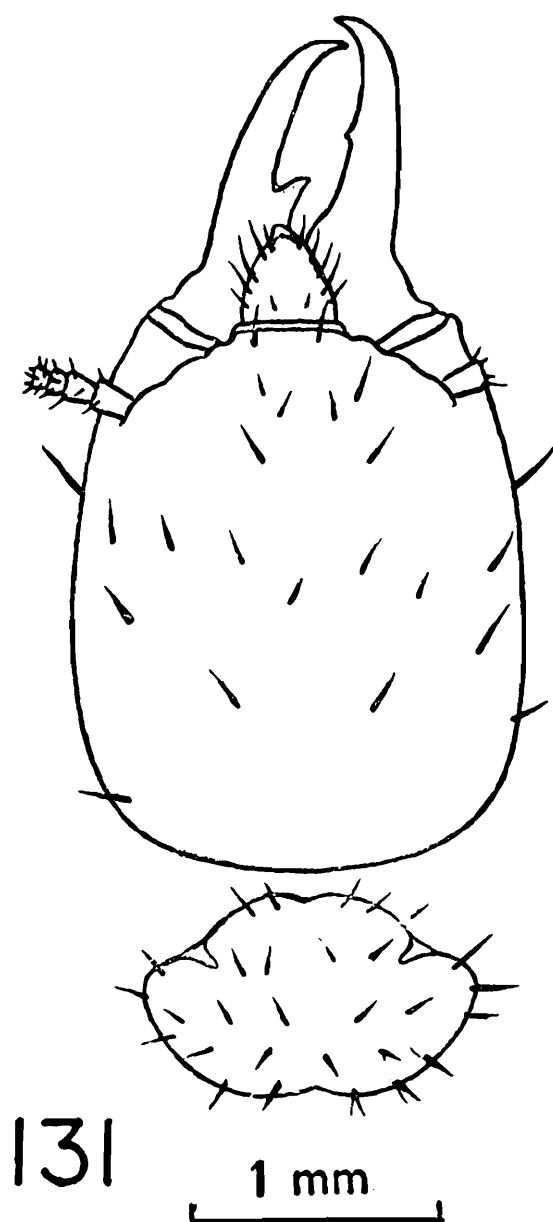


Fig. 131. Head and pronotum of soldier of *Odontotermes horni* (Wasmann).

50 km from Bangalore on road to Kolar, under cowdung (01 and 04), earthen galleries over trees (05 and 06), under soil (08), and stem of mango tree (012); 019 and 024/14.11.62, Bermangal, 20 miles from Bangalore on Mysore Road, from galleries over Eucalyptus trees; 01, 2, and 5/18.11.62, Meghalpura, about 25 km from Mysore City, from dry piece of wood and leaves, dead *Ficus* sp. branch and galleries over an unknown tree, respectively and 04/20.11.62, Mercara Reserve Forest, under cowdung.

Lot 4. Eighteen vials with S. and W., Tamil Nadu and Kerala states, coll. O. B. Chhotani, February-March, 1969, thus: 01, 06 and

037/11.2.69, Salem (Tamil Nadu), under layers of earth over *Poinciana elata* (06/11.2.69) and twigs covered with soil (037/11.2.69); 022/11.2.69, Kurambapatty River Bank, Salem from galleries over a mango tree; 08 and 013/13.2.69, Salem from earthen galleries over mango trees; 013 and 035/13.2.69, Yercaud, (Tamil Nadu) from galleries and layers of earth over mango trees; 02 and 07/18.2.69, Sirkarpadi Tunnel Entry, Top Slip (Tamil Nadu), from earthen galleries over a teak tree and under elephant dung, respectively; 01/19.2.69, Top Slip, from dead stump; 050/23.2.69, Suranganar Reserve Forest, Lower Camp (Tamil Nadu), from galleries of earth over an unknown tree; 031/24.2.69, Lower Camp, from galleries over teak tree; 010/1.3.69, Mumdamthorai Tiger Sanctuary, 25 km West of Ambasumudrum (Tamil Nadu), from dead stump of wood; and 02/5.3.69, Panchakanam Reserve Forest, Periyar Lake Area (Kerala), from dead wood.

Measurements :

(i) <i>Imago</i> (specimen from Sri Lanka) :	(1 ex.)
1. Total body-length with wings <i>c</i>	... 27.20
2. Total body-length without wings <i>c</i>	... 14.20
3. Length of head to base of mandibles	... 2.10
4. Max. width of head	... 2.80
5. Max. diameter of compound eye	... 0.75
6. Max. diameter of lateral ocellus	... 0.30
7. Min. eye-ocellus distance	... 0.25
8. Max. length of pronotum	... 1.53
9. Max. width of pronotum	... 2.55
10. Length of forewing with scale	... 24.00
11. Length of hindwing with scale	... 22.50
(ii) <i>Soldier</i> :	Range (5 exs.)
1. Total body-length <i>c</i>	6.70—6.80
2. Length of head to base of mandibles	2.55—2.80
3. Max. width of head	1.85—2.15
4. Max. length of pronotum	0.83—0.89
5. Max. width of pronotum	1.30—1.55

Distribution : INDIA : Southern India : Karnataka : Bangalore, Bermangal, Chamundi Hills, Chikbillapur For. Range, Dharwar, Meghalpur, Mercara, Ramachandra Plantations; Tamil Nadu : Coimbatore, Kurambapatty River Bank, Lower Camp, Mumdamthorai

Tiger Sanctuary, Salem, Suranganar Res. For., Top Slip, Yercaud ; Kerala : Pancha Kanam Res. For. Elsewhere : It is common in Sri Lanka and is also reported from Cambodia and Vietnam.

Biology : The nest of this species is mainly subterranean, lying about 25—90 cm below the ground surface extending over an area of about 1.5—2.0 m. There are a number of inter-communicating chambers containing fungus combs of different sizes. In Cambodia, mounds of cemented earth of the height of about 1 m are built (Bathelier, 1927). It attacks fallen woods and bark of living trees over which it makes sheaths of earth. In Sri Lanka, it is reported to attack tea and in Vietnam rubber trees. Swarming of this species is reported in October in India and in December-January in Sri Lanka.

66. *Odontotermes kulkarnii* Roonwal and Chhotani

(Fig. 132)

1959. *Odontotermes kulkarnii* Roonwal and Chhotani, *Sci. & Cult.*, 25 : 325, S. and W. (maj. and min.). Type-locality : Bijapur, Karnataka.

1960. *Odontotermes kulkarnii* ; Roonwal and Chhotani, *Indian J. Agric. Sci.*, 29(4) ; 57-62.

Material : Holotype S., morphotype W. (maj. and min.) and paratype S. and paramorphotype W., in separate vials, Bijapur, Karnataka, coll. B. M. Kulkarni, last week of Dec. 1957, under cowdung mixed with earth.

Measurements :

<i>Soldier</i> :		Range (2 exs.)
1. Total body-length <i>c</i>	...	5.03—5.30
2. Head-length to base of mandibles	...	1.50
3. Max. width of head	...	1.20
4. Max. length of pronotum	..	0.53
5. Max. width of pronotum	...	0.88—0.93

Distribution : INDIA : Southern India : Karnataka : Bijapur.

Biology : This termite has been collected from cowdung and soil and its nest is probably underground.

67. *Odontotermes mathadi* Roonwal and Chhotani

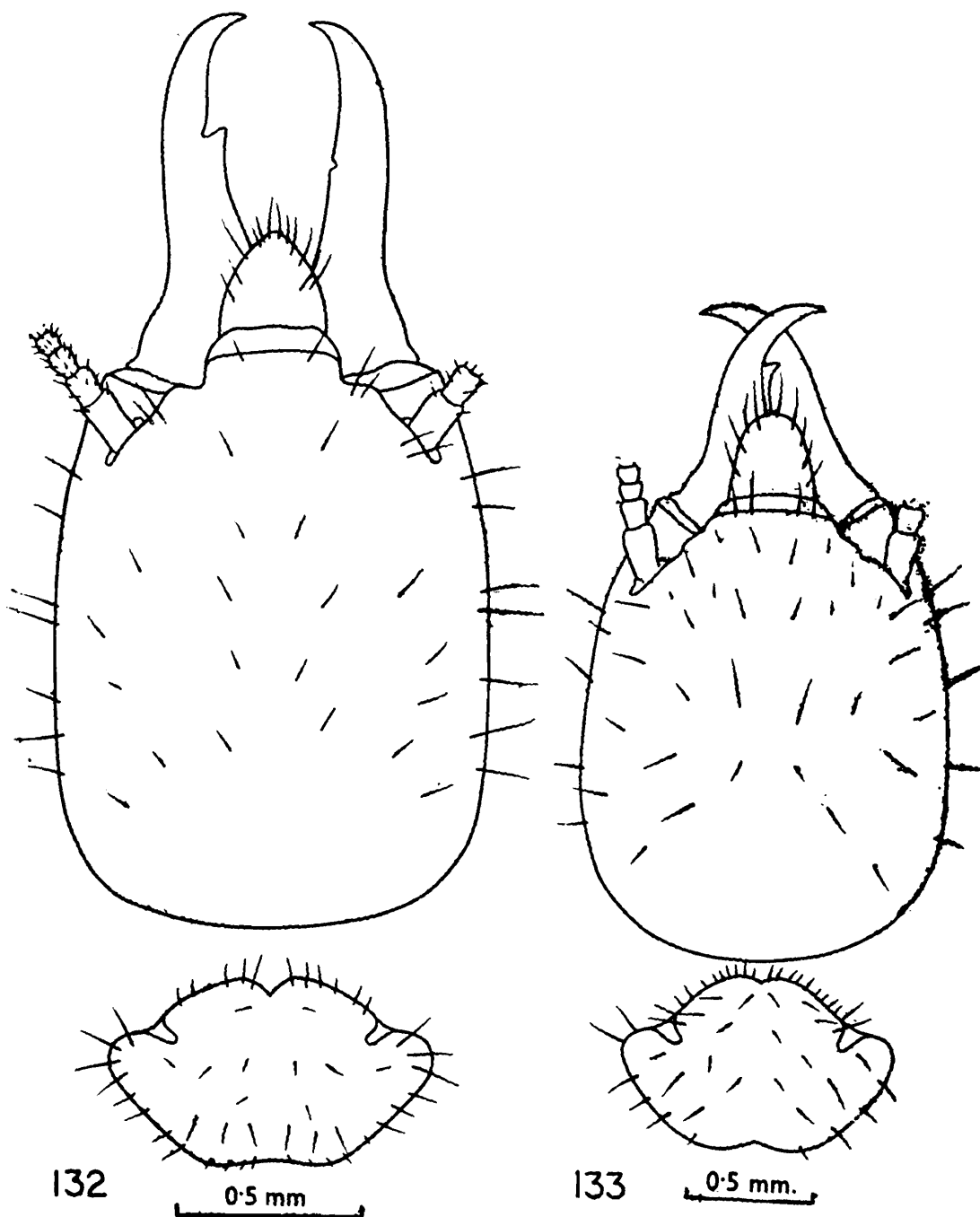
(Fig. 133)

1964. *Odontotermes mathadi* Roonwal and Chhotani, *Beitr. Ent.*, 14 : 45-48. S. and W. Type-locality : Badami, Bijapur District, Karnataka.

Material : Holotype S., paratype S. and morphotype W., Badami (Bijapur district, Karnataka), coll. S. B. Mathad, 16. x. 1961. A vial with S., W., Tiger Valley Hill Colony, Andhra Pradesh, coll. I. N. Maligi, 5. viii. 1962.

Measurements :

<i>Soldier</i> :		Range (5 exs.)
1. Total body-length c	...	5.35—6.25
2. Length of head to base of mandibles	...	1.80—1.87



Figs. 132-133. Head and pronotum, in dorsal view, of soldiers of :
 Fig. 132. *Odontotermes kulkarnii* Roonwal & Chhotani.
 Fig. 133. *Odontotermes mathadi* Roonwal & Chhotani.

3. Max. width of head	...	1.43—1.53
4. Max. length of pronotum	...	0.67—0.70
5. Max. width of pronotum	...	1.08—1.17

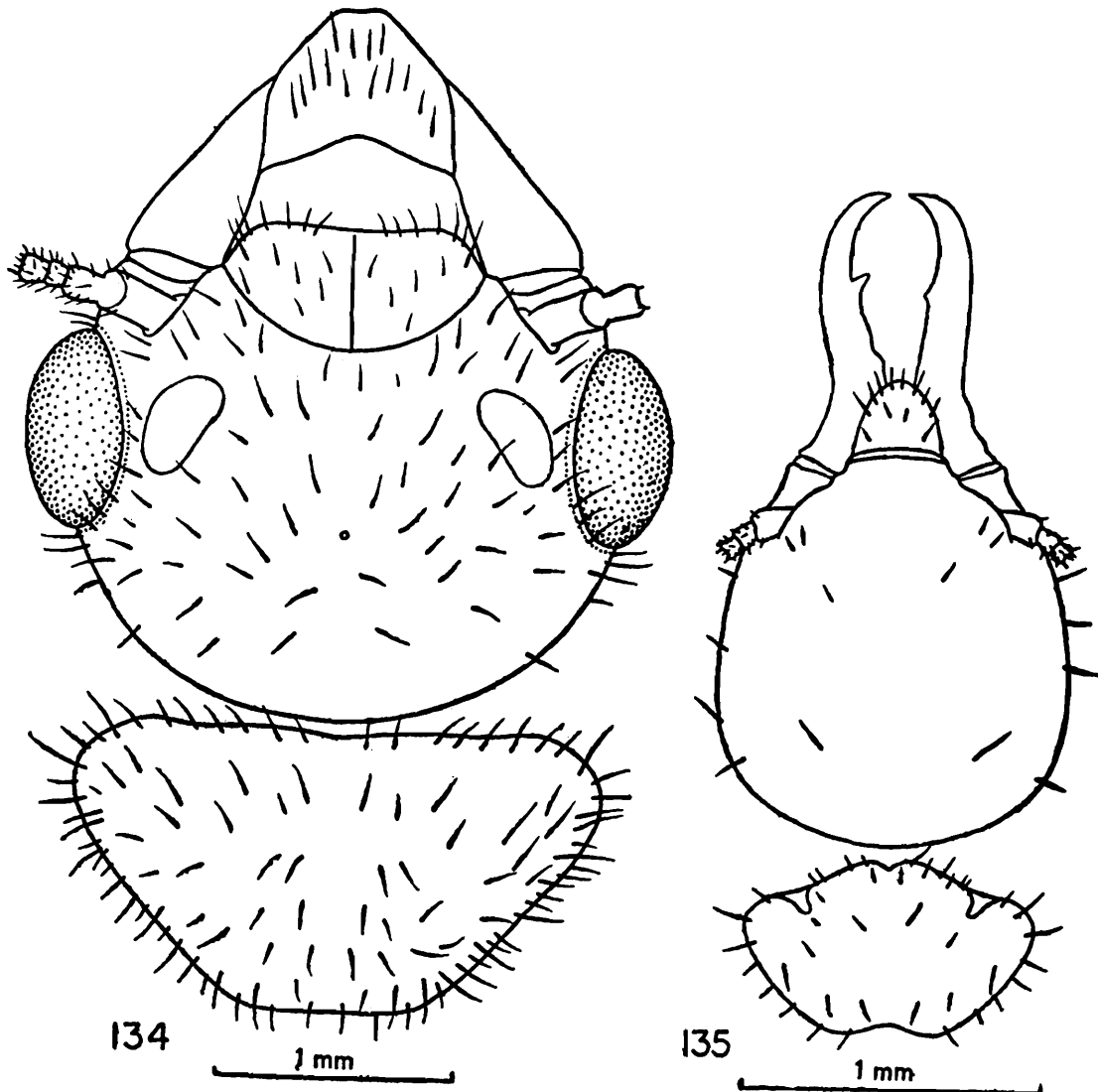
Distribution: INDIA : Southern India : Karnataka : Badami ;
Andhra Pradesh : Tiger Valley Hill Colony.

68. *Odontotermes obesus* (Rambur)

(Figs. 134, 135)

1842. *Termes obesus* Rambur, *Histoire naturelle des insectes, Névroptères* :
304. Im. Type-locality : Bombay.

1949. *Odontotermes (Odontotermes) obesus* ; Snyder, *Smiths. misc. Coll.*,
112 : 235.



Figs. 134-135. *Odontotermes obesus* (Rambur)

Fig. 134. Head and pronotum of imago, in dorsal view.

Fig. 135. Ditto, soldier.

Material : Lot 1. Twentyseven vials with S. and W., coll. M. L. Roonwal, Karnataka, Tamil Nadu and Kerala states, Feb.-Mar. 1955, as follows : Tamil Nadu : R2 and R5/8.2.55(2 vials), 7-10 km N of Madras ; R2/10.2.55 and R20/13.2.55 (2 vials), Coimbatore ; R1, R11 and R14/11.2.55 (3 vials), Top Slip. R1/15.2.55, R1, 2, 6 and 8/16.2.55, R3 and R4/17.2.55 and R2/18.2.55 (8 vials), Nilambur ; R8/20.2.55, Konnoth Forest Range (Wynaad Div.). Karnataka : R1/24.2.55 and R1/25.2.55 (2 vials), Makut (Coorg) ; R2, R3, and R4/1.3.55 (3 vials), Ranganathitu Island (Bird Sanctuary), 15 km N-E of Mysore ; R4/2.3.55 (1 vial), Chamundi Hills nr. Mysore ; R6 and R7/3.3.55 (2 vials), Yelwal Forest, 15 km W of Mysore ; R3 and R4/5.3.55 (2 vials), Chikbillapur, Kolar Forest ; and one vial from Bangalore (Lal Bagh), 7.iii. 1955.

Lot 2. One hundred and three vials with S. and W., coll. O. B. Chhotani, Nov. 1962 and Feb.-Mar. 1969. Karnataka, Tamil Nadu and Kerala states, as follows : Karnataka : 07 and 014/5.11. 62, 02, 13, 14, 16 and 21/6.11. 62, 05, 11, 16, 21, 29/8.11. 62, 07, 8, 9 and 14/9.11.62 (15 vials), Dharwar ; 01, 3, 4, 16, 19, and 24/7.11.62 (6 vials), Dandeeli ; 04/10.11.62, 019 and 20/11.11.62 and 015 and 17/12.11.62 (5 vials), Chickmagalur ; 010, 12, 13 and 16/14.11.62 (4 vials), Ramachandra plantation ; 020, 23, 26, 27, 29-32, 36 and 39/14.11.62 (10 vials), Bermangal ; 017, 19, 21, 22 and 24/15.11.62 (5 vials), Shanbhoganhalli ; 03, 5, 9, 15, 16-18, 20 and 23/18.11.62 (9 vials), Meghalpura ; 05, 6, 8, 12, 17, 19, 23, 25, 28 and 29/20.11.62 (11 vials), Mercara Reserve Forest ; 01, 4, 11, 14, 18-20, 22 and 23/21.11.62 (9 vials), Anekad Forest Range ; 07/23.11.62, Mangalore. Tamil Nadu : 02, 37a and 39/11.2.69, 02/12.2.69. and 07, 8 and 12/13.2.69 (7 vials), Salem ; 014 and 16/11.2.69 (2 vials), Kurambapatty Reserve Forest ; 033/13.2.69, Yercaud ; 09/16.2.69, Tudiyalur ; 02, 15, 18 and 28/18.2.69 (4 vials), Sirkarpadi Tunnel Entry, Top Slip ; 022/19.2.69, Top Slip ; 012 and 21/22.2.69 (2 vials), Periyakulam ; 017, 23, 40 and 45/23.2.69 (4 vials), Mylar, Kulasekaram For. Range ; and 018/1.3.69, Mumdamthorai Tiger Sanct. Kerala : 013/5.3.69, Panchakanam Res. Forest.

Lot 3. Twelve vials with S. and W., Southern Regional Station, Z. S. I. colln., Oct.-Nov. 1961, Madras.

Lot 4. Three vials with S. and W., Southern Forest Research Centre, colln.. Mar 1966. Coimbatore.

Lot 5. Six vials with S. and W., coll. G. Bose, Jan. 1971, thus : four vials from Bangalore and 2 vials from Seringapatam.

Lot 6. Four vials with S. and W., coll. K. S. Pradhan, Apr. 1966, from Goa. thus : Nagargaon (3 vials) and Rubber Plantation area, Walpoi Dist. (1 vial).

Measurements :

(i) <i>Imago :</i>		Range (5 exs.)
1. Total body-length with wings <i>c</i>	...	23.50—28.30
2. Total body-length without wings <i>c</i>	...	12.20—13.30
3. Length of head to base of mandibles	...	1.55—2.00
4. Max. width of head	...	2.70—2.80
5. Max. diameter of eye	...	0.70—0.85
6. Max. diameter of ocellus	...	0.35—0.45
7. Min. eye-ocellus distance	...	0.07—0.13
8. Max. length of pronotum	...	1.10—1.45
9. Max. width of pronotum	...	1.90—2.55
10. Length of forewing with scale	...	21.50—24.50
11. Length of hindwing with scale	...	18.00—21.00
(ii) <i>Soldier :</i>		Range (15 exs.)
1. Total body-length <i>c</i>	...	4.60—5.20
2. Length of head to base of mandibles	...	1.15—1.48
3. Max. width of head	...	1.03—1.18
4. Max. length of pronotum	...	0.45—0.60
5. Max. width of pronotum	...	0.63—0.90

Distribution : INDIA : Southern India : Karnataka : Anekad For. Range, Bababuddin Hills, Bangalore, Bellahunisi-Hospet Road, Bellary, Bermangal, Chamundi Hills nr. Mysore, Chickmagalur, Chikbillapur, Dandeeli, Dharwar, Hadagalli-Herpanahalli Road, Hagari, Hospet, Kadur, Kollegal, Kamalapuram, Maddur, Makut, Mangalore, Meghalpura, Mercara, Mysore, Ramachandra Plantations, Ranganathitu Bird Sanctuary nr. Mysore, Shanbhoganhalli, Sidapur and Yelwal Forest nr. Mysore ; Tamil Nadu : Coimbatore, Karambapatty Reserve Forest nr. Salem, Lower Camp, Madras, Mumdamthorai Tiger Sanctuary, Mylar, Periyakulam, Salem, Top Slip, Tudiyalur nr. Coimbatore and Yercaud ; Kerala : Konnoth For. Range, Nilambur, Panchakanam Res. Forest, and Quilandy. Elsewhere : It is widely distributed species and is known from almost all over the subcontinent except the colder parts.

Biology : It is a very common species and is reported to feed on almost all the varieties of cellulotypic materials like twigs, leaves, grasses,

bark of trees, agricultural crops, forest-trees, seedlings, etc. It is reported as a serious pest of sugarcane and cotton crops.

It is a mound-building termite. Different types of mounds have often been attributed to this species. Holmgren (1912) has mentioned about three different types of mounds of this species. Besides, Roonwal (1962b) has referred another (tall, subcylindrical mound with buttresses) to this species. At the same time, similar mounds have been referred to different species. As suggested by Chhotani (1977), species specificity in respect of the mound structure in *Odontotermes* warrants further investigating.

Swarming of *O. obesus* occurs with the break of monsoon.

Remarks : The species, *O. obesus* (Rambur) and *O. redemanni* (Wasmann) form a group and are not easily separable. Different types of mounds are attributed to these two species and it is difficult to reconcile to the idea that the same species makes different kinds of mounds in the same locality.

69. *Odontotermes redemanni* (Wasmann)

(Figs. 136-137)

1893. *Termes Redemanni* Wasmann, *Wien. Ent. Zeit.*, 12 : 239. Im., Q., S. and W. Type-locality : Sri Lanka.

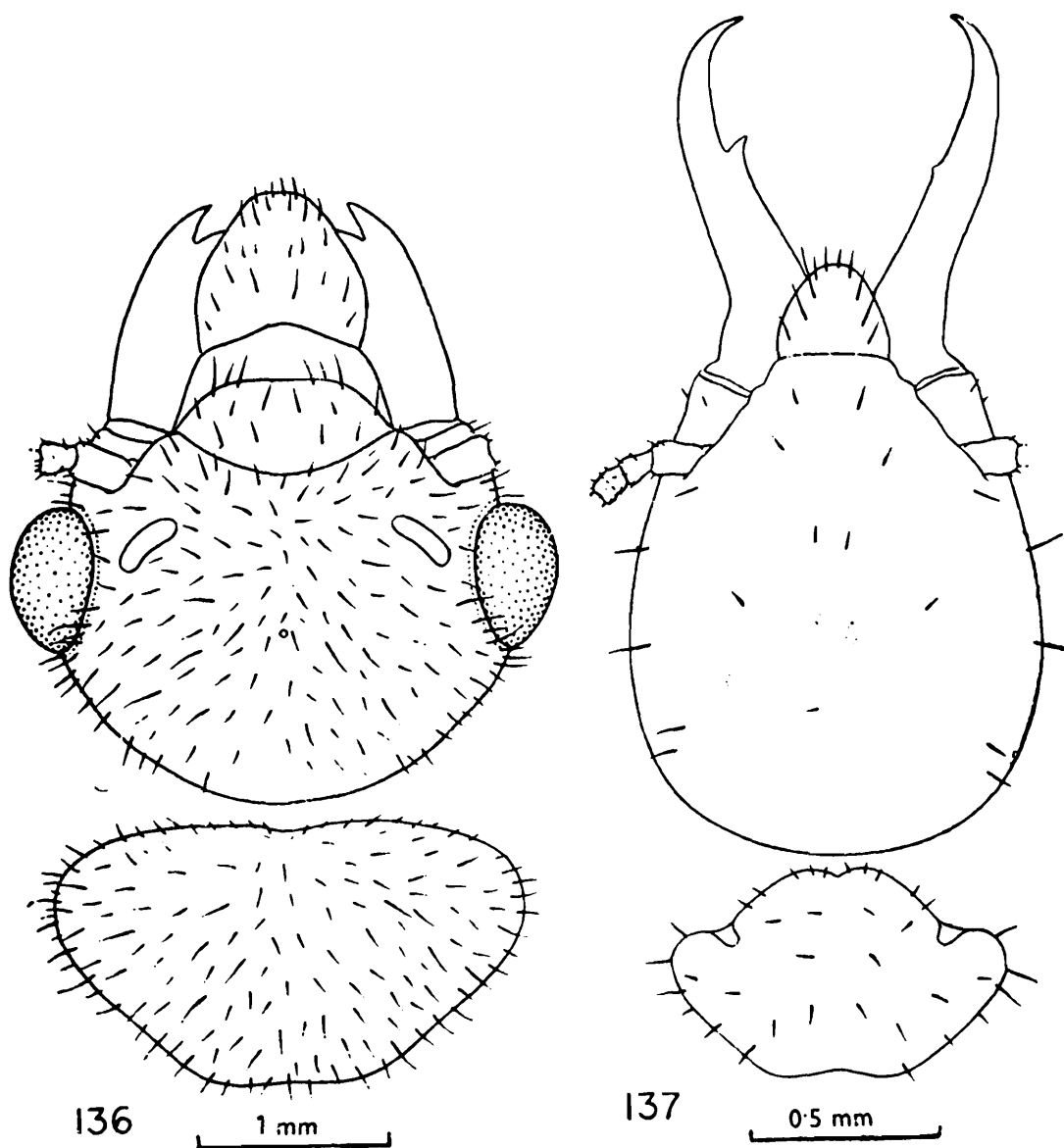
1949. *Odontotermes (Odonotermes) redemanni* Snyder, *Smiths. misc. Coll.*, 112 : 238.

Material : Lot 1. Seven vials with S. and W., coll. M. L. Roonwal, Feb.-Mar. 1955, Karnataka, Tamil Nadu and Kerala states, thus : R3/9.2.55, Villivakkam, about 10 km N of Madras (Tamil Nadu), ex. mound ; R4/13.2.55, Coimbatore (Tamil Nadu), ex. dried stem of castor plant ; R10/16.2.55, Nilambur (Kerala) ; R8/25.2.55, Makut, Coorg (Karnataka), ex. soil ; R5 and 7/1.3.55, Srirangapatnam, (Karnataka), ex. plaster on a mango tree and under cowdung, respectively ; R1/5.3.55, Chikbillapur, Kolar For. Div.

