

Fauna of India



ISOPTERA (TERMITES)

VOLUME II

O.B. CHHOTANI

The present Isoptera Fauna—
Volume II comprises the family
Termitidae which is by far the largest
and includes 239 species, some of
which are most common and
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and household timber in India and
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**THE FAUNA OF INDIA
AND
THE ADJACENT COUNTRIES**

ISOPTERA (TERMITES)

Volume II

(Family Termitidae)

O.B. CHHOTANI

Edited by the Director, Zoological Survey of India



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FOREWORD

Roonwal and Chhotani (1989) published volume I of "*The Fauna of India—Isoptera (Termites)*" which included general information on this important group of insects and diagnosis, descriptions, etc. of the species of families Termopsidae, Hodotermitidae, Kalotermitidae, Rhinotermitidae, Stylotermitidae and Indotermitidae. In all, 98 species, under these families, were dealt with.

The present Isoptera Fauna—Volume II comprises the family Termitidae which is by far the largest and includes 239 species, some of which are most common and injurious, causing extensive harm and damage to agriculture, forestry and household timber in India and neighbouring countries. All the species are adequately described and figured and in case of common species the biology, ecology and the damage caused are also discussed.

Dr. O. B. Chhotani has been working on termites for more than 35 years and the knowledge he has acquired during this period has been well utilized in presenting this volume.

I congratulate Dr. Chhotani on the completion of this extensive study. It is hoped that the information contained in the two volumes on termites of India and neighbouring countries will be of use to the taxonomists and economic entomologists.

Calcutta,
April, 1997

J.R.B. Alfred
Director
Zoological Survey of India

PREFACE TO VOLUME II

Volume I of "The Fauna of India—Isoptera (Termites)," including general information on the Order and the families Termopsidae, Hodotermitidae, Kalotermitidae, Rhinotermitidae, Stylotermitidae and Indotermitidae, was published in the year 1989 in collaboration with Dr. M.L. Roonwal, the well known authority on termites. It is unfortunate that Dr. Roonwal is now no more and the author had to take up this stupendous task of bringing out Volume II which includes the family Termitidae. It is represented by 239 species which is more than twice the number of the species (98 species) included in all the six families treated in Volume I.

The presentation of data is in conformity with that of Volume I. As many as 337 species of termites are now known from the Indian subregion, and all the 239 of the family Termitidae are described and adequately figured here. Keys for easy identification of various genera under different subfamilies and for the species of different genera are provided.

The bibliography at the end of two volumes should come to be useful to the future workers on termites as it is complete so far as taxonomy of these insects from the Indian Region is concerned.

Dr. Roonwal had been a guiding factor during the course of this work and I dedicate this volume to him.

O.B. Chhotani

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To the various institutes and museums and their authorities the author acknowledges his gratefulness for the loan of specimens especially the types but for which it may not have been possible to authenticate these studies. These are the Forest Research Institute, DehraDun; the Indian Agricultural Research Institute, New Delhi; The American Museum of Natural History, New York; and the Natural History Museum, Maastricht.

He is also thankful to the termitologists Dr. P.K. Sen-Sarma, Dr. P.K. Maiti, Dr. M.L. Thakur, Dr. S.C. Verma and Dr. N.S. Rathore, his friends and colleagues, for providing information on various aspects; and to Dr. (Ms) S. Ghai, Head of Division of Entomology, Indian Agricultural Research Institute, New Delhi and Dr. G.S. Arora, the then Officer-in-Charge, Northern Regional Station, Zoological Survey of India, Dehradun, for loan of some specimens under their charges.

To Late Prof. Alfred E. Emerson he is very much obliged for allowing him to use his notes present in the American Museum of Natural History and to Prof. K. Krishna for allowing him to examine the collections at that museum while working with him.

To his wife Dr. (Ms) Geeta Chhotani (nee Bose), also a termitologist of standing, he is really very thankful for her help in various ways but

for which it may not have been possible to complete this voluminous work within this time; to Shri P.H. Roy and others in the Isoptera Section, Z.S.I. for unstinted assistance in many ways; and to Shri A.K. Ghosh, Retired Senior Artist of the Zoological Survey of India for help in making the drawings for this volume.

For devotional inspiration he is grateful for the guiding words of his late mother for acquisition of true knowledge.

O.B. Chhotani

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INTRODUCTION

GENERAL

Termites (Order Isoptera) are economically greatly significant as they cause extensive damage to agriculture, plantation crops, forestry and woodwork in buildings.

A little more than 2,000 species of these insects are known from all over the world and these are mostly confined to the tropical parts. In the Indian subregion as many as 337 species, belonging to 59 genera (including 2 new described here) under the families Termopsidae, Hodotermitidae, Kalotermitidae, Rhinotermitidae, Stylotermitidae, Indotermitidae and Termitidae, are known. Roonwal and Chhotani 1989, in the first volume of "The Fauna of India-Isoptera (Termites)" have given general information on the group dealing with definitions, brief history of termite study, characters useful in taxonomy, polymorphism, sexual dimorphism, biology and ecology, and distribution and zoogeography in the 'Introduction' chapter. In the "Systematic Account", they have discussed history of classification and classification adopted, important diagnostic characters; have given keys to the various families of termites; and dealt with the species of the families Termopsidae, Hodotermitidae, Kalotermitidae, Rhinotermitidae, Stylotermitidae and Indotermitidae. In all 98 species belonging to 22 genera under these families were taken into account giving their descriptions, drawings and keys for the identification of the various genera under different families and different species under the genera.

The present second volume of the 'Fauna' deals with the family Termitidae. In this family 4 subfamilies viz. Amitermitinae, Termitinae, Macrotermitinae and Nasutitermitinae have been recognised. The Amitermitinae comprise 8 genera and 67 species; the Termitinae 11 genera and 52 species; the Macrotermitinae 6 genera and 62 species, and the Nasutitermitinae 12 genera and 58 species. All the species have been

described and illustrated adequately as far as possible. Types have been examined in the species wherever possible and lectotypes designated and deposited in the museums from where the syntypes were received for study.

Thus, in all 337 species belonging to 59 genera are now known and recognised here from Indian subregion (India, Pakistan, Bangladesh, Nepal, Bhutan, Burma and Sri Lanka).

IMPORTANT FINDINGS IN INDIAN TERMITE FAUNA

Some of the important findings and discoveries are enumerated here as the researchers may miss them in the extensive text of this volume.

(i) Subfamily AMITERMITINAE

The genus *Anoplotermes*, reported by Roonwal and Chhotani (1959a) from India, is since now confined to the Neotropical zoogeographical region (Sands, 1972), and so it has not been taken into account here; the species *A. shillongensis* described by Roonwal and Chhotani (1960b) probably belongs to the genus *Euhamitermes*.

The genus *Doonitermes*, described by Chatterjee and Thakur (1965), is treated as a synonym of *Indotermes* Roonwal and Sen-Sarma.

Genus *Microcerotermes* is by far the most predominant one in the region. It is known by 29 species. The problems in respect of identification of soldier caste are enumerated. Lectotypes of the species *annandalei* Silvestri, *cylindriceps* Wasmann and *heimi* Wasmann are designated. In the opinion of the author the records of the species *annandalei* Silvestri from Thailand, Malaysia and China seem to be doubtful.

(ii) Subfamily TERMITINAE

The genus *Angulitermes* is known by 18 species and in a number of species only one or two soldiers were available, thus posing some problems in identifications. A note on the same is given under the genus.

The species *Dicuspitermes cornutella* Silvestri and *D. fontanellus* Thakur and Chatterjee, have been found to be very close to *D. graveleyi* but are kept separate due to certain reasons and *D. pername* Thakur and

Chatterjee and *D. tripurensis* Sen-Sarma and Thakur have been taken as synonyms of *D. incola* (Wasmann) and *D. laetus* (Silvestri), respectively. Two new *Dicuspiditermes* and the unknown imago of *D. gravelyi* are described here.

The species *Capritermes fletcheri* Holmgren and Holmgren, so far recognised as a species of *Dicuspiditermes* is actually a *Pseudocapritermes* and *P. fontanellus* Mathur and Thapa, *P. roonwali* Verma have been found to be synonymous with *P. fletcheri* (Holmgren and Holmgren); also see Chhotani (1993).

Under the genus *Pericapritermes*, the name *perparvus* has priority over the name *ceylonicus* since it is published as *Eutermes perparvus* on page 201 and *Capritermes ceylonicus* on pages 204-205 in the same publication (*Termitenleben auf Ceylon*) by Holmgren 1911b. The name *perparvus* was so far being treated as a junior synonym of *ceylonicus*, but it is resurrected here and *ceylonicus* is taken as its synonym. The species *P. vythiri* Verma is found to be a synonym of *Labiocapritermes distortus* (Silvestri).

Two genera having soldier mandibles very much like those of *Pericapritermes* were found to have very different imago-worker mandibles and soldier labrum. They are described as new, one is monotypic and the other has two species, new to science, found in southern India.

The genus *Malaysiocapritermes* is reported to occur in southern India and two new species are described, see Chhotani and Ferry (in press) also.

The lectotypes of the species *Angulitermes fletcheri* (Holmgren and Holmgren) and *A. obtusus* (Holmgren and Holmgren) and of *Discuspiditermes obtusus* Silvestri, are designated.

(iii) Subfamily MACROTERMITINAE

The genus *Odontotermes* with 43 species is the most predominant and problematic one. The difficulties in the correct identification and status of different species are discussed under the genus.

The species *Odonototermes guptai* Roonwal and Bose, *O. horni* (Wasmann), *O. kulkarnii* Roonwal and Chhotani, *O. parvidens* (Holmgren and Holmgren) and *O. vaishno* Bose, taken as synonyms of different

species by Thakur 1981, are resurrected. The species *O. meturensis* Roonwal and Chhotani, *O. lokanandi* Chatterjee and Thakur are treated synonymous with *O. ceylonicus* (Wasmann) and *O. guptai* Roonwal and Bose. The species *Termes (Termes) dehraduni* Snyder and *O. roonwali* Bose are taken as synonyms of *O. globicola* (Wasmann). See Chhotani (1977a), Bose (1984) and Chhotani and Bose (1987).

Lectotypes are designated in case of *Macrotermes annandalei* (Silvestri), *Odontotermes gravelyi* Silvestri, *Hypotermes obscuriceps* (Wasmann) and *Hypotermes xenotermitis* (Wasmann).

(iv) Subfamily NASUTITERMITINAE

The genus *Nasutitermes* is the most common in this subfamily and is recognised by 30 species from the Indian Region.

The genera *Fletcheritermes* Sen-Sarma and *Alstonitermes* Thakur have been found to be synonymous with *Nasutitermes*. The species *Alstonitermes flavescens* Thakur is relegated to the synonymy of *Nasutitermes anamalaiensis* Snyder; *N. lambai* Verma and *N. guptai* Sen-Sarma and Thakur to *N. dunensis* Chatterjee and Thakur; *Fletcheritermes salemensis* to *N. fletcheri* (Holmgren and Holmgren); and *N. beckeri* Prashad and Sen-Sarma and *Eutermes (Eutermes) processionarius* Schmitz to *N. indicola* (Holmgren and Holmgren).

The species *Bulbitermes emersoni* Maiti is transferred to the genus *Ahmaditermes* Akhtar.

Lectotypes are designated in case of the species *Nasutitermes moratus* Silvestri, *N. roboratus* Silvestri and *Trinervitermes biformis* (Wasmann).

SOME TAXONOMIC LACUNAE AND GAPS

By bringing out these two volumes of "Fauna" on termites of the Indian Region it cannot be said with impunity that the studies on termite fauna are complete in all respects. I have tried to update all the information on different genera and species and given expression of my studies, but there remain some gaps and lacunae since in some cases the descriptions and drawings have been provided on the basis of existing literature due to non-availability or paucity of collections. These are

enumerated here to bring to the notice of future researchers so as to enable them to put in concerted efforts to fill up these lacunae.

All the castes are not known in a large number of species, for example the imago is not known in case of 176 out of a total of 337 species. The soldier caste in case of only *Speculitermes sinhalensis* Roonwal and Sen-Sarma is described out of a total of ten species of the genus reported from the Indian Region and also soldier caste is not known in about ten more other species. These gaps can be filled by making further collections complete with all castes.

There are doubts about the validity of some species since types of some older species were not accessible to me in a number of cases. As such some of the species are separated on the basis of minor differences which may not stand when variations in those species are studied on the availability of larger collections. For example in a number of cases in *Angulitermes* only one or two examples of soldier caste were available; all such cases have been brought to the notice of workers with remarks under different genera and species.

In a number of cases the species are known only through a single type collection. These species may be rare but with further surveys and collections a better picture of the distribution of various categories will emerge. In the Indian Region many areas along the foot hills of Himalayas in the states of Sikkim, Bihar, North Western Uttar Pradesh, Himachal Pradesh, Jammu and Kashmir and certain parts of Madhya Pradesh, Andhra Pradesh and Tamil Nadu in India and Nepal, Bhutan, Burma and Sri Lanka still need to be surveyed rather intensively for a better picture about the distribution of various species. It is also expected that some more species new to science may come to light through such explorations.

ABBREVIATIONS USED

In text : AMNH, American Museum of Natural History, New York (U.S.A.); BM, British Museum (Natural History), London (U.K.); coll., collector/collection; det., determination; E, east; Ed/Eds, Editor/Editors; ex, example; FRI, Forest Research Institute, Dehra Dun (India); IARI, Indian Agricultural Research Institute, New Delhi (India); Im, imago; K,

king; maj., major; max., maximum; min., minor/minimum; N, north; NHM, Natural History Museum, Maastricht (Holland); NRS, Northern Regional Station; NZC, National Zoological Collections; Ny, nymph; PU, Zoology Dept., Punjab University, Lahore (Pakistan); Q, queen; S, soldier; sev, several; Silv. Coll., Silvestri Collection at Univ. of Agriculture, Portici, Italy; USNM, United States National Museum, Washington; W, worker; ZSI, Zoological Survey of India.

In lettering of figures : acl., anteclypeus; ant., antenna; ap. t., apical tooth; at., anterior; C., costa; cer., cercus; cl., clypeus; Cu., cubitus; e., eye; ft., fontanelle; ft. pl., fontanelle plate; lr., labrum; lt., left; M., media; m 1, m 2, first and second marginal teeth of mandibles; md., mandible; m. pl., molar plate; m.s., mid dorsal spot; mst., mesonotum; mtt., metanotum; oc., ocellus; pcl., postclypeus; pmt., postmentum; prt., pronotum; pt., posterior; R., radius; Rs., radial sector; rt., right; Sc., subcosta; tb. sr., tibial spur.

SYSTEMATIC ACCOUNT (Contd.)*

Family VII. TERMITIDAE Westwood

Family Termitidae Westwood :

1840. Westwood, *Introduction Modern Classification Insects* Vol. 2 : 11.
 1949. Snyder, *Smiths. misc. Colls.*, **112** : 79. See for detailed synonymy.
 1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** (Art. 2) : 56.
 1953. Rattan Lal and Menon, *Catalogue Indian Insects, Part 27-Isoptera* : 34-37.
 1955. Ahmad, *Biologia*, Lahore, **1**(2) : 203.
 1955. Emerson, *Fieldiana : Zool.*, **37** : 468, 472, 475, 476, 477, 480-481, 482, 505, 507, 510, 515, 516.
 1958. Ahmad, *Biologia*, Lahore, **4**(1 & 2) : 35.
 1961. Harris, *Termites their Recognition & Control* : 45-48 (2nd Ed., 1971).
 1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 129, 130, 140-150.
 1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 342-384. Biology of various species.
 1970. Gay, In : *The Insects of Australia* (Ed Waterhouse) : 275-293.
 1970. Weidner, *Handb. d. Zool.*, **4** (Arthropoda-2, Halfte : Insects) : 11, 12, 22-28.

* Systematic Account is in continuation of volume 1.

1973. Chhotani and Bose, *Zool. Anz.*, **190** : 232, 234-235.
1974. Akhtar, *Pakistan J. Zool.*, **6** (1 & 2) : 91-95, 99, 100, 101-103.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 41.
1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 3, 5, 35.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 17, 23.
1983. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) **49** : 359-391.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 14, 90.
1987. Chhotani, *Beitr. Ent.*, **37** : 407-420.
1989. Roonwal and Chhotani, *Fauna of India-Isoptera (Termites)* Vol. 1 : 109, 110, 114, 118-119, 120, 121, 122.

Type Genus : *Termes* Linn.

1. Characters of Family Termitidae

Imago : Small to large forms. Head-capsule round or subsquarish. Fontanelle present. Fontanelle plate minute to fairly large. Eyes and ocelli present. Mandibles with an apical and two marginals. Antennae 14 to 23-segmented. Postclypeus generally swollen. Pronotum trapezoidal or sub-semicircular, slightly raised anteriorly. Legs with 3 : 2 : 2 or 2 : 2 : 2 (Nasutitermitinae) apical tibial spurs; tarsi 4-jointed. Hindwing without anal lobe; forewing scale small; wings covered with various combinations of papillae, arrowheads (rare), spearheads (rare), pimpules (rare), micrasters, microsetae (rare) and rods; wing venation reduced and either not reticulated or with a weak reticulum.

Soldier : Present or absent; when present either monomorphic or sometimes dimorphic. Head-capsule variously shaped, without or with a nasute (Nasutitermitinae). Fontanelle present, in some cases indistinct. Antennae with 13-20 segments. Mandibles prominent or reduced (Nasutitermitinae). Pronotum saddle-shaped. Legs with 3 : 2 : 2 or 2 : 2 : 2 (Nasutitermitinae) apical tibial spurs.

Worker : Monomorphic or dimorphic. Head subcircular or subsquarish. Fontanelle plate distinctly marked or indistinct. Antennae with 13-20 segments. Mandibles each with an apical and two marginals. Pronotum and legs as in soldier.

2. *Distribution and Composition of Termitidae*

Distribution : This family is the most highly evolved of all the families of Isoptera and is known to occur in all the zoogeographical regions of the world, between 40° N and 40° S. Chhotani 1987 has discussed the distribution and zoogeography of the Oriental Termitidae in some detail.

Composition : Nearly 2,000 species of Isoptera are known and about 75 percent of these belong to the family Termitidae. According to Chhotani (1987), 527 species belonging to 59 genera of the family are recorded from the Oriental zoogeographical region, of which 239 species under 37 genera occur in the Indian subregion. The family comprises the subfamilies Amitermitinae, Apicotermitinae, Termitinae, Macrotermitinae and Nasutitermitinae and all the subfamilies except Apicotermitinae are found in the Indian subregion. Grasse and Noirot (1954) erected the subfamily Apicotermitinae for *Apicotermes* and six other genera of Termitinae. Emerson 1959 had questioned the status of the subfamily and Krishna 1970 also did not take it into consideration, while Sands 1972 synonymised the subfamily Amitermitinae distributing the genera to Apicotermitinae and Termitinae. Various workers including some from the Indian subregion (Akhtar 1974a, b, 1975; Maiti 1983; Bose 1984; Chhotani 1987) accepting the latest view of Sands 1972 had placed the Indian Amitermitine genera under Apicotermitinae without any comments. Roonwal and Chhotani 1989 have discussed the status of Apicotermitinae and have opined that "It is better perhaps to accept the original Apicotermitinae of Grassé and Noirot (Sens. strict.) with its few genera but that too does not seem to give particular clarity and it is more advisable to follow the original and simpler arrangement" Here, therefore, as mentioned by Roonwal and Chhotani 1989, in the *Fauna of India-Isoptera (Termites)* Vol. 1, the Termitid species are grouped in the subfamilies Amitermitinae, Termitinae, Macrotermitinae and Nasutitermitinae.

3. *Keys to Subfamilies of Termitidae*

IMAGOES

1(4) Labrum wider than long or as long as wide

2(3) Apical tooth of mandibles larger than 1st marginal and widely separated with a wide angle of more than 45°.....Termitinae

- 3(2) Apical tooth of mandibles smaller than 1st marginal and not widely separated, angle between two smaller nearly 45°Amitermitinae
- 4(1) Labrum longer than wide
- 5(6) Labrum with a sclerotised band. Apical tibial spurs generally 3 : 2 : 2Macrotermitinae
- 6(5) Labrum without a sclerotised band. Apical tibial spurs generally 2 : 2 : 2 (3 : 2 : 2 in primitive genera).....Nasutitermitinae

SOLDIERS

- 1(2) Head produced into a nasute or rostrum; generally retort-shaped. Mandibles reduced. (Rectangular but with a distinct nasute, not retort-shaped and with functional mandibles in primitive genera)Nasutitermitinae
- 2(1) Head variously shaped (oval, rectangular or squarish), not produced into a nasute or rostrum. Mandibles prominent and functional
- 3(6) Mandibles sabre-shaped or hooked; generally shorter than head. Fontanelle open and distinct or indistinct
- 4(5) Mandibles each with a prominent tooth or serrated (*Microcerotermes*)Amitermitinae
- 5(4) Mandibles either toothed or without tooth; left with a prominent and right with a smaller or indistinct tooth (*Odontotermes*) or with crenulations (*Hypotermes*, *Macrotermes*).....Macrotermitinae
- 6(3) Mandibles rod-like or twisted; as long as or a little longer than head and shorter in some genera. Fontanelle generally placed below frontal projection.....Termitinae

Subfamily (i) AMITERMITINAE Kemner

1. Subfamily Amitermitinae Kemner :

1934. Kemner, *K. Svensk. Vetensk.-Akad. Handl.*, (3) 13 (4) : 110.

1949. Snyder, *Smiths. misc. Colls.*, 112 : 100-101. See for synonymy and genera included.

1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, 95 (Art. 2) : 64-68.

1955. Emerson, *Fieldiana : Zool.*, **37** : 468, 480, 484-485, 493-494, 505, 506, 510, 516, 517.
1965. Bouillon and Mathot, *Zooleo*, No. 1 : 21.
1970. Weidner, *Handb. d. Zool.*, **4** (Sect. 2, Pt. 2, Lief. 13, No. 14, Isoptera) : 11, 12, 23-24. Characters.
1970. Krishna, In : *Biology of Termites* Vol. 2 : 140-143.
1970. Roonwal, In : *Biology of Termites* Vol. 2 : 342.
1971. Bouillon and Mathot, *Zooleo*, No. 1 (Suppl. 2) : 3, 6, 9. Tab. of genera.
1972. Sands, *Bull. Br. Mus. (nat. Hist.) Ent.*, Suppl. 18 : 32-37. Divides Amitermitine genera between Apicotermitinae and Termitinae.
1972. Coaton and Sheasby, *Cimbebasia*, Mem. No. 2 : 65.
1973. Chhotani and Bose, *Zool. Anz.*, **190** : 233.
1979. Roonwal, *Termite Life and Termite Control Tropical South Asia* : 80, 118.
1989. Roonwal and Chhotani, *Fauna of India, Isoptera (Termites)* Vol. 1 : 25, 37, 38, 75, 76, 109, 110, 112-113, 114-118, 119.

2. Family Termitidae (Part) :

1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27, Isoptera* : 34, 86. Part of the genera included in the family.

3. Subfamily Apicotermitinae (Part) :

1972. Sands, *Bull. Br. Mus. (nat. Hist.) Ent.*, Suppl. 18 : 37.
1987. Chhotani, *Beitr. Ent.*, **37** : 407-408.

4. Subfamily Termitinae (Part) :

1972. Sands, *Bull. Br. Mus. (nat. Hist.) Ent.*, Suppl. 18 : 39.
1977. Mathews, *Studies Termites Mato Grasso State, Brazil* : 103-141.
1977. Araujo, *Cat. Isoptera Novo Mundo* : 56-67.
1987. Chhotani, *Beitr. Ent.*, **37** : 408-411, 416-417.

Type Genus : *Amitermes* Silvestri

1. Characters of Subfamily Amitermitinae

Imago : Small, pale, delicate to medium sized and dark species. Head round or broadly oval. Fontanelle plate situated at middle, minute to prominent. Antennae with 13-16 segments. Mandibles generally with an apical and two marginals (except *Protohamitermes* in which left

mandible has 3 marginals); apical generally smaller than 1st marginal, posterior margin of 2nd marginal of right either straight or incurved. Pronotum generally flat. Legs with 3 : 2 : 2 apical tibial spurs, dorsal spur of forelegs sometimes reduced or absent, tarsi 4-jointed. Wing microsculpturing consists of papillae and micrasters.

Soldier : Head rectangular or oval. Fontanelle minute, distinct or indistinct. Antennae with 12-16 segments. Mandibles sabre- or sickle-shaped; generally with a tooth, except serrate in *Microcerotermes*. Pronotum saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs, dorsal spur sometimes reduced or absent; tarsi 4-jointed.

Worker : Head subcircular or subsquarish. Fontanelle plate small, minute or large and swollen (*Speculitermes*). Antennae with 13-15 segments. Mandibles as in imago. Pronotum and legs as in soldier.

2. Distribution and Composition of Amitermitinae

(Figs. 1, 2)

Distribution : Amitermitine genus *Amitermes* is known to occur in all the zoogeographical regions and *Microcerotermes* in all except the Nearctic Region. The remaining genera are either endemic to a particular region such as *Protohamitermes*, *Orientotermes*, *Prohamitermes*, *Speculitermes*, *Eurytermes*, *Euhamitermes*, *Synhamitermes*, *Globitermes*, and *Labritermes* to the Oriental; *Cephalotermes*, *Pseudomicrotermes*, *Firmitermes* and *Eburnitermes* to the Ethiopian; *Cylindrotermes*, *Gnathamitermes* and *Ruptitermes* to the Neotropical; and *Drepanotermes*, *Ahamitermes* and *Incolitermes* to the Australian, regions and others are known to occur in more than one zoogeographical regions.

Composition : The Amitermitinae of the Indian subregion are known by the following 8 genera comprising as many as 67 species.

1. *Eurytermes* Wasmann—Oriental (India)
2. *Speculitermes* Wasmann—Oriental
3. *Euhamitermes* Holmgren—Oriental
4. *Synhamitermes* Holmgren—Oriental
5. *Amitermes* Silvestri—Cosmotropical

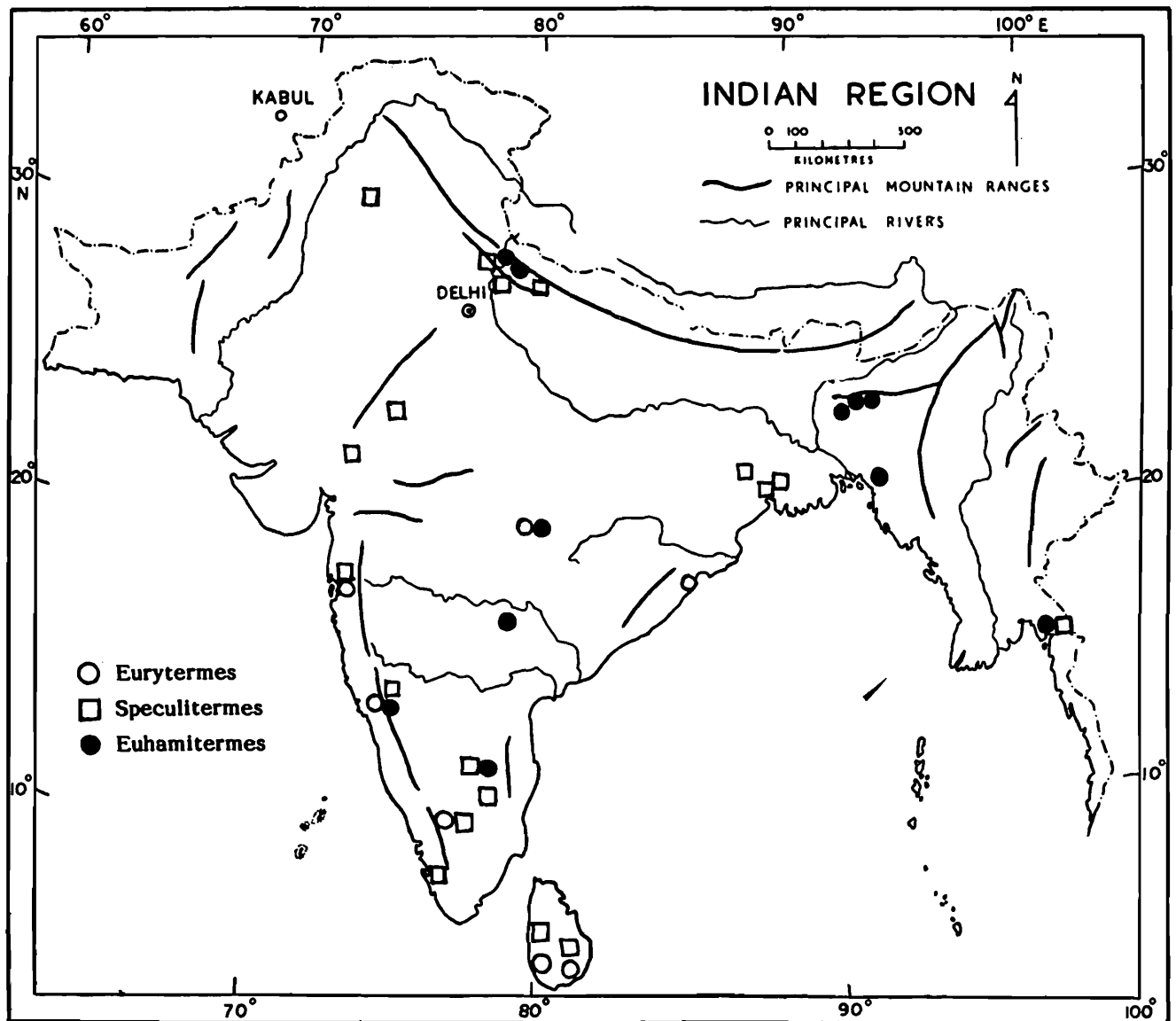


Fig. 1 : Map of Indian Region showing distribution of Amitermitinae genera *Eurytermes*, *Speculitermes* and *Euhamitermes*.

6. *Globitermes* Holmgren—Oriental
7. *Eremotermes* Silvestri—Palaeartic, Oriental
8. *Microcerotermes* Silvestri—Cosmotropical except Nearctic

3. Remarks on Genera *Anoplotermes* and *Doonitermes* from Indian Region

(i) Genus *Anoplotermes* Müller

Roonwal and Chhotani 1959a reported the occurrence of genus *Anoplotermes* Müller from the Indian subregion and described (1960b,

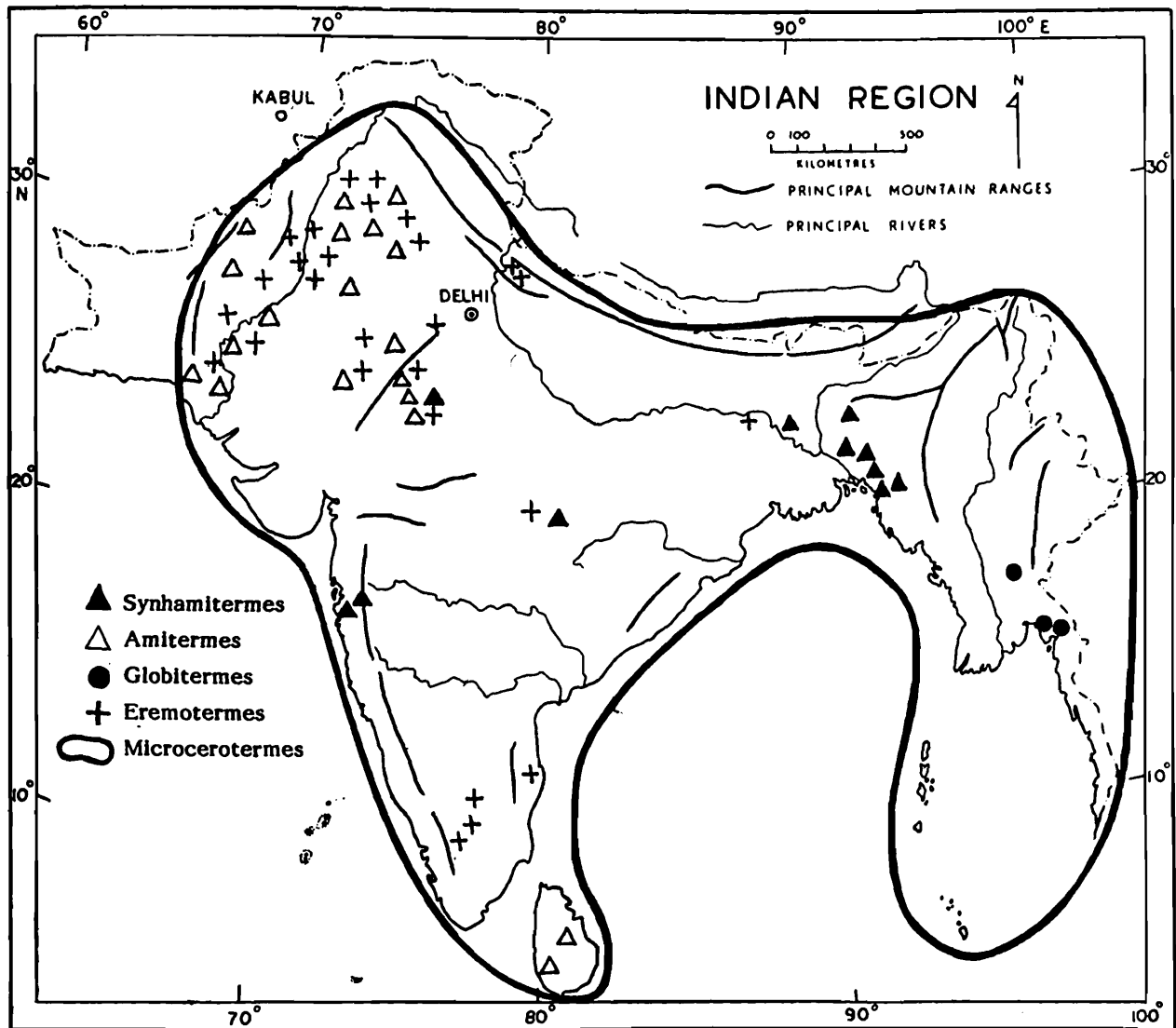


Fig. 2 : Map of Indian Region showing distribution of Amitermitinae genera *Synhamitermes*, *Amitermes*, *Globitermes*, *Eremitermes* and *Microcerotermes*.

1962d) the species *A. shillongensis* from Shillong, Meghalaya, India from worker caste. In the opinion of Krishna 1970 this species belongs to either *Euhamitermes* or *Eurytermes* while Sands 1972, working on the soldierless termites of Africa, restricted the genus *Anoplotermes* to the Neotropical Region and suggested that the species described by Roonwal and Chhotani from India is not likely to be congeneric with the type species, *A. pacificus* Müller.

Since *Anoplotermes* is now been restricted to the Neotropical Region, Chhotani 1987 did not take into account the genus while discussing the

distribution and zoogeography of the Oriental Termitidae and since genus *Euhamitermes* is now known from North-eastern India, *A. shillongensis* is very probably a species of that genus. Also as in this species no other castes have so far been collected it is preferred to keep it as such without assigning it to any genus.

(ii) Genus *Doonitermes* Chatterjee and Thakur

Chatterjee and Thakur 1965 described the genus *Doonitermes* and also the species *D. capillosus* from Dehradun Forest Division, Uttar Pradesh, India. Later Thakur and Chatterjee 1970 described the imago caste of the same and Thakur and Sen-Sarma 1973 described another species of the genus (*D. buxensis*) from Jamir Forest, Buxa Forest Div., West Bengal.

I have examined the types of both these species and have come to the conclusions that the genus *Doonitermes* is synonymous with *Indotermes* (Family Indotermitidae) and the species *buxensis* is a synonym of *Indotermes rongrensis* (Roonwal and Chhotani). The family Indotermitidae has been dealt with in volume I of the 'Fauna' and since the species *capillosus* is described quite adequately, here it is just only transferred to the genus *Indotermes*.

3. Keys to Indian Genera of Amitermitinae

IMAGOES

- 1(6) Posterior margin of 2nd marginal of right mandible straight
- 2(3) Head-capsule subsquarish; sides substraight. Postclypeus longer than half its width and strongly pushed back into frons
.....*Microcerotermes*
- 3(2) Head-capsule subcircular; sides convex. Postclypeus about half its width and not much pushed back into frons
- 4(5) Second marginal of left mandible obtuse, hardly differentiated. Postclypeus somewhat more swollen, length 1/2 width.. *Amitermes*
- 5(4) Second marginal of left mandible somewhat acute and clear. Postclypeus somewhat less swollen, length less than 1/2 width
.....*Globitermes*

- 6(1) Posterior margin of 2nd marginal of right mandible weakly to strongly incurved
- 7(10) Apical tooth of mandibles longer than 1st marginal and the two widely separated from each other. Second marginal of left not separated from 1st by a cut or notch.
- 8(9) Posterior margin of 2nd marginal of right mandible clearly incurved*Eremotermes*
- 9(8) Posterior margin of 2nd marginal of right mandible weakly incurved*Synhamitermes*
- 10(7) Apical tooth of mandibles as long as or smaller than 1st marginal and the two not as widely separated. Second marginal of left separated from 1st by a cut or notch
- 11(12) Fontanelle plate large, round or irregular in shape. Apical tooth of mandibles as long as 1st marginal and angle between the two acute.....*Speculitermes*
- 12(11) Fontanelle small, point-like or somewhat larger and oval. Apical tooth of mandibles smaller than 1st marginal and angle between the two wider*Eurytermes/Euhamitermes*

SOLDIERS

- 1(2) Mandibles serrated (finely or coarsely) on inner margin*Microcerotermes*
- 2(1) Mandibles not serrated on inner margin, with a weak to prominent tooth on each mandible
- 3(4) Head with frontal protuberance. Mandibles long, thin, slender, slightly incurved apically.....*Eremotermes*
- 4(3) Head without frontal protuberance. Mandibles short, strong and strongly curved apically
- 5(6) Clypeus bilobed.....*Amitermes*
- 6(5) Clypeus not bilobed
- 7(8) Head almost rounded. Mandibles strongly curved, almost rounded from middle to apex.....*Globitermes*

- 8(7) Head subsquarish to subrectangular. Mandibles weakly to fairly curved apically
- 910) Head subsquarish, small. Mandibles weak, fairly strongly curved apically.....*Synhamitermes*
- 10(9) Head subrectangular. Mandibles strongly built and very weakly to fairly curved apically
- 11(12) Head large. prominent and highly chitinised, brownish. Mandibles strongly built and long; comparatively thinner basally and fairly well curved apically; each with a prominent, triangular tooth*Speculitermes*
- 13(14) Head small and weakly chitinised, pale yellow to pale brownish yellow. Mandibles strongly built, short and stout; comparatively thick at base and slightly bent inwards apically; each with a weak to prominent tooth
- 14(15) Mandibles very thick, stout and very broad and heavy at base*Euhamitermes*
- 15(14) Mandibles thick, stout and less so heavy at base.....*Eurytermes*

Genus 23. *Eurytermes* Wasmann

(Synonym : *Beesonitermes* Chatterjee and Thapa)

1. Genus *Eurytermes* Wasmann :

1902. Wasmann, *Zool. Jb.*, **17** : 124.

1955. Emerson, *Fieldiana : Zool.*, **37** : 468, 510.

1958. Ahmad, *Biologia*, Lahore, **4** (1 & 2) : 86, 90, 162-163.

1966. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **31** (3 & 4) : 81-88. See for synonymy, description, etc.

1966. Roonwal and Chhotani, *Biol. Zbl.*, **85**(2) : 203, 204, 207.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner), Vol. **2** : 141.

1970. Roonwal, In : *Biol. of Termites* (Eds Krishna and Weesner) Vol. **2** : 342-343.

1972. Sands, *Bull. Brit. Mus. (nat. Hist.) Ent.*, Suppl. **18** : 37. Places under Apicotermitinae.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 7, 8, 10.
 1981. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) 46(3) : 251.
 1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 23, 56.
 1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 90, 91, 104.
 1987. Chhotani, *Beitr. Ent.*, 37 : 407, 408, 416.
 1989. Roonwal and Chhotani, *Fauna of India-Isoptera (Termites)* Vol. 1 : 119.

2. Genus *Beesonitermes* Chatterjee and Thapa :

1963. Chatterjee and Thapa, *J. Timb. Dry. Preserv. Assoc. India*, 9 : 20, 21.
 1966. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 31 (3 & 4) : 82.
 1970. Roonwal, In : *Biol. of Termites* (Eds Krishna and Weesner) Vol. 2 : 342-343.
 1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 8.

3. Genus *Termes* Linn. (part) :

1904. Desneux, *Genera Insectorum, Isoptera*, Fasc. 25 : 28, 29.

Type of genus : *Eurytermes assmuthi* Wasmann (type by monotypy).

1. Characters of Genus *Eurytermes*

Imago : Head dark reddish brown to blackish brown; wings pale to dark brown. Head and body densely pilose. Head-capsule subcircular. Fontanelle dot-like (*assmuthi* and *boveni*) to large (only *ceylonicus*), situated medially. Eyes small, round. Ocelli oval, widely separated from eyes. Antennae with 14-15 (generally 15) segments; segment 3 shortest. Postclypeus swollen, about 1/2 its width in length, pilose; anteclypeus flat, apilose. Labrum broader than long. Mandibles each with an apical and two marginals. Left mandible with 1st marginal slightly shorter than apical, with a long posterior margin; 2nd short, separated by a deep cut from 1st; molar plate rounded. Right mandible with 1st marginal as in left; 2nd short with a weakly incurved and longer posterior margin; molar plate incurved. Pronotum narrower than head with eyes; substraight or faintly incurved at anterior and posterior margins. Meso- and metanota deeply notched medially at posterior margin. Wings hairy along margins;

microsculpturing (*boveni*) consists of papillae and non-asteroid (2-4 arms) micrasters; 1-2 rows of pointed, thorny, $6 \mu\text{m} \times 3 \mu\text{m}$ papillae present on anterior and somewhat smaller ones ($4-5 \mu\text{m} \times 1-2 \mu\text{m}$) on posterior, margins; micrasters of $4-8 \mu\text{m} \times 4-6 \mu\text{m}$ size with density of 9280/mm² present all over; costa and radius (radial sector of some authors) prominent and thick; subcosta short and indistinctly separated from costa in forewing, absent in hindwing; media independent in forewing, arising from radius in hindwing, thin with 2-4 branches; cubitus thin, with 8-11 branches to posterior margin. Apical tibial spurs 3 : 2 : 2; tarsi 4 jointed. Abdomen oblong; cerci 2 jointed; styli absent.

Soldier : Head pale yellow to yellow; body whitish. Head fairly and body densely hairy. Head-capsule subrectangular, thick, longer than broad. Fontanelle indistinct. Eyes and ocelli absent. Antennae with 14 segments. Labrum subtriangularly tongue-shaped. Mandibles thick, stout, broad at base; left with short and obtuse to a prominent and anteriorly directed tooth at about distal 1/4th and a small indentation basally; right with a short to prominent tooth at distal 1/3rd and with or without an indentation basally. Postmentum long, club-shaped. Pronotum strongly saddle-shaped; not notched at anterior and posterior margins. Legs fairly hairy and long; apical tibial spurs 3 : 2 : 2; tarsi 4-jointed. Abdomen elongate; cerci short, 2-jointed.

Worker : Head pale yellow; abdominal tergites and sternites transparent with greyish contents of abdomen showing through. Head fairly and body densely hairy. Head subcircular; broader than length to base of mandibles. Fontanelle plate round to oval, whitish spot. Antennae with 14 segments. Postclypeus swollen, about half as long as wide. Mandibles longer than broad; incurved at anterior margin; dentition as in imago; 2nd marginal of left sharper and of right strongly incurved at posterior margin and molar plate spatulate in left and more incurved in right. Pronotum and legs as in soldier; foreleg somewhat swollen and its dorsal spur either minute or sometimes absent.

2. *Distribution and Composition of Eurytermes*

(Fig. 1)

Eurytermes is endemic to Indian Region and is known from India and Sri Lanka. The following species and subspecies are known :—

1. *Eurytermes assmuthi assmuthi* Wasmann—India : Maharashtra, Orissa
2. *E. assmuthi modestior* Silvestri—India : Orissa
3. *E. boveni* Roonwal and Chhotani—India : Madhya Pradesh
4. *E. buddha* Bose and Maiti—India : Tamil Nadu, Karnataka, W. Bengal
5. *E. ceylonicus* Holmgren—Sri Lanka
6. *E. topslipensis* (Chatterjee & Thapa)—India : Tamil Nadu

3. Keys to Indian Species of *Eurytermes*

IMAGOES

- 1(2) Fontanelle large, oval, ocellus-like (max. diameter 0.15 mm); larger species (max. width of head with eyes 1.30 mm).....*ceylonicus*
- 2(1) Fontanelle small, round, dot-like (max. diameter 0.03-0.06 mm); smaller species (max. width of head with eyes 1.07-1.13 mm)
- 3(4) Ocelli larger (length 0.10-0.13, width 0.09-0.10 mm); postclypeus longer (index length/width 0.46-0.53) and with weakly convex anterior margin.....*boveni*
- 4(3) Ocelli smaller (length 0.09-0.10, width 0.07 mm); postclypeus shorter (index length/width 0.43) and with weakly concave anterior margin
- 5(6) Eyes smaller (maximum diameter 0.27 mm).....*assmuthi assmuthi*
- 6(5) Eyes larger.....*assmuthi modestior*

SOLDIERS

- 1(4) Left mandibular tooth short and obtuse-angled
- 2(3) Head smaller (length to upper base of mandibles 1.87; maximum width 1.05 mm); mandibles shorter and narrower (length of left mandible from upper base of lateral condyle to tip 0.73 mm; index width at base/length 0.52); tooth on left mandible shorter, that on right reduced and point-like.....*topslipensis*
- 3(2) Head larger (length to upper base of mandibles 2.0; maximum width 1.2 mm); mandibles longer and broader (length of left

mandible from upper base of lateral condyle to tip 0.87 mm; index width at base/length 0.57); tooth on left mandible somewhat larger, that on right prominent and large.....*boveni*

- 4(1) Left mandibular tooth large and acute-angled
- 5(6) Larger species (head 2.0 mm long, 1.3 mm wide; mandibles 0.83-0.87 mm long).....*assmuthi assmuthi*
- 6(5) Smaller species (head 1.7-2.0 mm long, 1.03-1.18 mm wide; mandibles 0.66-0.85 mm long)
- 7(8) Head diverging anteriorly; mandibles shorter in comparison to head-length, index left mandible-length/head-length 0.41-0.42; left mandibular tooth forwardly placed, index tooth-distance/mandible-length 0.27.....*buddha*
- 8(7) Head parallel sided; mandibles longer in comparison to head-length, index left mandible-length/head-length 0.47; left mandibular tooth backwardly placed, index tooth-distance/mandible-length 0.30.....*assmuthi modestior*

99. *Eurytermes assmuthi assmuthi* Wasmann

(Figs. 3-6)

1. *Eurytermes assmuthi* Wasmann :

1902. Wasmann, *Zool. Jb.*, **17** : 124-125; pl. 4 fig. 6. Im, S, W. Lectotype S. (selected Roonwal and Chhotani 1965) in Natural History Museum, Maastricht. Type-locality : Khandala near Bombay (Maharashtra, India). Type examined.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 102.

1962. Mathur and Thapa, *Indian For Leaf.*, No. 167 : 42.

2. *Eurytermes assmuthi assmuthi* Wasmann :

1966. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **31** (3 & 4) : 81, 84, 88-89, 105, 106, 110, 112. See for detailed synonymy.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner). Vol. 2 : 343.

IMAGO (Figs. 3, 5) : Head-capsule blackish brown; antennae, mandibles and legs brownish; postclypeus, pronotum and abdomen dark brown; wings brown. Head and body thickly hairy with a coat of fine

short hairs and several longer hairs. Wing scales densely hairy, forewing membrane sparsely hairy; hindwing membrane without hairs. Total body-length 6.8-7.1 mm. Head-capsule subcircular; broader than length to base

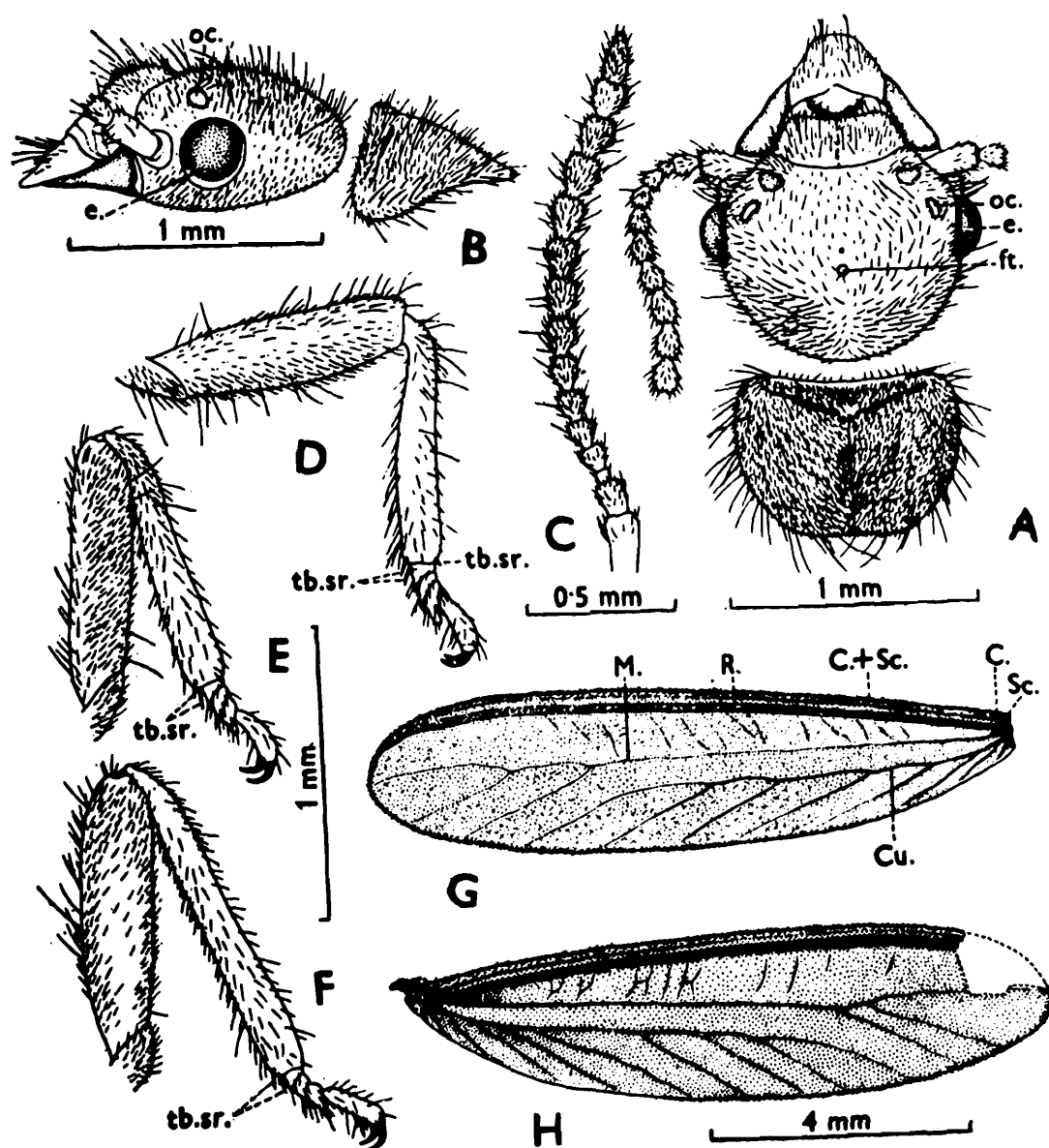


Fig. 3 : *Eurytermes assmuthi assmuthi*. Imago Drawings from specimens from Khandala, near Bombay (Maharashtra, India). Figs(A) and (B) from paralectotype imago Male; Figs. (C)-(F) from paralectotype imago Female; and (G) and (H) from paralectotype slide, sex unknown. (A) Head and pronotum, in dorsal view. (B) Same, in side view. (C) Right antenna. (D)-(F) Right fore, middle and hindlegs respectively, in dorsal view. (G)-(H) Left forewing and right hindwing, in dorsal view. (Ex Roonwal & Chhotani, 1966c).

of mandibles (length 0.80-0.83, width with eyes 1.10-1.13 mm); frons weakly depressed medially. Fontanelle small, round, whitish, spot-like (diameter 0.05 mm); situated a little behind middle on head-dorsum. Eyes small, round, 0.27 mm in diameter. Ocelli oval, translucent; separated from eyes by their width; 0.09-0.10 mm long and 0.07 mm wide. Antennae with 15 segments, segment 3 shortest. Postclypeus swollen, fairly densely pilose; divided into right and left halves by a thin line; length a little less

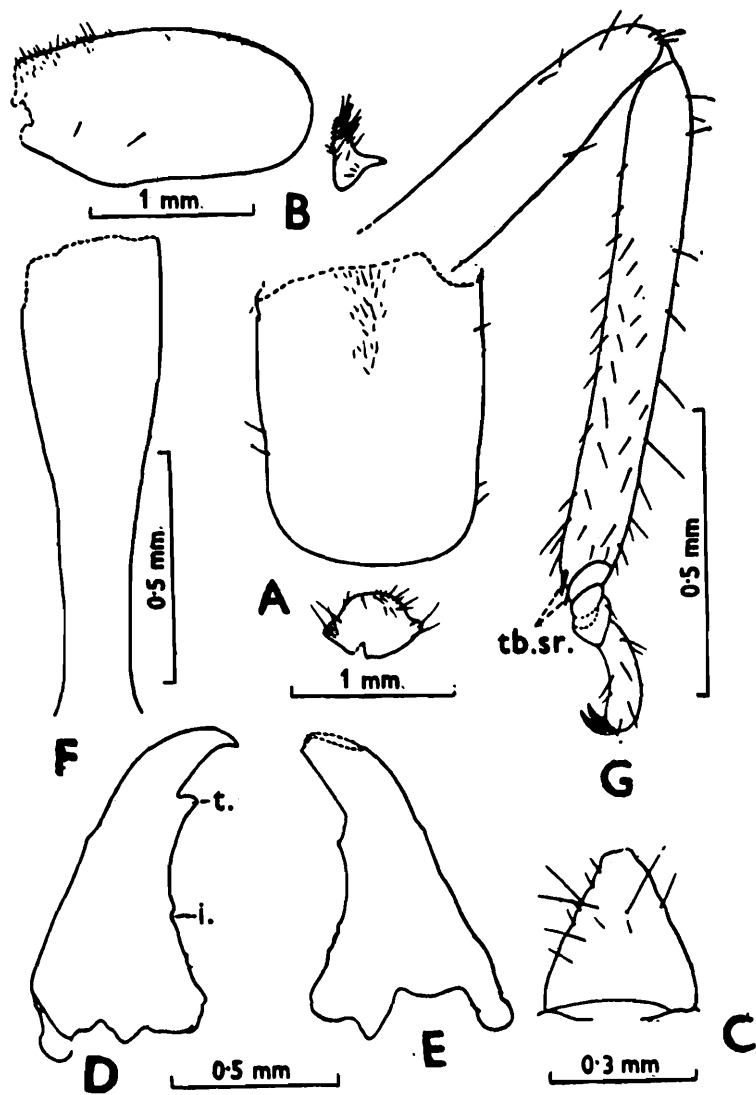


Fig. 4 : *Eurytermes assmuthi assmuthi*. Soldier. Drawings from the lectotype soldier, Khandala, India. Figs. (A), (B), (F) and (G) from specimen on card, and Figs. (C) - (E) from slide. (A) Head (Without anterior portion) and pronotum, in dorsal view. (B) Ditto, in side view. (C) labrum, in dorsal view as mounted on slide. (D), (E) Left and right mandibles respectively. (F) postmentum, distal margin damaged. (G) Right hindleg, in dorsal view. (Ex Roonwal & Chhotani, 1966 c).

than half of maximum width (length 0.23, width 0.53 mm); anterior margin faintly incurved; posterior margin rounded. Anteclypeus flat, translucent, with a V-shaped, chitinoid band on body; anteriorly somewhat projected in front. Labrum broad, tongue-shaped; with several short and long hairs (length 0.30-0.33, width 0.37-0.40 mm). Mandibles as in genus. Pronotum slightly narrower than head with eyes, length more than half of width (length 0.57-0.66, width 0.87-0.93 mm); anterior margin faintly incurved, not notched; posterior margin substraight, with a slight median incurving. Legs densely pilose; apical tibial spurs 3 : 2 : 2; tarsi 4-jointed. Wings and venation as in genus; media with 3 main branches in both wings, cubitus with 8-11 branches in forewing and 8-9 in hindwing; forewing without scale 9.5-10.0 and hindwing without scale 8.85-9.50 mm long and scales respectively 0.87-0.93 and 0.60-0.70 mm long. Abdomen elongately oblong; cerci 0.10 mm long; styli absent.

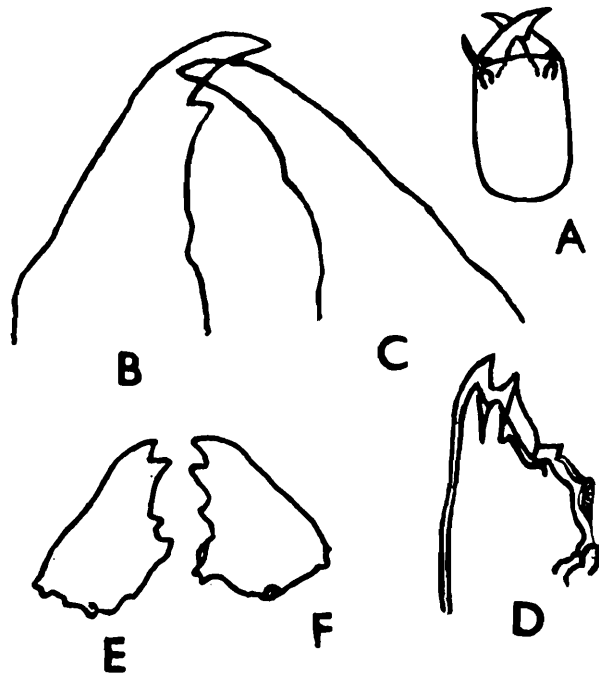


Fig. 5 : *Eurytermes assmuthi assmuthi*. Figures reproduced from literature and are from the type material. (A) Head of soldier, in dorsal view. (After Wasmann, 1902, pl. 4 fig 6). (B)-(C) Left and right mandibles respectively of soldier, in dorsal view. (After N. Holmgren, 1912a, p.83, fig. 52). (D) Left mandible of imago, (After N. Holmgren, 1912, p.82, fig. 51). (E)-(F) Left and right mandibles respectively of worker, in dorsal view. (After Ahmad, 1950, p. 64).

SOLDIER (Figs. 4, 5) : Head yellow; body and legs creamy white; mandibles dark brown, yellowish brown basally. Head-capsule with a few hairs; body densely hairy. Head subrectangular, weakly widening in front, sides subparallel; longer than broad (length without mandibles 2.0, max. width 1.30 mm. Fontanelle indistinct. Eyes and ocelli absent. Antennae with 14 segments; segment 3 shorter than 2. Labrum subtriangular, tip broadly pointed; length 0.30 and width 0.31 mm. Mandibles thick, stout; weakly incurved near tip; length 0.83-0.87 mm. Left mandible with a large, sharp, acute-angled tooth at about distal fourth and a weak indentation near base; left mandibular tooth index 0.23. Right mandible with a small tooth at distal third; tooth index 0.30. Postmentum long, club-shaped; waist lying below middle; max. width 0.33, at waist 0.20 mm. Pronotum strongly saddle-shaped; length 0.33, width 0.57 mm. Abdomen oblong; cerci 0.05 mm long, 2 jointed; styli absent.

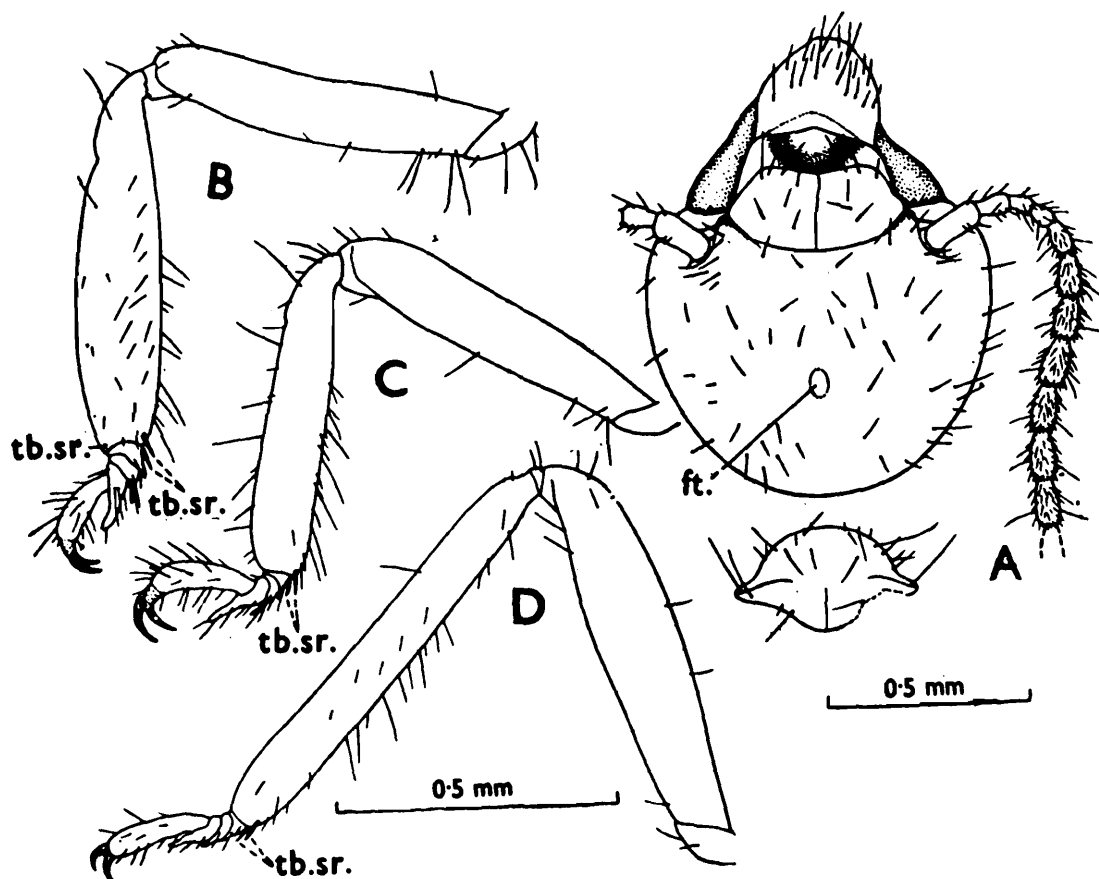


Fig. 6 : *Eurytermes assmuthi assmuthi*. Worker. Drawings from a paralectotype, Khandala, India, coll, J. Assmuth (n.2). (A) Head and pronotum, in dorsal view. (B)-(D) Left fore, middle-and hindlegs respectively in dorsal view. (Ex Roonwal and Chhotani, 1966c).

WORKER (Figs. 5, 6) : Head-capsule yellowish; antennae, legs and thorax creamy white; abdomen appearing greyish due to intestinal contents, tergites and sternites transparent. Head and body fairly densely hairy. Total body-length 3.0-3.5 mm. Head-capsule subcircular, broader than long (length to base of mandibles 0.70-0.73, max. width 0.87-0.90 mm). Fontanelle small (0.03 mm diameter), white, translucent, spot-like on head-dorsum. Eyes and ocelli absent. Antennae with 14 segments; segment 3 and 4 subequal, slightly shorter than 2. Postclypeus half as long as wide, swollen, with a few hairs (length 0.20-0.25, width 0.40-0.43 mm). Labrum broad, tongue-shaped (length 0.30, width 0.33 mm); fairly hairy. Mandibles as in genus. Pronotum as in soldier (length 0.23-0.25, width 0.50 mm). Legs as in genus. Abdomen oblong; densely pilose; cerci 2 jointed, 0.06 mm long; styli absent.

Distribution : INDIA : Maharashtra, Tamil Nadu, Karnataka, Orissa.

100. *Eurytermes assmuthi modestior* Silvestri

(Fig. 7)

1. *Eurytermes assmuthi* var. *modestior* Silvestri :

1923. Silvestri, *Rec. Indian Mus.*, **25** : 228-229. Q, S, W. Syntypes : Probably in Silvestri Coll., Ent. Inst., Agricultural University, Portici, Italy. A syntype W in FRI. Dehra Dun. Type-locality : Barkuda Island Chilka Lake, Orissa, India.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 102.

1962. Mathur and Thapa, *Indian For. Leaflet*, No. 167 : 42.

2. *Eurytermes assmuthi modestior* Silvestri :

1966. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **31** (3 & 4) : 84, 98-99. See for detailed synonymy.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner). Vol. 2 : 343.

The original description of Silvestri (1923) is reproduced here as the specimens of this subspecies were not available.

“Queen.-Length of body 6 mm, of head 0.96; width of the same between the eyes 0.90; length of antennae 1.72; of tibia III, 1.18”

“Antennae composed of 15 joints of which the second is double the length of the third which is subequal to the fourth”

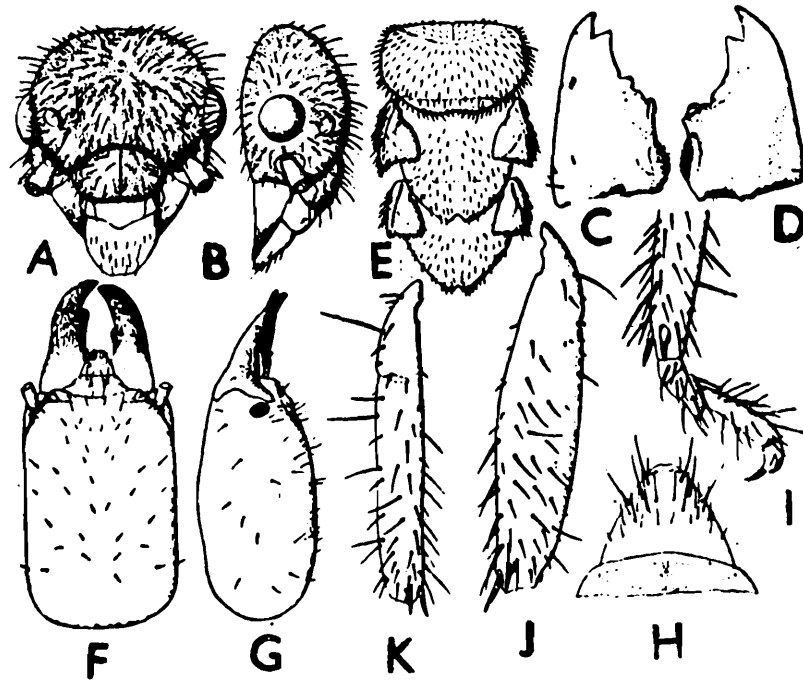


Fig. 7 : *Eurytermes assmuthi modestior*. Imago, soldier and worker. (After Silvestri, 1923, p.228, fig. V). (A) Head of imago, in dorsal view. (B) Same, in side view. (C)-(D) Mandibles of imago. (E) Thorax of imago, in dorsal view. (F) Head of soldier, in dorsal view. (G) Same, in side view. (H) Labrum of soldier. (I) Distal portion of third (hind) leg of soldier. (J) Fore-tibia of worker. (K) Middle-tibia of worker.

“Soldier.-Head 1.70 mm long, 1.08 wide, mandible 0.78 long”

“Antennae 14 jointed, second joint ca. 1/3 longer than third which is a little longer than fourth”

“Worker.-Head 0.84 mm wide.”

Distribution : INDIA : Barkuda Island, Chilka Lake, Orissa (type-locality); known only from type-locality.

101. *Eurytermes boveni* Roonwal and Chhotani

(Figs. 8-10)

Eurytermes boveni Roonwal and Chhotani :

1966. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India* (B) **31** (3 & 4) : 84, 97, 99-105. Im , S, W. Holotype : S, in ZSI. Type-locality : Kanha National Park, Mandla Dist., Madhya Pradesh, India.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 30.

1981. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) 46 (3) : 251.

IMAGO (Fig. 8) : Head-capsule blackish brown; postclypeus and pronotum dark brown; abdomen dark brown above, pale brown below;

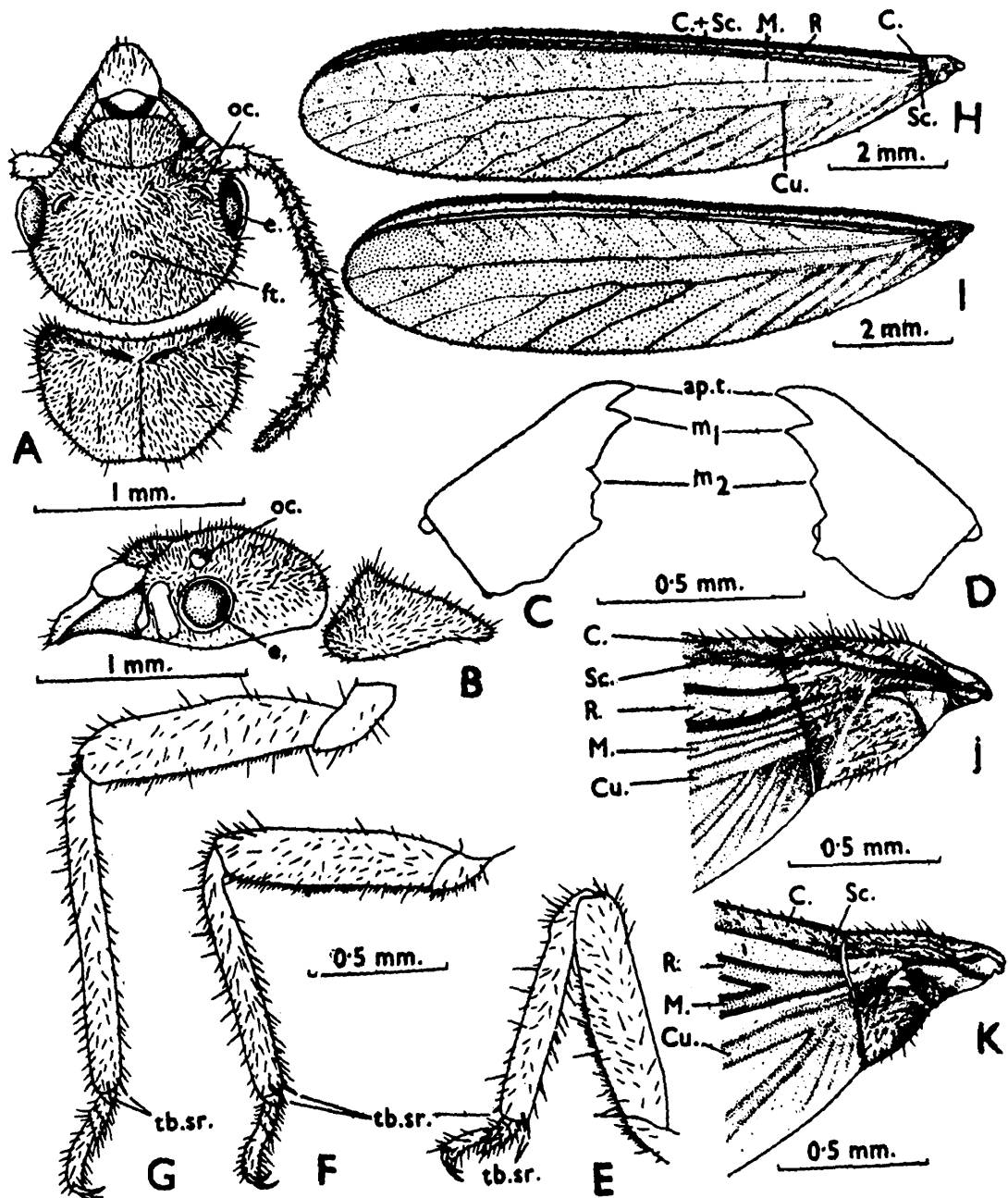


Fig. 8 : *Eurytermes boveni*. Imago. Drawings from paramorphotype. (A) Head and pronotum, in dorsal view. (B) Ditto, in side view. (C)-(D) Left and right mandibles respectively, in dorsal view. (E)-(G) Left fore, middle-and hind-legs respectively, in dorsal view. (H)-(I) Left fore-and hindwings respectively, in dorsal view. (J)-(K) Proximal portions of left fore-and hindwings, enlarged. (Ex-Roonwal and Chhotani, 1966c).

antennae and legs brown; wings brownish. Head and body with a thick coat of fine hairs and a few longer ones. Total body-length with wings 11.2-12.8 and without wings 6.5-8.00 mm. Head-capsule subcircular; with eyes broader than long (length to base of mandibles 0.77-0.93, width with eyes 1.07-1.13 mm). Fontanelle small, round, whitish, dot-like; at mid-dorsum of head (diameter 0.03-0.06 mm). Eyes round, 0.27-0.30 mm in diameter. Ocelli oval, translucent, max. diameter 0.10-0.13, min. diameter 0.09-0.10 mm, separated from eyes by about half of max. diameter to a little more but less than short diameter. Antennae with 15 segments, segment 3 shortest and narrowest. Postclypeus swollen, pilose; anterior margin substraight or slightly convex; length about 1/2 of width (length 0.23-0.25, width 0.47-0.50 mm). Anteclypeus apilose, flat; anterior margin somewhat projected medially. Labrum broad, tongue-shaped, hairy anteriorly and on body (length 0.30-0.33, width 0.37-0.41 mm). Mandibles as in genus. Pronotum slightly narrower than head; anterior margin incurved a little; posterior margin also slightly incurved; length 0.6-0.7, width 0.90-0.97 mm. Meso- and metanota deeply notched at posterior margin. Legs as in genus. Wings brown, hairy along margins; membrane of forewing moderately hairy, of hindwing without any hairs; forewing without scale 9.1-10.1 and hindwing 8.4-9.5 mm long; microsculpturing consists of 1-2 rows of pointed, thorny papillae on anterior margin (size $6 \mu\text{m} \times 3 \mu\text{m}$) and a row of smaller ones ($4\text{-}5 \mu\text{m} \times 1\text{-}2 \mu\text{m}$) on posterior margin and numerous nonasteroid (2-4 arms) micraster all over (size $4\text{-}8 \mu\text{m} \times 4\text{-}6 \mu\text{m}$, density 9280/mm²); venation as in genus, media and cubitus with 2-4 and 10-13 branches, respectively in forewing and with 2-3 and 9-12 branches, respectively in hindwing. Abdomen oblong densely pilose; cerci 0.07-0.10 mm long, 2 jointed; styli absent.