Lot 2. Three vials with S. and W., Trivandrum and environs (Kerala), 27-30.xi. 1958.

Lot 3. A vial with S. and W., coll. M. A. M. and P. P., 13.xi. 1961, Mylapur, Madras (Tamil Nadu).

Lot 4. Ten vials with S. and W., coll. O. B. Chhotani, Tamil Nadu and Kerala states, Feb.-March, 1969, thus : Tamil Nadu : 020/22.2.69, Periyakulam, ex. soil ; 01/27.2.69, Nagercoil-Tirunelveli Road, ex. mound ; 016/22.3.69, Mumdamthorai Tiger Sanctuary ; 02/2.3.69, Roadside between Theni and Kambam, ex. log of cocoanut ; Kerala : 01, 8, and 18/3.3.69, Kuttikanam nr. Peermade, ex. soil, trunk



Figs. 136-137. *Odontotermes redemanni* (Wasmann)

Fig. 136. Head and pronotum of imago, in dorsal view.

Fig. 137. Ditto, soldier.

of a tree and mound, respectively ; 018 and 26/4.3.69 and a vial without number, Thekkadi, ex. soil and dung.

Lot 5. A vial with S. and W., Nagarjunkonda, Andhra-Pradesh, coll. I. Maligi, 26. vii. 1962.

Measurements :

(i) *Imago* : The following measurements are from specimens from Sri Lanka.

		Range (2 exs.)
1. Total body-length with wings c	...	Wings broken
2. Total body-length without wings c	...	12.30

3. Length of head to base of mandibles	...	2.00—2.10
4. Max. width of head	...	2.85—2.87
5. Max. diameter of eye	...	0.80—0.88
6. Max. diameter of ocellus	...	0.35—0.38
7. Min. eye-ocellus distance	...	0.13—0.14
8. Max. length of pronotum	...	1.28—1.38
9. Max. width of pronotum	...	2.45—2.48
10. Length of forewing scale	...	1.25—1.30
11. Length of hindwing scale	...	1.21—1.23
(ii) <i>Soldier</i> :		Range (5 exs.)
1. Total body-length <i>c</i>	...	3.80—5.50
2. Length of head to base of mandibles	...	1.15—1.33
3. Max. width of head	...	0.98—1.05
4. Max. length of pronotum	...	0.43—0.53
5. Max. width of pronotum	...	0.73—0.90

Distribution : INDIA : Southern India : Andhra : Nagarjunkonda ; Karnataka : Bangalore, Chikbillapur For. Range, Makut, Sirangapatnam ; Tamil Nadu : Coimbatore, Madras, Mumdamthorai Tiger Sanctuary, Nagercoil-Tirunelveli Road, Periyakulam, Between Theni and Kumbam, Villivakam nr. Madras ; Kerala : Kuttikanam nr. Peermade, Nilambur, Thekkadi. Elsewhere : It is known from West Bengal, eastern Bihar and northern Maharashtra in India and is very common in Sri Lanka.

Biology : It is a common mound—building termite of Sri Lanka and is also known to make mounds in India. The mounds are large, dome-shaped, massive structures, reaching to a height of about 2 m above the ground. There are openings on surface of the mound and these lead into chimney-like shafts to the main nest. The nest inside consists of a number of chambers which contain the fungus combs. The royal cell is about 7-12 cm in length and is situated near a large central chamber. Normally only a single royal pair is found in the royal cell but sometimes up to four queens and more than one king have been reported.

To reach the source of food the insects make covered runways or sheaths of earth over the plants and dead woods. It is reported to damage woodwork of buildings in Sri Lanka.

Remarks : The species *Odontotermes redemanni* (Wasm.) and *O. obesus* (Rambur) are closely allied species and it is not possible to separate them easily. This has led to some confusion in respect of the association of particular types of mounds to these two species. In

Sri Lanka the mounds are generally dome-shaped with a number of vaults and chambers, but Becker (1962) has referred to some three types of mounds to this species from southern India. The tall subcylindrical mounds (of Becker, 1962, fig. 5) appear to be the same as those referred to as those of *O. obesus oculatus* by Annadale (1923) and as those of *O. obesus* by Roonwal (1962b). These mounds are found in northern India, Central India (Madhya Pradesh), eastern India (Orissa) and southern India (Bangalore, Dharwar, Dandeeeli). If the dome-shaped mounds of Sri Lanka are regarded as typical for *redemanni* then these tall, subcylindrical mounds should be referred to as those of *obesus*. From the previous records it appears that each of the species viz., *O. obesus* and *O. redemanni* is capable of making different types of mounds not only in different places but also in the same locality. This idea is difficult to be reconciled.

Since by morphological characters, *obesus* and *redemanni* cannot be easily separated, it will not be unreasonable to assume that previous records of the two species refer to one and only one species. But at present writer prefers to consider these two species in a group, *O. obesus/redemanni* group till the approach is made from some other angle to solve the problem.

70. *Odontotermes roonwali* BOSE

(Fig. 138)

1975. *Odontotermes roonwali* Bosc, *Orient. Insects*, 9(2) : 157-161. S. and W.
Type-locality : Nilambur, Kerala.

Material : Lot 1. Holotype S., morphotype W., paratype S. and paramorphotype W., coll. M. L. Roonwal (R9/17.2.55), Nilambur, Kerala, from dried cowdung.

Lot 2. Paratype S. and paramorphotype W., Tamil Nadu and Kerala states, as follows : Coll. M. L. Roonwal, Feb.-Mar. 1955, thus : Tamil Nadu ; R1/8.2.55, 6-10 km N of Madras, from mud plaster on trunk of unknown tree ; R1/9.2.55, Villivakkam, about 16 km N of Madras, from mud plaster on trunk of Palmyra palm. Karnataka : R1/1.3.55, Ranganathitu Bird Sanctuary, 15 km N-E of Mysore, from small holes in ground. Kerala : R2/15.2.55 and R10/17.2.55 Nilambur, dried unknown wood and dried cowdung, respectively.

Lot 3. Coll. O. B. Chhotani, Feb.-Mar., 1969, thus : Tamil Nadu : 06 and 07/26.2.69, Pallaimcottah, under cowdung ; 011/28.2.69, Mylar, Kulasekarum For. Range, under layers of earth over unknown trees ; and 03/1.3.69, Mumdamthorai Tiger Sanctuary, about 24 km W of Ambasumudrum.

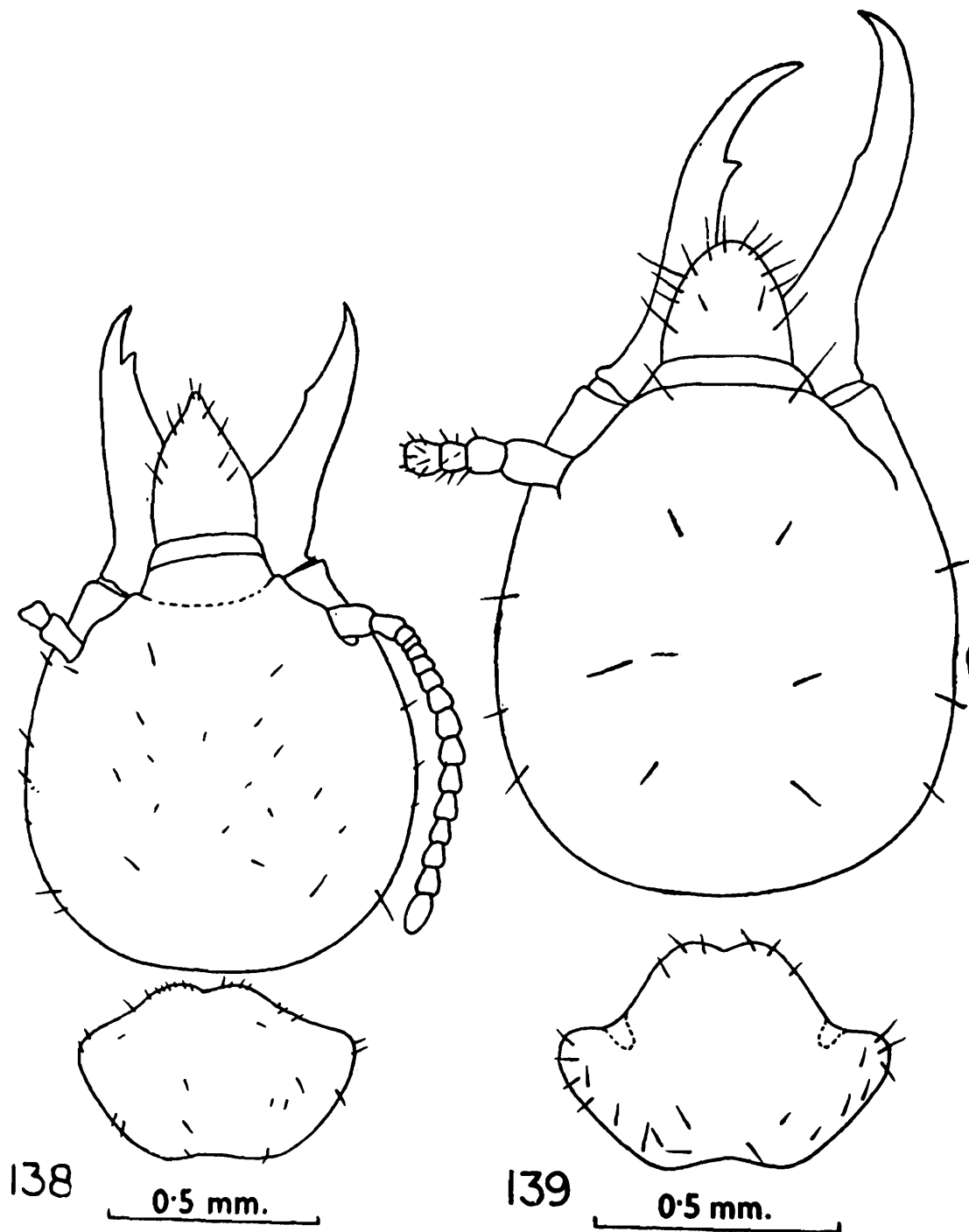


Fig. 138. *Odontotermes roonwali* Bose, Soldier (After Bose, 1975).
Fig. 139. *Odontotermes vaishno* Bose, Soldier (After Bose, 1975).

Measurements :

<i>Soldier :</i>		Range (20 exs.)
1. Total body-length c	...	3.00—3.90
2. Length of head to base of mandibles	...	0.90—1.03
3. Max. width of head	...	0.83—0.95
4. Max. length of pronotum	...	0.38—0.48
5. Max. width of pronotum	...	0.63—0.76

Distribution : INDIA : Southern India : Karnataka : Ranganathittu Bird Sanctuary ; Tamil Nadu : Mumdamthorai Tiger Sanctuary, Mylar, Pallaimcottah, Villivakkam ; Kerala : Nilambur.

Biology : *Odontotermes roonwali* has been collected from under cowdung, from dead and dry wood lying on ground and from under layers of earth over tree trunks. No mound is reported. Presumably the nests are underground.

71. *Odontotermes vaishno* BOSE

(Fig. 139)

1975. *Odontotermes vaishno* Bose, *Orient. Insects*, 9(2) : 161-164, S. and W.
Type-locality : Konnoth For. Range, Wynaad Div., Malabar, Kerala.

Material : Holotype S., morphotype W. and paratype S. and paramorphotype W., coll. M. L. Roonwal (R10/20.2.55), 20.ii.1955 Konnoth For. Range, Wynaad Div., Kerala, from bark of a teak tree.

Paratype S. and paramorphotype W., coll. O. B. Chhotani (012/7.11.62), 7.xi. 1962, Kanchilda Round, Dandeeli, Karnataka, from dead bamboo pieces lying on ground.

Measurements :

<i>Soldier :</i>		Range (7 exs.)
1. Total body-length c	...	3.78—4.10
2. Length of head to base of mandibles	...	1.05—1.14
3. Max. width of head	...	0.89—0.98
4. Max. length of pronotum	...	0.39—0.45
5. Max. width of pronotum	...	0.65—0.69

Distribution : INDIA : Southern India : Karnataka : Kachilda Round ; Kerala : Konnoth For. Range.

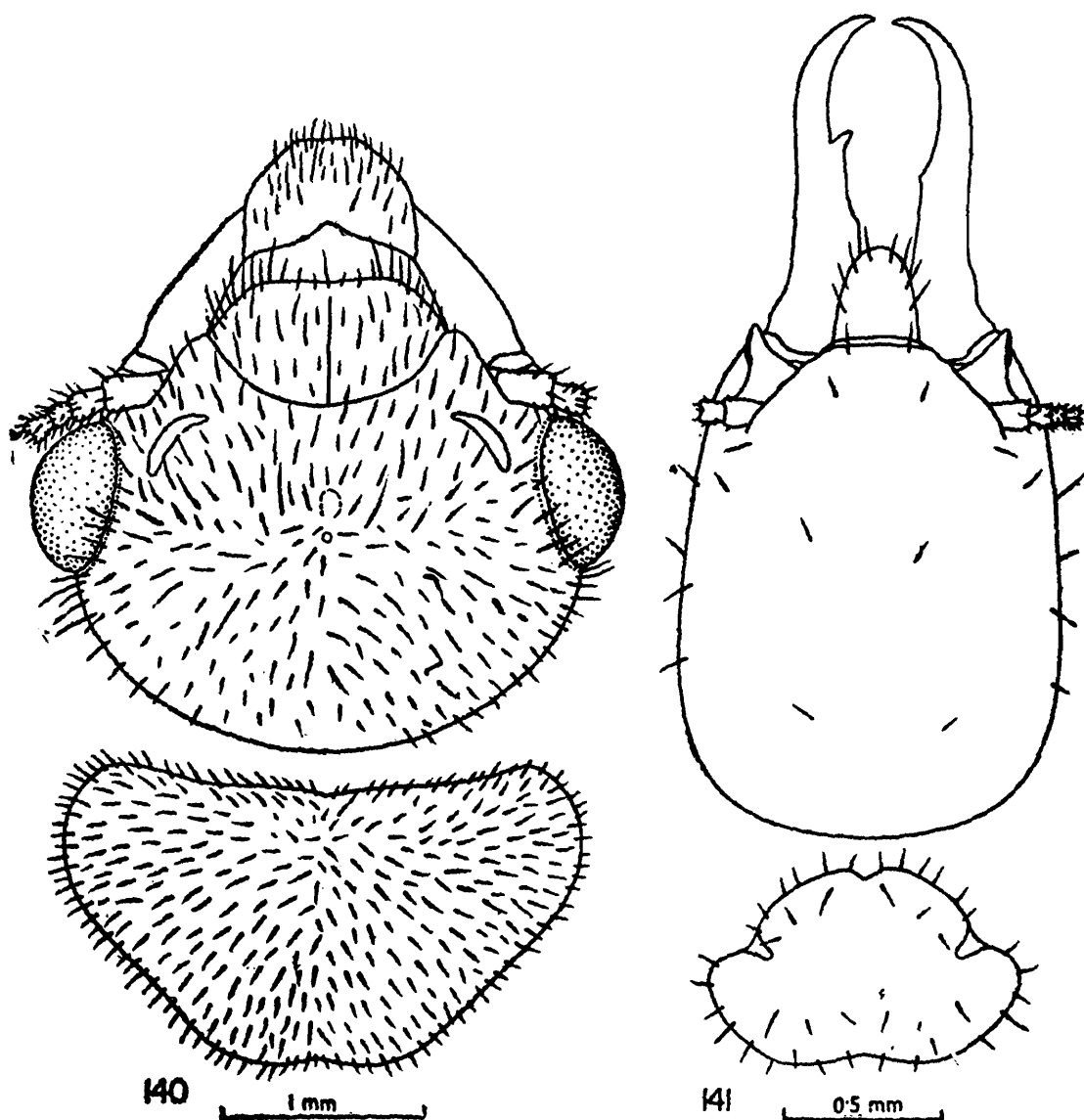
Biology : Nothing is known about the biology of this species. It has however, been collected feeding on bark of teak and bamboo pieces, lying on ground.

72. *Odontotermes wallonensis* (Wasmann)

(Figs. 140, 141)

1902. *Termes obesus wallonensis* Wasmann, *Zool. Jb.*, 17(1) : 106—109. Im and S. Type-localities : Wallon, Ahmadnagar District and Sangamner, Maharashtra.

1949. *Odontotermes (Odontotermes) wallonensis* Snyder, *Smiths. misc. Coll.*, 112 : 243.



Figs. 140-141. *Odontotermes wallonensis* (Wasmann)

Fig. 140. Head and pronotum of imago, in dorsal view.

Fig. 141. Ditto, soldier.

Material : From Karnataka state as follows :—(i) Q., K., S. and W., Ramachandra Plantations, coll. O. B. Chhotani (017/14.11.62), 14. xi. 1962, from mound ; (ii) S. and W., Meghalpur nr. Mysore, coll. O. B. Chhotani, 18. xi. 1962 ; (iii) S. and W., 12 km from Mysore on Yelwal

Road, coll. M. L. Roonwal (R2/3.3.55), 3.iii. 1955, from mound ; (iv) S. and W., Chikbillapur Range, Kolar For. Div., coll. M. L. Roonwal (R6/5.3.55), 5. iii. 1955, from mound.

Measurements :

(i) <i>Imago :</i>	Range (2 exs.)
1. Total body-length without wings <i>c</i>	... 13.20 (K.)
2. Length of head to base of mandibles	... 1.88—1.95
3. Max. width of head	... 2.75—2.80
4. Max. diameter of eye	... 0.82—0.85
5. Max. diameter of ocellus	... 0.37—0.45
6. Min. eye-ocellus distance	... 0.13—0.14
7. Max. length of pronotum	... 1.30—1.40
8. Max. width of pronotum	... 2.20—2.30
9. Length of forewing scale	.. 1.55—1.60
10. Length of hindwing scale	... 1.10—1.18
(ii) <i>Soldier :</i>	(Range 10 exs.)
1. Total body-length <i>c</i>	... 4.70—5.00
2. Length of head to base of mandibles	... 1.53—1.68
3. Max. width of head	... 1.20—1.28
4. Max. length of pronotum	... 0.56—0.60
5. Max. width of pronotum	... 0.93—1.05

Distribution : INDIA : Southern India : Karnataka : Bababuddin Hills, between Hampasagram and Hadagalli, Chikbillapur Forest Range, Kadur, Kollegal, Maddur, Meghalpura nr. Mysore, Ramchandra Plantations (50 km from Bangalore on road to Kolar), Siruguppa, 12 km from Mysore on Yelwal Road ; Tamil Nadu : Coimbatore. Elsewhere : Maharashtra : Pune, Sangamner, Wallon ; Madhya Pradesh : Hoshangabad ; Orissa : Sambalpur ; Bihar : Betla.

Biology : *Odontotermes wallonensis* is a mound-building termite and it has been recorded from Orissa, Bihar and peninsular India. The mounds are irregularly, dome-shaped of 30 cm to 1.40 m height and have large open mouthed chimeneys of 5-12 cm diameter, leading deep into the main nest. The fungus combs are large, flaky and appears as soft chunks, located in the vaults which are arranged in tiers one over the other. The royal cell is spindle-shaped, about 12-18 cm in length and 10-12 cm in width. Generally a single pair of reproductive castes is present. Mathur and Chhotani (1960) have, however, recorded 3 queens in a mound at Sambalpur, Orissa.

This species has also been recorded from under mud plaster on the stem of fig tree (Holmgren and Holmgren, 1917).

Genus *Hypotermes* Holmgren

1912. *Odontotermes (Xenotermes)* Holmgren, *K. Sv. Vet. Akad. Handl.*, 48 : 36-39.
 1913. *Odontotermes (Hypotermes)*; Holmgren, *K. Sv. Akad. Handl.*, 50(2) : 141. (*Xenotermes* nom. preoc.)
 1949. *Odontotermes (Hypotermes)*; Snyder, *Smiths. misc. Coll.*, 112 : 244.
 1956. *Hypotermes*; Roonwal and Sen-Sarma, *Indian J. Agric. Sci.*, 26(1) : 21.
 1963. *Hypotermes*; Chatterjee and Thakur, *Indian For. Rec. (N. S.) Ent.*, 10 : 171-203.

Type-species : *Hypotermes xenotermitis* (Wasm.)

73. *Hypotermes obscuriceps* (Wasmann)

(Figs. 142, 143)

1902. *Termes obscuriceps* Wasmann, *Zool. Jb.*, 17(1) : 113-114. Type-localities : Sri Lanka : Trincomali, Bandrawella.
 1949. *Odontotermes (Hypotermes) obscuriceps*; Snyder, *Smiths. misc. Coll.*, 112 : 244.
 1963. *Hypotermes obscuriceps*; Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, 10 : 174, 175-186, Im., S. and W. (maj. & min.). Type locality restricted to Trincomali.

Material : Lot 1. Six vials from Tamil Nadu, thus : Tambram, Madras, coll. I. Maligi, 22. ix. 1961 ; Top Slip (4 vials), coll. O. B. Chhotani, 18.ii. 1965, 020, 021 and 030/18.2.69, from under layers of earth over stem of trees and 041/18.2.69, from under cowdung ; and Mumdamthorai Tiger Sanctuary, coll, O. B. Chhotani (011/1.3.69), 1.iii. 1969, from soil.

Lot 2. Two vials from Karnataka, coll. O. B. Chhotani, thus : 027/20.ii. 69, Mercara Reserve Forest, Mercara, 20.xi. 1962, under stone ; and 07/21.11.62, Anekad Forest Range, Mysore-Mercara Road, 21.xi. 1962.

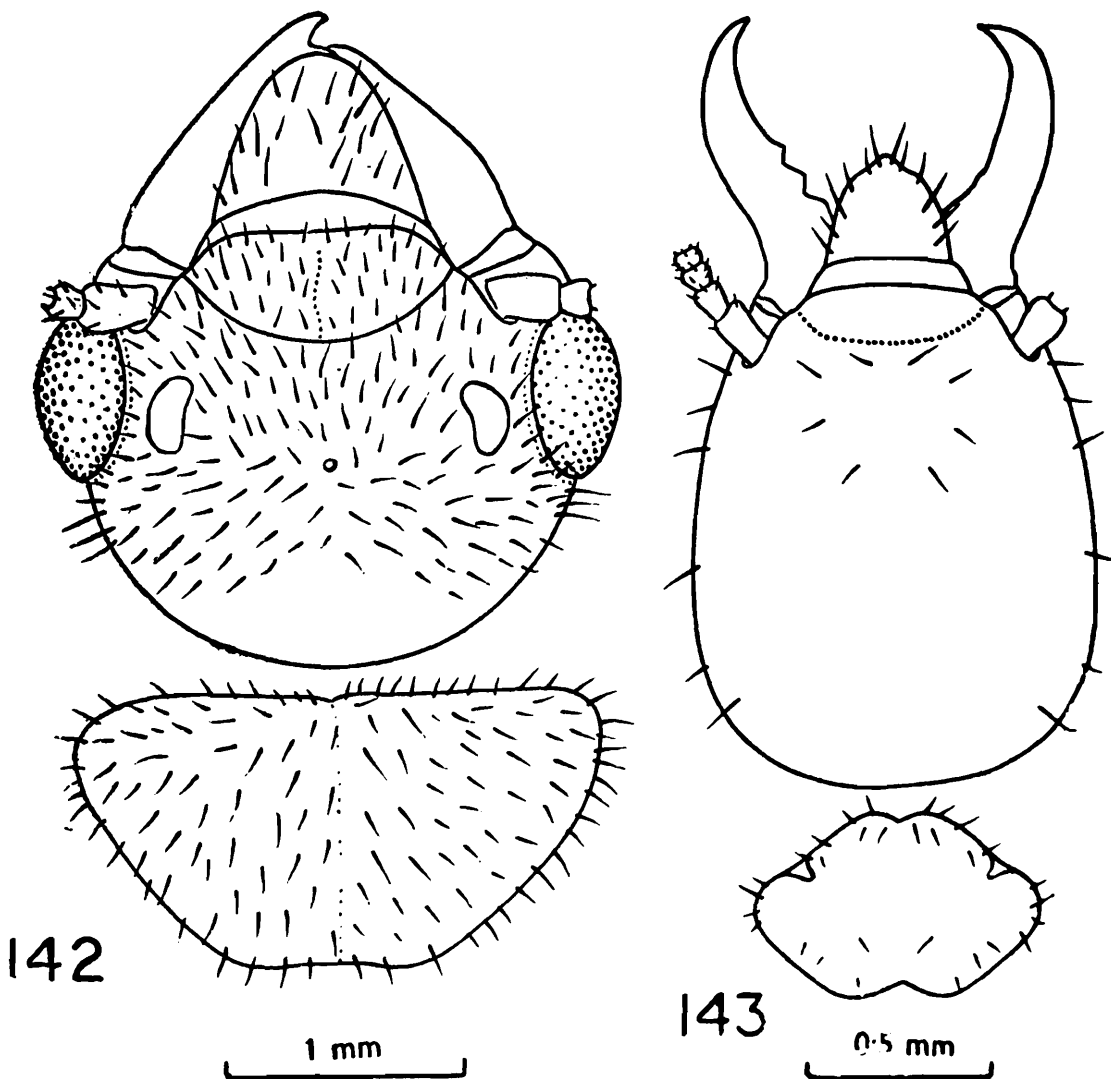
Measurements :

(i) Imago (From specimens from Sri Lanka) :	Range (2 exs.)
1. Total body-length with wings <i>c</i>	... 25.50—28.40
2. Total body-length without wings <i>c</i>	... 12.30—12.70
3. Length of head to base of mandibles	... 1.70— 1.75
4. Max. width of head with eyes	... 2.43— 2.45
5. Max. diameter of compound eye	... 0.63— 0.65

6. Max. diameter of lateral ocellus	...	0.30— 0.33
7. Min. eye-ocellus distance	...	0.12— 0.13
8. Max. length of pronotum	...	1.03— 1.10
9. Max. width of pronotum	...	2.20— 2.23
10. Length of forewing with scale	...	20.20—24.30
11. Length of hindwing with scale	...	19.10—22.40

(ii) *Soldier* : Range (5 exs.)

1. Total body-length <i>c</i>	...	4.30—4.70
2. Length of head to base of mandibles	...	1.18—1.33
3. Max. width of head	...	1.02—1.05
4. Max. length of pronotum	...	0.40—0.43
5. Max. width of pronotum	...	0.72—0.75



Figs. 142-143. *Hypotermes obscuriceps* (Wasmann)
 Fig. 142. Head and pronotum of imago (from Sri Lanka), in dorsal view.
 Fig. 143. Ditto, soldier (from southern India).

Distribution : INDIA : Southern India : Tamil Nadu : Top Slip, Tambram (Madras) ; Karnatak : Anekad Forest Range, Mercara Reserve Forest (Mercara). Otherwise : Sri Lanka : Avisavella, Bandara-wella, Colombo, Diyatalawa, Hali Ela, Kotte, Passara, Peradeniya, Raltota and Trincomali. Records from Indo-China (southern Vietnam) need checking.

Biology : It is a common mound-building termite in Sri Lanka. The mounds are large, irregular and conical in shape. Like those of *Odontotermes redemanni* (Wasmann), they have a large number of chambers containing fungus combs. In India, it does not build any mound. It has been collected in southern India making layers and sheaths of earth over tree trunks and from soil. It is reported to attack timber in houses in Sri Lanka.

Genus *Microtermes* Wasmann

1902. *Microtermes* Wasmann, *Zool. Jb.*, 17(1) : 115.

1949. *Microtermes* ; Snyder, *Smith. misc. Coll.*, 112 : 247.

1964. *Microtermes* ; Chatterjee and Thakur, *Indian For. Rec. (N. S.) Ent.*, 10(11) : 219-260.

Type-species : *Termes incertus* Hagen.

The genus *Microtermes* was erected by Wasmann (1902) and in it he included 3 species, viz., *Termes incertus* Hagen, *Microtermes globicola* his new species and *Termes pallidus* Haviland. While doing so Wasmann designated *Termes incertus* as the type of the genus, providing generic diagnostic characters for also the imago.

Chatterjee and Thakur (1964b) while dealing with Indian *Microtermes* write, "The generic name *Microtermes* was first introduced in literature by Wasmann in 1902, who included under it only one species *Microtermes globicola* from Ceylon, without designating it as generitype. Later workers like Fuller (1922), Sjöstedt (1926), Snyder (1949) and Ahmad (1955) also did not designate any generitype. However by virtue of its being a monotypic species, it is designated as a generitype".

From this statement, it is not unreasonable to guess that the authors did not have access to the original publication by Wasmann (1902) and therefore, wrongly designated *globicola* of Wasmann as the type of genus *Microtermes*.

So, here *Termes incertus* has been mentioned as the type of the

genus as was done by Wasmann (1902) himself. In this connection, it may be stated that Wasmann's (1902) original paper has been available to the author.

Two species of the genus are known from southern India.

Key to Species

(i) *Soldier* :

- | | | | |
|------|---|-----|---------------------------|
| 2(1) | Left mandible with one sharp tooth
in its distal third | ... | <i>globoicola</i> Wasmann |
| 1(2) | Left mandible without tooth | ... | <i>obesi</i> Holmgren |

74. *Microtermes globoicola* Wasmann

1902. *Microtermes globoicola* Wasmann, *Zool. Jb.*, 17(1) : 116, S. and W. Type-locality : Anuradhpura, Sri Lanka.

1949. *Microtermes globoicola* ; Snyder, *Smiths. misc. Coll.*, 112 : 249.

1964. *Microtermes globoicola* ; Chatterjee and Thakur, *Indian For. Rec. (N. S.) Ent.*, 10 : 222, 223-225, 250.

Material : As no material of this species was available for study, the following measurements are taken from Chatterjee and Thakur, 1964b.

Measurements :

Soldier :

- | | | | |
|----|-------------------------------------|-----|-----------|
| 1. | Total body-length <i>c</i> | ... | 3.50—3.60 |
| 2. | Length of head to base of mandibles | ... | 0.95—0.98 |
| 3. | Max. width of head | ... | 0.83—0.85 |
| 4. | Max. length of pronotum | ... | 0.38—0.40 |
| 5. | Max. width of pronotum | ... | 0.58—0.60 |

Distribution : INDIA : Southern India : Karnataka : Maddur ; Tamil Nadu : Coimbatore ; Kerala : Theora (Cochin). Also Anuradhpura, Sri Lanka.

Biology : The nest of this species is under the ground surface. At Coimbatore it has been collected from fungus combs of the size of about 3 inches height and 3 inches diameter found at about 8 inches below the ground level in one case and about four and half feet below in another case. The fungus comb is skep-shaped and rather brittle than soft even when fresh. It has also been collected from under flower pot and under log of trimmed wood lying on ground (Holmgren and Holmgren, 1917).

75. *Microtermes obesi* Holmgren

(Figs. 144-145)

1911. *Microtermes obesi* Holmgren, *J. Bombay nat. Hist. Soc.*, 21(1) : 787-788.

Im. Type-locality : Khandala, Maharashtra.

1949. *Microtermes obesi* ; Snyder, *Smiths. misc. Coll.*, 112 : 252.1964. *Microtermes obesi* ; Chatterjee and Thakur, *Indian For. Rec. (N. S.) Ent.*, 10 : 222, 223, 234-239, 255-256.

Material : Lot 1. Seven vials, coll. M. L. Roonwal, Feb.-Mar., 1955, from Karnataka, Tamil Nadu and Kerala states, thus : R10/11.2.55,

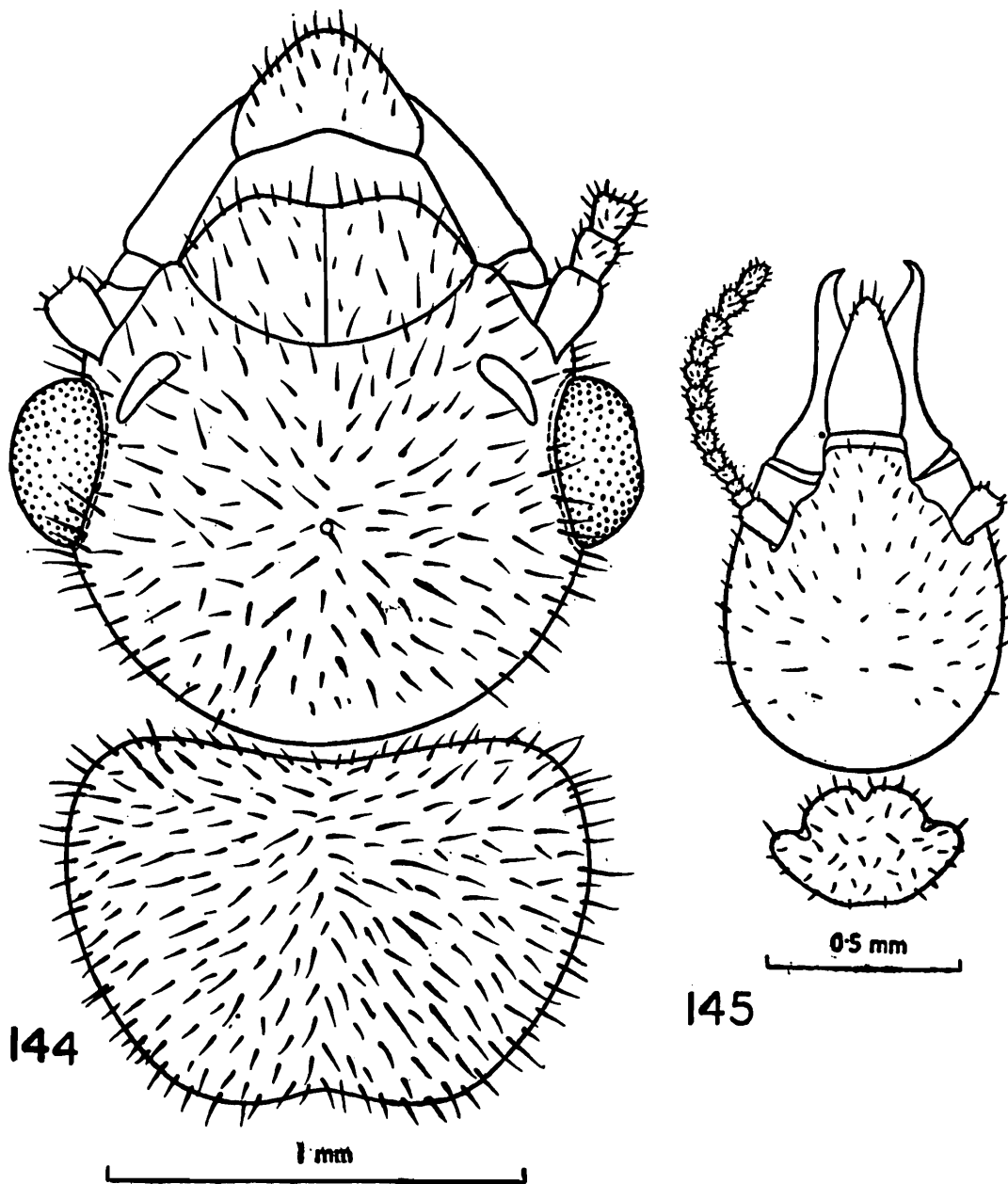
Figs. 144-145. *Microtermes obesi* Holmgren.

Fig. 144. Head and pronotum of imago, dorsal view.

Fig. 145. Ditto, soldier.

S. and W., Top Slip (Tamil Nadu), under dry cowdung ; R3/16.2.55, Im., S. and W., Nilambur (Kerala), from mound of *Odontotermes* sp. ; R5/16.2.55, S. and W., Nilambur, from fungus comb in *Odontotermes* sp. mound ; R6 and R9/25.2.55 (2 vials), S. and W., Makut (Coorg, Karnataka), from lump of earth in hollow of a felled unknown tree and inside rotten *Hevea brasiliensis* ; R12/5.3.55, S. and W., Chikbillapur Range, Kolar Forest (Karnataka), from soil at base of Eucalyptus tree ; and R17/12.3.55, S. and W., Bangalore Forest Div. (Karnataka), from under bark of dead *Casuarina equisetifolia*.

Lot. 2. Thirtysix vials with S. and W., coll. O. B. Chhotani, Karnataka, Tamil Nadu and Kerala states, thus : Karnataka : 03, 05 and 06/6.11.62 (3 vials), Dharwar, from twigs of 'Shikakai' ; 02, 07, 011, 014, 015, 018 and 021/7.11.62 (7 vials), Dandeeli, from bamboo pieces (07 and 015), from dead woods (014 and 021), from mounds of *Odontotermes* sp. (02 and 011) and from under stone (018) ; 02 and 07/8.11.62 and 03 and 013/9.11.62 (4 vials), Dharwar, ex. base of mango tree, galleries over a wooden pole, galleries over an unknown tree and soil, respectively ; 07, 08, 010, 012 and 013/12.11.62 (5 vials), Chickmagalur, under stone (07), from galleries inside an unknown tree (08) and base of plants (010, 012 and 013) ; 02, 010 and 014/14.11.62 (3 vials), Ramachandra Plantation, from dead stump, under leaves on ground and from dead stump of Eucalyptus, respectively ; 02/15.11.62, Tallagatpura, ex. soil ; 016 and 020/15.11.62 (2 vials), Shanbhoganhalli, from roots of a Ficus tree and under stone, respectively ; 017/18.11.62, Meghalpura, from roots of Ficus sp. ; 09 and 012/21.11.62 (2 vials), Anekad Forest Range from mound of *Odontotermes* sp. and soil, respectively ; 012, 013, and 018/23.11.62 (3 vials), Mangalore, from dead stump, galleries over a dead log and under stone, respectively. Tamil Nadu : 05/27.11.62, Top Slip, ex. mound of *Odontotermes* sp. ; 03, 014 and 015/1.3.69, Mumdamthorai Tiger Sanctuary, ex. mound (03) and soil (014 and 015). Kerala : 09/5.3.69, Panchakanam Reserve Forest, Periyar Lake Area, ex. tea stump.

Measurements :

(i) <i>Imago :</i>	Range (5 exs.)
1. Total body-length with wings <i>c</i>	... 13.20—14.40
2. Total body-length without wings <i>c</i>	... 7.20— 7.70
3. Length of head to base of mandibles	... 1.13— 1.18
4. Max. width of head with eyes	... 1.35— 1.48

5. Max. diameter of eye	...	0.35— 0.38
6. Max. diameter of ocellus	...	0.18— 0.20
7. Min. eye-ocellus distance	...	0.05— 0.06
8. Max. length of pronotum	...	0.78— 0.83
9. Max. width of pronotum	...	1.13— 1.20
10. Length of forewing with scale	...	11.60—12.40
11. Length of hindwing with scale	...	10.50—11.40

(ii) *Soldier* : Range (6 exs.)

1. Total body-length <i>c</i>	...	3.30—3.40
2. Length of head to base of mandibles	...	0.90—0.92
3. Max. width of head	...	0.80—0.83
4. Max. length of pronotum	...	0.41—0.43
5. Max. width of pronotum	...	0.52—0.55

Distribution : INDIA : Southern India : Karnataka : Anekad For. Range, Bangalore, Chikbillapur For. Range, Chickmagalur, Dandeeli, Dharwar, Hadagalli Road, between Hospet and Bellahunisi, Kadur, Makut (Coorg), Mangalore, Meghalpura, Ramachandra Plantations (Bangalore-Kolar Road), Santikopa, Sidapur (Coorg), Shanbhoganhalli, Siruguppa, Tallagatpura ; Tamil Nadu : Coimbatore, Mumdamthorai Tiger Sanctuary, Shevaroy Hills, Top Slip. Elsewhere : Widely distributed all over the Indian subcontinent. Also recorded from Ceylon, Burma and Thailand.

Biology : *Microtermes obesi* lives underground or in the mounds of *Odontotermes* spp. where it makes its own galleries and cultivates fungus combs which are small and subrounded and are lodged in small rounded vaults. This species feeds on dead twigs, logs, etc. lying on ground. It is also reported as a serious pest of sugarcane, wheat, vegetables, garden flowers, etc. The swarming occurs generally between April to August, sometimes earlier as well.

Subfamily NASUTITERMITINAE

Genus *Nasutitermes* Dudley

1890. *Nasutitermes* Dudley, *Trans. N. Y. Acad. Sci.*, 9 : 158.
 1949. *Nasutitermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 265.
 1959. *Nasutitermes* ; Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (I. C. A. R. Monogr. 10.23) : 2-5.
 1965. *Nasutitermes* ; Sands, *Bull. Brit. Mus. (nat. Hist.) Ent.*, Supplement 4 : 13, 15-20.
 1970. *Nasutitermes* ; Krishna, in *Biology of Termites* (Ed. Krishna and Weesner) : 147-149.

Type-species : *Nasutitermes costalis* (Holmgren)

Nine species of the genus *Nasutitermes* are known from southern India.

Key to Species

(i) *Imago* :

- 1(4) Ocelli situated rather away from eyes, minimum eye-ocellus distance may be less than min. diameter of ocellus to almost equal to its max. diameter (0.078—0.13 mm).
- 2(3) Fontanelle plate oval, small ; segment 3 of antenna shorter than 2 ; eyes larger, max. diameter 0.35—0.40 mm ... *brunneus* Snyder
- 3(2) Fontanelle plate bluntly Y-shaped ; segment 3 of antenna longer than 2 ; eyes smaller, max. diameter 0.32 mm ... *fletcheri* Holmgren and Holmgren
- 4(1) Ocelli situated close to eyes, almost touching the ocular sclerite of its side
- 5(6) Pronotum much narrower than head, pronotum width 1.20—1.25 mm ; head narrow, width including eyes 1.35—1.40 mm ; eyes 0.45 mm in diameter ; ocelli 0.18 mm in long diameter ... *beckeri* Prashad and Sen-Sarma
- 6(5) Pronotum slightly narrower than head, pronotum width 1.33—1.40 mm ; head wider, width including eyes 1.40—1.47 mm ; eyes 0.47—0.50 mm in diameter ; ocelli 0.15—0.17 mm in long diameter ... *indicola* Holmgren and Holmgren
- (ii) *Soldier* :
- 1(2) Anterior abdominal tergites without long hairs ... *processionarius* Schmitz
- 2(1) Anterior abdominal tergites with long hairs
- 3(8) Head capsule without rostrum sub-circular (Figs. 146, 151, 157)
- 4(7) Head-capsule pale, straw-coloured ; abdominal tergites creamy white to yellowish ; paler species

- 5(6) Head-length with rostrum 1.85—1.98 mm and without rostrum 1.10—1.15 mm ; 3rd segment of antenna longer than 2nd ; larger species ... *anamalaiensis* Snyder
- 6(5) Head-length with rostrum 1.55—1.70 mm and without rostrum 0.80—0.95 mm ; 3rd segment of antenna shorter than 2nd ; smaller species ... *vishnu* sp. n.
- 7(4) Head-capsule brown ; abdominal tergites pale brown to brown ; darker species ... *crassicornis* Holmgren and Holmgren
- 8(3) Head-capsule without rostrum pear-shaped (Figs. 148, 150, 153, 155, 156).
- 9(1C) Spine-like process on outer margin of each mandible very minute ; rostrum as dark as head, reddish brown ; abdominal tergites brown ... *beckeri* Prashad and Sen-Sarma
- 10(9) Spine-like process on outer margin of each mandible well developed ; rostrum darker than head-capsule, castaneous brown ; abdominal tergites pale yellowish
- 11(14) Rostrum cylindrical (Figs. 153, 155)
- 12(13) 3rd segment of antenna about one and a half times as long as 2nd ; head-capsule faintly constricted behind antennae ; rostrum short in relation to head-length without rostrum (rostrum/head-length index 0.56-0.58) ... *fletcheri* Holmgren and Holmgren
- 13(12) 3rd segment of antenna only slightly longer than 2nd ; head capsule not constricted behind antennae ; rostrum relatively long in relation to head-length without rostrum (rostrum/head-length index 0.58—0.74) ... *indicola* Holmgren and Holmgren
- 14(11) Rostrum conical (Figs. 150, 156)
- 15(16) Abdominal tergites distinctly brown ; head brownish ... *brunneus* Snyder
- 16(15) Abdominal tergites yellowish white ; head pale brownish yellow ... *salemensis* (Sen-Sarma)

76. *Nasutitermes anamalaiensis* Snyder

(Fig. 146)

1933. *Nasutitermes (Rotunditermes) anamalaiensis* Snyder, *Proc. U. S. nat. Mus.*, 82(Art. 16) : 11, 12, S. Type-locality : Anamalai Hills, Tamil Nadu.
1949. *Nasutitermes anamalaiensis* ; Snyder, *Smiths. misc. Coll.*, 112 : 266.
1959. *Nasutitermes anamalaiensis* ; Prashad and Sen-Sarma, *Rev. Termite Gen. Nasutitermes Indian Region (I.C.A.R. Monogr. 10.23)* : 4, 5-6.

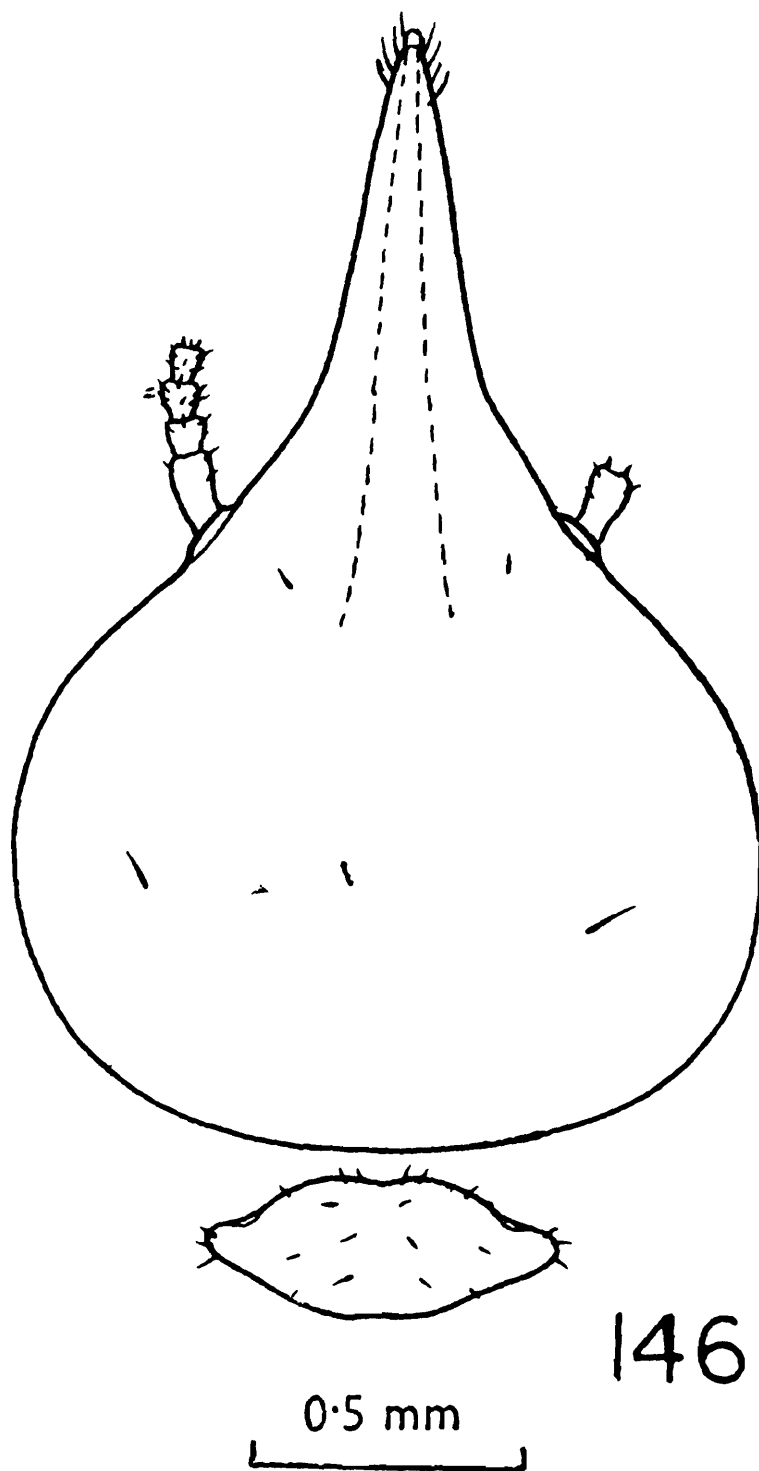


Fig. 146. Head and pronotum of soldier of *Nasutitermes anamalaiensis* Snyder, in dorsal view.

Material : Lot 1. Twelve vials with S. and W., coll. O. B. Chhotani, 21. ix. 1962, Karnataka and Feb. 1969, Tamil Nadu states, thus : Karnataka : 013 and 017/21.11.62, Mercara, from galleries over trees. Tamil Nadu : 022/18.2.69 and 021 and 025/19.2.69, Top Slip (Anamalai Hills), under layers of earth over a tree trunk, log of wood and fallen tree, respectively ; 03, 04, 012 and 022/23.2.69, Suranganar Res. Forest, Lower Camp, ex. dead stumps (03 and 04), dead fallen tree (012) and fallen *Albicia* (022) ; and 04/24.2.69, Vanathiparai Res. Forest, Lower Camp, from galleries over a 'Kusum' tree.

Lot 2. A vial with S. and W., Nandikonda Valley, Andhra Pradesh, coll. I. Maligi and Party, 11. viii. 1962.

Measurements :

<i>Soldier</i> :		Range (5 exs.)
1. Total body-length <i>c</i>	...	4.08—5.20
2. Length of head with rostrum	...	1.93—1.98
3. Length of head without rostrum	...	1.10—1.15
4. Length of rostrum	...	0.74—0.80
5. Max. width of head	....	1.28—1.34
6. Max. length of pronotum	...	0.30—0.31
7. Max. width of pronotum	...	0.58—0.60

Distribution : INDIA : Southern India : Karnataka : Mercara (Coorg) ; Andhra : Nandikonda Valley ; Tamil Nadu ; Anamalai Hills, Top Slip, Suranganar Reserve Forest and Vanathiparai Reserve Forest. Elsewhere : Known only from southern India, as above.

Biology : It has been collected from soft wood of *Albicia* trees and does extensive damage to such old trees and fallen logs in Suranganar Reserve Forest, Lower Camp. It lives in large communities. In the living trees the damage cannot be easily made out although the inside may have been completely eaten up.

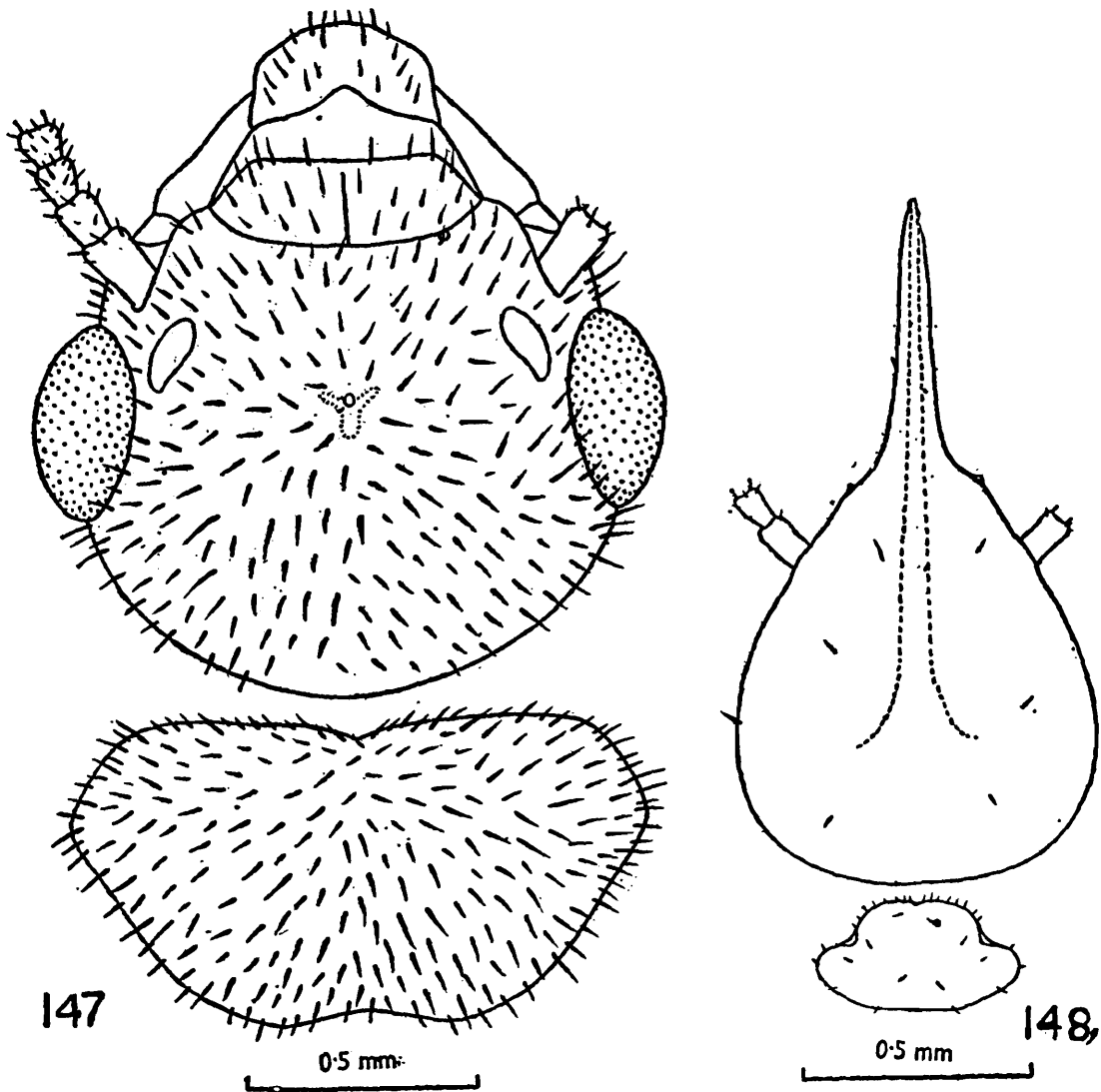
77. *Nasutitermes beckeri* Prashad and Sen-Sarma

(Figs. 147-148)

1959. *Nasutitermes beckeri* Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (I.C.A.R. Monogr. 10.23) : 4, 5, 8—13. Im., S. and W. Type locality : Neriyaanglam, Kerala.

Material : Lot 1. A vial with paratype S. and paramorphotype Im. and W., Neriyaanglam, Kerala, coll. G. Becker, 18. x. 1956, ex. 'carton nest in a tree'.

Lot 2. Three vials, Periyar Lake area, Kerala, coll. O. B. Chhotani as follows : 025/3.8.69, Q., S. and W., Kuttikanam nr. Peermade, from carton nest ; 01/5.3.69, S. and W., Panchakanam Res. Forest, from carton nest lying on ground ; 04/4.3.69. Thekaddi, from damaged portion of a tree.



Figs. 147-148. *Nasutitermes beckeri* Prashad & Sen-Sarma
 Fig. 147. Head and pronotum of imago (Paralectotype).
 Fig. 148. Ditto, soldier.

Measurements :

		Range (2 exs.)
(i) <i>Imago :</i>		
1. Total body-length with wings <i>c</i>	...	16.20—17.50
2. Total body-length without wings <i>c</i>	...	8.60— 8.80
3. Length of head to base of mandibles	...	1.08— 1.18
4. Max. width of head	...	1.35— 1.43
5. Max. diameter of eye	...	0.43— 0.47
6. Max. diameter of ocellus	...	0.17— 0.19

7. Min. eye-ocellus distance	...	0.04
8. Max. length of pronotum	...	0.68— 0.73
9. Max. width of pronotum	...	1.18— 1.35
10. Length of forewing	...	15.00—15.50
11. Length of hindwing	...	13.20—13.60
(ii) <i>Soldier</i> :		Range (6 exs.)
1. Total body-length <i>c</i>	...	3.20—3.90
2. Length of head with rostrum	...	1.50—1.60
3. Length of head without rostrum	...	0.83—0.88
4. Length of rostrum	...	0.65—0.70
5. Max. width of head	...	0.73—0.75
6. Max. length of pronotum	...	0.18—0.20
7. Max. width of pronotum	...	0.40—0.44

Distribution : INDIA : Southern India : Kerala : Kuttikanam nr. Peermade, Neriamanglam, Panchakanam Res. Forest, Thekaddi.