SOLDIER (Fig. 9) : Head-capsule pale yellow; antennae, labrum, legs and body whitish; mandibles dark brown, paler basally. Head-capsule fairly and body densely hairy. Total body-length c 5.9 mm. Head-capsule subrectangular, flat, longer than wide (length to base of mandibles 2.0, max. width 1.2 mm); sides substraight, faintly converging behind into rounded posterior margin. Fontanelle indistinct and eyes and ocelli absent. Antennae with 14 segments, segment 4 shortest. Postclypeus flat, pilose, 0.15 mm long and 0.57 mm wide; anteclypeus narrow, strip-like, apilose. Labrum subtriangular (length 0.20, width 0.27 mm). Mandibles thick, stout, basally broad, 0.83-0.87 mm long; left with a tooth at distal one-

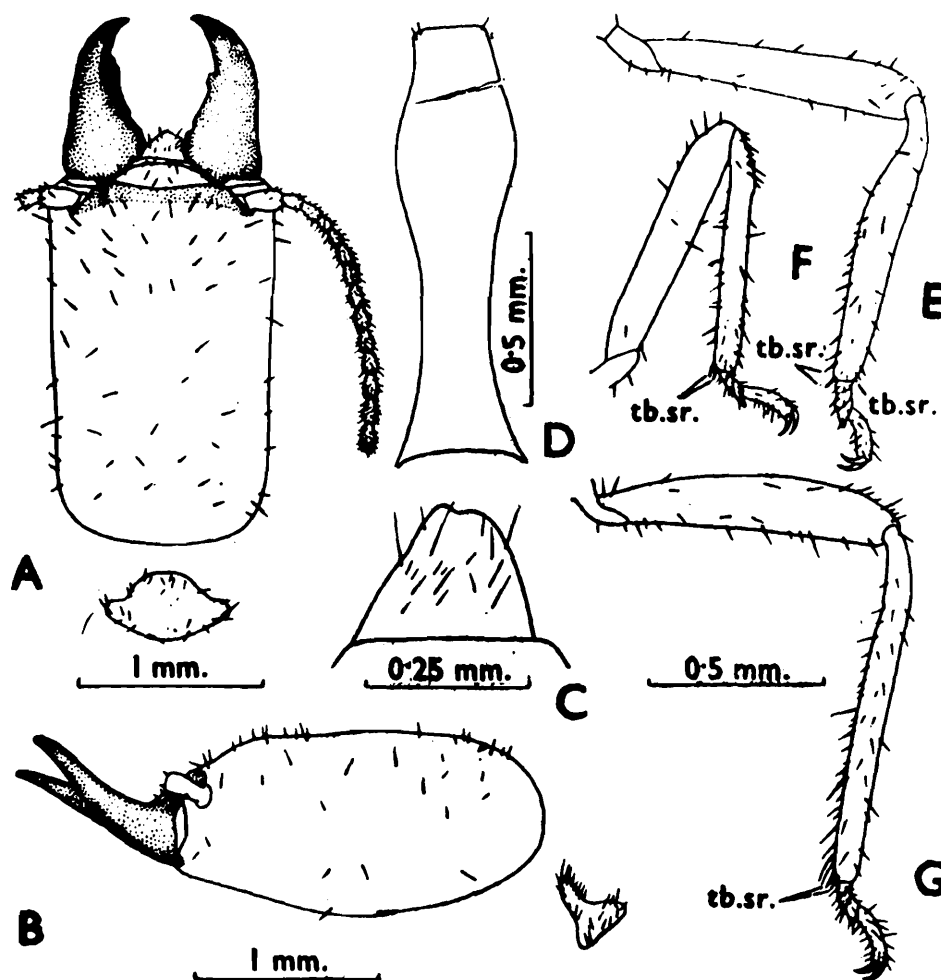


Fig. 9 : *Eurytermes boveni*. Soldier. Drawings from holotype. (A) Head and pronotum, in dorsal view. (B) Ditto, in side view. (C) Labrum, in dorsal view. (D) Postmentum, in ventral view. (E)-(G) Right fore, middle-and hindlegs, in dorsal view. (Ex Roonwal and Chhotani, 1966c).

fourth, right with a prominent tooth a little below distal one-third from tip. Postmentum long, club-shaped; widest at distal one-third and narrowest a little below middle; waist long; length 1.23, max. width 0.33, min. width at waist 0.20 mm. Pronotum strongly saddle-shaped; length 0.33, max. width 0.70 mm; both anterior and posterior margins without indentation. Legs and abdomen as in genus; cerci 0.08 mm long.

WORKER (Fig. 10) : Head-capsule, postclypeus and antennae pale yellow; thorax and legs creamish white; abdominal tergites transparent, abdomen appears greyish due to intestinal contents. Head fairly and body densely hairy. Total body-length c 4.1-4.5 mm. Head-capsule subcircular,

broader than long (length to base of mandibles 0.70-0.77, max. width 0.87-0.90 mm). Fontanelle translucent, round; at middle of head-dorsum (diameter 0.10-0.13 mm). Antennae with 14 segments, segment 3 shorter than 2, 4 shortest. Clypeus, labrum and mandibles as in genus; postclypeus length 0.23-0.27, width 0.40-0.43 mm; labrum length 0.27-0.33, width 0.37-0.40 mm). Pronotum as in soldier (length 0.23-0.27, max. width 0.50-0.53 mm). Legs as in soldier, forelegs swollen. Abdomen oblong, tapering behind; cerci 0.07 mm long.

Distribution : INDIA : Madhya Pradesh (Kanha National Park; type locality), known only from type-locality.

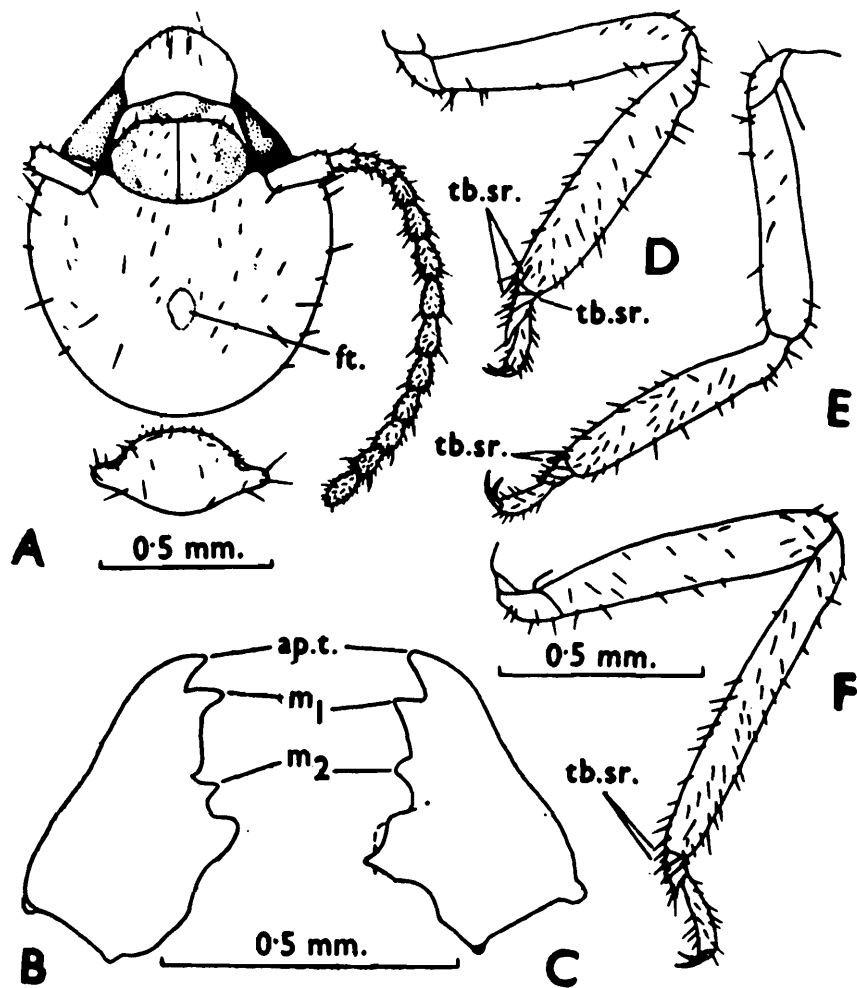


Fig. 10 : *Eurytermes boveni*. Worker, Drawings from paramorphotype. (A) Head and pronotum, dorsal view. (B), (C) Left and right mandibles respectively, dorsal view. (D)-(F) Left Fore, middle-and hindlegs, in dorsal view. (Ex Roonwal and Chhotani, 1966c).

102. **Eurytermes buddha** Bose and Maiti

(Figs. 11, 12)

Eurytermes buddha Bose and Maiti :

1966. Bose and Maiti, *Proc. zool. Soc.*, Calcutta, **19** : 115-120. S and W.
Holotype : S, in ZSI. Type-locality : Coimbatore (Tamil Nadu).
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 30 (Misspelt as
budha)
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 23, 56-58, map. 1.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 91, 104-105, 106.

IMAGO : Unknown.

SOLDIER (Fig. 11) : Head-capsule pale yellow to brown; thorax, legs and abdomen whitish to pale brown; mandibles basally yellowish, distally dark brown. Head sparsely and body somewhat densely pilose. Total length 5.0-6.1 mm. Head-capsule subrectangular, longer than broad, length to base of mandibles 1.70-2.00, width 1.03-1.18 mm; with substraight sides narrowing posteriorly to weakly convex posterior margin. Fontanelle indistinct. Eyes and Ocelli absent. Antennae pilose, with 14 segments; segment 2 smaller than 1, longer than 3; 4 shortest. Clypeus divided into an ante- and a postclypeus; anteclypeus apilose, whitish, narrow, strip-like; postclypeus pilose, broader than long, distinctly demarcated from frons. Labrum subtriangular (length 0.18-0.20, width 0.26-0.30 mm); with a few long and short hairs. Mandibles thick, stout, short (0.66-0.85 mm); basally broad, distally narrowed, apices pointed and weakly incurved. Left mandible with a prominent tooth at about 1/3rd its length from tip (distance of tooth from tip 0.19-0.23 mm, tooth index i.e. tooth distance from tip/mandible-length 0.27); with a small basal indentation. Right also with one prominent tooth a little below 1/3rd of mandible-length from tip) tooth distance from tip 0.21-0.30 mm, tooth index 0.35-0.37); with a smaller basal indentation. Postmentum long, club-shaped (length 1.12-1.26, width 0.32-0.35, width at waist 0.20-0.25 mm); broadest at distal one-third; waist fairly long; anterior margin substraight, posterior concave. Pronotum strongly saddle-shaped, small (length 0.40-0.45, width 0.63-0.72 mm); anterior margin strongly convex. Mesonotum very much narrower and metanotum slightly narrower than pronotum. Legs pilose;

middle legs shortest, fore-and hindlegs long; tibial spurs 3 : 2 : 2; tarsi 4-jointed. Abdomen oblong pilose; cerci 2 jointed, 0.04 mm. Styli absent.

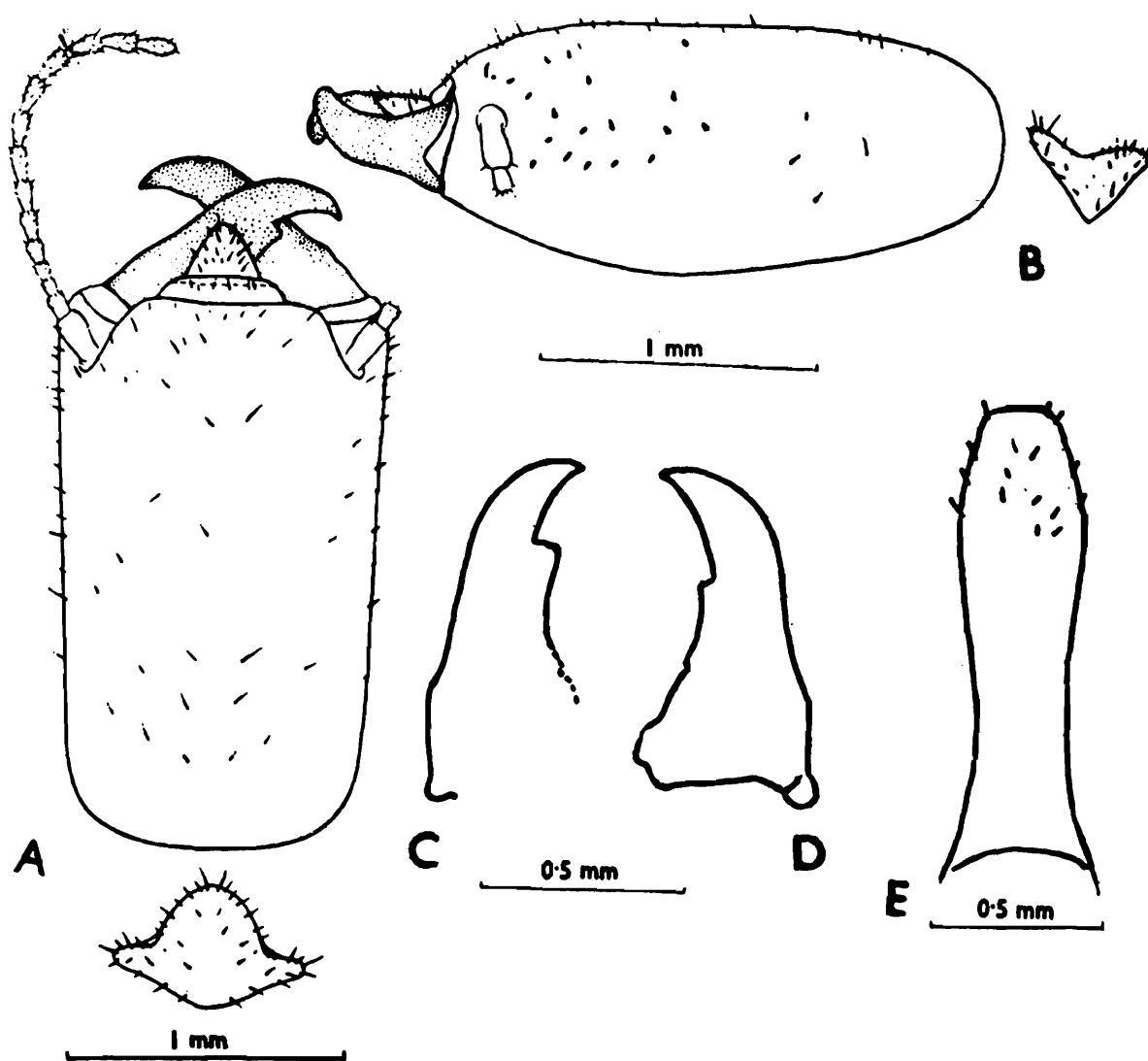


Fig. 11 : *Eurytermes buddha*. Soldier, holotype. (A) Head and pronotum, dorsal view. (B) Same, side view. (C), (D) Left and right mandibles respectively, in dorsal view. (E) Postmentum, in ventral view. (After Bose and Maiti 1966).

WORKER (Fig. 12) : Head-capsule yellowish to brownish yellow; mandibles paler with dark brown teeth; thorax and legs yellowish to brownish white; abdomen transparent, appears blackish due to contents showing through. Head and body pilose. Total length 3.0-3.5 mm. Head subcircular, flat, slightly broader than long (length to base of mandibles 0.70-0.75, max. width 0.82-0.87 mm). Fontanelle whitish, translucent,

elongate, on mid-dorsum. Eyes and ocelli absent. Antennae pilose, with 14 segments, 4 shortest. Clypeus divided into an ante and a postclypeus; anteclypeus apilose, whitish, medially projecting; postclypeus pilose, broader than long (width 0.32-0.36, length 0.20-0.25 mm). Labrum broader than long (length 0.20-0.25, width 0.33-0.37 mm); with hairs on anterior margin. Mandibles of *Eurytermes*-type. Pronotum strongly saddle-shaped, small (length 0.21-0.25, width 0.45-0.50 mm).

Distribution : INDIA : Tamil Nadu (Coimbatore); Karnataka (Dharwar) and West Bengal (Midnapur).

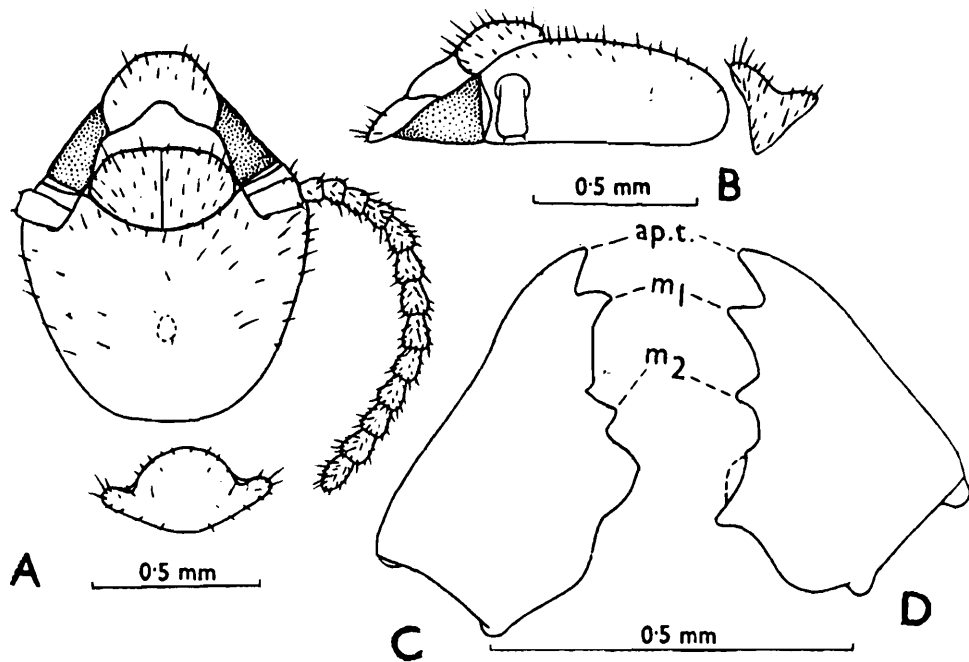


Fig. 12 : *Eurytermes buddha* .Worker, paramorphotype. (A) Head and pronotum, in dorsal view. (B) Same, in side view. (C)-(D) Left and right mandibles respectively, in dorsal view. (After Bose and Maiti, 1966).

103. *Eurytermes ceylonicus* Holmgren

(Syn. *Eutermes ceyloniellus* Kemner)

(Figs. 13, 14)

1. *Eurytermes ceylonicus* Holmgren :

1913. Holmgren, K. *Svenska Vetensk.-Akad. Handl.*, **50** : 222-223. Im, W. Type not traceable in Holmgren Coll. in Swedish Museum of Nat. History, Stockholm. Syntypes (one imago damaged and one worker)

in FRI, Dehra Dun (India). Type-locality : Sri Lanka, No specific locality on labels on syntypes in FRI.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 102.

1966. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **31** (3 & 4) : 83, 84, 87, 88, 97-98, 99, 106-110. See for detailed synonymy.

2. *Eutermes ceyloniellus* Kemner (syn. vide Snyder 1949) :

1926. Kemner, *Bull. ent. Res.*, **16** : 389.

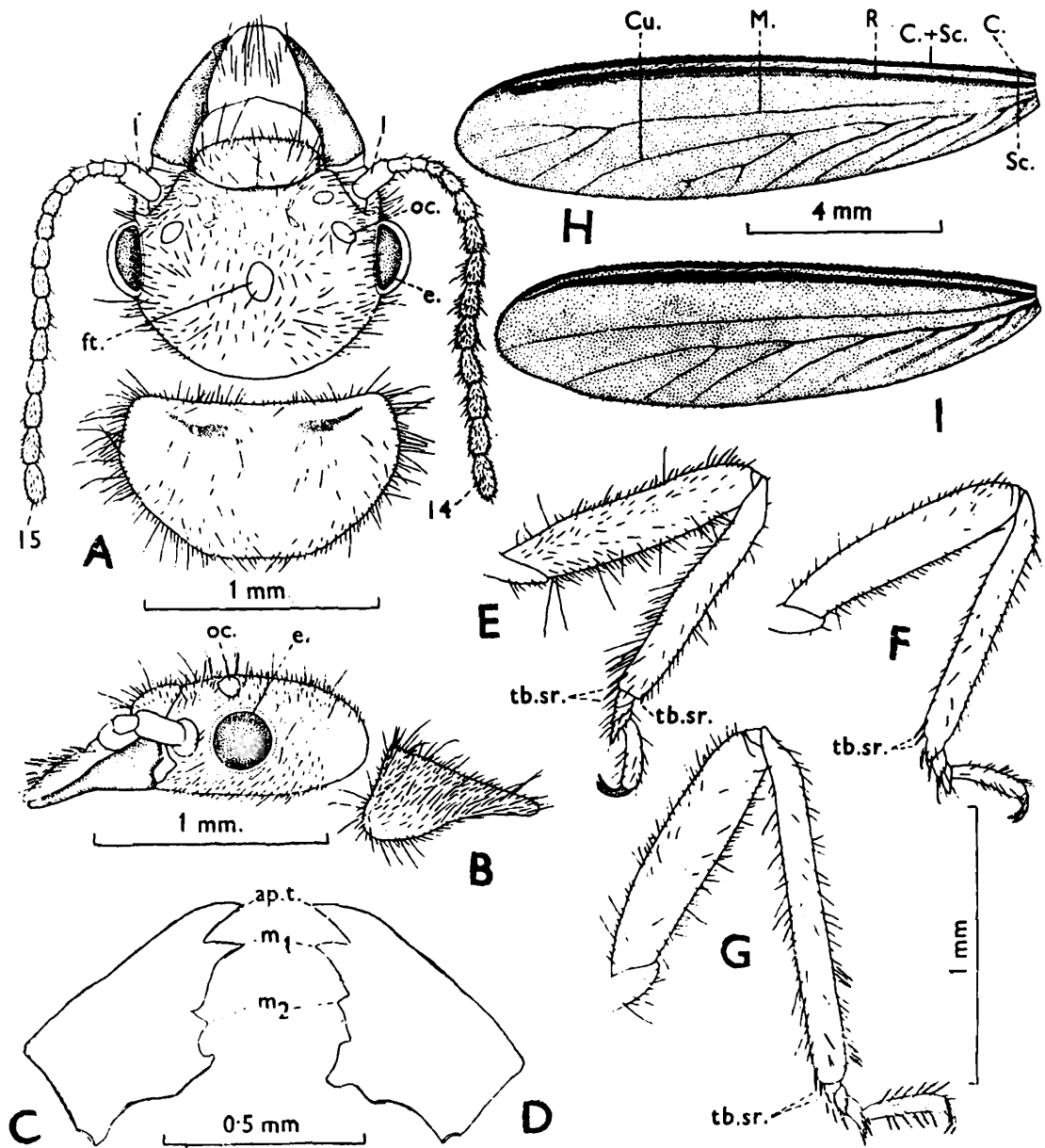


Fig. 13 : *Eurytermes ceylonicus*. Imago. Drawings from syntype, Ceylon. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C) Left mandible, dorsal view. (D) ditto, right mandible. (E)-(G) Right fore, middle-and hindlegs respectively, in dorsal view. (H), (I) Left fore-and hindwings, in dorsal view. (After Roonwal & Chhotani, 1966c)

IMAGO : (Fig. 13) : Head-capsule dark reddish brown; postclypeus, legs and pronotum yellowish brown; antennae and labrum pale yellowish brown; abdominal tergites reddish brown, paler than head; sternites yellowish brown, paler medially. Head and body with a thick coat of short hairs and several longer hairs. Head-capsule subcircular (length to base of mandibles 0.93, width with eyes 1.30 mm). Fontanelle large, oval, ocellus-like (max. diameter 0.15, min. diameter 0.10 mm); situated at middle of head-dorsum. Eyes rounded, max. diameter 0.30 mm. Ocelli broadly oval, translucent (max. diameter 0.13, min. diameter 0.11 mm); from eyes situated at a distance (0.09 mm) of little less than short diameter. Antennae with 14-15 segments, 3rd segment shortest. Postclypeus swollen, pilose; length (0.27 mm) less than half of width

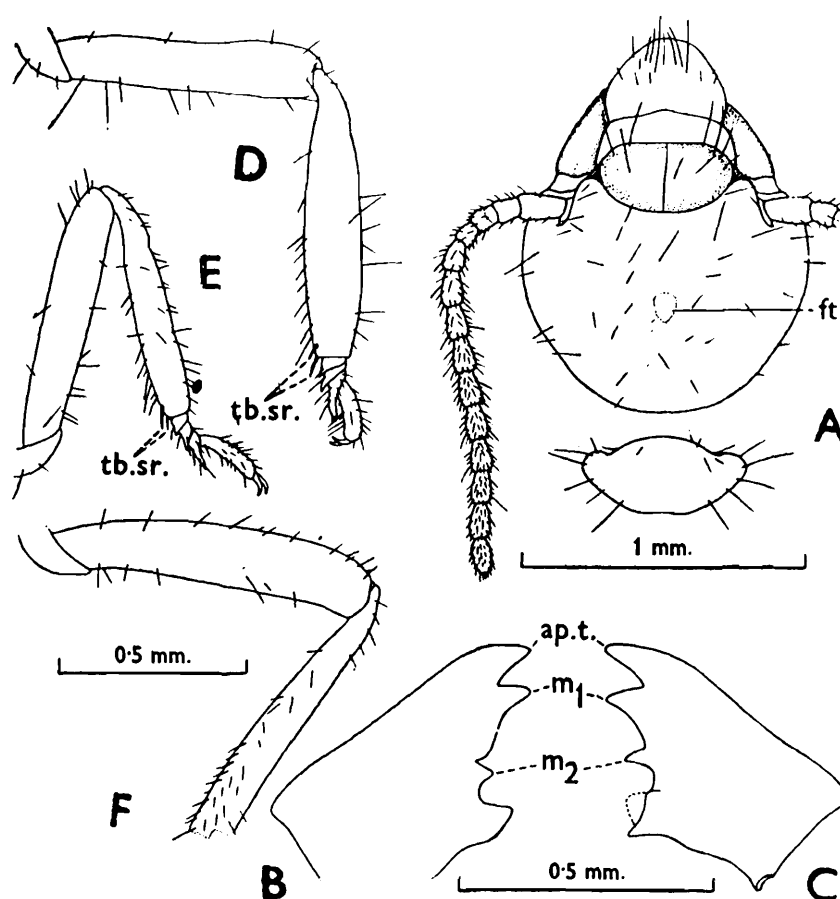


Fig. 14 : *Eurytermes ceylonicus*. Worker. Drawings from syntype, Ceylon. (A) Head and pronotum, dorsal view. (B) Left mandible, dorsal view. (C) Ditto, right mandible. (D)-(F) Fore, middle-and hindlegs, respectively, dorsal view. Hindleg damaged distally. (After Roonwal & Chhotani, 1966c).

(0.60 mm). Anteclypeus apilose, flat, medially projected in front. Labrum tongue-shaped, truncate apically (length 0.40, width 0.47 mm). Mandibles as in genus. Pronotum slightly narrower than head with eyes (length 0.67, max. width 1.17 mm); anterior margin weakly incurved, without notch; posterior margin substraight, without notch. Legs as in genus. Wings pale brown; venation as in genus; in forewing media with 3 main branches and cubitus with 8; in hindwing media either unbranched or bifurcating in distal fourth and cubitus with 9 main branches. Forewing 11.3 and hindwing 10.0 mm without scale.

SOLDIER : Unknown.

WORKER (Fig. 14) : Head-capsule and postclypeus pale yellowish brown; antennae, labrum, legs and body paler than head; abdominal tergites and sternites transparent. Head and body fairly densely hairy. Head-capsule subcircular (length to base of mandibles 0.83, max. width 1.0 mm). Fontanelle round (diameter 0.09 mm). Antennae with 14 segments; segment 3 subequal to 2 and subdivided. Postclypeus 0.23 mm long and 0.47 mm wide; with a few long hairs. Labrum broad, tongue-shaped; 0.37 mm long and 0.43 mm wide. Mandibles as in genus. Pronotum as in soldier; length 0.30, width 0.57 mm. Legs as in genus.

Distribution : Sri Lanka.

104. **Eurytermes topslipensis** (Chatterjee and Thapa)

(Fig. 15)

1. *Beesonitermes topslipensis* Chatterjee and Thapa :

1963. Chatterjee and Thapa, *J. Timber Dry. Preserv. Assoc. India*, **9** : 21-26. S and W. Holotype : S, in FRI. Type-locality : Mount Stuart, Topslip (Coimbatore Dist., Tamil Nadu, India).

2. *Eurytermes topslipensis* (Chatterjee and Thapa) :

1966. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **31** (3 & 4) : 81, 84, 85, 87, 97, 105, 110-112.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 30.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 91, 104, 105, 106.

IMAGO : Unknown.

SOLDIER (Fig. 15) : Head-capsule pale yellow; antennae, labrum, legs and body whitish. Head sparsely and body fairly densely hairy. Total body-length 4.2 mm. Head-capsule subrectangular (length to base of mandibles 1.87, width 1.05 mm). Fontanelle indistinct; eyes and ocelli absent. Labrum subtriangular with distal tip faintly notched or incurved. Postclypeus flat with a few hairs; anteclypeus short, strip-like, apilose. Mandibles short, stout, broad basally (length 0.73 mm). Left mandible with a small, obtuse-angled tooth at anterior one-fourth (index tooth-distance from tip/mandible-length 0.27). Right mandible with a small, pointed tooth at anterior third (index tooth-distance from tip/mandible-length 0.34). Postmentum long, club-shaped (length 1.12, max. width 0.30, width at waist 0.18 mm); waist lying below middle. Pronotum, legs and abdomen as in genus; pronotum length 0.30, width 0.60 mm.

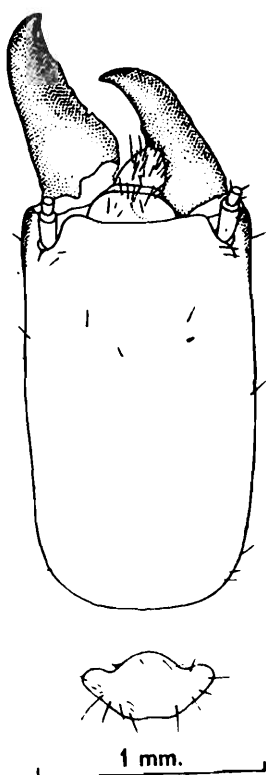


Fig. 15 : *Eurytermes topslipensis*. Head and pronotum of Soldier. Drawings from holotype. (Ex Roonwal and Chhotani, 1966c).

WORKER : Head-capsule, postclypeus and antennae pale yellow; abdomen appears greyish due to intestinal contents, sternites and tergites however; transparent. Head fairly and body densely hairy. Total body-

length 3.0-3.20 mm. Head subcircular, length to base of mandibles 0.67-0.70, max. width 0.83 mm. Fontanelle round, small, 0.07 mm in diameter. Eyes and ocelli absent. Antennae with 14 segments. Postclypeus as in genus, 0.20 mm long and 0.40-0.41 mm wide. Labrum broad, tongue-shaped (length 0.23-0.25, width 0.30-0.32 mm). Mandibles as in genus. Pronotum, legs and abdomen as in genus; length of pronotum 0.17, width 0.40-0.43 mm.

Distribution : INDIA : Tamil Nadu (Mount Stuart, Dist. Coimbatore, type-locality), known only from type-locality.

Genus 24. *Speculitermes* Wasmann

1. Genus *Speculitermes* Wasmann :

1902. Wasmann, *Zool. Jb. Syst.*, **17** (1) : 161.
1949. Snyder, *Smiths. misc. Colls.*, **112** : 110. Synonymy.
1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** (Art. 2) : 64, 65.
1955. Emerson, *Fieldiana : Zool.*, **37** : 480, 493, 500, 510.
1960. Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (ICAR Ent. Monogr. 1) : 15.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 8.
1966. Roonwal and Chhotani, *Biol. Zbl.*, **85** (2) : 183-189, 202-209.
1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 141.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 343-345.
1972. Sands, *Bull. Brit. Mus (Nat. Hist.) Ent.*, Suppl. 18 : 32, 33, 37. Places under Apicotermitinae.
1972. Chaudhry, et al., *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 42.
1973. Chhotani and Bose, *Zool. Anz.*, **190** : 233, 234.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Project No. A7-FS-58) : 12.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 39, 42.
1977. Mathews, *Studies Termites Mato Grasso State, Brazil* : 100.
1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 4.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 17.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 101, 102, 106-107.

1987. Chhotani, *Beitr. Ent.*, **37** : 408. 416.
 1989. Roonwal and Chhotani, *Fauna of India-Isoptera (Termites)* Vol. 1 :
 10, 17, 23, 91, 101, 102, 104, 109, 120.

2. Subgenus *Eutermes* (of *Termes*) Heer (Part) :

1904. Desneux, *Genera Insect.*, Fasc. **25** : 41.

3. Subgenus *Speculitermes* (of *Anoplotermes*) Wasmann :

1912. Holmgren, *K. Svenska Ventensk.-Akad. Handl.*, **48** : 74.

4. Genus *Anoplotermes* Müller :

1953. Rattan Lal and Menon, *Catalogue Indian Insects, Part-27-Isoptera*
 : 51. Treat *Speculitermes* as a synonym of *Anoplotermes*:

Type of genus : *Speculitermes cyclops* Wasm.

1. *Characters of Genus Speculitermes*

Imago : Medium sized dark brown to blackish species. Head and body with a coat of short, minute hairs and several longish bristles. Head subcircular; Y-suture indistinct or faintly marked. Mid-dorsal spot (fontanelle plate) minute to large. Eyes large, projecting out. Ocelli broadly oval, separated from eyes. Antennae generally 15 segmented (15-16 in *sinhalensis*); segment 3 generally shortest, sometimes subequal to 4. Postclypeus strongly swollen, length about half its width. Mandibles each with an apical and two marginal teeth; apical finger-like. Left mandible : 1st marginal subequal to apical and with a long, sinuate posterior margin; 2nd marginal short, triangular, separated from 1st by a deep cut; molar projection short, not reaching upto 1st marginal. Right mandible : 1st marginal subequal to apical or slightly shorter and with a little longer posterior margin; 2nd marginal short, with a long, slightly incurved posterior margin, molar plate subequal to posterior margin of 2nd marginal. Pronotum subcircular to subrectangular in shape, both anterior and posterior margins weakly to appreciably emarginate medially. Legs thin; apical tibial spurs 3 : 2 : 2*; tarsi 4-jointed. Wings pale brown to

* Roonwal and Sen-Sarma, 1960 give "each tibia with 2 apical spurs" In all other species available the apical tibial spurs are 3 : 2 : 2. I have examined the lectomorphotype imago of *cyclops* and it appears that Roonwal and Sen-Sarma, missed the dorsal spur which is very small. Also see foot note under the species *S. cyclops*.

dark brown; microsculpture consists of papillae and nonasteroid micrasters; membrane reticulate (*cyclops*) or without any reticulation; costa thick, running along anterior margin; subcosta short, meeting costa just outside scale; radius as thick as costa and running close to and parallel with fused costa-subcosta; media running medially, thin, weakly chitinised and with a few branches near distal end; cubitus thin and weak, with 10-13 branches to posterior margin; all veins arising independently from scale except media in hindwing coming out from radius just outside scale.

Soldier : Soldier caste of only *Speculitermes sinhalensis* Roonwal and Sen-Sarma is known from the Indian Region. The soldier of *Speculitermes macrodentatus* Ahmad is very different from that of *sinhalensis* in many respects, it appears to be close to *Indotermes*, but since I had no access to *macrodentatus* I base the soldier characters of the genus on *sinhalensis* soldier, as follows :—Head dark brown, body whitish. Head scantily and body fairly hairy. Head-capsule subrectangular, rather heavy. Fontanelle indistinct. Eyes and ocelli absent. Antennae thin, elongate, with 14 segments; segment 3 longer than 2. Postclypeus well marked. Labrum dome-shaped. Mandibles long, thick; strongly and sharply bent inwards distally; each mandible with a sharp, acute, triangular tooth a little above middle. Postmentum club-shaped, weakly incurved at waist. Pronotum strongly saddle-shaped; without any emargination on anterior and posterior margins. Legs generally with 3 : 2 : 2 (rarely 2 : 2 : 2) apical tibial spurs; tarsi 4-jointed.

Worker : Head pale brown to greyish brown and generally sparsely hairy. Head-capsule subcircular; sutures present or indistinct. Eyes and ocelli absent. Mid-dorsal spot small to fairly large; either flush with head-surface or swollen and raised. Antennae with 14 segments; segment 3 longer than 2 and subdivided, 4 shortest. Postclypeus strongly swollen, generally about half its width in length, sometimes a little longer. Mandibles as in imago; 2nd marginal of right mandible however with strongly incurved posterior margin. Pronotum strongly saddle-shaped; anterior and posterior margins without any emargination. Legs thin and long; apical tibial spurs either 3 : 2 : 2 or 2 : 2 : 2, the dorsal spur when present very small, sometimes not discernible; tarsi 4-jointed.

2. *Distribution and Composition of Speculitermes*

(Fig. 1)

Distribution : The genus *Speculitermes* is endemic to the Indian region (India, Pakistan, Sri Lanka). The species *S. rongrensis* Roonwal and Chhotani described from North-eastern India and later reported from Thailand has been transferred to the genus *Indotermes* Roonwal and Sen-Sarma and the species *S. cyclops* reported from Burma from workers is also probably an *Indotermes* species.

Composition : In all ten species of the genus are known and distributed in the Indian region, as follows :—

1. *Speculitermes chadaensis* Chatterjee and Thapa—India
2. *S. cyclops* Wasmann—India, Pakistan
3. *S. deccanensis* Roonwal and Chhotani—India
4. *S. dharwarensis* Roonwal and Chhotani—India
5. *S. emersoni* Bose—India
6. *S. goesswaldi* Roonwal and Chhotani—India
7. *S. paivai* Roonwal and Chhotani—India
8. *S. roonwali* Maiti—India
9. *S. sinhalensis* Roonwal and Sen-Sarma—India, Sri Lanka
10. *S. triangularis* Roonwal and Sen-Sarma—India

3. *Keys to Indian Species of Speculitermes*

IMAGOES

- 1(6) Head with eyes narrower, 1.20-1.43 mm
- 2(3) Head-width 1.20-1.25 mm. Postclypeus shorter than 1/2 of width (length 0.24-0.26, width 0.53-0.57 mm). Eyes smaller (max. diameter 0.30-0.34 mm). Ocelli smaller and closer to eyes (long diameter 0.11-0.13, short diameter 0.08-0.11, eye-ocellus distance 0.05-0.06 mm). Wings smaller, forewing length 10.75 mm*roonwali*
- 3(2) Head-width 1.39-1.43 mm. Postclypeus longer, about 1/2 to more than 1/2 of width (length 0.34-0.37, width 0.64-0.70 mm). Eyes larger (max. diameter 0.34-0.40 mm). Ocelli larger and farther from eyes (long diameter 0.13-0.18, short diameter 0.10-0.17, eye-

- ocellus distance 0.09-0.11 mm). Wings longer, forewing length 13.1-14.7 mm
- 4(5) Mid-dorsal spot smaller, 0.17-0.19 mm in diameter. Eyes smaller (0.34-0.35 mm diameter) and ocelli larger (0.18 × 0.11-0.17 mm). Wings without any reticulation.....*emersoni*
- 5(4) Mid-dorsal spot larger, 0.25 mm in diameter. Eyes larger (0.40 mm) and ocelli smaller (0.13 × 0.10 mm). Wings with reticulation.....*cyclops*
- 6(1) Head with eyes wider, 1.43-1.70 mm
- 7(8) Head-capsule blackish in colour. Head with eyes 1.43-1.63 mm wide. Mid-dorsal spot minute.....*sinhalensis*
- 8(7) Head-capsule dark brown to blackish brown. Head with eyes 1.50-1.70 mm. Mid-dorsal spot prominent and large
- 9(10) Head dark brown and wider, with eyes 1.63-1.70 mm wide. Mid-dorsal spot smaller and of variable shape (0.09-0.13 × 0.07-0.10 mm). Ocelli separated from eyes by their long diameter (0.13-0.17 mm).....*goesswaldi*
- 10(9) Head blackish brown and narrower, with eyes 1.50 mm wide. Mid-dorsal spot larger and circular (0.17 mm diameter). Ocelli separated from eyes by less than their short diameter (0.07 mm).....*dharwarensis*

WORKERS

- 1(10) Mid-dorsal spot swollen and raised
- 2(9) Postclypeus-length about half its width or a little more (length 0.26-0.30, width 0.56-0.60 mm). Mid-dorsal spot smaller (diameter 0.12-0.17 mm)
- 3(6) Mid-dorsal spot weakly swollen or very slightly raised from head-surface (diameter 0.12-0.16 mm). Head-width 1.20-1.40 mm
- 4(5) Paler species : Head-capsule brown to dark brown.....*cyclops*
- 5(4) Darker species : Head-capsule dark smoky brown.....*chadaensis*
- 6(3) Mid-dorsal spot strongly swollen and raised from head-surface (diameter 0.13-0.17 mm). Head-width 1.16-1.27 mm

- 7(8) Mid-dorsal spot larger (0.13-0.17 mm). Head generally smaller (width 1.16-1.29 mm).....*emersoni*
- 8(7) Mid-dorsal spot smaller (0.13 mm). Head generally larger (width 1.20-1.27 mm).....*deccanensis*
- 9(2) Postclypeus-length less than half of its width (length 0.23-0.25, width 0.53-0.57 mm). Mid-dorsal spot larger (0.17 mm)...*paivai*
- 10(1) Mid-dorsal spot flush with head-surface, not swollen
- 11(12) Mid-dorsal spot large and triangular in shape (0.20-0.30 mm).....*triangularis*
- 12(11) Mid-dorsal spot small and round in shape (0.07-0.13 mm diameter)
- 13(14) Smaller species (head-width 1.03-1.23, pronotum-width 0.57-0.73 mm).....*dharwarensis*
- 14(13) Larger species (head-width 1.20-1.40, pronotum-width 0.65-0.83 mm)
- 15(16) Postclypeus-length nearly half its width (length 0.29-0.33, width 0.60-0.66 mm).....*sinhalensis*
- 16(15) Postclypeus-length a little more than half its width (length 0.35-0.37, width 0.57-0.63 mm).....*goesswaldi*

105. *Speculitermes chadaensis* Chatterjee and Thapa

(Fig. 16)

Speculitermes chadaensis Chatterjee and Thapa :

1964. Chatterjee and Thapa, *Indian Forester*, **90** (8) : 514-516. W only.
Holotype : W, in FRI. Type-locality. Chada, Karnajia Forest Range, Madhya Pradesh. Paratype examined.
1966. Roonwal and Chhotani, *Biol. Zbl.*, **85** (2) : 183.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 31. (sp. wrongly assigned to Mathur and Thapa).

IMAGO : Unknown.

SOLDIER : Unknown.

WORKER (Fig. 16) : Paratype examined. Head dark smoky brown; postclypeus a little paler; thorax and abdomen pale brown above; antennae yellowish. Head sparsely and body fairly hairy. Total body-length 4.57-6.10 mm. Head-capsule subcircular (length to tip of labrum 1.50, length

to base of mandibles 0.95-1.05, max. width 1.20-1.28 mm); mid-dorsal spot round or somewhat kite-shaped, slightly swollen and raised (diameter 0.13-0.17 mm); Y-suture faintly marked. Antennae with 14 segments, 3

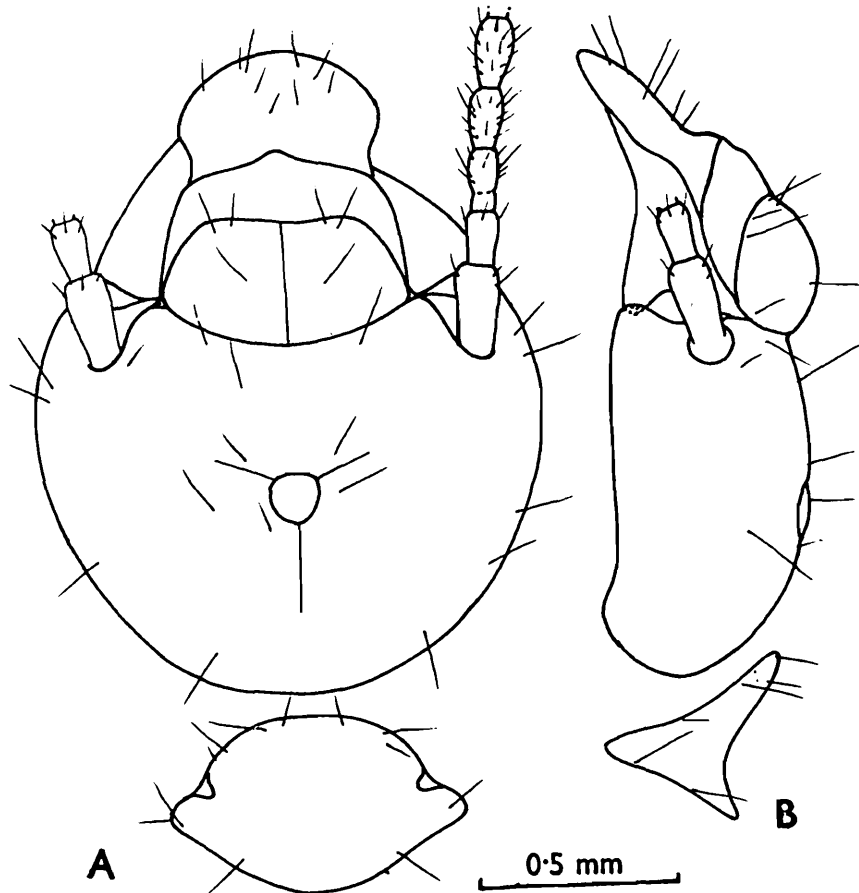


Fig. 16 : *Speculitermes chadaensis*. Worker (Paratype). (A) Head and pronotum, in dorsal view. (B) Same, side view.

longer than 2 and subdivided; 4 subequal to 2. Postclypeus strongly swollen, hairy; length equal to or a little more than half of width (length 0.27-0.33, width 0.55-0.58 mm). Labrum dome-shaped (length 0.35, width 0.53 mm). Pronotum strongly saddle-shaped (length 0.38-0.45, width 0.67-0.75 mm). Legs generally with 2 : 2 : 2 apical tibial spurs; sometimes dorsal spur on foretibia present but very minute.

Distribution : INDIA : Madhya Pradesh.

106. *Speculitermes cyclops* Wasmann

(Figs. 17, 18)

1. *Speculitermes cyclops* Wasmann :

1902. Wasmann, *Zool. Jb. Syst.*, **17**(1) : 160-162. Im and W. Lectotype (designated Roonwal and Sen-Sarma, 1960) W, in FRI. Type-locality : Khandala near Bombay. Maharashtra, India. Lectotype examined.
1949. Snyder, *Smiths. misc. Colls.*, **112** : 110. Synonymy.
1960. Roonwal and Sen-Sarma, *Contrib. Syst. Oriental Termites* (ICAR Ent. Monogr. 1) : 16.
1965. Ahmad, *Bull. Am. mus. nat. Hist.*, **131** (Art. 1) : 62.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 42, 43, Fig. 47.
1974. Akhtar, *Pakistan J. Zool.*, **6**(1-2) : 92-93.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL. 480 Proj. No. A7-FS-58) : 12, 62.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 53.
1981. Bose and Das, *Rec. zool. Surv. India*, **80** : 202.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 62-63.
- 2. *Speculitermes cyclops cyclops* Wasmann :**
1958. Roonwal, *Trans. Bose Res. Inst.*, **22** : Pl. 1.
1960. Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (ICAR Ent. Monogr. 1) : 16-23.
1964. Roonwal and Chhotani, *Indian J. agric. Sci.*, **34**(2) : 125, 130.
1967. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **11**(1) : 6, 22-24.
1982. Verma and Thakur, *Rec. zool. Surv. India*, **79** : 312.
1984. Verma, *Indian J. For.*, **7**(4) : 305.

IMAGO (Fig. 17) : Lectomorphotype examined. Head-capsule dark castaneous brown; postclypeus a little paler than head; antennae and tarsi of legs pale straw coloured; thorax and abdomen above almost as dark as head or slightly paler; abdominal sternites brown. Head and body densely covered with short microscopic hairs interspersed with several long hairs. Total body-length with wings 15.0-16.0 and without wings 9.0-10.0 mm. Head subcircular (length to base of mandibles 0.88-1.20 and max. width of head 1.35-1.52 mm). Mid-dorsal spot large, circular (diameter 0.25 mm), shining and translucent, situated medially; Y-suture not present. Eyes subcircular (max. diameter 0.35-0.40 mm). Ocelli small, suboval, translucent, situated dorso-ventrally obliquely at about their short diameter from eyes (long diameter 0.13-0.16, short diameter

0.10-0.12, eye-ocellus distance 0.09-0.10 mm). Antennae with 15 segments; segment 3 shortest. Postclypeus greatly swollen, hairy as head; medially divided into 2 halves; length about half of width. Anteclypeus translucent white, apilose; anterior margin projected medially. Labrum dome-shaped with a few hairs anteriorly and on body; length 0.45, width 0.50 mm. Pronotum subrectangular, sides rounded; a little narrower than head with eyes (length 0.75-0.80, width 1.19-1.30 mm); anterior margin slightly incurved and with a weak median notch; posterior margin substraight, slightly incurved medially. Mesonotum and metanotum sharply and angularly incurved at posterior end. Legs short, slender and pilose; apical tibial spurs 3 : 2 : 2* Wings dirty brown, hairy along margins; forewing and hindwing with scale 13.55 and 12.65 mm long and without scale 12.8 and 12.0 mm long, respectively; membrane with a reticulation of evanescent veins.

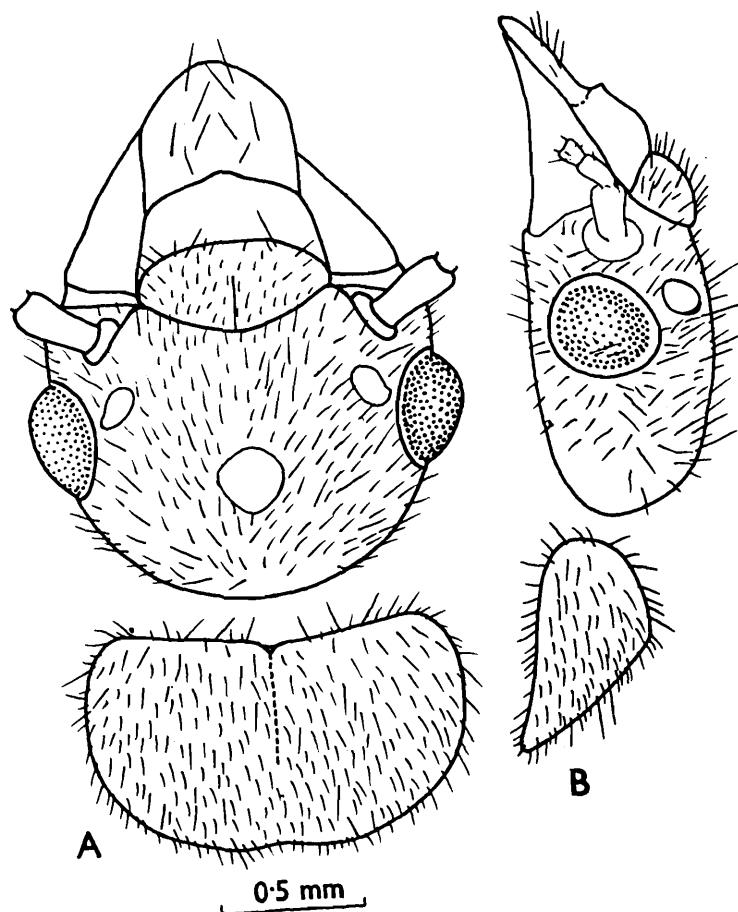


Fig. 17 : *Speculitermes cyclops*. Paralectotype imago. (A) Head and pronotum, in dorsal view. (B) Same, side view.

* Roonwal and Sen-Sarma (1960) give apical tibial spurs as 2 : 2 : 2. I have examined lectomorphotype imago and a number of workers from type colony, they have 3 : 2 : 2.

SOLDIER : Unknown.

WORKER (Fig. 18) : Head-capsule shining brown to dark brown; postclypeus generally paler than but sometimes as dark as head; antennae and legs yellowish white; abdomen brown above and whitish below. Head and body fairly hairy. Total body-length 4.30-6.00 mm. Head-capsule subcircular (length to base of mandibles 0.90-1.20, max. width 1.20-1.40 mm); Y-suture present; mid-dorsal spot translucent white, shining, round (diameter 0.12-0.16 mm); situated at junction of Y-suture, very weakly swollen. Antennae with 14 segments; segment 2 shortest; 3 long, club-shaped, longer than 2 or 4. Postclypeus swollen, hairy; length about half or a little more than half of width. Labrum dome-shaped, hairy near distal end and on body, wider than long. Pronotum strongly saddle-shaped (length 0.40-0.50, max. width 0.65-0.80 mm); anterior margin round. Legs long, slender, apical tibial spurs 3 : 2 : 2.

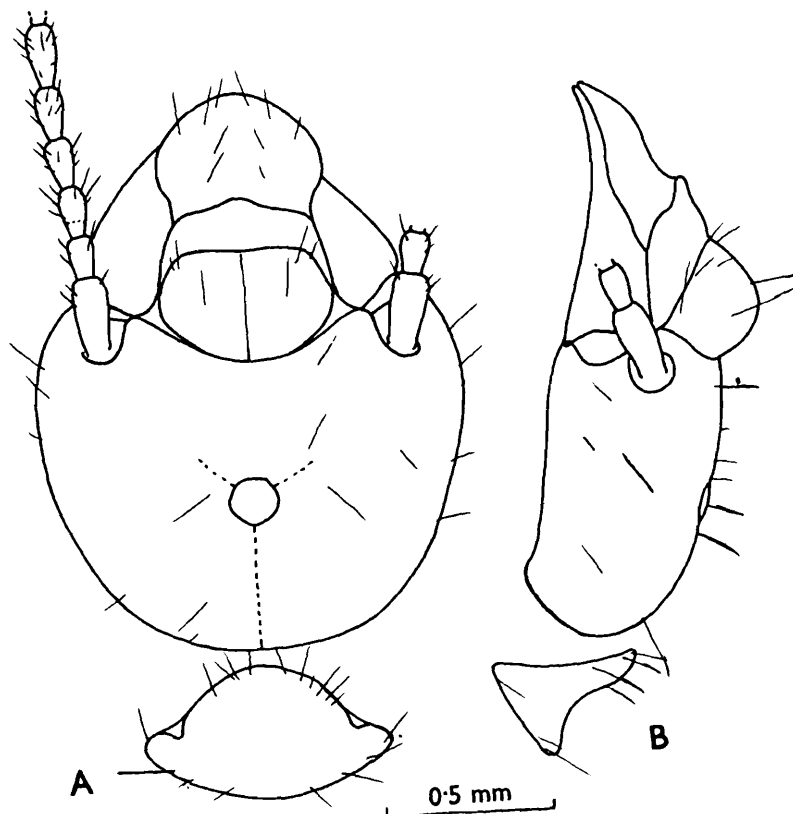


Fig. 18 : *Speculitermes cyclops*. Worker from type colony. (A) Head and pronotum, dorsal view. (B) Head and pronotum, side view.

Distribution : INDIA : Jammu & Kashmir, Maharashtra, Karnataka, Orissa, Madhya Pradesh, Rajasthan, Uttar Pradesh. PAKISTAN : Panjáb.

107 *Speculitermes deccanensis* Roonwal & Chhotani

(Fig. 19)

1. *Speculitermes deccanensis deccanensis* Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Zool. Anz.*, **168**(1-4) : 57-62. W only. Holotype : W, in ZSI. Type-locality. Bababudin Hills, Karnataka, India. Type examined.

1966. Roonwal and Chhotani, *Biol. Zbl.*, **85**(2) : 183.

1977. Chhotani. *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 32.

2. *Speculitermes deccanensis* Roonwal and Chhotani :

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 107.

IMAGO : Unknown.

SOLDIER : Unknown.

WORKER (Fig. 19) : Type examined. Head-capsule golden brown; antennae, labrum and legs pale yellow; postclypeus slightly paler than head; abdominal tergites and sternites semi-transparent, hyaline. Head and thorax sparsely and abdomen fairly hairy. Total body-length c 5.0-5.6 mm. Head-capsule subcircular (length to base of mandibles 1.0-1.13, max. width 1.20-1.27 mm); sides sharply converging behind middle; sutures indistinct; mid-dorsal spot round, small (diameter 0.13 mm), greatly swollen and raised. Antennae with 14 segments; segment 3 club-shaped, appears subdivided; 4 shortest. Postclypeus swollen, with few hairs; divided into right and left halves by a median line; length about half or a little less than half of width (length 0.27-0.30, width 0.58-0.60 mm). Labrum dome-shaped (length 0.40-0.43, width 0.47 mm). 2nd marginal tooth of right mandible truncate, mandibles otherwise as in genus. Pronotum strongly saddle-shaped (length 0.37-0.40, width 0.66 mm). Legs with 2 : 2 : 2 apical tibial spurs.

Distribution : INDIA : Karnataka (Bababudin Hills, type-locality), known only from type-locality.

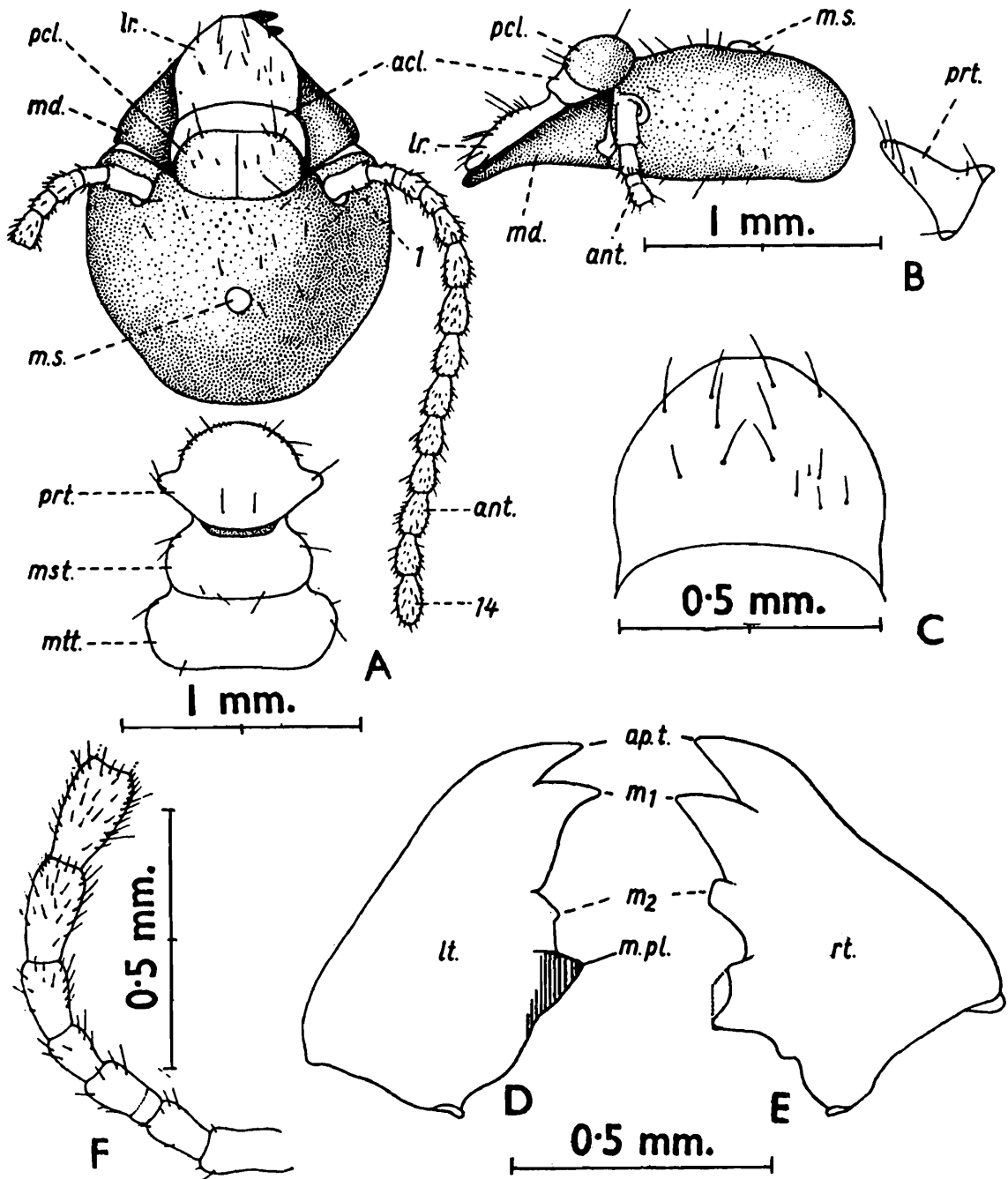


Fig. 19 : *Speculitermes deccanensis*. Paratype Worker. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (C) Labrum, dorsal view. (D) Left mandible, dorsal view. (E) Ditto, right mandible. (F) Right antenna, only basal seven segments shown. (Ex Roonwal and Chhotani, 1962b).

108. ***Speculitermes dharwarensis*** Roonwal & Chhotani

(Figs. 20, 21)

Speculitermes dharwarensis Roonwal and Chhotani :

1964. Roonwal and Chhotani, *Indian J. agric. Sci.*, **34** : 120-125. Im and W. Holotype : Im, in ZSI. Type-locality : Dharwar, Karnataka, India. Type examined.
1966. Roonwal and Chhotani, *Biol. Zbl.*, **85** (2) : 183.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 32.
- 1977 Roonwal and Chhotani, *Ent. Basil.*, **2** : 53.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 63.
1984. Bose. *Occ. Pap. Rec. zool. Surv. India.*, No. 49 : 91, 107, 108-109, 112.

IMAGO DEALATE (Fig. 20) : Type Examined. Head-capsule blackish brown; postclypeus, mid-dorsal spot and thoracic and abdominal tergites

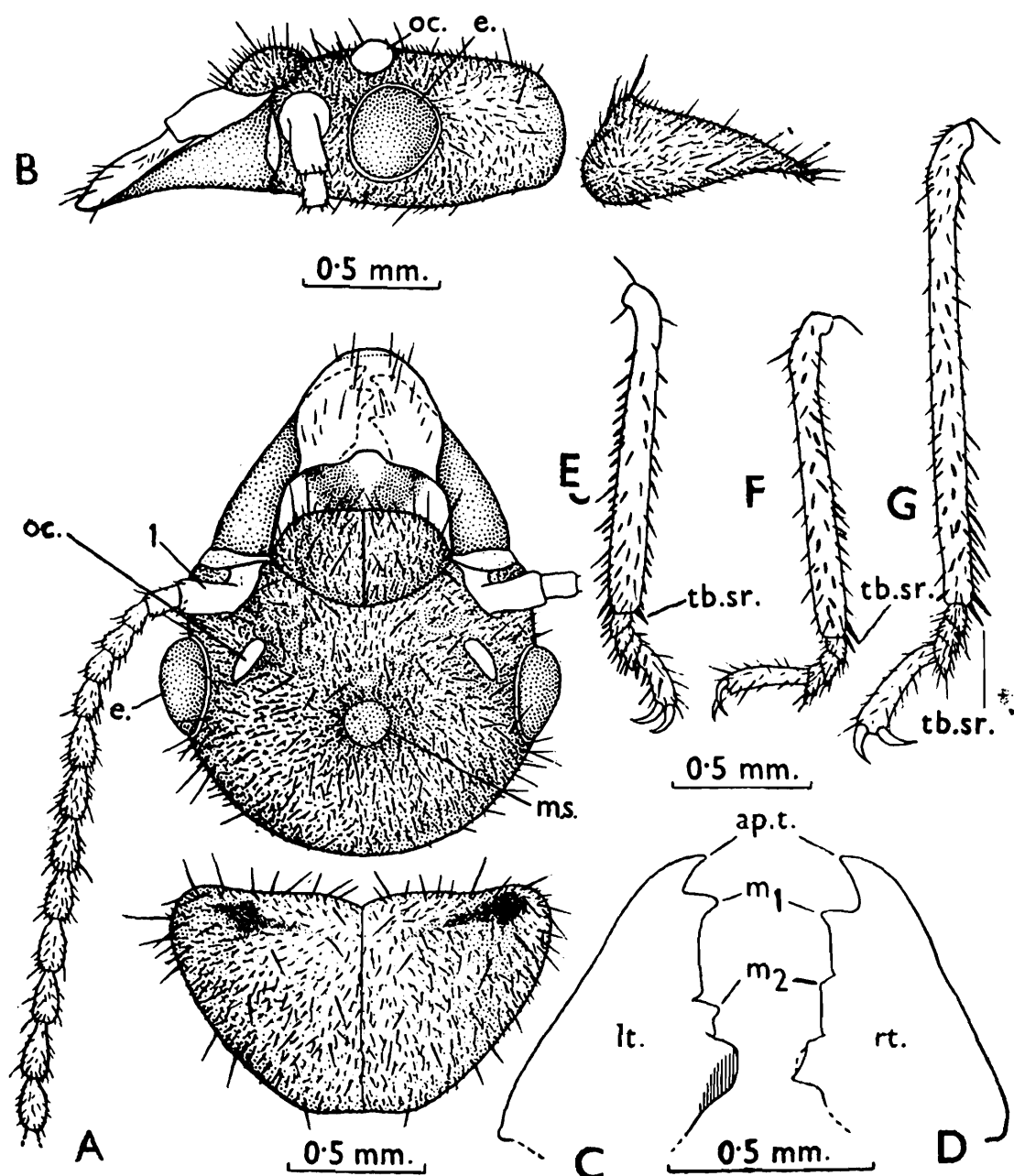


Fig. 20 : *Speculitermes dharwarensis*. Holotype imago. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C) Left mandible, dorsal view. (D) Ditto, right mandible. (E), (F) and (G) Fore, middle-and hind-tibia, respectively. (Ex Roonwal and Chhotani, 1964b).

slightly paler; labrum and antennae pale brown; legs brown; abdominal sternites dark brown, paler medially. Head and body with a thick coat of short, fine hairs and several longer hairs. Total body-length c 7.3 mm. Head subcircular (Length to base of mandibles 1.17, width with eyes 1.50 mm); dorsum weakly depressed medially around fontanelle plate or mid-dorsal spot. Mid-dorsal spot round, swollen (diameter 0.17 mm). Eyes subcircular, faintly narrowed towards lateral margin (max. diameter 0.39 mm). Ocelli broadly oval or subrounded (max. diameter 0.17 mm); from eyes situated at less than half of long diameter (0.07 mm). Antennae with 14 + segments : segment 3 shortest. Postclypeus greatly swollen; length a little more than half of width (length 0.37, width 0.66 mm); anterior margin straight, posterior margin rounded. Anteclypeus hyaline, trapezoidal ; anterior margin projected in front medially. Labrum dome-shaped; broader than long (length 0.43, width 0.57 mm). Pronotum narrower than head with eyes (length 0.83, width 1.40 mm); anterior margin slightly incurved and with a median notch; posterior margin substraight faintly incurved medially; sides strongly converging behind. Meso- and metanota deeply notched at posterior margin.

SOLDIER : Unknown.

WORKER (Fig. 21) : Head-capsule brown; mid-dorsal spot yellowish; abdominal tergites pale brown, translucent, sternites translucent; abdomen appearing dark greyish due to intestinal contents. Head and thorax moderately and abdomen rather densely pilose. Total body-length c 3.7-5.5 mm. Head subcircular, broader than long (length to base of mandibles 0.87-1.0, max. width 1.03-1.23 mm); Y-suture faint; mid-dorsal spot rounded (0.11-0.13 mm in diameter), not swollen. Antennae with 14-segments; segment 3 subequal to or longer than 2, faintly subdivided. Postclypeus brown, swollen, length half or slightly more than half of width (length 0.25-0.27, width 0.43-0.53 mm). Labrum dome-shaped, length 0.30-0.40, width 0.45-0.57 mm. Pronotum strongly saddle-shaped (length

0.30-0.37, width 0.57-0.73 mm); both anterior and posterior margins without notch.

Distribution : INDIA : Karnataka (Dharwar, type-locality) and Andhra Pradesh (Tirumala).

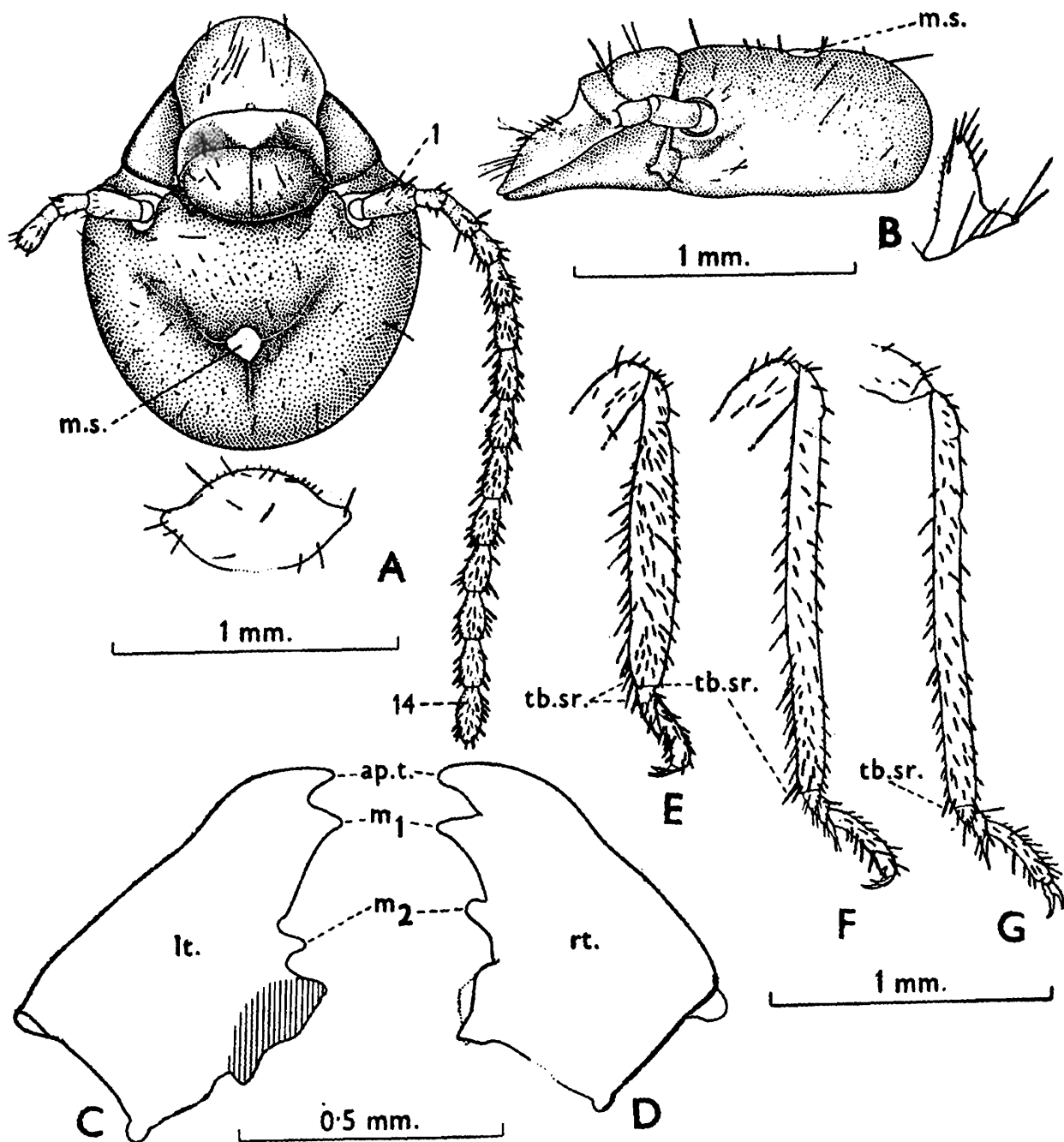


Fig. 21 : *Speculitermes dharwarensis*. Paramorphotype worker. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C), (D) Left and right mandibles respectively, dorsal view. (E), (F) and (G) Fore, middle- and hind-tibia, respectively. (Ex Roonwal and Chhotani, 1964b).