Biology : It is a carton-nest building termite. The nests are found on the trees and in the damaged portions of trees. The nests are made of brownish hard woody material.

The imagos have been collected in October from a nest. It is probable that swarming occurs during that month.

78. *Nasutitermes brunneus* Snyder

(Figs. 149-150)

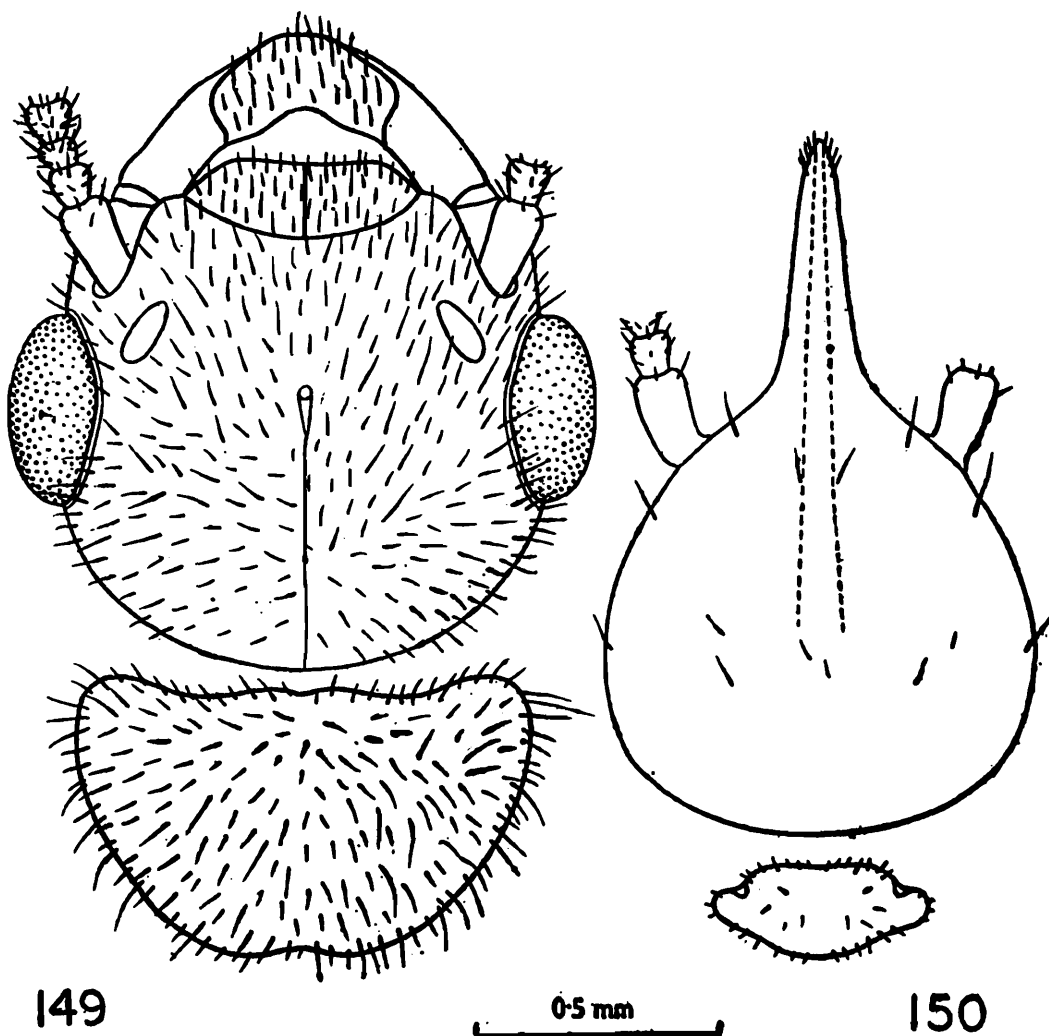
1933. *Nasutitermes (Nasutitermes) fletcheri*, Snyder (nec Holmgren and Holmgren, 1917), *Proc. U. S. nat. Mus.*, 82 (Art. 16) : 10-11, pl. 1 (S). Im.
 1944. *Nasutitermes brunneus* Snyder, *Indian For. Rec.*, 20(11) : 11. Im. and S. Type locality : Anamalai Hills, Tamil Nadu.
 1949. *Nasutitermes brunneus* ; Snyder, *Smiths, misc. Coll.*, 112 : 269.
 1959. *Nasutitermes brunneus* ; Prashad and Sen-Sarma, *Rev. Termite Gen. Nasutitermes Indian Region (I.C.A.R. Monogr. 10.23)* : 13-18.

Material : Lot 1. Im. and S. (in 2 vials), labelled cotypes, Anamalai Hills, Tamil Nadu, coll. J. C. M. Gardner, 8. v. 1930.

Lot 2. Nine vials with S. and W. from Tamil Nadu, Kerala and Karnataka states, coll. M. L. Roonwal, Feb., 1955, thus : Tamil Nadu : R7/11.2.55, Top Slip, under dry bamboo on ground ; Kerala : R4/15.2.55, Nilambur, from galleries in hollow of a fallen tree ; R7/and R11/20.2.55, Konnoth For. Range (Wynaad Div.), ex. unknown tree and log of unknown wood lying on ground, respectively ; Karnataka : R3 and

R14/24.2.55, R4/25.2.55 and R2 and R7/26.2.55, Makut, Coorg, ex. under bark of cashewnut, attacking dead branch of live cashew tree, exposed roots of a tree, galleries on a tree and blackish carton, respectively.

Lot 3. Eleven vials with S. and W., Tamil Nadu, coll. O. B. Chhotani, Nov., 1962 and Feb., 1969, thus : 07, 011, 015, 019, 021 and 022a/27.11.62, Top Slip, from twigs of an unknown wood on ground (07), from galleries over unknown trees (011 and 021), from galleries over dead stump (015 and 019) and at base of a teak plant (022a); 015/13.2.69, Sanyasimalai Res. Forest, Yercaud, from dead stump of wood ; 020, 021 and 030/18.2.69, Top Slip from under layers of earth over trees and 06/16.2.69, Top Slip, from dead stump of a tree.



Figs. 149-150. *Nasutitermes brunneus* Snyder

Fig. 149. Head and pronotum of imago (Paralectotype).

Fig. 150. Ditto, soldier.

Measurements :

(i) Imago :		Range (2 exs.)
1.	Total body-length with wings <i>c</i> ...	11.60
2.	Total body-length without wings <i>c</i> ...	5.80—6.90
3.	Length of head to base of mandibles ...	0.80—0.90
4.	Max. width of head ...	1.15—1.18
5.	Max. diameter of eye ...	0.38—0.40
6.	Max. diameter of ocellus ...	0.14—0.18
7.	Min. eye-ocellus distance ...	0.06—0.08
8.	Max. length of pronotum ...	0.50—0.53
9.	Max. width of pronotum ...	0.90
10.	Length of forewing ...	9.20
11.	Length of hindwing ...	9.00
(ii) Soldier :		Range (5 exs.)
1.	Total body-length ...	3.50—3.60
2.	Length of head with rostrum ...	1.36—1.45
3.	Length of head without rostrum ...	0.83—0.88
4.	Length of rostrum ...	0.53—0.57
5.	Max. width of head ...	0.89—0.91
6.	Max. length of pronotum ...	0.18—0.19
7.	Max. width of pronotum ...	0.45—0.48

Distribution : INDIA : Southern India : Karnataka : Makut (Coorg), Mangalore ; Tamil Nadu : Anamalai Hills, Top Slip, Sanayasimalai Res. Forest (Yercaud) ; Kerala : Konnoth For. Range (Wynaad Div.), Nilambur.

Biology : This species has been found feeding on dead wood, twigs, etc. lying on ground in a jungle and on stumps and bark of trees. It makes covered runways and layers and sheaths of earth over tree trunks and blackish carton nest.

79. *Nasutitermes crassicornis* (Holmgren and Holmgren)

(Fig. 151)

1917. *Eutermes (Eutermes) crassicornis* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 : 162. S. and W. Type-localities : Anamalai Hills (Tamil Nadu) ; Sidapur (Coorg) and Bababuddin Hills (Karnataka).
1949. *Nasutitermes crassicornis* ; Snyder, *Smiths. misc. Coll.*, 112 : 273.
1959. *Nasutitermes crassicornis* ; Prashad and Sen-Sarma, *Rev. Termite Gen. Nasutitermes Indian Region (I.C.A.R. Monogr. 10.23)* : 23-25. Type locality restricted to Bababuddin Hills.

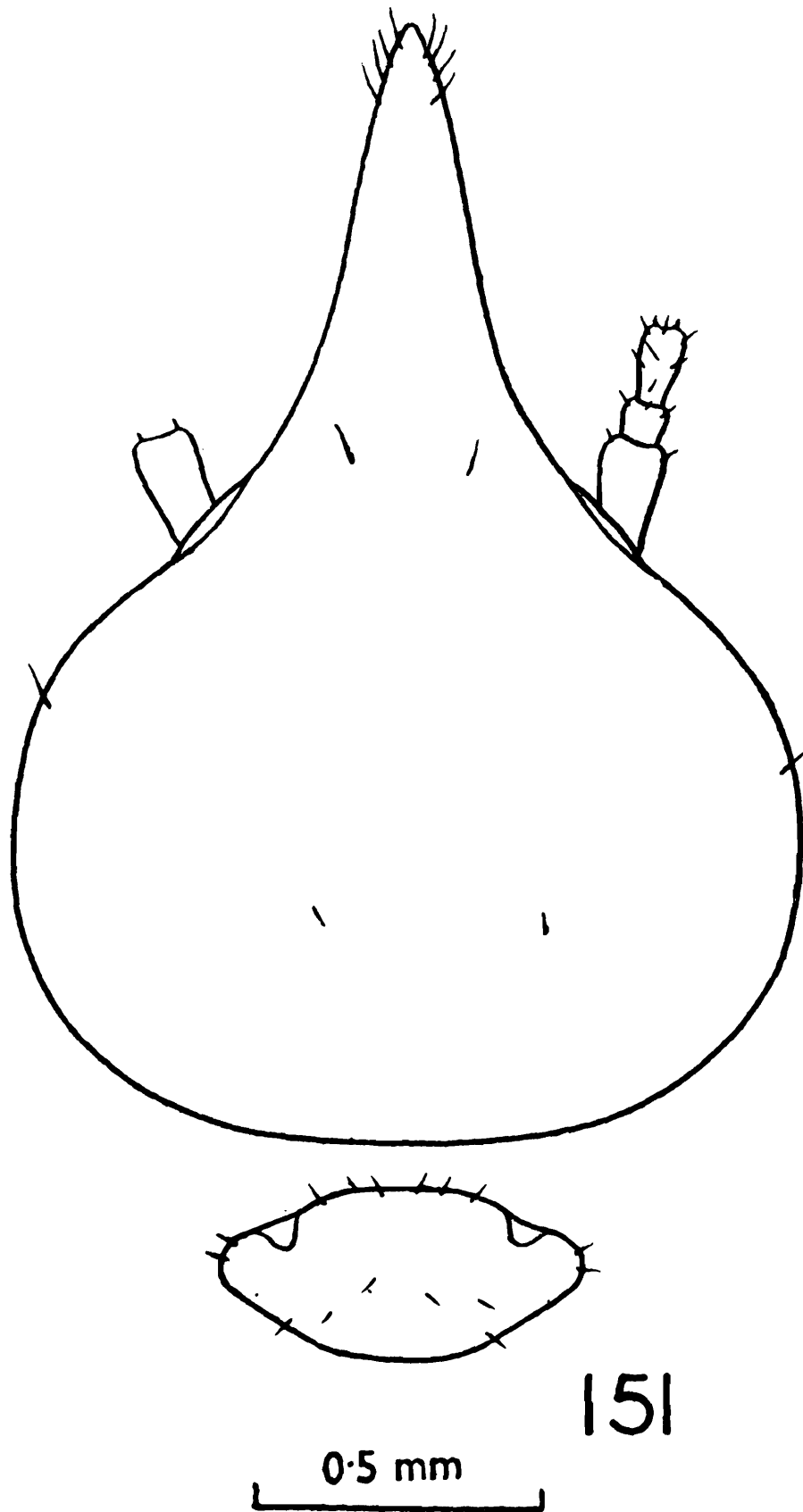


Fig. 151, Head and pronotum of soldier of *Nasutitermes crassicornis* Holmgren & Holmgren (Paralectotype), in dorsal view,

Material : A vial with several syntype S. and two W., Bababuddin Hills, Karnataka state, coll. T. B. Fletcher, 7.-9.ii.1912.

Measurements :

<i>Soldier</i> :		Range (4 exs.)
1. Total body-length <i>c</i>	...	4.40—4.80
2. Length of head to tip of rostrum	...	2.03—2.07
3. Length of head without rostrum	...	1.25—1.30
4. Length of rostrum	...	0.70—0.75
5. Max. width of head	...	1.43—1.47
6. Max. length of pronotum	...	0.31—0.34
7. Max. width of pronotum	...	0.64—0.68

Distribution : INDIA : Southern India : Karnataka : Bababuddin Hills, and Sidapur (Coorg) ; Tamil Nadu : Anamalai Hills.

Biology : *N. crassicornis* has been reported making galleries on tree trunks and in wood and rotten logs. The nest of the species is reported to be above in the tree. The species has not been collected further since it was described.

Remarks : Prashad and Sen-Sarma (1959) have selected the soldier as Lectotype from the syntypes collected at Bababuddin Hills. The other soldiers in the above mentioned syntype collection thus become the paralectotypes.

80. *Nasutitermes fletcheri* (Holmgren and Holmgren)

(Figs. 152, 153 ; Table 10)

1917. *Eutermes (Eutermes) fletcheri* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 : 161-162. S. and W. Type-locality. Shevaroy Hills, Tamil Nadu.

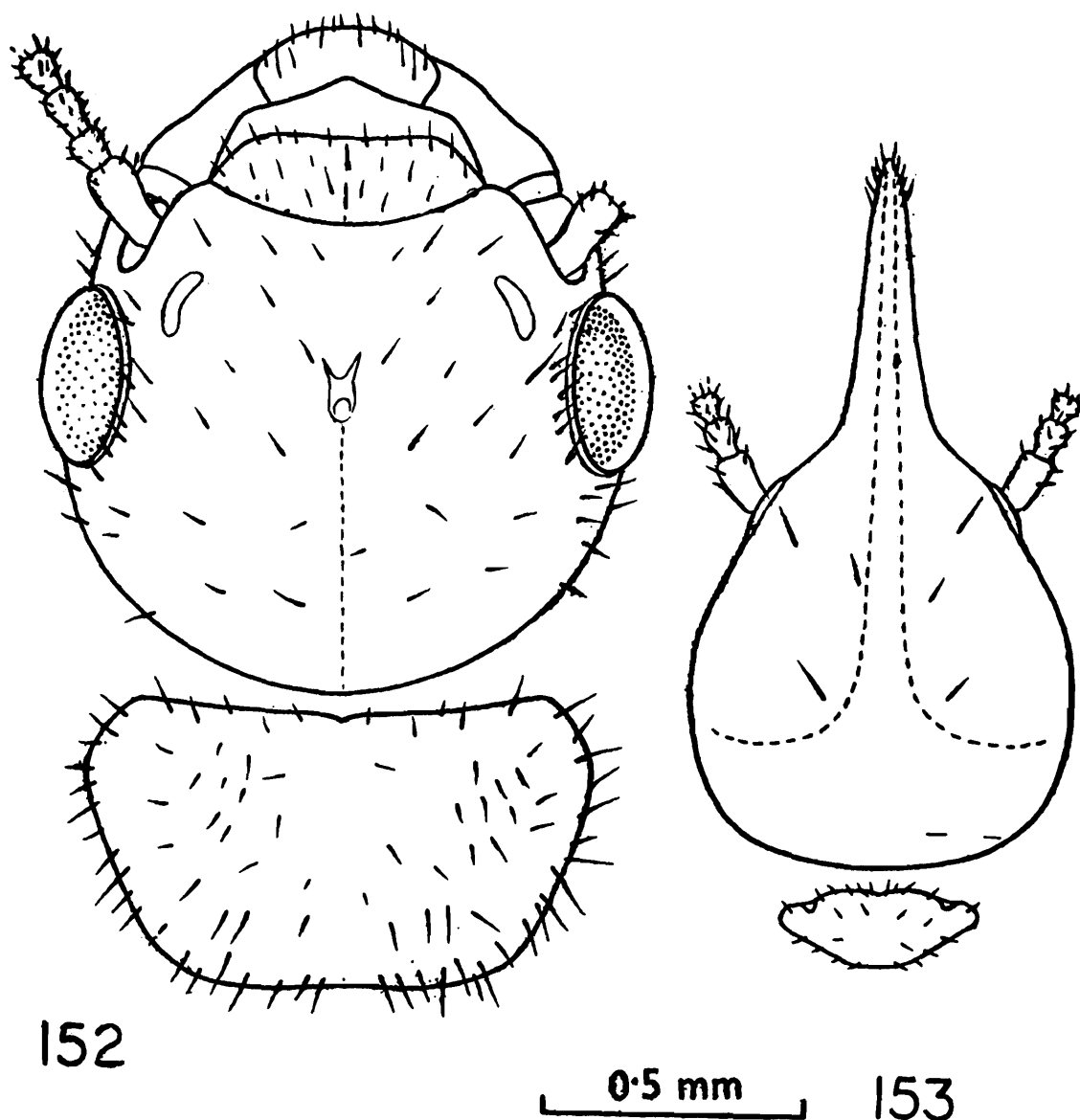
1949. *Nasutitermes fletcheri* ; Snyder, *Smiths. misc. Coll.*, 112 : 276.

1949. *Nasutitermes fletcheri* ; Prashad and Sen-Sarma, *Rev. Termite Gen. Nasutitermes Indian Region (I.C.A.R. Monogr. 10.23)* : 28-31.

Material : Lot 1. Two vials with syntype S. and W., Shevaroy Hills, Tamil Nadu, coll. T. B. Fletcher, Oct. 1912.

Lot 2. Nine vials with S. and W., Tamil Nadu state, coll. O. B. Chhotani, 1962 and 1969, thus : 06/27.11.62, Top Slip, from mound of *Odontotermes* sp. ; 05 and 029/12.2.69, 031 and 033/13.2.69, Yercaud, ex. a 'dadap' tree, unknown plant, roots of a plant and dead wood lying on ground, respectively ; 03a/19.2.69, Top Slip, from dead stump of a tree ; 040/23.2.69, Suranganar Reserve Forest, from

unknown wood, 06/28.2.69, Mylar, from unknown tree ; and 04/1.3.69, Mumdamthorai Tiger Sanctuary, from twigs of unknown plant ; 017/1.3.69, Q., S., W., Mumdamthorai, 1. iii. 1969, ex. base of small plant.



Figs. 152-153. *Nasutitermes fletcheri* (Holmgren & Holmgren)

Fig. 152. Head and pronotum of imago, dorsal view.

Fig. 153. Ditto, soldier.

Description : IMAGO (Physogastric queen) (Fig. 152). Described here for the first time.

General : Head-capsule light reddish brown ; postclypeus, labrum and antennae light golden yellow ; fontanelle plate whitish ; eyes black ; pronotum light yellowish brown ; abdomen and legs yellowish, abdominal tergites light brown. Head and body sparsely pilose. Total body length c 11.80.

Table 10. Measurements of *Nasutitermes fletcheri* Holmgren and Holmgren
CASTE—Imago

<i>Body parts</i>	<i>Queen (1 ex)</i>
1. Total body-length <i>c</i>	... 11.80
2. Length of head to tip of labrum	... 1.28
3. Length of head to base of mandibles	... 1.05
4. Max. width of head (with eyes)	... 1.23
5. Max. height of head	... 0.53
6. Max. length of labrum	... 0.30
7. Max. width of labrum	... 0.35
8. Max. diameter of fontanelle plate	... 0.15
9. Max. diameter of compound eye	... 0.32
10. Max. diameter of lateral ocellus	... 0.15
11. Min. diameter of lateral ocellus	... 0.08
12. Min. eye-ocellus distance	... 0.08
13. Max. length of pronotum	... 0.55
14. Max. width of pronotum	... 0.98
15. Length of forewing scale	... 0.55
16. Length of hindwing scale	... 0.50

Head: Head-capsule subcircular, little broader than long (head-length to base of mandibles 1.05, head-width including eyes 1.23 mm).

Fontanelle: Fontanelle plate bluntly Y-shaped, elongate. *Eyes*: moderately large, circular; moderately bulging out. *Ocelli*: oval, situated at a distance from eyes equal to the short ocellar diameter.

Antennae: Broken, only 11 segments present, segment 2 little shorter than 3, 4 shortest. *Clypeus*: Postclypeus swollen, semicircular; length little less than half of its width (length 0.20, width 0.50 mm). Anteclypeus hyaline, trapezoidal. *Labrum*: Broadly mushroom-shaped; little broader than long. *Mandibles*: Of *Nasutitermes*-type.

Thorax: *Pronotum*: Flat, subtrapezoidal, broadest anteriorly; weakly notched on anterior and faintly incurved on posterior margin
Legs: Broken.

Abdomen: Oblong, elongate; cerci 2-segmented, 0.13 mm long.

Measurements:

(i) *Imago*: See table 10.

(ii) *Soldier*: Range (5 exs.)

1. Total body-length *c* ... 3.18—3.74

2. Head-length to tip of rostrum ... 1.43—1.50

3. Length of head without rostrum	...	0.88—0.91
4. Length of rostrum	...	0.55—0.58
5. Max. width of head	...	0.83—0.85
6. Max. length of pronotum	...	0.17—0.20
7. Max. width of pronotum	...	0.45—0.47

Distribution : INDIA : Southern India : Tamil Nadu : Mumdamthorai Tiger Sanctuary, Mylar, Shevaroy Hills, Suranganar Res. Forest (Lower Camp), Top Slip, and Yercaud.

Biology : This species has been collected from dead wood, twigs and roots of a number of unidentified plants and from a mound of *Odontotermes* sp. It is also reported making galleries over dead tree stumps and over a rock. When disturbed they march in long files, four to five abreast (Holmgren and Holmgren, 1917).

Remarks : Since Prashad and Sen-Sarma (1959) have designated a syntype soldier as lectotype, the other syntype soldiers vide 'Material' above become the paralectotypes.

81. *Nasutitermes indicola* (Holmgren and Holmgren)

(Figs. 154, 155)

1917. *Eutermes (Eutermes) indicola* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 (3) : 161. S. and W. Type localities : Mercara, Karnataka and Anamalai Hills, Tamil Nadu.
1949. *Nasutitermes indicola* ; Snyder, *Smiths. misc. Coll.*, 112 : 280.
1959. *Nasutitermes indicola* ; Prashad and Sen-Sarma, *Rev. Termite Gen. Nasutitermes Indian Region* (I. C. A. R. Monogr. 10.23) : 35-39 (type-locality restricted to Anamalai Hills).
1971. *Nasutitermes indicola*, Chhotani, *Rec. Zool. Surv. India*, 63 : 223-229.

Material : Lot 1. Two vials with S. and W., labelled cotypes, Mercara, Coorg, coll. T. B. Fletcher, 21. xi. 1912 and a vial with a S. and W., labelled cotypes, Anamalai Hills, coll. T. B. Fletcher, 22.1.1912. These cotypes become paralectotypes now as a lectotype has been designated by Prashad and Sen-Sarma (1959) from the collection from Anamalai Hills.

Lot 2. A vial with a Q., S. and W. and another with S. and W., Thekkadi, Kerala, coll. A. E. Emerson, Oct. 1960, ex. carton nest and under log in grassy forest, respectively.

Lot 3. Coll. O. B. Chhotani, 20. xi. 1962, from Mercara, Coorg, Karnataka, as follows : Nos. 01, 010, and 021/20.11.62, each with a

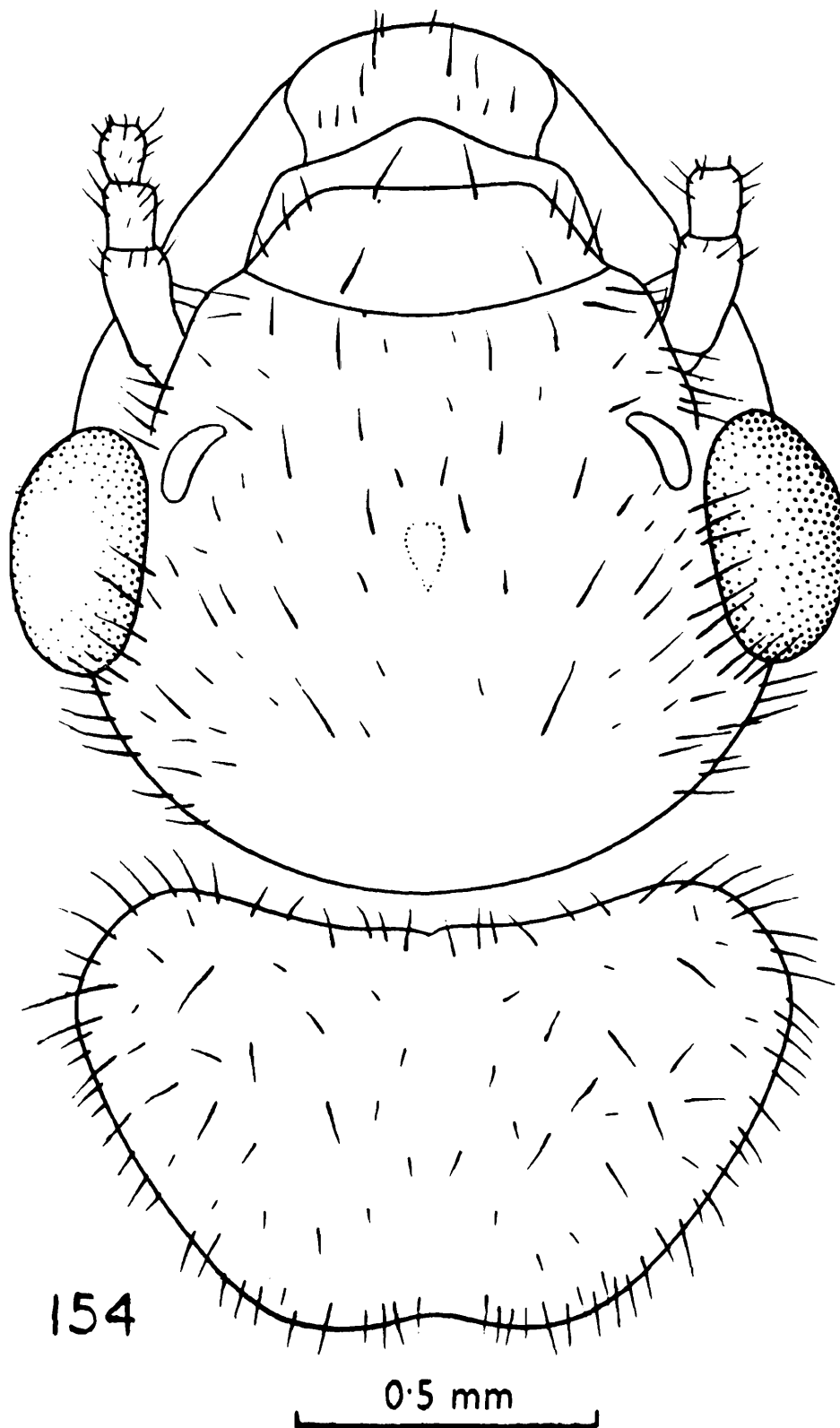


Fig. 154. *Nasutitermes indicola* (Holmgren & Holmgren). Head and pronotum of imago, dorsal view.

Q., S. and W. and 03/20.11.62 with K., Q., and S. and W., all ex. carton nests ; 07 and 026/20.ii.62 with S. and W. from stumps of dead trees ; 09, 020 and 024/20.11.62, S. and W., from galleries over stem of a tree, at base of a dead tree and under stone, respectively.

Measurements :

(i) <i>Imago :</i>		Range (4 exs.)
1. Total body-length <i>c</i>	...	22.00—28.00 (Q.) 8.50 (K.)
2. Length of head to base of mandibles		1.10—1.17
3. Max. width of head	...	1.40—1.47
4. Max. diameter of eye	...	0.47—0.50
5. Max. diameter of ocellus	...	0.15—0.17
6. Min. eye-ocellus distance	...	0.03
7. Max. length of pronotum	...	0.70—0.80
8. Max. width of pronotum	...	1.33—1.40
(ii) <i>Soldier :</i>		Range (5 exs.)
1. Total body-length <i>c</i>	...	3.40—3.50
2. Length of head with rostrum	...	1.63—1.70
3. Length of head without rostrum	...	0.90
4. Length of rostrum	...	0.73—0.80
5. Max. width of head	...	0.85—0.86
6. Max. length of pronotum	...	0.20
7. Max. width of pronotum	...	0.47—0.48

Distribution : INDIA : Southern India : Karnataka : Mercara (Coorg) ; Tamil Nadu : Anamalai Hills ; Kerala : Thekkadi.

Biology : *Nasutitermes indicola* makes carton nests on trees in between and on the branches and on the main trunk. It makes long, thin, narrow galleries which connect the nest with the soil. Through these galleries the insects go out foraging. The nests are globular to oval in shape, dark brown in colour and are made up of vegetable matter. The outer wall is thin and papery. The inside structure is rough, honeycombed and hard. The species has been reported making nests on a variety of trees at Mercara (Chhotani, 1971). This termite has been collected feeding on dead woods, small twigs, etc. lying on the ground and also from under stones.

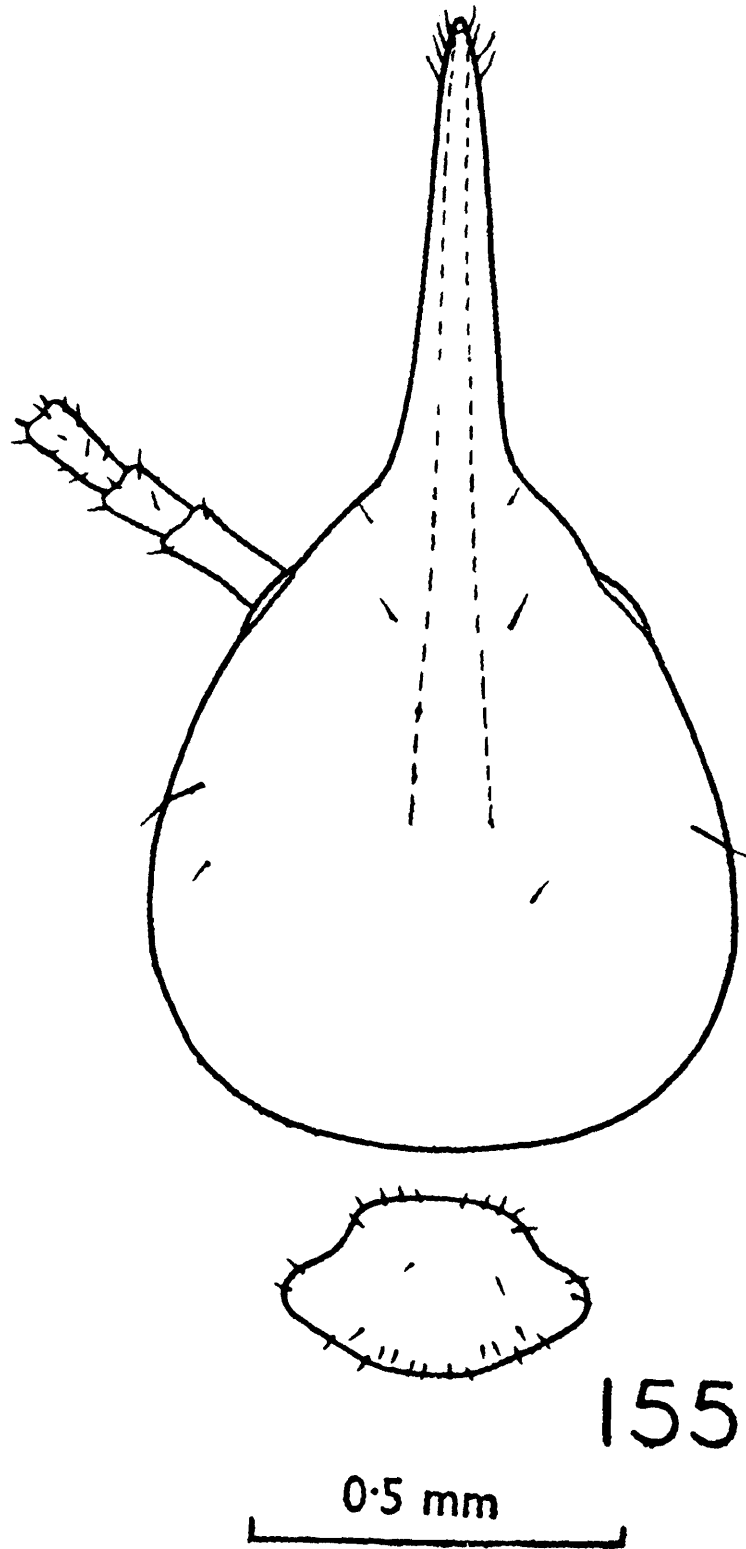


Fig. 155. *Nasutitermes indicola* (Holmgren & Holmgren).
Head and pronotum, in dorsal view, of soldier
(Paralectotype).

82. *Nasutitermes processionarius* (Schmitz)

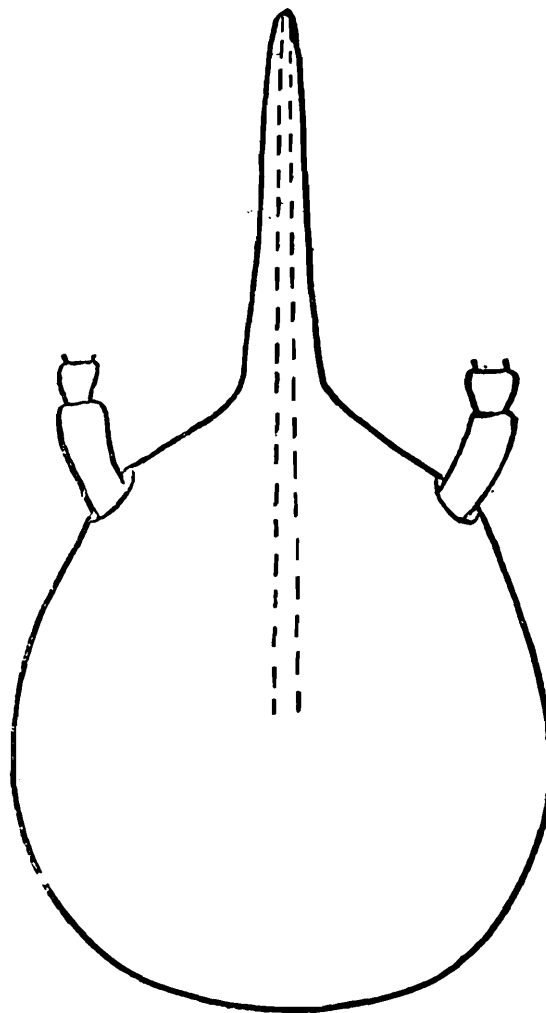
(Fig. 156a)

1924. *Eutermes* (*Eutermes*) *processionarius* (misprint for *processionarius*) Schmitz. *Zool. Anz.*, 59 (11-12) : 301-304.

1949. *Nasutitermes processionarius* ; Snyder, *Smiths. misc. Coll.*, 112 : 280.

1959. *Nasutitermes processionarius* ; Prashad and Sen-Sarma, *Rev. Termite Gen. Nasutitermes Indian Region* (I. C. A. R. Monogr. 10. 23) : 57-60.

Material : As no material of this species was available in the National Zoological Collections, the measurements of two syntype soldiers, have been taken from Prashad and Sen-Sarma (1959),



0.5 mm

156(a)

Fig. 156(a). Head of *Nasutitermes processionarius* (Schmitz), dorsal view, (Redrawn from Prashad and Sen-Sarma, 1959).

Measurements :

<i>Soldier :</i>		(2 syntype exs.)
Total body-length	...	3.5 — 4.1
Length of head with rostrum	...	1.55—1.60
Length of head without rostrum	...	0.95—1.00
Length of rostrum	...	0.55—0.65
Max. width of head	...	0.85
Max. length of pronotum	...	0.20
Max. width of pronotum	...	0.45

Distribution : INDIA : Navoor (South Canara Dist.), Type locality.

83. *Nasutitermes salemensis* (Sen-Sarma)
(Fig. 156)

1965. *Fletcheritermes salemensis* Sen-Sarma, *Proc. Zool. Soc.*, 18(2) : 145—148.
S. and W. Type-locality : Yercaud, Tamil Nadu.

Material : A vial with a paratype S., Yercaud, Salem District, coll.
T. B. Fletcher, 12. xii. 1913.

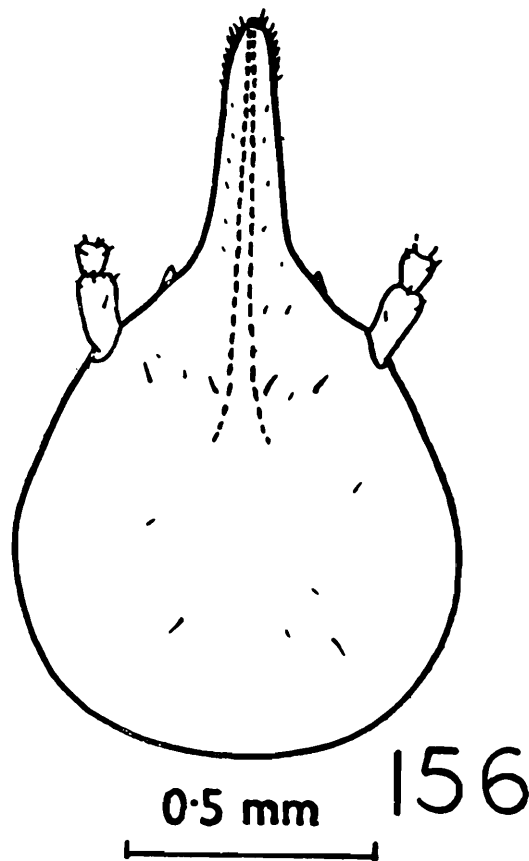


Fig. 156. Head of soldier *Nasutitermes salemensis* (Sen-Sarma), in dorsal view, (After Sen-Sarma, 1965).

*Measurements :**Soldier :*

		(1 ex.)
1. Total body-length <i>c</i>	...	4.00
2. Length of head to tip of rostrum	...	1.55
3. Length of head without rostrum	...	0.98
4. Length of rostrum	...	0.60
5. Max. width of head	...	0.94
6. Max. length of pronotum	...	0.23
7. Max. width of pronotum	...	0.48

Distribution : INDIA : Southern India : Tamil Nadu : Yercaud.

Biology : Nothing is known about the biology of this species.

Remarks : Sen-Sarma (1965) described *N. salemensis* as a species of his genus *Fletcheritermes*. Krishna (1970) considers *Fletcheritermes* as a synonym of *Nasutitermes*. Following this later study of Krishna (1970) the author has placed *salemensis* under the genus *Nasutitermes*, as *Fletcheritermes* is not different from *Nasutitermes* to the extent to deserve a generic status.

84. *Nasutitermes vishnu** sp. n.

(Figs. 157—160 ; Table 11)

Material : A vial with S. and W. Makut (Coorg), *c* 240 km alt., coll. M.L. Roonwal (R2/25.2.55), 25. ii. 1955, ex. "felled *Eleacarpus* sp. tree"; a vial with one S., Chikbillapur, Kolar Forest, coll. M. L. Roonwal (R2/5.3.55), 5. iii. 1955, ex. "soil under cowdung".

Description :

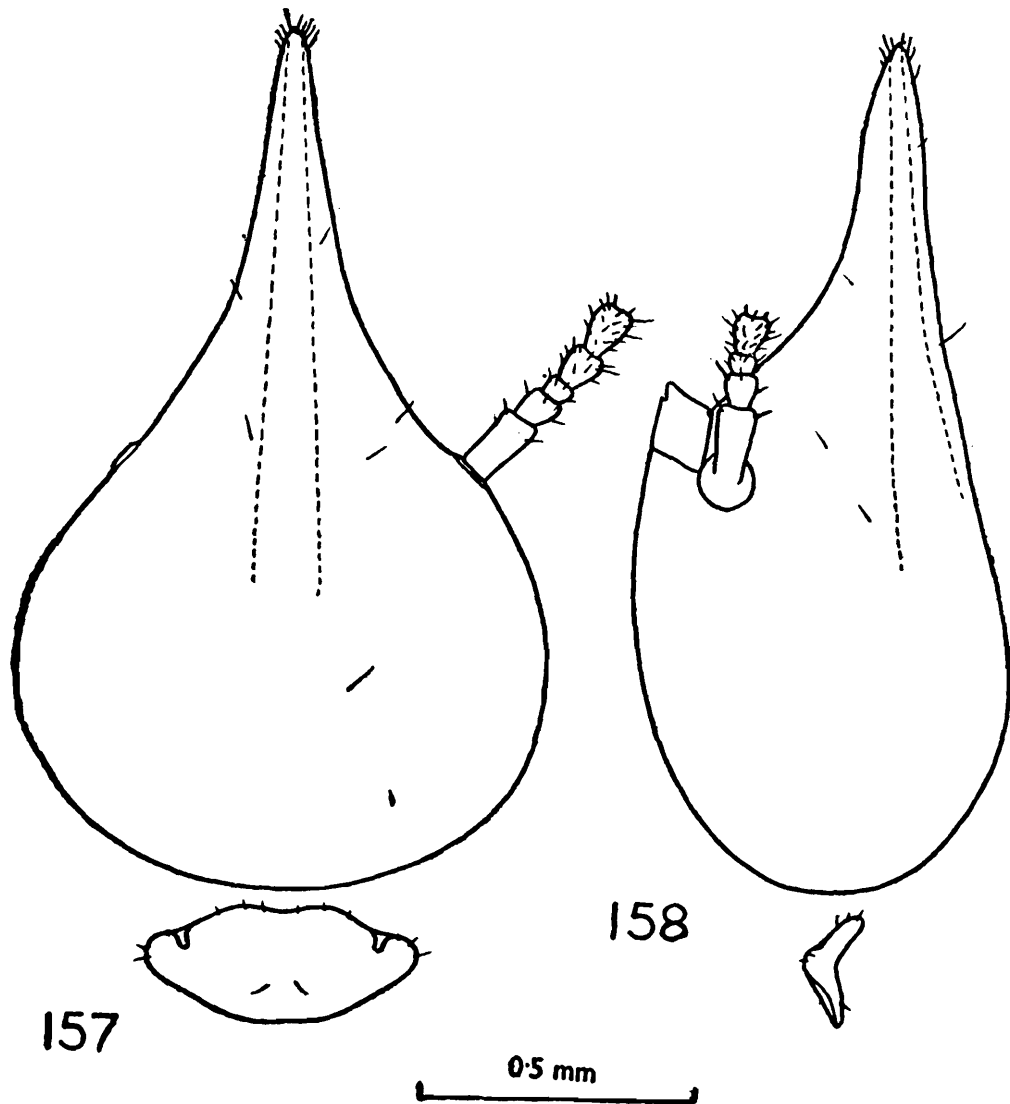
1. IMAGO. Unknown.
2. SOLDIER (Fig. 157—158 ; Table 11).

General : Head-capsule golden yellow ; rostrum pale reddish brown basally, darker apically, tip hyaline ; antennae and thorax light golden brown, anterior margin of pronotum slightly darker and legs somewhat paler, abdomen pale yellow. Head sparsely and body moderately hairy ; anterior abdominal tergites and sternites hairy with several long hairs. Total body length *c* 3.35—3.45 mm.

Head : Head-capsule subcircular when seen from above, a little broader than long (head-length to base of rostrum 0.90—0.95, head-width 0.95—1.05 mm), faintly constricted at base of antennae. *Rostrum :*

*Named after Lord Vishnu

long, tubular broad at base and tapering towards tip. *Fontanelle* : Fontanelle gland with a long, distinct tube opening at the tip of rostrum. *Eyes and ocelli* : Absent. *Antennae* : With 13 segments ; segment 1 large,



Figs. 157-158. *Nasutitermes vishnu* sp. n., Soldier (Paratype).

Fig. 157. Head and pronotum in dorsal view.

Fig. 158. Ditto, in side view.

cylindrical, segment 2 a little shorter than 1 and subequal to 3 ; 4 shortest, from 5 gradually increasing in size ; last (13) slender, club-shaped, equal to penultimate. *Mandibles* : Vestigial, knob-like, without any spine ; inner margins rounded. *Postmentum* : Subrectangular, short, length subequal to breadth, sides parallel, somewhat converging anteriorly.

Thorax : Pronotum : Small, saddle-shaped, weakly hairy, broader than long (width about 2 times length) ; anterior margin rounded with

a weak median notch, posterior margin substraight. *Mesonotum* oval, as wide as pronotum. *Metanotum* : Broader than mesonotum, semicircular. *Legs* : Long, pilose, with 2 : 2 : 2 apical tibial spurs.

Table—11. Measurements (in mm), etc. of *Nasutitermes vishnu* sp. n.

CASTE—Soldier

Body-parts		Range (5 exs)	Holotype
1. Total body-length <i>c</i>	...	3.35—3.45	3.38
2. Length of head with rostrum	...	1.55—1.63	1.58
3. Length of head to base of rostrum	...	0.89—0.95	0.90
4. Length of rostrum	...	0.62—0.68	0.68
5. Max. width of head	...	0.95—1.05	0.98
6. Max. height of head	...	0.63—0.70	0.70
7. Head Index I (width/length to base of rostrum)	...	1.06—1.16	1.09
8. Head-rostrum index (length of rostrum/length of head to base of rostrum)	...	0.67—0.76	0.75
9. Posterior bulge of head	...	0.22—0.25	0.22
10. Head production index (posterior bulge/head length to base of rostrum)	...	0.24—0.28	0.24
11. Min. median length of postmentum	...	0.30—0.33	0.33
12. Max. width of postmentum	...	0.30—0.35	0.35
13. Minimum width of postmentum (at anterior margin)	...	0.25—0.28	0.28
14. Max. length of pronotum	...	0.20—0.25	0.23
15. Max. width of pronotum	...	0.48—0.50	0.50

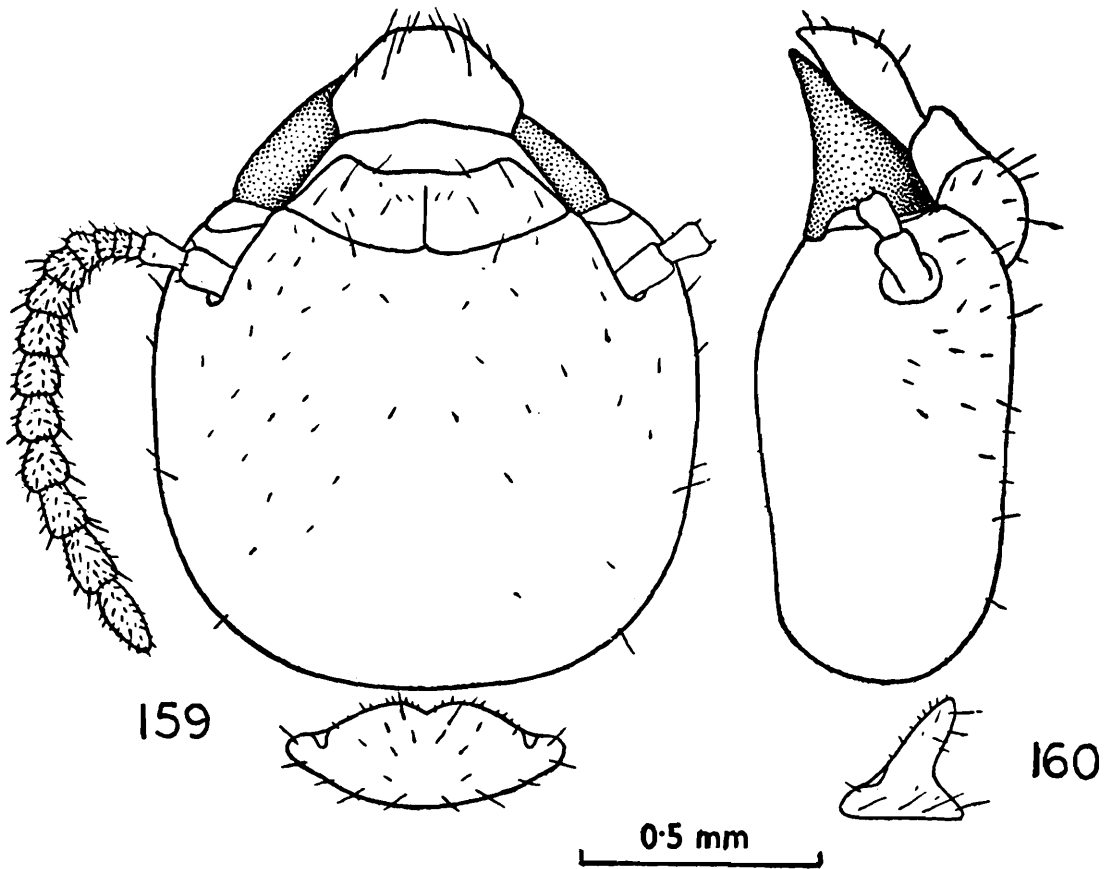
Abdomen : Oval, pilose Cerci 2-joined, 0.09 mm long.

2. WORKER MAJOR (Figs.159, 160)

General : Head-capsule, antennae, labrum and bases of mandibles pale yellowish brown ; tooth region of mandibles and margins dark reddish brown ; thorax and legs pale yellowish. Abdomen pale creamy white with contents showing through. Head and body fairly pilose.

Head : Head-capsule subrounded, much broader than long. *Eyes and ocelli* : Absent. *Antennae* : With 14 segments, segment 1 longest and cylindrical, 2 shorter than 1, 3 and 5 subequal, shorter than 2, 4 shortest, 6 to penultimate gradually increasing in size ; last slender, club-shaped. *Postclypeus* : Swollen, pilose ; semicircularly differentiated from frons. *Anteclypeus* : narrow, trapezoidal strip, hyaline and

apilose. *Labrum* : Broadly tongue-shaped ; anterior margin substraight ; with two pairs of long and a few pairs of short bristles near anterior margin and on body. *Mandibles* : Of typically *Nasutitermes*-type.



Figs. 159-160. *Nasutitermes vishnu* sp. n., Worker (Paramorphotype).

Fig. 159. Head and pronotum, in dorsal view.

Fig. 160. Ditto, side view.

Thorax : Pronotum and legs as in soldier.

Abdomen : As in soldier.

4. WORKER MINOR

Resembles worker major but is generally smaller in size.

Measurements :

	Range	
	Major (5 exs.)	Minor (5 exs.)
1. Total body-length <i>c</i> ...	3.40—4.10	2.80—2.90
2. Length of head to base of mandibles ...	0.95—1.05	0.80—0.81
3. Max. width of head ...	1.08—1.15	0.92—0.93
4. Max. length of pronotum ...	0.27—0.30	0.13—0.15
5. Max. width of pronotum ...	0.52—0.55	0.33—0.35

Type-specimens : Holotype S. (Z. S. I. Reg. No. 1012/H11,) morphotype W. (one major and one minor) (Z. S. I. Reg. No. 1013/H11) and paratype S. (3) and paramorphotype W. (2 major, 3 minor) (Z. S. I. Reg. No. 1014/H11), in three separate vials, vide "Material" above, deposited in National Zoological Collections, Zoological Survey of India, Calcutta.

Type-locality and Distribution : INDIA : Southern India : Karnataka : Makut, Coorg (type-locality) and Chickbillapur, Kolar Forest range.

Comparison : The soldier of *N. vishnu* sp. n. is closest to that of *N. anamalaiensis* (Snyder) but differs for its smaller head (head-length including rostrum 1.55—1.70 vs. 1.85, head-length without rostrum 0.89—0.95 vs. 1.12—1.15 and head width 0.95—1.05 vs. 1.25—1.30 mm) ; longer rostrum in comparison to head (head-rostrum length index i.e., rostrum-length/head-length 0.68—0.79 vs. 0.61—0.65) ; and third antennal segment shorter than second (longer in *anamalaiensis*).

Its soldier is also close to that of *N. lacustris* (Bugnion) but is separable for its paler colour, wider and thicker rostrum at base and absence of spine-like, lateral processes on mandibles.

Genus *Alstonitermes* Thakur

1975. *Alstonitermes* Thakur, *J. Bombay Nat. Hist. Soc.*, 72(3) : 781-782.

This is a monotypic genus restricted to southern India.

85. *Alstonitermes flavescens* Thakur (Fig. 161)

1975. *Alstonitermes flavescens* Thakur, *J. Bombay. nat. Hist. Soc.*, 72(3) : 783—785, 2 plates. S., W.

Type-locality : Top Slip, Tamil Nadu.

Material : One vial with 1 S. (paratype) and 2 W. (paramorphotype), Kareyan shola forest, Top Slip, South Coimbatore Forest Division, Tamil Nadu, coll. M. L. Thakur. II. xii. 1970, ex. *Alstonia scholaris*.

Measurements :

Soldier :

		Paratype (1 ex.)
1. Total body length c	...	4.45
2. Length of head with rostrum	...	1.88
3. Length of head without rostrum	...	1.13
4. Max. width of head	...	1.15
5. Length of pronotum	...	0.35
6. Max. width of pronotum	...	0.68

Biology : This species has been collected only once from *Alstonia scholaris*.

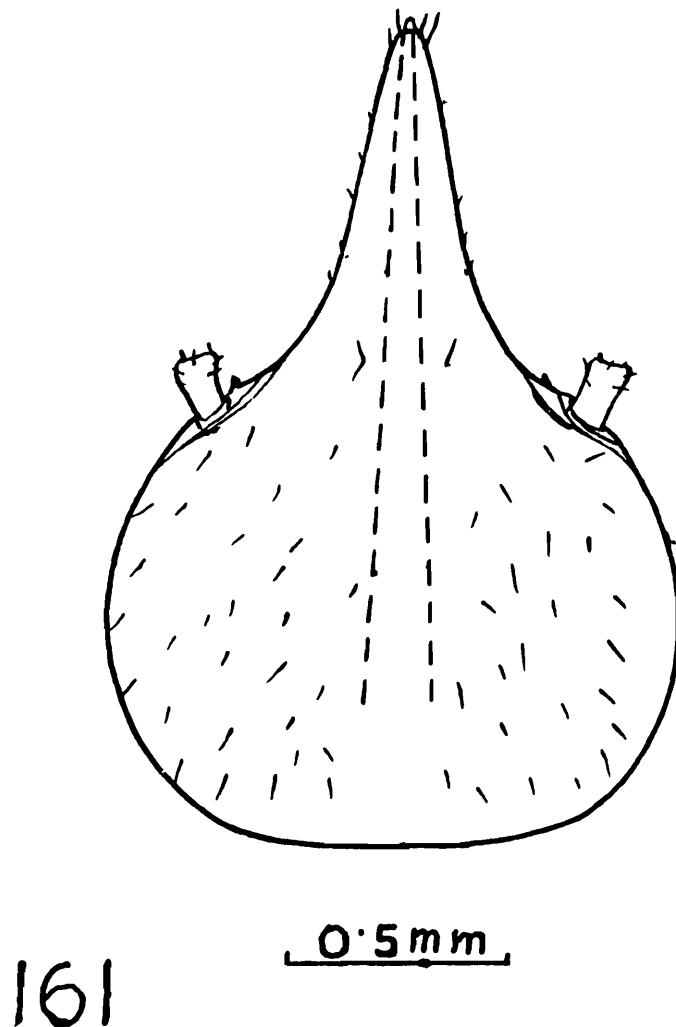


Fig. 161. Head of soldier, in dorsal view, of *Alstonitermes flavescens* Thakur.