109. *Speculitermes emersoni* Bose

(Fig. 22)

Speculitermes emersoni Bose:

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 107, 109-112. Im and W. Holotype : Im, in AMNH. Type-locality : Thekkadi, Kerala, India. Type examined.

IMAGO (Fig. 22) : Type examined. Head-capsule reddish brown; fontanelle plate or mid-dorsal spot much paler than head; postclypeus, pronotum and abdomen above pale brown; antennae, legs and abdomen

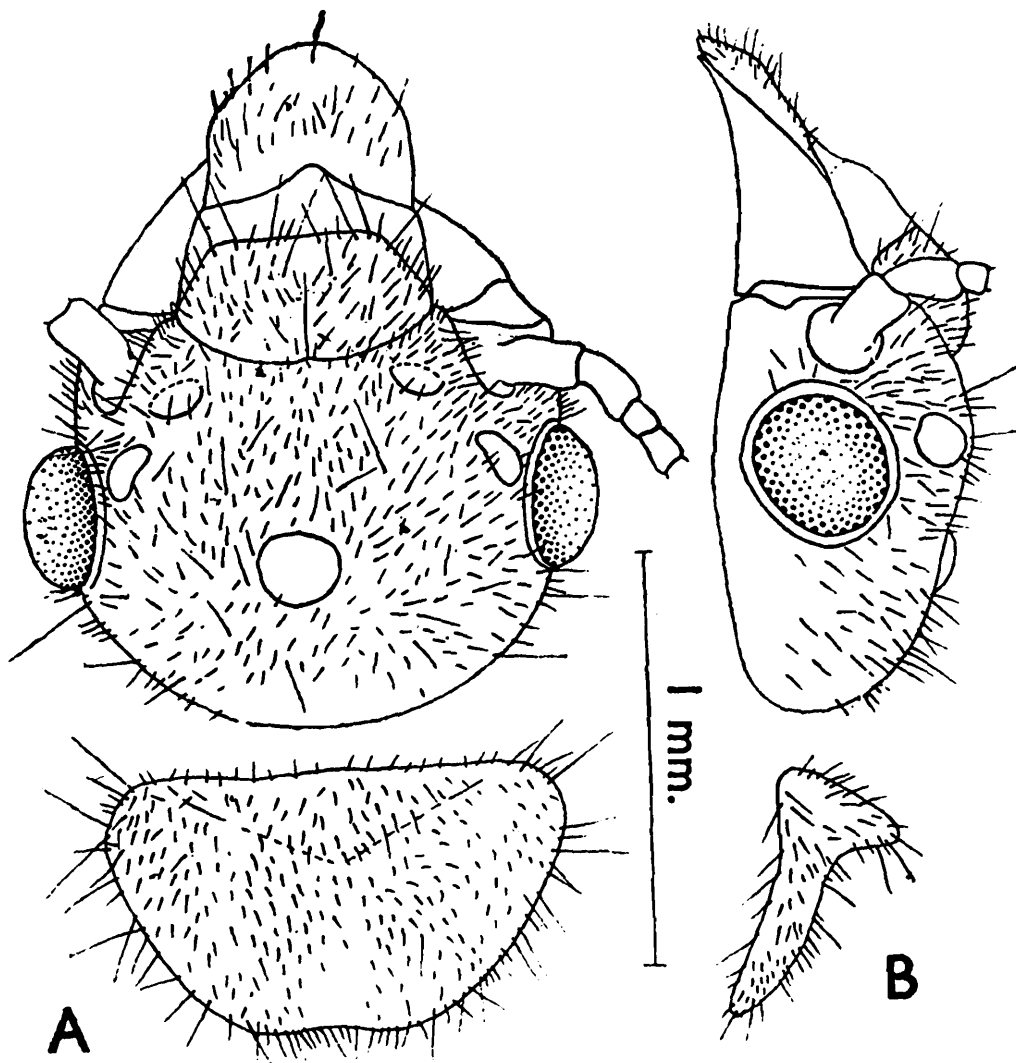


Fig. 22 : *Speculitermes emersoni*. Paratype imago. (A) Head and pronotum, dorsal view. (B) same, side view. (Ex Bose, 1984).

below pale golden brown; wings hyaline. Head and body densely pilose. Total body-length with wings 15.0 and without wings 8.0-8.4 mm. Head subcircular; with eyes broader than long (width with eyes 1.39-1.43, length to base of mandibles 0.98-1.05 mm). Fontanelle plate or mid-dorsal spot large, subcircular and raised (diameter 0.17-0.19 mm). Eyes subcircular (max. diameter 0.34-0.35 mm); situated 0.07-0.09 mm from lower margin of head. Ocelli broadly oval (long diameter 0.18, short diameter 0.11-0.17 mm); eye-ocellus distance less than short diameter (0.09-0.11 mm). Antennae with 15 segments; segment 3 shortest, 4 slightly longer than 3. Postclypeus swollen, densely hairy with short and long hairs; length about half of width (length 0.34-0.35, width 0.64-0.68 mm). Pronotum flat, with irregular shaped pale marking; anterior margin straight weakly raised and without median notch; posterior margin substraight, weakly incurved medially; a little narrower than head and wider than long (length 0.62-0.68, width 1.18 mm). Legs with 3 : 2 : 2 apical tibial spurs, outer spur extremely small, not very clear. Wings hyaline with pale brownish tint and covered with small hairs. Forewing with scale 13.10-14.7 and hindwing with scale 11.4-12.0 mm. Venation as in genus; media with 2-3 and cubitus with 11-12 branches in both wings.

SOLDIER : Unknown.

WORKER : Head-capsule pale reddish brown; mid-dorsal spot much paler than head; antennae and postclypeus pale yellow to pale brown; pronotum and abdomen pale brown. Head and body sparsely pilose with long, fine hairs. Total body-length c 4.8-6.0 mm. Head subcircular, slightly broader than long (length to base of mandibles 0.94-1.09, max. width 1.16-1.29 mm). Mid-dorsal spot large, rounded and raised (diameter 0.13-0.17 mm). Antennae with 14 segments; segment 3 subequal to 2, subdivided. Postclypeus pilose, swollen, length about half of width (length 0.26-0.28, width 0.56-0.60 mm). Pronotum saddle-shaped; anterior margin without notch in middle, posterior margin subcircular; length 0.32-0.42, width 0.64-0.69 mm. Legs with 2 : 2 : 2 apical spurs, dorsal spur of foretibia indistinct.

Distribution : INDIA : Kerala (Thekkadi, type-locality and Periyar Lake area) and Karnataka (Somwarpet, 960 m, present record).

110. *Speculitermes goesswaldi* Roonwal and Chhotani

(Figs. 23, 24)

Speculitermes goesswaldi Roonwal and Chhotani :

1964. Roonwal and Chhotani, *Indian J. agric. Sci.*, **34**(2) : 126-130. Im (dealate) and W. Holotype : Im (dealate), in ZSI. Type-locality : Dharwar, Karnataka, India. Type examined.
1966. Roonwal and Chhotani, *Biol. Zbl.*, **85**(2) : 183.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India.*, No. 9 : 32.
1982. Verma and Thakur, *Rec. zool. Surv. India*, **79** : 312-313.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 91, 107, 112-114.

IMAGO DEALATE (Fig. 23) : Type examined. Head-capsule dark brown; mid-dorsal spot whitish, sometimes specked with brownish marks; postclypeus paler than head; antennae and labrum pale brown; pronotum brown with dark brown, T-shaped mark; mesonotum and metanotum brown; abdominal tergites brown, paler medially and with a dark spot on either side; sternites pale brown, paler medially and with a lateral dark spot each on 2nd-6th and 2 or 3 such spots on 7th, sternites. Head and body with a thick coat of fine hairs and several longer hairs. Total body-length c 7.5 mm. Head subcircular, with eyes much broader than long (length to base of mandibles 1.15-1.20, width with eyes 1.63-1.70 mm); mid-dorsal spot whitish, translucent and of irregular shape (length 0.09-0.13, width 0.07-0.10 mm); Y-suture incomplete or hardly discernible. Eyes round, medium-sized (max. diameter 0.40-0.43 mm). Ocelli subboval, translucent (max. diameter 0.13-0.17 mm); from eyes situated at approximately their long diameter, eye-ocellus distance 0.13-0.17 mm. Antennae with 15 segments, segment 3 shortest, 4 as long as 2 and 5 smaller than 4. Postclypeus greatly swollen and pilose, longer than half of width (length 0.38-0.40, width 0.70-0.73 mm); anterior margin substraight, posterior margin projecting deep into frons. Anteclypeus apilose, either narrow, strip-like or trapezoid with medially projected anterior margin. Labrum broadly tongue-shaped to subsquarish (length 0.30-0.40, width 0.50-0.60 mm). Pronotum much broader than long (length 0.85-0.93, max. width 1.47-1.60 mm); anterior margin substraight and slightly upturned ; posterior margin convex with a prominent median notch. Mesonotum and metanotum weakly to deeply notched medially.

Wing scales dark brown, hairy, forewing and hindwing scales 0.70-0.75 and 0.57-0.60 mm long, respectively.

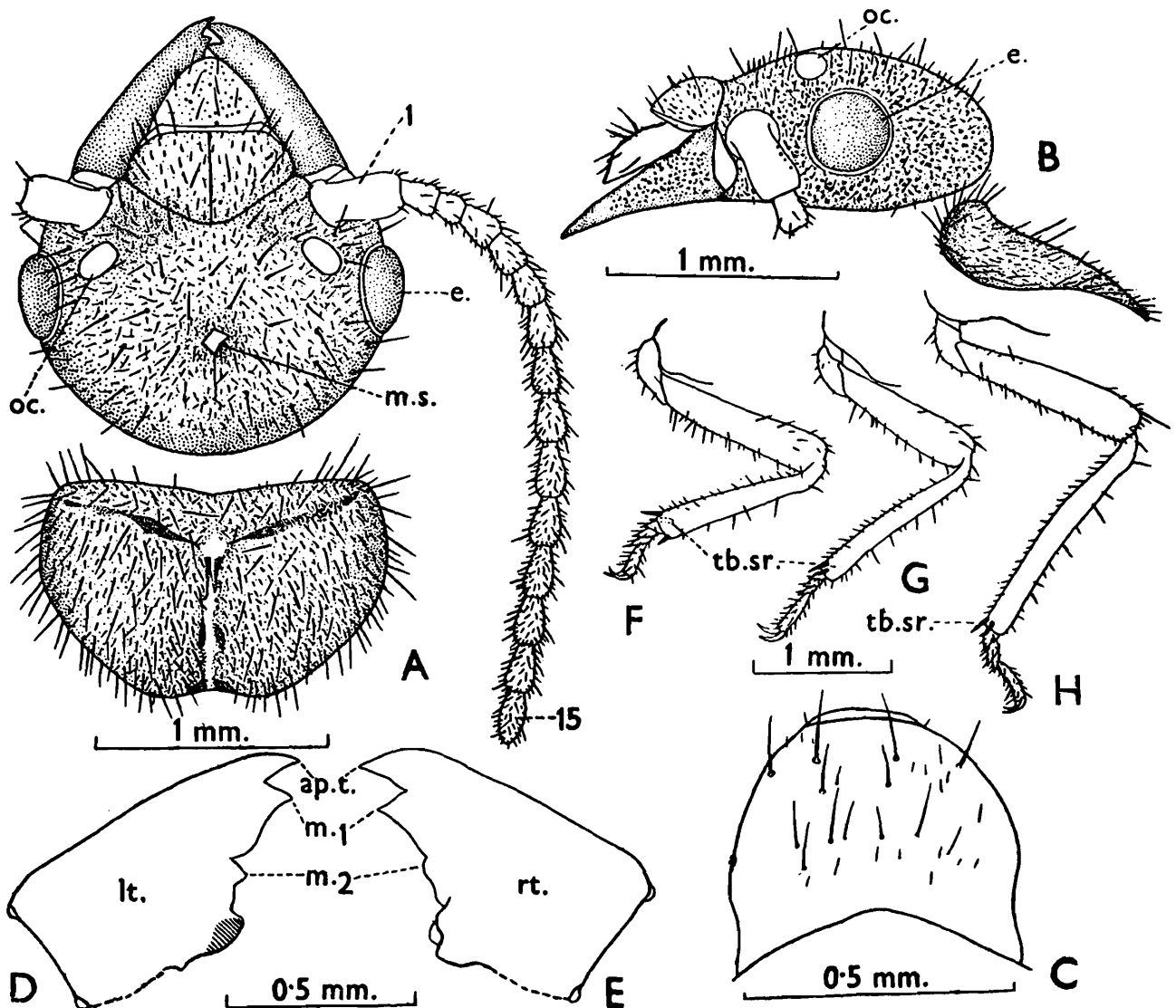


Fig. 23 : *Speculitermes goesswaldi*. Paratype imago (dealate). (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C) Labrum. (D), (E) Left and right mandibles, respectively, dorsal view. (F), (G) and (H) Fore, middle and hindlegs. (Ex Roonwal and Chhotani, 1964b).

SOLDIER : Unknown.

WORKER (Fig. 24) : Head and postclypeus brown; antennae and labrum yellowish; thorax and legs pale yellow; abdominal tergites and sternites transparent but abdomen appearing greyish due to intestinal contents. Head sparsely and body moderately pilose. Total body-length 4.60-6.30 mm. Head-capsule subcircular (length to base of mandibles 1.08-1.17, max. width 1.35-1.40 mm) ; Y-suture prominent; mid-dorsal

spot small, round, diameter 0.07-0.09 mm, whitish. Antennae with 14 segments; segment 3 long, club-shaped and partially subdivided, 4 a little smaller than 2. Anteclypeus either small, apilose and strip-like or subtrapezoidal plate with anterior margin slightly projected in front. Postclypeus swollen, pilose, slightly longer than half of width (length 0.35-0.37, width 0.58-0.66 mm). Labrum-length 0.37-0.43 and width 0.57-0.63 mm. Pronotum strongly saddle-shaped (length 0.40-0.45, width 0.80-0.86 mm); both anterior and posterior margins round and without notch. Apical tibial spurs 3 : 2 : 2 or 2 : 2 : 2 (dorsal spur sometimes rudimentary or absent.)

Distribution : INDIA : Karnataka (Dharwar, type locality) and Madhya Pradesh.

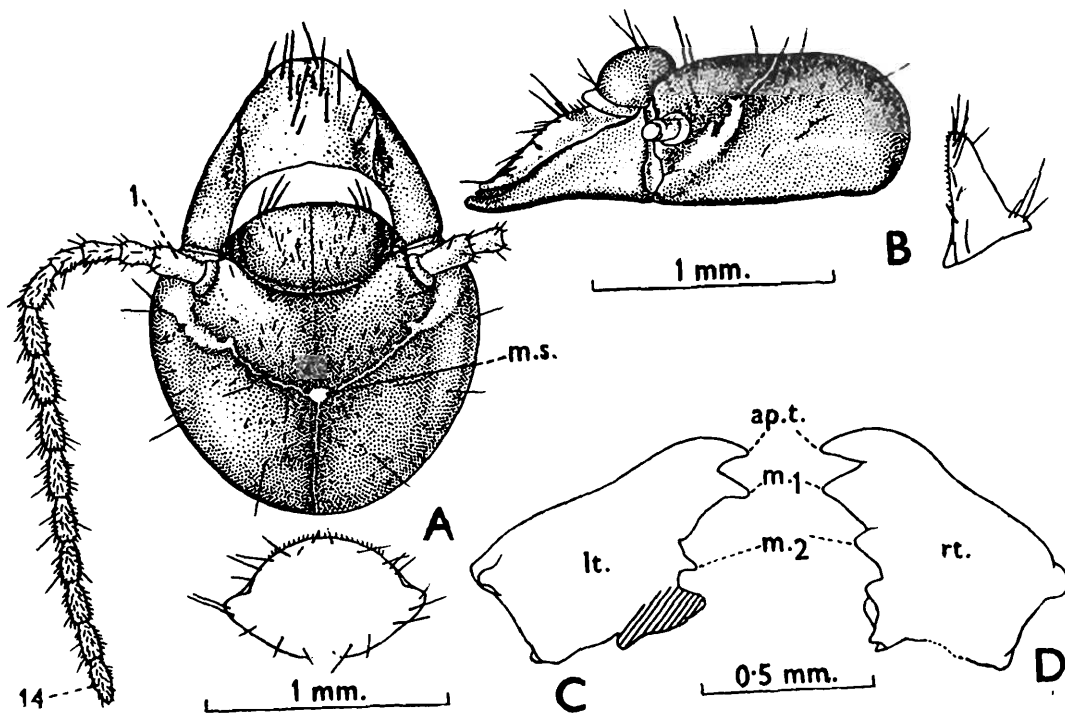


Fig. 24 : *Speculitermes goesswaldi*. Paramorphotype worker. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C), (D) Left and right mandibles, respectively, dorsal view. (Ex Roonwal and Chhotani 1964b).

111. *Speculitermes paivai* Roonwal & Chhotani

(Fig. 25)

1. *Speculitermes deccanensis paivai* Roonwal and Chhotani :

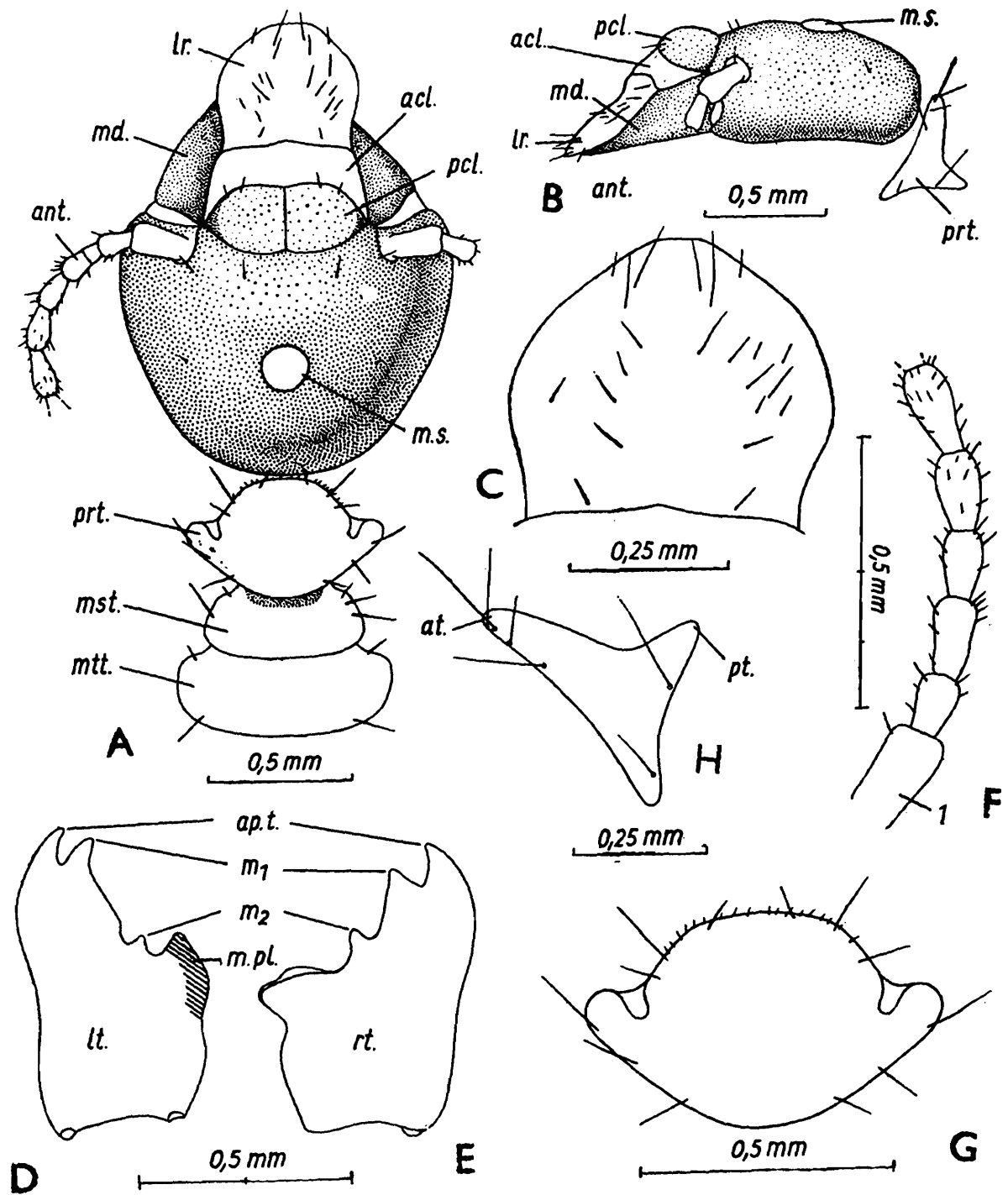


Fig. 25 : *Speculitermes paivai*. Paratype worker. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (C) Labrum. (D) Left mandible, dorsal view. (E) Ditto, right mandible. (F) Left antenna, only basal six segments shown. (G) Pronotum, dorsal view. (H) Pronotum, side view. (After Roonwal and Chhotani, 1962b).

1962. Roonwal and Chhotani, *Zool. Anz.*, **168** (1-4) : 62-63. W only. Holotype : W, in ZSI. Type-locality : Madhupur (Bihar, India). Type examined.

1966. Roonwal and Chhotani, *Biol. Zbl.*, **85**(2) : 183.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India.*, No. 9 : 32.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 58-59.

IMAGO : Unknown.

SOLDIER : Unknown.

WORKER (Fig. 25) : Type examined. Head-capsule golden brown; postclypeus slightly paler; antennae, labrum, legs and thorax pale yellow; abdominal tergites and sternites transparent but abdomen appearing greyish due to intestinal contents. Head very sparsely hairy; body fairly hairy. Total body-length 4.75-5.10 mm. Head subcircular, size same as in *deccanensis* (length 1.0-1.16, width 1.20-1.23 mm); mid-dorsal spot larger and swollen (diameter 0.17 mm); Y-suture not distinct. Antennae with 14-segments; segment 3 long, club-like, subdivided. Postclypeus swollen; anterior and posterior margins medially notched, length less than half of width (length 0.23-0.25, width 0.53-0.57 mm). Pronotum saddle-shaped (length 0.40, width 0.63-0.66 mm).

Distribution : INDIA : West Bengal (Tollygunge area, Calcutta) and Bihar (Madhupur, type-locality and Dhanbad, present record).

112. *Speculitermes roonwali* Maiti

(Fig. 26)

Speculitermes roonwali Maiti :

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 59-63. Im and W. Holotype : Im, in ZSI. Type-locality: Midnapur, West Bengal, Type examined.

IMAGO (Fig. 26) : Type examined. Head-capsule brownish black; postclypeus and mid-dorsal spot pale brown to brown; antennae yellowish; labrum yellowish brown; pronotum and abdominal tergites dark brown, sternites paler; wings brownish; legs yellowish white. Head and body with dense coat of short, fine hairs and several longer hairs. Total body-length with wings 13.0-14.0, without wings 7.0-8.8 mm. Head subcircular

(length to base of mandibles 0.96-1.0, max. width with eyes 1.20-1.25 mm); Y-suture indistinct; mid dorsal spot large and round (diameter 0.17-0.20 mm). Eyes round, medium sized (diameter 0.30-0.34 mm). Ocelli oval, translucent (long diameter 0.11-0.13, short diameter 0.08-0.11 mm); eye-ocellus distance less than short diameter, 0.05-0.06 mm). Antennae with 15 segments; segment 2 about half of 1; 3 little shorter than 2; 4 subequal to or little larger than 3. Postclypeus moderately swollen, pilose; length about half of width (length 0.24-0.26, width 0.53-0.57 mm). Labrum dome-shaped, wider than long (length 0.26-0.28, width 0.46-0.49 mm). Pronotum wider than long and slightly narrower than head with eyes (length 0.66-0.75, width 1.10-1.15 mm); anterior margin weakly incurved or substraight, without notch; posterior margin fairly strongly emarginate medially; sides strongly narrowing posteriorly. Legs with 3 : 2 : 2 apical tibial spurs. Wings dirty brown, hairy at anterior and posterior margins

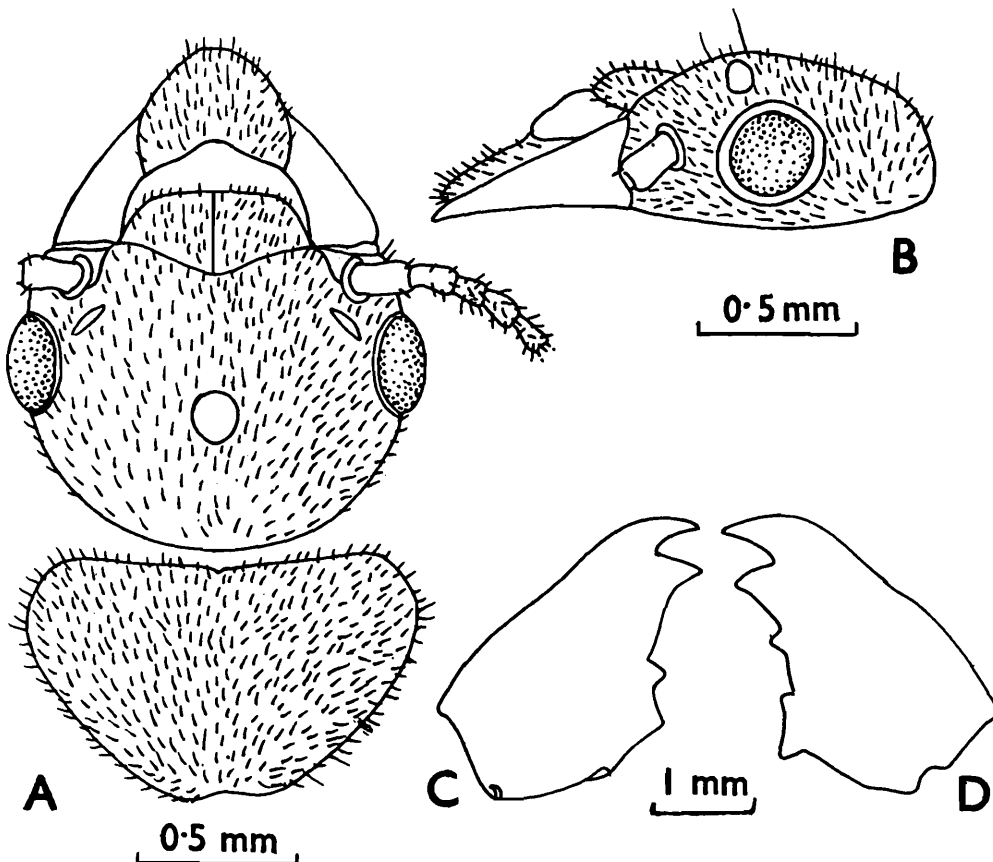


Fig. 26 : *Speculitermes roonwali*. Imago (Holotype). (A) Head and pronotum, dorsal view. (B) Head, side view. (C) and (D) Mandibles, left and right. (Ex Maiti, 1983).

and with a few cross veins between media and radius; membrane without hairs, covered thickly with micrasters; length of fore-and hindwings with scale 10.00-10.75 and 9.90-10.20 mm, respectively.

SOLDIER : Unknown.

WORKER : Unknown.

Distribution : INDIA : West Bengal (Midnapur, type-locality).

113. *Speculitermes sinhalensis* Roonwal & Sen-Sarma

(Figs. 27-30)

1. *Speculitermes cyclops sinhalensis* Roonwal and Sen-Sarma :

1960. Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (ICAR Ent. Monogr. No. 1) : 15, 23-26. W only. Holotype : W, in FRI. Type-locality : Vavuniya, Sri Lanka. Also see for other references in literature which refer to this species but under the name *S. cyclops* Wasmann. Paratype examined.
1960. Roonwal and Chhotani, *Sci. & Cult.*, **26**(3) : 143-144.
1962. Roonwal and Chhotani, *Zool. Anz.*, **168** : 57.
1964. Roonwal and Chhotani, *Indian J. Agric. Sci.*, **34**(2) : 130.

2. *Speculitermes sinhalensis* Roonwal and Sen-Sarma :

1966. Roonwal and Chhotani, *Biol. Zbl.*, **85** : 183, 186-201.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 343-344.
1977. Roonwal and Rathore, *Zool. Anz.*, **198** : 303, 305.
1977. Chhotani, *Rec. zool. Surv. India*, **72** : 368.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B)**46**(3) : 254.
1981. Chhotani, In : *Progress in Soil Biology and Ecology in India* (Ed Veeresh) : 231 (Univ. Agric. Sci., Bangalore).
1982. Bose and Das. *Rec. zool. Surv. India*, **80** : 202.
1984. Bose, *Occ.Pap. Rec. zool Surv. India*, No. 49 : 106, 114-116.
1987. Bose and Das, In : *Fauna of Orissa, State Fauna Series 1* : 104.
1989. Roonwal and Chhotani, *Fauna of India-Isoptera (Termites)* Vol. 1 : 11.

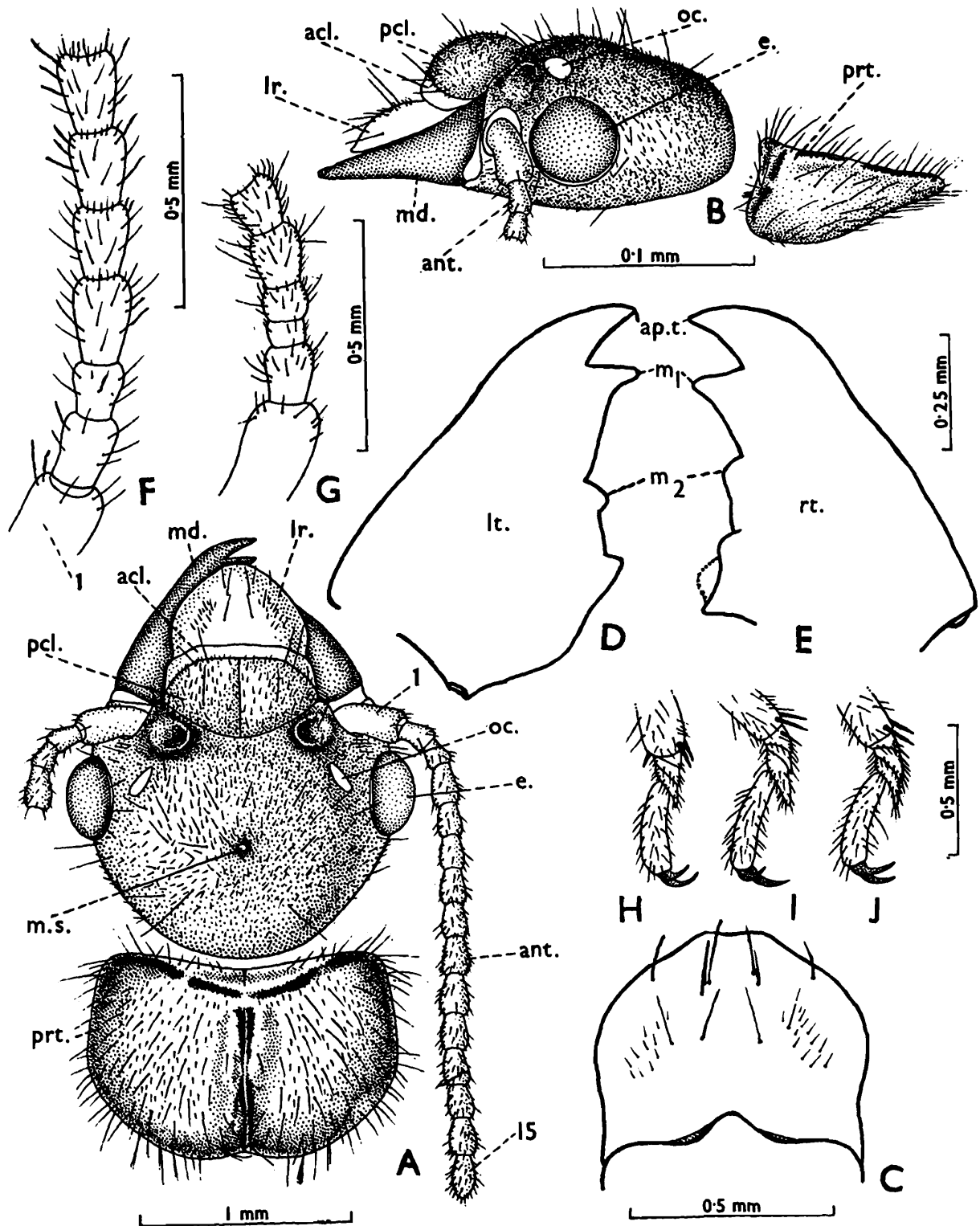


Fig. 27 : *Speculitermes sinhalensis*. Imago. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C) Labrum. (D) Left mandible, dorsal view. (E) Ditto, right mandible. (F)-(G) Right antennae of two different specimens, showing the proximal segments. Note variations in 3rd and 4th segments. (H)-(J) Fore-mid-and hind-tibiae, showing the apical tibial spurs. (Ex Roonwal and Chhotani, 1966b).

IMAGO (Figs. 27, 28) : Head-capsule blackish with a pale subcrescentic spot between ocelli and postclypeus, one on either side; antennae and labrum brown; postclypeus and pronotum blackish brown; wings brown; legs yellowish brown to brown; abdominal tergites dark brown; sternites

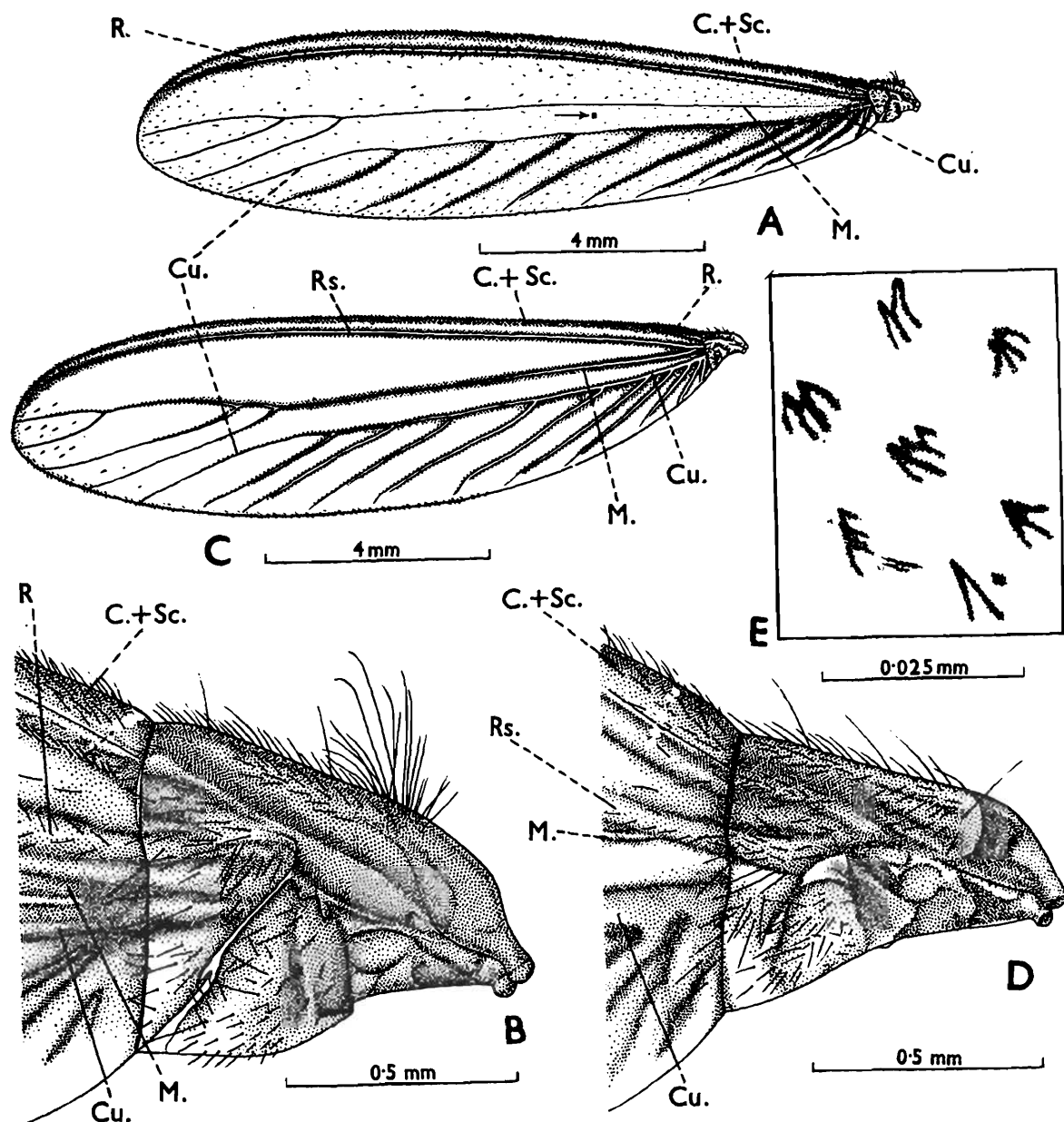


Fig. 28 : *Speculitermes sinhalensis*. (A) Left forewing with scale, in dorsal view. (B) Ditto, proximal part including scale. Enlarged. (C) Left hindwing with scale, in dorsal view. (D) Ditto, proximal part including scale. Enlarged. (E) Portion of forewing, from a place marked by arrow in figure A. Highly magnified, to show the pattern on wing-membrane (Ex Roonwal and Chhotani, 1966b).

brownish, paler medially. Head-capsule densely pilose with many small and some long hairs; body fairly densely hairy with longish hairs. Total body-length with wings 15.0-16.9, without wings 7.2-9.4 mm. Head-capsule subcircular, broader than long (length to base of mandibles 1.10-1.20, width with eyes 1.43-1.63 mm); weakly depressed in region of mid-dorsal spot on head; mid-dorsal spot minute, circular. Eyes subround, diameter 0.37-0.40 mm. Ocelli suboval, translucent (long diameter 0.17-0.18, short diameter 0.11-0.13 mm); separated from eyes by about half their long diameter (eye-ocellus distance 0.05-0.11 mm). Antennae with 15 (rarely 16) segments; 3rd segment shortest (in 16-segmented one subdivided). Postclypeus hairy with short and long hairs, length slightly more than half of width (length 0.38-0.40, width 0.68-0.73 mm). Labrum broad, tongue-shaped, anterior margin truncate medially (length 0.33-0.38, width 0.57-0.66 mm). Pronotum blackish brown with a dark marking below anterior margin and also vertically with a pale line centrally; broader than long but narrower than head (length 0.73-0.87, width 1.30-1.43 mm); anterior margin weakly incurved, not notched; posterior margin round, with a deep, median notch. Mesonotum and metanotum with deep median notch at posterior margin. Wings brownish, transparent; forewing hairy all over, hindwing hairy only distally; forewing with scale 13.1-14.7, hindwing 12.2-13.2 mm long; membrane with non-asteroid micrasters (1-3 arms) of 5-12 μm x 2-5 μm size and 3850/ mm^2 density.

SOLDIER (Fig. 29) : Head-capsule dark brown, with a pale yellow streak on either side running from frons posteriorly and converging, sometimes not prominent; antennae brown; mandibles dark brown; labrum pale yellow; thorax, legs and abdomen yellowish white. Head and thorax sparsely and abdomen moderately hairy. Total body-length 6.5-8.2 mm. Head subrectangular, flat and sloping in front in profile (length to base of mandibles 2.3-2.6, max. width 1.8-1.93 mm, index width/length 0.74-0.83). Antennae with 14 segments; 3rd segment longer than 2nd and incompletely divided. Postclypeus pale yellow, scantily hairy and subdivided into right and left halves by a thin, incomplete line; anteclypeus thin, apilose, strip-like. Labrum broadly tongue-shaped or dome-shaped (length 0.33-0.40, width 0.50-0.53 mm); with a few hairs near anterior margin and on body. Mandibles thick and long; strongly bent inwards from distal 1/3 (length 1.47-1.50 mm); a little longer than half of head-length, index mandible-length/head-length to base of mandibles 0.58-0.65;

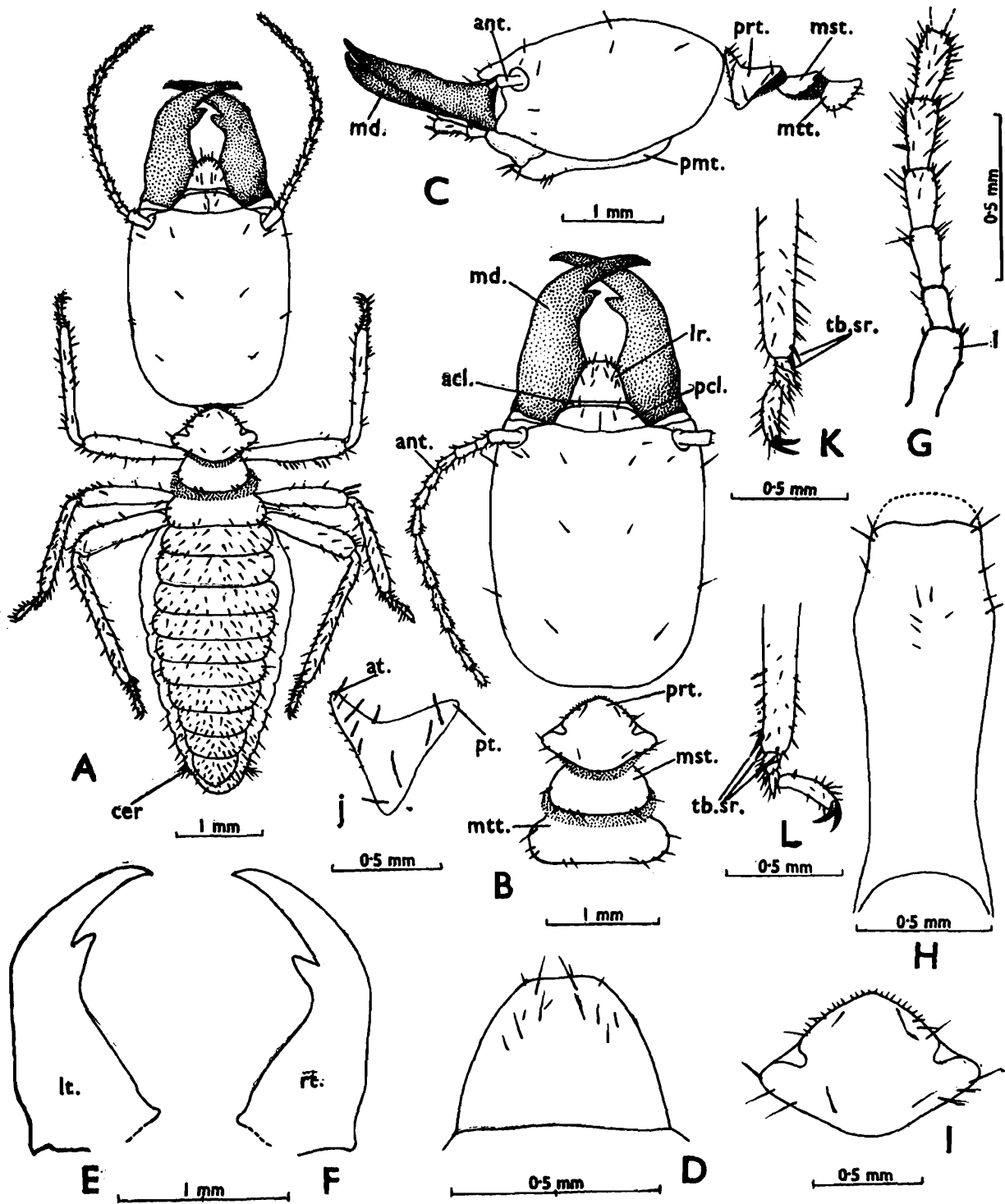


Fig. 29 : *Speculitermes sinhalensis*. Soldier. (A) Entire soldier, in dorsal view. (B) Head and thorax, in dorsal view. (C) Ditto, in side view. (D) Labrum. (E) Left mandible, dorsal view, (F) Ditto, right mandible. (G) Left antenna, dorsal view-only the proximal six segments shown. (H) Postmentum, in ventral view. (I) Pronotum, dorsal view. (J) Ditto, side view. (K) Fore-tibia, showing two apical tibial spurs (rare occurrence). (L) Fore-tibia, showing three apical tibial spurs (The general case). (Ex Ronowal and Chhotani, 1966b).

each mandible with a large, forwardly directed, triangular tooth at 1/3 of mandible-length from tip, index tooth distance/mandible length 0.31-0.33 in left and 0.35 in right mandibles. Postmentum long, club-shaped, weakly narrowed at waist; with 2 bristles on either side of anterior margin and a few shorter ones on anterior broader portion; length 1.47-1.60, max., width 0.50-0.60 and width at waist 0.33-0.43 mm. Pronotum strongly saddle-shaped; without any median notch on anterior and posterior margins; with a fringe of short hairs on anterior margin and a few longer bristles on margins, length 0.57-0.63, max. width 0.93-1.03 mm. Mesonotum slightly narrower (width 0.77-0.83 mm) and metanotum slightly wider (1.0-1.18 mm), than pronotum. Legs thin, long and hairy; apical tibial spurs 3 : 2 : 2 or 2 : 2 : 2, dorsal spur on foreleg rudimentary or sometimes absent. Abdomen elongate, moderately pilose, tergites and sternites weakly chitinised.

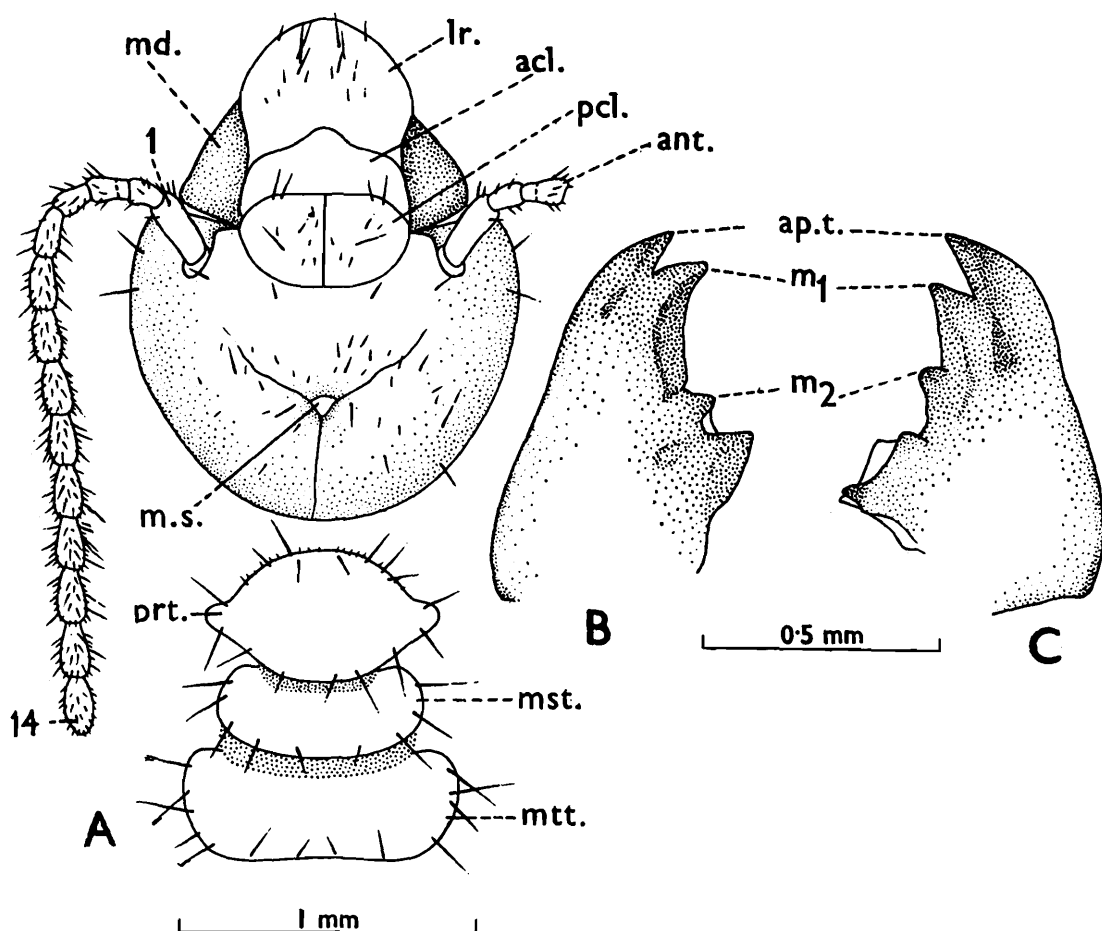


Fig. 30 : *Speculitermes sinhalensis*. Worker. (A) Head and thorax, in dorsal view. (B) Left mandible, dorsal view. (C) Ditto, right mandible (Ex Roonwal and Chhotani 1966b).

WORKER (Fig. 30) : Paratype examined. Head brown to greyish brown; postclypeus, antennae and labrum paler; body and legs translucent white. Head sparsely and body moderately hairy. Total body-length c 4.5-6.3 mm. Head subcircular (length to base of mandibles 1.05-1.17, max. width 1.25-1.40 mm) : Y-suture present; a small, round (0.07-0.11 mm diameter) mid-dorsal spot present at junction of Y-suture. Antennae with 14 segments; segment 3 longer than 2, club-shaped and subdivided. Postclypeus swollen and hairy, length half of width (length 0.29-0.33, width 0.60-0.66 mm). Pronotum saddle-shaped (length 0.37-0.40, width 0.77-0.83 mm).

Distribution : INDIA : Quite widely distributed and is recorded from Tamil Nadu, Kerala, Karnataka, Maharashtra, Andhra Pradesh, Orissa and Madhya Pradesh states. SRI LANKA.

Biology : The species makes long, subterranean, narrow galleries of 2-5 mm in diameter, running zigzag horizontally and open on the ground surface either singly or in groups of 4 or 5 usually under a stone or dry cowdung. These galleries go upto a depth of approximately 50 cm below the ground surface. The galleries often branch and cross each other terminating in round, hollow, empty pouches of 10-15 mm diameter, such pouches also occur along their course.

The winged forms emerge from nests in March-April and nymphs were come across in Septemer and early November. The soldier caste is very rare and soldier-worker percentage is 0.02-0.44 to 99.56-99.98 (Roonwal and Chhotani, 1966b).

114. *Speculitermes triangularis* Roonwal and Sen-Sarma

(Fig. 31)

Speculitermes triangularis Roonwal and Sen-Sarma :

- 1960. Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (ICAR Ent. Monogr. No. 1) : 15, 26-28. W only. Holotype : W, in FRI. Type-locality : Dehradun (U.P. India). Paratype examined.
- 1966. Roonwal and Chhotani, *Biol. Zbl.*, **85**(2) : 183.
- 1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rept. PL 480 Proj. A 7-FS-58) : 12, 62.
- 1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 32.

IMAGO : Unknown.

SOLDIER : Unknown.

WORKER (Fig. 31) : Paratype examined. Head-capsule yellow to pale straw coloured; postclypeus and labrum slightly paler than head; antennae and legs yellowish white; abdomen transparent white. Head and body moderately hairy. Total body-length c 4.5-6.00 mm. Head subcircular (length to base of mandibles 1.05-1.10, max. width 1.30-1.35 mm); mid-dorsal spot translucent white, triangular (length 0.20, width 0.30 mm), flush with head-dorsum; Y-suture faint. Antennae with 14 segments; segment 2 shortest, 3 longer than 2 ; 4 subequal to 2. Postclypeus greatly swollen, pilose, medially divided into 2 halves, length about half of width; anterior and posterior margins straight. Pronotum strongly saddle-shaped; anterior and posterior margins rounded, not notched; length 0.40-0.45, width 0.75-0.80 mm. Legs long and slender ;

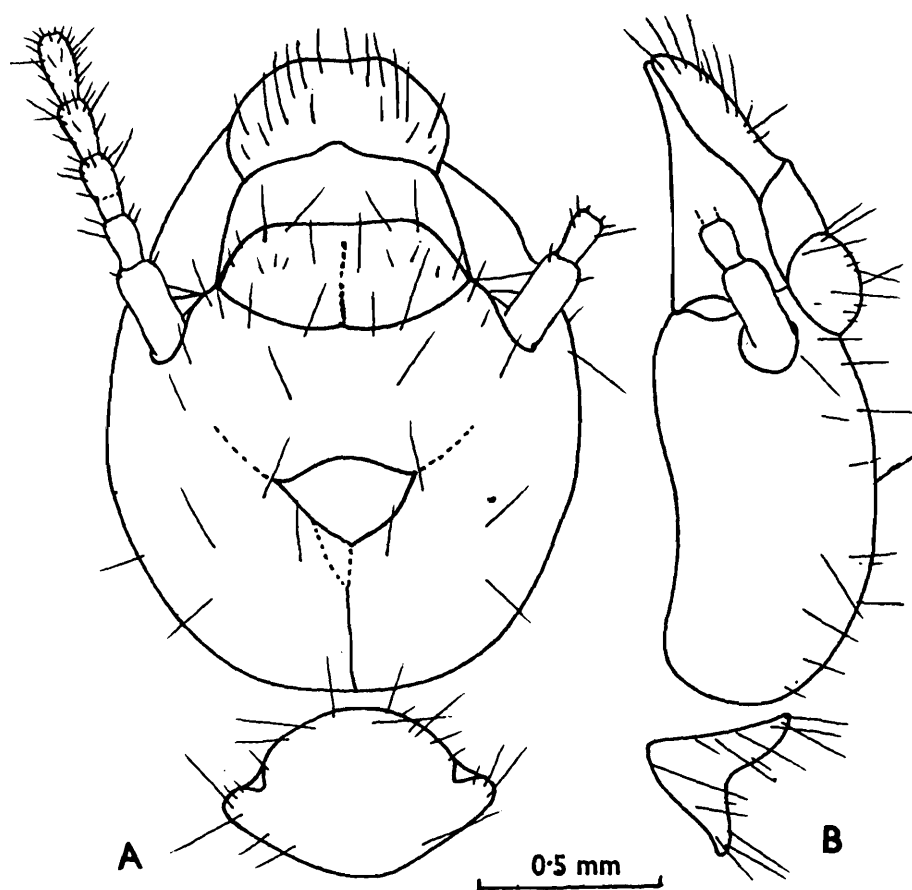


Fig. 31 : *Speculitermes triangularis*. Worker (Paratype). (A) Head and pronotum, dorsal view. (B) Head and pronotum, side view.

apical tibial spurs generally 2 : 2 : 2; sometimes 3 : 2 : 2, dorsal spur when present very minute.

Distribution : INDIA : Uttar Pradesh (Dehra Dun, type-Localities).
Known only from type-locality.

Genus 25. *Euhamitermes* Holmgren

1. Subgenus *Euhamitermes* (of *Hamitermes*) Holmgren :

1912. Holmgren, *K. Svenska Vetensk. Akad. Handl.*, **48** : 88, 89.

2. Genus *Euhamitermes* Holmgren :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 112.

1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** (Art. 2) : 64, 66.

1955. Emerson, *Fieldiana : Zool.*, **37** : 510.

1958. Ahmad, *Biologia*, Lahore, **4** (1 & 2) : 90.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 8.

1965. Roonwal and Chhotani, *Proc. zool. Soc. Calcutta*, **18** : 11.

1966. Chatterjee and Thakur, *Indian For. Bull.*, No. 256 : 10.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner)
Vol. 2 : 140, 141.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol.
2 : 345.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rept. PL 480
proj. No. A 17- FS-12) : 43.

1972. Sands, *Bull. Brit. Mus. (nat. Hist.) Ent.*, Suppl. 18 : 37.

1974. Thakur and Chatterjee, *J. Indian Acad. Wood Sci.*, **5**(2) : 75.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, Art. 7 : 59, 60.

1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 42, 44.

1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46**(3) : 254-
255.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 23.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 101, 117.

1987. Chhotani, *Beitr. Ent.*, **37** : 408, 416.

Type of genus : *Hamitermes* (*Euhamitermes*) *hamatus* Holmgren.

1. *Characters of Genus Euhamitermes*

Imago : Dark brown to blackish brown, small to medium size species; densely pilose with a mat of short hairs and some long bristles. Head subcircular; Y-suture faint or absent. Fontanelle plate minute to fairly large, round or oval. Eyes small, circular. Ocelli oval to somewhat rounded or broadly oval; from eyes separated by half their short diameter to a little less than long diameter. Antennae with 15 segments, segment 3 generally shortest, sometimes equal to 4 and 5 (*urbanii*). Postclypeus weakly swollen, slightly paler than head and less than half as long as wide, median line generally present (not indicated in *kanhaensis*). Mandibles each with an apical and two marginal teeth. Left mandible : Apical finger-like; 1st marginal slightly smaller than apical and with a long posterior margin; 2nd short, triangular. Right mandible : Apical as in left; 1st marginal with posterior margin a little longer than its anterior margin; 2nd short with incurved posterior margin. Pronotum slightly raised in front and a little paler and narrower than head; anterior margin straight or slightly outcurved, with or without median notch; posterior margin weakly emarginate medially. Legs with 3 : 2 : 2 apical tibial spurs, dorsal spur on foretibia short. Wings transparent to dirty brown, with one or two rows of pointed papillae on anterior and a row on posterior margins and simple 2-3 armed micrasters on membrane. Costa thick, subcosta short meeting costa just outside scale in forewing, absent in hindwing; radius as thick as costa, running close and parallel to costa; media weak, arising independently in forewing and from radius in hindwing, branching out near distal end; cubitus with 9-10 branches to posterior margin. Abdomen elongate, cerci 2-jointed; styli absent.

Soldier : Pale yellow to pale brownish and delicate. Head subrectangular, sides substraight; Y-suture absent. Fontanelle indistinct. Eyes and ocelli absent. Clypeus divided into an ante- and a postclypeus; anteclypeus pilose, subrectangular. Labrum broad, tongue-shaped. Antennae with 14 segments; segments 2 and 3 generally subequal, 3 sometimes shorter (*aruna*, *chhotanii*); 4 generally shortest, sometimes subequal to 3 (*chhotanii*, *indicus*). Mandibles short, sickle-shaped, very broad basally and incurved at tip; each mandible with a small to a fairly large tooth in middle third and one or two small denticles on broad basal part. Postmentum club-shaped weakly to fairly incurved at waist.

Pronotum strongly saddle-shaped; anterior lobe generally without any emargination, sometimes with a weak notch (*dentatus*). Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Abdomen oblong; cerci 2 jointed.

Worker : Pale creamish to straw coloured with abdomen greyish due to gut contents showing through; fairly hairy. Head subcircular. Fontanelle indistinct, a whitish spot however present on mid-dorsum. Eyes and ocelli absent. Postclypeus weakly swollen, length less than half of width. Labrum broad, tongue-shaped. Antennae with 14 segments. Mandibles as in imago. Pronotum, legs and abdomen as in soldier, fore tibia swollen.

2. Distribution and Composition of *Euhamitermes*

(Fig. 1)

Genus *Euhamitermes* is endemic to the Oriental Region with all the 10 known species reported from the Indian Region. One of the species i.e. *E. hamatus* is, however, very widely distributed in the whole region.

List of species form Indian Region :

1. *Euhamitermes aruna* Chhotani—India (Arunachal Pradesh)
2. *E. chhotanii* Maiti—India (West Bengal)
3. *E. dentatus* Thakur and Chatterjee—India (Andhra Pradesh)
4. *E. hamatus* Holmgren—Bangladesh, Burma, Thailand, Singapore, Malayasia (Malacca).
5. *E. indicus* Holmgren and Holmgren—India (Tamil Nadu).
6. *E. kanhaensis* Roonwal and Chhotani—India (Madhya Pradesh, Arunachal Pr.). Bangladesh.
7. *E. karnatakensis* Roonwal and Chhotani—India (Karnataka)
8. *E. lighti* Snyder—India (Uttar Pradesh)
9. *E. urbanii* Roonwal and Chhotani—Bhutan
10. *E. wittmeri* Roonwal and Chhotani—Bhutan

3. Keys to Indian Species of *Euhamitermes*

IMAGOES

Of the ten species of the genus, imagoes are known for only five species and keyed as follows :—

- 1(6) Ocellus large, oval (long diameter 0.13-0.15, short diameter 0.09-0.11 mm)
- 2(3) Smaller species (total body-length with wings 12.3-13.2, without wings 7.8-8.3, head-width with eyes 1.03-1.13, pronotum-width 0.93-1.03 mm); Y-suture present, faint; ocellus from eye separated by about its short diameter..... *wittmeri*
- 3(2) Larger species (total body-length with wings 13.00-14.8, without wings 7.5-9.25, head-width with eyes 1.15-1.30, pronotum-width 1.00-1.17 mm); Y-suture absent; ocellus from eye separated by about half its short diameter to about half its long diameter
- 4(5) Fontanelle plate oval and larger (0.13 mm long); ocellus closer to eye, separated by half its short diameter..... *urbanii*
- 5(4) Fontanelle plate oval and smaller (0.08 mm long); ocellus farther from eye, separated by half long diameter..... *lighti*
- 6(1) Ocellus smaller, broadly oval (long diameter 0.09-0.13, short diameter 0.07-0.10 mm)
- 7(8) Head smaller (max. width with eyes 0.96-1.06 mm) and pronotum narrower (width 0.85-0.90 mm); ocellus smaller (length 0.09-0.11, width 0.07-0.09 mm) and separated from eye by its short diameter or width (0.07 mm); median line of postclypeus not indicated *kanhaensis*
- 8(7) Head larger (max. width with eyes 1.06-1.22 mm) and pronotum wider (width 0.96-1.22 mm); ocellus larger (length 0.10-0.13, width 0.09-0.10 mm) and separated from eye by about its long diameter or a little less; median line of postclypeus present..... *hamatus*

SOLDIERS

Soldiers of 8 of the 10 species are known and are keyed as follows :—

- 1(4) Smaller species : Head-length to base of mandibles less than 1.40 mm, head-width 0.97-1.11 mm

- 2(3) Head-length to base of mandibles 1.27, head-width 0.97 mm; head comparative to length narrower, index width/length 0.76; third segment of antenna shortest*aruna*
- 3(2) Head-length to base of mandibles 1.38, head width 1.11 mm; head comparative to length wider, index width/length 0.805; third segment of antenna subequal to fourth.....*chhotanii*
- 4(1) Larger species : Head-length to base of mandibles more than 1.40 mm, head-width 1.07-1.30 mm
- 5(8) Tooth on each mandible small and not very prominent
- 6(7) Larger species : Head-length to base of mandibles 1.90 mm; head narrower in comparison to length, index width/length without mandibles 0.60.....*indicus*
- 7(6) Smaller species : Head-length to base of mandibles 1.43-1.75 mm; head wider in comparison to length, index width/length 0.71-0.81.....*hamatus/lighti*
- 8(5) Tooth on each mandible large and prominent
- 9(10) Larger species : Head-length to base of mandibles 1.75, max. width 1.30 mm; tooth on each mandible forwardly placed, index tooth-distance/mandible-length 0.27.....*dentatus*
- 10(9) Smaller species : Head-length to base of mandibles 1.44-1.60, max. head-width 1.07-1.20 mm; tooth on each mandible comparatively backwardly placed, index tooth-distance/mandible-length 0.32-0.40
- 11(12) Mandibles thinner, index width at base/length 0.64; tooth smaller and lying somewhat anteriorly, index tooth-distance/mandible-length 0.32.....*kanhaensis*
- 12(11) Mandibles thicker, index width at base/length 0.67-0.71; tooth larger and lying somewhat posteriorly, index tooth-distance/mandible-length 0.39-0.40.....*karnatakensis*

115. *Euhamitermes aruna* Chhotani

(Fig. 32)

Euhamitermes aruna Chhotani:

1975. Chhotani, *Orient. Insects*, 9 (2) : 149-153 : S and W. Holotype S, in ZSI. Type-locality : Charduar Forest (towards Bhalukpong), Kameng Div., Arunachal Pradesh, India.

In press. *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Not known.

SOLDIER (Fig. 32) : Head-capsule straw yellow, brownish at base of mandibles; mandibles brownish, paler basally; antennae, labrum, legs and body paler than head. Head and body fairly pilose. Total body-length c 4.0 mm. Head-capsule subrectangular, longer than wide (length to base of mandibles 1.27, maximum width 0.97 mm, index width/length 0.76); in

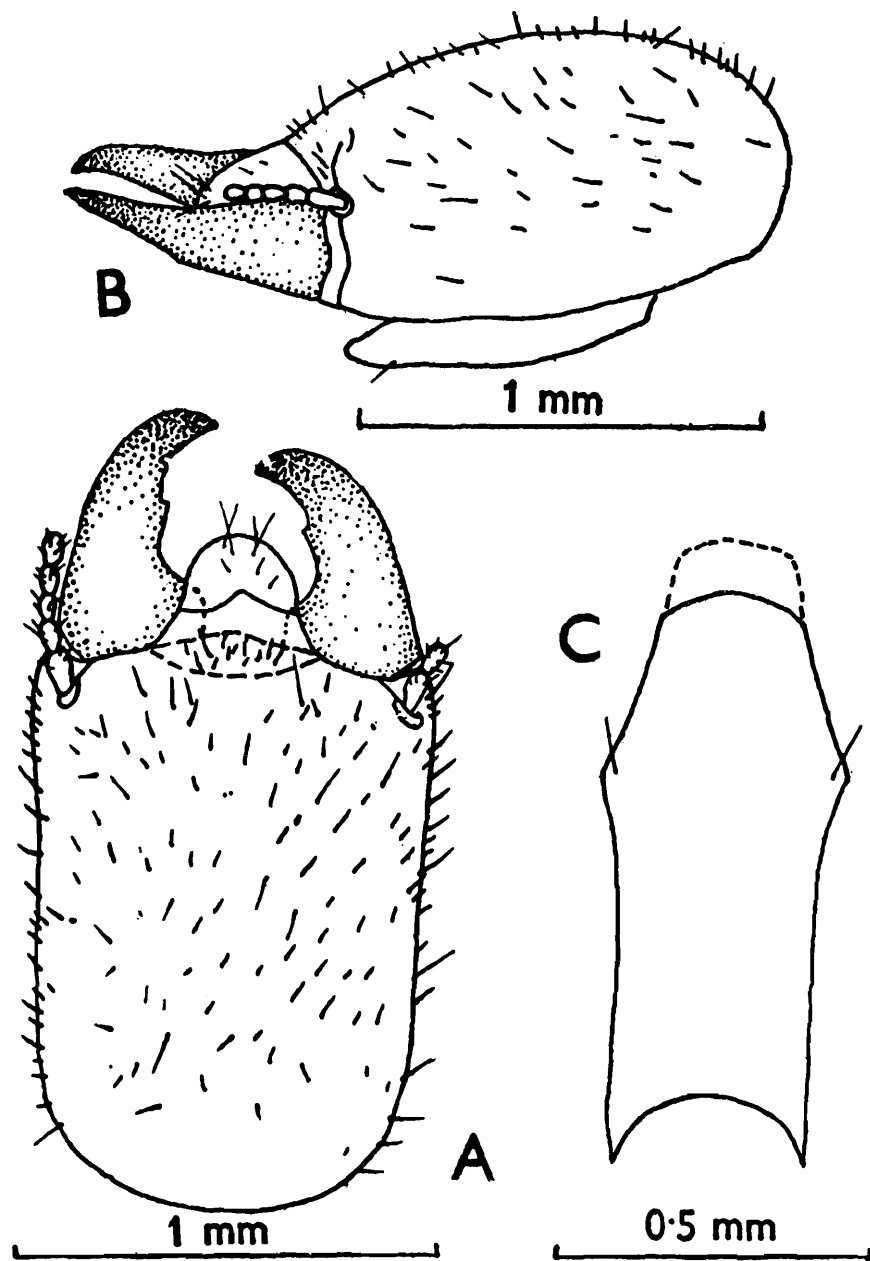


Fig. 32 : *Euhamitermes aruna*. Soldier (Holotype). (A) Head, dorsal view. (B) Same, side view. (C) Postmentum. (After Chhotani, 1975).

profile convex above; frons inclining in front slightly. Anteclypeus subtrapezoidal, apilose, medially projected in front; postclypeus subrectangular, pilose. Antennae with ? segments; segment 3 shortest. Labrum broadly tongue-shaped, wider than long (length 0.20, width 0.30 mm). Mandibles thick, short and sickle-shaped; basally thick and broad (length 0.60-0.63, width at base 0.43 mm); each mandible with a small tooth at distal third. Postmentum club-shaped; widest at anterior one third and posteriorly narrowing weakly to a thick waist; anterior margin convex and posterior margin fairly deeply incurved (median length 0.87, maximum width 0.37, width at waist 0.30 mm). Pronotum saddle-shaped; anterior margin convex, without notch; posterior margin weakly convex (length 0.27, width 0.43 mm).

WORKER : Head-capsule straw yellow, paler medially; antennae, labrum, thorax and legs paler; abdomen greyish due to intestinal contents showing through. Head and body densely hairy. Total body-length 3.00-3.40 mm. Head subcircular, a little wider than length to base of mandibles (length 0.63-0.67, width 0.73-0.77 mm). Anteclypeus apilose, trapezoidal, projected in front medially; postclypeus swollen, pilose (length 0.15-0.17, width 0.37 mm). Labrum broadly tongue-shaped, with a few hairs on body. Mandibles of *Euhamitermes*-type. Pronotum as in soldier (length 0.20-0.30, width 0.45-0.50 mm).

Distribution : INDIA : Charduar Forest, Kameng Div., Arunachal Pradesh.

116. *Euhamitermes chhotanii* Maiti

(Fig. 33)

Euhamitermes chhotanii Maiti :

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 63-68. S and W.
Holotype : S, in ZSI. Type-locality : Atiamochar Forest Beat, Cooch Behar Forest Range, Cooch Behar Dist., West Bengal, India.

IMAGO : Unknown.