Genus *Ampoulitermes* Mathur and Thapa

1962. *Ampoulitermes* Mathur and Thapa, *Indian Forester*, 88 : 49-50.

Type-species : *Ampoulitermes wynaadensis* Mathur and Thapa

This monotypic genus is restricted to southern India.

86. *Ampoulitermes wynaadensis* Mathur and Thapa

(Fig. 162)

1962. *Ampoulitermes wynaadensis* Mathur and Thapa, *Indian Forester*, 88 : 50-52. S. and W. Type-locality : Wynaad, Periyar Reserve Forest, Kerala.

Material : A vial with a paratype S. and 2 paramorphotype W.,
Wynaad, Periyar Reserve Forest, Kerala, coll. A. H. Khan, 14. vi. 1940.

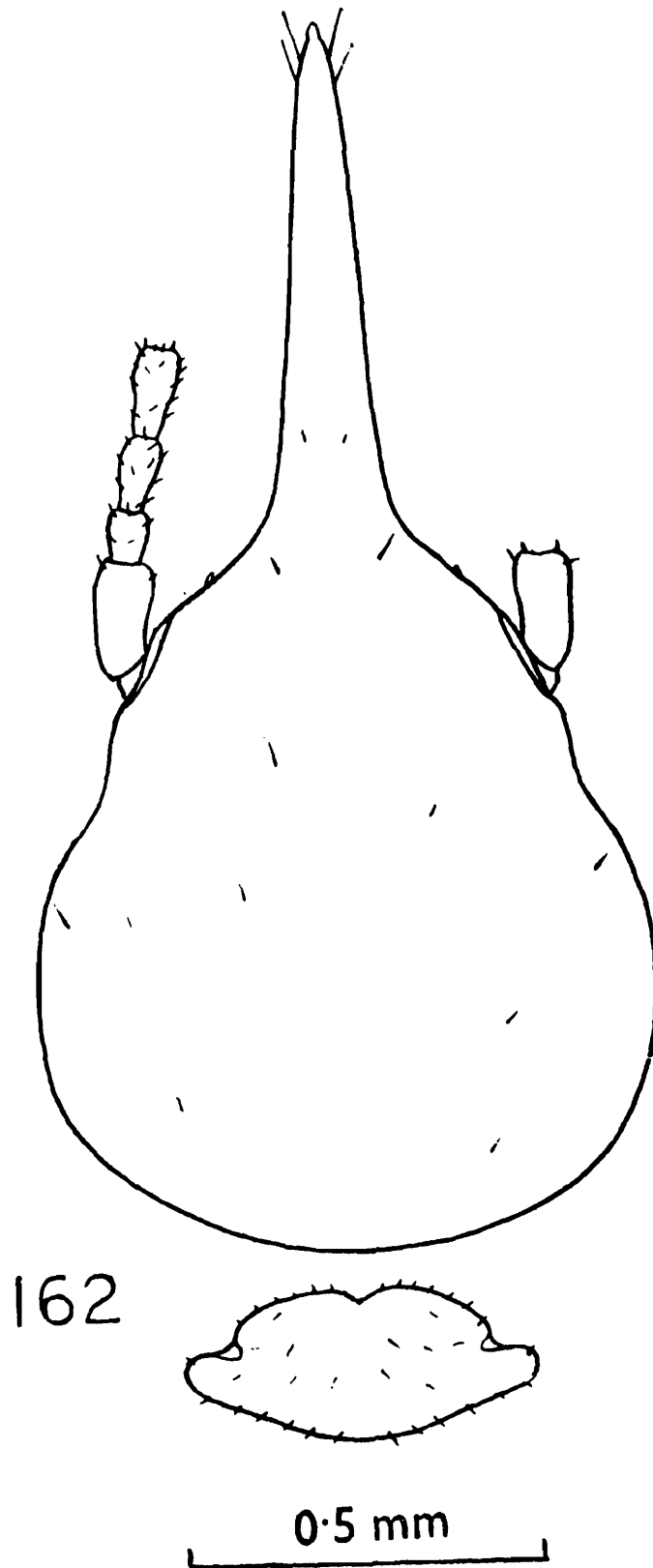


Fig. 162. Head and pronotum of soldier of *Ampoulitermes wynaadensis* Mathur & Thapa (Paratype), dorsal view.

Measurements :

<i>Soldier :</i>		Paratype (1 ex.)
1. Total body-length <i>c</i>	....	3.30
2. Length of head to tip of rostrum	....	1.70
3. Length of head without rostrum	...	0.95
4. Length of rostrum	...	0.75
5. Max. width of head	....	0.85
6. Max. Length of pronotum	...	0.20
7. Max. width of pronotum	...	0.48

Distribution : INDIA : Southern India : Wynaad, Periyar Reserve Forest, Kerala state.

Biology : Nothing is known about the biology of this species except that it was collected from a fallen branch in an evergreen forest.

Genus *Emersonitermes* Mathur and Sen-Sarma

1959. *Emersonitermes* Mathur and Sen-Sarma. *Z. ang. Entom.*, 45 : 66.

Type-species : *Emersonitermes thekadensis* Mathur and Sen-Sarma. It is also a monotypic genus confined to southern India.

87. *Emersonitermes thekadensis* Mathur and Sen-Sarma

(Fig. 163)

1959. *Emersonitermes thekadensis* Mathur and Sen-Sarma. *Z. ang. Ent.*, 45(1) : 67, 68—71, S. and W. Type-locality : Thekaddi (= Thekaday), Kerala state.

1966. *Emersonitermes thekadensis*. Prashad and Sen-Sarma, *Indian For. Bull.* (N. S.), No. 248 : 11-12.

Material : A vial with 2 S. and 2 W., Makut (Coorg, Karnataka), coll. M. L. Roonwal, 26. ii. 1955, ex. "soil under rotten log of *Anacardium occidentale*".

Measurements :

<i>Soldier</i>		Range (2 exs.)
1. Total body-length <i>c</i>	...	3.60—3.90
2. Length of head with rostrum	...	1.75—1.80
3. Length of head without rostrum	...	0.95
4. Length of rostrum	...	0.80—0.85
5. Max. width of head	...	0.80
6. Max. length of pronotum	...	0.20
7. Max. width of pronotum	...	0.40

Distribution : INDIA : Southern India : Kerala : Thekkadi ; Karnataka : Makut, Coorg.

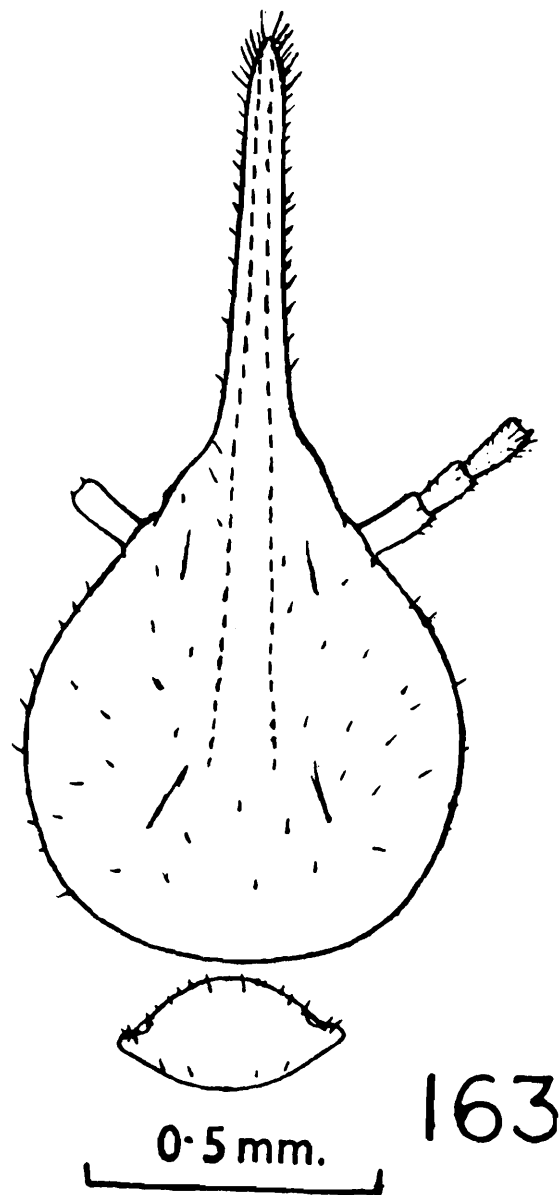


Fig. 163. Head and pronotum of soldier of *Emersonitermes thekadensis* Mathur & Sen-Sarma, in dorsal view.

Biology: This species feeds on and has been collected from decaying wood. It is reported from a rotten log of *Anacardium occidentale* and decaying wood of unidentified plants in soil.

Genus *Grallatotermes* Holmgren*

1912. *Eutermes* (*Grallatotermes*) Holmgren, K. Sv. Vet. Akad. Handl., 48 (4) : 59-62, 65.

*Sen-Sarma (1966) transferred the Indian species of *Grallatotermes* to his genus *Indograllatotermes*. Sands (1967) and Krishna (1970) are, however, doubtful about the validity of *Indograllatotermes* and author has followed Sands (1967) and Krishna (1970) in assigning these species to *Grallatotermes*.

1930. *Grallatotermes* ; Light, *Philippine J. Sci.*, 42 (1) : 16-17, 19, 40-41.
 1949. *Grallatotermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 314.
 1966. *Grallatotermes*, Prashad and Sen-Sarma, *Indian For. Bull. Ent.*, No. 248 : 6-8.
 1966. *Grallatotermes complex* ; Sen-Sarma, *J. Bombay nat. Hist. Soc.*, 64 : 167-184.
 1967. *Grallatotermes* ; Sands, *Compt. Rend. 5th Congr. Union Int. Insect. Sociaux* (Toulouse, 5-10, July, 1965) : 161-162, 163-164.
 1970. *Grallatotermes* ; Krishna, in *Biology of Termites* (Ed. Krishna & Weesner) : 148-149.

Type-species : *Grallatotermes grallator* (Desneux).

Only two species of this genus are known and are keyed as follows :—

Key to the Species

Larger species ; head length with rostrum 1.93-1.94 ; head-width 1.20-1.23	...	<i>G. niger</i>
Smaller species ; head-length with rostrum 1.60-1.90 head width 1.00-1.18	...	<i>G. grallatoriformis</i>

88. *Grallatotermes grallatoriformis* Holmgren and Holmgren

(Fig. 164)

1917. *Eutermes (Grallatotermes) grallatoriformis* Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, 5 (3) : 163-164, S., W. Type-localities Tallkadi (Anamalai Hills), Tamil Nadu and Aryapur (S. Kanara), Karnataka.
 1949. *Grallatotermes grallatoriformis* ; Snyder, *Smiths. misc. Coll.*, 112 : 314.
 1966. *Grallatotermes grallatoriformis* ; Prashad and Sen-Sarma, *Indian For. Bull. (N. S.)*, No 248 : 8-10.
 1966. *Indograllatotermes grallatoriformis* ; Sen-Sarma, *J. Bombay nat. Hist. Soc.*, 63(1) : 176, 177, 178, 179.

Material : As no material of this species was available for the present study, the following measurements, etc. are taken from Holmgren and Holmgren (1917) and Prashad and Sen-Sarma (1966a).

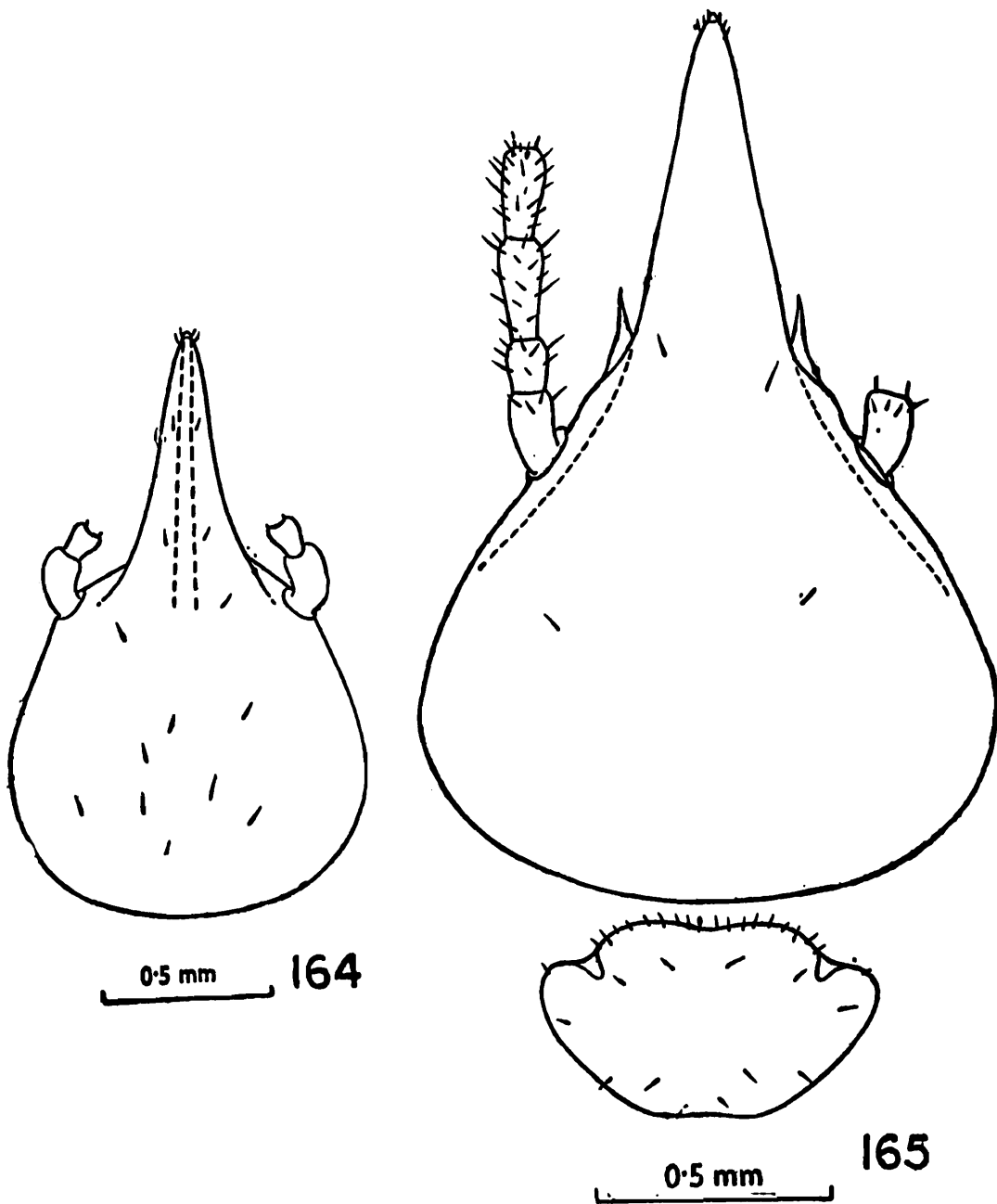
Measurements :

Soldier :

1. Total body-length <i>c</i>	...	3.90—4.20
2. Length of head with rostrum	...	1.60—1.90
3. Length of head without rostrum	...	1.00—1.10
4. Length of rostrum	...	0.65
5. Max. width of head	...	1.00—1.18
6. Max. length of pronotum	...	0.35
7. Max. width of pronotum	...	0.60—0.65

Distribution : INDIA : Southern India : Karnataka : Aryapur (S. Kanara) ; Tamil Nadu : Tellakadi (Anamalai Hills).

Biology : Nothing is known of the biology of this species, except that it was collected from long galleries over a mango tree at Aryapur.



Figs. 164-165. Soldiers of *Grallatotermes* spp.

Fig. 164. Head, in dorsal view, of *G. gallatoriformis* Holmgren & Holmgren (After Sen-Sarma, 1966)

Fig. 165. Head and pronotum of *G. niger* Chatterjee and Thapa (Paratype).

89. *Grallatotermes niger* Chatterjee and Thapa

(Fig. 165)

1964. *Grallatotermes niger* Chatterjee and Thapa, *Indian Forester*, 90(4) : 210-214, S. and W. Type-locality : Tunacadur Range, Mount Stuart Block, Top Slip, Tamil Nadu.

1966. *Indograllatotermes niger* ; Sen-Sarma, *J. Bombay nat. Hist. Soc.*, 63 : 176.

Material : A vial with 2 paratype S. and 2 paramorphotype W., Mt. Stuart Block, Tunacadur Range, Top Slip, coll. R. M. Mishra, 20. ix. 1962, ex. *Alstonicia scholaris* green standing tree.

Measurements :

<i>Soldier</i> :		Range (2 exs.)
1. Total body-length <i>c</i>	...	5.40—5.50
2. Length of head with rostrum	...	1.93—1.94
3. Length of head without rostrum	...	1.10—1.13
4. Length of rostrum	...	0.81—0.83
5. Max. width of head	...	1.20—1.23
6. Max. length of pronotum	...	0.38—0.40
7. Max. width of pronotum	...	0.70—0.73

Distribution : INDIA : Southern India : Tamil Nadu : Mt. Stuart Block, Tunacadur Range, Top Slip.

Biology : Nothing is known about the biology of this species except that it was collected from a living *Alstonicia scholaris* plant.

Genus *Hospitalitermes* Holmgren

1912. *Eutermes (Hospitalitermes)* Holmgren, *K. Sv. Vet. Akad. Handl.*, 48 : 52-62, 66.

1949. *Hospitalitermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 318.

1960. *Hospitalitermes* ; Prashad and Sen Sarma, *Rev. Termite Genus Hospitalitermes Indian Region (I. C. A. R. Monogr. 10. 29)* : 1-4.

Type-species : *Hospitalitermes hospitalis* (Haviland).

Only one species is reported from southern India.

90. *Hospitalitermes madrasi* Snyder

(Fig. 166)

1934. *Nasutitermes (Hospitalitermes) madrasi* Snyder, *Indian For. Rec.*, 20 : 16-17, S. Type-locality : North Vellore, Tamil Nadu.

1949. *Hospitalitermes madrasi* Snyder, *Smiths. misc. Coll.*, 112 : 321.

1960. *Hospitalitermes madrasi* ; Prashad and Sen-Sarma, *Rev. Termite Gen. Hospitalitermes Indian Region (I. C. A. R. Monogr. 10. 29)* : 4, 21-26.

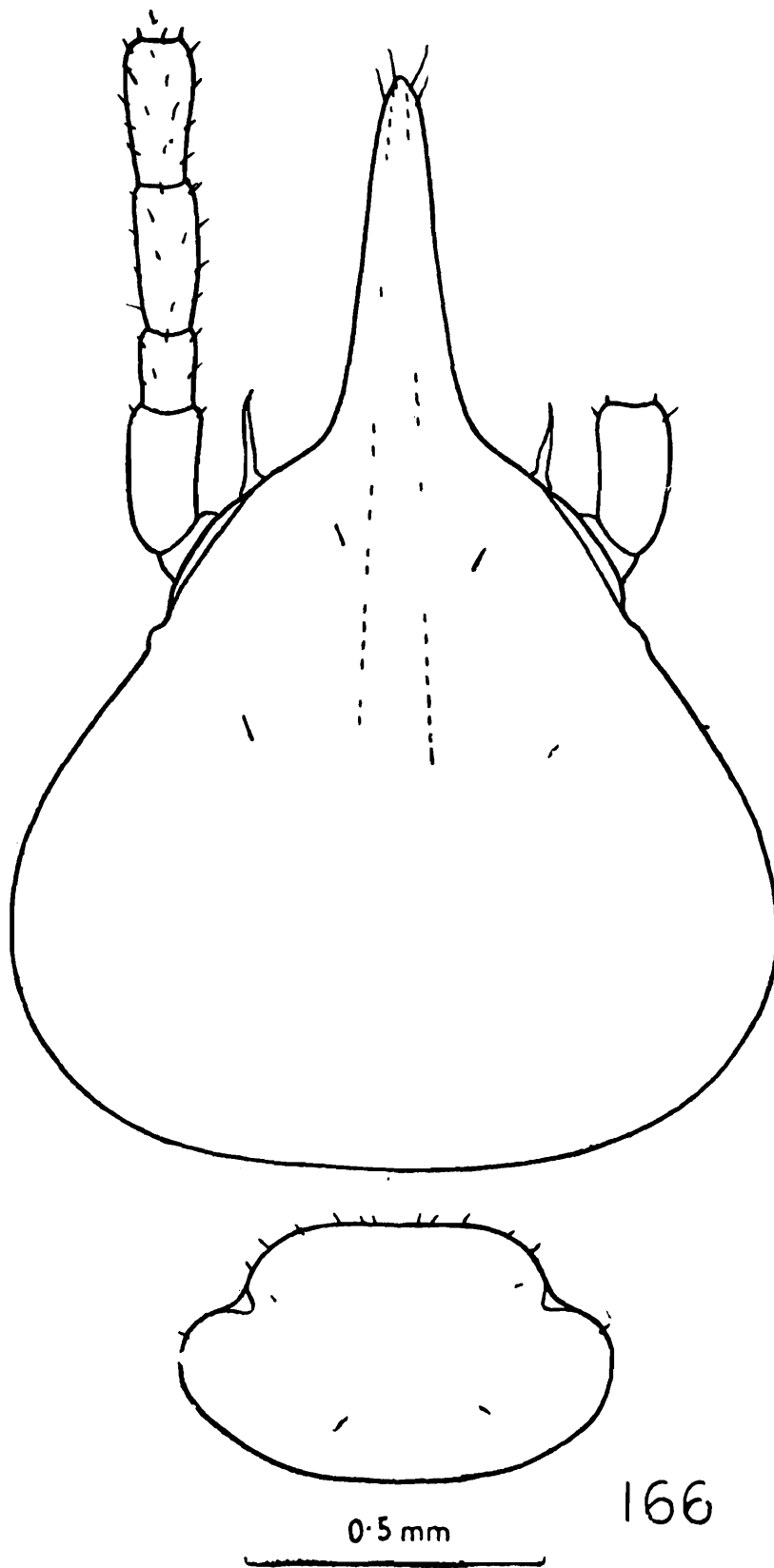


Fig. 166. Head and pronotum of soldier of *Hospitalitermes madrasi* Snyder, in dorsal view.

Material : A vial with S., W. and Ny., syntypes, North Vellore Div., Tamil Nadu, coll. T. N. Heassy.

Measurements :

(ii) <i>Soldier</i> :		Range (4 exs.)
1. Total body-length <i>c</i>	...	4.70—5.40
2. Length of head with rostrum	...	1.75—2.00
3. Length of head without rostrum	...	1.10—1.35
4. Length of rostrum	...	0.65
5. Max. width of head	...	1.20—1.32
6. Max. length of pronotum	...	0.40—0.43
7. Max. width of pronotum	...	0.68—0.72

Distribution : INDIA : Tamil Nadu : North Vellore.

Genus *Ceylonitermes* Holmgren

1912. *Eutermes* (*Ceylonitermes*) Holmgren, *K. Sv. Vet. Akad. Handl.*, 48(4) : 59-61, 64.
 1930. *Ceylonitermes* ; Light, *Philipp. J. Sci.*, 42(1) : 16.
 1949. *Ceylonitermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 313.

Type-species : *Ceylonitermes escherichi* (Holmgren).

Only one species of the genus is known to occur in southern India.

91. *Ceylonitermes indicola* Thakur

(Fig. 167)

1976. *Ceylonitermes indicola* Thakur, *J. Timb. Dev. Assoc. India*, 22 (2) : 15-17.
 S., W. Type-locality : Nilambur, Kerala, India.

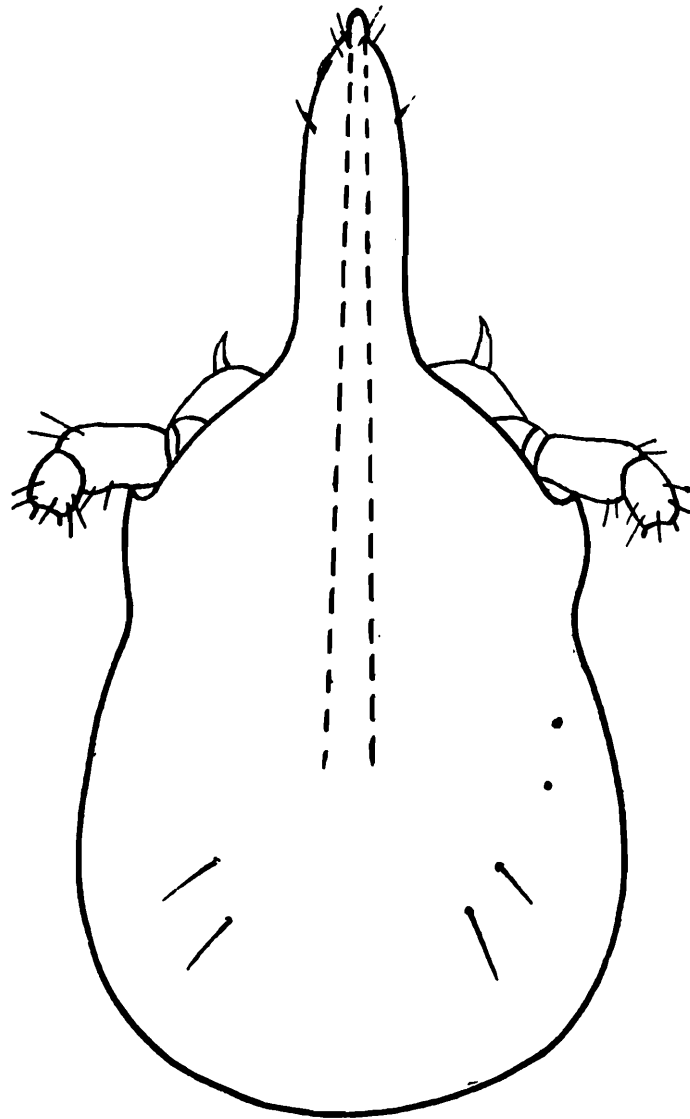
Material : A vial with a paratype S. and paramorphotype W., Nilambur, Kerala, coll. M. L. Thakur, 21. xii. 70, ex. "roots of bamboo clump."

Measurements :

Soldier :

1. Total body-length <i>c</i>	...	2.50
2. Length of head with rostrum	...	1.18
3. Length of head without rostrum	...	0.78
4. Max. width of head	...	0.58
5. Length of rostrum	...	0.40
6. Max. width of pronotum	...	0.33

Distribution : INDIA : Southern India : Kerala : Nilambur (type-locality).



0.25 mm,

167

Fig. 167. Head of Soldier of *Ceylonitermes indicola* Thakur (After Thakur, 1976).

Genus *Trinervitermes* Holmgren

1912. *Eutermes* (*Trinervitermes*) Holmgren *K. Sv. Vet. Akad. Handl.*, 48 : 59, 61, 64-65, 67, 70, 72.
1922. *Trinervitermes* ; Fuller, *S. Afr. J. nat. Hist.*, 3 : 107.
1949. *Trinervitermes* ; Snyder, *Smiths. misc. Coll.*, 112 : 322.
1968. *Trinervitermes* ; Prasad and Sen-Sarma, *Indian For. Bull. (N. S.) Ent.*, No, 247 : 2-6,

Type-species : *Trinervitermes trinervius* (Rambur).

Four species (including one new) are known from southern India.

Key to Species

- (i) *Imago* :
- 1(2) Paler species : Head-capsule reddish brown ; ocelli comparatively small (0.18-0.23 mm long) ... *biformis* (Wasmann)
- 2(1) Darker species : Head-capsule blackish brown ; ocelli comparatively large (0.25-0.30 mm long) ... *nigrirostris* Mathur and Sen-Sarma
- (ii) *Soldier major* :
- 1(2) Head-length including rostrum 1.78-2.00 ; head pearshaped ; smaller species ... *sen-sarmai* sp. n.
- 2(1) Head-length including rostrum 2.23-2.53 ; head rounded ; larger species
- 3(4) Rostrum blackish brown, apex somewhat paler ; posterior bulge of head less marked (index : Head bulge/Head length 0.28-0.35) ... *nigrirostris* Mathur and Sen-Sarma
- 4(3) Rostrum reddish brown to dark brown, apex reddish brown ; posterior bulge of head well marked (index : Head bulge/Head length 0.34—0.48)
- 5(6) Antennae longish ; anterior margin of pronotum deeply invaginated (Fig. 169) ... *biformis* (Wasmann)
- 6(5) Antennae comparatively short ; anterior margin of pronotum broadly invaginated (Fig. 171) ... *fletcheri* Chatterjee and Thakur

92. *Trinervitermes biformis* (Wasmann)

(Figs. 168-170)

1902. *Eutermes biformis* Wasmann, *Zool. Jb.*, 17(1) : 133-135, pl. 4. figs. 10 and 10a. Im., S. (maj. & min.) and W. Type-localities : Bandarawela, Ceylon ; and Khandala, Maharashtra, India.
1949. *Trinervitermes biformis* ; Snyder, *Smiths. misc. Coll.*, 112 : 323-324.
1966. *Trinervitermes biformis* ; Prashad and Sen-Sarma, *Indian For. Bull. (N. S.)*, No. 247 : 6, 7-26.

Material : Lot 1. Ten vials with S. and W., Karnataka, Tamil Nadu and Kerala states, coll. M. L. Roonwal, Feb. – March, 1955, as

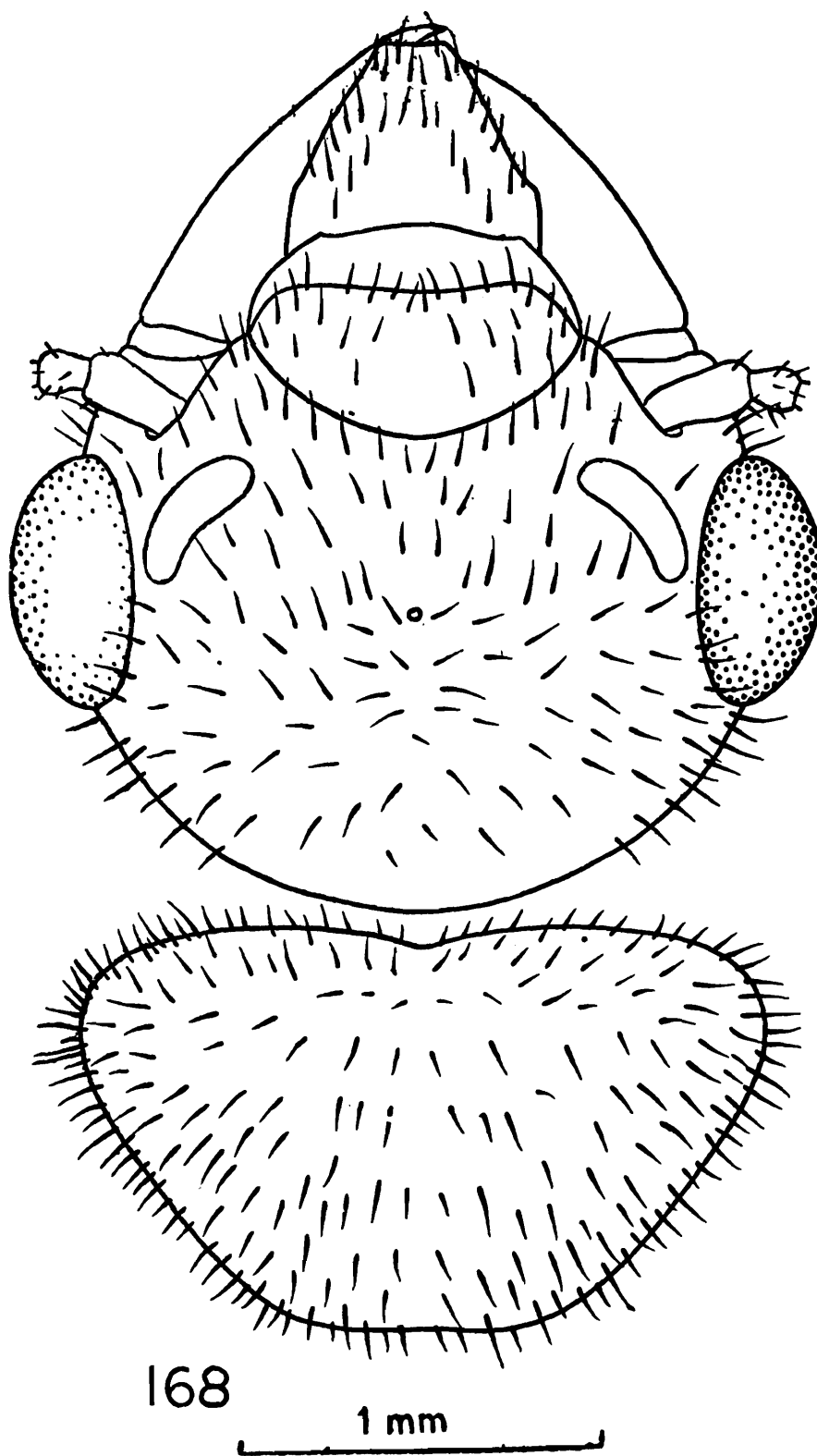
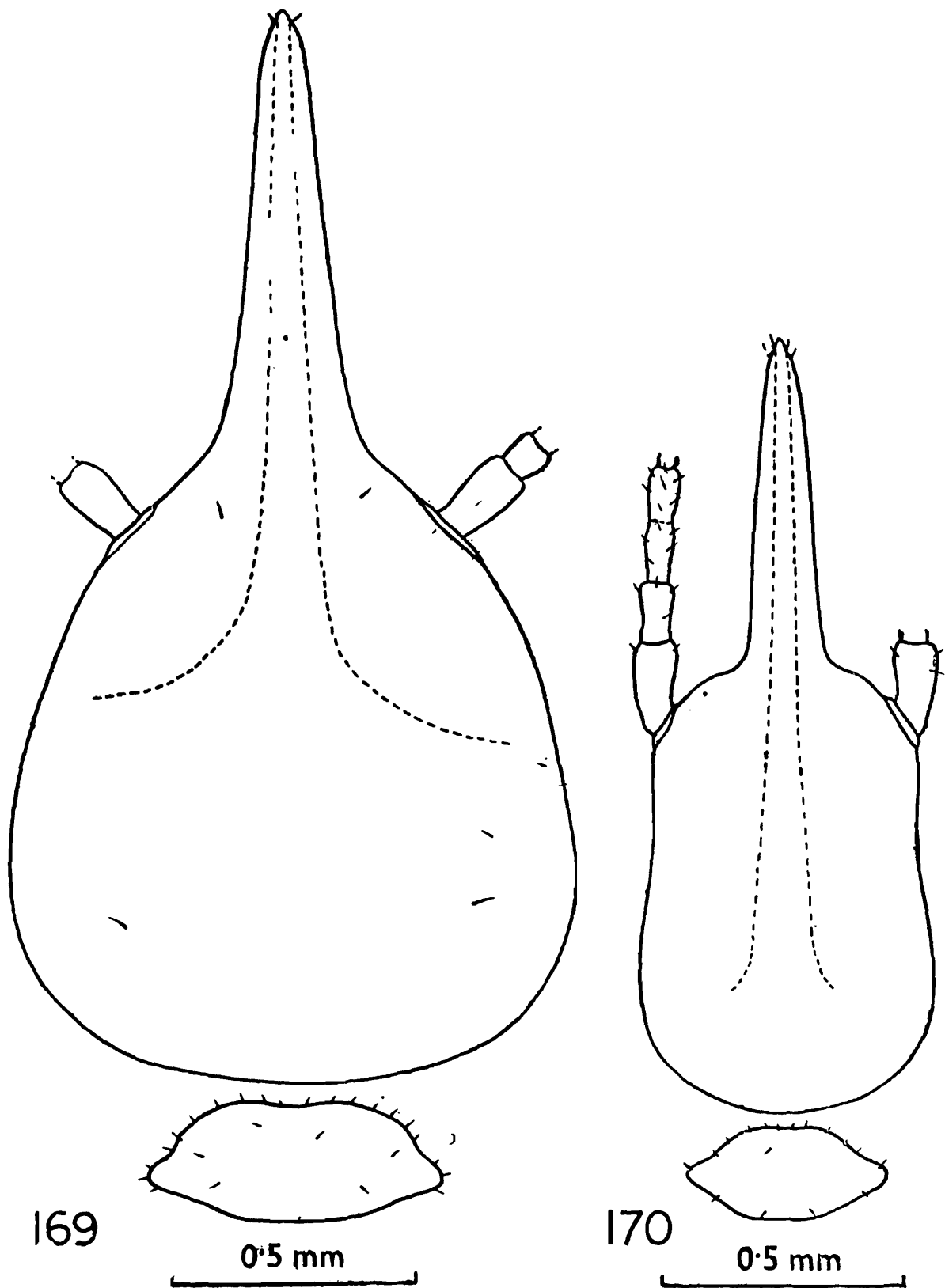


Fig. 168. Head and pronotum of imago, in dorsal view, of *Trinervitermes biformis* (Wasmann)



Figs. 169-170. *Trinervitermes biformis* (Wasmann)
Fig. 169. Head and pronotum of soldier major.
Fig. 170. Ditto, soldier minor.

follows :—Tamil Nadu : R4/8.2.55, Madras and vicinity, ex. mound ; R5/9.2.55, Villivakkam nr. Madras, ex mound ; Kerala : R3/18.2.55, Nilambur, under cowdung ; R1/22.2.55 Tellichery, Malabar, under soil ; Karnataka, R5/2.3.55, Chamundi Hills nr. Mysore, from blackish galleries on soil surface and under stone ; R3, R9 and R10/3.3.55, Yelwal Forest nr. Mysore, ex mounds ; R2/5.3.55, Chikbillapur Range, Kolar Fr. Div., ex heaps of earth ; and R9/7.3.55, Bangalore.

Lot 2. Six vials with S. and W., Karnataka and Tamil Nadu states, coll. O. B. Chhotani, Nov. 1962 and Feb., 1969, thus : Karnataka : 025 and 035/14.11.62, Bermangal nr. Bangalore, under stones ; 020/23.11.62, Mangalore, under cowdung ; Tamil Nadu : 038/11.2.69 about 7 miles from Salem on way to Kurambapatty Res. Forest, from small holes in ground ; 04 and 05/22.2.69, Satyenpathi nr. Palaimcottah, from twigs of dry shrubs and galleries in a mound.

Lot 3. Four vials with S. and W. from Chingleput Dist., Tamil Nadu, coll. J. K. Sen, Feb. 1965, thus : Karinkuzhi (1 vial), Mahabali-puram (1 vial) ; Kanakkanthan (1 vial) and Chingleput (1 vial).

Lot 4. Three vials with S. and W., Bangalore, coll. G. Bose, Jan. 1971.

Lot 5. Two vials with Im., S. and W., a vial with Im. and 14 vials with S. and W., from Nagarjunkonda, Andhra Pradesh, coll. I. Maligi, July—August, 1962.

Lot 6. A vial with S. and W., Madras, coll. P. P., Z. S. I., Madras.

Lot 7. Three vials with S. and W., Goa, coll. K. S. Pradhan, Apr. 1966, thus : Marmagao (1 vial), Road to Majorda (1 vial), Caisua Fort (1 vial).

Measurements :

(i) Imago :		Range (exs.)
1. Total body-length with wings	...	18.00—18.50
2. Total body-length without wings	...	10.00—10.20
3. Length of head to base of mandibles	...	1.35—1.38
4. Max. width of head	...	1.78—1.80
5. Max. diameter of eye	...	0.53—0.55
6. Max. diameter of ocellus	...	0.23—0.25
7. Min. eye-ocellus distance	...	0.05—0.08
8. Max. length of pronotum	...	0.98—1.00
9. Max. width of pronotum	...	1.63—1.70
10. Length of forewing	...	15.40—15.80
11. Length of hindwing	...	14.10—14.50

(ii) <i>Soldier</i> :		Range	
		major (5 exs.)	minor (5 exs.)
1.	Total body-length <i>c</i>	4.50—5.00	3.25—3.50
2.	Length of head with rostrum	2.40—2.50	1.63—1.70
3.	Length of head without rostrum	1.40—1.50	0.90—0.93
4.	Max. width of head	1.38—1.42	0.66—0.68
5.	Length of rostrum	0.85—0.95	0.68—0.75
6.	Max. length of pronotum	0.27—0.28	0.18—0.20
7.	Max. width of pronotum	0.66—0.68	0.40—0.43

Distribution : INDIA : Southern India : Andhra Pradesh : Nagarjunkonda and Vijayapuri (Guntur Dist.), Lake view (Nagarjunsagar Dam) ; Karnataka : Bangalore, Bermangal (32 km from Bangalore on Bangalore-Mysore Road), Chamundi Hills nr. Mysore, Chikbillapur For. Range, (Kolar For. Div.), Hadagalli, Hampi Ruins, Maddur, Mangalore, Yelwal Forest (45 km W of Mysore) ; Tamil Nadu : Chingleput, Coimbatore, Madras, Kanakkantham, Karin Kuzhi North Vellor, Palayamkottai, Saidapet, Salem, Shevaroy Hills, Villivakam nr. Madras ; Kerala : Nilambur, Tellichery (Malabar). Elsewhere : It is known from Maharashtra, Madhya Pradesh, Rajasthan and West Bengal in India. Also known from Sri Lanka (Bandarawella and Colombo).

Biology : *Trinervitermes biformis* is a common foraging termite of India. The workers march in a regular column for foraging at sunset, with the soldiers taking up position on either side for protection. The nests are generally underground and consist of irregularly running galleries and chambers. The earth from under the ground is brought up in the form of small heaps on the ground surface or there are just small holes leading down below. Sen-Sarma and Mathur (1961) have recorded it making small, dome-shaped mounds 15-30 cm high in areas densely covered with grass. The outer wall of these mounds is 5-10 cm thick and the inner structure is a ramification of inter-connected, narrow galleries which are coated with blackish faecal matter.

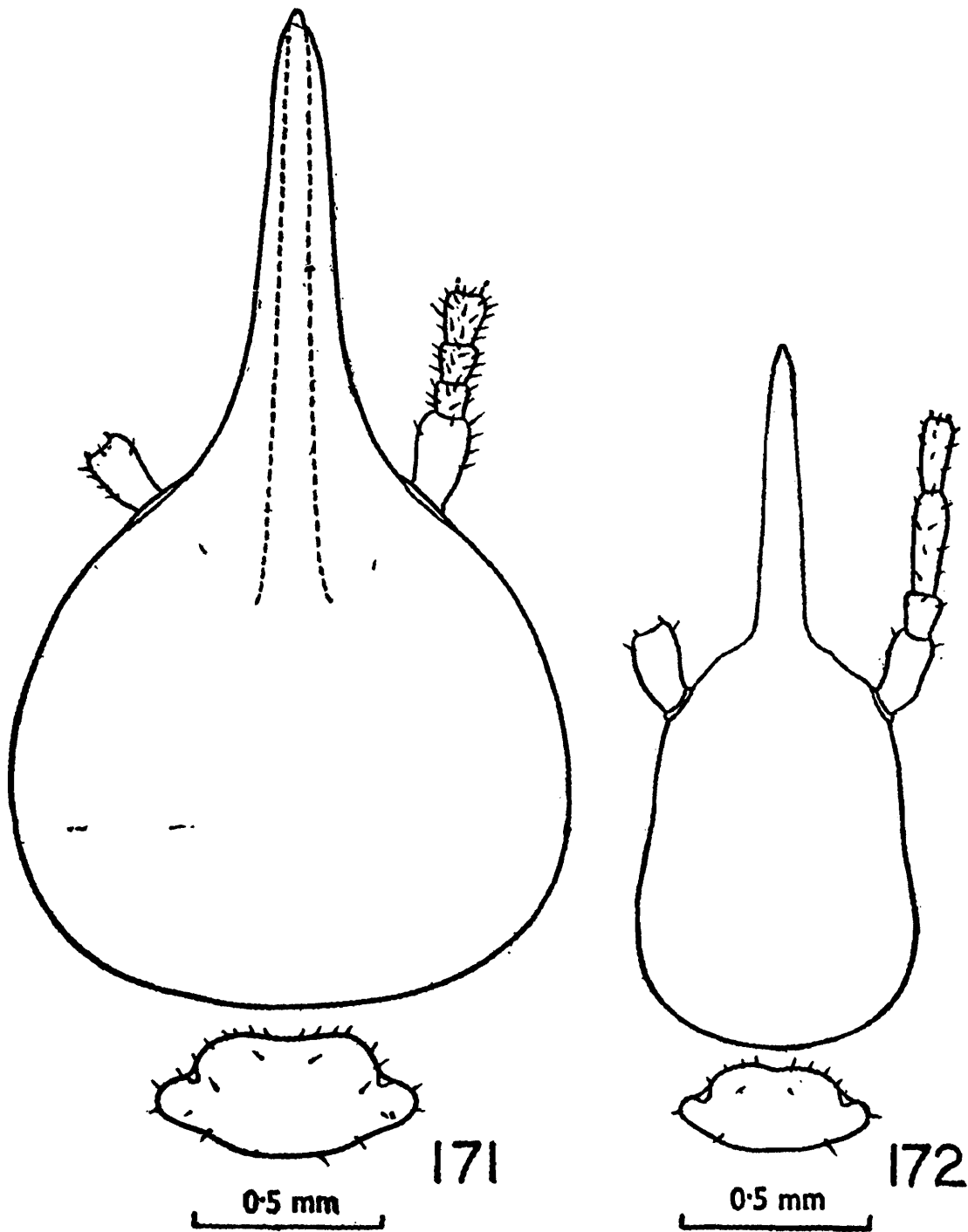
It is a pest of fruit trees, especially mango and also feeds on grasses, and attacks 'dunda thor' (*Euphorbia* sp.) (Roonwal, 1970)

Remarks : Prashad and Sen-Sarma (1966b) treat *T. heimi* (Wasmann) and *T. longinotus* (Snyder) as synonyms of *T. biformis* as the characters of these two fall in the range of variation of *biformis*.

93. *Trinervitermes fletcheri* Chatterjee and Thakur
(Figs. 171-172)

1965. *Trinervitermes fletcheri* Chatterjee and Thakur, *Bull. Syst. Zool.*, 1(1):
11-18. S. (maj. and min.) and W. Typelocality : Coimbatore, Tamil Nadu.

Material : Two S. (maj.) paratype and two S. (min.) and two W.
paramorphotypes, Coimbatore, Tamil Nadu, coll. T. B. Fletcher, 20.i.
1920 ex 'while foraging in the evening'.



Figs. 171-172. *Trinervitermes fletcheri* Chatterjee & Thakur
Fig. 171. Head and pronotum of soldier major, dorsal view.
Fig. 172. Ditto, soldier minor.

Measurements :

		Range	
		Major (2 exs.)	Minor (2 exs.)
<i>Soldier :</i>			
1. Total body-length <i>c</i>	...	4.40—4.50	3.30—3.70
2. Length of head with rostrum	...	2.45—2.53	1.71—1.80
3. Length of head without rostrum	...	1.40—1.50	0.93—1.00
4. Max. width of head	...	1.40—1.43	0.64—0.70
5. Length of rostrum	...	1.03—1.05	0.78—0.80
6. Max. length of pronotum	...	0.27—0.28	0.20—0.23
7. Max. width of pronotum	...	0.60—0.70	0.45—0.48

Distribution : INDIA : Southern India : Tamil Nadu : Coimbatore.

Biology : This species was collected while foraging in the evening.

94. *Trinervitermes nigrirostris* Mathur and Sen-Sarma

(Figs. 173-174)

1959. *Trinervitermes nigrirostris* Mathur and Sen-Sarma, *Z. ang. Ent.*, 45(1) : 71-77, Im., S. (maj. and min.), W. Type-locality : Mandapam, Tamil Nadu.

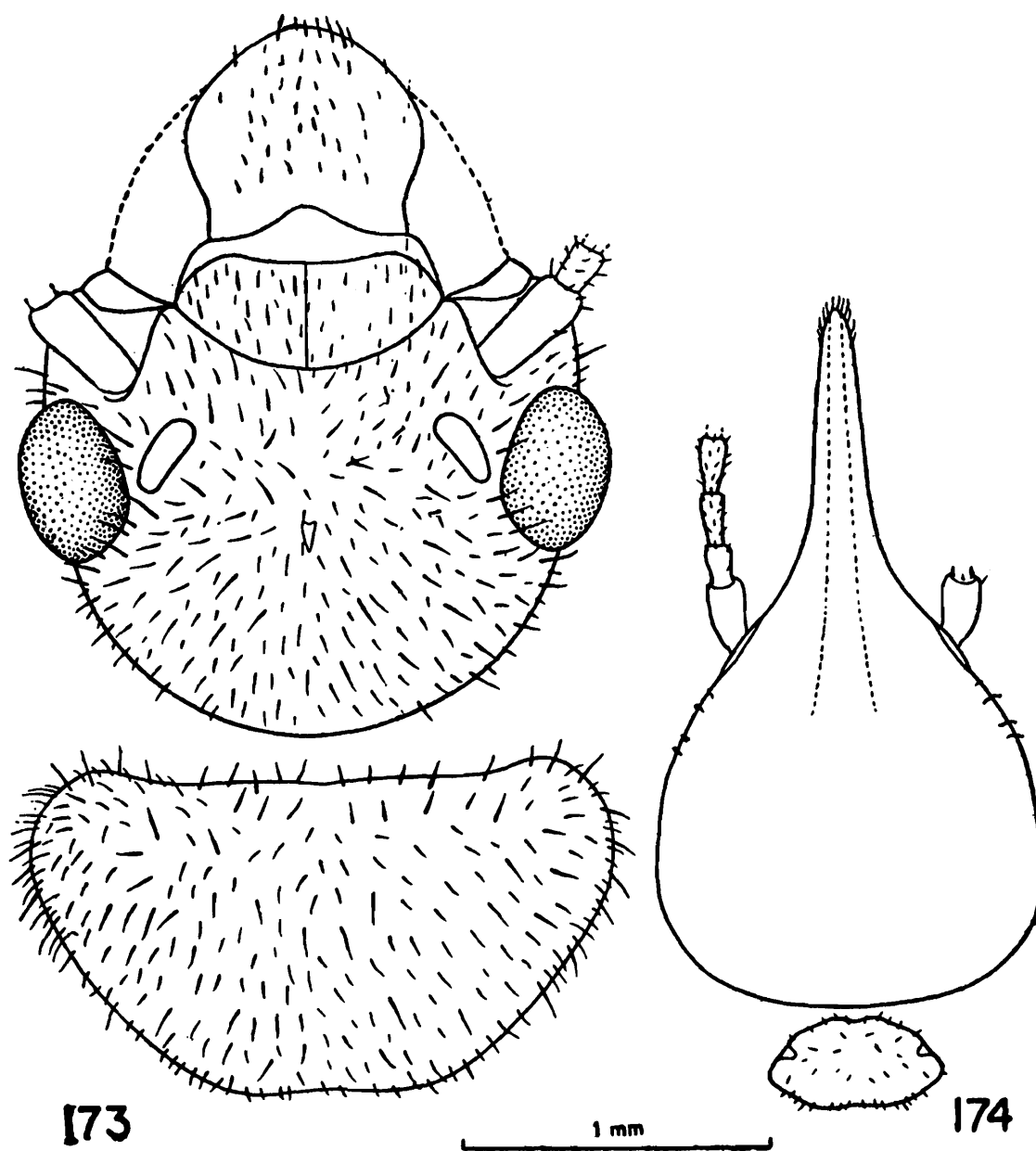
1966. *Trinervitermes nigrirostris* : Prashad and Sen-Sarma, *Indian For. Bull. (N. S.) ent.*, No. 247 : 30-31.

Material : A vial with a paratype S. (maj.) and paramorphotype S. (Minor), Im. and W. Mandapam, Tamil Nadu, coll. G. Becker (No. 162), 30. x. 1956, ex. mound ; (ii) A vial with several S. (maj. & min.) and W., Nagercoil-Tirunelveli Road, Tamil Nadu, coll. O. B. Chhotani, 27. ii. 1969, ex. soil.

Measurements :

(i) <i>Imago :</i>		(1 ex.)
1. Total body-length with wings <i>c</i>	...	19.00
2. Total body-length without wings <i>c</i>	...	10.80
3. Length of head to base of mandibles	...	1.20
4. Max. width of head with eyes	...	1.93
5. Max. diameter of eye	...	0.60
6. Max. diameter of ocellus	...	0.24
7. Min. eye-ocellus distance	...	0.06
8. Max. length of pronotum	...	1.00
9. Max. width of pronotum	...	1.85
10. Length of forewing	...	16.50
11. Length of hindwing	...	15.50

(ii) <i>Soldier</i> :	Range	
	S. major (5 exs)	S. minor (5 exs.)
1. Total body-length <i>c</i>	... 4.40—4.70	3.30—3.35
2. Length of head with rostrum	... 2.27—2.38	1.55—1.64
3. Length of head without rostrum	... 1.33—1.34	0.85—0.88
4. Max. width of head	... 1.23—1.25	0.62—0.63
5. Length of rostrum	... 0.92—1.05	0.70—0.76
6. Max. length of pronotum	... 0.20—0.28	0.19—0.20
7. Max. width of pronotum	... 0.58—0.63	0.43—0.45



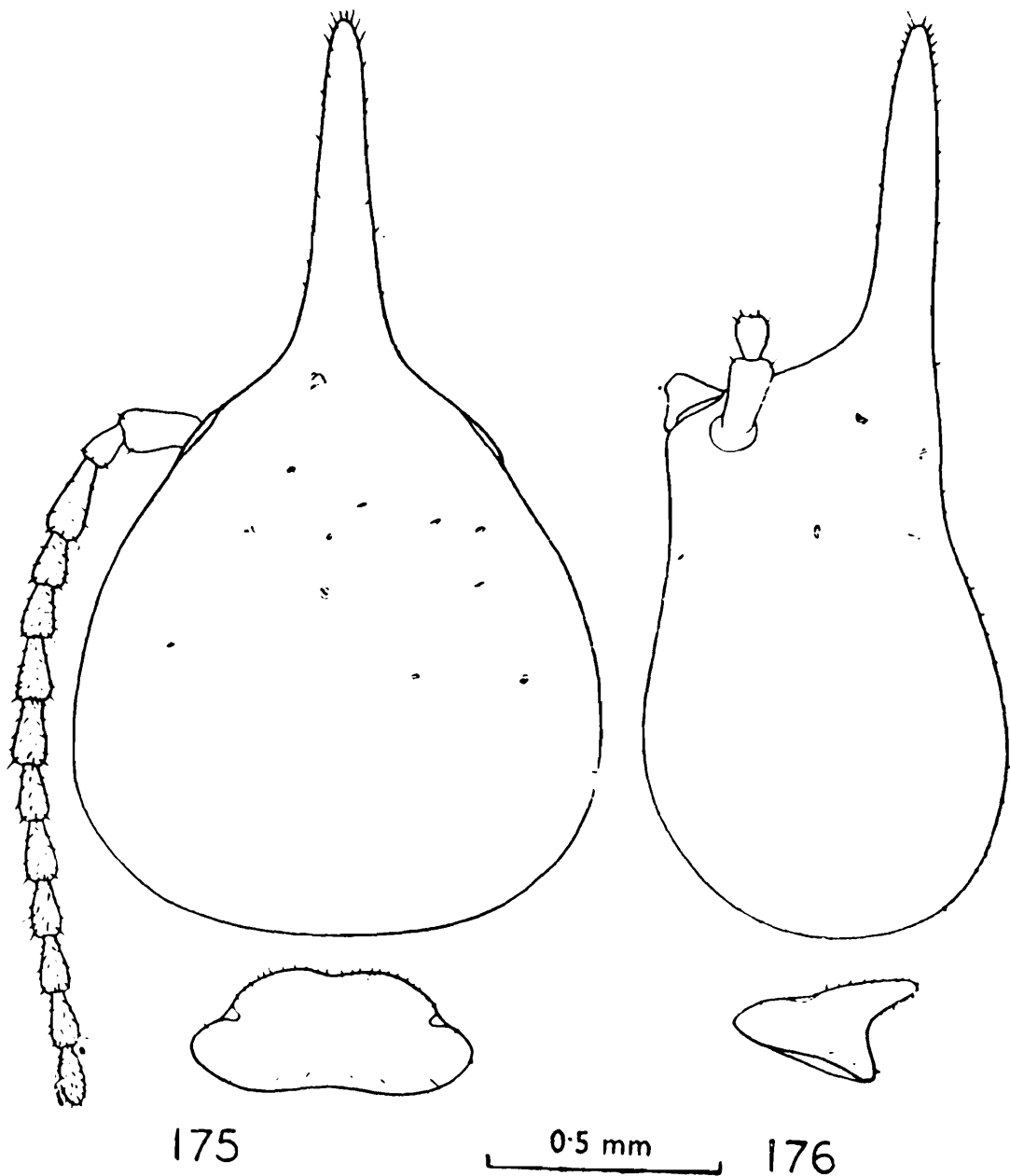
Figs. 173-174. *Trinervitermes nigrirostris* Mathur & Sen-Sarma.
 Fig. 173. Head and pronotum of imago (Paramorphotypæ), dorsal view.
 Fig. 174. Ditto, soldier major (Paratype).