SOLDIER (Fig. 33A-E) : Head-capsule creamish yellow, somewhat darker posteriorly; antennae, labrum, legs and abdomen whitish; mandibles dark brown, paler basally; pronotum paler than head. Head and body fairly densely hairy. Total body-length 4.20-4.60 mm. Head

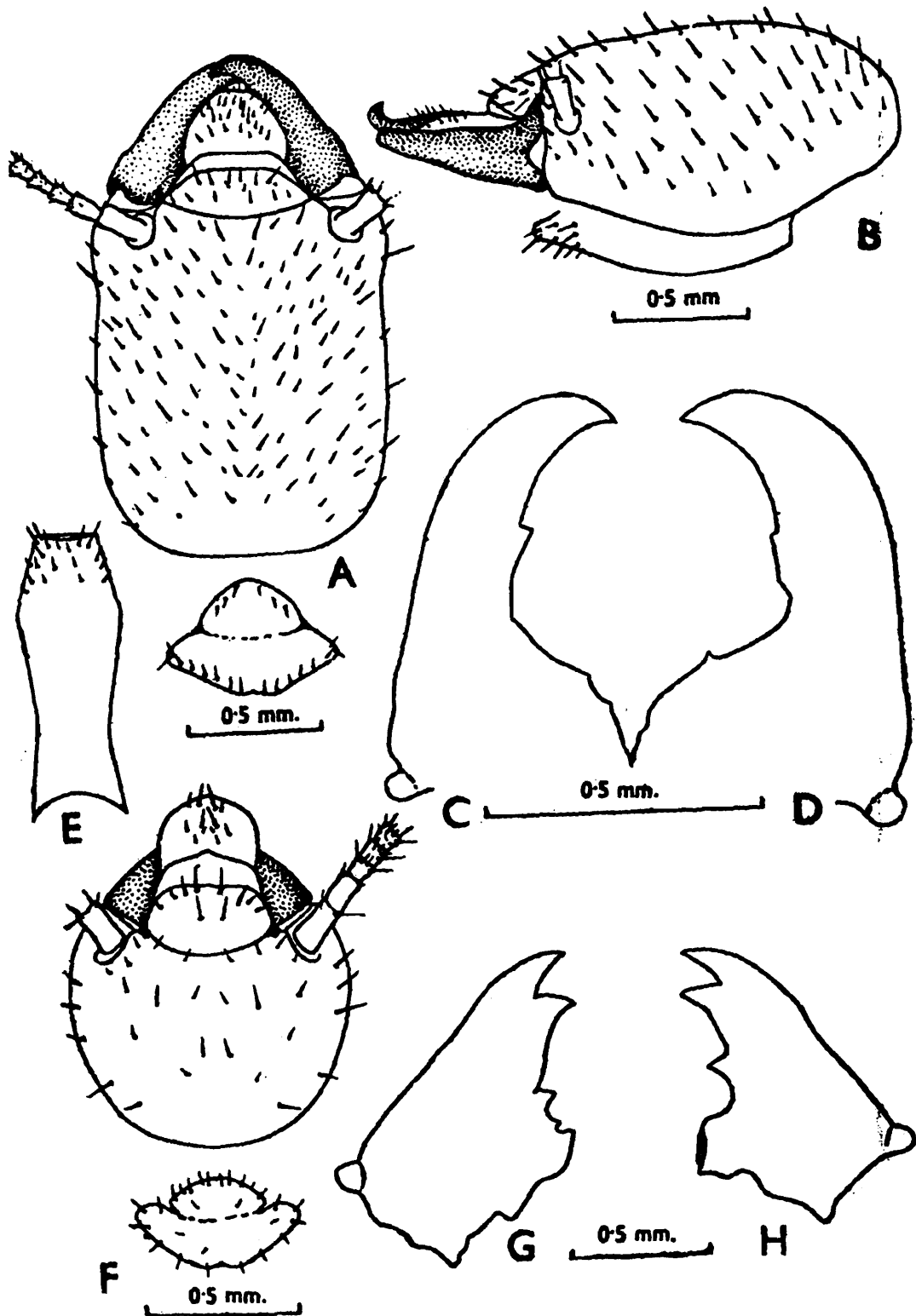


Fig. 33 : *Euhamitermes chhotanii*. Soldier (A-E). (A) Head and pronotum, in dorsal view. (B) Head, in side view (C) and (D) Left and right mandibles respectively. (E) Postmentum. Worker (F-H). (F) Head and pronotum, in dorsal view. (G) and (H) Left and right mandibles. (After Maiti, 1983).

subrectangular, longer than wide (length to base of mandibles 1.38, max. width 1.11 mm); Y-suture absent. Antennae with 14-segments; segment 3 shorter than 2, 4 subequal to 3. Anteclypeus hyaline, yellowish white, apilose; postclypeus pilose, subtrapezoidal, flat. Labrum broadly tongue-shaped, broader than long (length 0.21, width 0.32 mm), pilose with scattered hairs on body and near anterior margin. Mandibles short, stout and sickle-shaped, very broad basally (length 0.69, width at base 0.42 mm); about half of head-length, head-mandibular length index 0.50. Left mandible with a small tooth situated a little behind one-third of its length from tip (tooth-distance from tip 0.24 mm) and 2 minute denticles in basal portion; right with a somewhat smaller tooth at distal third (tooth-distance from tip 0.25 mm) and a minute denticle in basal portion. Postmentum long, club-shaped, widest at about anterior one-third whence sides gradually and weakly incurved to fairly wide waist (length 0.96, max. width 0.38, width at waist 0.30 mm, postmentum-contraction index i.e. width at waist/max. width 0.78). Pronotum strongly saddle-shaped; anterior margin without median notch, posterior margin weakly emarginate medially; length 0.38, width 0.61 mm.

WORKER (Fig. 33F-H) : Head-capsule creamish white, paler anteriorly; antennae, labrum, legs and thorax whitish; abdomen blackish due to intestinal contents showing through. Head and body fairly densely hairy. Total body-length 4.15-4.35 mm. Head subcircular, broader than long (length to base of mandibles 0.69-0.73, max. width 0.80-0.90 mm). Anteclypeus hyaline, apilose, subtrapezoidal; postclypeus swollen and pilose, length about half of width (length 0.15-0.20, width 0.30-0.40 mm). Labrum broad, tongue-shaped; with a few short and long hairs on body and near anterior margin (length 0.22-0.27, width 0.31-0.39 mm). Pronotum saddle-shaped (length 0.25-0.28, width 0.48-0.53 mm).

Distribution : INDIA : West Bengal : Atiamochar Forest Beat, Cooch Behar Forest Range, Dist. Cooch Behar, type-locality. Known only from type-locality.

117. *Euhamitermes dentatus* Thakur and Chatterjee

(Fig. 34)

Euhamitermes dentatus Thakur and Chatterjee :

1974. Thakur and Chatterjee, *J. Indian Acad. Wood Sci.*, 5(2) : 72-75. S

and W. Holotype : S, in FRI, Dehradun. Type-locality : Satpalli. Compartment No. 266, Lankapalli Block, Annapradipalli Range, Khammam Division, Andhra Pradesh.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 31.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No 49 : 117-118.

IMAGO : Unknown.

SOLDIER (Fig. 34) : Head-capsule yellowish; mandibles pale brown, paler basally; body whitish. Head and body fairly densely hairy. Total body-length 5.35 mm. Head-capsule subrectangular (length to base of mandibles 1.75, max. width 1.30 mm, index width/length 0.74); sides subparallel; posterior margin sinuate; Y-suture absent. Fontanelle indistinct. Antennae with 14 segments; segments 2 and 3 subequal, 4 shortest. Postclypeus flat, pilose, elyptical; anteclypeus hyaline, apilose, strip-like. Mandibles thick, sickle-shaped, very broad basally; about half

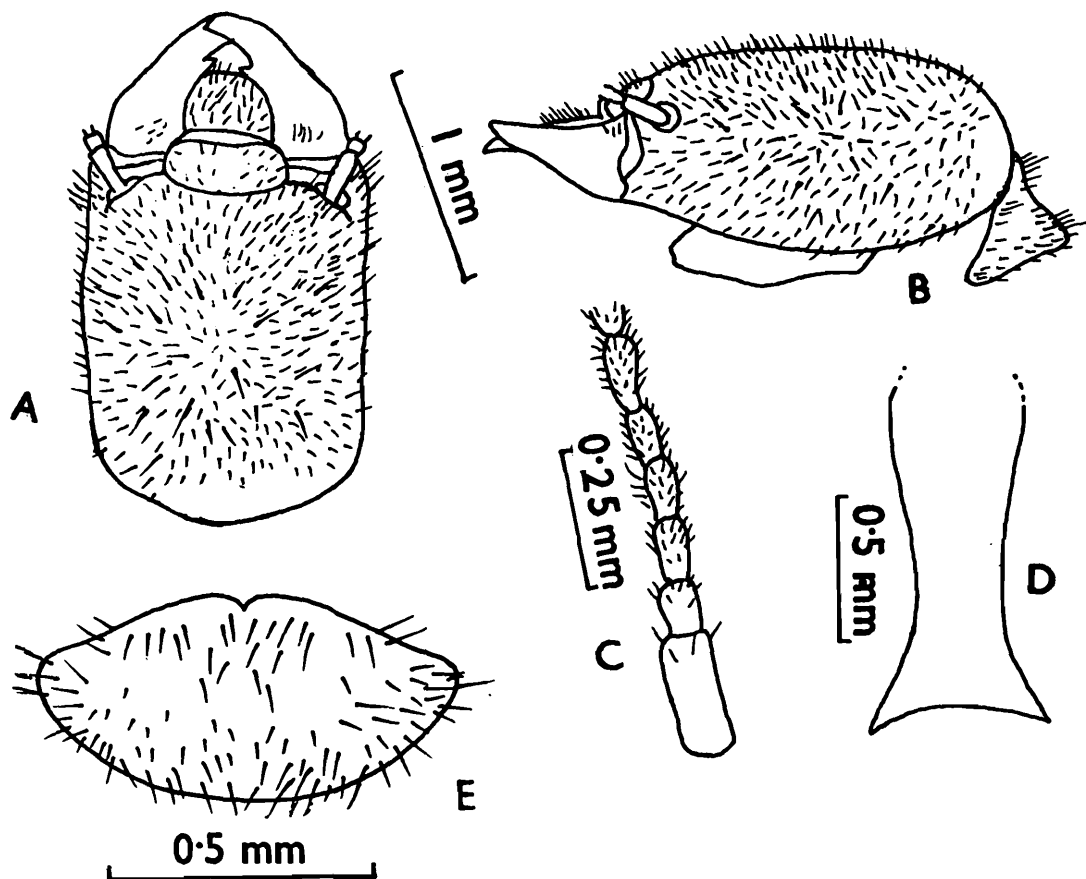


Fig. 34 : *Euhamitermes dentatus*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal segments of antenna. (D) Postmentum. (E) Pronotum. (Ex Thakur and Chatterjee, 1974).

of head-length to base of mandibles (length 0.88 mm, index mandible-length/head-length 0.50); with a sharp, prominent tooth near distal third (tooth index i.e. tooth-distance from tip/mandible-length 0.27). Postmentum club-shaped; waist lying below middle (length 1.0, max. width 0.45, width at waist 0.25 mm). Pronotum strongly saddle-shaped; anterior margin with a weak notch medially; wider than long (length 0.43, width 0.70 mm).

WORKER : Head, antennae, labrum and thorax pale yellow; abdomen greyish due to gut contents showing through. Head and body fairly hairy. Total body-length 4.00-4.70 mm. Head-capsule subcircular (length to base of mandibles 0.70-0.80, max. width 0.80-0.95 mm); Y-suture absent. Fontanelle plate whitish, hyaline, circular spot (0.10 mm); situated on mid-dorsum. Eyes and ocelli absent. Antennae with 14-segments; segment 4 shortest. Mandibles as in genus. Pronotum saddle-shaped (length 0.25-0.30, max. width 0.50-0.58 mm).

Distribution : INDIA : Andhra Pradesh : Satpalli, Compartment No. 266, Lankapalli Block, Annapradipalli Range, Khammam Division, (type-locality). Known only from type-locality.

118. *Euhamitermes hamatus* Holmgren

(Figs. 35, 36)

1. *Hamitermes (Euhamitermes) hamatus* Holmgren :

1912. Holmgren, *K. Svenska Vetensk. Akad. Handl.*, **48**(4) : 89, 93, 98, Pl. 4 fig. 22. S only. Holotype : Probably in Holmgren Coll., Stockholm. Type-locality : Singapore.

1913. Holmgren, *K. Svenska Vetensk. Akad. Handl.*, **50**(2) : 223-224, Pl. 8 fig. 18.

2. *Euhamitermes hamatus* Holmgren :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 112.

1958. Ahmad, *Biologia*, Lahore, **4** : 163.

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 4-5.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 63-64.

1972. Chaudhry, et al., *Termites of Pakistan* (Final Tech. Rep. PL. 480 Project No. A 17-FS-12) : 43, fig. 48.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab, (N.S.)*, Art. 7 : 121-122.

1977. Roonwal and Chhotani, *Ent. Basil.*, 2 : 56, 58.

1983. Maiti, *Occ. Pap. Rec. zool. Surv India*, No. 42 : 67.

IMAGO (Fig. 35) : Head-capsule dark brown with a pale, small spot in front of fontanelle plate and an ocellus-like paler spot in front of ocelli; postclypeus paler than head; antennae pale brown; labrum yellowish; pronotum brown, paler than head; legs yellowish brown; abdomen brown above, paler than head, underside paler. Head and body covered with thick mat of short hairs and several longer bristles. Wings covered with "minute hairs" (Ahmad 1965), probably minute micrasters as found in other species. Head subcircular, wider than length to base of mandibles (length 0.72-0.94, max. width with eyes 1.06-1.22 mm); suture faint. Fontanelle small, circular, hyaline; situated medially. Eyes subcircular (max. diameter 0.27-0.31 mm); from lower margin separated by 0.05-0.08 mm. Ocelli round to broadly oval (length 0.10-0.13, width 0.09-0.10 mm); separated from eyes by a little less than to a little more than their

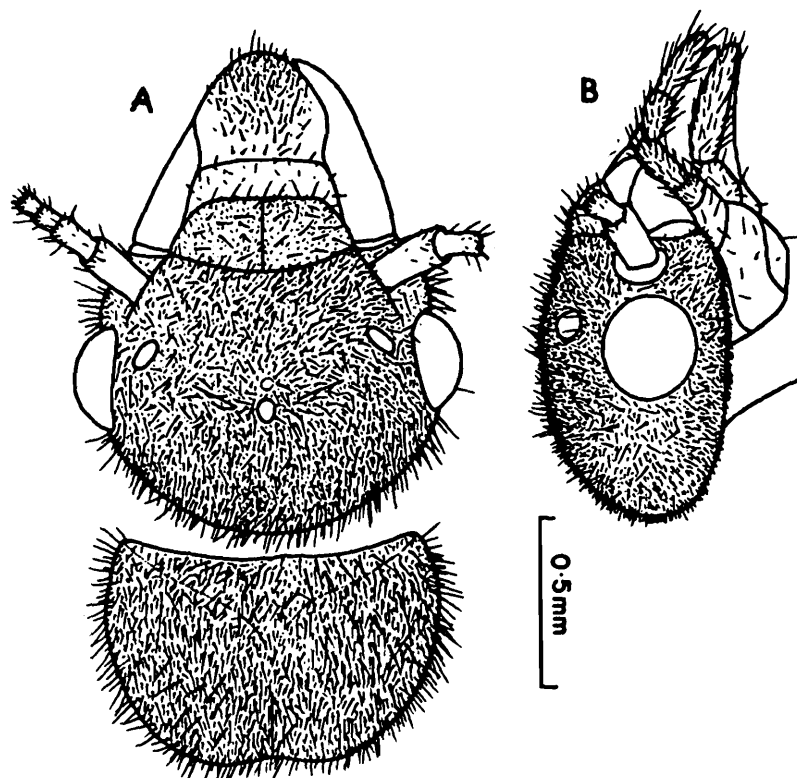


Fig. 35 : *Euhamitermes hamatus*. Imago. (A) Head, and pronotum, dorsal view. (B) Head, side view. (After Krishna, 1965b).

diameter (0.06-0.12 mm). Antennae with 15 segments; segment 3 shortest. Postclypeus pilose, weakly swollen, a little shorter than half of width (length 0.18-0.23, width 0.44-0.49 mm). Anteclypeus hyaline, apilose, subtrapezoidal, weakly projected in front medially. Labrum broad, tongue-shaped. Pronotum a little narrower than head (length 0.64-0.71, width 0.96-1.22 mm); anterior margin substraight or weakly incurved, not emarginate medially; posterior margin weakly emarginate.

SOLDIER (Fig. 36) : Head-capsule yellowish brown; postclypeus yellowish, anteclypeus paler; mandibles reddish brown, paler basally; antennae yellowish; pronotum yellow; abdomen whitish. Head densely covered with short hairs and scattered long bristles; pronotum slightly less hairy. Head subrectangular, longer than wide (length to base of mandibles 1.43-1.51, max. width 1.14-1.21 mm); widest at base of antennae. Fontanelle indistinct. Antennae with 14-segments; segment 3 subequal to 2, 4 shortest. Postclypeus as hairy as head, elyptical; anteclypeus apilose, weakly projecting in front medially. Labrum broad, dome-shaped; broader than long. Mandibles short, stout, very broad basally; about half of head-length (length 0.67-0.80 mm); each mandible with a small tooth at about distal one-third (tooth distance from tip 0.23-

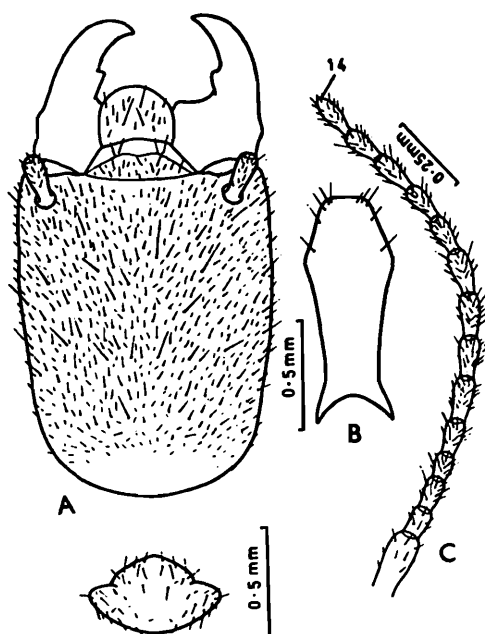


Fig. 36 : *Euhamitermes hamatus*. Soldier. (A) Head and pronotum, dorsal view. (B) Postmentum. (C) Antenna. (After Akhtar, 1975).

0.29 mm). Postmentum club-shaped, elongate (length 0.91-1.04, max. width 0.37-0.46, width at waist 0.23-0.26 mm); waist lying near posterior margin. Pronotum strongly saddle-shaped; anterior lobe convex, without medial notch; posterior margin also convex, without any emargination (length 0.38-0.39, width 0.65-0.68 mm).

Distributaion : BANGLADESH : Shishak Forest. BURMA : Maibung, east of Salween River, Pa-an, Karen state. THAILAND : (Kachong). SINGAPORE, MALAYSIA (Malacca).

119. *Euhamitermes indicus* Holmgren and Holmgren

1. *Hamitermes (Euhamitermes) indicus* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, **5** : 165-166. S and W. Holotype : Probably in Holmgren Coll., Stockholm. Type-locality : Shevaroy Hills, Tamil Nadu.

2. *Euhamitermes indicus* Holmgren and Holmgren :

1949. Snyder. *Smiths. misc. Colls.*, **112** : 112.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 67.

1984. Bose, *Occ. Pap. Rec. zool. Surv.. India*, No. 49 : 117, 118, 120.

IMAGO : Unknown.

SOLDIER : Head yellow; mandibles brown towards tip; body whitish. Head with scattered short hairs; abdomen with dense short hairs. Total body-length 5.0-5.50 mm. Head-capsule subrectangular; longer than wide (length without mandibles 1.90, max. width 1.14 mm), longer but slenderer than in *hamatus*. Clypeus, labrum and mandibles as in *hamatus*. Antennae with 14 segments; segment 2 longer than 3 and 4 equal to 3. Pronotum saddle-shaped; anterior margin not indented; width 0.72 mm.

WORKER : Head yellowish, body whitish. Sparsely hairy. Head oval, narrowed anteriorly, max. width of head 0.80 mm. Fontanelle not distinct. Antennae with 14-segments; segment 3 shorter than 2; 4 shorter than 3. Pronotum strongly saddle-shaped; anterior lobe rather large, not indented; max. width 0.57 mm.

Distribution : INDIA. Tamil Nadu : Shevaroy Hills, c 4000 ft.

120. *Euhamitermes kanhaensis* Roonwal & Chhotani

(Figs. 37,38)

Euhamitermes kanhaensis Roonwal and Chhotani :

1965. Roonwal and Chhotani, *Proc. zool. Soc.*, Calcutta, 18 : 11-16, 19. S and W. Holotype : S, in ZSI. Type-locality : Kanha National Park, Mandla Dist., Madhya Pradesh, India.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Project No. A17-FS-12) : 44. fig. 49.
1974. Thakur and Chatterjee, *J. Indian Acad. Wood Sci.*, 5(2) : 75.
1975. Akhtar, *Bull. Dept. Zool Univ. Panjab (N.S.)*, Art. 7 : 121, 123-126.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 31.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 67, 68.
- In press. Bose, *Occ. Pap. Rec. zool. Surv. India*.

IMAGO (Fig. 37) : Head-capsule dark brown, slightly paler anteriorly; postclypeus paler; antennae light brown; pronotum light brown with smoky

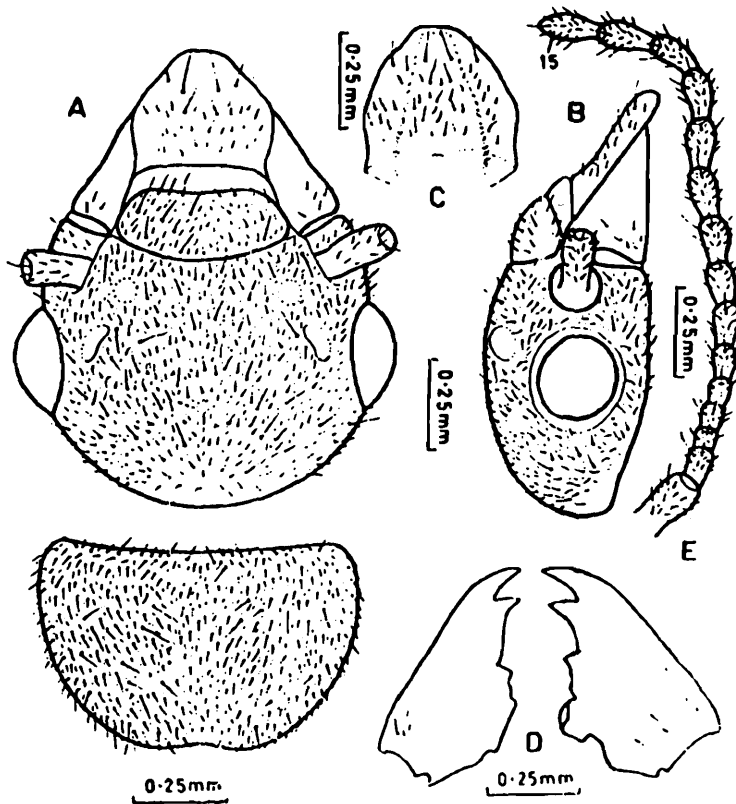


Fig. 37 : *Euhamitermes kanhaensis*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Labrum. (D)-(E) Left and right mandibles. (After Akhtar, 1975).

tinge; legs yellowish brown; abdomen above as dark as pronotum. Head and pronotum densely hairy with many short and a few long hairs. Head subcircular, wider than length to base of mandibles (length 0.68-0.78, maximum width 0.96-1.06 mm); epicranial suture faintly marked. Fontanelle small, circular. Eyes subcircular, bulging out (max. diameter 0.27-0.29, minimum diameter 0.24-0.27 mm). Ocelli broadly oval; separated from eyes by their short diameter (long diameter 0.09-0.11, short diameter 0.07-0.09, eye-ocellus distance 0.07 mm). Postclypeus weakly swollen, length subequal to half its width (length 0.18-0.22, max. width 0.41-0.46 mm); median line not clear. Labrum dome-shaped. Antennae with 15 segments; segment 3 shortest. Pronotum flat, a little narrower than head; anterior margin shallowly incurved, not notched; posterior margin incurved medially (length 0.51-0.57, width 0.85-0.98 mm).

SOLDIER (Fig. 38) : Head-capsule straw yellow to yellowish with brownish tinge; antennae, postclypeus, labrum, legs and thorax paler than head; mandibles brownish, paler basally. Head and body fairly densely hairy. Total body-length c 4.0-7.0 mm. Head-capsule subrectangular, longer than wide (length to base of mandibles 1.44-1.50, width 1.10-1.18 mm); sides subparallel; posterior margin rounded. Fontanelle and epicranial sutures indistinct. Postclypeus flat, oval, pilose; anteclypeus trapezoidal, weakly projected in front medially. Labrum broadly tongue-shaped with short and long hairs on body and anterior margin; anterior margin truncate and weakly incurved medially (length 0.27, width 0.33 mm). Antennae with 14 segments; segment 3 subequal to 2; 4 shortest. Mandibles short, stout, broad basally (length 0.70-0.73, width at base 0.47 mm, width at base/length index 0.64). Left mandible with a prominent tooth at distal third and 2 weak denticles at base; right with tooth as in left and one small denticle near base; left mandibular tooth index i.e. tooth distance from tip/length of mandible 0.23. Postmentum long, club-shaped, widest at anterior one-third whence gradually narrowing behind into a waist near hind margin (length 0.78-1.00, max. width 0.33-0.41, width at waist 0.20-0.26 mm). Pronotum saddle-shaped, broader than long (length 0.33-0.35, max. width 0.57-0.62 mm); anterior margin convex, without notch; posterior margin outcurved without indentation or notch.

WORKER : Head-capsule and postclypeus pale straw yellow; antennae, labrum, legs and thorax paler; abdomen greyish due to intestinal

contents showing through. Total body-length c 3.50-3.80 mm. Head-capsule subcircular (max. width 0.80-0.84, length to base of mandibles 0.67-0.73 mm). Fontanelle indistinct. Postclypeus pilose, swollen; length subequal to half of width (length 0.20-21, width 0.37-0.39 mm); anteclypeus subtrapezoidal, apilose; somewhat projected in front medially. Labrum

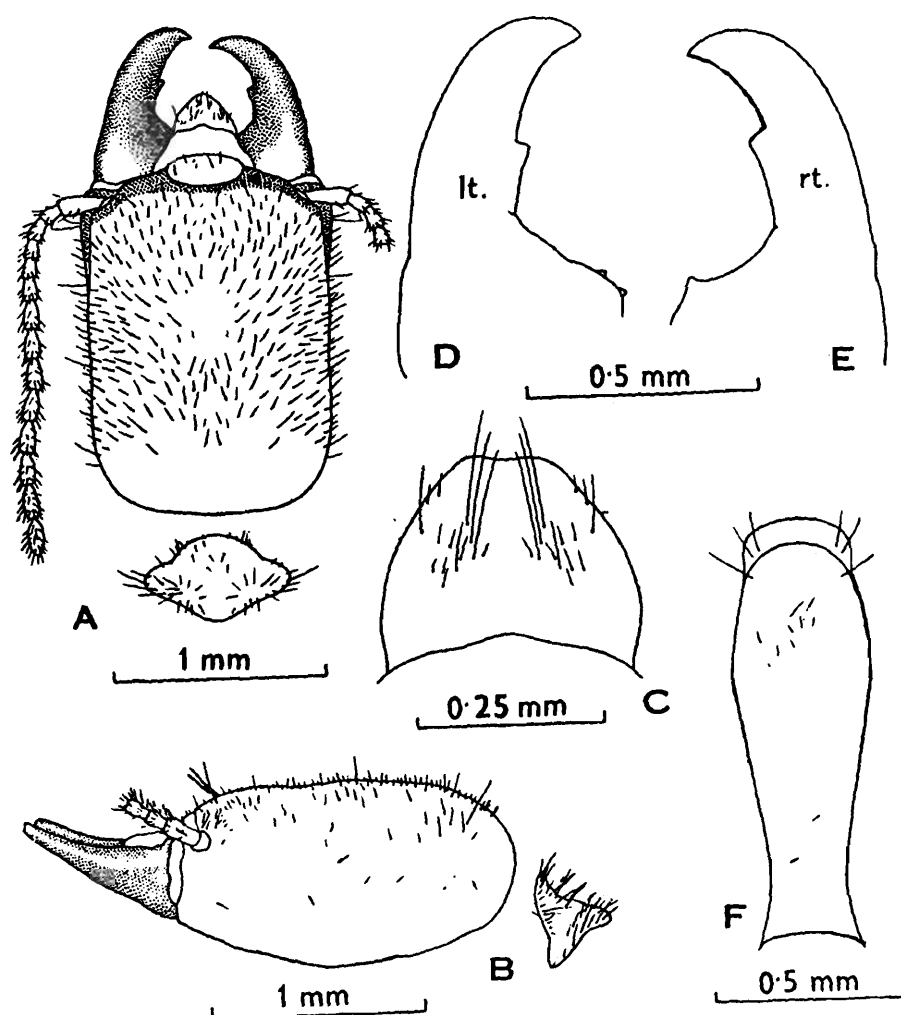


Fig. 38 : *Euhamitermes kanhaensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C) Labrum. (D) and (E) Left and right mandibles. (F) Postmentum. (After Roonwal and Chhotani, 1965a).

broad, tongue-shaped. Pronotum as in soldier (length 0.20-0.28, width 0.47-0.50 mm).

Distribution : INDIA : Kanha National Park, District Mandla, Madhya Pradesh, Arunachal Pradesh. BANGLADESH (Shishak Forest).

121. *Euhamitermes karnatakensis* Roonwal & Chhotani

(Figs. 39,40)

Euhamitermes karnatakensis Roonwal and Chhotani :

1965. Roonwal and Chhotani, *Proc. zool. Soc.*, Calcutta, **18** : 16-19. S and W. Holotype : S, in ZSI. Type-locality : Dharwar, Karnataka.
1974. Thakur and Chatterjee, *J. Indian Acad. Wood Sci.*, **5**(2) : 75.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rept. PL 480 Proj. A7-FS-58) : 62.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 31.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 67, 68.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 117, 119 120.

IMAGO : Unknown.

SOLDIER (Fig. 39) : Head-capsule straw yellow; antennae, postclypeus, thorax and legs much paler; mandibles dark brown, basally yellowish brown; labrum hyaline; abdomen whitish. Head-and body densely hairy. Total body-length c 4.30-5.30 mm. Head-capsule subrectangular, longer than wide (length to base of mandibles 1.47-1.60, max. width 1.07-1.20); sides subparallel; posterior margin weakly rounded. Fontanelle indistinct. Antennae with 14-segments, segment 3 subequal to 2; 4 shortest. Postclypeus large, subtrapezoidal, pilose; anteclypeus thin, apilose, strip-like. Labrum broad, tongue-shaped, anterior margin broad, truncate and weakly incurved. Mandibles thick, short, very broad basally (length 0.67-0.70, width at base of left mandible 0.47-0.50 mm, index width at base/length 0.67-0.71). Left mandible with a large, prominent tooth situated a little above middle and 1-3 small denticles near base; right with a similarly situated tooth and a small denticle near base (left mandibular-tooth index i.e. tooth-distance from tip/mandible-length 0.39-0.40). Postmentum club-shaped, with a broad and long waist (length 0.83-0.97, max. width 0.30-0.35, width at waist 0.20-0.23 mm); anterior margin straight, posterior margin incurved. Pronotum saddle-shaped, wider than long (length 0.33-0.36, width 0.60-0.67 mm); anterior lobe strongly upturned, with anterior margin without notch. Foreleg stouter; hindleg longest.

WORKER (Fig. 40) Head-capsule and postclypeus pale straw yellow, antennae, legs and thorax much paler; abdomen blackish due to intestinal

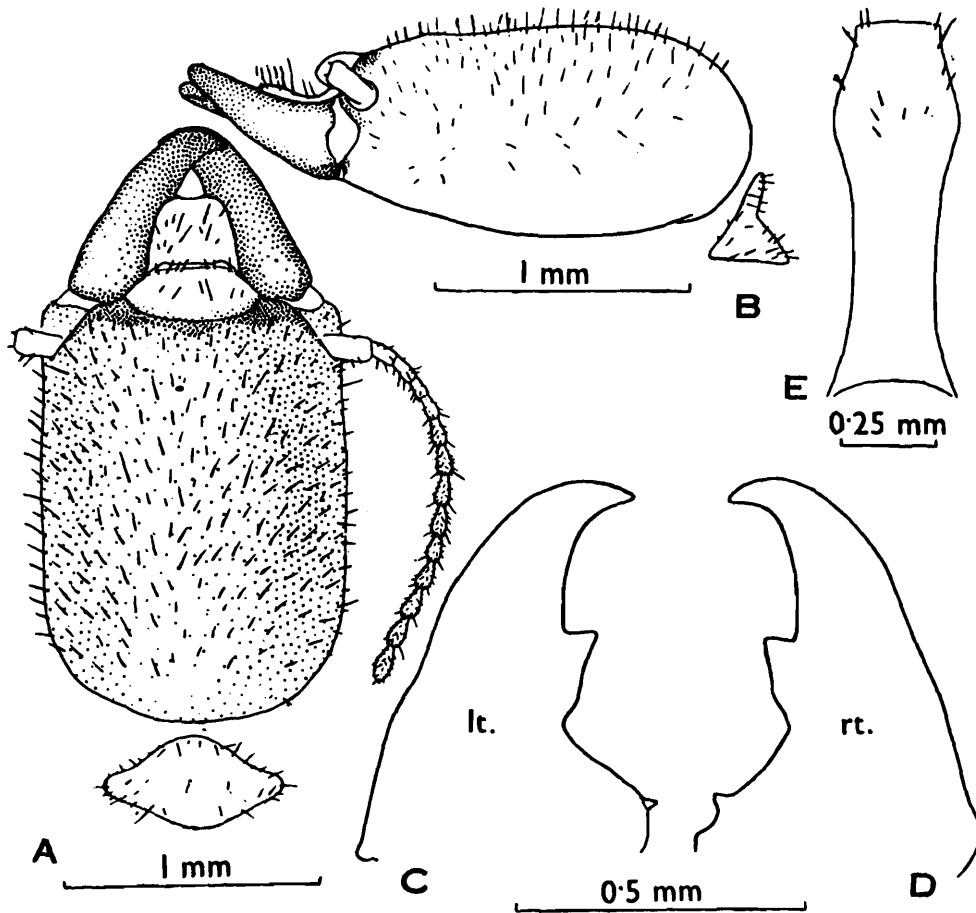


Fig. 39 : *Euhamitermes karnatakensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles. (E) Postmentum. (After Roonwal and Chhotani, 1965a).

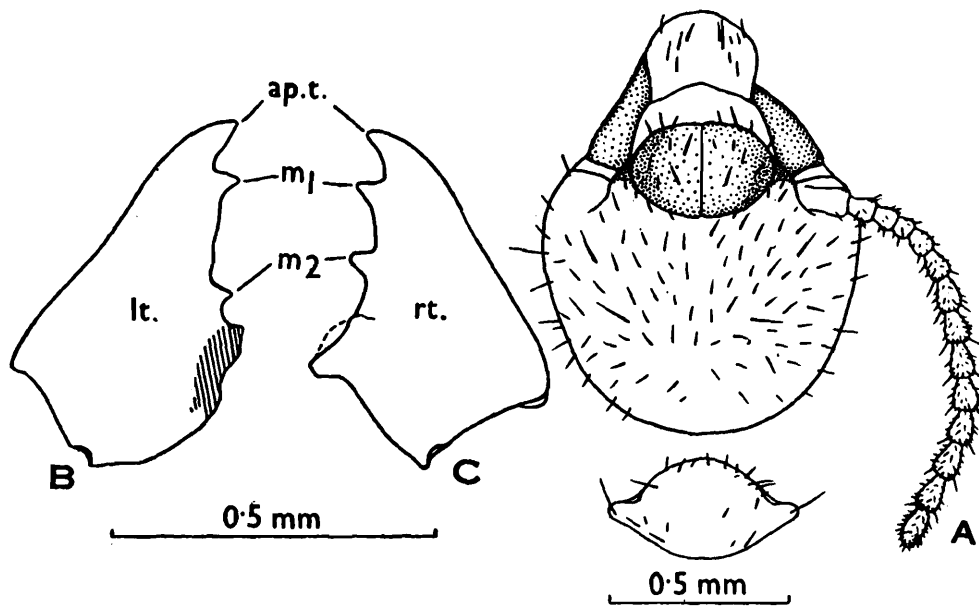


Fig. 40 : *Euhamitermes karnatakensis*. Worker. (A) Head and pronotum, dorsal view. (B) and (C) Left and right mandibles. (After Roonwal and Chhotani, 1965a).

contents showing through. Head and body fairly pilose. Total body-length c 3.50-4.10 mm. Head-capsule subcircular, wider than long (length to base of mandibles 0.67-0.75, max. width 0.77-0.90); sides somewhat converging behind to a rounded posterior margin. Fontanelle indistinct. Antennae with 14-segments; segment 3 a little shorter than 2,4 shortest. Anteclypeus apilose, subtrapezoidal and projected in front medially; postclypeus swollen, pilose, length a little more than half of width (length 0.23, width 0.37 mm). Labrum broadly tongue-shaped, broader than long (length 0.27-0.30, width 0.37-0.40 mm). Pronotum saddle-shaped (length 0.23-0.28, width 0.50-0.58 mm).

Distribution : INDIA : Karnataka, Madhya Pradesh.

122. *Euhamitermes lighti* Snyder

(Figs. 41,42)

1. *Amitermes (Euhamitermes) lighti* Snyder :

1933. Snyder, *Proc. biol. Soc.*, **46** : 93. S only. Holotype : S, in USNM.
Type-locality : Dehra Dun (Uttar Pradesh), India.

2. *Euhamitermes lighti* Snyder :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 112.

1966. Chatterjee and Thakur, *Indian For. Bull.*, No. 256 : 1-11.

1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 56, 58.

1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46**(3) : 254-255.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 67.

IMAGO (Fig. 41) : Head-capsule dark brown with blackish tinge; antennae and labrum yellowish brown; postclypeus and pronotum smoky brown; wings dirty brown; underside of body pale yellow. Head and body rather densely hairy. Total body-length with wings c 13.00-14.80, without wings 8.50-9.25 mm. Head-capsule subcircular (length to base of mandibles 0.80-1.00, max. width with eyes 1.15-1.30 mm); epicranial suture absent. Fontanelle plate small, oval (max. diameter 0.08 mm). Eyes subcircular (diameter with ocular sclerite 0.28-0.33 mm), projecting out. Ocelli oval (long diameter 0.13, short diameter 0.1 mm); separated from eyes by about half their long diameter (0.065-0.075 mm). Antennae with 15 segments; segment 3 shortest, 4 and 5 subequal. Postclypeus swollen,

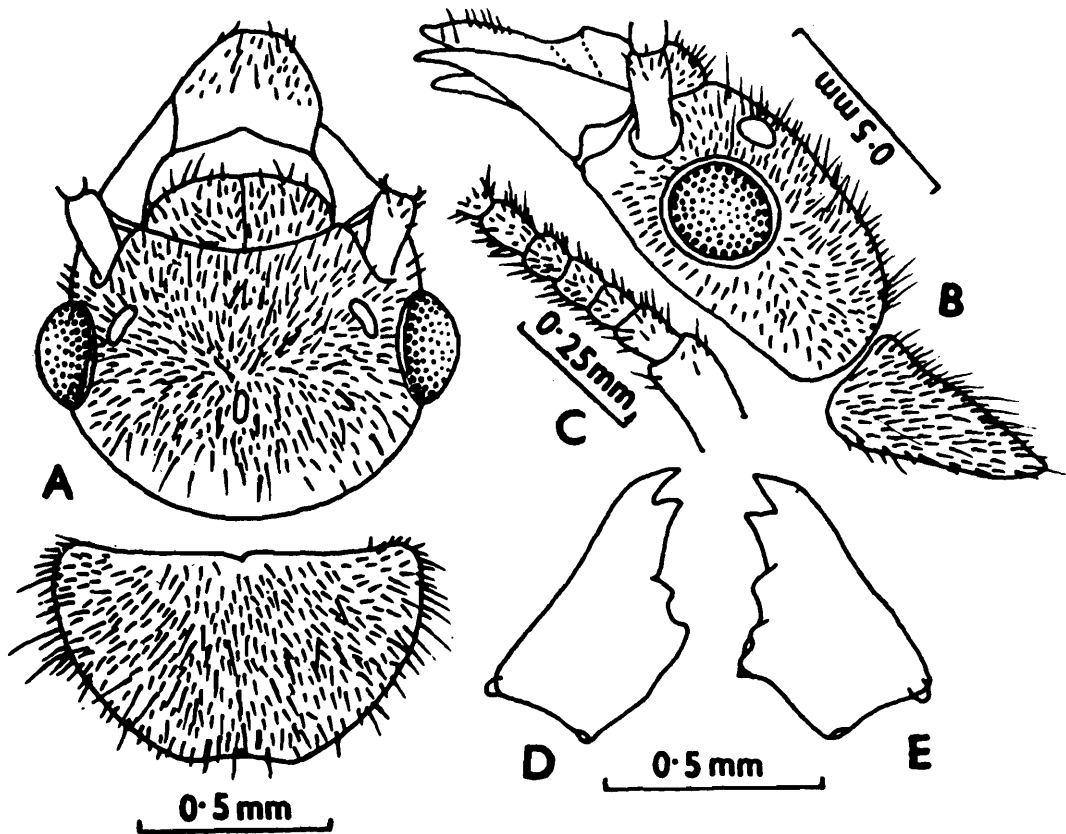


Fig. 41 : *Euhamitermes lighti*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Basal part of antenna. (D) and (E) Left and right mandibles. (Ex Chatterjee and Thakur, 1966b).

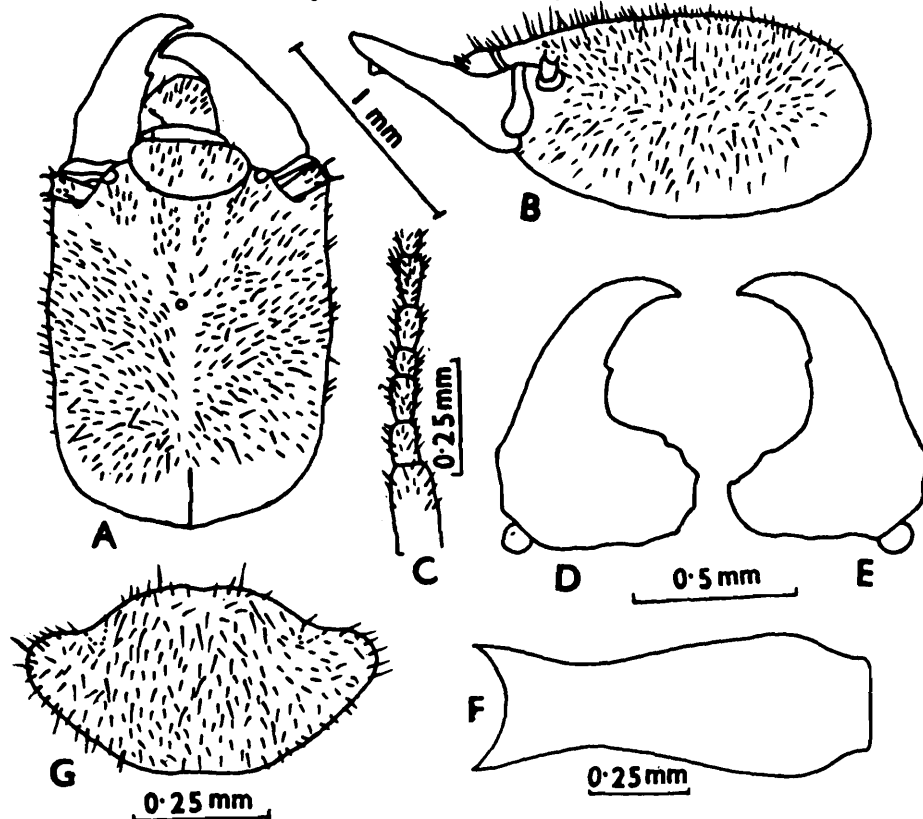


Fig. 42 : *Euhamitermes lighti*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal part of antenna. (D) and (E) Left and right mandibles. (F) Postmentum. (G) Pronotum. (Ex Chatterjee and Thakur, 1966b).

length a little less than half of width (length 0.18-0.20, width 0.50-0.55 mm); anteclypeus subtrapezoidal, translucent, weakly projecting in front medially. Pronotum flat, anterior margin slightly raised; a little narrower than head with eyes (length 0.60-0.65, max. width 1.00-1.13 mm); anterior margin faintly incurved, with a minute median notch; posterior margin with distinct emargination. Wings transparent, colourless to dirty brown; with 2 rows of hairs along anterior margin and 1-2 rows near posterior margin; membrane with 1-2 rows of small pointed papillae on anterior margin, a row of smaller ones on posterior margin and simple hyaline non-asteroid micrasters on membrane (density 7250/mm² and 4-6×1-4 μm in size). Venation as in genus. Forewing with scale 10.5-12.4 and hindwing with scale 9.9-11.50 mm.

SOLDIER (Fig. 42) : Head-capsule pale yellow to brownish, frons paler; mandibles brownish, paler basally; body whitish. Head and body moderately hairy. Total body-length c 4.0-5.40 mm. Head-capsule subrectangular; width nearly 3/4 of length (length to base of mandibles 1.50-1.75, max. width 1.18-1.30 mm, index width/length 0.71-0.81); sides subparallel, posterior margin round. Fontanelle indistinct. Antennae with 14 segments; segment 3 subequal to 2, 4 shortest. Postclypeus elliptical, hairy, with anterior margin straight; anteclypeus hyaline, apilose, subtrapezoidal with substraight anterior margin. Labrum broad, tongue-shaped (length 0.20-0.25, width 0.31-0.40 mm). Mandibles thick, stout, very broad basally; each mandible with a small tooth lying in middle third; length (0.75-0.80 mm) less than half of head-length. Postmentum club-shaped (length 0.90-1.15, max. width 0.35-0.48 and width at waist 0.25-0.30 mm); waist lying near posterior margin; postmentum contraction i.e. width at waist/max. width 0.56-0.70. Pronotum strongly saddle-shaped; anterior margin round without any distinct notch; posterior margin straight; width a little more than half the width of head (length 0.30-0.40, max. width 0.63-0.70 mm).

WORKER : Head-capsule creamish to pale yellow, medially paler in fontanelle region; antennae, labrum and thorax creamish. Head and body fairly densely hairy. Total body-length 4.10-4.75 mm. Head subcircular, wider than long (length to base of mandibles 0.65-0.80, max. width 0.80-0.90 mm); Y-suture absent. Fontanelle plate indistinct; a hyaline, circular, small (0.05 mm) spot however present. Antennae with 14 segments; segment 3 slightly shorter than 2, 4 shortest. Postclypeus pilose, swollen;

about twice as wide as long, anterior margin substraight; anteclypeus translucent, apilose, subtrapezoidal, anteriorly projected medially. Labrum broad, tongue-shaped (length 0.25-0.30, width 0.33-0.40 mm). Pronotum saddle-shaped (length 0.23-0.28, width 0.50-0.53 mm).

Distribution : INDIA : Uttar Pradesh : Dehra Dun (Lachhiwala Forest and Asarori Range, Dehra Dun Forest Div.).

123. *Euhamitermes urbanii* Roonwal & Chhotani

(Fig. 43)

Euhamitermes urbanii Roonwal and Chhotani :

1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 53-56. Im only. Holotype : Im, in NHM, Basel, Type-locality : Changra (1900 m), Bhutan.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 31.

1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (3) : 255.

IMAGO (Fig. 43) : Head blackish brown, anteriorly with a dark brown streak between ocelli; postclypeus and pronotum yellowish brown; antennae paler; wings faintly brownish, transparent; abdominal tergites brown; sternites paler and medially yellowish; legs brownish yellow. Head and body thickly pilose with short and long hairs. Total body-length with wings 14.6-14.7, without wings 7.5-8.1 mm. Head-capsule subcircular, broader than long (length to base of mandibles 0.90-0.97, max. width with eyes 1.20 mm); depressed weakly around fontanelle plate; epicranial sutures absent; a minute pale, raised spot in front of fontanelle and one oval spot on either side in front of ocelli, present. Fontanelle plate oval, fairly large (length 0.13, width 0.09-0.10 mm), depressed. Eyes subcircular (max. diameter 0.31-0.33 mm), projecting out. Ocelli oval, translucent; separated from eyes by about half their short diameter (long diameter 0.13-0.15, short diameter 0.11, eye-ocellus distance 0.05 mm) and from antennae by their short diameter. Postclypeus weakly swollen, pilose, length less than half of width (length 0.18-0.20, width 0.53); anteclypeus apilose, translucent, projecting in front medially. Antennae with 15 segments; segments 3, 4 and 5 subequal. Pronotum slightly narrower than head and raised a little anteriorly (length 0.67, width 1.10-1.17 mm); anterior margin substraight or faintly concave, without a median notch; posterior margin weakly incurved medially. Legs thin, long and hairy;

apical tibial spurs 2 : 2 : 2 or 3 : 2 : 2, dorsal spur on foretibia either present or absent. Wings transparent with a row of papillae on anterior and posterior margins; membrane covered with numerous 2-or 3- armed micrasters (density 3600-4000/mm², size 4-5 × 2-2.5 μm); wing venation as

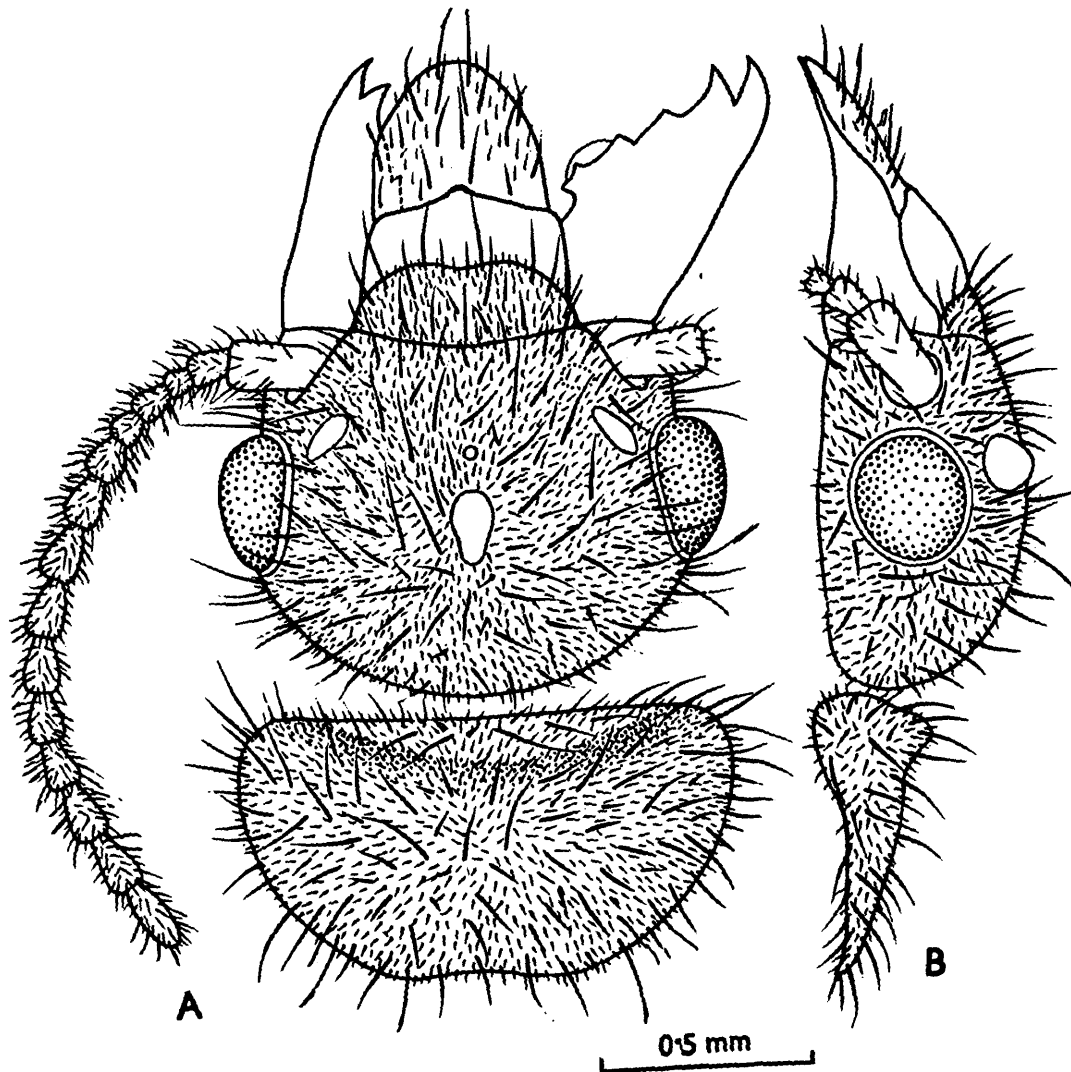


Fig. 43 : *Euhamitermes urbanii*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (After Roonwal and Chhotani, 1977)

in genus. Forewing with scale 12.2-12.3 and hindwing with scale 11.6 mm long.

SOLDIER : Unknown.

WORKER : Unknown.

Distribution : BHUTAN : Changra, 1900 m (type-locality).

124. *Euhamitermes wittmeri* Roonwal & Chhotani

(Fig. 44)

Euhamitermes wittmeri Roonwal and Chhotani :1977. Roonwal and Chhotani, *Ent. Basil.*, 2 : 53, 56-58. Im and W. Holotype : Im, in NHM, Basel. Type-locality : Samchi, Bhutan.1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 31.1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) 46 (3) : 255.

IMAGO (Fig. 44) : Head blackish brown with a darker streak in between ocelli; antennae and postclypeus pale yellowish brown; pronotum

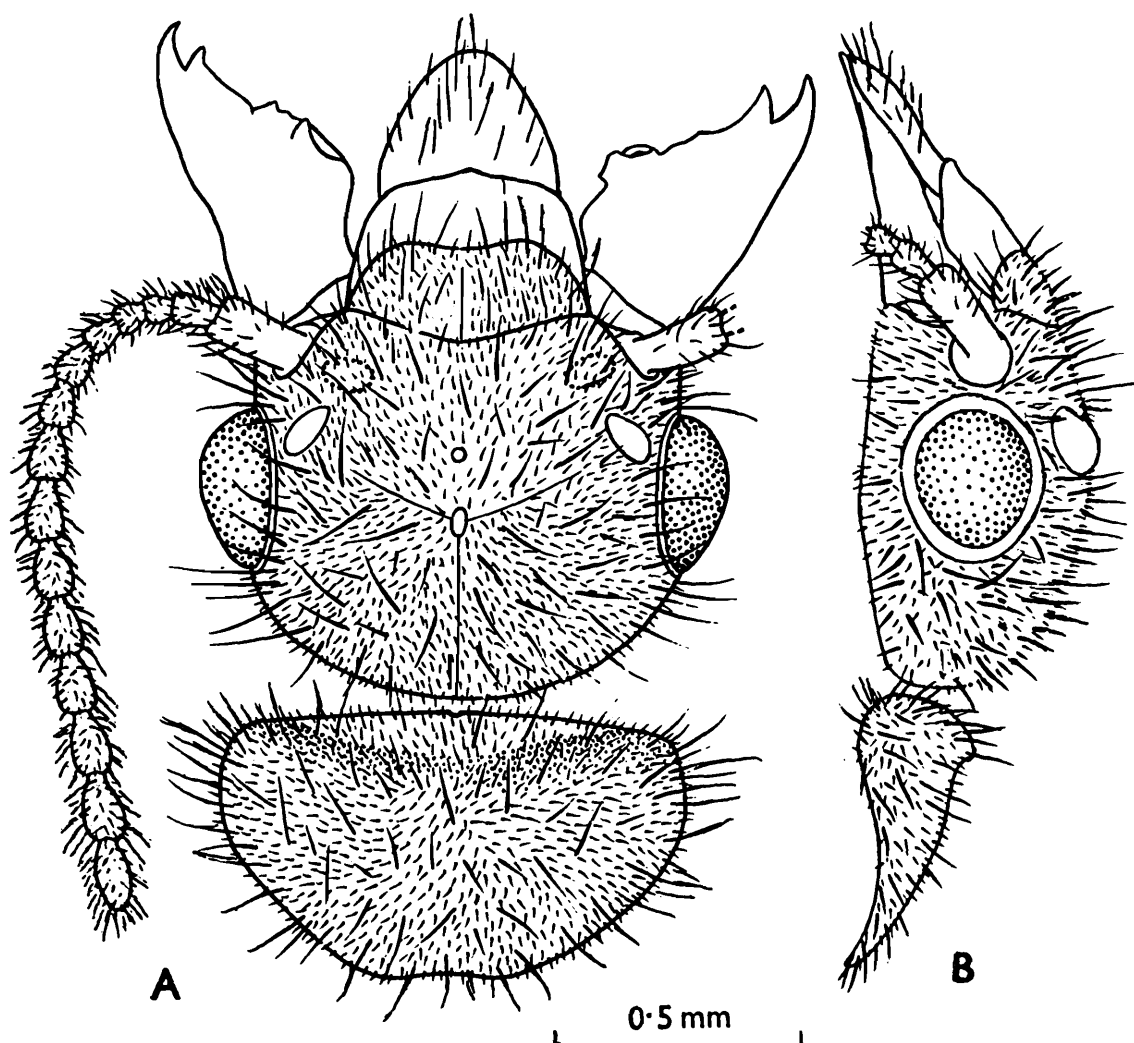


Fig. 44 : *Euhamitermes wittmeri*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (After Roonwal and Chhotani, 1977).

paler, yellowish brown medially and somewhat darker laterally; wings faintly brownish, transparent; abdomen above brownish; sternites yellowish, each with a pale brown spot laterally. Head and body with a mat of short hairs and few longer hairs; abdominal pleurites densely hairy in male, sparsely so in female. Total body-length with wings 12.3-13.2, without wings 7.8-8.3 mm. Head-capsule subcircular, broader than long (length to base of mandibles 0.77-0.83, max. width with eyes 1.03-1.13 mm); area around fontanelle depressed; epicranial suture faint; with a minute pale spot a little in front of fontanelle plate and a faint, oval spot on either side above ocelli. Fontanelle plate small, depressed, translucent, round to oval spot (0.05-0.07 × 0.04-0.05 mm). Eyes suboval (max. diameter 0.29-0.33 mm); equidistant from ocelli, antennae and lateral margin (eye-ocellus distance 0.03-0.05 and eye-antennal distance 0.03-0.07 mm). Ocelli oval (long diameter 0.13-0.15, short diameter 0.10-0.11 mm), translucent; situated at a distance of about half their short diameter from eyes (eye-ocellus distance 0.03-0.05 mm). Antennae with 15 segments; segment 3 shortest. Postclypeus pilose, weakly swollen and slightly incurved at anterior margin; length less than half of width (length 0.17-0.20, width 0.49-0.51 mm). Anteclypeus apilose, translucent, weakly projected in front medially. Labrum broad tongue-shaped, with a few short hairs (length 0.33-0.37, width 0.35-0.43 mm). Pronotum flat, anteriorly somewhat raised; weakly narrower than head (length 0.66-0.67, width 0.93-1.03 mm); anterior margin substraight or slightly convex, medially with a faint notch; posterior margin slightly incurved medially. Legs with 3 : 2 : 2 apical spurs; tarsi 4-jointed. Wing membrane transparent with papillae and numerous simple 2- or 3- armed micrasters as in *urbani* (density 4000-4800/mm², size 4-5 × 2-2.5 μm); venation as in genus. Forewing 10.20-11.20 and hindwing 9.80-10.2 mm long.

SOLDIER : Unknown.

WORKER : Head and thorax whitish to creamish; abdomen greyish due to gut contents showing through. Head and body moderately hairy. Head subcircular with a small, white, medial spot (length to base of mandibles 0.70, width 0.87 mm). Antennae with 14 segments; 4 shortest, 3 slightly shorter than 2. Pronotum saddle-shaped (width 0.50-0.53 mm). Foretibia slightly swollen, apical tibial spurs 3 : 2 : 2 or 2 : 2 : 2; outer spur of foretibia minute or absent.

Distribution : BHUTAN : Samchi, 300 m and Thimphu River Bank.

Genus 26. *Synhamitermes* Holmgren

1. Subgenus *Synhamitermes* (of *Hamitermes*) Holmgren :

1912. Holmgren, K. *Svenska Vetensk.-Akad. Handl.*, **48**(4) : 88, 89, 91.
 1953. Rattan lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : 41. See for Synonymy.

2. Genus *Synhamitermes* Holmgren :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 129. Synonymy.
 1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** (Art. 2) : 65, 66, 67.
 1955. Emerson, *Fieldiana : Zool.*, **37** : 494, 510.
 1958. Ahmad, *Biologia*, Lahore, **4** : 87, 90.
 1960. Roonwal and Sen-Sarma, *Contr. Syst. Orient. Termites* (ICAR Ent. Monogr. 1) : 14.
 1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 204.
 1964. Roonwal and Bose, *Zoologica*, **40**(113) : 8.
 1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 141, 142.
 1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 345.
 1972. Chaudhry, et al., *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. A 17-FS-12) : 51.
 1972. Sands, *Bull. Br. Mus. (nat. Hist.) Ent.*, Suppl. 18 : 37. Places under Termitinae.
 1973. Chhotani and Bose, *Zool. Anz.*, **190** : 233, 234.
 1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 59, 60.
 1977. Araujo, *Cat. Isoptera Nova Mundo* : 66.
 1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 18, 24.
 1987. Chhotani, *Beitr. Ent.*, **37** : 409, 416.

Type of genus : *Amitermes quadriceps* Wasmann.

1. Characters of Genus *Synhamitermes*

Imago : Small, dark brown, fairly hairy species. Head-capsule broad, oval, somewhat subsquarish, Y-suture absent. Fontanelle small, round or

oval, Eyes small, weakly projecting. Ocelli oval, separated from eyes. Antennae with 14-15 segments, segment 3 shortest. Postclypeus swollen. Mandibles each with an apical and two marginals; apical finger-like and longer than 1st marginal. Left mandible : 1st marginal having a long incurved posterior margin; 2nd marginal short; no notch between 1st and 2nd marginals; molar projection small. Right mandible : Posterior margin of 1st marginal a little longer than anterior; 2nd marginal short, with a long, straight posterior margin; molar plate a little longer than posterior margin of 2nd marginal. Pronotum narrower than head, slightly raised at anterior margin. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Wings tuberculate, microsculpture consists of papillae on anterior margin and micrasters on membrane (*quadriceps*); costa thick; subcosta in forewing short, faintly marked at base, absent in hindwing; radius as thick as costa, running parallel and close to fused costa-subcosta; media thin, branching distally; cubitus thin, with 9-14 branches.

Soldier : Head-capsule pale yellow to pale brownish, small species. Head-capsule broadly oval or subsquarish; Y-suture absent. Fontanelle indistinct. Antennae with 13 segments. Labrum broadly tongue-shaped. Postclypeus well marked from frons, semicircular. Eyes and ocelli absent. Mandibles short, stout, strongly incurved in distal half; each with a tooth at middle. Postmentum broad, club-shaped. Pronotum saddle-shaped, anterior margin faintly or not emarginate at middle. Legs moderately strong and short; apical spurs 3 : 2 : 2, tarsi 4-jointed.

Worker : Small and pale. Head subsquarish. Eyes and ocelli absent. Antennae with 13 segments. Mandibles as in imago. Pronotum saddle-shaped. Foretibia swollen, apical tibial spurs 3 : 2 : 2; tarsi 4-jointed.

2.. *Distribution and Composition of Synhamitermes*

(Fig. 2)

Distribution : The genus *Synhamitermes* is restricted to the Indian Region (India, Sri Lanka, Bangladesh). Holmgren (1912a, p. 91), Snyder (1949) and Araujo (1977) record *Amitermes brevicorniger* Silvestri as a species of this genus from South America. I have examined the syntype soldier of *A. brevicorniger* and find that it does not belong to either *Synhamitermes* or *Amitermes*. I, therefore, am restricting the distribution of *Synhamitermes* to the Indian Region.

Composition : The following 3 species belong to this genus and are taken into account.

1. *Synhamitermes ceylonicus* Holmgren—Sri Lanka
2. *S. colombensis* Roonwal and Sen-Sarma—Sri Lanka.
3. *S. quadriceps* Wasmann—India, Bangladesh.

3. Key to Indian Species of *Synhamitermes*

IMAGOES

The imagoes of two species viz. *ceylonicus* and *quadriceps* are known. The imago of the former species was not available and from John's (1925) description it has not been possible to find any differences between the imagoes of these two species.

SOLDIERS

- 1(2) Outer margin of mandibles incurved near middle, and apical half of mandibles weakly incurved.....*quadriceps*
- 2(1) Outer margin of mandibles not incurved and apical half of mandibles relatively strongly incurved
- 3(4) Apical half of mandibles strongly incurved, head-capsule with several long hairs.....*ceylonicus*
- 4(3) Apical half of mandibles relatively less incurved; head-capsule without hairs*colombensis*

125. *Synhamitermes ceylonicus* Holmgren

(Fig. 48C)

1. *Hamitermes quadriceps* Wasmann :

1911. Holmgren, In : Escherich's *Termitenleben auf Ceylon* : 205, Pl. 2, fig. T. S and W. Sri Lanka : Peradeniya. (Wrong identification).

2. *Hamitermes (Synhamitermes) ceylonicus* Holmgren :

1913. Holmgren, *K. Svenska Ventensk. Akad. Handl.*, **50**(2) : 225, Pl. 8, fig. 21.S and W. Syntypes : Probably in Holmgren Coll., Riksmuseum, Stockholm. Type-locality : Sri Lanka.

1925. John, *Treubia*, **6**(3-4) : 407-408.

1953. Rattan Lal and Menon. *Cat. Indian Insects, Pt. 27-Isoptera* : 41. Synonymy.

3. *Synhamitermes ceylonicus* Holmgren :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 129. See for detailed synonymy also.

1958. Ahmad, *Biologia*, Lahore, **4** : 177.

1960. Roonwal and Sen-Sarma, *Contrib. Syst. Oriental Termites* (ICAR-Ent. Monog. 1) : 1, 7, 8, 14.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) : 346.

IMAGO : Head and pronotum dark brown; postclypeus and legs pale; antennae rust brown; thorax and abdominal tergites paler than head. Head and body moderately thickly hairy. Total body-length with wings c 9.5, without wings 5.0 mm. Head broadly oval (head-width with eyes 0.90 mm) ; Y-suture absent. Eyes small, oval, weakly projecting out. Ocelli oval; situated at their short diameter from eyes. Fontanelle small, oval, smaller than ocelli; situated centrally at mid-line of eyes. Antennae with 15 segments; segment 3 shorter and narrower than succeeding ones. Pronotum as wide as head without eyes (0.67 mm), longer than half its width; anterior lobe very short and slightly raised, anterior margin clearly emarginate, hind margin straight. Meso- and metanota strongly notched at hind margin.

SOLDIER (Fig. 48C) : Colour and hairiness as in *quadriceps*. Total body-length 3.2-3.3 mm. Head-capsule subsquarish (length with mandibles 1.35-1.37, length without mandibles 0.82-0.91, max. width 0.78-0.80 mm). Antennae longer than in *quadriceps*. Outer margin of mandibles not incurved at middle and mandibles more strongly incurved in distal half than in *quadriceps* and shape of tooth also different. Pronotum saddle-shaped (length 0.31, width 0.49-0.52 mm).

WORKER : Resembles that of *quadriceps* and not separable. Total body-length 3.0-3.5, head-width 0.76 and pronotum-width 0.46 mm.

Distribution : SRI LANKA.

126. *Synhamitermes colombensis* Roonwal and Sen-Sarma

(Fig. 45, 48B)

Synhamitermes colombensis Roonwal and Sen-Sarma :

1960. Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (ICAR Ent. Monogr. 1) : 1-7. S and W. Holotype : S, in FRI. Type-locality : Colombo, Sri Lanka.

1962. Roonwal, In : *Termites Humid Tropics* : 40. Paris, Unesco
 IMAGO : Unknown.

SOLDIER (Fig. 45, 48B) : Head-capsule deep straw coloured; mandibles dark brown, pale brown basally; pronotum and body yellowish white. Head dorsum without any hairs; postclypeus without or with a pair of hairs at anterior margin; labrum, pronotum and body sparsely hairy. Head-capsule subsquarish, posterior margin rounded and sides substraight (length to base of mandibles 0.85-0.95, max. width 0.80-0.85 mm); Y-suture not present. Antennae broken in the specimen examined. Postclypeus spindle-shaped, well marked; anteclypeus translucent white,

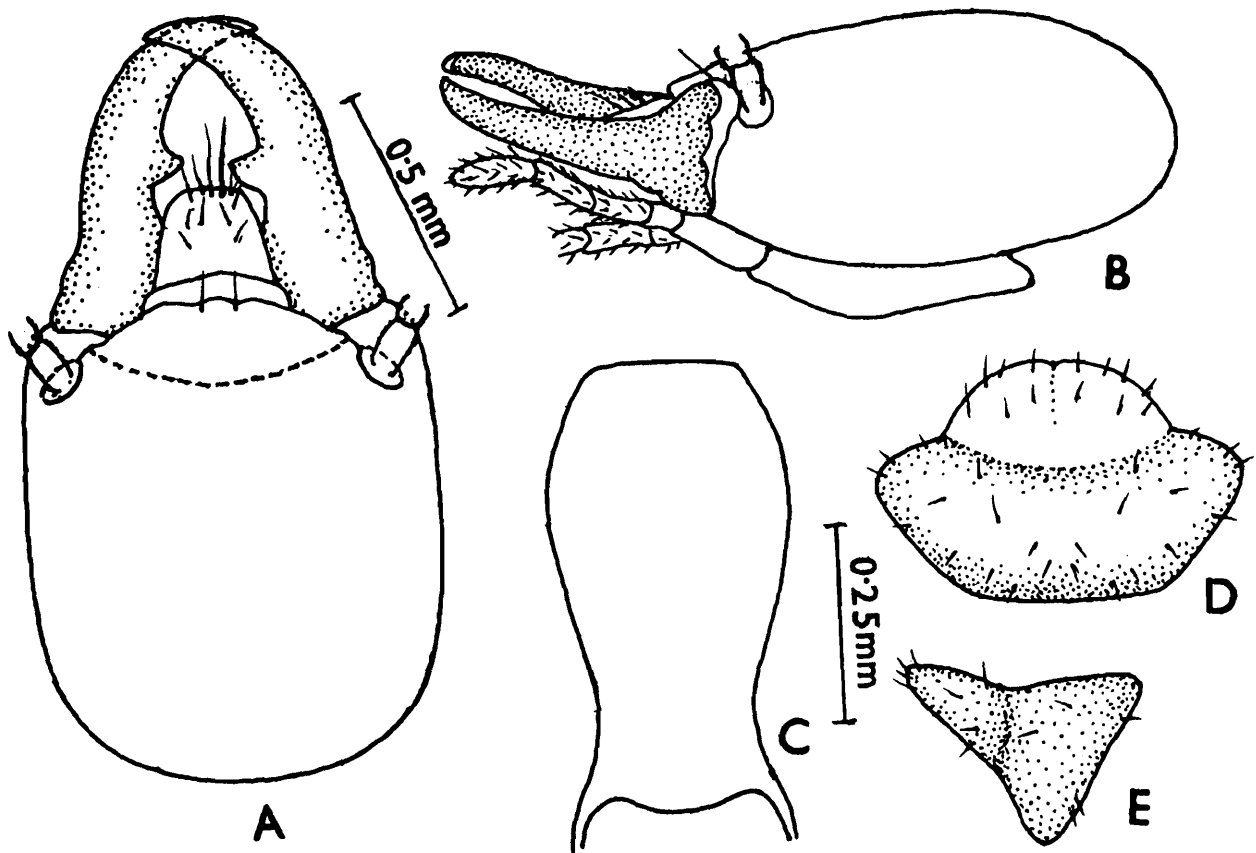


Fig. 45 : *Synhamitermes colombensis*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Postmentum. (D) Pronotum, dorsal view. (E) Same, side view. (Ex Roonwal and Sen-Sarma, 1960).

apilose, strip-like. Labrum subsquarish, slightly narrowed anteriorly (length 0.13-0.15, max. width 0.18-0.20 mm). Mandibles short (length 0.65-0.70 mm), strongly incurved apically from middle onwards, outer margin not incurved; at about middle of inner margin of left mandible a large, triangular tooth and a large, somewhat subsquarish one in right mandible, present; length of mandibles about $\frac{3}{4}$ of head-length (index mandible-length/head-length 0.72-0.76). Postmentum broad, club-like, widest at anterior $\frac{1}{3}$; narrowest near posterior margin (length 0.50-0.55, max. width 0.25-0.28, min. width at waist 0.20 mm, contraction index i.e. min. width/max. width 0.73-0.80). Pronotum saddle-shaped; anterior lobe semicircular, with a faint median notch at anterior margin; posterior margin straight, without notch (length 0.25, width 0.50 mm).

WORKER : Head-capsule and pronotum yellowish white with smoky tinge; antennae and labrum pale yellow. Head and body rather densely hairy. Head-capsule subsquarish (length to base of mandibles 0.70, max. width 0.80-0.85 mm). Antennae with 13 segments; segment 3 shortest; 2 equal to 4. Postclypeus swollen, hairy, length about half of width; anteclypeus subtrapezoidal, apilose, translucent. Labrum subsquarish, hairy (length 0.20, width 0.25 mm). Pronotum saddle-shaped; anterior margin without notch; posterior margin substraight, without notch (length 0.25, width 0.50 mm).

Distribution : SRI LANKA : Colombo (West Province, type-locality), known only from the type-locality.

127 *Synhamitermes quadriceps* (Wasmann)

(Figs. 46, 47, 48A)

1. *Amitermes quadriceps* Wasmann :

1902. Wasmann, *Zool. Jb. Syst.*, 17(1) : 123, Pl. 4 fig. 5. S,W and Ny.
Holotype : S, in Wasmann Coll., NHM, Maastricht. Type-locality :
Khandala near Bombay, Maharashtra, India. Type examined.

2. *Termes (Eutermes) quadriceps* (Wasmann) :

1904. Desneux, *Gen. Insectorum*, Fasc. 25 : 41.

3. *Hamitermes (Synhamitermes) quadriceps* (Wasmann) :

1912. Holmgren, *K. Svenska Vetensk.-Akad. Handl.*, 48 : 91, Pl. 4 fig. 25.

1913. Holmgren, *K. Svenska Vetensk.-Akad. Handl.*, 50(2) : 224.

1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27 (Isoptera)* : 16.
See for synonymy.

4. *Synhamitermes quadriceps* (Wasmann) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 129. See for synonymy.
 1958. Ahmad, *Biologia*, Lahore, **4** : 176.
 1960. Roonwal and Sen-Sarma, *Contrib. Syst. Oriental Termites* (ICAR Ent. Monogr. 1) : 1, 7-14.
 1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 317, 319.
 1964. Roonwal and Bose, *Zoologica*, **40**(113) : 22-23.
 1968. Chatterjee and Thakur, *Indian Forester*, **94**(7) : 564-565.
 1969. Roonwal and Bose, *Rec. zool. Surv. India*, **61** : 440, 446.
 1972. Chaudhry et al., *Termites of Pakistan* (Final Tech. Rep. PL. 480 Proj. No. A 17 FS-12) : 51-52, figs. 60, 61.
 1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (NS.)*, Art. 7 : 159-162.
 1975. Sen-Sarma, et al., *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 53.
 1976. Roonwal, *Zool. Jb. Syst.*, **103** : 464, 465, 466, 468, 469, 484.
 1977. Chhotani, *Rec. zool. Surv. India*, **72** : 369-370.
 1978. Roonwal and Bose, *Proc. Indian natn. Sci. Acad.*, (B) **44**(5) : 324.
 1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13**(1) : 15, 41.
 1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 18, 24, 68-70.
 1989. Roonwal and Chhotani, *Fauna of India-Isoptera (Termites)* Vol. 1 : 18.

IMAGO (Fig. 46) : Head-capsule dark brown; postclypeus yellowish; antennae and labrum paler than postclypeus; pronotum paler than head, with a weak T-shaped, paler marking; abdomen paler than pronotum. Head and body densely pilose with a thick mat of fine hairs and several longer hairs. Total body-length with wings 8.85-10.40, without wings 4.5-5.2 mm. Head subsquarish, length to base of mandibles 0.55-0.75, width with eyes 0.80-0.94 mm; Y-suture absent. Fontanelle small, subcircular; situated a little behind middle of head. Eyes subcircular, medium sized (diameter 0.20-0.27 mm). Ocelli, oval, obliquely situated at less than half their long diameter from eyes (long diameter 0.08-0.14, short diameter 0.05-0.75, eye-ocellus distance 0.03-0.05 mm). Antennae with 14-15 segments; segment 3 shortest and thinnest; 4 and 5 subequal. Postclypeus swollen, semilunar, pilose; about half as long as wide; anteclypeus apilose,

trapezoidal; slightly projected in front medially. Pronotum subtrapezoidal; a little narrower than head with eyes (length 0.43-0.61, width 0.64-0.80 mm). Wings pale brown; hairy along margins, membrane scantily hairy, microsculpture and venation as in genus. Length of forewing 7.3-8.2, of hindwing 7.0-8.00 mm.

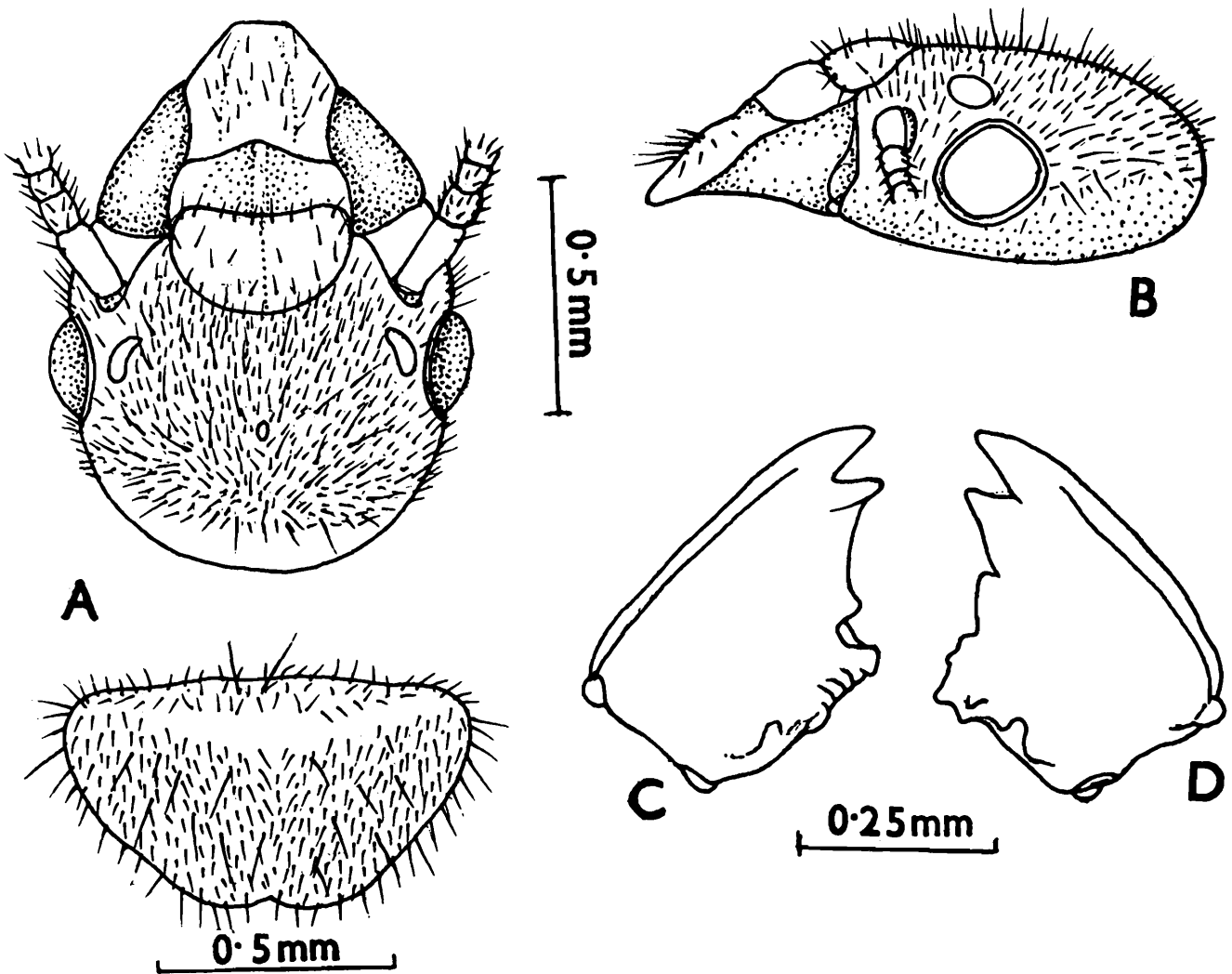


Fig. 46 : *Synhamitermes quadriceps*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) and (D) Left and right mandibles. (Ex Roonwal and Sen-Sarma, 1960).

SOLDIER (Fig. 47, 48A) : *Type examined*. Head pale yellow to brownish yellow; antennae slightly paler than head; mandibles reddish brown to dark brown, paler basally; pronotum creamish yellow; legs and abdomen whitish to pale yellow. Head scantily and body moderately densely hairy. Head-capsule subsquarish, a little longer than wide (length to base of mandibles 0.84-1.0, max. width 0.69-0.85 mm); Y-suture absent. Antennae with 13 segments; segment 3 shortest. Postclypeus semicircular, clearly demarcated from frons and with a pair of bristles at anterior margin;

anteclypeus thin, strip-like. apilose. Labrum broadly tongue-shaped (triangular with a narrow tip in type, probably it is got shrivelled as it is mounted dry on card). Mandibles short, stout, 0.57-0.67 mm long; outer margin incurved medially; each mandible with a triangular tooth on inner margin at about middle. Postmentum short, club-shaped, strongly incurved at waist (length 0.52-0.62, max. width 0.23-0.29, width at waist 0.16-0.20 mm). Pronotum saddle-shaped; anterior margin without notch, posterior margin substraight or indistinctly incurved medially (length 0.24-0.35, max. width 0.48-0.55 mm). Mesonotum as wide as and metanotum a little wider than pronotum; both not emarginate at posterior margin.

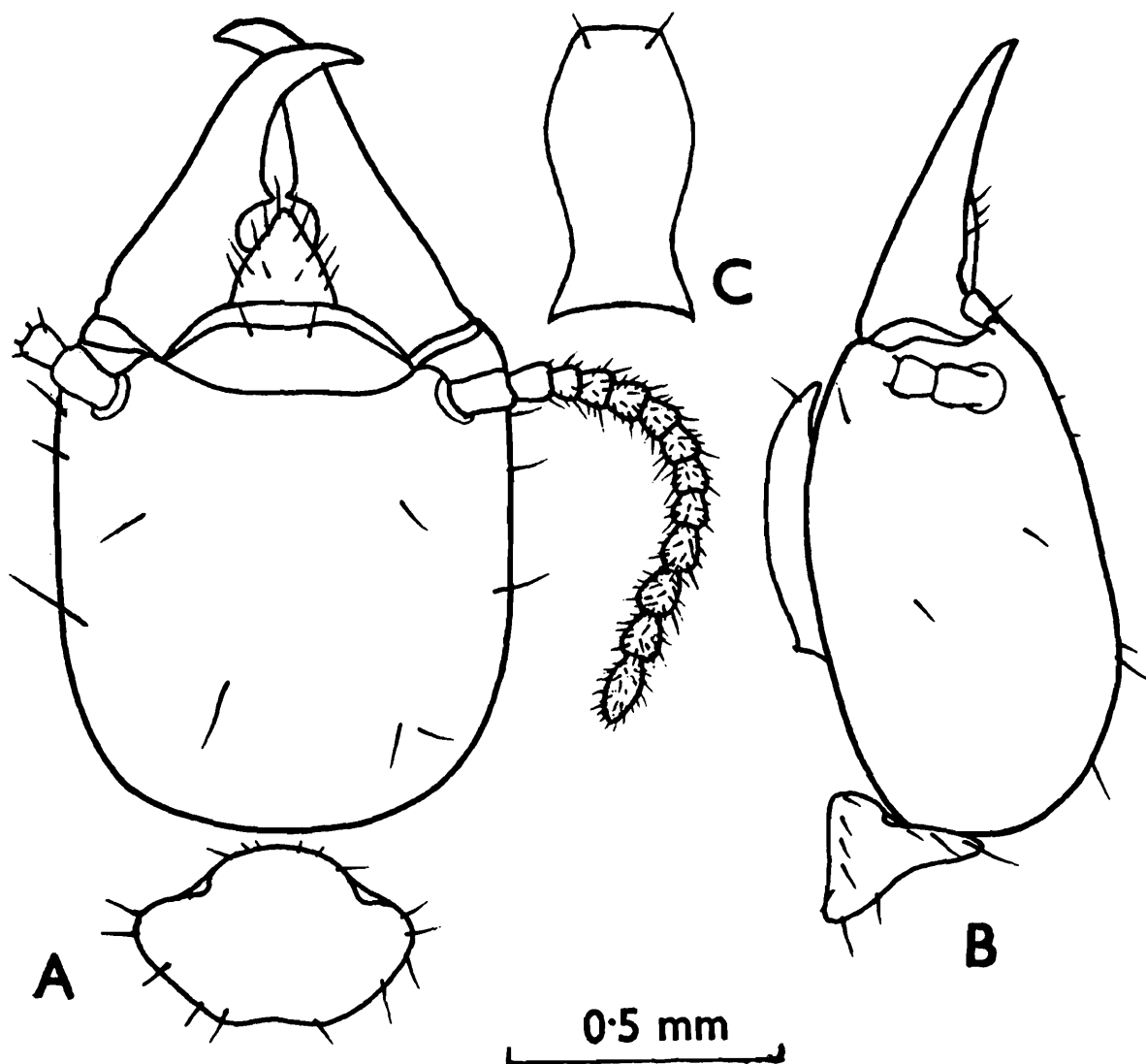


Fig. 47 : *Synhamitermes quadriceps*. Soldier (Type). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

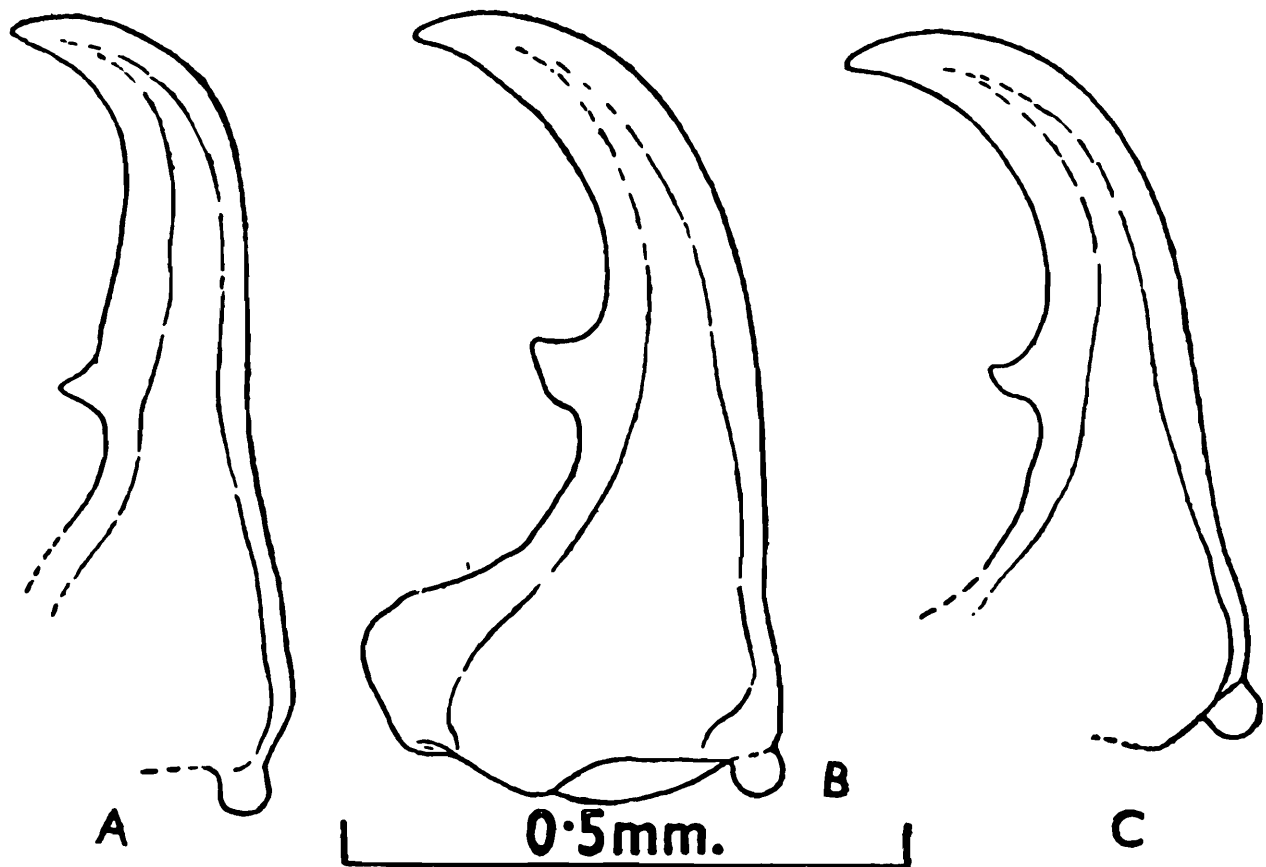


Fig. 48 : Right mandibles of soldiers of (A) *Synhamitermes quadriceps*. (B) *S. colombensis*. (C) *S. ceylonicus*. (After Roonwal and Sen Sarma, 1960).

WORKER : Head-capsule pale yellow to pale brown; antennae, legs and thorax pale yellowish; abdomen dirty white due to intestinal contents. Head and body fairly densely hairy. Total body-length 3.0-4.20 mm. Head subsquarish; sides and posterior margin weakly rounded (head-length to tip of labrum 0.90-1.03, length to base of mandibles 0.60-0.73 and max. width 0.70-0.83 mm). Antennae with 13 segments; segment 3 shortest, slightly shorter than 2. Postclypeus swollen, length less than half of width (length 0.15-0.20, width 0.35-0.38 mm). Labrum subsquarish, hairy. Pronotum saddle-shaped (length 0.22-0.35, width 0.40-0.50 mm); not notched at anterior or posterior margins.

Distribution : INDIA : Maharashtra, Goa, Daman, Rajasthan, Madhya Pradesh, West Bengal, Assam, Tripura, and presently reported from as far south as Trichur in Kerala. BANGALADESH.

Genus 27 **Amitermes** Silvestri1. Genus *Amitermes* Silvestri :

1901. Silvestri, *Bull. Mus. Zool. Anat. Comp. Tornio*, **16**(389) : 4.
1949. Snyder, *Smiths, misc. Colls.*, **112** : 113- 114. See for detailed synonymy.
1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95**(Art. 2) : 67, 68.
1955. Emerson, *Fieldiana : Zool.*, **37** : 466, 467, 469, 510.
1958. Ahmad, *Biologia*, Lahore, **4** : 84, 90.
1964. Roonwal and Bose, *Zoologica*, **40**(113) : 8.
1965. Bouillon and Mathot, *Zooleo*, No. 1 : 21, 22.
1968. Gay, *Australian J. Zool.*, **16** : 405-456. Australian species.
1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 140-143.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 345.
1971. Bouillon and Mathot, *Zooleo*, No. 1(Suppl. 2) : 4.
1972. Sands, *Bull. Br. Mus. (nat. Hist.) Ent.*, Suppl. 18, 33, 35, 39. Places under Termitinae.
1972. Chaudhry, et al., *Termites of Pakistan* (Final Tech. Rep. PL. 480 Proj. No. A 17-Fs-12) : 54.
1973. Chhotani and Bose, *Zool. Anz.*, **190** : 233, 234.
1974. Akhtar, *Pakistan. J. Zool.*, **6**(1-2) : 93-94, 95, 96, 97, 100.
1986. Roonwal and Rathore, *Proc. Indian Acad. Sci. (Anim. Sci.)*, **94**(5) : 317-321.
1987. Chhotani, *Beitr. Ent.*, **37** : 407, 408, 409, 416, 417.
1989. Roonwal and Chhotani, *Fauna of India-Isoptera (Termites)* Vol. 1 : 91, 119.
1992. Sands, *Bull. Nat. Resour. Inst.*, No. 51 : 1-140.

Type of genus : *Amitermes amifer* Silvestri

1. *Characters of the Genus Amitermes*

Imago : Brown to dark brown, medium sized, densely hairy. Head subcircular. Eyes medium sized. Ocelli oval, separated from eyes. Antennae with 14-16 segments. Postclypeus fairly swollen, as long as half of width. Fontanelle small, round to fairly large and oval with extensions in front. Left mandible with an apical and one marginal tooth having a long

posterior margin. Right mandible with an apical and two marginals; 1st marginal with its posterior margin slightly longer than anterior margin and 2nd marginal with straight posterior margin. Pronotum saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed.

Soldier : Head rectangularly oval to broadly oval, thick and narrowed in front; frons sharply sloping in front. Antennae with 13-17 (usually 14-15) segments. Fontanelle situated anteriorly on frontal slope. Postclypeus bilobed. Mandibles sabre-shaped, strongly incurved from middle onwards; each generally with a sharp, pointed tooth directed forwardly, backwardly or inwardly. Postmentum arched, subrectangular. Pronotum saddle-shaped. Apical tibial spurs generally 3 : 2 : 2; dorsal spur of foretibia sometimes indistinct, tarsi 4-jointed.

Worker : Head-capsule subcircular. Antennae with 14-15 segments generally. Postclypeus swollen, length about half of width. Mandibles as in imago. Pronotum saddle-shaped. Apical tibial spurs 3 : 2 : 2, dorsal spur sometimes not distinct or absent; tarsi 4-jointed.

2. *Distribution and Composition of Amitermes*

(Fig. 2)

Distribution : Genus *Amitermes* is a cosmopolitan genus known from all the zoogeographical regions.

Composition : This genus is known by nearly 114 species of which 5 occur in the Oriental Region (Chhotani 1987). In the Indian Region it is reported by the following species.

1. *Amitermes baluchistanicus* Akhtar—Pakistan
2. *A. belli* Desneux—India, Pakistan
3. *A. paradentatus* Ahmad—Pakistan

3. *Key to Indian Species of Amitermes*

SOLDIERS

- 1(2) Tooth of mandibles laterally directed.....*paradentatus*
 2(1) Tooth of mandibles posteriorly or postero-laterally directed

- 3(4) Posterior margin of head round. Mandibles thinner; tooth on mandibles directed posteriorly.....*belli*
- 4(3) Posterior margin of head weakly convex. Mandibles thicker; tooth on mandibles directed postero-laterally.....*baluchistanicus*

128. *Amitermes baluchistanicus* Akhtar

(Fig. 49)

1. *Amitermes baluchistanicus* Chaudhry, et al. (nom. nud.) :

1972. Chaudhry, et al., *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. A 17-FS-12) : 54 (nom. nud.)

2. *Amitermes baluchistanicus* Akhtar :

1974. Akhtar, *Biologia*, Lahore, **20**(1) 58-59. S only. Holotype : S, in PU. Type-locality : Mastung, Baluchistan, Pakistan.

1974. Akhtar, *Pakistan J. Zool.*, **6**(1 & 2) : 93-94, 103.

IMAGO : Unknown.

SOLDIER (Fig. 49) : Head brownish yellow to yellowish brown; antennae brownish yellow; anteclypeus, labrum, pronotum, legs and abdomen yellowish; mandibles reddish brown, basally brownish yellow. Head and pronotum sparsely hairy. Head-capsule subrectangularly oval; longer than wide (length to base of mandibles 1.19-1.40, max. width 1.06-1.21 mm); sides weakly convex and slightly narrowed anteriorly (width at base of mandibles 0.74-0.85 mm); posterior margin weakly convex. Fontanelle situated anteriorly; frontal projection not prominent, a little more hairy than head. Eyes and ocelli absent. Antennae with 14 segments; 2nd segment longer than 3rd; 4th shortest. Postclypeus bilobed. Labrum broad, tongue-shaped, broader than long. Mandibles thick at base and sharply narrowed and strongly incurved anteriorly (length 0.72-0.82 mm); each with a prominent postero-laterally directed tooth, situated medially. Postmentum club-shaped; broadest at anterior third, narrowest at waist near posterior margin (length 0.63-0.82, max. width 0.31-0.41 mm). Pronotum saddle-shaped; indistinctly notched at anterior and substraight at posterior, margins (length 0.30-0.36, max. width 0.62-0.72 mm). Tibial spurs 3 : 2 : 2; tarsi 4-jointed.

Distribution : PAKISTAN : Mastung, Baluchistan (type-locality), known only from the type-locality.

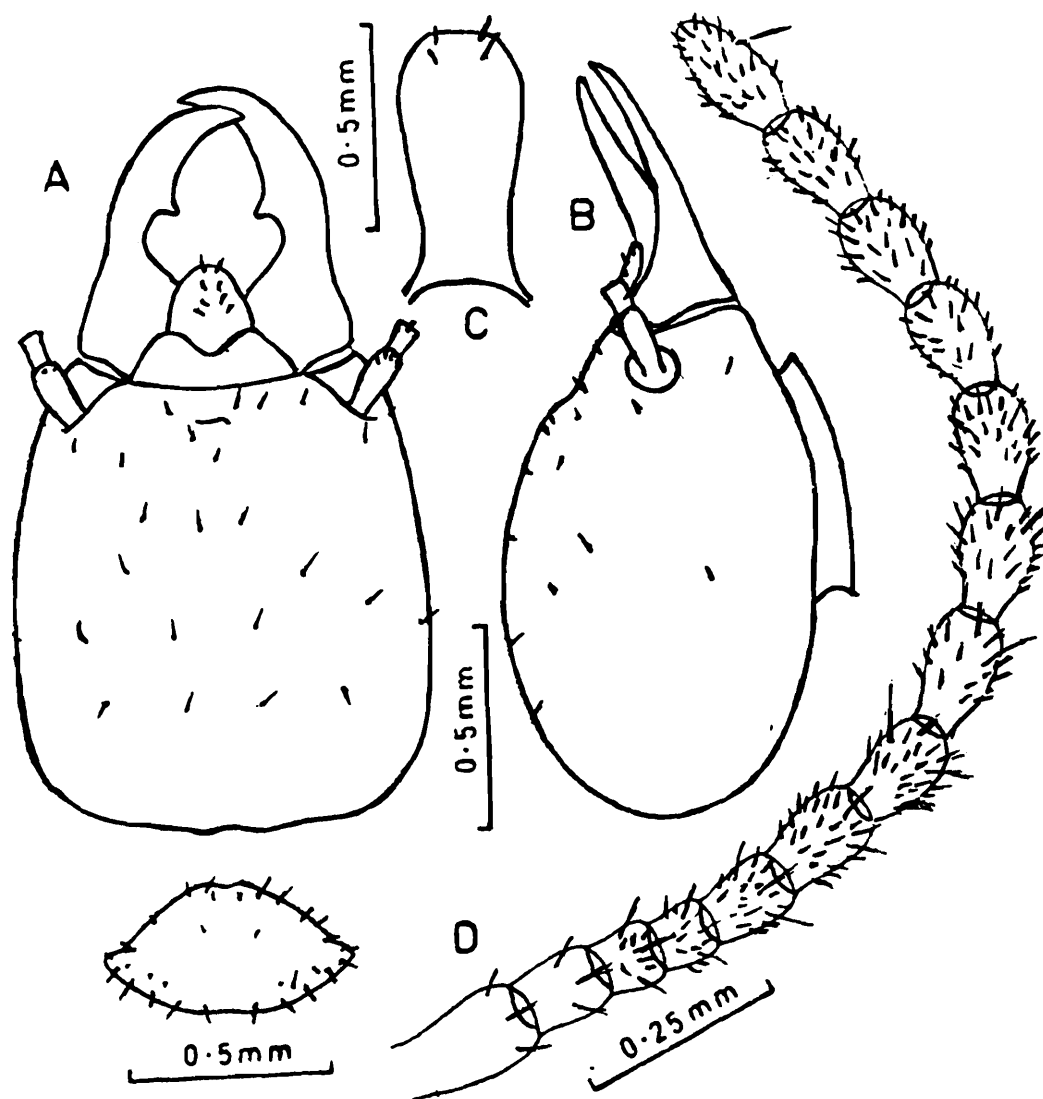


Fig. 49 : *Amitermes baluchistanicus*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Postmentum. (D) Antenna. (After Akhtar, 1974a)

129. *Amitermes belli* (Desneux)

(Figs. 50-52)

1. *Termes Belli* Desneux :

1906. Desneux, *Ann. Soc. ent. Belg.*, **49** : 352-354. Im, S and W. *Holotype* : Repository not known. Type-locality : Karachi, Sind, Pakistan.

2. *Hamitermes (Hamitermes) Belli* (Desneux) :

1912. Holmgren, *K. Svenska Vetensk. Akad. Handl.*, **48**(4) : 93, fig. 65.

3. *Amitermes belli* (Desneux) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 114.
1953. Roonwal and Pant, *Indian For. Leaflet.*, No. 121(3) : 49.
1955. Ahmad, *Biologia*, Lahore, **1** : 254-257.
1958. Ahmad, *Biologia*, Lahore, **4** : 177, 178.
1964. Roonwal and Bose, *Zoologica*, **40**(113) : 19-21.
1968. Vishnoi, *Pesticides*, **1**(11) : 114.
1969. Roonwal and Bose, *Rec. zool. Surv. India*, **61**(3 & 4) : 440, 446.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 345.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. A 17-FS-12) : 55, Fig. 65.
1974. Akhtar, *Biologia*, Lahore, **20**(1) : 59.
1974. Akhtar, *Pakistan J. Zool.*, **6**(1 & 2) : 94, 95.
1976. Roonwal, *Zool. Jb.*, **103** : 484, 485.
1977. Roonwal, In : *Natural Resources Rajasthan* (Ed Roonwal) : 375.
1978. Roonwal and Bose, *Proc. Indian natn. Sci. Acad.*, (B) **44**(5) : 324.
1985. Roonwal and Rathore, *Proc. Indian Acad. Sci. (Anim. Sci.)*, **94**(5) : 517-520.
1985. Roonwal, *Zool. Anz.*, **215**(3 & 4) : 226.
1985. Roonwal, *Proc. Indian natn. Sci Acad.*, (B) **51**(3) : 311-314.
1989. Roonwal and Chhotani, *Fauna of India-Isoptera (Termites)* Vol. 1 : 18.

IMAGO (Fig. 50) : Head brown; postclypeus yellowish brown; antennae and legs paler than postclypeus; pronotum paler than head; abdominal tergites paler than pronotum. Head and body densely hairy with short, fine and long hairs. Total body-length without wings c 5.0-6.30 mm. Head-capsule subcircular, length to base of mandibles subequal to width without eyes (length to tip of labrum 1.04-1.23, length to base of mandibles 0.70-0.78, width with eyes 0.74-0.81 mm); area around fontanelle slightly depressed. Fontanelle small, with oval extension anteriorly. Eyes circular, medium sized and weakly projecting (0.21-0.28 x 0.20 mm); situated at less than to half their diameter from lower margin of head (0.08-0.12 mm). Ocelli oval (0.10-0.14 x 0.06-0.09 mm); separated from eyes by their short diameter or a little more. Antennae with 15 segments; segment 2 as long as 3 + 4; 3rd shortest. Postclypeus swollen, as hairy as head; with

straight anterior and rounded posterior margins; medially divided into two by incomplete dark line (length 0.24, width 0.45 mm). Labrum dome-shaped. Mandibles as in figure. Left mandible with a finger-like apical and one leaf-like marginal; marginal shorter than apical and with a long posterior margin. Right mandible with finger-like apical and two marginals; 1st marginal shorter than apical and with slightly longer posterior margin; 2nd short with a long, straight posterior margin; molar

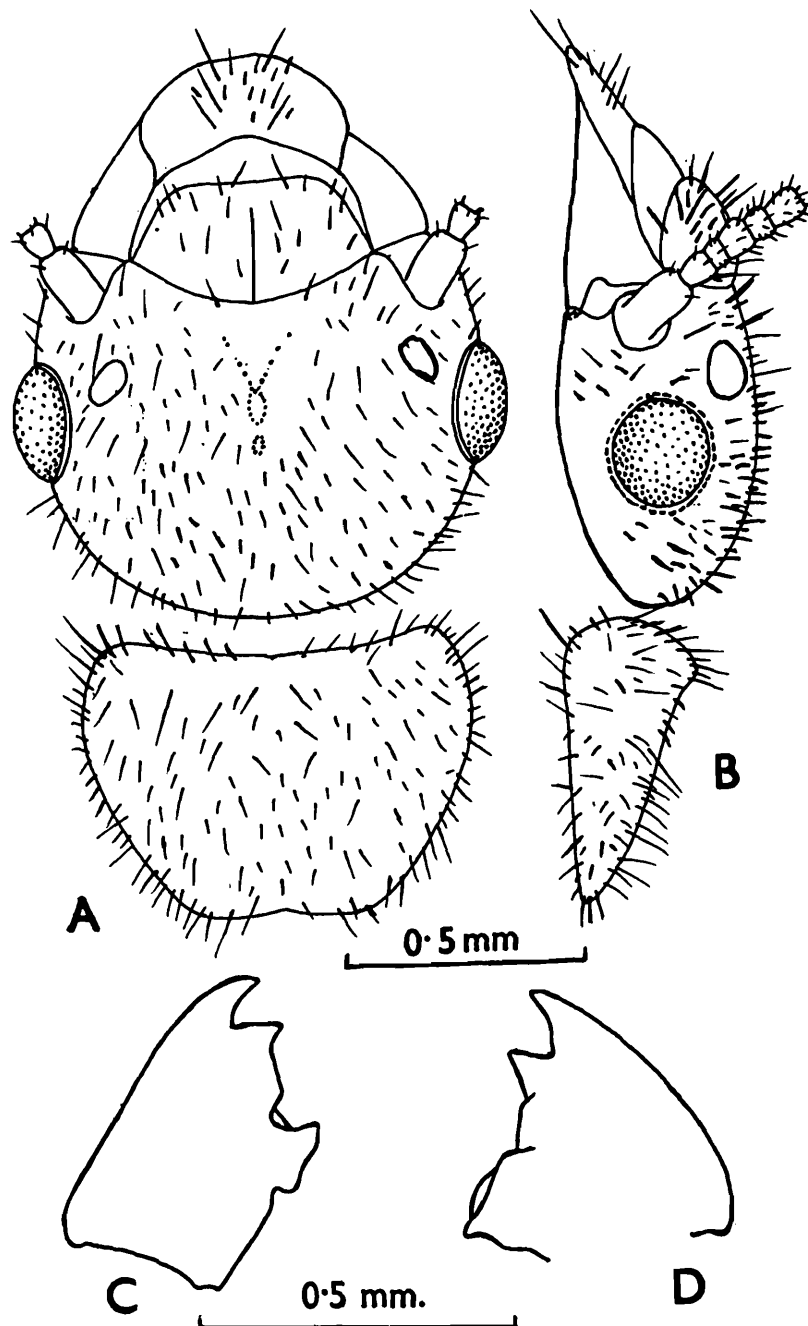


Fig. 50 : *Amitermes belli*. Imago. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C) and (D) Left and right mandibles respectively.

plate longer than posterior margin of 2nd marginal. Pronotum subtrapezoidal; anterior margin slightly raised and weakly notched medially, posterior margin weakly convex and faintly emarginate (length 0.48-0.58, width 0.71-0.89 mm).

SOLDIER (Fig. 51) : Head pale yellow to yellow; antennae pale yellow to pale brown; mandibles reddish; thorax and legs pale yellow; abdomen transparent with intestinal contents showing through. Head sparsely and body fairly hairy. Total body-length 3.50-5.60 mm. Head oval, narrowed in front, thick; frons sloping in front at about 45° angle (length to base of mandibles 1.07-1.44, max. width 0.85-1.15 mm). Fontanelle transverse, situated anteriorly a little behind postclypeus; fringed with

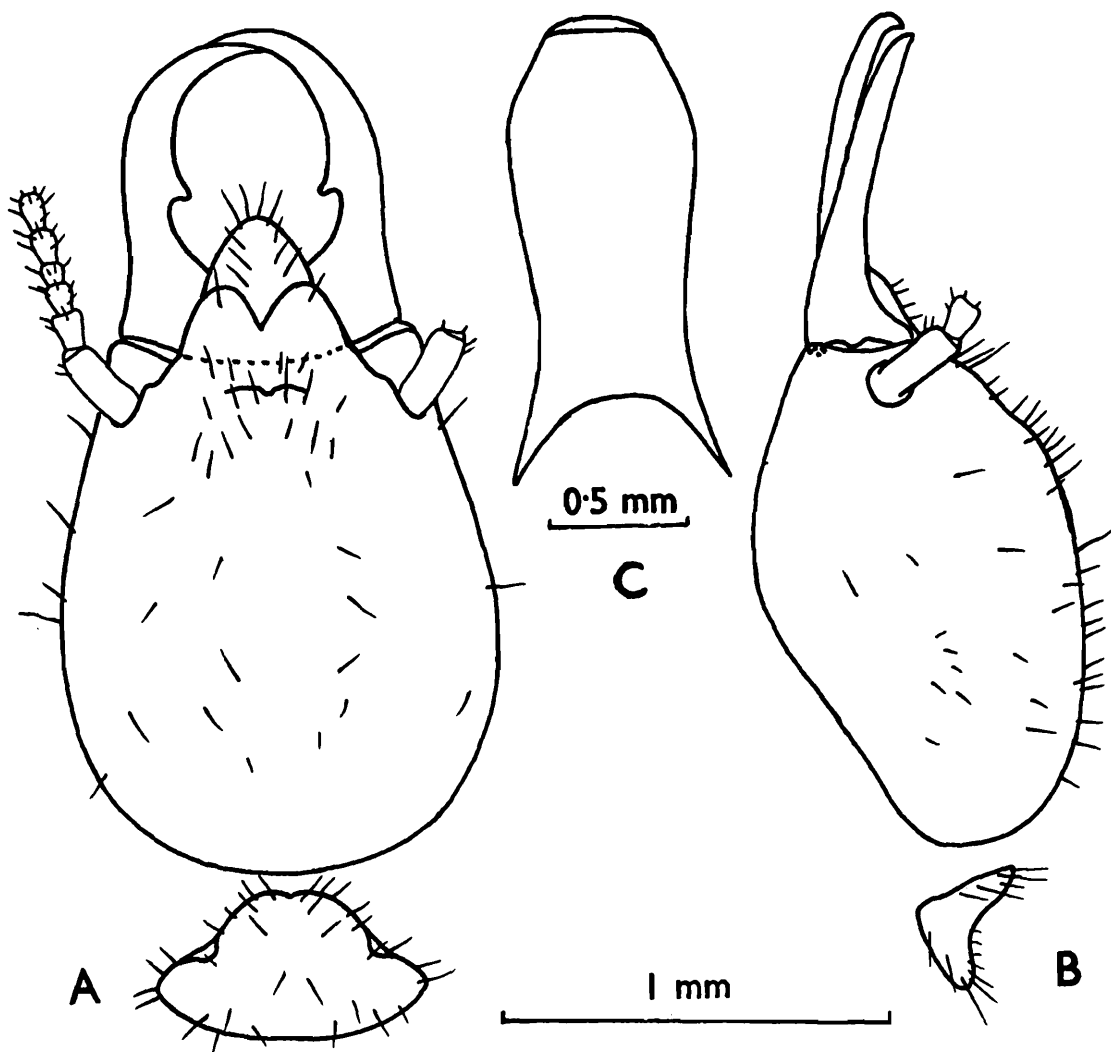


Fig. 51 : *Amitermes belli*. Soldier. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C) Postmentum.

several hairs. Antennae with 14 segments, segment 3 a little shorter than 2, 4 shortest. Clypeus bilobed. Labrum broad, tongue-shaped. Mandibles thin, long and strongly incurved in distal half, more or less sickle-shaped and basally wide (length 0.58-0.80 mm); each with a backwardly directed, sharp tooth at about middle. Postmentum fairly arched; subrectangular, sides weakly narrowed near posterior end (length 0.70-0.90, max. width 0.28-0.35, min. width 0.23-0.30 mm). Pronotum saddle-shaped (length 0.28-0.40, width 0.56-0.78 mm); anterior margin faintly notched, posterior margin substraight or indistinctly emarginate.

WORKER (Fig. 52) : Head-capsule pale yellow to pale brownish yellow; antennae, thorax and legs paler. Head and body fairly hairy. Total body-length 4.0-5.0 mm. Head-capsule subcircular (length to tip of labrum 1.17-1.75, length to base of mandibles 0.75-0.87, max. width 0.91-1.07 mm). Antennae with 14 segments; segment 4 shortest, 3 shorter than 2. Postclypeus swollen, roundly projecting behind into frons, anterior margin

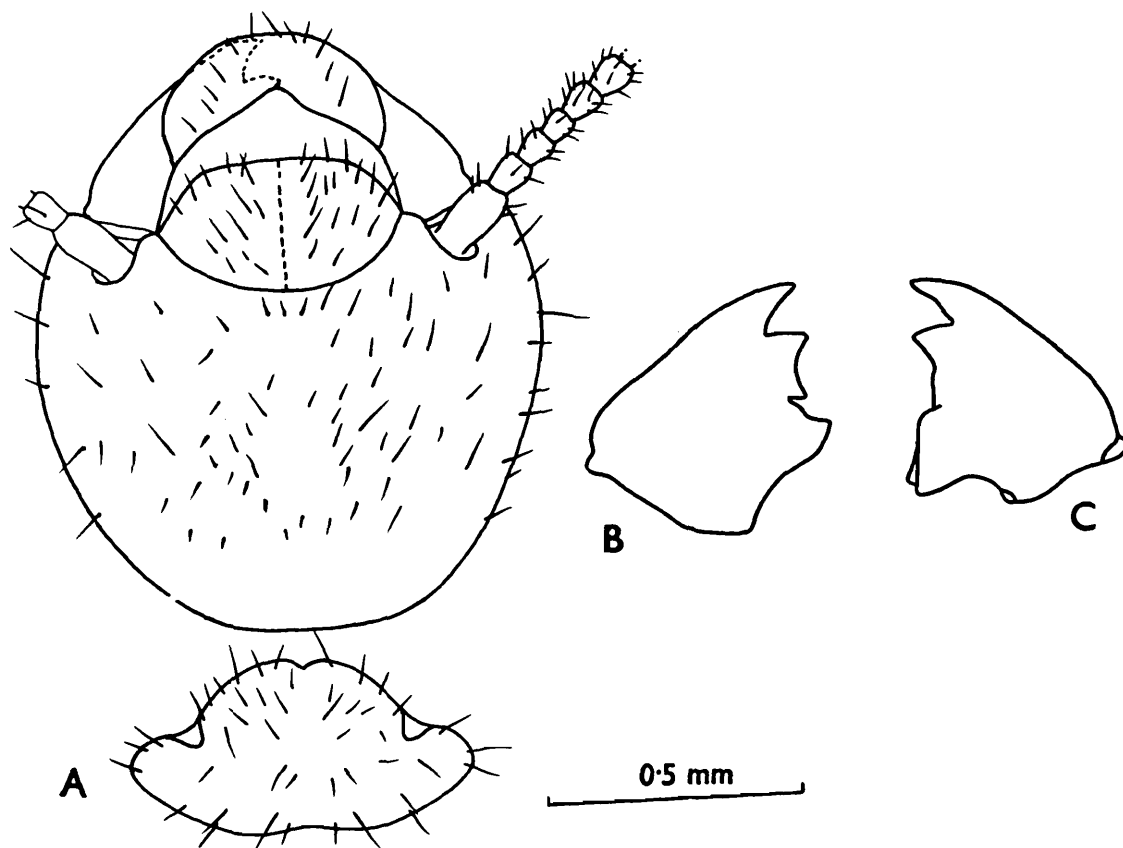


Fig. 52 : *Amitermes belli*. Worker. (A) Head and pronotum, dorsal view.(B) and (C) Left and right mandibles respectively.

substraight, length half of width (length 0.23-0.25, width 0.45-0.50 mm). Pronotum saddle-shaped (length 0.25-0.35, width 0.60-0.70 mm); anteriorly weakly notched medially. Apical tibial spurs 3 : 2 : 2, dorsal spur sometimes not discernible.

Distribution : INDIA : Rajasthan, Delhi and Madhya Pradesh. In Madhya Pradesh it is recorded for the first time from Manpur, 480 m altitude. PAKISTAN : Sind, Panjab and Baluchistan.

130. *Amitermes paradentatus* Ahmad

(Fig. 53)

Amitermes paradentatus Ahmad :

1955. Ahmad, *Biologia*, Lahore, **1** : 257-259. S only. Holotype : S, in PU.
Type-locality : Budhapur, Dist. Dadu, Sind, Pakistan.
1958. Ahmad, *Biologia*, Lahore, **4** : 178.
1962. Roonwal, *Termites Humid Tropics* : 40.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 73.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. A 17-FS-12) : 56.
1974. Akhtar, *Biologia*, Lahore, **20** : 59.
1974. Akhtar, *Pakistan J. Zool.*, **6** : 94, 103.

IMAGO : Unknown.

SOLDIER (Fig. 53) : Head, antennae and pronotum brownish yellow; anteclypeus and labrum yellowish; mandibles reddish brown, basally brownish yellow. Head and body fairly hairy, frontal projection however with numerous hairs; labrum hairy at anterior half. Head-capsule thick, broadly oval; narrowing in front, widest in posterior half (length to base of mandibles 1.16-1.39, max. width 0.92-1.06 mm). Fontanelle forwardly placed, frontal projection weak, with a number of hairs. Antennae with 14 segments; 2nd segment longer than 3rd; 4th slightly longer than 3rd. Postclypeus deeply bilobed. Labrum broadly tongue-shaped, about as wide as long. Mandibles thick, short and broad basally; anteriorly incurved (length 0.54-0.65 mm); each mandible with a prominent, laterally directed tooth, situated a little in front of middle. Postmentum club-shaped; widest in anterior one-third whence weakly narrowed behind into a thick waist at about mid point between widest point and hind margin (length 0.55-

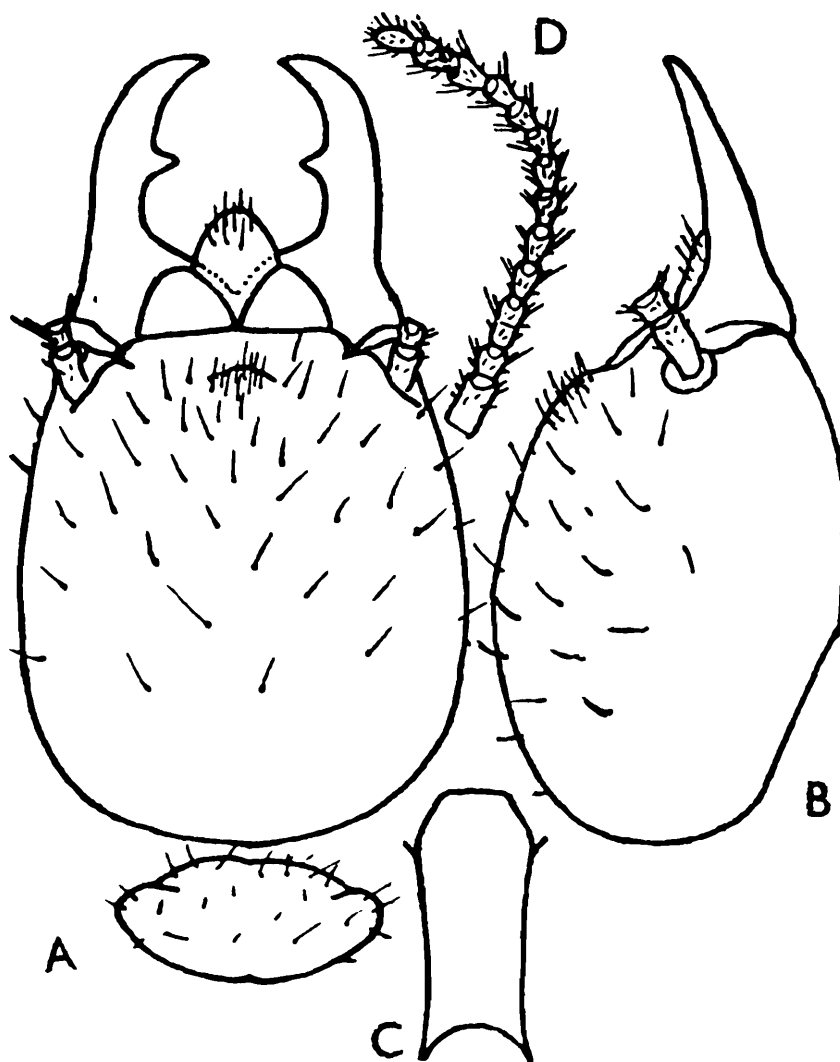


Fig. 53 : *Amitermes paradentatus*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Postmentum. (D) Antenna. (After Ahmad, 1955b).

0.65, max. width 0.30-0.37 mm). Pronotum saddle-shaped; weakly emarginate at anterior and posterior margins (length 0.28-0.34, width 0.57-0.66 mm).

Distribution : PAKISTAN : Sind : Budhapur (type-locality) and Karachi.

Genus 28. *Globitermes* Holmgren

1. Subgenus *Globitermes* (of *Hamitermes*) Holmgren :

1912. Holmgren, K. *Svenska Vetensk. Akad. Handl.*, **48**(4) : 92, 98.

1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : 37, 40.

2. Subgenus *Eutermes* (of *Termes*) Heer (Part) :

1904. Desneux, *Gen. Insectorum*, Fasc. 25 : 39.

3. Genus *Globitermes* Holmgren :

1914. Silvestri, *Rec. Indian Mus.*, 8(5) : 432.

1934. Kemner, *K. Svenska Vetensk-Akad. Handl.*, 13(4) : 111.

1949. Snyder, *Smiths. misc. Colls.*, 112 : 129.

1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, 95(Art. 2) : 64, 65.

1955. Emerson, *Fieldiana : Zool.*, 37 : 469, 510.

1958. Ahmad, *Biologia*, Lahore, 4 : 85, 91, 173-174.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, 131(Art. 1) : 8, 70.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 141.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 346-347.

1973. Chhotani and Bose, *Zool. Anz.*, 190(3 & 4) : 233, 234.

1982. Thapa, *Sabah For. Rec.*, No. 12 : 6, 9,

1987. Chhotani, *Beitr. Ent.*, 37 : 408, 409.

Type of Genus : *Termes globosus* Haviland.

1. *Characters of Genus Globitermes*

Imago : Dark brown, fairly hairy, medium sized species. Head subcircular. Fontanelle small, circular. Eyes subcircular, fairly large and weakly to moderately projecting out. Ocelli broadly oval, separated from eyes. Antennae with 15 segments. Postclypeus flat or weakly raised, short, length less than half of width. Mandibles each with an apical and two marginal teeth; apical and 1st marginal subequal; 2nd marginal of left small and separated from 1st by its long and straight posterior margin, 2nd marginal of right small with a straight posterior margin. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Wings brownish; costa and radius thick; subcosta in forewing short, meeting costa just outside scale, absent in hindwing, media either unbranched or with 2-3 branches; cubitus with 9-13 branches.

Soldier : Head rounded. Fontanelle either indistinct or very minute, and situated medially above middle. Antenna with 14 segments. Postclypeus well demarcated from frons. Labrum tongue-shaped.

Mandibles strongly sickle-shaped, each with a sharp tooth near middle. Pronotum saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed.

Worker : Pale, fairly hairy. Head-capsule subsquarishly round. Fontanelle plate rounded. Antennae with 14 segments. Postclypeus flat to weakly swollen, length less than half of width. Mandibles as in imago. Pronotum saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs, tarsi 4-jointed.

2. *Distribution and Composition of Globitermes*

(Fig. 2)

Distribution : The genus *Globitermes* is endemic to the Oriental Region and is reported from BURMA in the Indian Region and further East from THAILAND, VIETNAM, CHINA, KAMPUCHEA, MALAYSIA and INDONESIA.

Composition : The genus is known by only three species viz., *globosus* (Haviland), *sulphureus* (Haviland) and *vadaensis* Kemner of which only *sulphureus* is reported from the Indian Region (Burma).

131. *Globitermes sulphureus* (Haviland)

(Synonyms : *Termes annamensis* Desneux, *Globitermes audax* Silvestri and *Amitermes (Globitermes) birmanicus* Snyder)

(Figs. 54, 55)

1. *Termes sulphureus* Haviland :

1898. Haviland, *J. Linn. Soc. London*, **26** : 405, Pl. 24 figs. 42, 43, 44. Im, S and W. Syntypes : Mus. Zoology Cambridge University, Cambridge; also in AMNH and FRI. Type-locality : Perak, Selangor, Malacca, Malaysia.

2. *Termes annamensis* Desneux :

1904. Desneux, *Ann. Soc. Ent. Belgique*, **48**(3) : 148.

3. *Globitermes audax* Silvestri :

1914. Silvestri, *Rec. Indian Mus.*, **8**(5) : 432-434.

1958. Mathur and Sen-Sarma, *Indian For. Leaf.*, No. 219 : 1-3. Synonymy and description of imago.

1962. Mathur and Thapa, *Indian For. Leaf.*, No. 167 : 43.

4. *Amitermes (Globitermes) birmanicus* Snyder :

1934. Snyder, *Indian For. Rec.*, **20**(11) : 17-18.

1953. Rattan Lal and Menon. *Cat. Indian Insects, Pt. 27 (Isoptera)* : 41.

5. *Globitermes sulphureus* (Haviland) :

1957. Harris, *Malayan Nat. J.*, **12** : 25 , 30.

1962. Mathur and Thapa, *Indian For. Leaflet*, No. 167 : 43.

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 6. Synonymy.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131**(Art. 1) : 70-72. Synonymy, descriptions, etc.

1966. Harris, *Proc. Linn. Soc. London*, **177**(1) : 13.

1968. Harris, *Opuscula Ent.*, **33** : 145.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 346.

1973. Morimoto, *Bull. Govt. For. exp. Sta.*, No. 257 : 62, 77.

1986. Gao and Lam, *Mem. Hong Kong nat. Hist. Soc.*, **17** : 82.

IMAGO (Fig. 54) : Head dark brown; antennae, postclypeus and labrum brownish yellow; pronotum a little paler than head, with a yellowish T-shaped mark in middle and one shoulder spot on either side; wings brown; abdominal tergites brown, sternites yellowish medially. Head and body moderately hairy; wing membrane thinly hairy. Total body-length with wings c 12.0 and without wings 5.3-6.0 mm. Head-capsule subcircular (length to base of mandibles 0.80-0.96, width with eyes 1.10-1.18 mm). Fontanelle small, circular; a small, pale spot present in front of it. Eyes subcircular, moderately large and bulging out (max. diameter 0.33-0.39, min. diameter 0.31-0.36 mm); situated very close to lower margin. Ocelli broadly oval; separated from eyes by less than half their short diameter (long diameter 0.10-0.14, short diameter 0.09-0.11 and eye-ocellus distance 0.02-0.038 mm). Antennae with 15 segments; segment 3 shortest; 4 as long as 2 and a little longer than 5. Postclypeus shorter than half of width (length 0.20-0.26, width 0.46-0.52 mm); anteriorly straight or weakly incurved, posteriorly weakly convex. Pronotum a little narrower than head; anterior margin straight with a weak notch medially; posterior margin rounded, medially depressed (length 0.54-0.65, max. width 0.91-1.00 mm). Forewing scale much longer than hindwing scale; forewing c 10.0 and hindwing c 9.5 mm long.

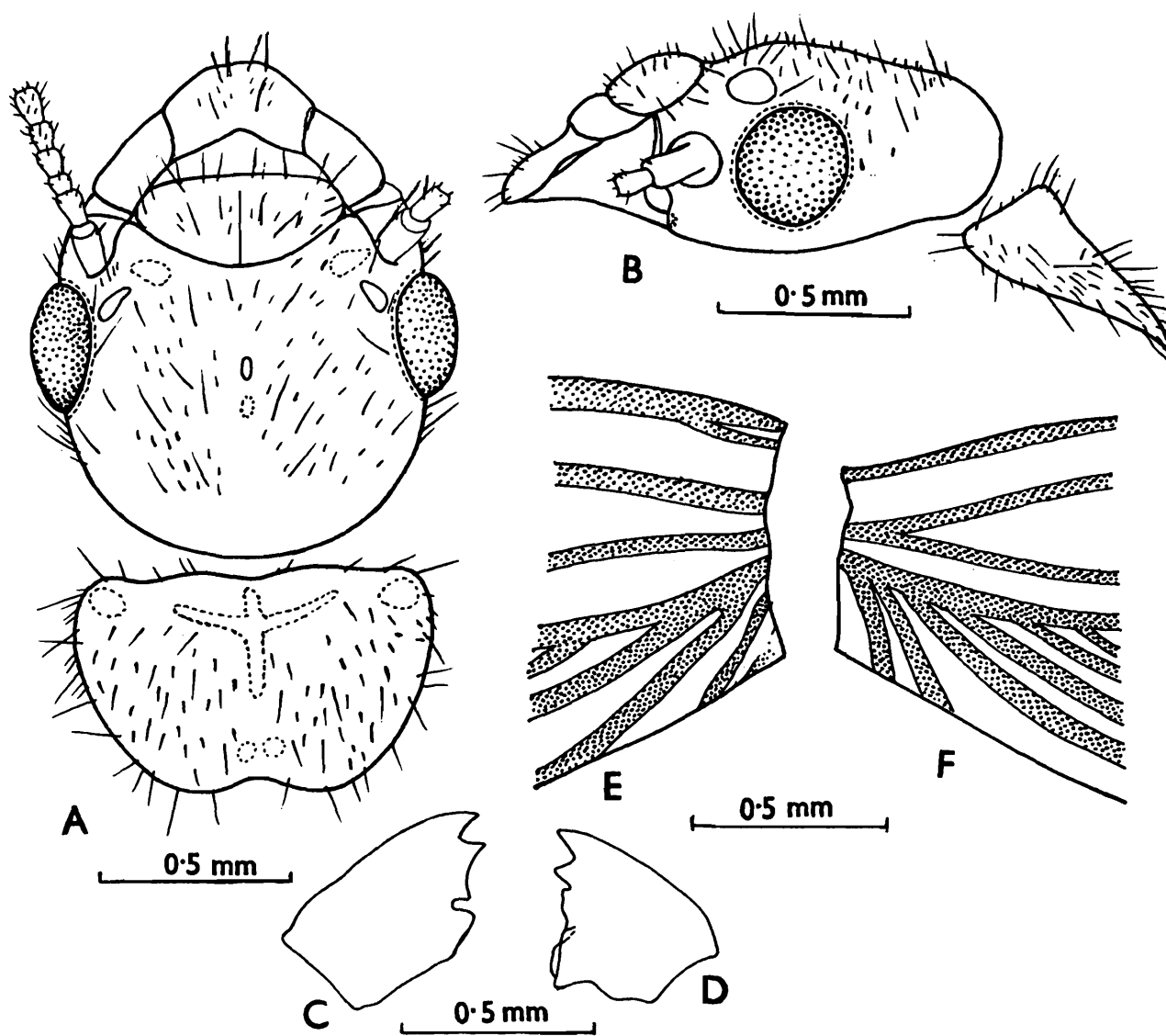


Fig. 54 : *Globitermes sulphureus*. Imago. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C) and (D) Left and right mandibles, respectively. (E) and (F) Basal parts of fore-and hind-wings.

SOLDIER (Fig. 55) : Head-capsule brownish yellow; antennae pale brownish; mandibles reddish, brownish yellow basally; body yellowish white to rust yellow. Head sparsely hairy; abdomen moderately thickly hairy. Total body-length c 4.0-5.0 mm. Head round; sides rounded; as wide as or a little wider than long (length to base of mandibles 0.75-1.17, max. width 0.80-1.20 mm). Fontanelle indistinct. Antennae 14-segmented; segments 2-4 variable, 2 as long as 3 + 4, sometimes equal to or shorter than 3 and sometimes as long as 4. Postclypeus flat or slightly swollen. Labrum tongue-shaped, as long as wide. Mandibles long, thin, very strongly incurved in distal region; each mandible with a laterally directed

tooth situated below middle. Postmentum subrectangular, strongly arched, waist weakly marked (length 0.26-0.36, max. width 0.19-0.27 mm). Pronotum saddle-shaped; weakly notched anteriorly and faintly emarginate posteriorly (length 0.26-0.39, width 0.57-0.80 mm).

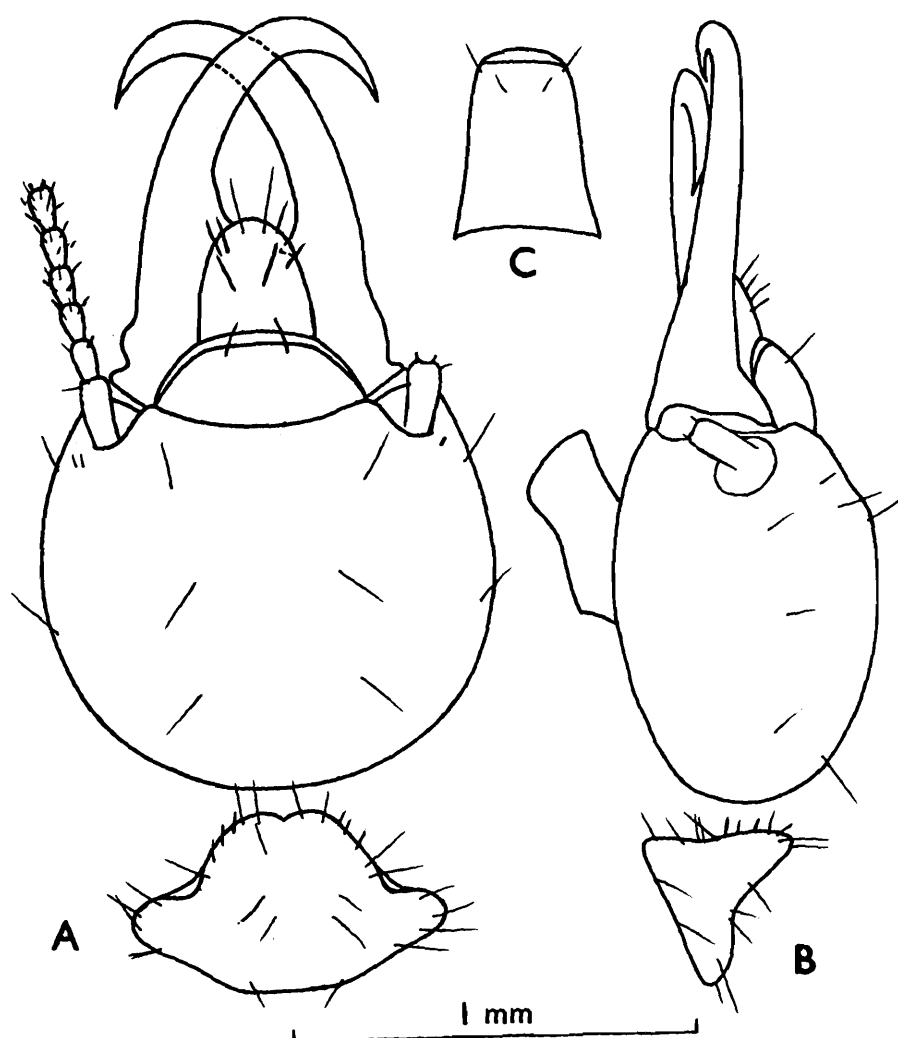


Fig. 55 : *Globitermes sulphureus*. Soldier. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C) Postmentum.

WORKER : Head yellow; body whitish. Head thinly and abdomen fairly thickly hairy. Total body-length 4.0-4.5 mm. Head subsquarish, slightly wider than long (length to base of mandibles 1.00-1.10, max. width 1.10-1.23 mm). Fontanelle indistinct. Antennae with 14 segments; segment 2 equal to 3 + 4. Postclypeus swollen, length less than half its width. Pronotum saddle-shaped, very faintly or not notched anteriorly (length 0.30-0.35, width 0.60-0.68 mm).

Distribution : BURMA in the Indian Region; further East it is widely distributed and is reported from THAILAND, KAMPUCHEA, VIETNAM, MALAY PENINSULA, INDONESIA and SOUTHERN CHINA.

Genus 29. *Eremotermes* Silvestri

1. Genus *Eremotermes* Silvestri :

1911. Silvestri, *Boll. Lab. Zool. gen. agr. Portici*, **6** : 108.
1949. Snyder, *Smiths. misc. Colls.*, **112** : 131. Synonymy.
1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95**(Art. 2) : 66, 67.
1953. Rattan Lal and Menon, *Cat. Indian Insects, Part 27-Isoptera* : 37. Synonymy.
1955. Emerson, *Fieldiana : Zool.*, **37** : 472, 480, 483, 510.
1958. Ahmad, *Biologia*, Lahore, **4** : 87, 90.
1960. Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (ICAR Ent. Monogr. 1) : 46-53.
1964. Roonwal and Bose, *Zoologica*, **40**(113) : 8.
1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 141.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 347.
1971. Bouillon and Mathot, *Zooleo*. No. 1, Suppl 2 : 3.
1972. Chaudhry et al., *Termites of Pakistan* (Final Tech Rep. PL 480 Proj. No. A17-FS-12) : 52.
1974. Akhtar, *Pakistan J. Zool.*, **6**(1 & 2) : 93, 95, 96, 97, 100.
1975. Sen-Sarma, et al., *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 4, 8.
1977. Roonwal and Verma, *Rec. zool. Surv. India.*, **72** : 466-467.
1977. Roonwal, *Proc. zool. Soc., Calcutta*, **28** : 36, 37, 39.
1977. Roonwal, *Zool. Anz.*, **198** : 305, 308, 309, 311.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46**(3) : 255, 261, 262.
1983. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) **49**(5) : 381.
1984. Bose, *Occ., Pap. Rec. zool. Surv. India*, No. 49 : 102, 120.
1985. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) **51**(3) : 312.
1985. Roonwal, *Zool. Anz.*, **215** : 225.
1985. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) **51**(2) : 157, 158.
- 1987 Chhotani, *Beitr. Ent.*, **37** : 409, 416.

Type of genus : *Eremotermes indicatus* Silvestri

1. Characters of Genus *Eremotermes*

Imago : Pale to dark brown, fairly densely pilose species. Head-capsule roundish. Eyes medium sized, not strongly projecting out. Ocelli small to fairly large, not touching eyes. Fontanelle-plate long, whitish. Antennae with 14-15 (mostly 15) segments. Postclypeus swollen, pilose, about 1/2 as long as wide; medially divided by longitudinal line. Mandibles each with an apical and two marginal teeth; apical longer than 1st marginal. Left mandible : 1st marginal with a long posterior margin; 2nd marginal very small; no cut between posterior margin of 1st marginal and 2nd marginal; molar projection small. Right mandible : 1st marginal triangular, with posterior margin about 1.5 times of anterior margin; 2nd marginal with incurved posterior margin; molar plate longer than posterior margin of 2nd marginal. Pronotum semi-lunar or subtrapezoidal; anterior margin weakly to deeply notched. Wings small, transparent; microsculpture consists of papillae and nonasteroid and asteroid micrasters; costa thick, along anterior margin; subcosta in forewing short (sometimes not discernible), meeting costa just outside scale, absent in hindwing; radius thick as costa + subcosta and close to it; media thin, arising independently in forewing but from radius outside scale in hindwing, with 1-4 branches; cubitus also thin and with 6-11 branches to posterior margin. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed.

Soldier : Pale, fairly pilose species. Head ovoid; frons projected weakly to fairly strongly into frontal protuberance and sloping sharply in front. Antennae with 14-15 segments. Labrum subtriangular or tongue-shaped. Mandibles thin, long, weakly to strongly incurved at apices; inner margin with a minute to fairly prominent tooth near middle or below middle. Pronotum strongly saddle-shaped; anterior margin with or without notch; posterior margin straight. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed.

Worker : Dimorphic. *Worker major* : Small, pale yellow, fairly densely hairy species. Head-capsule subsquarish. fontanelle indistinct. Antennae with 14 segments. Postclypeus swollen, about half as long as its width and divided into 2 by a median line. Mandibles as in imago. Pronotum and legs as in soldier. *Worker minor* : Smaller and mandibles with longish and pointed teeth otherwise as in worker major.

2. Distribution and Composition of *Eremotermes*

(Fig. 2)

Distribution : This genus is known from the Oriental, Ethiopian and Palaearctic zoogeographical regions. In the Oriental Region it is reported from India and Pakistan by 5 species of which 4 are from India and 3 from Pakistan (2 being common).

Composition : Ten species of the genus are known of which 5 occur in the Indian Region as follows and are taken into account here.

1. *Eremotermes dehraduni* Roonwal and Sen-Sarma—India
2. *E. fletcheri* Holmgren and Holmgren—India, Pakistan
3. *E. madrasicus* Roonwal and Sen-Sarma—India
4. *E. neoparadoxalis* Ahmad—Pakistan
5. *E. paradoxalis* Holmgren—India

3. Keys to Indian Species of *Eremotermes*

IMAGOES

- 1(2) Larger species : Head-width with eyes 0.85-0.90, pronotum-width 0.75 mm.....*fletcheri*
- 2(1) Smaller species : Head-width with eyes 0.70-0.80, pronotum-width 0.55-0.65 mm
- 3(4) Ocelli closer to eyes (eye-ocellus distance 0.025-0.038 mm).....*paradoxalis*
- 4(3) Ocelli farther from eyes (eye-ocellus distance 0.05-0.063 mm).....*dehraduni*

SOLDIERS

- 1(2) Mandibles comparative to head longer, index mandible-length/head-length 1.12-1.23. Mandibular tooth weak or indistinct*neoparadoxalis*
- 2(1) Mandibles comparative to head shorter, index mandible-length/head-length 0.78-1.07 Mandibular tooth prominent

- 3(4) Mandibles almost straight; concavity on outer margin of mandibles very weak or absent.....*madrasicus*
- 4(3) Mandibles appreciably curved; concavity on outer margin strong
- 5(6) Larger species : Head-length to base of mandibles 0.94-1.105, head-width 0.81-0.85 mm. Mandible-length equal to or slightly more than head-length, index mandible-length/head-length 1.0-1.07.....*fletcheri*
- 6(5) Smaller species : Head-length to base of mandibles 0.80-0.95, head-width 0.68-0.80 mm. Mandible-length generally less than head-length, index mandible-length/head-length 0.78-0.98
- 7(8) Frontal protuberance prominent and frons very steeply inclined in front. Head thick, height/width index 0.81-0.93. Mandibles strongly incurved at apices.....*dehraduni*
- 8(7) Frontal protuberance a little weaker and frons somewhat less so steeply inclined in front. Head thinner, height/width index 0.66-0.87. Mandibles weakly incurved at apices.....*paradoxalis*

132. *Eremotermes dehraduni* Roonwal and Sen-Sarma

(Figs. 56, 57)

*Eremotermes dehraduni** Roonwal and Sen-Sarma :

1960. Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (ICAR Ent. Monogr. No. 1) : 49, 50, 51, 53-63, Pls. 9, 10. Im, S and W. Holotype : S, in FRI. Type-locality : Malhan Forest Range, 12 miles N-W of Dehradun, Uttar Pradesh, India. The imago described is from a different source of collection not associated with S and W, but is taken as belonging to this species as *dehraduni* is the only sp. of genus known from Dehradun.
1960. Mathur and Sen-Sarma, *J. Timb. Dry. Preser. Assoc. India*, 6(2) : 23.
1962. Roonwal, In *Termites in Humid Tropics* : 41.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 347.

*The species is described from soldier and worker but the imago description is taken from Roonwal and Sen-Sarma 1960 and it is based on a collection not associated with soldiers and workers.

IMAGO (Fig. 56) : Head-capsule and thorax dark smoky brown; postclypeus straw coloured; abdominal terga and legs a little paler than head. Head and body fairly hairy. Head-capsule subcircular (length to base of mandibles 0.65, maximum width with eyes 0.75 mm). Fontanelle plate prominent, small, narrow, elongate and translucent; situated medially little behind middle. Eyes subcircular, close to antennae (maximum diameter 0.20 mm; eye-antennal distance 0.05 mm). Ocelli, oval (0.075 mm long); separated from eyes by a distance little less than its length (0.05-0.063 mm). Antennae broken. Postclypeus swollen, hairy; length half of width. Labrum subsquarish, length (0.20 mm) subequal to width (0.20-0.25 mm). Mandibles as in genus. Pronotum flat, subrectangular (length 0.35, maximum width 0.55-0.60 mm); anterior margin substraight with a faint median notch.