Distribution : INDIA : Southern India : Tamil Nadu : Mandapam, Nagercoil-Tirunelveli Road (between 11 and 12 mile stones).

Biology : Nothing is known about the biology of this species. It is, however, a soil inhabiting form as it has been collected from small mounds and soil.

95. *Trinervitermes sensarmai* sp. n.

(Figs. 175-180 ; Table 15)



Figs. 175-176. *Trinervitermes sensarmai* sp. n. Soldier major (Paratype),
Fig. 175. Head and pronotum, in dorsal view.
Fig. 176. Ditto, side view.

Material : A vial with S. (maj., min.) and W. Western slope of Hill colony, North Vijayapuri, Andhra Pradesh, coll. I. N. Maligi, 18. viii. 1962.

Description : 1. IMAGO—Unknown.

2. SOLDIER MAJOR (Figs. 175, 176 ; Table 12).

General : Head-capsule deep golden brown ; rostrum reddish brown, apically a little paler ; antennae deep golden yellow ; thorax, legs and abdomen brownish yellow, abdominal tergites deep brownish. Head covered with minute hairs, body sparsely pilose. Total body-length 3.8-4.2 mm.

Head : Head-capsule semicircularly pear-shaped. *Rostrum* : short, subparallel sided, ending in a small hyaline tip. *Fontanelle* : Fontanelle gland with a long tube from anterior part of head opening at the tip of rostrum. *Eyes and Ocelli* : Absent. *Antennae* : With 13 segments, segment 1 long, segment 2 about half as long as 3 and about as long as 4, from 5 increasing in length to 9 and from 10 gradually decreasing in length, apical segment very short, slender, club-shaped. *Mandibles* : Vestigial, with no spinous process, outer edges rounded. *Postmentum* : Very short and broad.

Thorax : Pronotum : Small, saddle-shaped, upper lobe very short, lower lobe larger and broader, both anterior and posterior margins without median notch. *Legs* : Robust, long ; tarsi 4 jointed ; apical tibial spur 2 : 2 : 2.

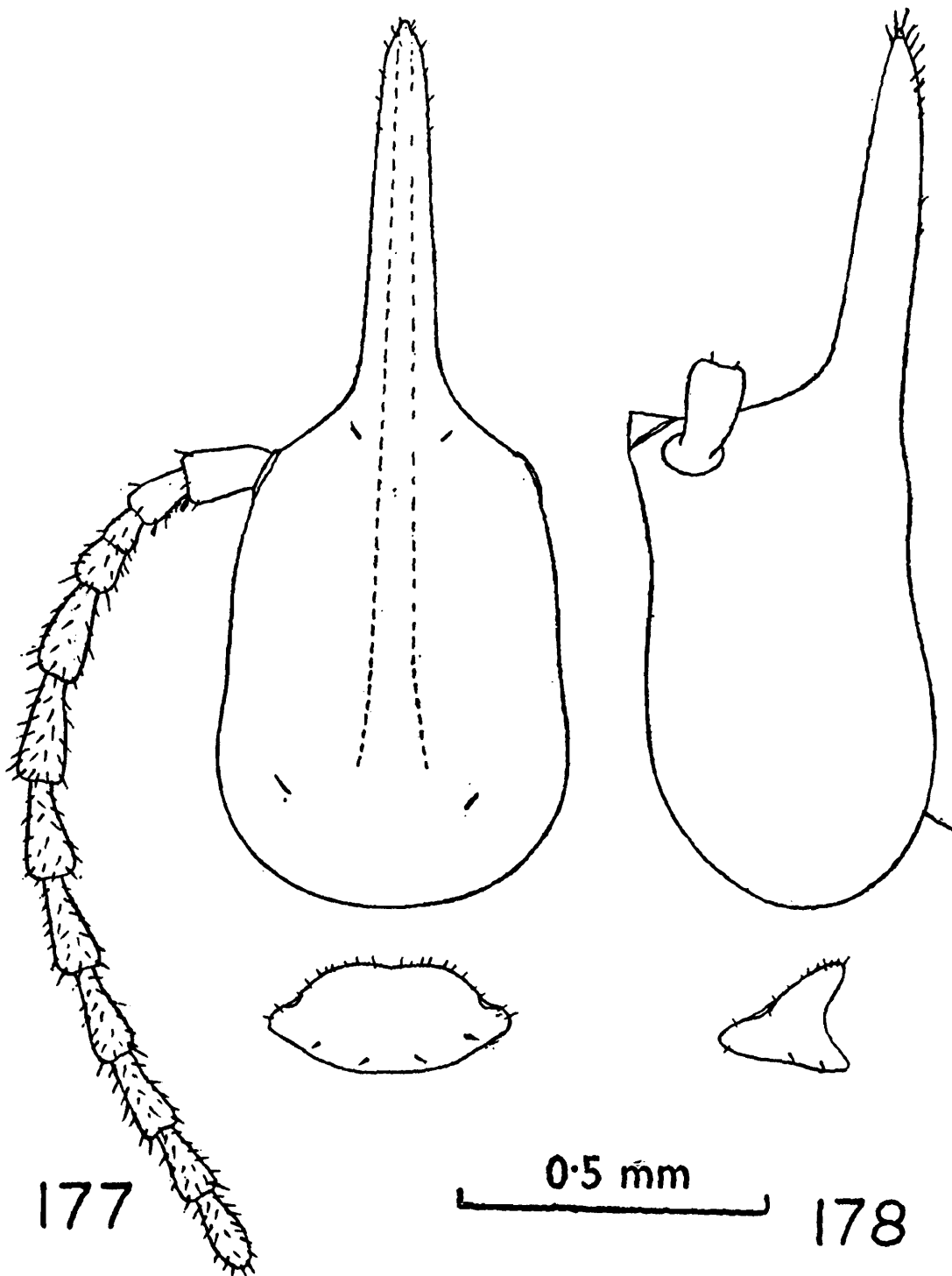
Abdomen : oblong, with 2-jointed cerci, 0.18-mm. long.

3. SOLDIER MINOR (Figs. 177, 178 ; Table 12).

General : Head capsule anteriorly dark golden yellow, posteriorly paler and reddish brown at base of rostrum ; rostrum reddish brown, darker medially and hyaline at tip ; antennae and rest of body creamy yellow. Head sparsely and body moderately pilose. Total body length 3.10-3.25 mm.

Head : Head-capsule subrectangularly oval, sides weakly constricted in middle. *Rostrum* : subparallel sides, ending in a hyaline tip. *Fontanelle* : Fontanelle gland with a long tube extending from middle of head opening at tip of rostrum. *Eyes and Ocelli* : Absent. *Antennae* : With 12-13 segments ; segment 1 long ; 2 and 4 subequal ; 3 longer than 2 or 4. *Mandibles and Postmentum* : As in soldier major.

Thorax : Pronotum : Small, saddle-shaped, anterior margin with a weak median notch, posterior margin substraight. *Legs.* : Long, slender ; tarsi 4-jointed : apical tibial spur 2 : 2 : 2.



Figs. 177-178. *Trinervitermes sensarmai* sp. n. Soldier minor (Parmorphotype).

Fig. 177. Head and pronotum, in dorsal view.

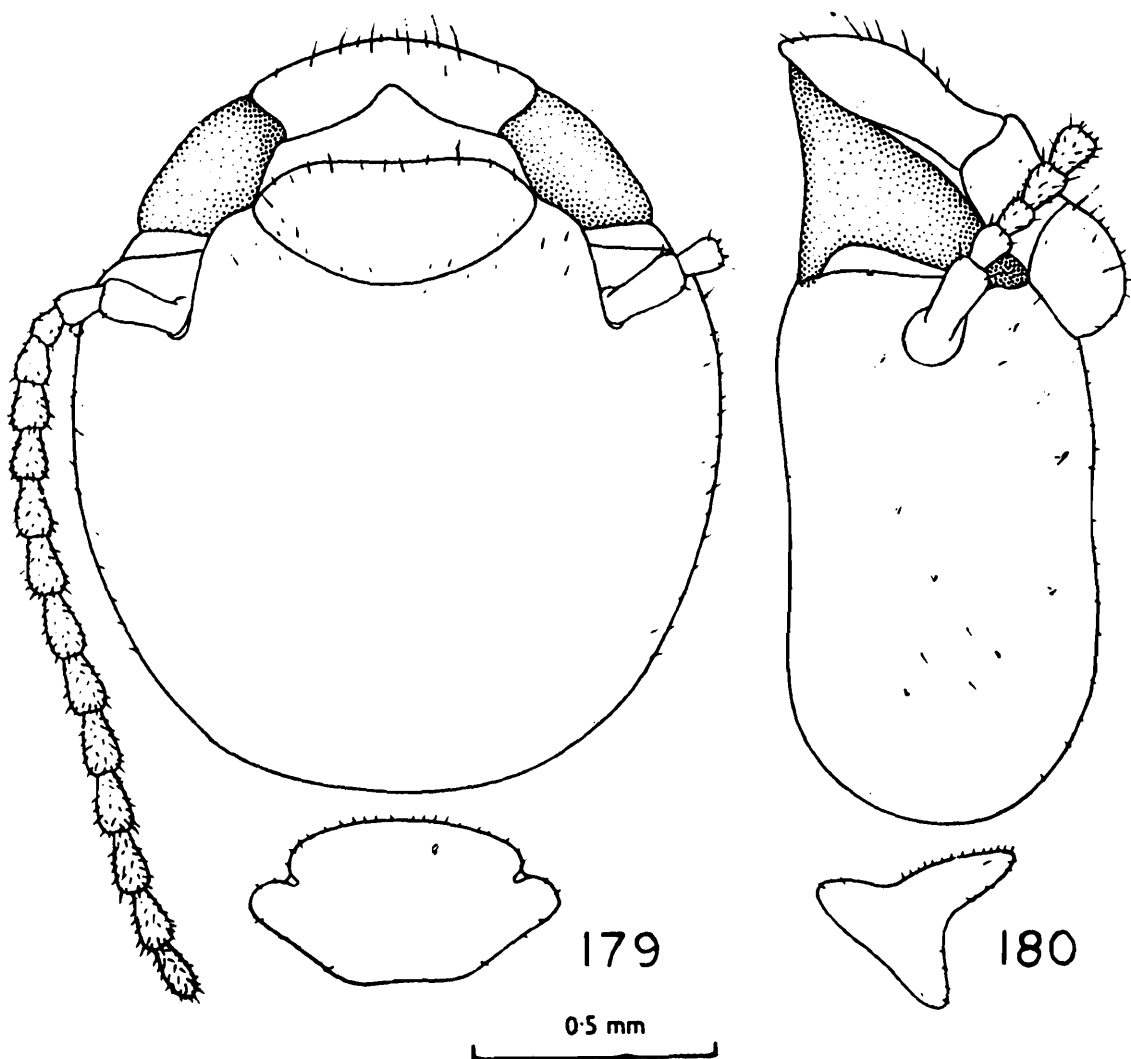
Fig. 178. Ditto, in side view.

Abdomen : Oblong, short ; with 2-segmented cerci, 0.08 mm long.

4. WORKER (Figs. 179, 180)

General : Head-capsule dark golden brown, pale yellowish anteriorly ; antennae, postclypeus, pale golden yellow ; thorax, legs and abdomen dark golden yellow ; head sparsely and body moderately pilose. Total body-length c 5.20—5.50 mm.

Head : Head-capsule subcircular, a little broader than long. **Fontanelle plate :** Translucent, oval. **Antennae :** With 15 segments, segment 3 shortest, 4 and 5 subequal, from segment 6 increasing in size to penultimate segment ; apical segment slender, club-shaped, shorter. **Labrum :** Mushroom-shaped, with many hairs on margins and on body. **Postclypeus :** Convexical, swollen, length slightly less than half of its width. **Anteclypeus :** Trapezoidal, apilose, with a small median tip. **Mandibles :** Typically of *Trinervitermes*-type.



Figs. 179-180. *Trinervitermes sensarmai* sp. n. worker (Paramorphotype).

Fig. 179. Head and pronotum in dorsal view.

Fig. 180. Ditto, in side view.

Thorax : Pronotum : Saddle-shaped. with large anterior lobe ; anterior margin weakly notched medially ; posterior margin substraight.

Legs : Long, slender, tarsi 4-jointed ; apical tibial spur 2 : 2 : 2.

Abdomen : Oblong ; cerci 2-segmented (0.10 mm long).

Measurements :

		Range (6 exs.)
1. Total body-length <i>c</i>	...	5.25—5.40
2. Length of head to base of mandibles	...	1.10—1.23
3. Max. width of head	...	1.30—1.43
4. Max. length of pronotum	...	0.20—0.40
5. Max. width of pronotum	...	0.60—0.68

Type-specimens Holotype : Soldier Major (ZSI Reg. No. 674/H11).
Morphotypes (paratypes) : A soldier minor, and a worker (ZSI, Reg. No. 675/H11).

Paratypes and Paramorphotypes : Soldier major (paratypes) and soldier minor and workers (paramorphotypes), Z. S. I. Reg. No. 692/H11.

All in separate vials deposited in the National Zoological collections, Zoological Survey of India, Calcutta.

Distribution : INDIA : Western slope of Hill Colony, North Vijayapuri, Andhra Pradesh (type-locality).

Comparison : The soldier major of *T. sensarmai* can be separated from those of the other Indian *Trinervitermes* spp. by its smaller size. From *T. biformis* the new species can be separated by its somewhat pear-shaped head (rounded in *biformis*) and from *nigrirostris* by the darker and pearshaped head (paler and round in *nigrirostris*), also.

The soldier minor can be distinguished from those of other species by slightly smaller size, and from that of *T. fletcheri*, to which it is closest, by shorter and thicker rostrum (long and slender in *T. fletcheri*).

Table 12. Measurements, etc of *Trinervitermes sensarmai* sp. n.

CASTE—Soldier

<i>Body parts</i>	<i>SOLDIER MAJOR</i>		<i>SOLDIER MINOR</i>
	(6 exs)	<i>Holotype</i>	(4 exs)
1. Total body-length <i>c</i>	3.80—4.30	3.80	3.10—3.25
2. Length of head with rostrum	1.78—2.00	1.90	1.40
3. Length of head to base of rostrum	1.10—1.20	1.13	0.77—0.80
4. Max. width of head	1.06—1.15	1.06	0.55
5. Length of rostrum	0.68—0.80	0.78	0.63
6. Max. height of head	0.75—0.85	0.75	0.43—0.45
7. Head Index : Width/Length to base of rostrum	0.94—0.98	0.94	0.68—0.70
8. Head-rostrum Index : Length of rostrum/Length of head to base of rostrum	0.62—0.69	0.69	0.78—0.80
9. Posterior bulge of head	0.25—0.37	0.28	0.15—0.18
10. Head production Index : Posterior bulge/Head length to base of rostrum	0.22—0.32	0.25	0.19—0.22
11. Min. median length of postmentum	0.23—0.25	0.25	—
12. Min. width of postmentum at anterior margin	0.18—0.20	0.18	—
13. Max. width of postmentum	0.30—0.38	0.33	—
14. Max. length of pronotum	0.20—0.25	0.21	0.18
15. Max. width of pronotum	0.50—0.60	0.50	0.38—0.40

III. SUMMARY

The present work concerns the termite fauna of southern India ranging between 8°N to 16°N latitudes. The region comprises the states of Karnataka, Andhra, Tamil Nadu, Kerala, Karikal, Pondicherry and Goa.

The collection from this part of India has revealed the existence of 95 species, distributed over 33 genera, under five families, viz., Kalotermitidae, Hodotermitidae, Rhinotermitidae, Stylotermitidae and Termitidae. Of these five families, Kalotermitidae contains 18 species, Hodotermitidae one species, Rhinotermitidae five species, Stylotermitidae one species and Termitidae 70 species.

The find of these 95 species in southern India, reveals that nearly 30 percent of the total Indian species, are found in this part of the country. Out of these 95 species eight are described as new to science

viz., *Neotermes dhirendrai*, *N. eleanorae*, *N. krishnai*, *N. venkateshwara*, *Speculitermes emersoni*, *Microcerotermes ganeshi*, *Nasutitermes vishnu* and *Trinervitermes sensarmai*. *Prorhinotermes flavus* (Buginon and Popoff), *Pericapritermes ceylonicus* (Holmgren) and *Odontotermes ceylonicus* Holmgren are newly recorded from southern India. Hitherto unknown imagos of *Procryptotermes dhari* Roonwal and Chhotani, *Microcerotermes fletcheri* Holmgren and Holmgren and *Nasutitermes fletcheri* (Holmgren and Holmgren) are described here for the first time.

Running keys have been provided for the families, genera and species. Wherever necessary, relevant discussions have been incorporated with regard to the taxonomic status. In a similar manner, relevant notes have been provided under each species in respect of collection data, biology and distribution.

At the beginning, a review has been given concerning the literature related to the termite fauna of India and southern India in particular and the present position of the termite fauna is discussed. The distribution of the genera found in southern India is discussed under each of the five families of termites.

The species wherever necessary have been illustrated with camera lucida drawings. Besides this, maps depicting the distributional pattern of the species have also been incorporated. This is particularly helpful in extending the knowledge of the distribution of termite species, found in southern India.

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APPENDIX—I

List of termites of southern India

<i>Species</i>	<i>Castes known</i>
Family Kalotermitidae	
1. <i>Postelectrotermes bhimi</i> Roonwal and Maiti	S., Pw.
2. <i>Postelectrotermes nayari</i> Roonwal and Verma	S., Pw.
3. <i>Neotermes assmuthi</i> Holmgren	Im., S., Pw.
4. <i>Neotermes dhirendrai</i> sp. n.	S., Pw.
5. <i>Neotermes eleanorae</i> sp. n.	Im., S., Pw.
6. <i>Neotermes fletcheri</i> Holmgren and Holmgren	Im., S., Pw.
7. <i>Neotermes keralai</i> Roonwal and Verma	S., Pw.
8. <i>Neotermes krishnai</i> sp. n.	S., Pw.
9. <i>Neotermes nilamburensis</i> Thakur	Im., S. Pw.
10. <i>Neotermes venkateshwara</i> sp. n.	S., Pw.
11. <i>Glyptotermes coorgensis</i> Holmgren and Holmgren	Im., S., Pw.
12. <i>Procryptotermes dhari</i> Roonwal and Chhotani	Im., S., Pw.
13. <i>Procryptotermes hunsuriensis</i> Thakur	S., Pw.
14. <i>Procryptotermes valeriae</i> Bose	Im., S., Pw.
15. <i>Cryptotermes domesticus</i> (Haviland)	Im., S., Pw.
16. <i>Cryptotermes dudleyi</i> Banks	Im., S., Pw.
17. <i>Cryptotermes havilandi</i> (Sjöstedt)	Im., S., Pw.
18. <i>Cryptotermes roonwali</i> Chhotani	S., Pw.
Family Hodotermitidae	
Subfamily Hodotermitinae	
19. <i>Anacanthotermes viarum</i> (König)	Im., S., W.
Family Stylotermitidae	
20. <i>Stylotermes fletcheri</i> Holmgren and Holmgren	Im., S., W.
Family Rhinotermitidae	
Subfamily Heterotermitinae	
21. <i>Heterotermes malabaricus</i> Snyder	Im., S., W.
Subfamily Coptotermitinae	
22. <i>Coptotermes beckeri</i> Mathur and Chhotani	S., W.
23. <i>Coptotermes ceylonicus</i> Holmgren	Im., S., W.
24. <i>Coptotermes heimi</i> (Wasmann)	Im., S., W.
Subfamily Prorhinotermitinae	
25. <i>Prorhinotermes flavus</i> (Bugnion and Popoff)	Im., S., W.

Family Termitidae

Subfamily Apicotermitinae

- | | | |
|-----|--|-------------|
| 26. | <i>Eurytermes budha</i> Bose and Maiti | S., W. |
| 27. | <i>Eurytermes topslipensis</i> (Chatterjee and Thapa) | S., W. |
| 28. | <i>Speculitermes deccanensis</i> Roonwal and Chhotani | W. |
| 29. | <i>Speculitermes dharwarensis</i> Roonwal and Chhotani | Im., W |
| 30. | <i>Speculitermes emersoni</i> sp. n. | Im., W. |
| 31. | <i>Speculitermes goesswaldi</i> Roonwal and Chhotani | Im., W. |
| 32. | <i>Speculitermes sinhalensis</i> Roonwal and Sen-Sarma | Im., S., W. |
| 33. | <i>Euhamitermes dentatus</i> Thakur and Chatterjee | S., W. |
| 34. | <i>Euhamitermes indicus</i> Holmgren and Holmgren | S., W. |
| 35. | <i>Euhamitermes karnatakensis</i> Roonwal and Chhotani | S., W. |

Subfamily Termitinae

- | | | |
|-----|--|-------------|
| 36. | <i>Eremotermes fletcheri</i> Holmgren and Holmgren | Im., S., W. |
| 37. | <i>Eremotermes madrasicus</i> Roonwal and Sen-Sarma | S., W. |
| 38. | <i>Eremotermes paradoxalis</i> Holmgren | Im., S., W. |
| 39. | <i>Microcerotermes cameroni</i> Snyder | Im., S., W. |
| 40. | <i>Microcerotermes fletcheri</i> Holmgren and Holmgren | Im., S., W. |
| 41. | <i>Microcerotermes ganeshi</i> sp. n. | S., W. |
| 42. | <i>Microcerotermes minor</i> Holmgren | Im., S., W. |
| 43. | <i>Angulitermes acutus</i> Mathur and Sen-Sarma | S., W. |
| 44. | <i>Angulitermes fletcheri</i> (Holmgren and Holmgren) | S., W. |
| 45. | <i>Angulitermes obtusus</i> (Holmgren and Holmgren) | S., W. |
| 46. | <i>Homallotermes pilosus</i> (Mathur and Thapa) | S., W. |
| 47. | <i>Dicuspiditermes fletcheri</i> (Holmgren and Holmgren) | S., W. |
| 48. | <i>Dicuspiditermes fontanellus</i> Thakur and Chatterjee | S., W. |
| 49. | <i>Dicuspiditermes gravelyi</i> (Silvestri) | S., W. |
| 50. | <i>Dicuspiditermes pername</i> Thakur and Chatterjee | S., W. |
| 51. | <i>Pericapritermes ceylonicus</i> (Holmgren) | Im., S., W. |
| 52. | <i>Pericapritermes topslipensis</i> Thakur | S., W. |
| 53. | <i>Procapritermes fontanellus</i> (Mathur and Thapa) | S., W. |
| 54. | <i>Procapritermes goanicus</i> (Thakur and Chatterjee) | S., W. |
| 55. | <i>Labiocapritermes distortus</i> (Silvestri) | Im., S., W. |

Subfamily Macrotermitinae

- | | | |
|-----|--|---------------------------|
| 56. | <i>Macrotermes convulsionarius</i> (Konig) | Im. S. (maj.,
min.) W. |
| 57. | <i>Odontotermes anamallensis</i> Holmgren and Holmgren | S., W. |
| 58. | <i>Odontotermes assmuthi</i> Holmgren | Im., S., W. |

- | | |
|---|-------------|
| 59. <i>Odontotermes bellahunisensis</i> Holmgren and Holmgren | Im., S., W. |
| 60. <i>Odontotermes brunneus</i> (Hagen) | Im., S., W. |
| 61. <i>Odontotermes ceylonicus</i> (Wasmann) | Im., S., W. |
| 62. <i>Odontotermes distans</i> Holmgren and Holmgren | Im. |
| 63. <i>Odontotermes feae</i> (Wasmann) | Im., S., W. |
| 64. <i>Odontotermes feaeoides</i> Holmgren and Holmgren | S., W. |
| 65. <i>Odontotermes horni</i> (Wasmann) | Im., S., W. |
| 66. <i>Odontotermes kulkarnii</i> Roonwal and Chhotani | S., W. |
| 67. <i>Odontotermes mathadi</i> Roonwal and Chhotani | S., W. |
| 68. <i>Odontotermes obesus</i> (Rambur) | Im., S., W. |
| 69. <i>Odontotermes redemanni</i> (Wasmann) | Im., S., W. |
| 70. <i>Odontotermes roonwali</i> Bose | S., W. |
| 71. <i>Odontotermes vaishno</i> Bose | S., W. |
| 72. <i>Odontotermes wallonensis</i> (Wasmann) | Im., S., W. |
| 73. <i>Hypotermes obscuriceps</i> (Wasmann) | Im., S., W. |
| 74. <i>Microtermes globicola</i> Wasmann | S., W. |
| 75. <i>Microtermes obesi</i> Holmgren | Im., S., W. |
| Subfamily Nasutitermitinae | |
| 76. <i>Nasutitermes anamalaiensis</i> Snyder | S., W. |
| 77. <i>Nasutitermes beckeri</i> Prashad and Sen-Sarma | Im., S., W. |
| 78. <i>Nasutitermes brunneus</i> Snyder | Im., S., W. |
| 79. <i>Nasutitermes crassicornis</i> (Holmgren and Holmgren) | S., W. |
| 80. <i>Nasutitermes fletcheri</i> (Holmgren and Holmgren) | Im., S., W. |
| 81. <i>Nasutitermes indicola</i> (Holmgren and Holmgren) | Im., S., W. |
| 82. <i>Nasutitermes processionarius</i> (Schmitz) | S., W. |
| 83. <i>Nasutitermes salemensis</i> (Sen-Sarma) | S., W. |
| 84. <i>Nasutitermes vishnu</i> sp. n. | S., W. |
| 85. <i>Alstonitermes flavescens</i> Thakur | S., W. |
| 86. <i>Ampoulitermes wynaadensis</i> Mathur and Thapa | S., W. |
| 87. <i>Emersonitermes thekadensis</i> Mathur and Sen-Sarma | S., W. |
| 88. <i>Grallatotermes grallatoriformis</i> Holmgren and
Holmgren | S., W. |
| 89. <i>Grallatotermes niger</i> Chatterjee and Thapa | S., W. |
| 90. <i>Hospitalitermes madrasi</i> Snyder | S., W. |
| 91. <i>Ceylonitermes indicola</i> Thakur | S., W. |
| 92. <i>Trinervitermes biformis</i> (Wasmann) | Im., S., W. |
| 93. <i>Trinervitermes fletcheri</i> Chatterjee and Thakur | S., W. |
| 94. <i>Trinervitermes nigrirostris</i> Mathur and Sen-Sarma | Im., S., W. |
| 95. <i>Trinervitermes sensarmai</i> sp. n. | S., W. |

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ERRATA

<i>Page</i>	<i>Line from top</i>	<i>Correction</i>
17	12	Read <i>Procryptotermes</i> as <i>Procryptotermes</i>
61	—	Read <i>valerise</i> as <i>valeriae</i> in explanation of fig. 45
78	1	Read <i>Heterotermes</i> as <i>Heterotermes</i>
82	14	Serial No. 21 of the species <i>Coptotermes beckeri</i> Mathur and Chhotani to read as 22
91	—	Read <i>budha</i> as <i>buddha</i> in fig. 68
96	—	Distribution of <i>Odontotermes parvidens</i> to stand deleted in figure 73