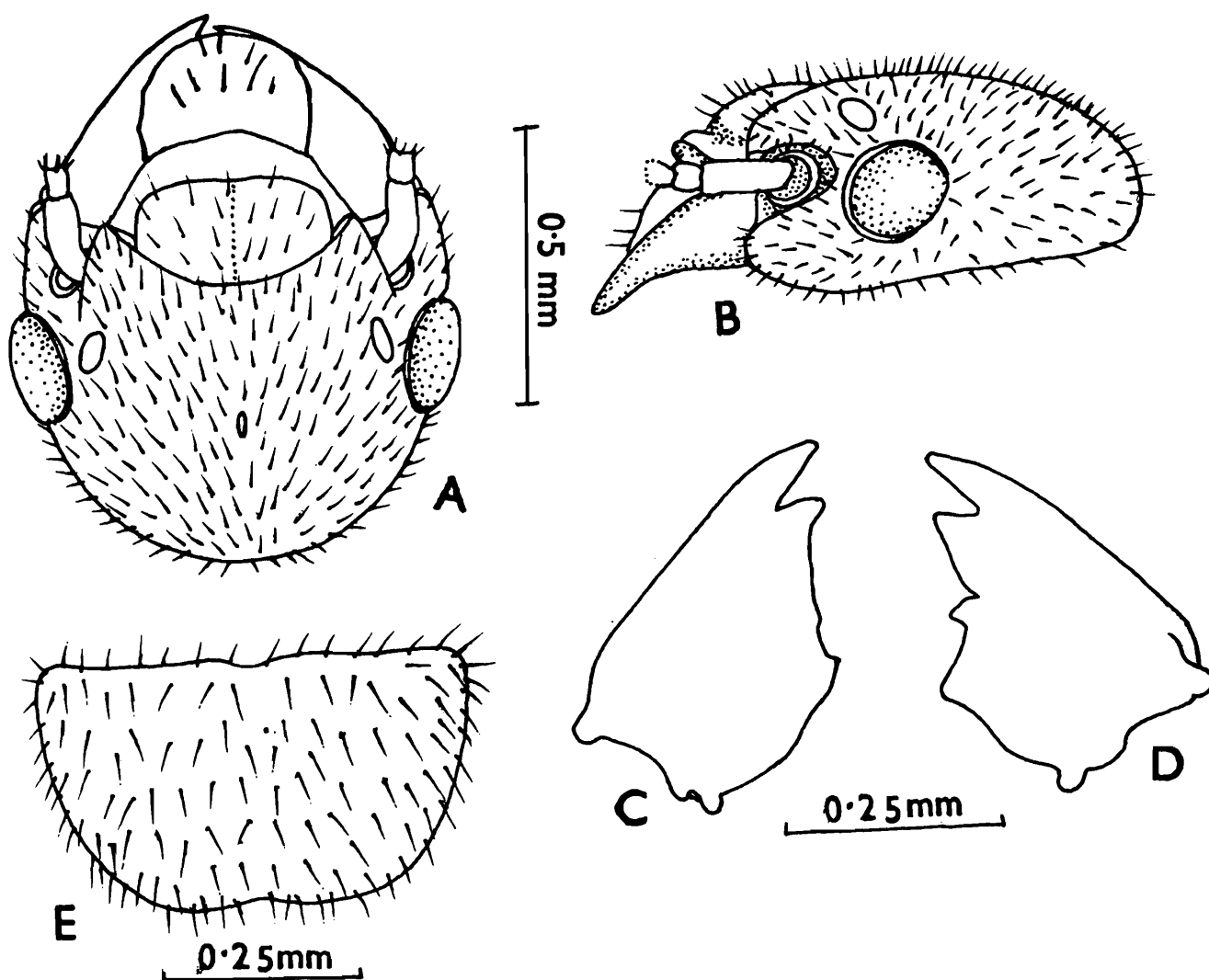


Fig. 56 : *Eremotermes dehraduni*. Imago. (A) Head, dorsal view. (B) Head, side view. (C) and (D) Left and right mandibles, respectively. (E) Pronotum. (Ex Roonwal and Sen-Sarma, 1960).

SOLDIER (Fig. 57) : Head-capsule deep straw coloured, smoky around frontal protuberance; antennae paler; mandibles dark reddish brown; pronotum, legs and body creamish. Head and body densely hairy. Total body length 3.0-4.0 mm. Head-capsule subrectangularly oval, thick (length to base of mandibles 0.85-0.90, maximum width 0.75-0.80, height 0.65-0.70 mm); width a little less than length, index max. width/length to base

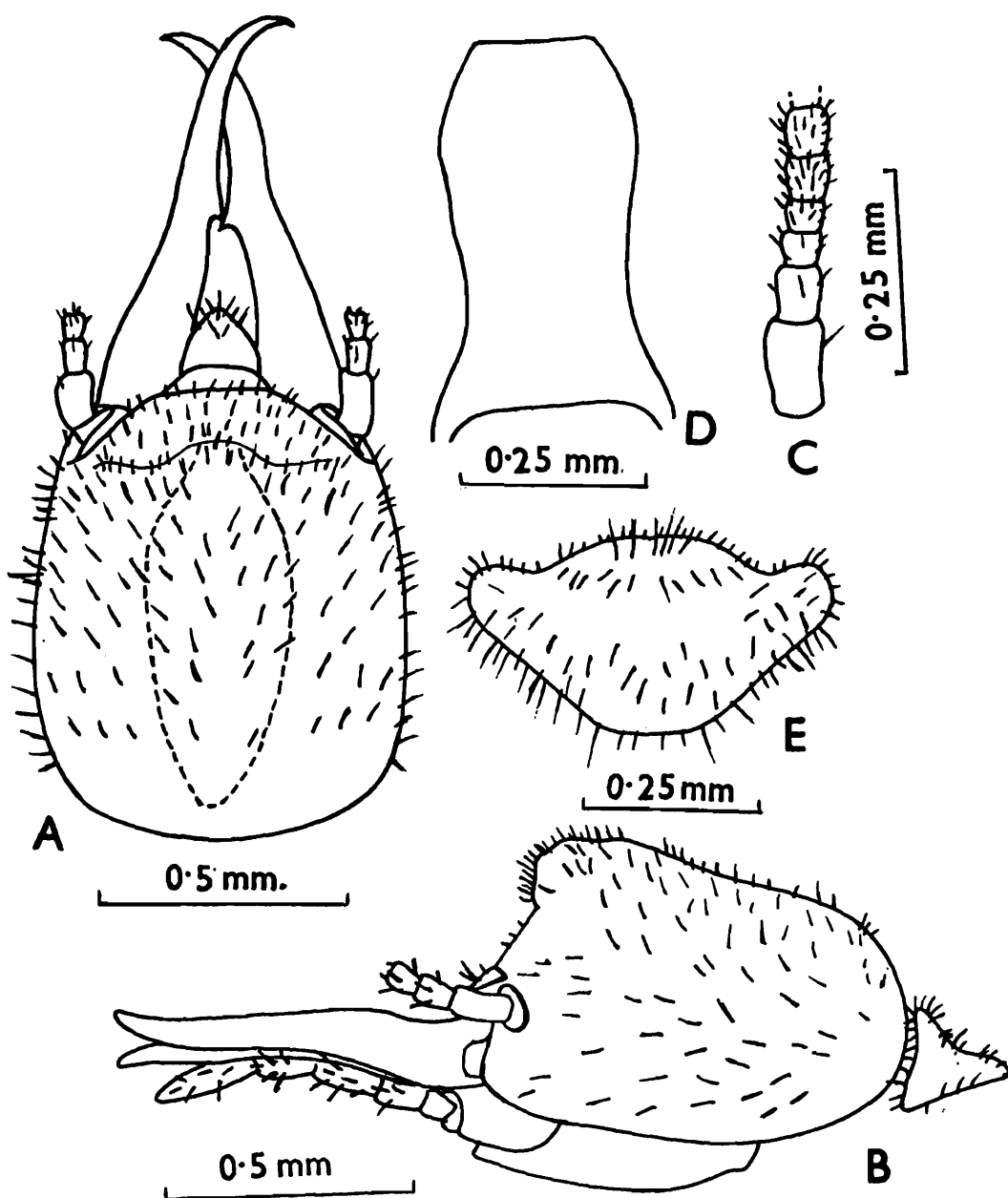


Fig. 57 : *Eremotermes dehraduni*. Soldier. (A) Head, dorsal view. (B) Head and pronotum, side view. (C) Basal few segments, of antenna. (D) Postmentum. (E) Pronotum, dorsal view. (Ex Roonwal and Sen-Sarma, 1960).

of mandibles 0.83--0.89; frontal protuberance prominent; round, knob-like; frons steeply inclining in front. Fontanelle situated below frontal protuberance; prominent, with a chitinous ring (occipito-fontanelle-distance 0.80 mm); fontanelle gland large. Antennae with 14 segments; segment 3 shorter than 2, subequal to or little longer than 4. Labrum tongue-shaped, narrowed in front (length 0.10-0.13, width 0.15-0.175 mm). Mandibles long, sabre-shaped, strongly incurved at apices and incurved medially at outer margin; length very slightly less than head-length (length 0.80-0.85 mm, index mandible-length/head-length to base of mandibles 0.89-0.98); each mandible with a sharp well-marked tooth, situated medially and pointing a little backwards. Postmentum subrectangular, with a weakly incurved waist posteriorly (length 0.45, max. width 0.25, width at waist 0.15 mm); in profile fairly arched. Pronotum saddle-shaped; generally without any notch at anterior margin, sometimes feebly notched; posterior margin straight (length 0.20-0.25, width 0.40-0.45 mm).

WORKER : Dimorphic. *Worker major* : Head-capsule pale yellow to pale straw-coloured; pronotum and antennae paler; legs and body yellowish white. Head and body densely hairy. Total body-length c 3.0-3.5 mm. Head-capsule subsquarish (length to base of mandibles 0.60-0.65, max. width 0.70-0.75 mm). Antennae with 14 segments; segments 3 and 4 subequal, shorter than 2. Postclypeus swollen; half as long as wide. Pronotum saddle-shaped (length 0.25, width 0.45 mm); anterior margin weakly notched medially. *Worker minor* : As in worker major but smaller. Total body length 2.4-2.7, length of head to base of mandibles 0.55-0.60, max. width of head 0.65-0.70, length of pronotum 0.20-0.25, width of pronotum 0.40-0.45 mm.

Distribution : INDIA : Uttar Pradesh : Malhan Forest Range (near Dehra Dun), Dehra Dun, Rajpur and Kalsi.

133. **Eremotermes fletcheri** Holmgren and Holmgren

(Synonym : *Eremotermes maliki* Ahmad)

(Figs. 58, 59)

1. *Eremotermes fletcheri* Holmgren and Holmgren

1917. Holmgren and Holmgren, *Mem. Dep. Agric. India (Ent.)*, 5(3) : 167-168. Im, S and W. Lectotype : S, inFRI. Type-locality : Coimbatore, Tamil Nadu, India.

1958. Ahmad, *Biologia*, Lahore, 4 : 174.
 1960. Roonwal and Sen-Sarma, *Contrib. Syst. Oriental Termites* (ICAR Ent. Monogr. No. 1) : 46, 47, 49, 50, 51, 53, 63-68. See for synonymy, description, etc.
 1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 92, 121-123.

2. *Eremotermes maliki* Ahmad :

1955. Ahmad, *Biologia*, Lahore, 1 : 253-254. S only.
 1958. Ahmad, *Biologia*, Lahore, 4 : 174-175.
 1960. Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (ICAR Ent. Monogr. 1) : 63, 68.
 1962. Roonwal, In : *Termites in Humid Tropics* : 41.
 1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 52-53, fig. 62.
 1974. Akhtar, *Pakistan J. Zool.*, 6(1 & 2) : 41.

IMAGO (Fig. 58) : Head-capsule yellow to pale brown; postclypeus straw-coloured; thorax a little paler than head; antennae, legs and

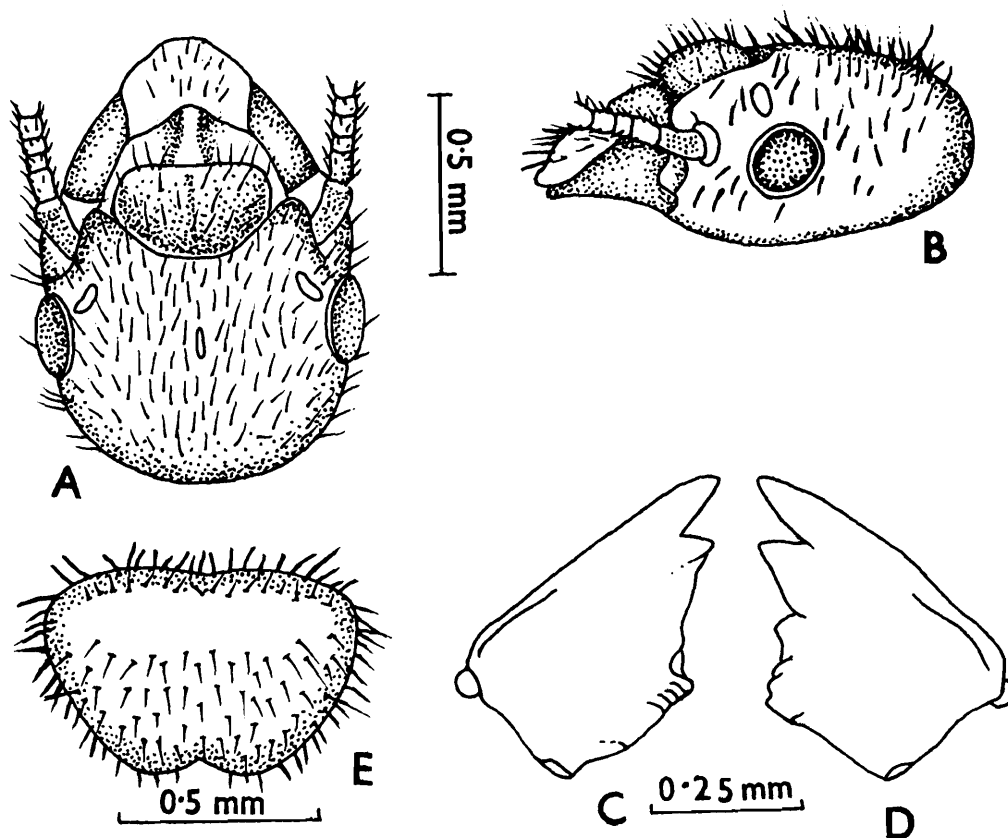


Fig. 58 : *Eremotermes fletcheri*. Imago. (A) Head, dorsal view. (B) Head, side view. (C) and (D). Left and right, mandibles. (E) Pronotum, dorsal view. (Ex Roonwal and Sen-Sarma, 1960).

abdomen yellowish white. Head and body densely hairy. Total body-length with wings 8.0-9.2, without wings 5.5-6.20 mm. Head-capsule roundly oval, somewhat flat (length to base of mandibles 0.65-0.80, width with eyes 0.83-0.90 mm); fontanelle plate longish, whitish, situated medially. Eyes subcircular (0.20-0.23 mm diameter); not projecting much. Ocelli oval, max. diameter 0.075-0.10 mm; separated from eyes by 0.05-0.062 mm. Antennae 15 segmented; segment 3 shortest, 4 and 5 subequal. Postclypeus swollen, length about half of width. Mandibles as in genus. Pronotum subtrapezoidal (length 0.48-0.53, width 0.73-0.80 mm); anterior margin substraight or subconvex, faintly notched; posterior margin straight with a strong median notch. Wings transparent, colourless; membrane covered with numerous micrasters and sparsely with hairs; forewing-length 6.4-7.2, hindwing-length 5.8-6.7 mm. For variation in venation vide Roonwal and Sen -Sarma 1960.

SOLDIER (Fig. 59) : Head-capsule pale straw coloured; antennae and body creamish; mandibles brownish, straw coloured basally. Head and body pilose. Total body-length 3.5-4.6 mm. Head ovoid, thick; sides slightly convex (length to base of mandibles 1.0-1.05, max. width 0.80-0.85, height 0.60-0.65 mm); frontal protuberance weak or absent; frons strongly inclining in front. Fontanelle round, prominent; situated at beginning of frontal slope; fontanelle gland large, elongate (occipito-fontanelle distance 0.85 mm). Antennae with 14 segments; segment 3 slightly shorter or subequal to 2, 4 subequal to or shorter than 3. Mandibles long, sabre-shaped, with apices slightly incurved; length subequal to head-length (length 1.0-1.05 mm, index left mandible-length/head-length 1.0-1.07); outer margin incurved below level of tooth; each mandible with a medially placed, sharp and prominent tooth (left mandibular tooth index i.e. tooth distance/mandible-length 0.52-0.57). Postmentum swollen in side view (length 0.55, max. width 0.25-0.30, min. width at waist 0.15-0.20 mm). Pronotum saddle-shaped; anterior margin faintly notched, posterior margin without notch; length 0.30, width 0.50-0.55 mm.

WORKER : Dimorphic. *Worker major* : Head-capsule pale yellow; antennae and body creamish. Head and body densely hairy. Total body-

length c 4.0 mm. Head subsquarish (length to base of mandibles 0.75, width 0.85 mm). Fontanelle indistinct. Antennae 14 segmented. Postclypeus swollen, pilose. Pronotum saddle-shaped (length 0.25, width 0.55 mm). *Worker minor* : Generally as in worker major except for its smaller size. Total body-length c 3.0, head-length to base of mandibles 0.65, width of head 0.75, pronotum-length 0.25 and pronotum-width 0.50 mm.

Distribution : INDIA : (Tamil Nadu). PAKISTAN.

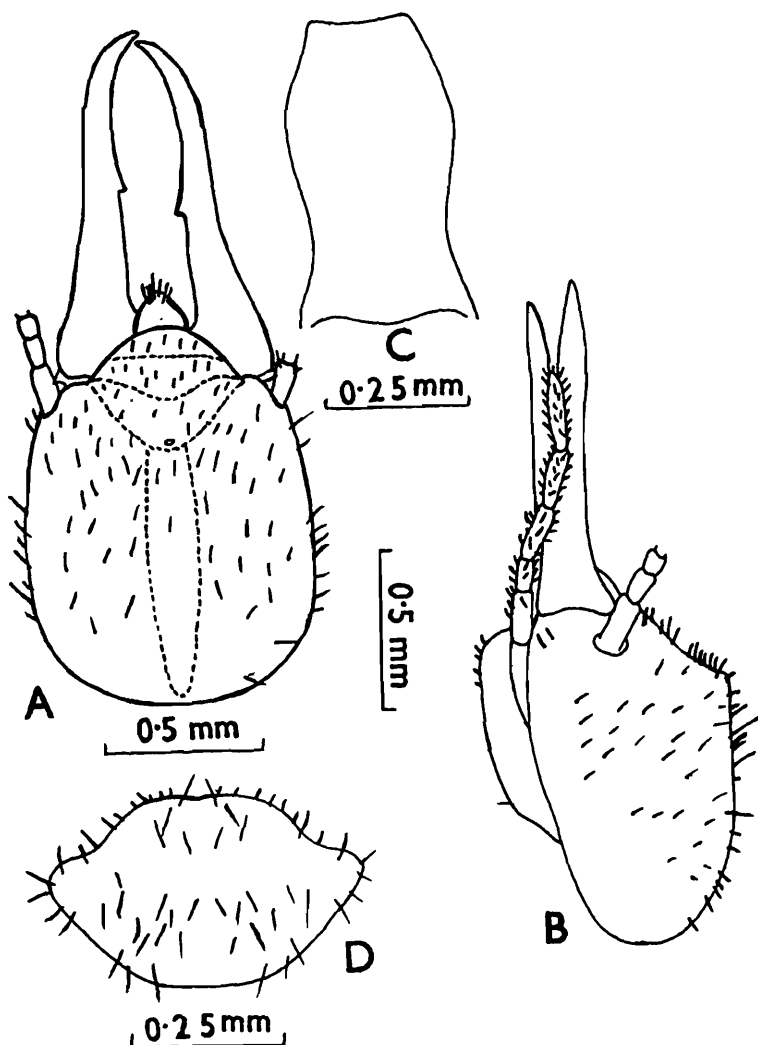


Fig. 59 : *Eremotermes fletcheri*. Soldier. (A) Head, dorsal view. (B) Ditto, side view. (C) Postmentum. (D) Pronotum, dorsal view. (Ex Roonwal and Sen-Sarma, 1960).

134. *Eremotermes madrasicus* Roonwal and Sen-Sarma

(Fig. 60)

Eremotermes madrasicus Roonwal and Sen-Sarma :

1960. Roonwal and Sen-Sarma, *Contrib. Syst. Oriental Termites* (ICAR Ent. Monogr. 1) 46, 50, 53, 75-79, Pls. 13, 14. S and W. Holotype : S, in FRI. Type-locality : Villivakkam, 10 miles N. of Madras City, Tamil Nadu.

1962. Roonwal, In : *Termites in Humid Tropics* : 41.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 92, 121, 123.

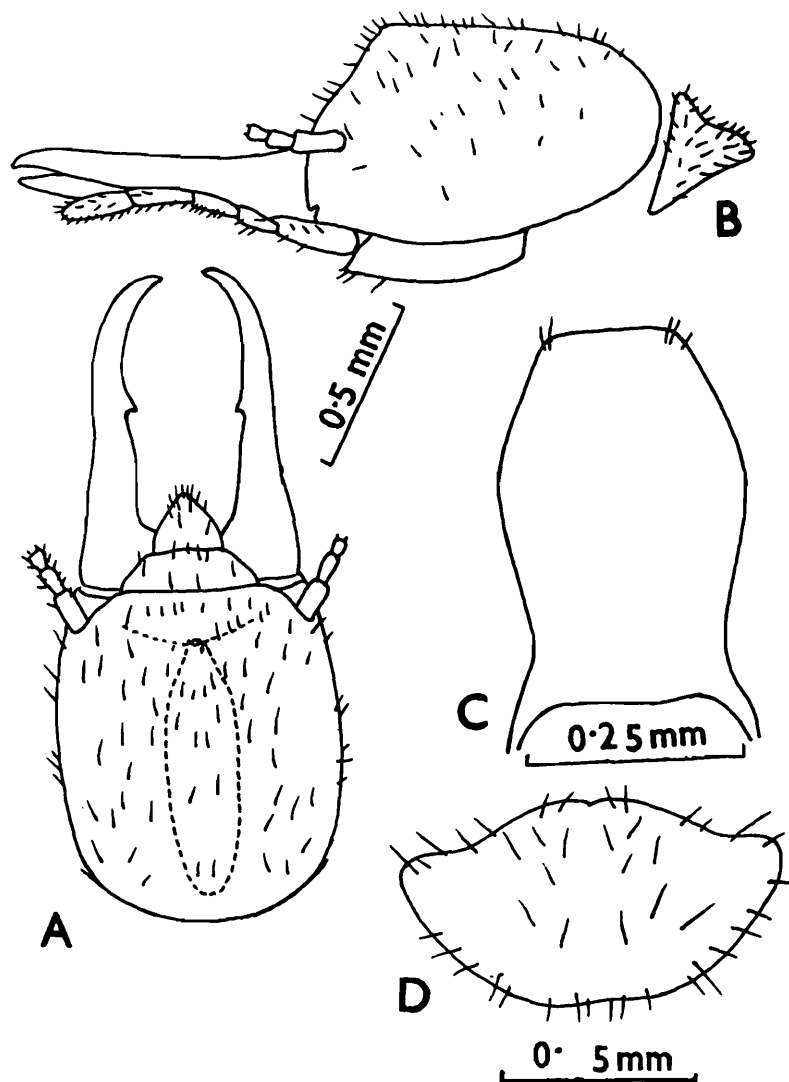


Fig. 60 : *Eremotermes madrasicus*. Soldier. (A) Head, dorsal view. (B) Head and pronotum, side view. (C) Postmentum. (D) Pronotum, dorsal view. (Redrawn from Roonwal and Sen-Sarma, 1960).

IMAGO : Unknown.

SOLDIER (Fig. 60) : Head-capsule straw-coloured; antennae and labrum paler than head; body yellowish white. Head and body fairly hairy. Total body-length 3.3-3.9 mm. Head-capsule subrectangularly oval (length to base of mandibles 0.85-0.93, max. width 0.75-0.78 mm), rather thick (height 0.60-0.65 mm, index height/width 0.80-0.87); frontal protuberance weak or sometimes absent; frons sharply sloping in front. Fontanelle prominent, situated at beginning of frontal slope (occipito-fontanelle distance 0.75-0.80 mm); fontanelle gland large and prominent. Antennae with 14 segments; segment 3 shorter than 2 and subequal to or shorter than 4. Labrum tongue-shaped with a sharp tip (length 0.15-0.18, width 0.20 mm). Mandibles long, sabre-shaped, straighter, thicker and sharply incurved at apices; length subequal to head-length (length 0.88-0.95 mm, index left mandible-length/head-length 0.94-1.07); outer margin straight or faintly incurving; each mandible with a sharp, laterally directed tooth at middle (tooth distance 0.48-0.55 mm, left mandibular tooth index i.e. tooth-distance/mandible-length 0.51-0.59). Postmentum swollen, arched in side view; thick, club-like (length 0.45-0.50, max. width 0.25, min. width at waist 0.15-0.175 mm). Pronotum saddle-shaped; anterior margin fairly to weakly notched (length 0.25, width 0.45-0.50 mm).

WORKER : Dimorphic. *Worker major* : Head-capsule pale yellow; antennae, legs and body yellowish white. Total body-length c 3.0-3.5 mm. Head-capsule subsquarish (length to base of mandibles 0.70-0.80, max. width 0.70-0.83 mm). Fontanelle indistinct. Antennae 14 segmented; segments 3 and 4 subequal, 2 equal to 3 + 4. Postclypeus swollen, length about half of width; anterior margin straight, posterior margin rounded. Pronotum saddle-shaped (length 0.25, width 0.50-0.53 mm). *Worker minor* : As worker major, but smaller.

Distribution : INDIA : Tamil Nadu : Villivakkam (type-locality, 10 miles N of Madras). Known only from type-locality.

135. *Eremotermes neoparadoxalis* Ahmad

(Figs. 61, 62)

Eremotermes neoparadoxalis Ahmad :

1955. Ahmad, *Biologia*, Lahore, 1(2) : 252-253. S only. Holotype : S, in PU, Lahore. Type-locality : Shahdadpur, Sind, Pakistan.

1958. Ahmad, *Biologia*, Lahore, 4 : 175.
 1960. Roonwal and Sen-Sarma, *Contrib. Syst. Oriental Termites* (ICAR Ent. Monogr. 1) : 46, 49, 53, 79-83.
 1962. Roonwal, In : *Termites in Humid Tropics* : 41.
 1964. Roonwal and Bose, *Zoologica*, 40(113) : 5, 23-24.
 1969. Roonwal and Bose, *Rec. zool. Surv. India*, 61(3 & 4) : 440, 446.
 1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 53, fig. 63.
 1974. Akhtar, *Pakistan J. Zool.*, 6(1 & 2) : 103.
 1976. Akhtar, *Pakistan J. Zool.*, 8(2) : 163-165.
 1977. Roonwal, In : *Natural Resources of Rajasthan* (Ed Roonwal) : 375, pl. 3. fig. g.

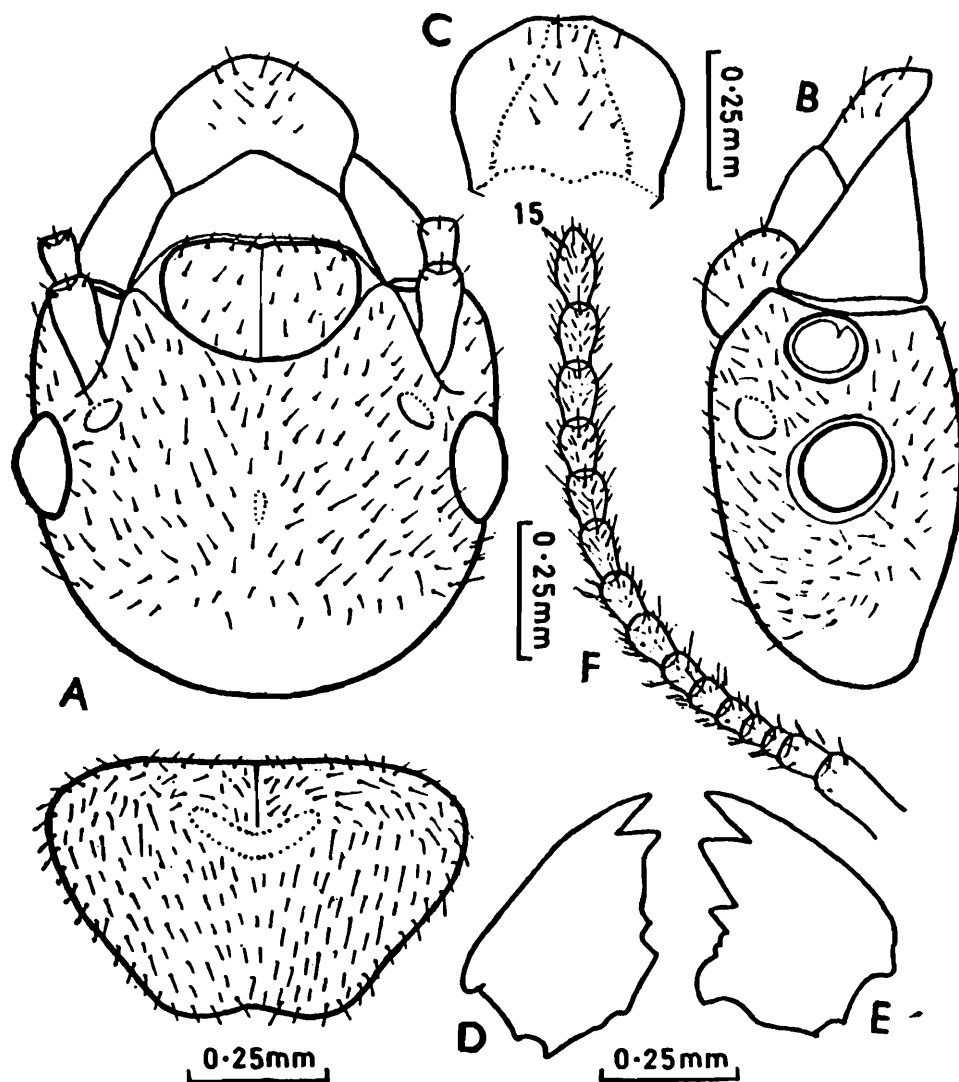


Fig. 61 : *Eremotermes neoparadoxalis*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view (C) Labrum. (D) and (E) Left and right mandibles, respectively. (F) Antenna. (After Akhtar, 1976).

1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 427, 437, 461, 466, 472.

IMAGO (Fig. 61) : Head dark brown; antennae light brown, slightly darker apically; postclypeus light brown; pronotum a little paler than head; legs and abdomen pale brown. Head and body densely hairy. Head-capsule subcircular (length to base of mandibles 0.66-0.71, width with eyes 0.78-0.84 mm); fontanelle plate long, whitish. Eyes subrounded (max. diameter 0.19-0.20, min. diameter 0.16-0.17 mm); slightly bulging; separated from lower margin of head by more than half their max. diameter (0.11 mm). Ocelli oval separated from eyes by about their short diameter (long diameter 0.08-0.09, short diameter 0.06-0.07 and eye-ocellus distance 0.04-0.06 mm). Antennae with 15 segments; segment 3 shortest. Postclypeus swollen; about half or a little longer than half its width (length 0.18-0.21, width 0.37-0.39 mm). Pronotum subtrapezoidal (length 0.39-0.44, width 0.66-0.75 mm); anterior margin substraight, not notched; posterior margin distinctly emarginate medially.

SOLDIER (Fig. 62) : Head-capsule deep straw yellow; antennae and body yellowish white, paler than head; mandibles reddish brown, basally deep straw yellow. Head and body fairly pilose. Total body length c 3.5-4.0 mm. Head-capsule rectangularly oval, thick (length to base of mandibles 0.70-0.85, max. width 0.65-0.75, height 0.50-0.60 mm, index height/width 0.71-0.85); frontal protuberance weak; frons sharply sloping in front. Fontanelle prominent, situated at the beginning of frontal slope (occipito-fontanelle distance 0.60-0.75 mm). Antennae 14-segmented (13-segmented vide Ahmad 1955); segment 3 a little shorter than 2 and subequal to or a little longer than 4; 5 longer and broader than 4. Labrum short, subsquarish, pointed distally (length 0.075-0.10, width 0.10-0.15 mm). Mandibles long (0.80-0.95 mm), sabre-shaped, weakly incurved and pointed apically; outer margin strongly incurved basally behind middle; each mandible with a minute, rudimentary tooth a little behind middle (tooth-distance 0.35-0.45 mm), left mandibular tooth index i.e. tooth-distance/mandible-length 0.41-0.47). Postmentum short, swollen (length 0.30-0.37, max. width 0.20-0.25 and min. width at waist 0.15 mm). Pronotum saddle-shaped; anterior margin with or without a median notch; posterior margin straight, without notch (length 0.25, width 0.40-0.45 mm).

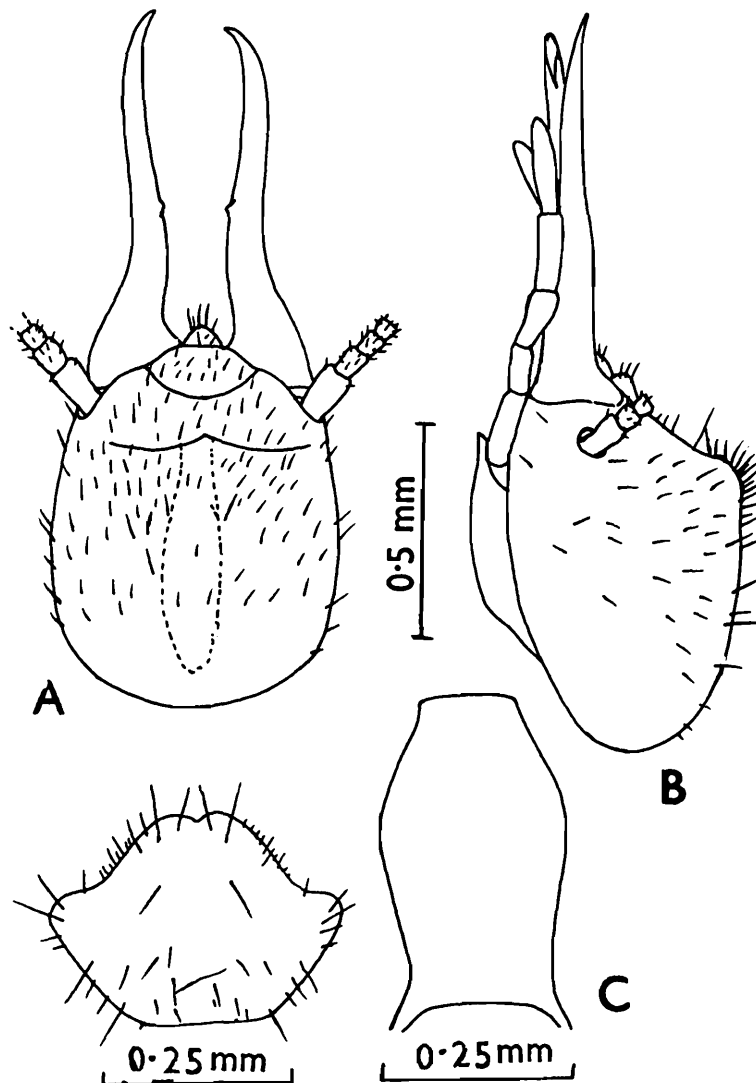


Fig. 62 : *Eremotermes neoparadoxalis*. Soldier. (A) Head, dorsal view (B). Ditto, side view, (C) Postmentum. (D) Pronotum, dorsal view. (Ex Roonwal and Sen-Sarma, 1960).

WORKER : Dimorphic. *Worker major* : Head-capsule straw coloured; antennae, labrum and body paler than head. Head and body densely hairy. Total body-length c 3.5-4.0 mm. Head subsquarish (length to base of mandibles 0.60-0.65, max. width 0.70-0.75 mm). Fontanelle indistinct. Antennae 14-segmented; segment 2 equal to 3 + 4; 3, 4 and 5 subequal. Postclypeus swollen, length about half of width; anterior margin straight, posterior margin rounded. Pronotum saddle-shaped; anterior margin weakly or generally not notched; posterior margin straight (length 0.25, width 0.40 mm). *Worker minor* : As worker major but slightly smaller.

Distribution INDIA : Rajasthan. PAKISTAN : Sind.

136. **Eremotermes paradoxalis** Holmgren

(Figs. 63, 64)

Eremotermes paradoxalis Holmgren :

1912. Holmgren, *K. Svenska Vetensk. Akad. Handl.*, **48**(4) : 95, Pl. 4 fig. 22 (S). No description.
1913. Holmgren, *J. Bombay nat. Hist. Soc.*, **22**(1) : 115-116, S and W. Syntypes : In Holmgren Coll. Riksmus., Stockholm and AMNH. Type-locality : Bangalore, Karnataka, India.
1958. Ahmad, *Biologia*, Lahore, **4** : 174, 195.
1960. Roonwal and Sen-Sarma, *Contr. Syst. Oriental Termites* (ICAR Ent. Monogr. 1) : 47, 49, 50, 51, 53, 83-92, 93. See for synonymy, description, etc.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 53-54, fig. 64.
1974. Akhtar, *Pakistan J. Zool.*, **6**(1 & 2) : 103.
1977. Roonwal and Rathore, *Zool. Anz.*, **198** : 300, 307-308.
1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 6, 36-37.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46**(3) : 257. Wing microsculpture.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*. No. 49 : 92, 123-125.
1985. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) **51**(3) : 312, 315-317.

IMAGO (Fig. 63) : Head-capsule yellowish to chestnut brown with several paler spots; postclypeus pale brown; thorax and body a little paler than head; legs and body pale brown. Head and body densely hairy. Total body-length with wings 8.0-10.0, without wings 4.5-6.7 mm. Head-capsule roundly oval (length to base of mandibles 0.65-0.75, width with eyes 0.70-0.80 mm). Fontanelle plate longish, whitish, situated medially. Eyes subcircular (max. diameter 0.20-0.23 mm); situated very close to antennae (eye-antennal distance 0.025-0.05 mm). Ocelli oval (max. diameter 0.075-0.125 mm); lying close to eyes (eye-ocellus distance 0.025-0.038 mm). Antennae 14-15 (mostly 15) segmented; segment 3 shortest, 4 and 5 subequal. Postclypeus swollen, pilose; length half of its width. Pronotum flat, subtrapezoidal (length 0.40-0.43, width 0.60-0.70 mm); anterior margin straight or slightly convex, weakly notched medially; posterior margin straight, with a median notch. Wings smoky; hairy along margins, membrane with a few hairs; microsculpture consists of thin, pointed

papillae on anterior and posterior margins and micrasters of non-asteroid and asteroid type; for variation in venation vide Roonwal and Sen-Sarma 1960. Forewing-length 6.7-8.0, hindwing-length 6.0-7.0 mm.

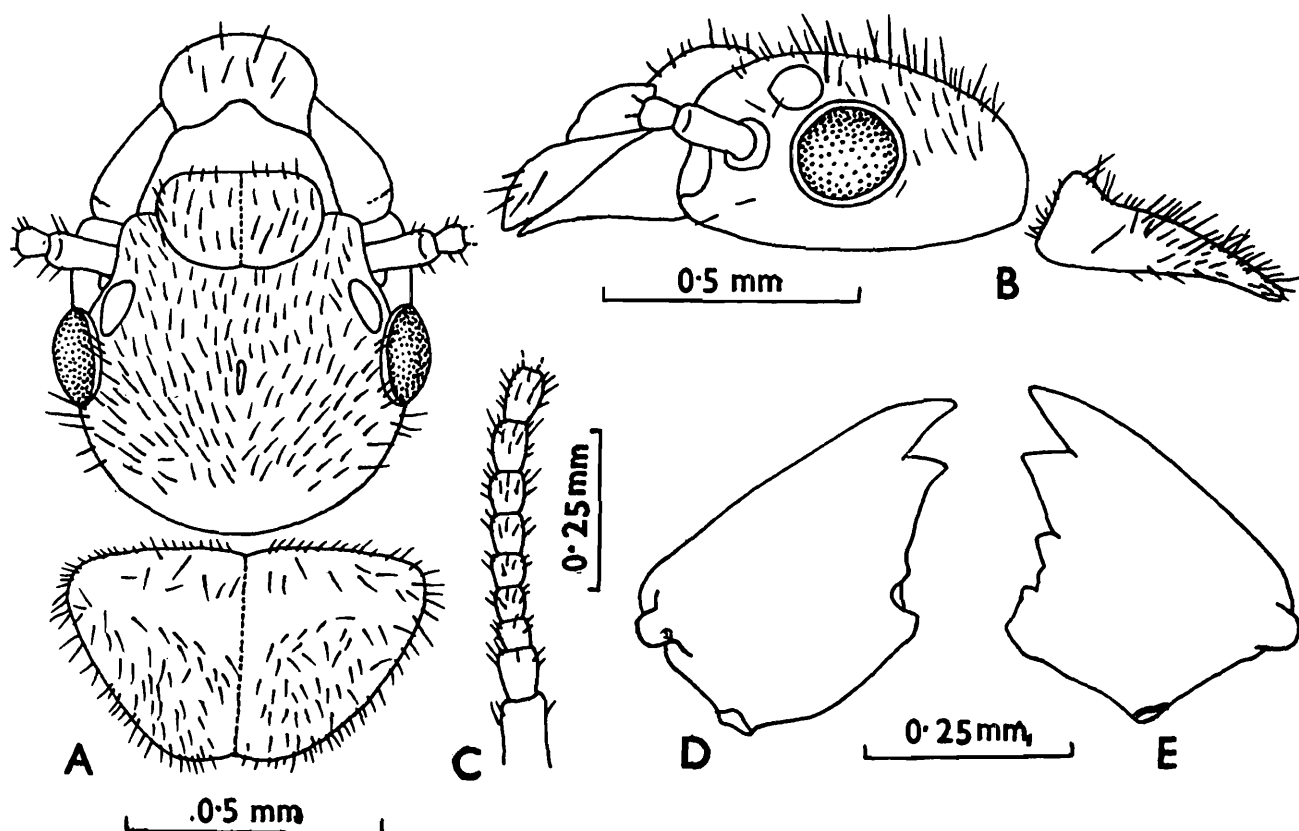


Fig. 63 : *Eremotermes paradoxalis*. Imago. (A) Head and pronotum, dorsal view. (B) Ditto, side view. (C) Basal few segments of antenna. (D) and (E) Left and right mandibles respectively. (Ex Roonwal and Sen-Sarma, 1960).

SOLDIER (Fig. 64) : Head-capsule yellow to straw-coloured; antennae and body yellowish white. Head and body fairly densely hairy. Total body-length 3.5-4.3 mm. Head-capsule rectangularly ovoid (length to base of mandibles 0.80-0.95, max. width 0.68-0.75 mm); rather thick (height 0.45-0.65 mm); frontal protuberance prominent; frons sloping in front sharply. Fontanelle prominent, lying below frontal protuberance; fontanelle gland large, elongate to fusiform. Antennae with 14 segments; segment 3 as long as or a little shorter than 2, 4 shorter than 3. Labrum tongue-shaped, narrowed in front (length 0.10-0.15, width 0.13-0.18 mm). Mandibles slender, long, sabre-like; weakly incurved at tip. length less than to as long as head (length 0.70-0.85 mm, index left mandible-length/

head-length 0.78-0.98). Postmentum arched in side view; shape as in fig; length 0.35-0.45, max. width 0.23-0.25, min. width at waist 0.15-0.20 mm. Pronotum saddle-shaped (length 0.23-0.25, width 0.40-0.45 mm); anterior margin either faintly or not notched, posterior margin substrainght.

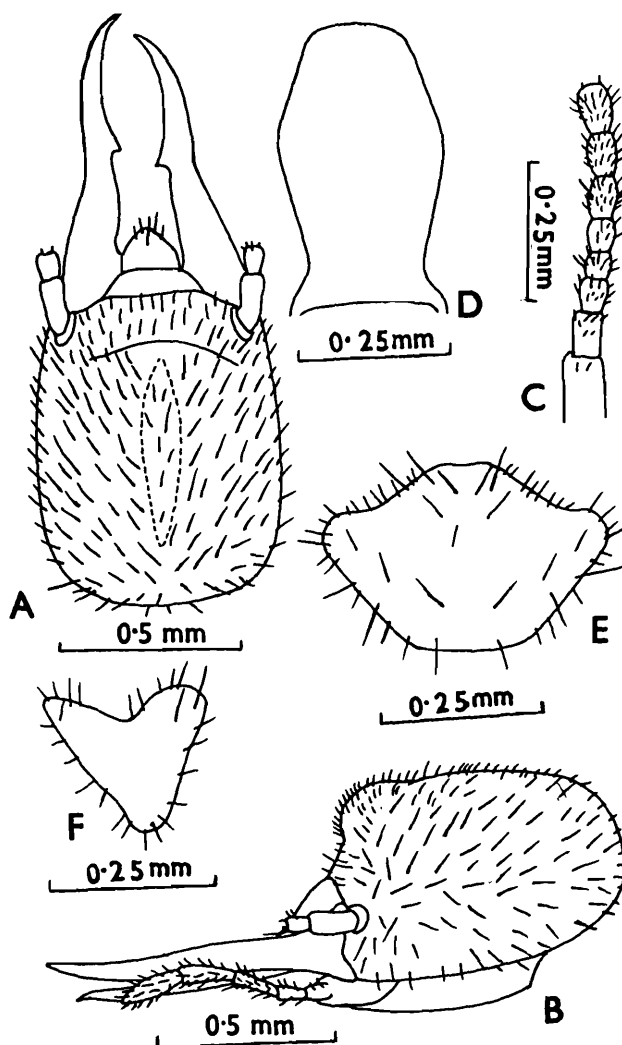


Fig. 64 : *Eremotermes paradoxalis*. Soldier. (A) Head, dorsal view. (B) Ditto, side view. (C) Basal few segments of antenna. (D) Postmentum. (E) Pronotum, in dorsal view. (F) Ditto, side view. (Ex Roonwal and Sen-Sarma, 1960).

WORKER : Dimorphic. *Worker major* : Head-capsule yellowish; antennae, labrum and body yellowish white. Head and body densely hairy. Total body-length c 3.0-4.0 mm. Head-capsule subsquarish (length to base of mandibles 0.70-0.75, max. width 0.75-0.80 mm). Antennae 13 to 14-segmented. Pronotum saddle-shaped; anterior margin faintly notched

(length 0.25-0.35, width 0.45-0.50 mm). *Worker minor* : Generally as in worker major, but smaller in size. Total body-length 2.3-2.5, length of head to base of mandibles 0.55-0.60, max. width of head 0.65-0.75, length of pronotum 0.25, width of pronotum 0.40 mm.

Distribution : INDIA : Panjab, Delhi, Bihar, Madhya Pradesh, Karnataka and Tamil Nadu states. PAKISTAN : Panjab, N.W.F.P. and Sind.

Genus 30. *Microcerotermes* Silvestri

Genus *Microcerotermes* Silvestri :

1901. Silvestri, *Bull. Mus. Zool. Anat. Comp. Tornio*, **16**(389) : 3.
1949. Snyder, *Smiths. misc. Colls.*, **112** : 132. Synonymy.
1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95**(Art. 2) : 64, 66.
1953. Rattan Lal and Menon. *Cat. Indian Insects-Pt. 27-Isoptera* : **42**. Synonymy, Indian species.
1955. Emerson. *Fieldiana : Zool.*, **37** : 467, 469, 472, 473, 477, 480, 485, 488, 493, 510.
1964. Roonwal and Bose, *Zoologica*, **40**(113) : 8.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131**(Art. 1) : 7, 8, 64.
1965. Bouillon and Mathot, *Zooleo*, No. 1 : 12, 21, 22.
1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 2-7. See for Synonymy, characters, distribution, keys, etc.
1969. Roonwal and Bose, *Rec. zool. Surv. India*, **61** : 445.
1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 141, 142.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 347.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. A 17-FS-12) : 44.
1973. Chhotani and Bose, *Zool. Anz.*, **190**(3 & 4) : 233, 234, 235.
1974. Akhtar, *Pakistan J. Zool.*, **6**(1-2) : 94, 96, 97, 98, 100.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 59, 150-151.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 8, 12-13, 37, 169.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 43.
1977. Roonwal and Rathore, *Zool. Anz.*, **198** : 308, 311.
1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13**(1) : 1, 4, 5.
1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 6, 37.

1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46**(3) : 257.
 1982. Bose and Das; *Rec. zool. Surv. India*, **80** : 199-200.
 1982. Thapa, *Sabah For. Rec.*, No. 12 : 6, 9, 163.
 1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 18.
 1983. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) **49**(5) : 364, 374, 375, 381.
 1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 102, 125-126.
 1985. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) **51**(2) : 158.
 1987. Bose and Das, In : *Fauna of Orissa*, Pt. 1 : 108-109.
 1987. Chhotani, *Beitr. Ent.*, **37** : 409, 410.
 1989. Roonwal and Chhotani, *Fauna of India-Isoptera (Termites)* Vol. 1 : 37, 91, 110.

Type of genus : *Microcerotermes strunckii* Sorensen

1. Characters of Genus *Microcerotermes*

Imago : Pale brown to blackish brown, densely hairy species. Head-capsule subsquarish, sides subparallel; Y-suture present or indistinct. Fontanelle either indistinct or minute, spot-like. Eyes generally broad and oval or subcircular; well away from lower margin of head. Ocelli small, oval; separated from eyes. Antennae with 13-14 (generally 14) segments; segment 3 smallest. Postclypeus moderately swollen; length about half of its width and divided into two by a median line; posterior margin rounded and projecting well behind into head-capsule. Mandibles each with an apical and two marginal teeth; 1st marginal triangular, subequal to apical; angle between apical and 1st marginal acute. Left mandible : Posterior margin of 1st marginal long and incurved, 2nd marginal short, triangular, not separated from 1st by any notch or cut; basal projection rounded. Right mandible : Posterior margin of 1st marginal only a little longer than its anterior margin; 2nd marginal small, with a long and straight posterior margin, molar plate slightly longer than posterior margin of 2nd marginal. Pronotum subsemicircular or subtrapezoidal; anterior margin substraight or slightly concave and weakly projected in front medially. Legs short slender; apical tibial spurs 3 : 2 : 2; middle tibiae with 2 extra spines; tarsi 4-jointed. Wings brown to dark smoky brown; microsculpture consists of pointed papillae on anterior and posterior margins and numerous non-asteroid and asteriod micrasters on membrane; costa thick; sclerotic, running along anterior

margin; subcosta short, meeting costa just outside scale in forewing, absent in hindwing; radius as thick as costa-subcosta and running close to and parallel with it; media weak, arising separately from scale in forewing and from radius outside scale in hindwing, with a few branches distally or unbranched; cubitus weak with 9-16 branches. Abdomen elongate, hairy; cerci 2-jointed; styli in male single jointed.

Soldier : Head-capsule subrectangular; Y-suture indistinct; frons weakly sloping in front; in profile weakly concave behind frontal slope. Fontanelle minute, situated medially in front of middle on head-dorsum or indistinct. Postclypeus convex posteriorly. Labrum subsquarish or projected medially into a blunt tip. Antennae with 12-13 segments. Mandibles symmetrical, pointed and incurved at tip and basally incurved at outer margin; inner margin finely or coarsely serrate. Postmentum club-shaped. Pronotum saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs, middle tibiae with 2 extra spines; tarsi 4-jointed. Abdomen elongate; cerci 2-jointed; styli single jointed, rudimentary.

Worker : Head subrectangularly oval or subsquarish. Fontanelle indistinct. Antennae 13-segmented. Postclypeus swollen, projected behind into frons; as long as half of its width. Mandibles as in imago. Pronotum, legs and abdomen as in soldier.

2. *Distribution and Composition of Microcerotermes*

(Fig. 2)

Distribution : Genus *Microcerotermes* is cosmotropical in distribution, occurring in all the zoogeographical regions except Nearctic. According to Chhotani 1987, it is a very wide spread genus in the Oriental Region and is reported from almost all the countries in the Region and is equally well distributed in the Ethiopian Region.

Composition : In the Oriental Region, according to Chhotani 1987, it is known by 42 species of which 29 occur in the Indian Region (India, Pakistan, Nepal, Bhutan, Bangladesh, Burma and Sri Lanka), as follows, and are taken into account here in this publication.

1. *Microcerotermes annandalei* Silvestri—India (Thailand and Malaya records need confirmation, see 'Remarks' under species)

2. *M. baluchistanicus* Ahmad—Pakistan, India
 3. *M. beelsoni* Snyder—India, Pakistan, Bhutan
 4. *M. bugnioni* Holmgren—Sri Lanka, China
 5. *M. cameroni* Snyder—India
 6. *M. chaudhryi* Akhtar—Pakistan
 7. *M. crassus* Snyder—India, Bangladesh, Burma
 8. *M. cylindriceps* Wasmann—Sri Lanka
 9. *M. danieli* Roonwal and Bose—India
 10. *M. fletcheri* Holmgren and Holmgren—India
 11. *M. ganeshi* Bose—India
 12. *M. greeni* Holmgren—Sri Lanka
 13. *M. heimi* Wasmann—India
 14. *M. kudermukhae* n. sp—India
 15. *M. labioangulatus* Sen-Sarma and Thakur—India
 16. *M. lahorensis* Akhtar—Pakistan
 17. *M. laxmi* Roonwal and Bose—India
 18. *M. longignathus* Ahmad—Pakistan
 19. *M. maliki* Akhtar—Pakistan
 20. *M. minor* Holmgren—India, Sri Lanka
 21. *M. nicobarensis* Roonwal and Bose—India
 22. *M. pakistanicus* Akhtar—India, Pakistan
 23. *M. palestinensis* Spaeth—India, Palestine
 24. *M. prochampioni* Akhtar—Pakistan
 25. *M. raja* Roonwal and Bose—India
 26. *M. rambanensis* Chatterjee and Thakur—India
 27. *M. sakesarensis* Ahmad—Pakistan
 28. *M. tenuignathus* Holmgren—India, Pakistan
 29. *M. uncatus* Krishna—Burma
3. *Some Remarks on Soldier of Indian Microcerotermes and its Identity*

The soldiers of the Indian Region species of *Microcerotermes* fall in two major categories : A) having finely serrated mandibles and B) having

coarsely serrated mandibles. There are a number of species in each of these two categories, which fall in the range of size of each other and therefore, sometimes it becomes very difficult to make correct determination. The following remarks on these two categories will, it is expected, be of some help in the correct identity of different species.

Category (A)—Finely serrated mandibles :

Of the total of 29 species of the genus from the Indian Region, 12 fall in this category which can again be grouped into two groups : (a) *M. heimi* group (head-length to base of mandibles upto 1.30 mm) and (b) *M. cylindriceps* group (head-length above 1.3 mm). Group (a) is an assemblage of the species *baluchistanicus*, *heimi*, *laxmi*, *longignathus*, *palestinensis* and *tenuignathus* and almost all these fall in the range of size variation of each other. The mandibles are almost as long as head in *baluchistanicus*, *laxmi* and *longignathus*, with the mandible length/head-length index ranging from 0.82-0.98; of these *baluchistanicus* can be separated by its wider head and shorter mandibles, *laxmi* for longer mandibles (index 0.98) and *longignathus* for somewhat shorter mandibles (index 0.90-0.91), there being minor other differences. The mandibles are shorter in *heimi*, *tenuignathus* and *palestinensis* with the mandible-head-length index ranging between 0.70-0.79; *heimi* and *tenuignathus* have sharply pointed tip of labrum while *palestinensis* has broadly rounded anterior margin of labrum the other differences being minor. There is a possibility that some of these species may synonymise with others but they have been kept separate for lack of long series for the study of variations.

M. cylindriceps group is an assemblage of the species *bugnioni*, *crassus*, *cylindriceps*, *maliki*, *rambanensis* and *nicobarensis*. *M. cylindriceps* can be easily distinguished for its long and narrow head (length to base of mandibles 1.60-1.80, width 0.85-0.90 mm) and very short mandibles (length 0.75-0.80 mm, mandible-length/head-length index 0.43-0.48), but only the type series with 2 soldiers was available for study; *crassus* can be distinguished for longer and curved mandibles (mandible-length/head-length index 0.66-0.81); *nicobarensis* for short and strongly curved mandibles (mandible-length 0.90-0.95 mm, mandible-length/head-length index 0.53-0.54); while *bugnioni*, *maliki* and *rambanensis* are separated on minor characters and no long series were available in case of these 3 species.

Category (B)—Coarsely serrated mandibles :

The remaining 17 species come under this category and on the basis of head-length to base of mandibles we can put them under 3 groups, as follows : (a) *M. minor* group (head-length 1.12-1.41 mm) with the species *ganeshi*, *greeni*, *minor* and *raja*; (b) *M. fletcheri* group (head-length 1.26-1.74 mm) with the species *beesoni*, *cameroni*, *chaudhryi*, *danieli*, *fletcheri*, *lahorensis*, *pakistanicus*, *prochampioni* and *sakesarensis*; and (c) *M. annandalei* group (head-length 1.57-1.90) with the species *annandalei*, *kudermukhae* n. sp. and *labioangulatus*.

Of the *M. minor* group, the species *greeni* and *raja* are somewhat larger (head-length 1.27-1.41 mm) and *raja* is separated from *greeni* for uniformly serrated mandibles without any larger tooth-like serration and indistinct fontanelle (mandibles with a tooth-like large serration and distinct fontanelle in *greeni*); and the species *minor* and *ganeshi* for smaller head (length 1.12-1.29 mm), the species *ganeshi* can be separated from *minor* for its paler colouration and diverging head-sides anteriorly and some other minor characters of pronotum indentation, of these only the holotype of *raja*, the holotype and a paratype of *ganeshi* and 2 small series of *minor* were available and no material of *greeni* could be procured to study the variations. Of the *M. fletcheri* group, the species *lahorensis* is separated for its strongly convexical head-sides behind antennae but only a single soldier was available to Akhtar at the time of describing the species; all the other species in the group have subparallel or slightly convex head sides; the mandibles are short in comparison to head-length in *pakistanicus* (index mandible-length/head-length 0.46-0.56), long in *prochampioni* (index mandible-length/head-length 0.70-0.71) and of medium length (index 0.53-0.67) in the remaining species viz. *beesoni*, *cameroni*, *chaudhryi*, *danieli*, *fletcheri* and *sakesarensis* and of these *chaudhryi* and *cameroni* have roundly curved mandibles on outer margin and straighter in the rest of the species.

4. Keys to Indian Region Species of *Microcerotermes*

IMAGOES

1(10) Larger species : Head-width with eyes more than 0.90 mm

2(3) Head-capsule deep yellowish brown; postclypeus pale yellowish

- brown. [Head-width 0.90-0.97, pronotum-width 0.60-0.68 mm].....*nicobarensis*
- 3(2) Head-capsule brown to castaneous brown; postclypeus a little paler than head
- 4(5) Eyes smaller (0.18 x 0.16 mm). Head-width with eyes normally 1.01-1.10 mm. Forewing smaller, 6.0 mm.....*raja*
- 5(4) Eyes larger (0.23-0.28 x 0.20-0.23 mm). Head-width 0.91-1.07 mm. Forewing longer, 7.3-8.7 mm
- 6(7) Postclypeus length less than to about 1/2 of its width (length 0.18-0.29, width 0.53-0.57 mm). Pronotum wider (0.83-0.89 mm).....*palestinensis*
- 7(6) Postclypeus-length half or a little more than half of its width (length 0.19-0.28, width 0.40-0.50 mm). Pronotum narrower (0.65-0.85 mm)
- 8(9) Head dark brown with smoky tinge; Y-suture present. Postclypeus distinctly longer than half its width.....*longignathus*
- 9(8) Head brown to castaneous brown; Y-suture indistinct or if present very faint. Postclypeus length 1/2 or slightly more than half of its width.....*crassus*
- 10(1) Smaller species : Head-width with eyes less than 0.90 mm
- 11(12) Head-capsule paler brown; postclypeus yellow. Antennae 13-segmented. Eye farther from lower margin of head, c 3/4 of diameter.....*baluchistanicus*
- 12(11) Head-capsule brown to blackish brown; postclypeus a little paler than head. Eyes closer to lower margin of head
- 13(14) Smaller species : Head-width with eyes 0.77-0.78, pronotum-width 0.53-0.58 mm, forewing-length 4.7-5.4 mm. Antennae with 13-14 segments.....*minor*
- 14(13) Larger species : Head-width with eyes 0.77-0.98, pronotum-width 0.56-0.80 mm, forewing-length more than 6.0 mm. Antennae with 14 segments
- 15(16) Ocellus small, dot-like (diameter 0.05-0.06 mm), separated from eye by more than its diameter (nearly twice of diameter). Eyes

- small (max. diameter 0.18-0.21 mm); separated from lower margin of head by nearly its diameter.....*tenuignathus*
- 16(15) Ocellus larger (long diameter 0.07-0.13 mm), separated from eye by less than to about its long diameter. Eyes larger (max. diameter 0.18-0.28 mm), separated from lower margin of head by about 1/2 of diameter or a little less
- 17(20) Y-suture absent. Fontanelle not discernible
- 18(19) Head capsule castaneous brown. Smaller (head-width with eyes 0.83-0.86, pronotum-width 0.64-0.67 mm). Eyes larger (0.25-0.28 x 0.22-0.25 mm) and separated from lower margin of head by less than half of diameter. Ocellus closer to eye, separated by about 1/2 of shorter diameter.....*pakistanicus*
- 19(18) Head-capsule blackish brown. Larger (head-width with eyes 0.88-0.90, pronotum-width 0.68-0.80 mm). Eyes smaller (0.23-0.25 x 0.20 mm) and separated from lower margin of head by about half diameter. Ocellus farther from eye, separated by long diameter.....*heimi*
- 20(17) Y-suture distinct. Fontanelle small, circular or oval
- 21(24) Ocellus generally larger (max. diameter 0.09-0.13 mm), separated from eye by less than short diameter
- 22(23) Head-capsule chestnut brown. Pronotum subsemicircular, anterior margin weakly incurved and not notched.....*fletcheri*
- 23(22) Head-capsule brown. Pronotum subtrapezoidal, anterior margin substraight and faintly notched.....*bugnioni*
- 24(21) Ocellus smaller (max. diameter 0.07-0.10 mm), separated from eye by short diameter
- 25(26) Wings smaller, forewing-length 6.0-6.4 mm. Postclypeus slightly shorter than half its width.....*annandalei*
- 26(25) Wings longer, forewing-length 7.0-8.0 mm. Postclypeus half or a little longer than half its width
- 27(28) Head dark castaneous brown. Fontanelle faintly marked. Pronotum slightly notched at anterior margin.....*cameroni*

- 28(27) Head dark castaneous brown to blackish brown. Fontanelle distinctly marked. Pronotum without notch at anterior margin.....*beesoni*

SOLDIERS

- 1(24) Mandibles finely serrated
- 2(13) Larger species : Head-length to base of mandibles more than 1.30 mm
- 3(4) Mandibles more than 2/3 of head-length to base of mandibles [Head-length 1.43-1.97, head-width 0.91-1.21, mandible-length 0.96-1.20 mm, index mandible-length/head-length 0.66-0.81].....*crassus*
- 4(3) Mandibles less than 2/3 of head-length to base of mandibles
- 5(6) Head-capsule long, narrow, width about 1/2 of length, index width/length 0.50-0.53. Mandibles very short, less than half of head-length, index mandible length/head-length 0.43-0.48. [Head-length to base of mandibles 1.6-1.80, head-width 0.85-0.90, mandible-length 0.75-0.78 mm].....*cylindriceps*
- 6(5) Head comparatively wider; width more than 1/2 of length, index width/length 0.56-0.67 Mandibles longer, more than 1/2 of head-length, index mandible-length/head-length 0.53-0.61
- 7(8) Head larger : Head-length to base of mandibles 1.70-1.76, head-width 0.98-1.08 mm. Mandibles thick and strongly curved on outer margin. Postmentum longer, length 1.0-1.08 mm.....*nicobarensis*
- 8(7) Head smaller : Head-length 1.30-1.63, head-width 0.82-0.92 mm. Mandibles slenderer and less so curved on outer margin. Postmentum shorter, length 0.82-0.92 mm
- 9(10) Mandibles evenly serrated, more curved and without any larger serration on inner margin.....*bugnioni*
- 10(9) Mandibles irregularly serrated, less so curved and with a larger serration a little behind middle of inner margin
- 11(12) Larger (head-length to base of mandibles 1.58-1.60, width 0.88-0.90 mm). Mandibles thinner in apical half. Labrum rounded at anterior margin.....*rambanensis*

- 12(11) Smaller (head-length 1.38-1.56, width 0.82-0.87 mm). Mandibles thicker in apical half. Labrum generally narrowly round at anterior margin
- 13(2) Smaller species : Head-length to base of mandibles less than 1.30 mm
- 14(19) Mandibles only a little shorter than head-length to base of mandibles, index mandible-length/head-length 0.82-0.98
- 15(16) Head-capsule comparative to length wider, index width/length 0.77-0.86. Mandibles shorter, index mandible-length/head-length 0.82-0.87.....*baluchistanicus*
- 16(15) Head-capsule comparatively thinner, index width/length 0.67-0.77. Mandibles longer, index mandible-length/head length 0.90-0.98
- 17(18) Mandibles longer, almost, as long as head, index mandible-length/head-length 0.98 and mandibles more strongly incurved at apex. Labrum more sharply pointed at tip. Pronotum strongly emarginate at anterior margin.....*laxmi*
- 18(17) Mandibles shorter, index mandible-length/head-length 0.90-0.91 and mandibles less so curved at apex. Labrum less sharply pointed at tip. Pronotum indistinctly emarginate at anterior margin.....*longignathus*
- 19(14) Mandibles about 3/4 of head-length, index mandible-length/head-length 0.70-0.79
- 20(23) Labrum sharply pointed at tip
- 21(22) Head generally smaller, length 1.0-1.27 mm. Mandibles more strongly incurved at apices. Max. width of postmentum at anterior 1/3.....*tenuignathus*
- 22(21) Head generally larger, length 1.20-1.25, Mandibles weakly incurved at apices. Max. width of postmentum at about middle.....*heimi*
- 23(20) Labrum broadly rounded at tip.....*palestinensis*
- 24(1) Mandibles coarsely serrated
- 25(28) Smaller species : Head-length to base of mandibles generally less than 1.30 and width less than 0.80 mm

- 26(27) Head paler (golden yellow); head-sides diverging anteriorly. Mandibles slenderer and more incurved. Pronotum substraight at posterior margin.....*ganeshi*
- 27(26) Head darker (brown to dark brown); head sides subparallel not diverging anteriorly. Mandibles thicker and less so incurved. Pronotum emarginate at posterior margin.....*minor*
- 28(25) Larger species : Head length more than 1.30 and width more than 0.80 mm
- 29(34) Head generally more than 1.60 mm long. Mandibles longer 0.95-1.15 mm
- 30(31) Head long and slender, width less than half of length (length to base of mandibles 1.83, width 0.88 mm, index width/length 0.48). Mandibles shorter in comparison to head-length (index mandible-length/head-length 0.382.....*kudremukhae*
- 31(30) Head short to large but thicker, width more than half of length (length to base of mandibles 1.26-1.89, width 0.77-1.13 mm, index width/length 0.50-0.778). Mandibles longer in comparison to head-length (index mandible-length/head-length 0.46-0.71)
- 32(33) Labrum subsquarish, rounded at anterior margin and antero-lateral corners rounded. Head comparatively slenderer. Mandibles somewhat less incurved.....*annandalei*
- 33(32) Labrum subpentagonal, somewhat pointed at anterior margin at middle and antero-lateral corners sharply angulated. Head comparatively stouter. Mandibles more incurved.....*labioangulatus*
- 34(29) Head generally less than 1.6 mm long or upto 1.60 mm. Mandibles shorter 0.77-1.09 mm
- 35(36) Head sides slightly incurved at middle.....*uncatus*
- 36(35) Head sides substraight or convex
- 37(38) Head behind antennae very much convexical. [Head-width/head-length 0.778. Postmentum short and squat]*lahorensis*
- 38(37) Head behind antennae substraight or faintly convex
- 39(40) Mandibles in comparison to head-length longer, index mandible-length/head-length 0.70-0.71 [head-length 1.44-1.54, head-width

- 0.89-0.96, mandible length 1.03-1.07 mm; index head-width/head-length 0.50-.56].....*prochampioni*
- 40(39) Mandibles in comparison to head-length shorter, index mandible-length/head-length 0.46-0.67
- 41(42) Mandibles very much shorter in comparison to head-length, index mandible-length/head-length 0.46-0.56.....*pakistanicus*
- 42(41) Mandibles longer, index mandible-length/head-length 0.53-0.67
- 43(46) Mandibles roundly curved at outer margin
- 44(45) Mandibles longer as compared to head-length (mandible-length 0.94-1.05, head-length 1.26-1.66 mm). Labrum sharply rounded anteriorly. Postmentum strongly incurved at waist.....*chaudhryi*
- 45(44) Mandibles shorter (mandible-length 0.86-0.97, head-length 1.40-1.67 mm). Labrum broadly rounded anteriorly. Postmentum weakly and gradually incurving at waist.....*cameroni*
- 46(43) Mandibles weakly curved and straighter at outer margin
- 47(52) Labrum pentagonal, anteriorly pointed at middle
- 48(51) Smaller species : Head-length to base of mandibles generally less than 1.4 mm
- 49(50) Fontanelle indistinct. Pronotum distinctly notched at anterior margin. {Mandibles uniformly serrated, without any larger tooth-like serration]*raja*
- 50(49) Fontanelle present, small. Pronotum not notched at anterior margin.....*greeni*
- 51(48) Larger species : Head-length to base of mandibles generally more than 1.4 mm [Head-width 0.81-0.96, mandible-length 0.89-0.94 mm. Mandibles with a prominent tooth-like serration below middle. Pronotum weakly notched anteriorly].....*sakesarensis*
- 52(47) Labrum subsquarish or roundedly pentagonal
- 53(54) Head widest at base of antennae and weakly converging behind. Labrum pentagonal, anterior margin convex.....*fletcheri*
- 54(53) Head sides subparallel and straighter. Labrum subsquarish, anterior margin rounded

- 55(56) Mandibles shorter (0.80-0.92 mm long). Pronotum weakly notched at posterior margin.....*beesoni*
- 56(55) Mandibles longer (0.95-1.03 mm long). Pronotum substraight at posterior margin.....*danieli*

137. *Microcerotermes annandalei* Silvestri

(Figs. 65,66)

1. *Microcerotermes Annandalei/annandalei* Silvestri :

1923. Silvestri, *Rec. Indian Mus.*, **25**(2) : 225-228. Im, S,W (Maj. and minor). Lectotype (designated here) : S, in ZS1. Type-locality : Barkuda Island, Chilka Lake, Orissa, India. Type examined.
1963. Mathur and Thapa, *J. Soc. Indian For.*, **3**(3 & 4) : 106.
1965. 'Ahmad, *Bull. Am. Mus. nat. Hist.*, **131**(Art. 1) : 64, 65, 69-70.*
1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 6, 7, 8-12, figs. 1-3. Synonymy, descriptions, etc.
1973. Morimoto, *Bull. Govt. For. exp. Stn.*, No. 257 : 64, 78.*
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-58) : 13, 64.
1976. Morimoto, *Nat. Life SE Asia*, **7** : 323-326.*
1979. Sen-Sarma and Thakur, *Indian For. Rec. (N. S.) Ent.*, **13**(1) : 5, 15-16, 41.
1981. Reddy, *Mat. und Organism.*, **16** : 312-314.
1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 201, 203, 210.
1987. Bose and Das, In : *Fauna of Orissa-Pt.1* (State Fauna Sr. 1) : 104, 109.

IMAGO (Fig. 65) : Head-capsule, pronotum and abdominal tergites castaneous brown ; postclypeus paler ; legs and abdominal sternites pale yellow ; wings smoky brown. Head and body densely hairy. Total body-length with wings 7.3-9.0, without wings 4.5-5.5 mm. Head-capsule subsquarish (length to base of mandibles 0.77-0.91, width with eyes 0.80-0.98 mm) ; Y-suture distinct (not clear in paralectotype). Fontanelle plate small, smoky yellowish ; situated medially. Eyes subcircular (max. diameter 0.22-0.26 mm) ; from lower margin of head situated at about 1/2 of diameter. Ocelli oval (long diameter 0.07-0.09, short diameter 0.05-

* See 'Remarks' below.

0.06 mm) ; from eyes separated by about their long diameter 0.062-0.068 mm). Antennae 14 segmented ; segment 3 shortest. Postclypeus moderately swollen ; length a little less than or about half its width. Pronotum flat, subtrapezoidal (length 0.41-0.49, width 0.62-0.72 mm) ; anterior margin straight, without distinct median notch ; posterior margin convex, shallowly emarginate medially. Wings hairy along margins and covered with micrasters on membrane ; microsculpture consists of papillae and asteroid and non-asteroid micrasters ; forewing-length 6.0-6.4, hindwing-length 5.8-6.0 mm.

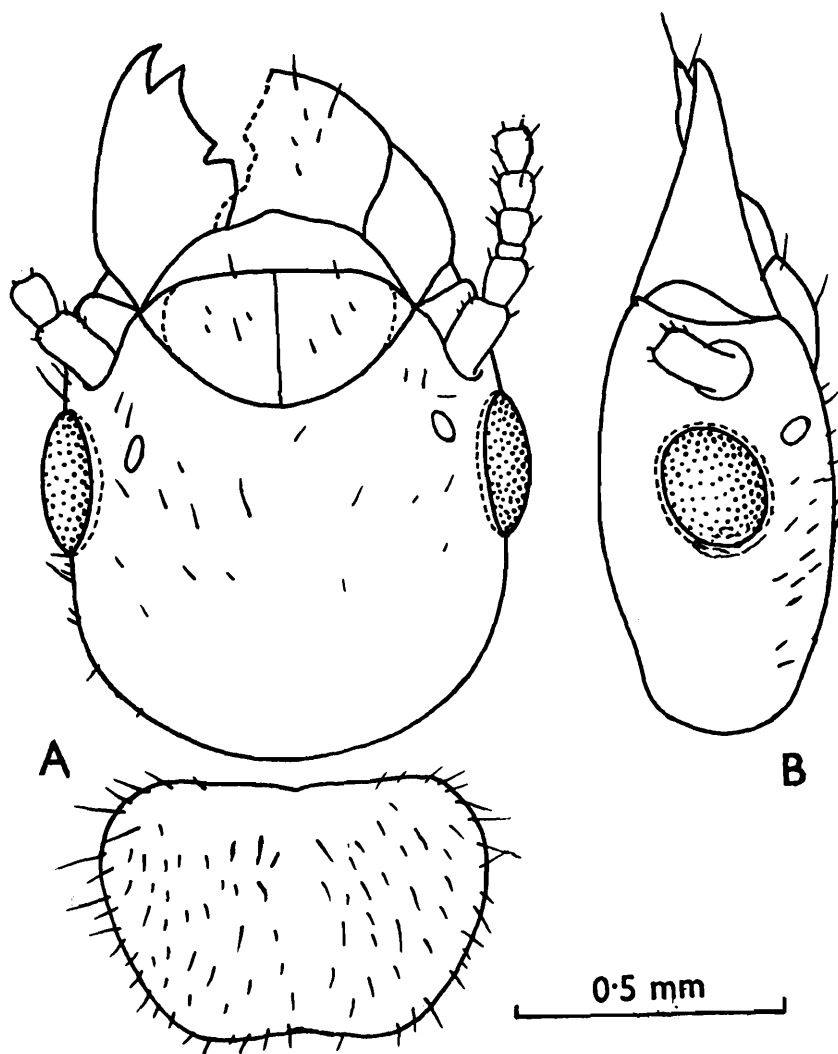


Fig. 65 : *Microcerotermes annandalei*. Imago (Paralectotype). (A) Head and pronotum, in dorsal view. (B) Head, in side view.

SOLDIER (Fig. 66) : Head brown, darker anteriorly ; antennae and labrum pale brown ; mandibles dark reddish black ; body yellowish. Total

body-length 4.08-5.5 mm. Head-capsule subrectangular (length to base of mandibles 1.57-1.90, width 0.91-1.09 mm) ; width a little more than half of length (index width/length 0.56-0.60). Fontanelle minute ; situated at about anterior third of head. Antennae 13-segmented ; segment 3 shortest. Labrum subsquarish ; anterior margin round, not narrowed into a tip. Postclypeus not well demarcated from frons. Mandibles short, thick and stout ; a little more than half the length of head (length 0.90-1.18 mm, index left mandible-length/head-length 0.51-0.60) ; coarsely serrated and with a tooth-like, large serration a little below middle, apices strongly incurved. Postmentum club-shaped ; with a long, narrow waist (length 0.92-1.19, max.width 0.32-0.33, width at waist 0.17-0.27 mm). Pronotum

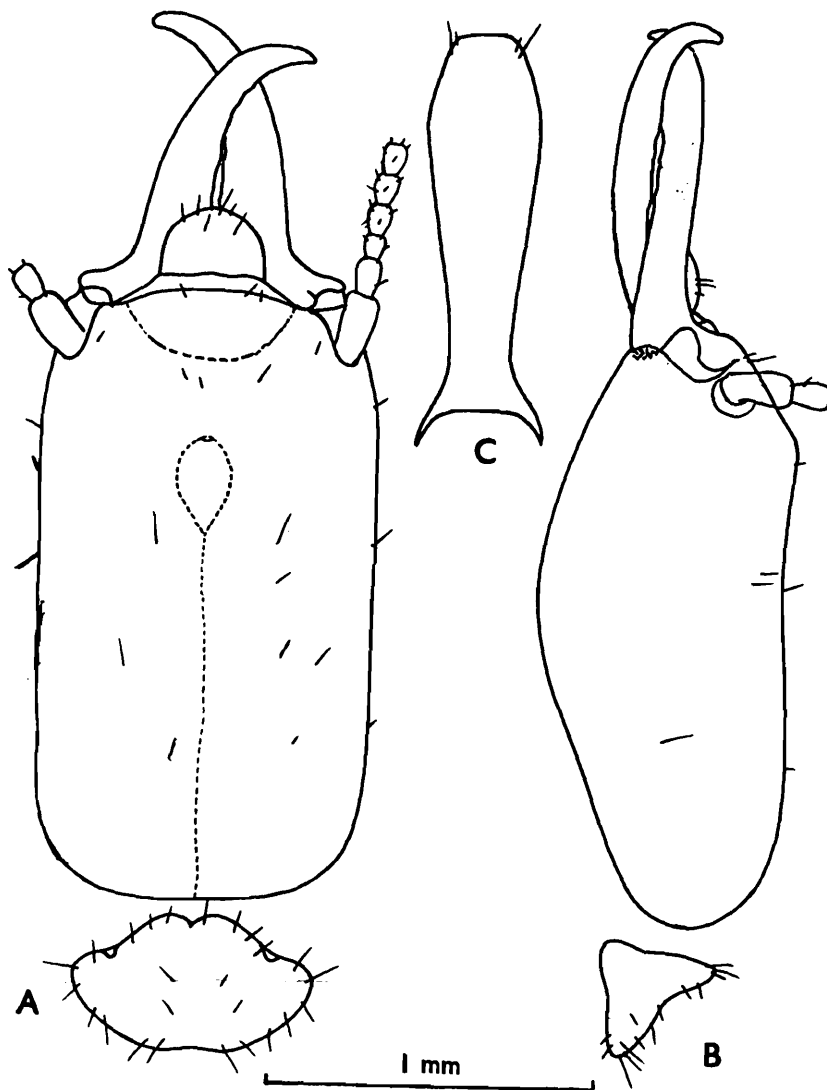


Fig. 66 : *Microcerotermes annandalei*. Soldier (Lectotype). (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Postmentum.

saddle-shaped ; anterior margin deeply notched, posterior margin substraight (length 0.30-0.41, width 0.55-0.73 mm).

WORKER : Head-capsule straw-coloured ; antennae and body pale yellow. Head and body fairly densely hairy. Total body-length 4.0-4.6 mm. Head-capsule somewhat squarish (length to base of mandibles 0.97-1.05, max. width 0.91-0.97 mm). Fontanelle indistinct. Antennae 13 segmented ; segment 3 shortest. Postclypeus swollen ; length slightly more than half its width. Pronotum saddle-shaped ; anterior margin distinctly notched, posterior margin weakly emarginate medially (length 0.17-0.27, width 0.50-0.57 mm).

Lectotype (designated here) : In ZSI there is a vial containing syntypes (2 imagos, one soldier and several workers) ; the soldier from that vial is designated as lectotype and deposited in the National Collections. It measures as follows : Total body-length 5.50, length of head to base of mandibles 1.83, max. width of head 1.02, length of mandibles 0.95, length of labrum 0.20, width of labrum 0.28, length of postmentum 1.13, max. width of postmentum 0.30, width of postmentum at waist 0.23, length of pronotum 0.35, width of pronotum 0.73 mm. Antennae broken, basal 7 segments present ; segment 3 shortest.

Distribution : INDIA : Bihar, Orissa, Tripura and Nagaland states.

Remarks : Ahmad (1965) and Morimoto (1973) record this species from Thailand. The soldier of *annandalei* falls under the coarsely serrated mandibles category where as Ahmad's description and drawing show that the specimens he had, belonged to the finely serrated category. It is, therefore, presumed that Ahmad's record was based on wrong determination. Morimoto's (1973) record is also probably based on the mistaken identification of Ahmad (1965).

Morimoto 1976 (vide "A Bibliography of Termite Literature 1966-1978") records this species from Malaysia. His identification, it is again presumed, was based on the mistaken identification of Ahmad (1965).

All those specimens available to Ahmad (1965) and Morimoto (1973, 1976) need checking which is beyond the scope of this publication. I, therefore, restrict the distribution of *M. annandalei* to India from where it is reported from Orissa, Bihar, Tripura and Nagaland states.

138. *Microcerotermes baluchistanicus* Ahmad

(Fig. 67)

Microcerotermes baluchistanicus Ahmad :

1955. Ahmad, *Biologia*, Lahore, **1** : 238, 243-245. Im and S. Holotype : S, in PU. Type-locality : Fort Sandeman, Dist. Zhob, Baluchistan, Pakistan.
1958. Ahmad, *Biologia*, Lahore, **4** : 164, 169.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art.1) : 66.
1967. Prashad, Thapa and Sen-Sarma, *Indian For. Bull.*, No.246 : 1,5,7,12-14, figs, 4,5.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 44-45.
1974. Akhtar, *Pakistan J. Zool*, **6** (1 & 2) : 102.
1977. Verma and Thakur, *Newsl. zool. Surv. India*, **3** (1) : 15.
1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 6, 37-38, 39.

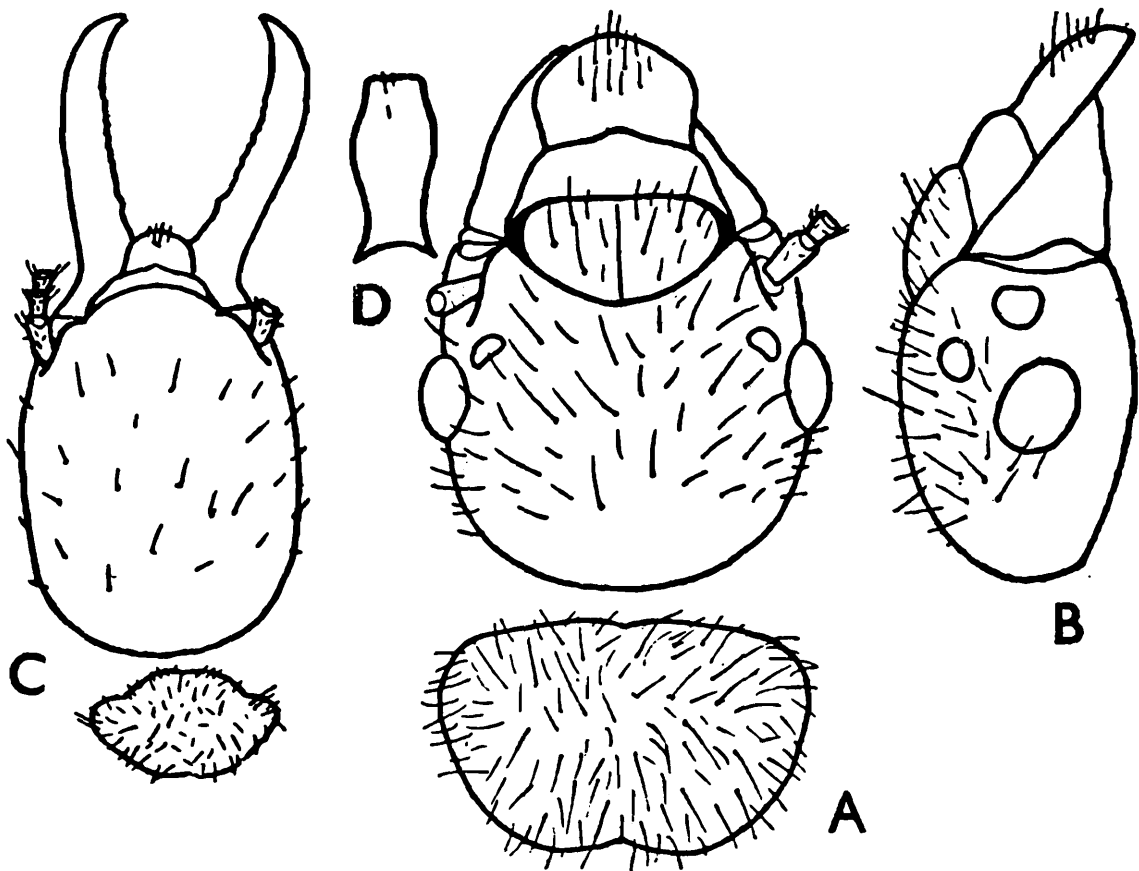


Fig. 67 : *Microcerotermes baluchistanicus*. Imago (A-B). (A) Head and pronotum, in dorsal view. (B) Head, in side view. Soldier (C-D). (C) Head and pronotum, in dorsal view. (D) Postmentum (After Ahmad, 1955b).

IMAGO (Fig. 67 A, B) : Head light brown ; antennae brownish yellow ; postclypeus and body yellow. Head sparsely and pronotum fairly, hairy. Head-capsule subsquarish, sides subparallel (length to tip of labrum 1.09, length to base of mandibles 0.72-0.79, max. width 0.84-0.89 mm). Antennae with 13 segments ; segment 3 shorter than 2. Eyes oval (max. diameter 0.20-0.24, min. diameter 0.16-0.20 mm) ; situated rather away from lower margin of head by about 3/4 (0.13 mm) of long diameter. Ocelli broadly oval (long diameter 0.06-0.10, short diameter 0.05-0.08 mm) ; separated from eyes by about long diameter (0.06-0.09 mm). Postclypeus swollen, length a little less than half its width. Labrum dome-shaped, hairy near tip. Pronotum wider than long and a little narrower than head (length 0.42, width 0.72-0.79 mm) ; anterior margin convex with a weak notch, posterior margin with a distinct emargination.

SOLDIER (Fig. 67 C, D) : Head-capsule brownish yellow ; mandibles pale reddish brown ; body yellowish. Head sparsely and pronotum fairly hairy. Total body-length 4.3-5.9 mm. Head subrectangularly oblong, narrowed a little anteriorly ; sides slightly convex (length to base of mandibles 0.94-1.29, max. width 0.78-0.99 mm). Antennae with 13 segments, 3 shortest. Labrum with subparallel postero-lateral sides and anteriorly broadly rounded. Mandibles long, finely serrated, curved in distal half ; basal third with a prominent denticle. Postmentum short, club-like (length 0.53-0.58, max. width 0.25-0.30, width at waist 0.22-0.25 mm). Pronotum saddle-shaped (length 0.25-0.33, width 0.50-0.59 mm).

Distribution : INDIA : Rajasthan. PAKISTAN : Panjab, Sind, Baluchistan.

139. *Microcerotermes beelsoni* Snyder

(Synonyms : *M. championi* Snyder and *M. lanceolatus* Mathur and Thapa)

(Figs. 68,69)

1. *Microcerotermes beelsoni* Snyder :

1933. Snyder, *Proc. U. S. natn. Mus.*, **82** (16) : 12-14. Im only. Lectotype : Im, in FRI. Type-locality : Chakata Range, Haldwani, Uttar Pradesh, India.

1958. Ahmad, *Biologia*, Lahore, **4** : 167, 171.
1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 6, 14-18, figs. 6-8. Synonymy, description, etc. Lectotype designated and deposited in FRI.
1968. Vishnoi, *Pesticides*, **1** (11) : 114.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 348.
1974. Roonwal, et al. *Z. zool. Syst. Evolut-forsch.*, **12** : 57, 58, 59, 60, 64, 69, 74.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 12, 37, 53, 64.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 58-59.
1977. Chhotani, *Rec. zool. Surv. India*, **72** : 370-371. Treats *M. championi* as a synonym of *M. besoni*.
1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 6, 38-40, 83-85.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (3) : 257, 258, 260.
1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 200, 203, 210, Tab. 2.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 18, 24, 70-74.
1987. Bose and Das, In : *Fauna of Orissa* (State Fauna Ser. 1) : 105, 109.

2. *Microcerotermes championi* Snyder :

1933. Snyder, *Proc. U. S. natn. Mus.*, **82** (Art. 16) : 14-15.
1958. Mathur and Sen-Sarma, *Indian For. Bull.*, No. 219 : 6.
1958. Ahmad, *Biologia*, Lahore, **4** : 167, 172.
1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 6, 31-34, figs. 18-20.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 45-46, figs. 52, 53.
1974. Akhtar, *Pakistan J. Zool.*, **6** (1 & 2) : 102.
1975. Akhtar, *Bull. Dep. Zool. Univ. Panjab. (N. S.)*, Art. 7 : 150, 151-154.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 2, 12, 38, 54, 64.
1989. Akhtar and Parveen, *Panjab Univ. J. Zool*, **4** ; 21-23.

3. *Microcerotermes heimi* Wasmann (Wrong determination) :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 318, 319. Is actually *M. besoni* Snyder.

4. *Microcerotermes lanceolatus* Mathur and Thapa : New Synonymy.

1965. Mathur and Thapa, *Bull. Ent.*, 6 : 4-5, 11.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 31.

IMAGO (Fig. 68) : Head-capsule brown to dark brown ; postclypeus as dark as head-capsule : antennae brownish ; labrum and legs yellowish brown ; pronotum and abdominal tergites and sternites paler than head ; wings pale smoky brown. Head and body densely hairy. Total body-length with wings 8.5-9.9, without wings 4.0-6.2 mm. Head-capsule subsquarish (length to base of mandibles 0.75-0.90, width with eyes 0.77-0.90 mm) ; sides subparallel ; Y-suture present. Fontanelle plate subcircular, yellowish. Eyes subcircular (max. diameter 0.18-0.24 mm) ;

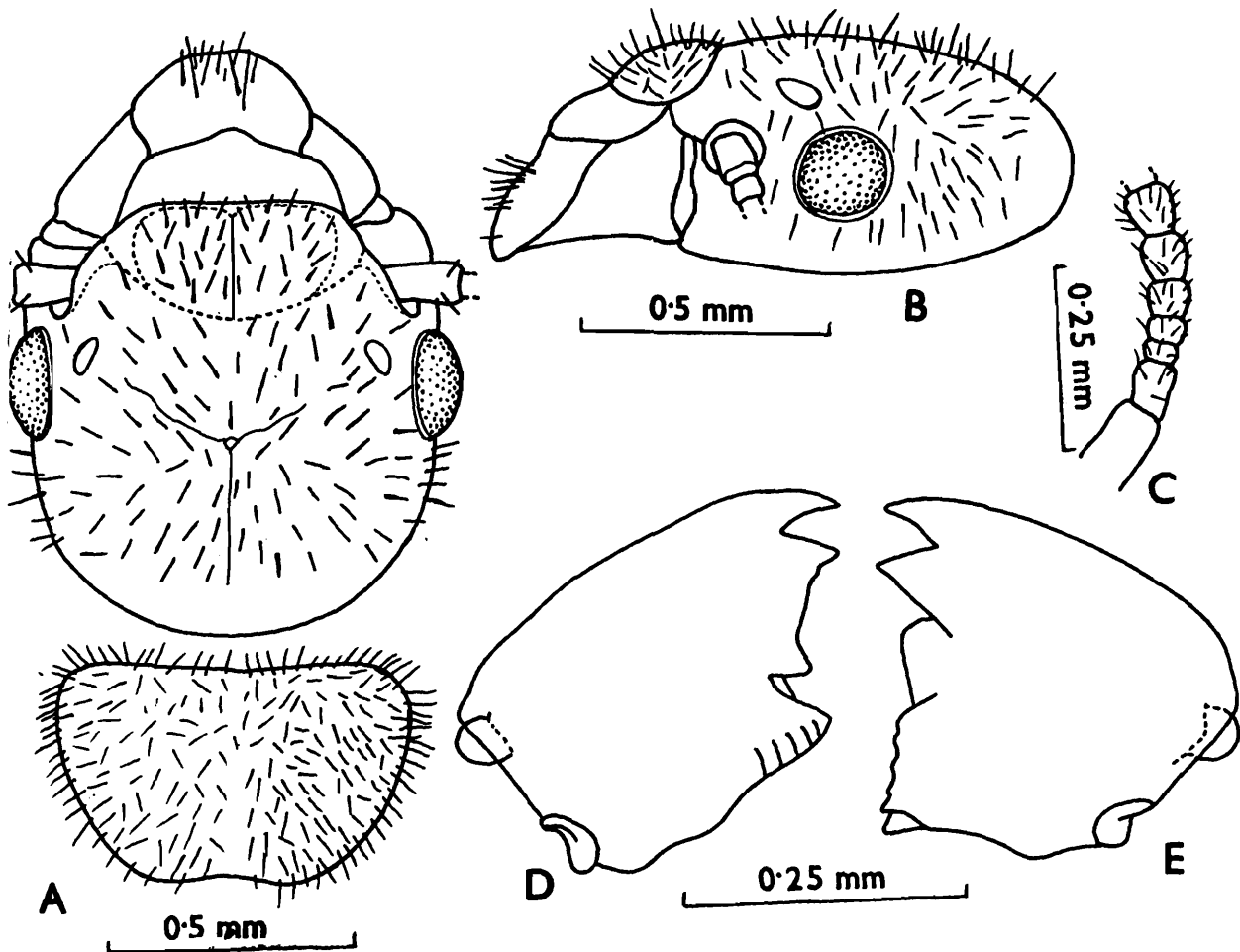


Fig. 68 : *Microcerotermes beelsoni*. Imago. (A) Head and pronotum, in dorsal view. (B) Head, in side view. (C) Basal few segments of antenna. (D) and (E) Left and right mandibles respectively. (Ex Prashad, et al. 1967).

situated at less than their half diameter from lower margin of head. Ocelli oval (long diameter 0.07-0.10 mm, short diameter 0.05-0.07 mm) ; separated from eyes by about their short diameter (0.05-0.07 mm). Antennae 14-segmented ; segment 2 longer than 3 or subequal to 3 + 4 ; 3 smallest. Postclypeus swollen, hairy ; almost as long as half its width. Pronotum subtrapezoidal (length 0.37-0.45, width 0.56-0.72 mm) ; anterior margin straight without median notch ; posterior margin weakly emarginate medially. Wings thin, transparent ; forewing 7.0-8.0 and hindwing 6.7-7.7 mm long ; microsculpture consists of 2-3 rows of short, spiky papillae on anterior margin and one row on posterior margin and membrane covered with both nonasteriod (5 arms) and asteriod (5-6 arms) micrasters.

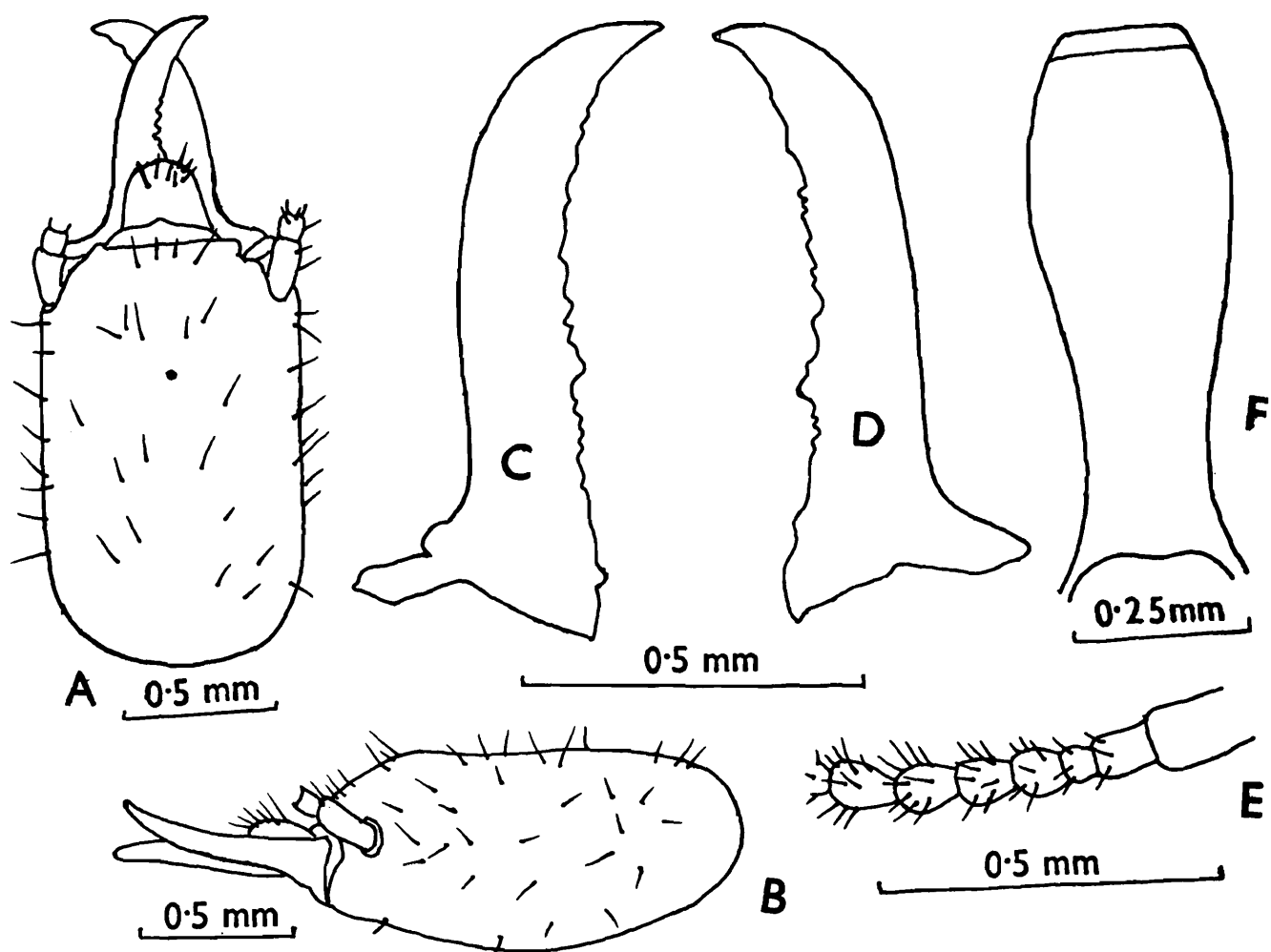


Fig. 69 : *Microcerotermes beelsoni* Soldier. (A) Head, dorsal view. (B) Head, side view. (C), (D) Left and right mandibles respectively. (E) Basal part of antenna. (F) Postmentum. (Ex Prashad, et al. 1967).

SOLDIER (Fig. 69) : Head-capsule yellow, a little darker anteriorly ; antennae and labrum pale yellow ; mandibles reddish brown ; body pale yellow. Head sparsely and body densely hairy. Total body-length 4.3-5.5 mm. Head-capsule subrectangular (length to base of mandibles 1.28-1.67, max. width 0.77-1.00 mm) ; width more than half of length (index width/length 0.58-0.60). Fontanelle minute ; situated at anterior 1/3. Antennae 13 segmented in general (rarely 12) ; segment 3 smallest. Labrum subpentagonal ; anterior margin sharply rounded ; sides subparallel (length 0.17-0.20, width 0.20-0.27 mm). Mandibles (0.75-0.92 mm) a little more than half to about 2/3 as long as head ; coarsely serrated, with a larger tooth-like serration a little behind middle ; anteriorly weakly to appreciably incurved (mandible-length/head-length index 0.58-0.66). Postmentum club-shaped with waist lying posteriorly (length 0.72-0.90, max. width 0.29-0.31, width at waist 0.16-0.17 mm). Pronotum saddle-shaped (length 0.22-0.33, width 0.47-0.60 mm) ; anterior margin weakly notched ; posterior margin slightly emarginate.

WORKER : Head-capsule yellowish, rest of body pale yellow. Head and body fairly densely hairy. Total body-length 3.8-4.5 mm. Head-capsule subsquarish (length to base of mandibles 0.70-0.95, max. width 0.80-0.90 mm). Fontanelle indistinct. Antennae 13-segmented ; segment 3 smallest. Postclypeus swollen, hairy ; length a little more than half of its width (length 0.19-0.22, width 0.32-0.41 mm). Pronotum saddle-shaped (length 0.17-0.25, width 0.39-0.57 mm) ; anterior margin without any distinct notch ; posterior margin slightly emarginate medially.

Distribution : INDIA : Uttar Pradesh, Delhi, Haryana, Punjab, Madhya Pradesh, Orissa, West Bengal and Assam. Also BHUTAN, PAKISTAN and BANGLADESH.

140. *Microcerotermes bugnioni* Holmgren

(Figs. 70, 71)

Microcerotermes Bugnioni/bugnioni Holmgren :

1911. Holmgren, In Escherich's *Termitenleben auf Ceylon* : 203-204, Pl.2 fig.5. Syntypes probably in Holmgren Coll., Riksm., Stockholm. Type-locality : Seenigoda Estate near Ambalangoda, Sri Lanka.
1927. Bathelier, *Fauna colonies Franc.*, **1** : 180-182.
1964. Tsai and Chen, *Acta Ent. Sinica*, **13** (1) : 35.

1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 5, 7, 19-22, figs. 9-11. Synonymy, descriptions, etc.
1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 40-41, 83, 85.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) 46 (3) : 258, 260.
1986. Gao and Lam, *Mem. Hongkong nat. Hist. Soc.*, 17 : 128.

IMAGO (Fig. 70) : Head-capsule brown ; postclypeus, pronotum and abdominal tergites paler than head ; wings pale brown with smoky tinge. Head and body densely hairy. Total body-length without wings 4.0-5.58

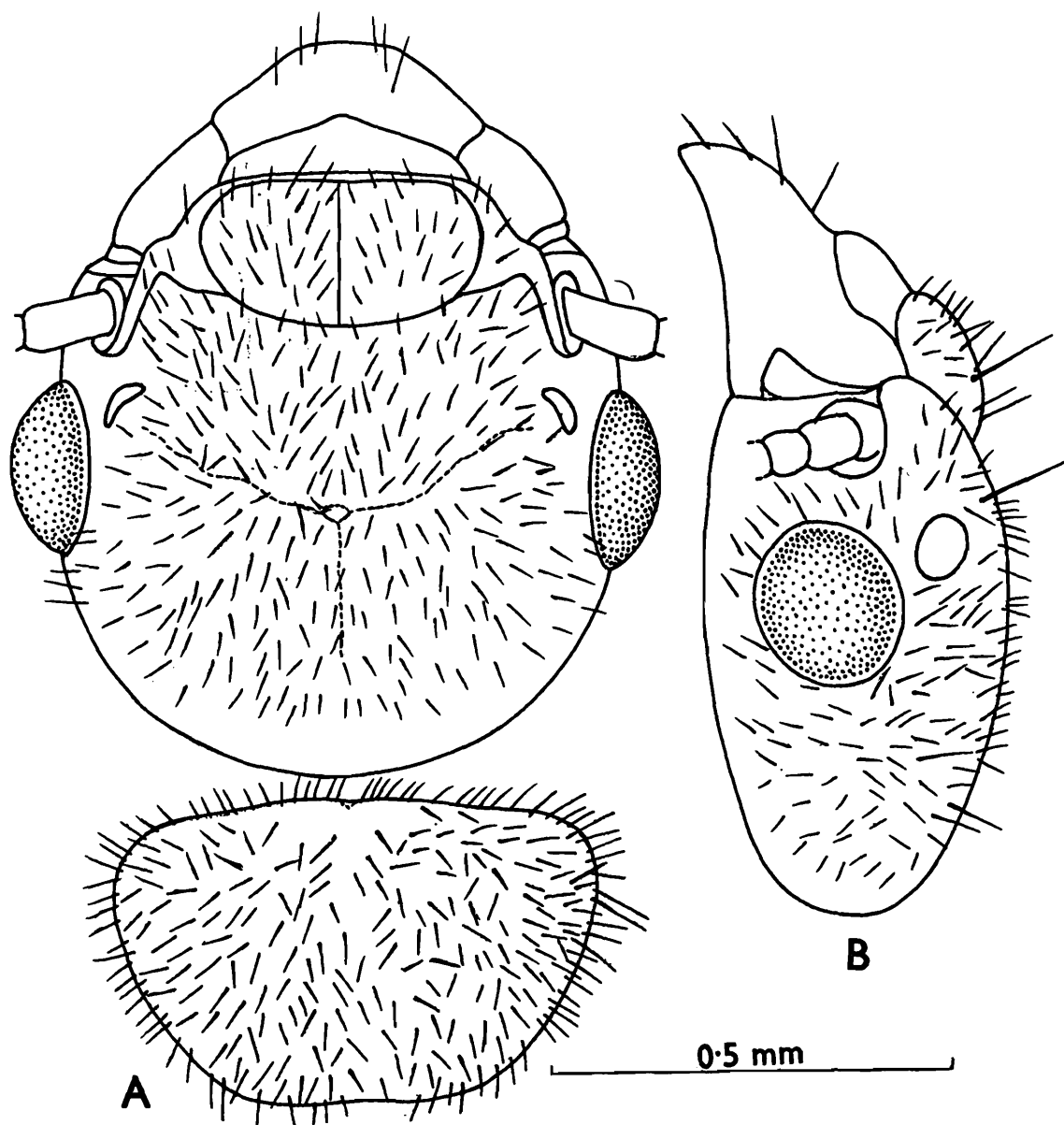


Fig. 70 : *Microcerotermes bugnioni*. Imago.(A) Head and pronotum, dorsal view. (B) Head, side view. (Ex Prashad, et al. 1967).

mm. Head-capsule subsquarish, sides subparallel (length to base of mandibles 0.65-0.70, width with eyes 0.79-0.86 mm) ; Y-suture faint. Fontanelle plate oval, slightly raised. Eyes subcircular (max. diameter 0.22 mm) ; weakly projecting and separated from lower margin of head by 1/3 of diameter. Ocelli oval (max. diameter 0.09 mm) ; very close to eyes (eye-ocellus distance 0.02-0.04 mm). Antennae 14-segmented ; segment 3 smallest. Postclypeus swollen, about 1/2 of its width in length. Pronotum flat, trapezoidal (length 0.37-0.44, width 0.57-0.67 mm) ; anterior margin substraight with a faint, median notch ; posterior margin nearly straight not notched. Wings with a few hairs on membrane and on anterior and posterior margins ; microsculpture consists of spiny papillae (1-3 rows on anterior margin and one row on posterior margin) and dark brown non-asteroid and asteroid micrasters on membrane. Forewing length 6.2-6.9, hindwing length 5.9-6.2 mm.

SOLDIER (Fig. 71) : Head-capsule dark brown ; antennae and labrum much paler than head ; mandibles dark brown with reddish tinge ; rest

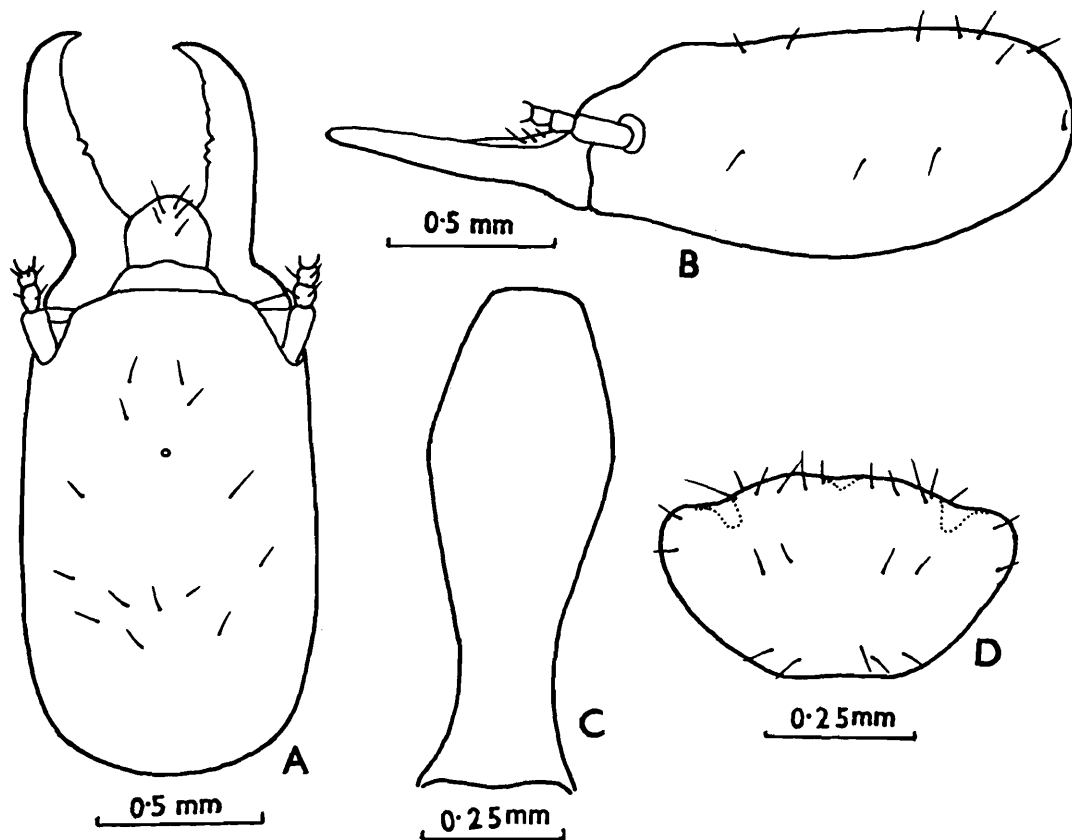


Fig. 71 : *Microcerotermes bugnioni*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Postmentum. (D) Pronotum. (Ex Prashad, et al. 1967).

of body pale yellow. Head sparsely and body fairly hairy. Total body-length 4.9-5.60 mm. Head-capsule subrectangular, sides almost parallel (length to base of mandibles 1.30-1.63, max. width 0.85-0.92 mm). Fontanelle minute, faintly marked. Antennae 13-segmented ; segment 2 twice as long as 3, the latter smallest. Labrum with sides straight and anterior margin rounded and broadly converging (length 0.20, width 0.25 mm). Mandibles short, thick and finely serrated (length 0.80 mm) ; a little longer than half of head-length (index mandible-length/head-length 0.53-0.61) ; apically incurved. Postmentum club-shaped ; waist lying at posterior 1/4 (length 0.87-0.92, max. width 0.30-0.32, width at waist 0.20-0.22 mm). Pronotum saddle-shaped ; anterior margin weakly notched ; posterior margin straight (length 0.30-0.32, width 0.55-0.61 mm).

WORKER : Head-capsule pale brownish ; rest of body pale yellow. Head and body fairly hairy. Total body-length 3.0-4.7 mm. Head subsquarish (length to base of mandibles 0.56-0.87, max. width 0.70-0.87 mm). Fontanelle indistinct. Antennae 13-segmented ; segment 3 smallest. Postclypeus moderately swollen, hairy ; length about 1/2 of width. Pronotum saddle-shaped ; anterior margin weakly notched, posterior margin weakly emarginate medially (length 0.22-0.26, width 0.45-0.52 mm).

Distribution : SRI LANKA. Also VIETNAM and CHINA (needs checking).

141. *Microcerotermes cameroni* Snyder

(Figs. 72, 73)

Microcerotermes cameroni Snyder :

- 1934. Snyder, *Indian For. Rec.*, **20** (11) : 21-22. Im and S. Holotype. Im, in BM. Type-locality : North Vellore Dist., Tamil Nadu.
- 1962. Becker, *Z. ang. Ent.*, **50** (4) : 360-361.
- 1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 5, 7, 27-31, figs. 15-17, Description, synonymy, etc.
- 1974. Roonwal, et al. *Z. zool, Syst. Evolut-forsch.*, **12** : 57, 58, 59, 60, 64, 69, 74.
- 1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (3) : 257, 258.
- 1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 6, 18, 24, 74-77.
- 1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 92, 126-128.

IMAGO (Fig. 72) : Head-capsule, pronotum and abdominal tergites castaneous brown ; antennae, labrum and abdominal sternites brown ; wings light smoky brown. Head and body densely hairy. Total body-length with wings 8.5-9.2, without wings 4.7-5.7 mm. Head-capsule subsquarish (length to base of mandibles 0.83-0.90, width with eyes 0.83-0.90 mm) ; sides subparallel ; Y-suture distinct. Fontanelle plate small, faint. Eyes broadly oval (max.diameter 0.20-0.25, min. diameter 0.20 mm) ; situated at 1/3 of diameter from lower margin of head. Ocelli oval (long diameter 0.07-0.10 mm), separated from eyes by about 1/2 long diameter (0.04-0.07 mm). Antennae with 14 segments; segment 2 equal to 3 + 4, 3 smallest. Postclypeus weakly swollen, hairy ; length equal to or a little more than half its width. Pronotum trapezoidal (length 0.40-0.51, width 0.65-0.72 mm) ; anterior margin substraight with a weak median notch; posterior margin shallowly emarginate. Wing microsculpture consists of

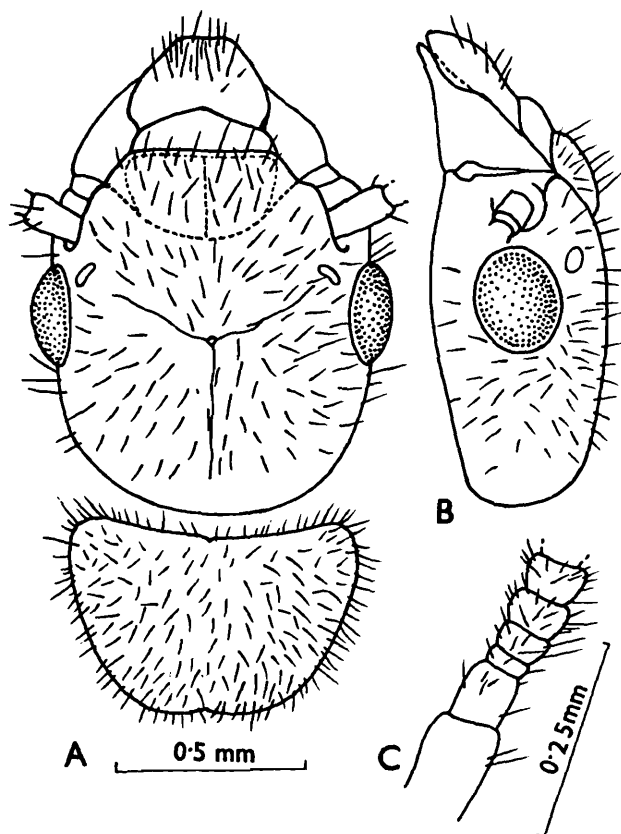


Fig. 72 : *Microcerotermes cameroni*. Imago. (A) Head and pronotum, dorsal view. (B) Head, in side view. (C) Basal few segments of antenna (Ex Prashad, et al. 1967).

1-2 rows of spiny, pointed papillae on anterior and posterior margins and both nonasteroid (4-6 arms) and asteriod (5-6 arms) micrasters on membrane. Forewing length 7.45-8.0, hindwing length 7.0-7.70 mm.

SOLDIER (Fig. 73) : Head-capsule yellowish brown ; antennae, labrum and pronotum yellowish ; mandibles brownish black ; body pale yellow. Head sparsely and body fairly hairy. Total body-length 4.3-5.2 mm. Head-capsule subrectangular (length to base of mandibles 1.40-1.67, max. width 0.90-1.00 mm) ; width more than half to a little less than $2/3$ of length (index width/length 0.56-0.64). Fontanelle minute ; situated at about anterior $1/3$ of head. Antennae with 13 segments ; segment 3 smallest. Labrum with anterior margin bluntly rounded ; sides parallel (length 0.20-0.25, width 0.25-0.27 mm). Mandibles less than $2/3$ of head-length (length 0.86-0.97 mm, index left mandible-length/head-length 0.59-0.63); and markedly incurved in anterior half ; coarsely serrated with one larger tooth-like serration behind middle. Postmentum club-shaped (length 0.85-1.02, max. width 0.29-0.35, width at waist 0.19-0.22 mm) ; waist lying posteriorly. Pronotum saddle-shaped (length 0.27-0.35, width 0.53-0.66

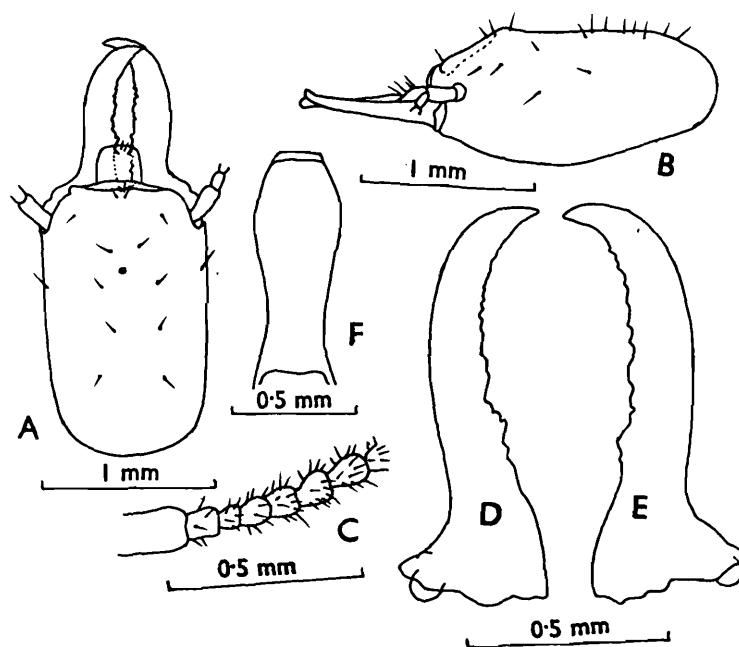


Fig. 73 : *Microcerotermes cameroni*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal few segments of antenna. (D), (E) Left and right mandibles. (F) Postmentum. (Ex Prashad. et, al 1967).

mm) ; anterior margin distinctly notched, posterior margin weakly emarginate or nearly straight.

WORKER : Head-capsule brownish yellow ; body pale yellow. Head and body fairly hairy. Total body-length 3.6-4.8 mm. Head-capsule subsquarish (length to base of mandibles 0.8-0.87, max. width 0.87 mm) ; sides subparallel. Fontanelle not visible. Antennae with 13 segments ; segment 3 smallest. Postclypeus swollen, hairy ; length about half or a little more than half of width. Pronotum saddle-shaped (length 0.17-0.25, width 0.45-0.57 mm).

Distribution : INDIA : Tamil Nadu, Kerala, Andhra and West Bengal states.

142. *Microcerotermes chaudhryi* Akhtar

(Fig. 74)

1. *Microcerotermes chaudhryi* Chaudhry, et al., Nom. nud. :

1972. Chaudhry, et al. *Termites of Pakistan*, (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 46. Nom. nud.

2. *Microcerotermes chaudhryi* Akhtar :

1974. Akhtar, *Biologia*, Lahore, **20** (1) : 46-49. S only. Holotype : S, in PU. Type-locality : Hangu, N. W. F. P., Pakistan.

1974. Akhtar, *Pakistan J. Zool.*, **6** (1 & 2) : 102.

IMAGO : Unknown.

SOLDIER (Fig. 74) : Head yellowish brown to pale brown. ; antennae brownish yellow ; mandibles reddish brown ; legs and abdomen pale. Head sparsely hairy. Head-capsule subrectangular, sides subparallel, slightly diverging anteriorly (length to base of mandibles 1.26-1.66, max. width 0.83-0.97 mm). Antennae with 13 segments ; segment 3 shortest. Clypeus trapezoidal. Labrum subpentagonal with a broad, rounded tip. Mandibles coarsely serrated and strongly incurved in apical half (length 0.94-1.05 mm). Postmentum club-shaped, waist at posterior third (length 0.70-1.01 ; max. width 0.27-0.32, width at waist 0.17-0.20 mm). Pronotum saddle-shaped ; anterior margin notched, posterior margin substraight (length 0.30-0.38, width 0.54-0.65 mm).

Distribution : PAKISTAN (N. W. F. P. and Baluchistan).

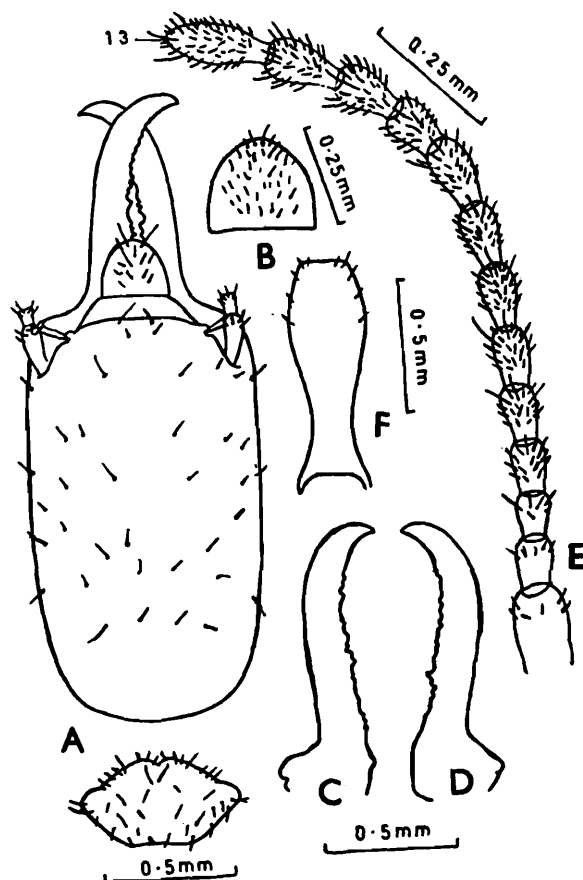


Fig. 74 : *Microcerotermes chaudhryi*. Soldier. (A) Head and pronotum, in dorsal view. (B) Labrum. (C) and (D) Left and right mandibles. (E) Antenna. (F) Postmentum. (After Akhtar, 1974a).

143. *Microcerotermes crassus* Snyder

(Synonym : *M. burmanicus* Ahmad)

(Figs. 75, 76)

1. *Microcerotermes crassus* Snyder :

1934. Snyder, *Indian For. Rec.*, **20** (11) : 22-23. S only, Syntypes : in BM, FRI and USNM. Type-locality : Meitkyina, Burma.

1958. Ahmad, *Biologia*, Lahore, **4** : 170.

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 6-8. Treats *burmanicus* as a synonym.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 64, 65, 68-69.

1969. Prashad, et al. *Indian For. Bull.*, No. 246 : 5, 7, 35-39.
1968. Harris, *Opusc. Ent.*, **33** : 146.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 46-48, figs. 54, 55.
1973. Morimoto, *Bull. Govt. For. exp. Stn.*, No. 257 : 64, 77.
1974. Roonwal, et al. *Z. zool. Syst. Evolut-forsch.*, **12** : 57, 58, 60, 61, 64, 69, 74.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, Art. 7 : 150, 151, 155-158.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 4, 13, 38, 54.
1979. Sen-Sarma and Thakur, *Indian For. Rec.*, **13** (1) : 5, 16, 42.
1980. Lahiri and Ghosh, *Rec. zool. Surv. India*, **80** : 66.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (3) : 258-259.
1986. Gao and Lam, *Mem. Hongkong nat. Hist. Soc.*, **17** : 82.

2. *Microcerotermes burmanicus* Ahmad :

1947. Ahmad, *Am. Mus. Novit.*, No. 1342 : 6.
1958. Mathur and Sen-Sarma, *Indian For. Bull.*, No. 219 : 4-6.
1964. Tsai and Chen, *Acta ent. Sinica*, **13** (1) : 35.
1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 6.
1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 5, 7, 23-26, figs. 12-14.
1974. Roonwal. *Z. zool. syst. Evolut.-forsch.*, **12** : 57, 58, 59, 60, 64, 69, 74.

IMAGO (Fig. 75) : Head-capsule brown to castaneous brown ; postclypeus a little paler ; antennae and labrum pale brown ; pronotum slightly paler than head and with T-shaped marking medially ; abdominal tergites as dark as head or a little paler, sternites brown and paler medially. Head and body densely hairy. Total body-length without wings 4.5-5.8 mm. Head-capsule subsquarish (length to base of mandibles 0.78-1.03, width with eyes 0.90-1.07 mm) ; sides subparallel ; Y-suture absent. Fontanelle plate weakly indicated or not discernible. Eyes broad, oval (max. diameter 0.24-0.28, min. diameter 0.22-0.24 mm) ; weakly projecting ; situated at a distance of less than to about half of short diameter from lower margin of head (0.07-0.14 mm). Ocelli oval (long diameter 0.06-0.12, short diameter 0.05-0.09 mm) ; from eyes separated by about their long diameter (0.06-0.10 mm). Antennae 13-14 (generally 14) segmented ; segment 3 shortest in 14-segmented antennae and almost as long as 4 in

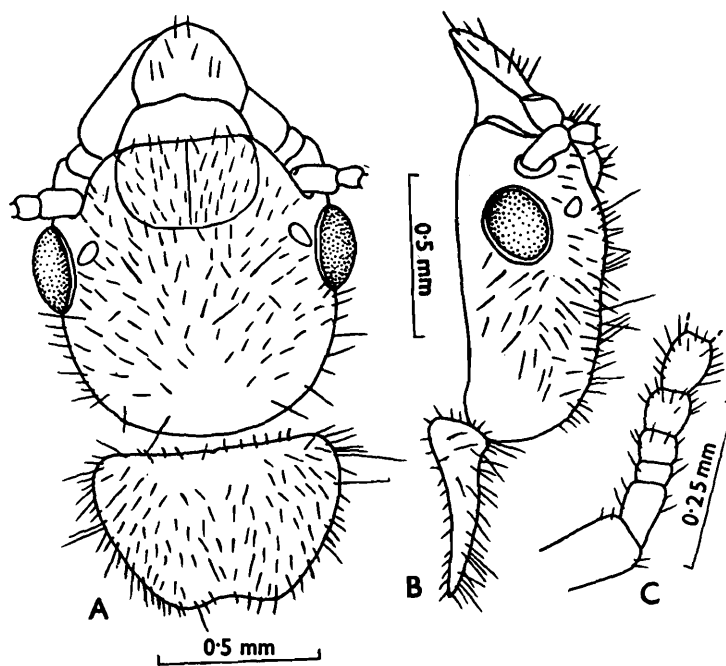


Fig. 75 : *Microcerotermes crassus*. Imago. (A) Head and pronotum, in dorsal view. (B) Same, side view. (C) Basal segments of antenna. (Ex Prashad, et al. 1967).

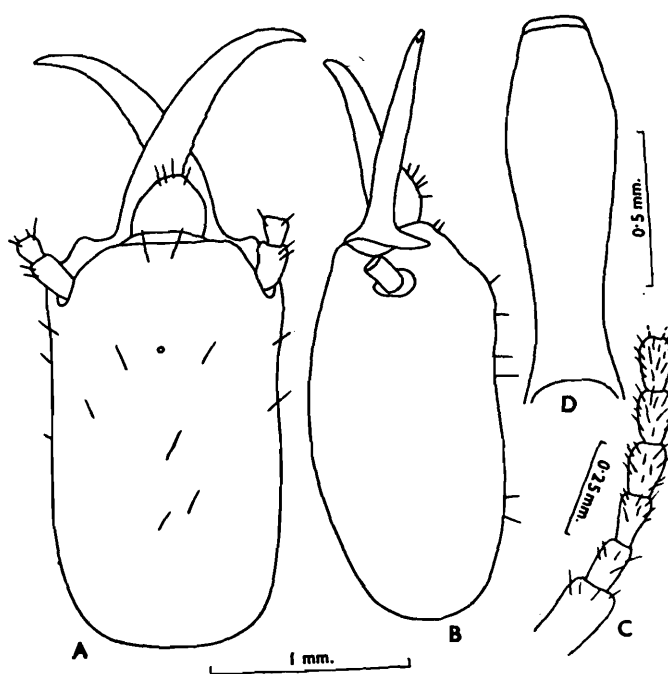


Fig. 76 : *Microcerotermes crassus*. Soldier. (A) Head, in dorsal view. (B) Ditto, side view. (C) Basal segments of antenna. (D) Postmentum. (Ex prashad, et al. 1967).

13 segmented antennae. Postclypeus swollen, hairy; as long as or slightly longer than half of its width (length 0.19-0.28, width 0.40-0.50 mm). Pronotum trapezoidal (length 0.41-0.53, width 0.65-0.88 mm) ; anterior margin straight, not notched or faintly notched ; posterior margin weakly to prominently emarginate. Wings smoky brown ; forewing-length 7.7-8.7 and hindwing-length 7.2-8.1 mm ; papillae and both types (nonasteroid and asteroid) micrasters present.

SOLDIER (Fig. 76) : Head brownish yellow to brownish, darker anteriorly ; antennae and labrum pale brown ; mandibles blackish brown ; body and legs straw yellow. Head sparsely and body densely hairy. Total body-length 4.4-6.4 mm. Head-capsule subrectangular (length to base of mandibles 1.43-1.97, max. width 0.91-1.15 mm) ; sides substraight. Fontanelle minute ; situated at anterior 1/3 of head. Antennae with 13 segments ; segment 3 shortest. Labrum broader than long ; anterior margin rounded, sometimes projecting medially a little. Mandibles long, strongly curved and finely serrated ; length more than 2/3 of head-length (length 0.96-1.21 mm, index left mandible-length/head-length 0.66-0.82). Postmentum club-shaped, elongate (length 0.78-1.19, max. width 0.28-0.37, width at waist 0.14-0.27 mm) ; waist situated near posterior margin. Pronotum saddle-shaped (length 0.27-0.41, width 0.59-0.82 mm) ; anterior margin slightly to distinctly notched, posterior margin nearly straight or slightly notched.

WORKER : Head-capsule yellowish brown ; antennae, legs and body fairly hairy. Total body-length 5.0-5.8 mm. Head-capsule subsquarishly round (length to base of mandibles 0.75, max. width 0.80-0.85 mm). Antennae with 13 segments ; segment 3 shortest. Postclypeus of same colour as head, weakly swollen and projecting behind ; length a little more than 1/2 width (length 0.23, width 0.43 mm). Pronotum saddle-shaped ; anteriorly faintly or not notched ; posteriorly weakly emarginate (length 0.25-0.30, width 0.55-0.60 mm).

Distribution : INDIA (Tripura and Manipur states). BANGLADESH, BURMA, THAILAND, VIETNAM, CHINA.

144. *Microcerotermes cylindriceps* Wasmann

(Fig. 77)

Microcerotermes cylindriceps Wasmann :

1902. Wasmann, *Zool. Jb. Syst.*, **17** (1) : 121-122, Pl. 4, fig. 4. S and W.

Syntypes in NHM, Maastricht. Type-locality. Pankulam, Sri Lanka.
Lectotype examined.

1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 7, 39-40, See for synonymy.

IMAGO : Unknown.

SOLDIER (Fig. 77) : Syntypes examined. Head-capsule yellowish to yellowish brown, darker anteriorly ; antennae yellowish ; labrum yellowish brown ; mandibles blackish ; rest of body yellowish. Head sparsely and body fairly densely hairy. Total body-length 4.0-6.0 mm. Head-capsule narrowly subrectangular ; sides substraight and parallel ; in profile substraight posteriorly, in front a little inclining ; width nearly half to slightly more than half of length (length to base of mandibles 1.6-1.8,

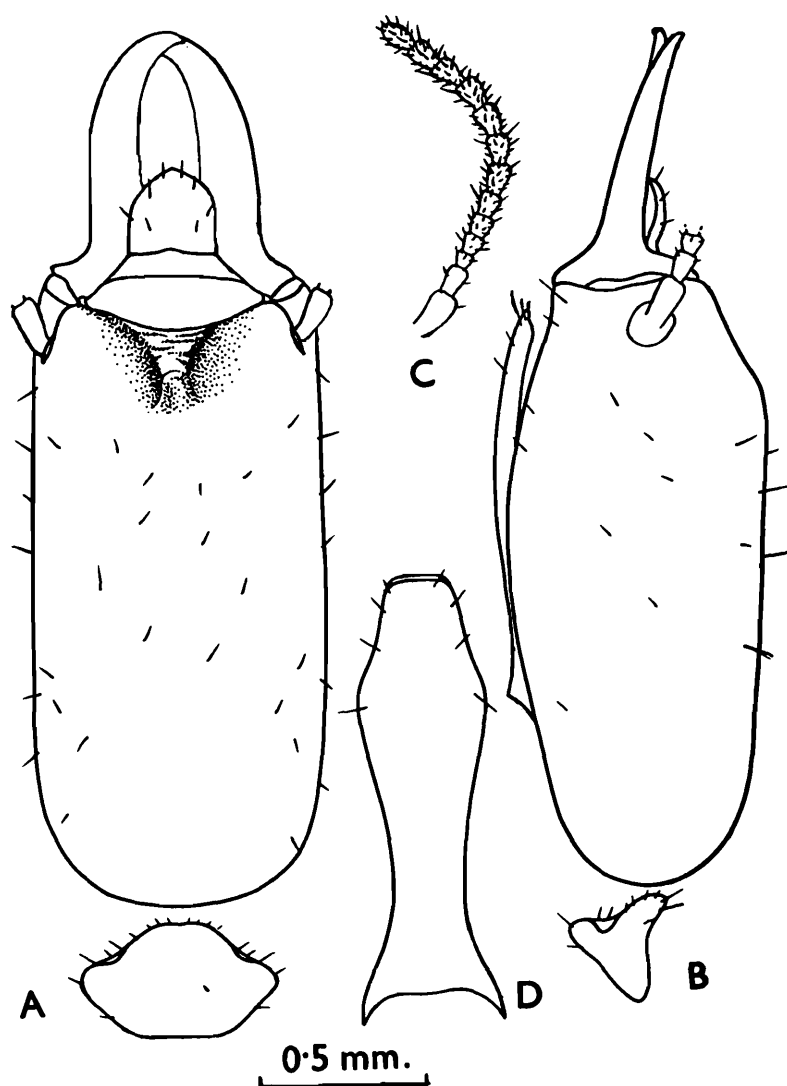


Fig. 77 : *Microcerotermes cylindriceps*. Soldier (Lectotype). (A) Head and pronotum, in dorsal view. (B) Same, side view. (C) Antenna. (D) Postmentum.

max. width 0.85-0.90 mm, index width/length 0.50-0.53). Antennae 13-segmented ; segment 3 shortest. Postclypeus subsemicircular, clearly demarcated from frons. Labrum broad, tongue-shaped (length 0.20-0.23, width 0.23-0.25) ; with a weak tip and with a pair of bristles near tip and some on body. Mandibles thick, short, stout and finely serrated ; length less than half of head-length to base of mandibles (length of left mandible 0.75-0.78 mm, index left mandible-length/head-length 0.43-0.48). Postmentum club-shaped ; waist below middle and about 2/3 of max. width (length 1.13-1.25, max. width 0.30-0.33, width at waist 0.18-0.20 mm). Pronotum saddle-shaped ; weakly notched anteriorly and substraight posteriorly (length 0.30-0.35, width 0.53-0.60 mm).

WORKER : Head-capsule, antennae and postclypeus pale yellowish ; rest of body paler. Total body-length 3.0 mm. Head-capsule subsquarish (length to base of mandibles 0.80, width 0.85 mm). Antennae 13 segmented; 3rd segment shortest. Postclypeus strongly swollen, hairy ; posteriorly projecting behind, anteriorly straight (length 0.23, width 0.50 mm). Pronotum saddle-shaped, not notched anteriorly or posteriorly (length 0.20, width 0.40 mm). Measurements from single worker in spirit (vial 17) in Wasmann Collection.

Lectotype : The syntypes in Wasmann Collection at NHM, Maastricht, are two soldiers and a worker on one pin, labelled as "type" by Wasmann. Emerson in the year 1957 selected the top soldier as the lectotype and the remaining specimens i.e. one soldier and one worker as paralectotypes, but no published data on the same is available. van Boven 1969, however, has made a mention to the effect on page 42. Since no data or figure of the lectotype is available I give here the measurements and the figures from this lectotype. Total body-length 4.7, length of head to lateral base of mandibles 1.80, max. width of head 0.90, height of head 0.75, length of left and right mandibles 0.78 and 0.75 respectively, length of postmentum 1.25, max. width of postmentum 0.33, width of postmentum at waist 0.20, length of pronotum 0.35 and width of pronotum 0.60 mm. The antennae in the lectotype are incomplete (only 11 segments present), the forelegs are broken and the remaining legs are lying under abdomen.

One soldier and one worker are also present in the Wasmann Collection in spirit in a vial (No. 17) which has the same data as the lectotype on pin, this collection is probably from the same colony.

145. *Microcerotermes danieli* Roonwal and Bose

(Figs. 78, 79)

Microcerotermes danieli Roonwal and Bose :

1970. Roonwal and Bose, *Rec. zool. Surv. India*, **62** (3 & 4) : 11, 117-118, 120, 141-146. S. and W. Holotype : S, in ZSI. Type-locality : Phoenix Bay, Port Blair, South Andamans, India. Types examined.

1980. Bose, *Rec. zool. Surv. India*, **77** : 101.

1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 6, 39, 41.

IMAGO : Unknown.

SOLDIER (Fig. 78) : Types examined. Head-capsule yellowish ; frons and labrum reddish ; mandibles reddish brown, basally reddish ; antennae and pronotum pale yellow; abdomen and legs creamish. Head sparsely and body moderately hairy. Total body-length 4.6-5.0 mm. Head-capsule subrectangular with substraight sides and rounded posterior margin (length to base of mandibles 1.54-1.63, max. width 0.95-1.00 mm) ; frons slightly sloping in front. Fontanelle small but distinct ; situated at anterior one-third on head dorsum. Antennae with 13 segments ; segment 3 shortest. Postclypeus pilose, indistinctly separated from frons ; anteclypeus apilose, hyaline, strip-like. Labrum subsquarish ; anterior margin rounded (length 0.18-0.20, width 0.28-0.30 mm). Mandibles coarsely serrate ; about 2/3 of head-length (length 0.95-1.03 mm). Left mandible with a tooth-like larger serration a little below middle ; right mandible with a similar large serration at about 1/3 of mandible from base. Postmentum club-shaped ; widest at anterior 1/4 and narrowest at waist lying near base (length 0.85-0.98, max. width 0.34-0.38, width at waist 0.20-0.23 mm). Pronotum saddle-shaped ; anterior margin round, with a weak median notch ; posterior margin substraight, faintly incurved medially ; length 0.30-0.34, max. width 0.58-0.68 mm. Mesonotum as wide as pronotum and metanotum a little wider than pronotum ; both with faintly incurved posterior margin.

WORKER (Fig. 79) : Head-capsule pale golden yellow, anteriorly pale yellow ; antennae and pronotum pale yellow ; legs and abdomen creamish white. Head and body moderately hairy. Total body-length 3.80-4.60 mm. Head subsquarish, broader than long (length to base of mandibles 0.73-0.98, max. width 0.80-0.98 mm). Antennae with 13 segments ;

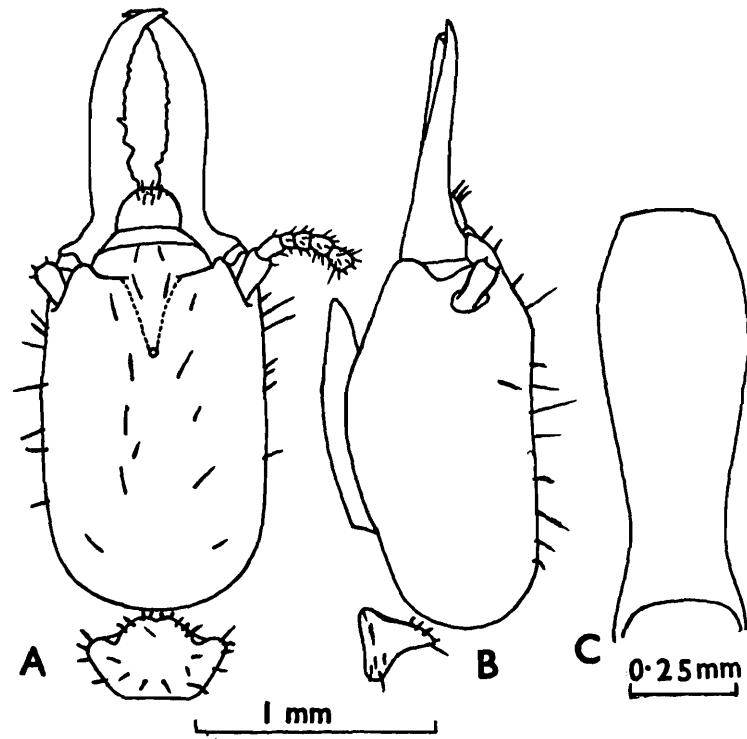


Fig. 78 : *Microcerotermes danieli*. Soldier. (A) Head and pronotum, in dorsal view. (B) Same, side view (C) Postmentum.

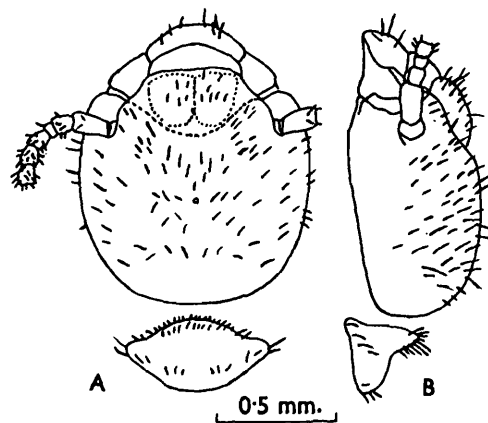


Fig. 79: *Microcerotermes danieli*. Worker. (A) Head and pronotum, in dorsal view. (B) Ditto, side view.

segment 3 shortest. Postclypeus swollen, sparsely hairy ; longer than half of width ; anteclypeus hyaline, apilose, anterior margin projected in front medially. Labrum dome-shaped, broader than long. Pronotum saddle-shaped ; length 0.23-0.26, width 0.53-0.58 mm ; anterior and posterior margins convex, not notched.

Distribution : INDIA : Andaman and Nicobar Islands : South and North Andamans and Little Andamans.

146. *Microcerotermes fletcheri* Holmgren and Holmgren

(Fig. 80)

Microcerotermes fletcheri Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dep. Agric. India (Ent.)*, **5** (2) : 170-171. S and W. Syntypes : in Riksmus., Stockholm. Type-locality : Bababudin Hills, Karnataka, India.
1958. Ahmad, *Biologia*, Lahore, **4** : 168.
1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 6, 40-42, figs. 24-25. Synonymy, description, etc.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 349.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 12, 38-39, 54, 65.
1978. Roonwal, *Z. ang Ent.*, **85** : 17-18.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 92, 126, 128-132. Im described.
1992. Ferry, *Pedobiologia*, **36** : 201, 202, 203-204, 207.

IMAGO (Fig. 80A) : Head-capsule dark chestnut brown ; postclypeus slightly paler ; antennae, labrum and legs golden yellow ; thorax and abdominal tergites deep yellowish brown. Head and body fairly densely hairy. Total body-length Q : 24. 2 and dealate male K : 4. 4 mm. Head-capsule subsquarish (length to base of mandibles 0.80-0.83, width with eyes 0.83-0.85 mm) ; Y-suture present, faint. Fontanelle plate small, circular. Eyes subcircular (0.24-0.25 x 0.23 mm in diameter). Ocelli oval (long diameter 0.10-0.13, short diameter 0.07-0.08 mm) ; separated from eyes by less than their short diameter. Antennae with 14 segments ; segment 3 shortest. Postclypeus slightly swollen, length nearly 1/2 of width ; anterior margin straight and posterior margin round. Pronotum

subtrapezoidal ; anterior margin slightly convex, without notch ; posterior margin straight, faintly emarginate medially ; length 0.40-0.41, width 0.65-0.70 mm.

SOLDIER (Fig. 80B) : Head-capsule yellowish brown to dark brown; antennae and labrum pale brown ; mandibles dark brown with reddish tinge ; body pale yellow. Head sparsely and body densely hairy. Total body-length 4.1-5.0 mm. Head-capsule subrectangular (length to base of mandibles 1.37-1.68, max. width 0.85-0.98 mm) ; sides subparallel, straight or slightly narrowed posteriorly ; width more than half of length (index width/length 0.54-0.64). Fontanelle minute ; situated at anterior 1/3 of head. Antennae 13-segmented ; segment 3 smallest. Labrum pentagonal ; anterior margin convex and roundly projected medially. Mandibles stout and coarsely serrated with one slightly larger serration behind middle ; length generally less than 2/3 of head-length (length 0.87-0.92 mm, index left mandible-length/head-length 0.53-0.67) Postmentum club-shaped

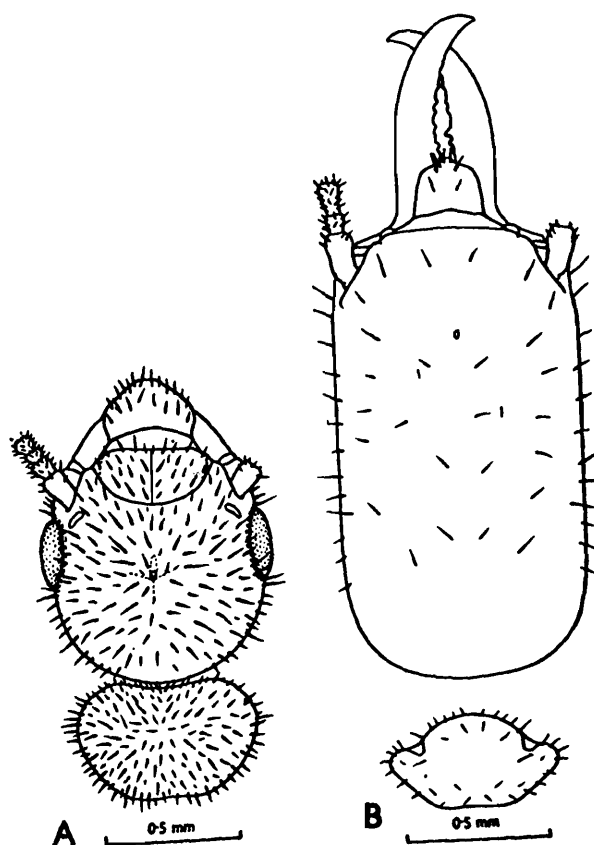


Fig. 80 : *Microcerotermes fletcheri*. (A) Imago. Head and pronotum, in dorsal view. (B) Soldier. Head and pronotum, in dorsal view. (After Bose, 1984).

(length 0.77-1.05, max. width 0.30-0.32, width at waist 0.17-0.20 mm) ; waist lying posteriorly. Pronotum saddle-shaped (length 0.27-0.32, width 0.55-0.60 mm) ; anterior margin with a distinct median notch, posterior margin slightly emarginate medially.

WORKER : Head-capsule yellowish ; body pale yellow. Head and body fairly densely hairy. Total body-length 3.5-4.0 mm. Head-capsule subsquarish (length to base of mandibles 0.90, max. width 0.90 mm). Fontanelle indistinct. Antennae 13-segmented. Postclypeus, hairy ; about half as long as wide ; anterior margin straight, posterior margin rounded. Pronotum saddle-shaped (length 0.17-0.30, width 0.47-0.55 mm).

Distribution : INDIA : Karnataka, Tamil Nadu, Kerala and Uttar Pradesh states.

147 *Microcerotermes ganeshi* Bose

(Fig. 81)

Microcerotermes ganeshi Bose :

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 92, 126, 132-136, 265. S and W. Holotype : S, in ZSI. Type-locality : Karambapatty Reserve Forest, Salem, Tamil Nadu, India. Types examined.

IMAGO : Unknown.

SOLDIER (Fig. 81) : Types examined. Head-capsule golden yellow, dark reddish brown anteriorly ; antennae pale yellow ; labrum dark golden brown ; mandibles and clypeus dark reddish brown ; thorax, legs and body creamy yellow. Head and body sparsely hairy. Total body-length 3.50-4.25 mm. Head-capsule subrectangular ; longer than wide and sides diverging anteriorly (head-length to base of mandibles 1.20-1.23, width 0.73-0.78 mm, index width/length 0.60-0.63) ; in profile frons inclining at about 45° and dorsum faintly incurved behind frons. Fontanelle small, circular, situated at about anterior 1/4. Antennae with 13 segments, segment 3 shortest. Postclypeus indistinctly differentiated from frons, semicircular, with 2 pairs of long hairs anteriorly ; anteclypeus hyaline, trapezoidal, apilose. Mandibles coarsely serrated, weakly incurved at anterior end ; serrations running almost up to tip ; a little longer than 1/2 of head-length (length 0.68-0.70 mm, index mandible-length/head-length 0.56-0.57). Labrum tongue-shaped, narrowed at anterior margin ;

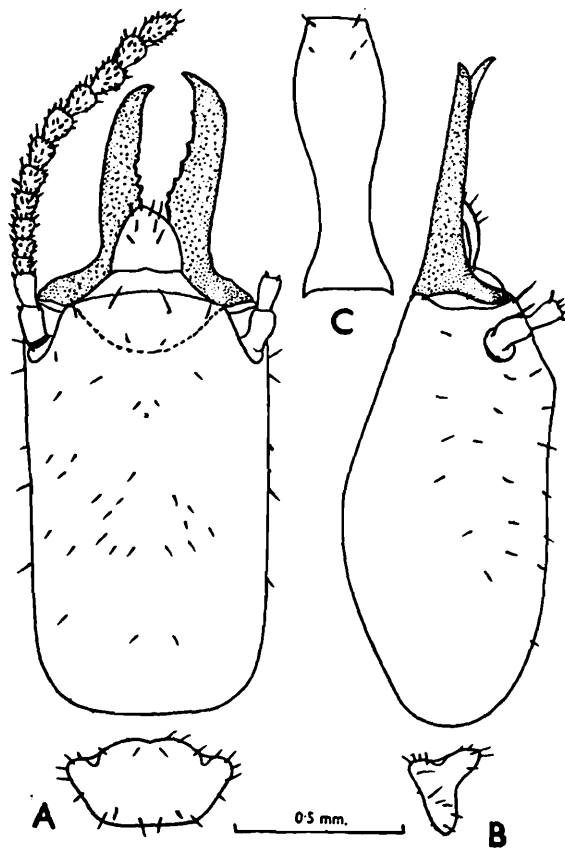


Fig. 81 : *Microcerotermes ganeshi*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum. (After Bose, 1984).

a little broader than long and with a few hairs on anterior margin and body (length 0.15-0.18, width 0.18-0.20 mm). Postmentum club-shaped, with waist lying below middle (length 0.70-0.80, max. width 0.28, width at waist 0.13-0.15 mm, postmentum-contraction index 0.47-0.525). Pronotum saddle-shaped (length 0.25-0.28, width 0.45-0.50 mm); anterior margin distinctly notched, posterior margin substraight.

WORKER : Dimorphic. *Worker major* : Head-capsule pale golden yellow ; thorax and legs creamy white ; abdomen grayish white. Total body-length 3.30-3.60. Head-capsule subsquarish (length to base of mandibles 0.76-0.85, max. width 0.76-0.78 mm). Antennae with 13 segments, segment 3 shortest. Postclypeus hairy, swollen and semicircular ; longer than 1/2 of width. Pronotum small, saddle-shaped (length 0.20-0.21, width 0.43-0.45 mm). *Worker minor*. Resembles worker major but is generally smaller. Total body-length 3.10-3.20, head-length to base of mandibles 0.58-0.63, head-width 0.62-0.68, pronotum-length 0.20, pronotum width 0.40 mm.

Distribution : Karambapatty Reserve Forest, Salem, Tamil Nadu, type-locality. Known only from the type-locality.

148. *Microcerotermes greeni* Holmgren

Microcerotermes Greeni/greeni Holmgren :

1911. Holmgren, *Spolia Zeyl.*, **8** (32) : 284. Syntypes in Riksmus., Stockholm. Type-locality : Ambalangoda, Sri Lanka.

1958. Ahmad, *Biologia*, Lahore, **4** : 168.

1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 6, 43-44, fig. 26. Synonymy, description, etc.

IMAGO : Unknown.

SOLDIER : Head yellowish brown ; body straw coloured. Head sparsely hairy. Total body-length 4.2-4.52 mm. Head subrectangular (length to base of mandibles 1.27-1.41, max. width 0.81- 0.84 mm) ; transverse suture distinct. Fontanelle minute. Antennae 13-segmented ; segment 2 equal to 3 + 4 ; 3 shortest. Labrum roundly pentagonal. Mandibles short, coarsely serrated, incurved apically. Pronotum saddle-shaped (width 0.52-0.53 mm).

WORKER : Head brownish yellow ; legs and body pale yellow. Head and body fairly hairy. Total body-length 3.0-3.7 mm. Head subsquarish (length to base of mandibles 0.67, max. width 0.68-0.72 mm). Fontanelle indistinct. Antennae 13 segmented ; segment 2 equal to 3 + 4, 3 shortest. Postclypeus swollen, longer than half of its width. Pronotum saddle-shaped (length 0.22, width 0.45-0.49 mm).

Distribution : SRI LANKA.

149. *Microcerotermes heimi* Wasmann

(Figs. 82, 83)

1. *Microcerotermes heimi* Wasmann :

1902. Wasmann, *Zool. Jb. Syst.*, **17** : 120-121, Pl. 4 fig. 3. Im, S and W. Syntypes : Im and S in NHM. Type-locality : Vorder-indien (vide Wasmann 1902) but syntypes are from Wallon, Ahmednagar Dist., Maharashtra (van Boven 1969): Syntypes examined.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 140.

1953. Rattan Lal and Menon, *Cat. Indian Insects -Part-27, Isoptera* : 45, Synonymy.
1969. van Boven, *Publ. Nat-hist. Genootschap Limburg*, **19**: 43.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 350.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 13, 39, 54.

2. *Microcerotermes Heimi/heimi* Wasmann (Wrong identifications).
See 'Remarks' below :

1913. Holmgren, K. *Svenska Vetensk.-Akad. Handl.*, **50** (2) : 256, 257, 260-261.
1955. Ahmad, *Biologia*, Lahore, **1** : 241-243.
1958. Ahmad, *Biologia*, Lahore, **4** : 165, 169.
1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 319. Is actually *M. beelsoni*.
1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 5, 7, 44-46, fig. 28.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 48.

IMAGO (Fig. 82) : Syntypes examined. Head blackish ; postclypeus blackish brown ; antennae brown ; thorax, legs and abdomen also blackish. Head and body densely hairy. Total body-length with wings 9.7-10.0, without wings 4.8-5.9 mm. Head-capsule subsquarish ; sides substraight, faintly incurved in region of eyes ; epicranial suture absent ; length to tip of labrum 1.15-1.25, length to base of mandibles 0.85-0.90, max. width with eyes 0.88-0.90, width in between eyes 0.70 mm. Fontanelle indistinct. Antennae with 14 segments ; 3rd segment shortest. Eyes oval, narrowed antero-laterally ; slightly projecting out ; from lower margin situated at half their short diameter (max. diameter 0.23-0.25, min. diameter 0.20 mm) Ocelli small, round ; from eyes separated by about their max. diameter (max. diameter 0.07-0.09, min. diameter 0.04-0.06, eye-ocellus distance 0.07-0.09 and ocellus-antennal distance 0.10-0.125 mm). Postclypeus swollen ; length about half of its width (length 0.25-0.28, width 0.48-0.52 mm). Pronotum flat, semicircular, slightly raised at anterior margin ; slightly wavy and faintly notched medially at anterior margin and substraight at posterior margin (length 0.48-0.50, width 0.68-

0.80 mm) Legs blackish brown ; tibiae somewhat paler apically and foretibiae slightly swollen.

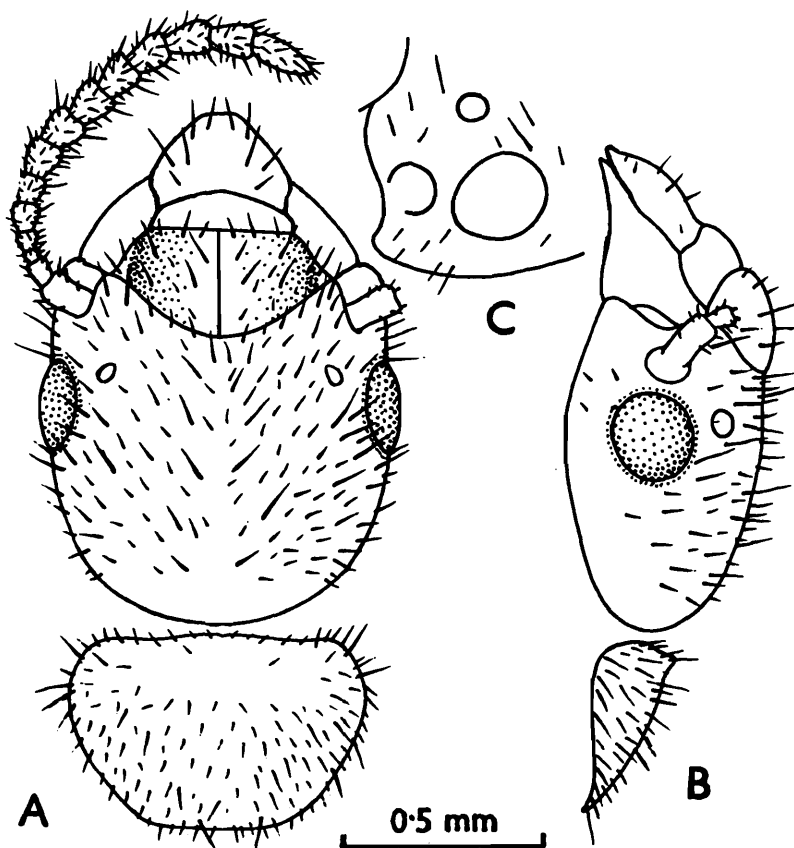


Fig. 82 : *Microcerotermes heimi*. Imago. (Paralectotype). (A) Head and pronotum, in dorsal view. (B) Same, side view. (C) Part of head showing position of eye, ocellus and antenna.

SOLDIER (Fig. 83) : Syntypes examined and lectotype designated. Head-capsule, antennae and labrum yellowish ; mandibles dark brown, a little paler basally, legs and body whitish. Head moderately and body fairly densely hairy. Total body-length 4.0-4.20 mm. Head-capsule subrectangular ; sides slightly narrowed behind ; frons gradually sloping in front ; length nearly one and a half times of width (length to base of mandibles 1.25-1.30, max. width 0.88-0.90 mm). Antennae with 13 segments ; segment 3 shortest. Postclypeus semicircular, demarcated by a thin suture from frons ; hairy. Labrum pentagonal, with a sharp tip ; a pair of hairs near tip and 3 or 4 pairs of short and long hairs on body (length 0.20-0.25, width 0.25 mm). Mandibles thin and long, as long as 3/4 of head-length and incurved in distal 1/3 ; inner margin finely serrated

(length 0.925-0.95 mm ; index left mandible-length/head-length to base of mandibles 0.731-0.74). Postmentum short, club-shaped ; weakly narrowed at waist (length 0.63, max. width 0.33-0.38, width at waist 0.25 mm). Pronotum saddle-shaped; anterior margin weakly notched and posterior margin substraight (length 0.30, width 0.58-0.60 mm). Mesonotum a little narrower and metanotum as wide as pronotum.

Lectotype soldier measurements (in mm) designated here and deposited in NHM, Maastricht in 'Wasmann Collection' : Total body-length 4.2, length of head to base of mandibles 1.30, max. width of head 0.90, height of head 0.73, length of labrum 0.25, width of labrum 0.25, length of mandibles 0.95, length of postmentum 0.63, max. width of

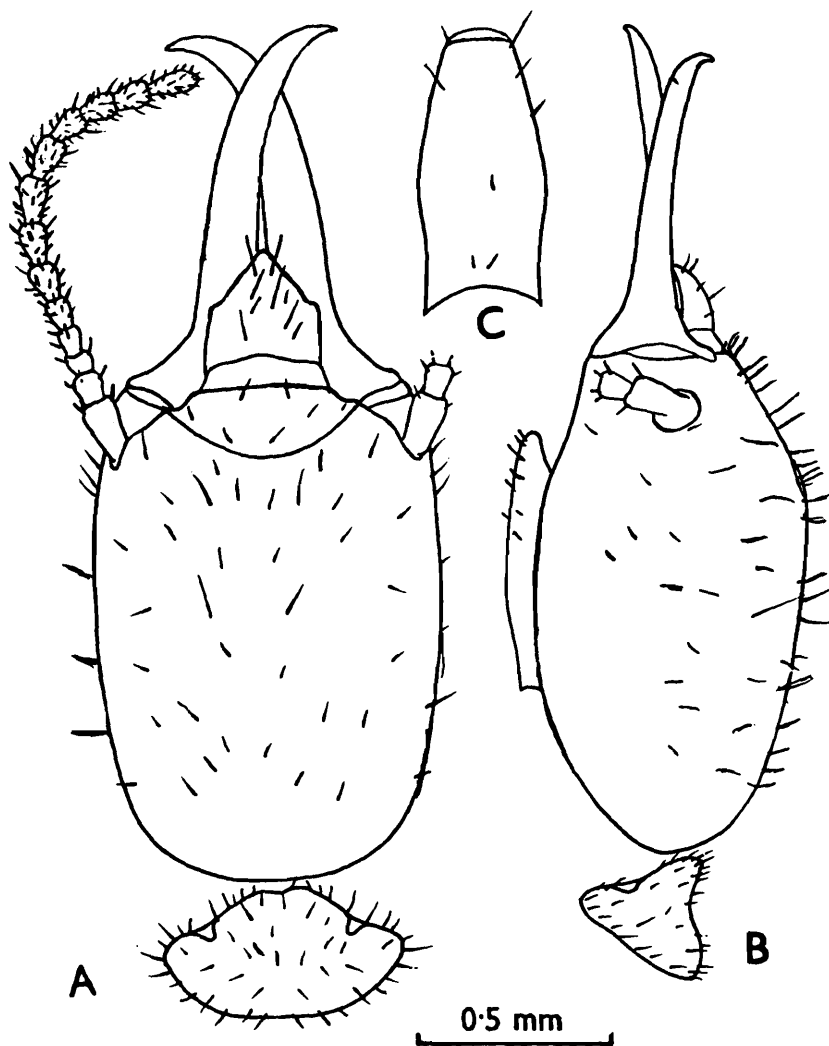


Fig. 83 : *Microcerotermes heimi*. Soldier (Lectotype). (A) Head and pronotum, in dorsal view. (B) Same, side view. (C) Postmentum.

postmentum 0.36, width of postmentum at waist 0.25, length of pronotum 0.30, width of pronotum 0.60 mm.

Distribution : INDIA : Maharashtra, Karnataka. SRI LANKA. Pakistan record doubtful (see remarks below).

Remarks : Ahmad (1955b) reported this species from Pakistan and remarked that Prof. A.E. Emerson had compared his specimens with cotypes and found them conspecific. I have examined the syntypes both imagoes and soldiers kindly loaned by NHM, Maastricht and find that the syntype imagoes differ from Ahmad's description in colour, (blackish in syntypes vs light brown as given by Ahmad), size of head, eyes and ocelli and for posterior margin of pronotum substraight in syntype (vs notched as given by Ahmad). Ahmad's soldier also is different in shape of labrum and mandibles. It is opined here that Ahmad's specimens belong to a different species and, therefore, all the references based on Ahmad's identification have been placed under wrong identifications in the synonymy of the species. Holmgren (1913b) places *M. heimi* under coarsely serrated mandibles category in the soldier key (finely serrated in syntypes of *heimi*) and Roonwal and Chhotani (1962c) have wrongly determined some specimens from Assam as *M. heimi* (actually *M. beelsoni*, supra).

150. *Microcerotermes kudremukhae* n. sp.

(Fig. 84)

IMAGO : Unknown.

SOLDIER (Fig. 84) : Head-capsule brownish, darker anteriorly ; antennae and legs yellowish brown ; mandibles blackish ; labrum dark brown ; pronotum pale brown, paler than antennae ; body pale yellowish. Head sparsely hairy ; pronotum fairly and body densely hairy. Total body-length c 5.3 mm. Head-capsule elongate, subrectangular ; sides slightly incurved (length with mandibles 2.5, length to base of mandibles 1.83, width 0.88 mm) ; width less than half of head-length (index width/length to base of mandibles 0.48 ; in profile weakly depressed in middle ; frons comparatively short and inclining at about 45° angle. Fontanelle indistinct. Antennae 13-segmented ; segments short and squat ; segment 3 smallest. Postclypeus fairly well marked from frons and darker. Labrum

broader than long ; sides substraight ; anterior margin narrowed and pointed medially (length 0.13, width 0.26 mm). Mandibles very short, stout and coarsely serrated ; length about $\frac{2}{5}$ of head-length (length : left 0.70, right 0.69, index left mandible-length/head-length 0.382). Postmentum long, club-shaped ; weakly narrowed at waist ; waist long and narrowest medially between maximum width and posterior margin (length 1.20, max. width 0.33, min. width at waist 0.18 mm). Pronotum saddle-shaped ; faintly notched at anterior margin and substraight at

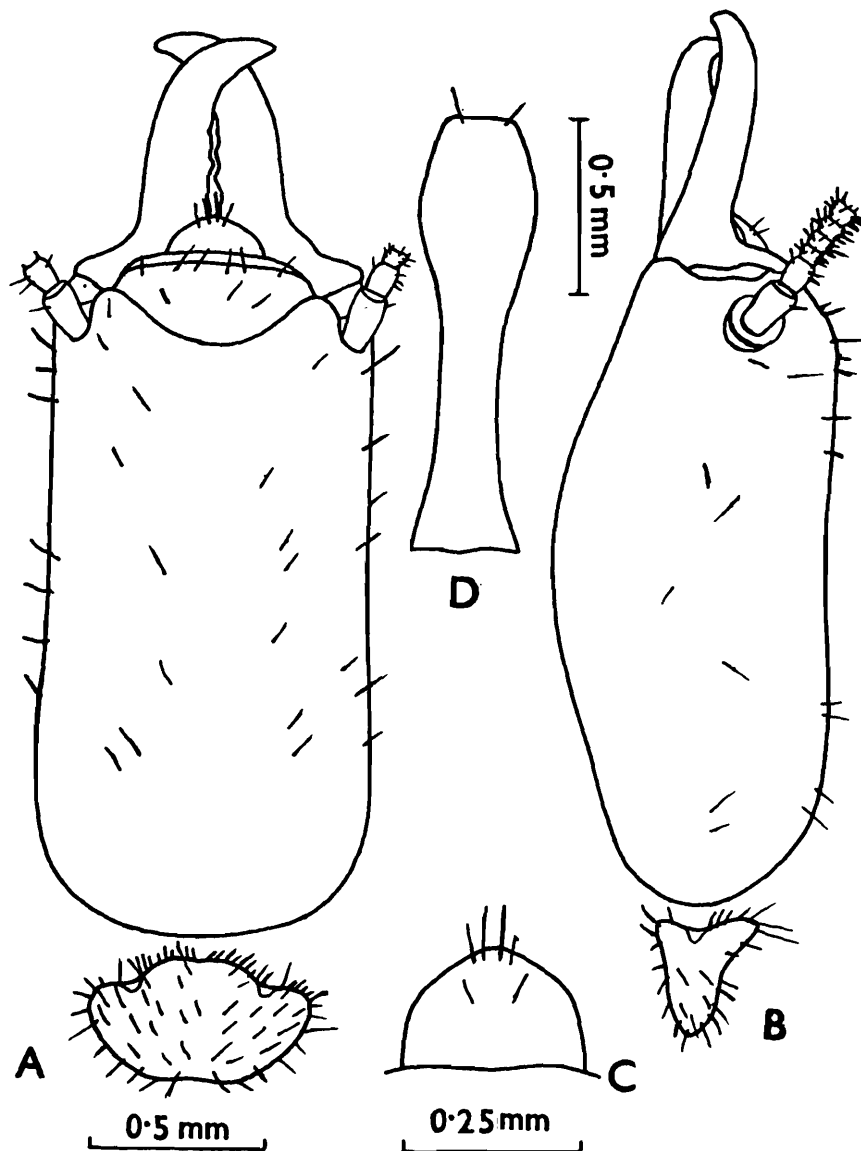


Fig. 84 : *Microcerotermes kudremukhi* n.sp. Soldier (Holotype). (A) Head and pronotum, in dorsal view. (B) Same, in side view. (C) Labrum. (D) Postmentum.

posterior margin (length 0.38, width 0.58 mm). Mesonotum almost as wide as pronotum and metanotum slightly wider ; posterior margins of both weakly convex.

WORKER : Dimorphic. *Worker major* : Head yellowish ; postclypeus and antennae slightly paler than head ; legs and thorax creamish ; abdomen translucent with gut contents showing through. Head and body fairly densely hairy. Total body-length 3.5 mm. Head-capsule subsquarish, wider at level of antennae (length to tip of labrum 1.05-1.10, length to base of mandibles 0.80-0.85, max. width 0.85-0.88 mm). Antennae 13-segmented ; segments short and squat, 3rd shortest. Postclypeus longer than half of width (length 0.25, width 0.45 mm) ; anterior margin straight, posterior margin convex and extending well into frons. Labrum scoop-like, broader than long. Pronotum saddle-shaped ; anterior margin without distinct notch, posterior margin straight (length 0.23-0.25, width 0.45-0.50 mm). *Worker minor* : As in worker major except for its smaller size. Total body-length 3.2-3.5, head-length to tip of labrum 0.85-0.90, head-length to base of mandibles 0.68, head-width 0.75, length of postclypeus 0.23-0.25, width of postclypeus 0.40, length of pronotum 0.20-0.25 and width of pronotum 0.44-0.50 mm.

Type-specimens and distribution : The species is based on a single soldier (holotype) and a few workers from Kalasa Forest Range, Koppa Division, 11 km from Kudremukh, Karnataka, India (type-locality), coll. B. Ferry, and are deposited in ZSI. The species is known only from the type-locality.

151. *Microcerotermes labioangulatus* Sen-Sarma and Thakur

(Fig. 85)

Microcerotermes labioangulatus Sen-Sarma and Thakur :

1975. Sen-Sarma and Thakur, In : Sen-Sarma, et al., *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A 7-FS-58) : 13, 54, 65. Included in soldier key, no descriptions given.
1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 5, 16-18. S and W. Holotype : S, in FRI. Type-locality : Zoelchara, Ambasa, Tripura, India.
1984. Verma, *Indian J. Forestry*, **7** (1) : 82.

IMAGO : Unknown.

SOLDIER (Fig. 85) : Head-capsule yellowish brown to deep brown ; antennae yellowish brown ; mandibles dark reddish brown ; body straw yellow. Head sparsely and body moderately hairy. Total body-length 4.5-5.9 mm. Head-capsule long, rectangular, sides almost parallel (length to base of mandibles 1.6-1.9, max. width 1.0-1.13 mm, width/length index 0.58-0.60). Antennae with 13 segments ; segment 3 shortest, 4 longer than 5. Labrum pentagonal ; antero-lateral corners greatly angulated and anterior margin somewhat pointed at middle ; broader than long (length 0.15-0.25, width 0.30-0.40 mm). Mandibles strongly curved like a scythe and apically pointed and incurved (length 0.95-1.15 mm) ; length a little more than half of head-length (index left mandible-length/head-length 0.55-0.63), inner margin coarsely serrated in basal half. Postmentum club-shaped, a little narrowed at waist behind middle (length

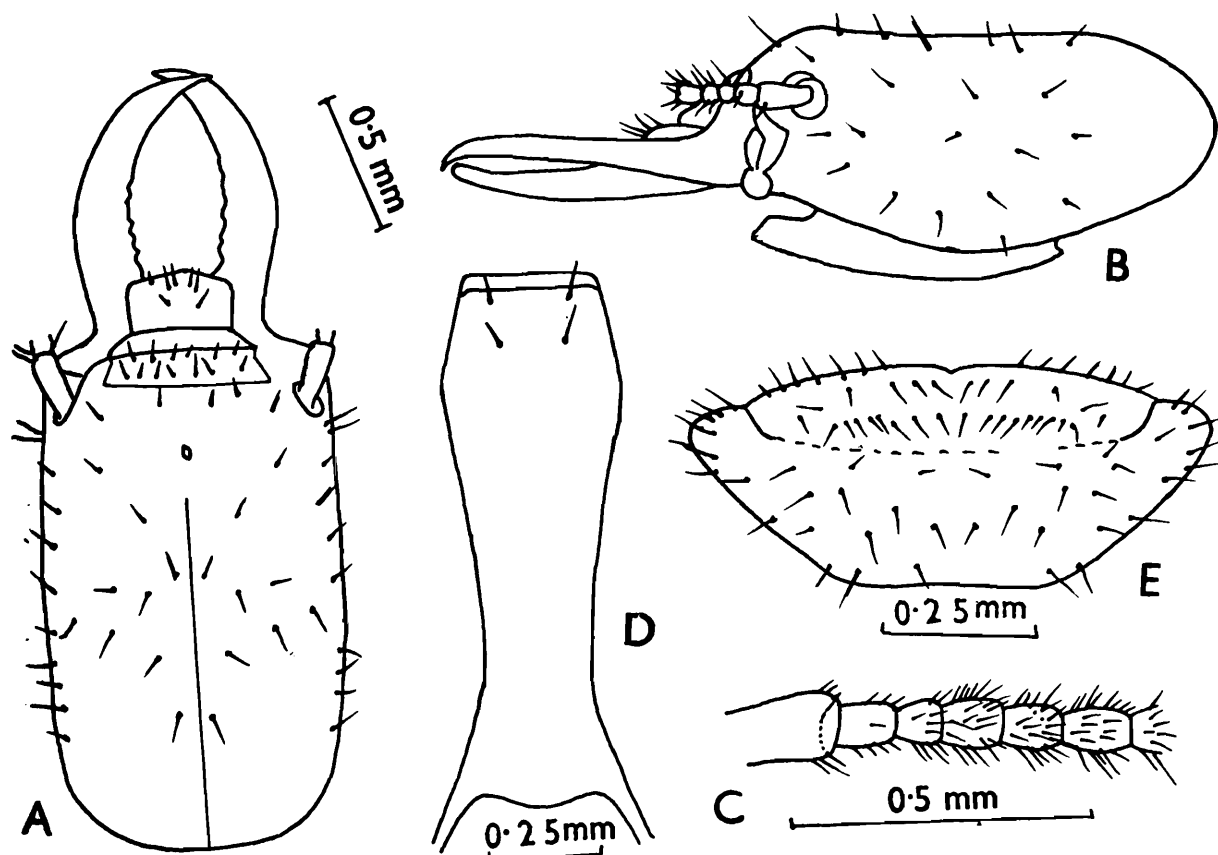


Fig. 85 : *Microcerotermes labioangulatus*. Soldier. (A) Head, in dorsal view. (B) Same, side view. (C) Antenna. (D) Postmentum. (E) Pronotum, in dorsal view. (Ex Sen-Sarma and Thakur, 1979)

1.0-1.15, max. width 0.30-0.35, width at waist 0.18-0.20 mm). Pronotum saddle-shaped (length 0.33-0.43, width 0.65-0.73 mm).

WORKER : Head-capsule and antennae yellowish ; body paler than head. Head moderately and body densely hairy. Total body-length 4.0-5.0 mm. Head-capsule subsquarish (length to base of mandibles 0.75-1.08, max. width 0.85-1.10 mm). Fontanelle indistinct. Antennae 13-segmented ; segment 3 shortest, 4 longer than 5. Postclypeus swollen, hairy ; length a little more than half of width. Pronotum saddle-shaped ; anterior margin with a distinct notch, posterior margin weakly emarginated (length 0.28-0.33, width 0.50-0.60 mm)

Distribution : INDIA : Tripura (Zoelchara, Ambasa, type-locality ; Chandrapur block, Paratia and Merakhera block, Manu Range) and Nagaland. The records of Andhra Pradesh and Uttar Pradesh given by Sen-Sarma, et al. 1975 (p. 54) are doubtful as there is no mention of these records in the later publication of Sen-Sarma and Thakur 1979 at the time of describing the species.

152. *Microcerotermes lahorensis* Akhtar

(Fig. 86)

1. *Microcerotermes lahorensis* Chaudhry, et al. Nom. nud. :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 48. Nom. nud.

2. *Microcerotermes lahorensis* Akhtar :

1974. Akhtar, *Biologia*, Lahore, **20** (1) : 49-51, 55. S only. Holotype : S, in PU. Type-locality : Lahore, Panjab, Pakistan.

1974. Akhtar, *Pakistan J. Zool*, **6** : 102.

IMAGO : Unknown.

SOLDIER (Fig. 86) : Head yellowish brown, slightly darker anteriorly; antennae yellowish ; mandibles dark reddish brown ; pronotum pale ; legs and abdomen dirty white. Head sparsely hairy ; postmentum with two pairs of hairs anteriorly. Head-capsule subrectangular, sides bulging out behind antennae (length to base of mandibles 1.40 ; maximum width 1.09 mm, index width/length 0.778). Antennae with 13 segments; segment 3 shortest. Clypeus subtrapezoidal. Labrum subpentagonal. Mandibles long, strongly incurved in distal half and coarsely serrated (length of left mandible 0.94 mm). Postmentum short and club-shaped, arched with a

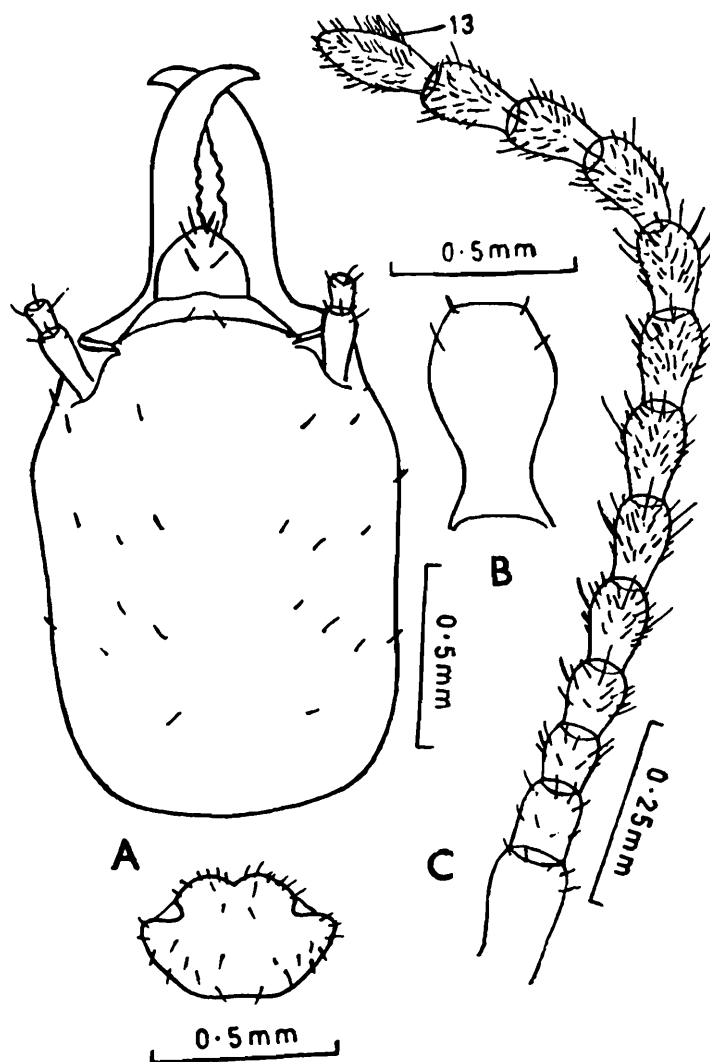


Fig. 86 : *Microcerotermes lahorensis*. Soldier. (A) Head and pronotum, in dorsal view. (B) Postmentum. (C) Antenna. (After Akhtar, 1974a).

strongly incurved waist (length 0.67, max. width 0.39, width at waist 0.22 mm). Pronotum saddle-shaped ; distinctly notched anteriorly, posterior margin slightly emarginate (length 0.35, width 0.61 mm).

Distribution : PAKISTAN : Panjab (Lahore, type-locality), known only from type-locality.

153. *Microcerotermes laxmi* Roonwal and Bose

(Figs. 87, 88)

1. *Microcerotermes tenuignathus laxmi* Roonwal and Bose :

1964. Roonwal and Bose, *Zoologica*, 40 (113) ; 5, 25, 29-31, Pl. 4. S. and W. Holotype : S, in ZSI. Type-locality : Kolayat, 50 km West of Bikaner (Dist. Bikaner), Rajasthan. Types examined.

1969. Roonwal and Bose, *Rec. zool. Surv. India*, **61** : 440, 445, Pl. 22 fig. 6.

1977. Roonwal, In : *Natural Resources of Rajasthan* (Ed Roonwal) : 375, Pl. 3 fig. j.

2. *Microcerotermes laxmi* Roonwal and Bose :

1976. Roonwal, *Zool. Jb. Syst.*, **103** : 464, 468, 486, 487.

1978. Roonwal and Bose, *Proc. Indian natn. Sci. Acad.*, (B) **44** (5) : 325, 328.

IMAGO : Unknown.

SOLDIER (Fig. 87) : Types examined. Head-capsule pale yellow, a

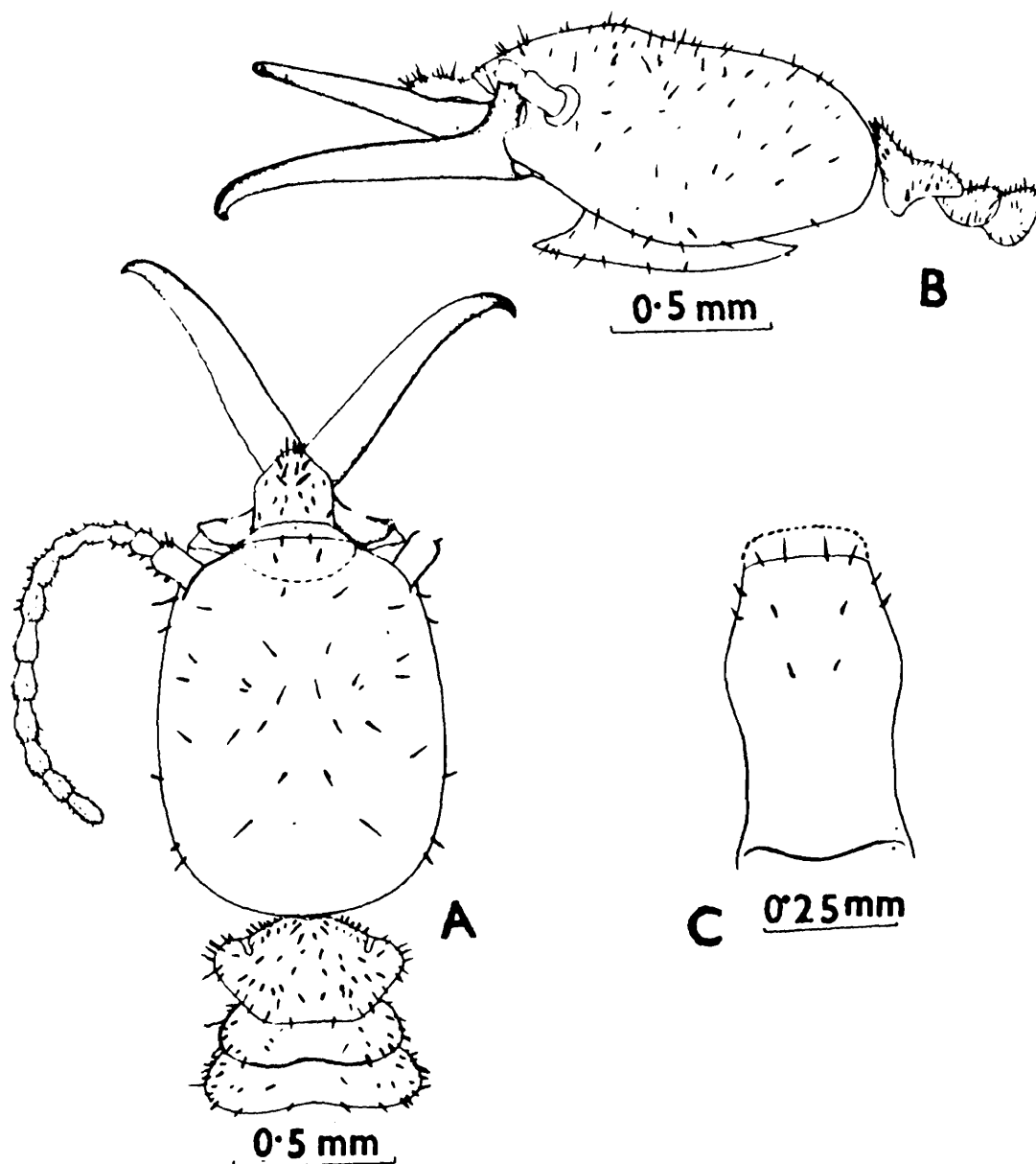


Fig. 87 : *Microcerotermes laxmi*. Soldier (Holotype). (A) Head and thorax, dorsal view. (B) Same, side view. (C) Postmentum.

little darker posteriorly ; antennae and labrum pale yellow ; mandibles reddish brown, basally pale yellow. Head sparsely and body fairly hairy. Total body-length 4.50 mm. Head-capsule subrectangular, slightly converging anteriorly (length to base of mandibles 1.175, max. width 0.85 mm, index width/length 0.72) ; sides slightly convex. Fontanelle indistinct. Antennae with 13 segments ; segment 3 shortest. Postclypeus not clearly demarcated from frons. Labrum pentagonal, broader than long (length 0.20, width 0.28 mm). Mandibles long slender, sabre-like, strongly incurved apically ; finely serrated and without any large tooth (length 1.13-1.15 mm). ; very slightly shorter than head-length (index left mandible-length/head-length 0.98). Postmentum short and squat, weakly narrowed at waist (length 0.55, max. width 0.30, width at waist 0.25 mm). Pronotum saddle-shaped ; anterior margin strongly notched, posterior margin substraight (length 0.30, width 0.58 mm).

WORKER (Fig. 88) : Head pale yellow ; antennae paler ; body yellowish white. Head and body fairly densely hairy. Total body-length 3.3-3.7 mm.

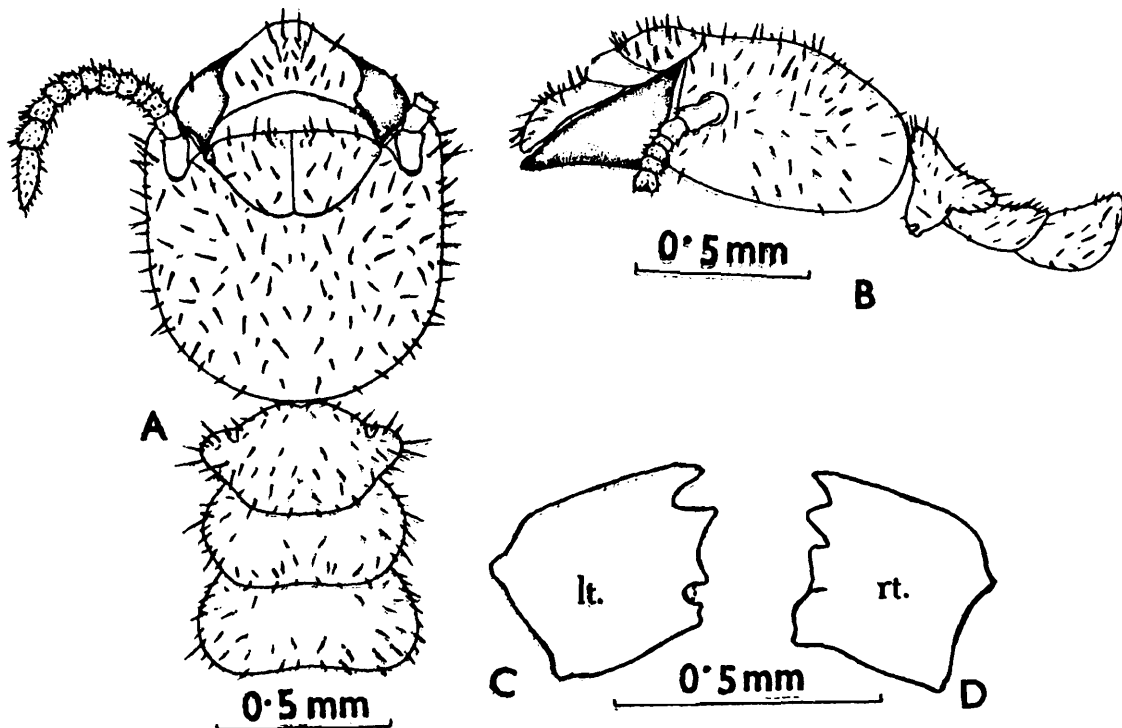


Fig. 88 : *Microcerotermes laxmi*. Worker. (Paratype) (A) Head and thorax, in dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles.

Head-capsule subsquarish (length to base of mandibles 0.78-0.88, max. width 0.80-0.88 mm). Antennae with 13 segments ; segment 3 shortest. Postclypeus swollen, length about 1/2 of width ; anterior margin straight, posterior margin rounded. Pronotum saddle-shaped ; anterior margin weakly notched, posterior margin substraight ; length 0.28-0.30, width 0.55 mm.

Distribution : INDIA : Rajasthan.

154. *Microcerotermes longignathus* Ahmad

(Figs. 89, 90)

Microcerotermes longignathus Ahmad :

1955. Ahmad, *Biologia*, Lahore, **1** : 248-249. S only. Holotype : S, in PU.
Type-locality : Fort Sandeman (Dist. Zhob) , Baluchistan, Pakistan.
1958. Ahmad, *Biologia*, Lahore, **4** : 168.
1964. Roonwal and Bose, *Zoologica*, **40** (113) : 31.
1967. Prashad, et al. *Indian For. Leaflet*, No. 246 : 1, 7, 47-48.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480
. Proj. No. A17-FS-12) : 48-49.
1974. Akhtar, *Pakistan J. Zool.*, **6** (1 & 2) : 102.
1976. Akhtar, *Pakistan J. Zool.*, **8** (2) : 161-163. Im described.

IMAGO (Fig. 89) : Head and pronotum dark brown with smoky tinge ; antennae dark brown ; postclypeus a little paler than head ; abdominal tergites dark reddish brown, slightly paler than pronotum and head. Head and body densely hairy with short hairs and scattered long bristles ; pronotum a little more hairy than head. Head-capsule subsquarish, sides subparallel (length to base of mandibles 0.88-0.96, width with eyes 0.92-1.03 mm), Y-suture slightly indicated. Fontanelle plate small, circular. Eyes roundly oval (max. diameter 0.23-0.25, min. diameter 0.20-0.22 mm) ; from lower margin of head placed away by a little more than half their max. diameter (0.12-0.14 mm), not projecting out. Ocelli small, nearly round (long diameter 0.06-0.10, short diameter 0.06-0.08 mm), separated

from eyes by their diameter 0.06-0.08 mm). Antennae 14-segmented ; segment 2 twice as long as 3, the latter shortest. Postclypeus swollen, hairy ; distinctly longer than half of width (length 0.24-0.26, width 0.43-0.47 mm). Pronotum subsemicircular (length 0.49-0.53, width 0.78-0.85 mm) ; anterior margin substraight, without any notch ; posterior margin rounded, slightly emarginate medially.

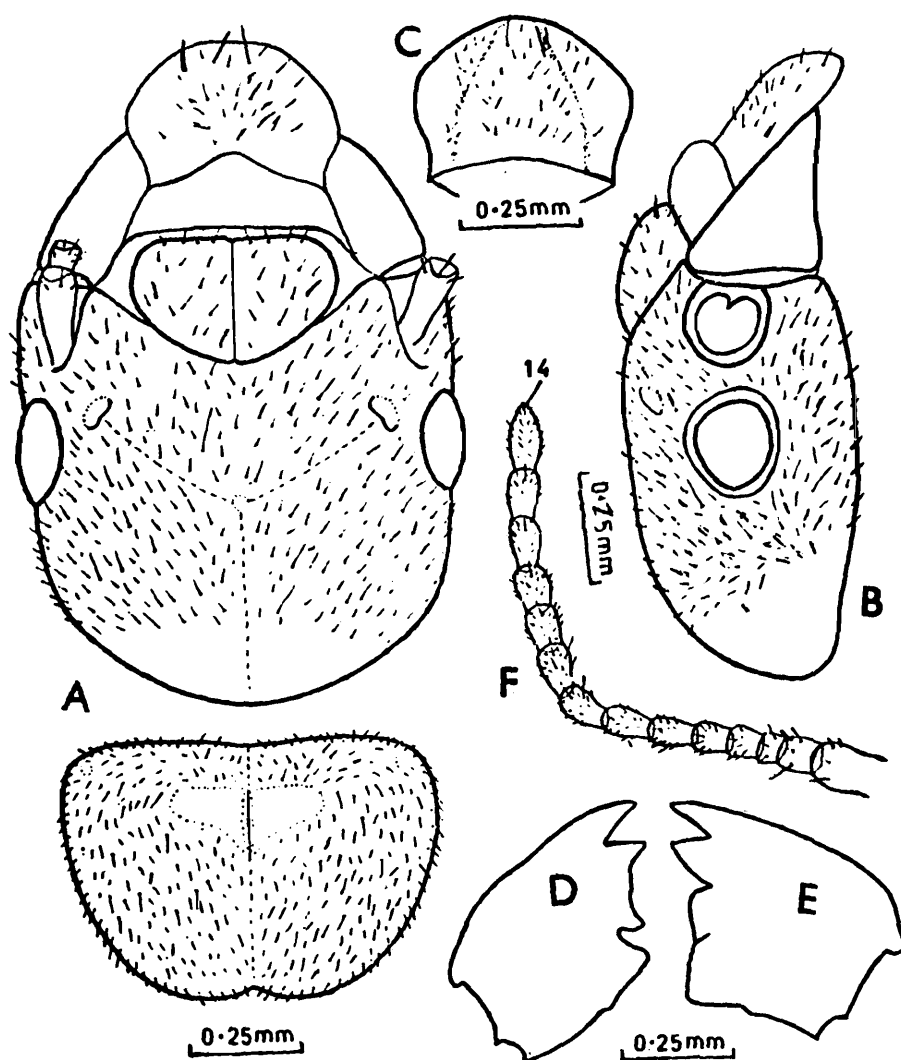


Fig. 89 : *Microcerotermes longignathus*. Imago. (A) Head and pronotum, in dorsal view. (B) Head in side view. (C) Labrum. (D) and (E). Left and right mandibles. (F) Antenna. (After Akhtar, 1976)

SOLDIER (Fig. 90) : Head and labrum brownish yellow ; mandibles dark reddish brown, paler basally ; pronotum yellow ; body pale. Head

sparsely and pronotum slightly more hairy. Head subrectangular (length to base of mandibles 1.13-1.25, max. width 0.88-0.96 mm). Antennae 13 segmented ; segment 3 shortest. Labrum subsquarish anterior margin narrowly rounded. Mandibles long weakly incurved at tip ; almost as long as head (length 1.13-1.21, index left mandible-length/head-length 0.90-0.91 ; finely serrated. Postmentum a little longer than half of head-length (length 0.88-0.96, max. width 0.30-0.33 mm) ; weakly incurved at waist (index width at waist/max. width 0.70-0.75). Pronotum saddle-shaped (length 0.29-0.30, width 0.55-0.59 mm) ; weakly emarginate both at anterior and posterior margins.

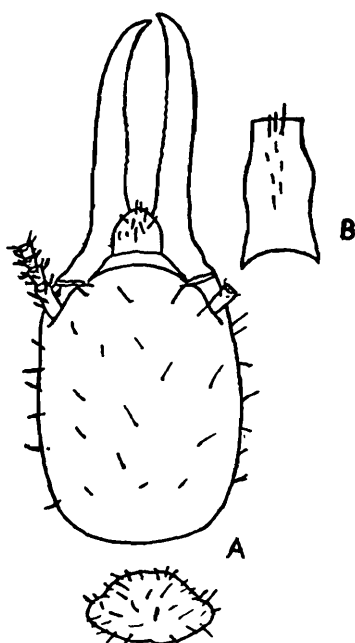


Fig. 90 : *Microcerotermes longignathus*. Soldier. (A) Head and pronotum in dorsal view. (B) Postmentum. (After Ahmad, 1955b).

Distribution : PAKISTAN : Sind, Baluchistan.

155. *Microcerotermes maliki* Akhtar

(Fig. 91)

1. *Microcerotermes maliki* Chaudhry, et al. Nom. nud. :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 49. Nom. nud.

2. *Microcerotermes maliki* Akhtar :

1974. Akhtar, *Biologia*, Lahore, **20** (1) : 51-54, S only. Holotype : S, in PU.

Type-locality : Peshawar, N. W. F. P., Pakistan.

1974. Akhtar, *Pakistan J. Zool.*, **6** (1 & 2) : 102.

IMAGO : Unknown.

SOLDIER (Fig. 91) : Head-capsule yellow to yellowish brown ; antennae brownish yellow ; mandibles dark reddish brown ; pronotum yellowish ; body and legs yellowish white. Head sparsely hairy ; pronotum with a few scattered hairs on margins and disc. Head subrectangular ; sides generally subparallel, bulging as a variation (length to base of mandibles

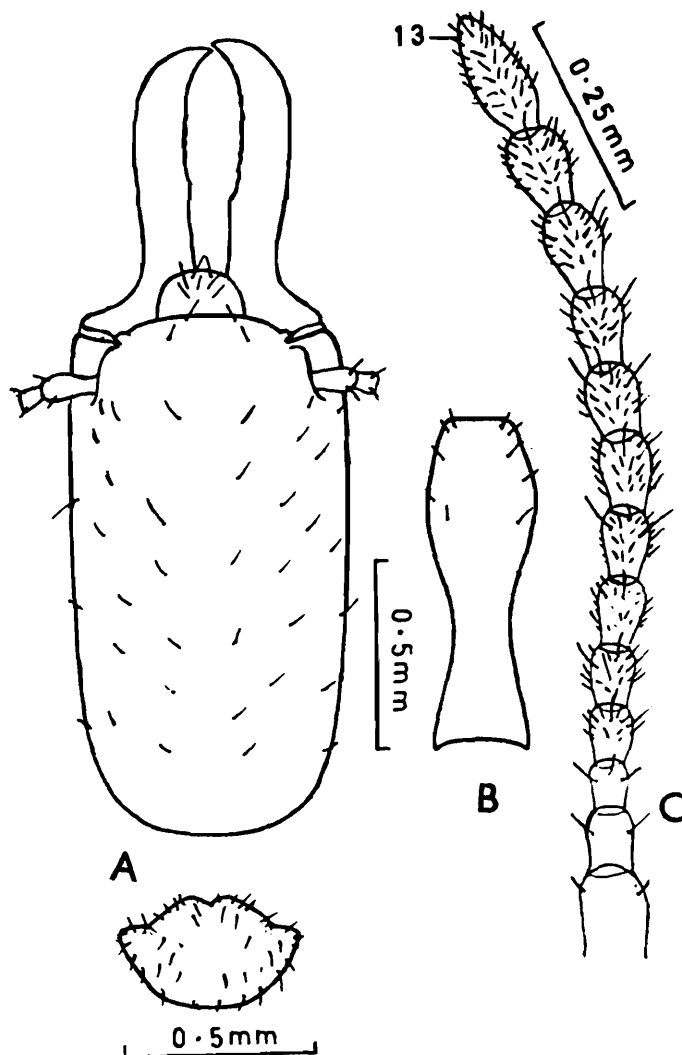


Fig. 91 : *Microcerotermes maliki*. Soldier. (A) Head and pronotum, in dorsal view. (B) Postmentum. (C) Antenna. (After Akhtar, 1974a).

1.38-1.56, max. width generally 0.82-0.87, 1.0-1.06 mm in bulging variants). Antennae with 13 segments ; segment 3 shortest. Clypeus trapezoidal. Labrum subpentagonal. Mandibles long (left mandible-length 0.78-0.88 mm), finely serrated ; thicker in distal half than in basal half and strongly hooked apically. Postmentum club-shaped, strongly narrowed at waist (length 0.80-0.92, max. width 0.30-0.35, width at waist 0.16-0.22 mm). Pronotum saddle-shaped ; anterior margin faintly notched ; posterior margin straight (length 0.27-0.35, width 0.49-0.61 mm).

Distribution : PAKISTAN : N. W. F. P. (Peshawar and Hangu).

156. *Microcerotermes minor* Holmgren

(Figs. 92, 93)

1. *Microcerotermes heimi* f. *minor* Holmgren :

1914. Holmgren, *Zool. Jb. Syst.*, **36**(2-3) : 285. Syntypes : Probably in Riksm., Stockholm. Type-locality : Maha Illupalama, North Sri Lanka.

2. *Microcerotermes minor* Holmgren :

1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 6, 48-50, fig. 30. Synonymy, description, etc.

1975. Thakur, *Indian Forester*, **101**(9) : 565-568. Im description.

1978. Roonwal, *Zeit. ang. Ent.*, **85** : 18.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 92, 126, 136-137.

1992. Ferry, *Pedobiologia*, **36** : 201, 205.

IMAGO (Fig. 92) : Head-capsule and pronotum chocolate brown; antennae fuscous ; postclypeus as dark as head; legs yellowish brown ; abdomen slightly paler than head. Head moderately and body densely hairy. Total body-length with wings 5.8-7.0, without wings 3.8-4.5 mm. Head-capsule subsquarish ; sides subparallel (length to tip of labrum 0.93-1.00, length to base of mandibles 0.65-0.75, max. width with eyes 0.70-0.78 mm) : Y-suture absent. Fontanelle minute, discernible in strong light. Eyes small, subcircular; separated from lower margin of head by 1/4 their diameter (max. diameter 0.20-0.23, min. diameter 0.18-0.20 mm). Ocelli small, oval (max. diameter 0.07-0.08, min. diameter 0.05-0.06 mm) ; separated from eyes by their short diameter (0.05 mm). Antennae with 13-14 segments; in 13-segmented antennae segment 2 twice as long as 3,

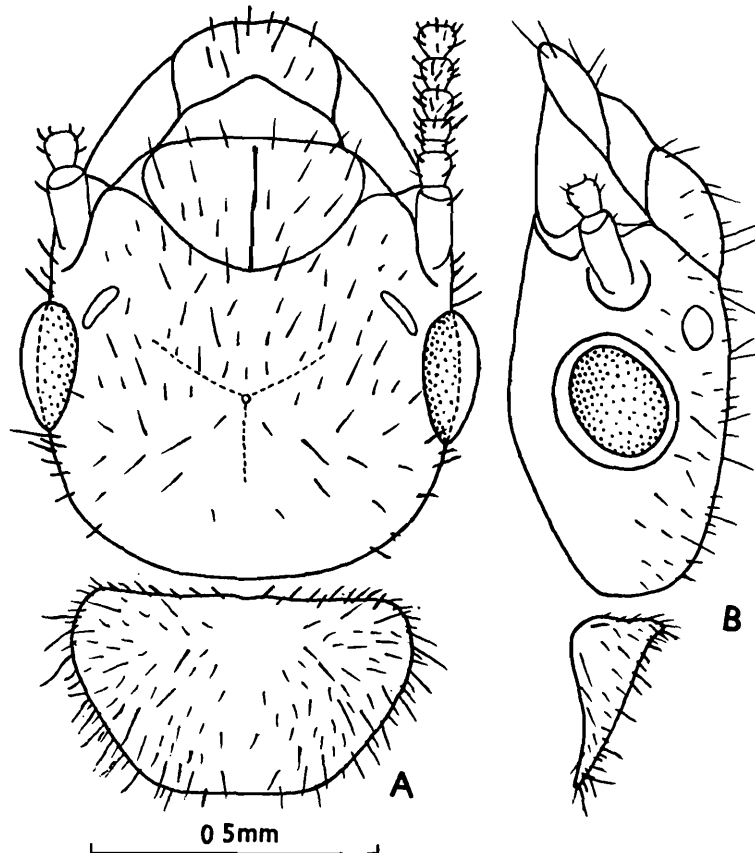


Fig. 92 : *Microcerotermes minor*. Imago. (A) Head and pronotum, in dorsal view. (B) same, in side view.

4 and 5 subequal; in 14-segmented ones 2 longer than 3+4, 3 ring-like and shortest, 4 shorter than 5. Postclypeus moderately swollen, length about half its width. Pronotum subtrapezoidal (length 0.30-0.38, width 0.53-0.58 mm); anterior margin slightly convex and without median notch; posterior margin with distinct notch. Wings smoky brown, membrane covered with micrasters (forewing length 4.7-5.4, hindwing length 4.5-5.2 mm).

SOLDIER (Fig. 93) : Head-capsule pale brown to dark brown; antennae and labrum pale brown; mandibles dark reddish brown; body pale yellow. Head sparsely and body fairly hairy. Total body-length 3.8-4.30 mm. Head-capsule subrectangular, sides subparallel (length to base of mandibles 1.12-1.29, max. width 0.75-0.80 mm). Fontanelle minute, circular, whitish spot; situated at anterior third of head. Antennae with 13 segments; segment 3 smallest. Labrum with subparallel sides upto middle and then converging anteriorly into somewhat pointed tip (length

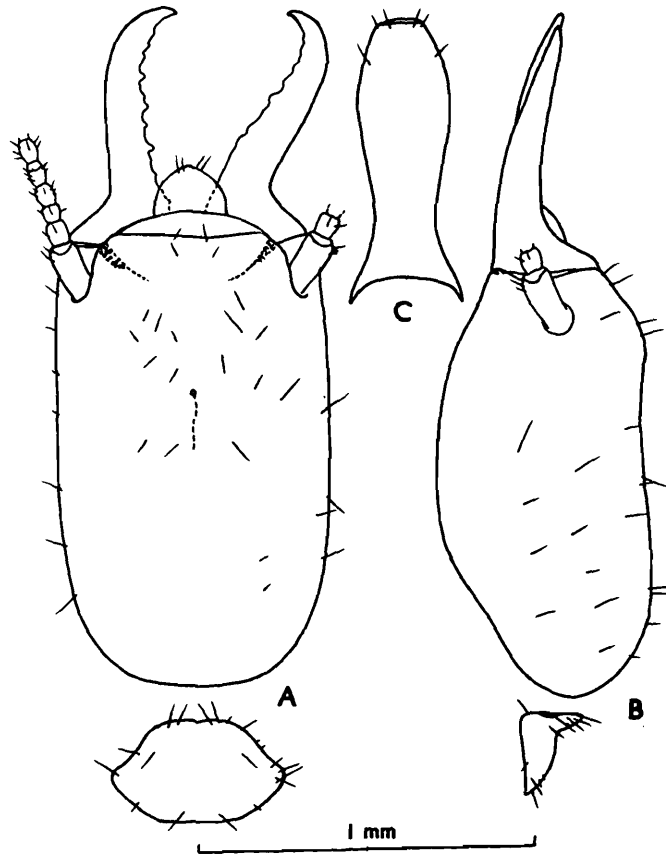


Fig. 93 : *Microcerotermes minor*. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Postmentum.

0.18-0.20, width 0.20-0.22 mm). Mandibles coarsely serrated, length (0.70-0.72 mm); about 2/3 of head-length (index left mandible-length/head-length 0.59-0.62). Postmentum club shaped; waist lying posteriorly (length 0.65-0.70, max. width 0.28-0.29, width at waist 0.16-0.18 mm). Pronotum saddle-shaped; anterior margin with a distinct notch; posterior margin emarginate; length 0.22-0.25, width 0.48-0.50 mm.

WORKER : Head-capsule yellowish ; rest of body pale yellow. Head and body fairly hairy. Total body-length 4.1-4.5 mm. Head-capsule subsquarish (length to base of mandibles 0.82-0.87, max. width 0.77-0.80 mm). Fontanelle plate pale, indistinct, whitish spot. Antennae with 13 segments; segment 3 smallest. Postclypeus swollen, hairy, as long as half its width. Pronotum saddle-shaped (length 0.17-0.20, width 0.42-0.45 mm); anterior margin without any notch, posterior margin faintly emarginate.

Distribution : INDIA : Karnataka, Andhra Pradesh and Tamil Nadu.
SRI LANKA.

157. *Microcerotermes nicobarensis* Roonwal and Bose

(Figs. 94-96)

Microcerotermes nicobarensis Roonwal and Bose :

1970. Roonwal and Bose, *Rec. zool. Surv. India*, **62**(3 & 4) : 111, 118, 120, 146-154. Im, S, W¹⁻². Holotype : S, in ZSI. Type-locality. Arong village, Car Nicobar Island, Andaman and Nicobar Islands, India. Types examined.

1974. Roonwal, Verma and Rathore, *Z. zool. Syst. Evolut-forsch.*, **12** : 57, 65, 69, 73, 74.

1980. Bose, *Rec. zool. Surv. India*, **77** : 101.

1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 6, 39, 41.

1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46**(3) : 259.

IMAGO (Figs. 94, 95) : Types examined. Head-capsule deep yellowish brown; postclypeus and pronotum pale brownish yellow; antennae and

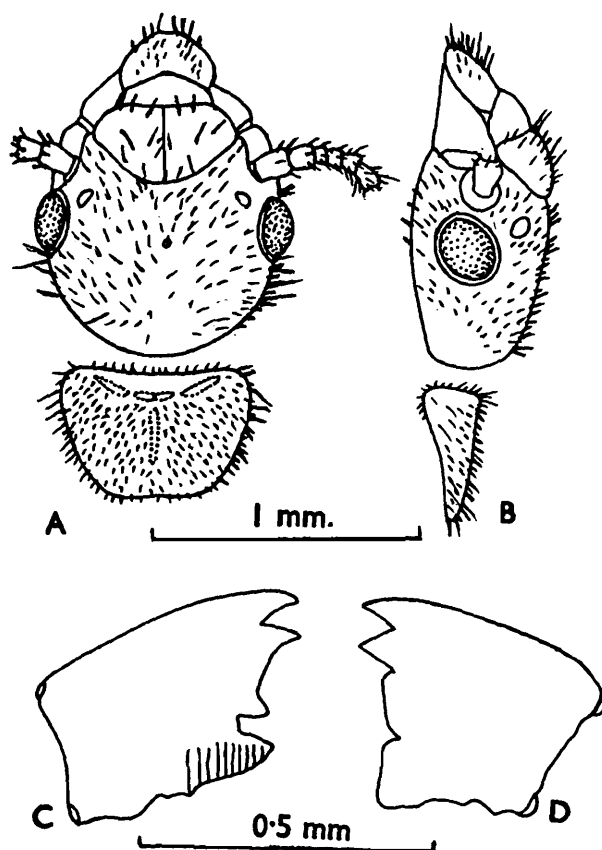


Fig. 94 : *Microcerotermes nicobarensis*. Imago. (A) Head and pronotum, in dorsal view. (B) Same, in side view. (C) and (D) Left and right mandibles, respectively. (Ex Roonwal and Bose, 1970).

thorax paler; anteclypeus and legs pale yellowish; wings pale yellowish brown ; abdominal tergites pale brown. Head fairly and body densely pilose. Total body-length with wings 9.0-10.6, without wings 5.7-6.8 mm. Head-capsule subsquarish, a little wider than long (length to base of mandibles 0.80-0.88, width with eyes 0.90-0.97 mm). Fontanelle minute but distinct, situated medially on head-dorsum. Eyes subcircular (max. diameter 0.25-0.26, min. diameter 0.22-0.23 mm) and about 1/2 of diameter

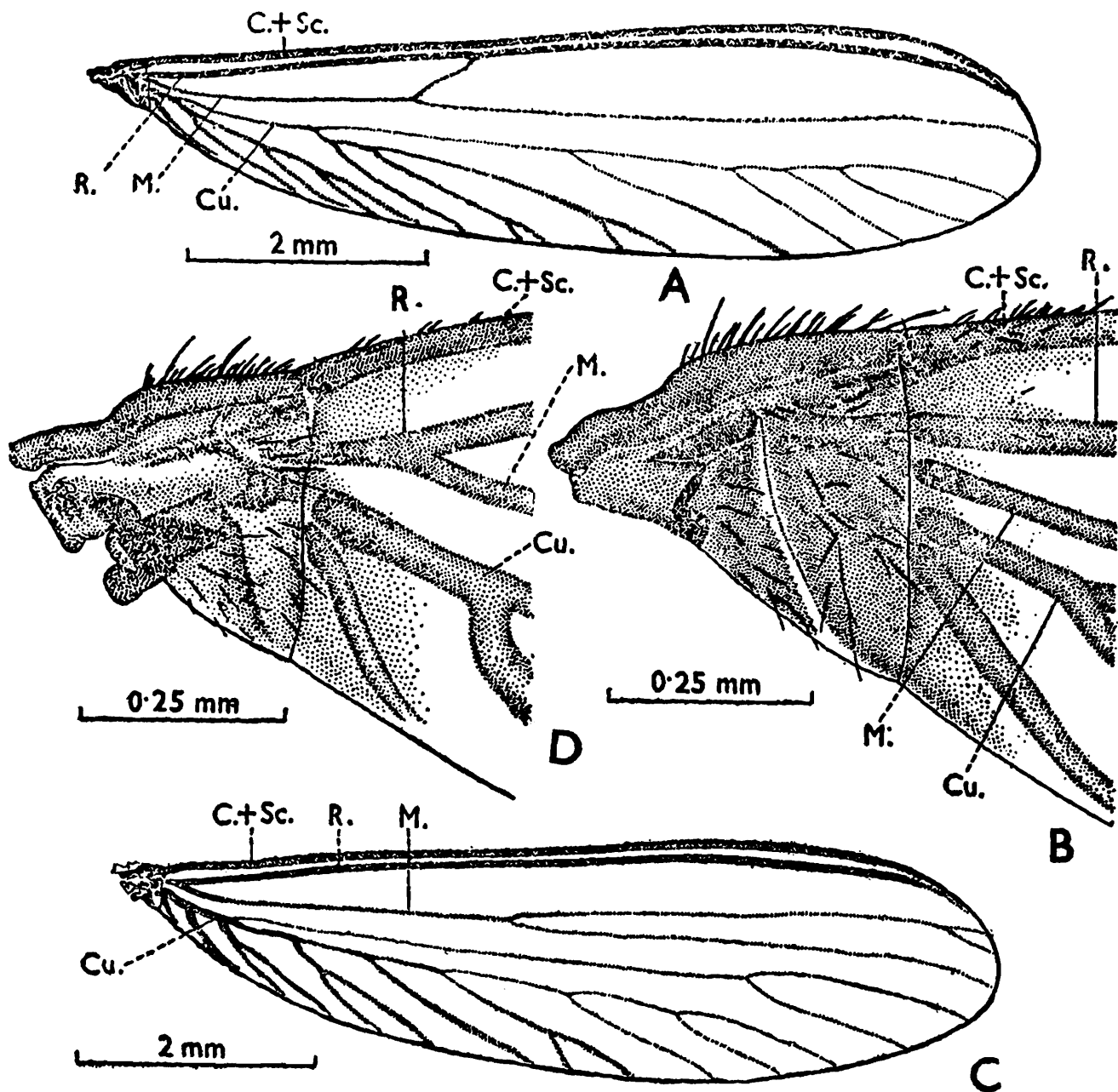


Fig. 95 : *Microcerotermes nicobarensis*. Imago wings. (A) Forewing. (B) Forewing Scale. (C) Hindwing. (D) Hindwing scale (After Roonwal and Bose, 1970).

away from lower margin of head. Ocelli translucent, subspherical (max. diameter 0.06-0.09, min. diameter 0.05-0.07 mm); situated at about their long diameter from eyes (eye-ocellus distance 0.08-0.10 mm). Antennae with 14 segments; segment 3 shortest, about half of 2. Postclypeus swollen, sparsely hairy; length about half of width (length 0.23-0.27, width 0.50-0.53 mm); posterior margin rounded, anterior margin substraight. Anteclypeus hyaline, apilose, medially projected in front. Labrum dome-shaped, broader than long (length 0.18-0.23, width 0.33-0.40 mm). Pronotum subtrapezoidal, broader than long (length 0.45-0.46, width 0.60-0.68 mm); anterior margin substraight, without any median notch; posterior margin weakly emarginate. Mesonotum deeply notched at posterior margin. Wings long, hairy, tuberculate. Forewing length with scale 7.30-7.70, hindwing length 6.80-7.00 mm. Wing venation as in genus. Media arising separately in forewing and from radius in hindwing and bifurcating near middle of wing; cubitus with 15-16 branches in forewing and 14 in hindwing. Wing microsculpturing consists of pointed papillae on anterior and posterior margins and non-asteroid (1-6 arms) and asteroid (5-8 arms) micrasters (mostly asteroid) all over membrane (size 5-8 μm x 2-8 μm , density 8775-9045/ mm^2).

SOLDIER (Fig. 96) : Types examined. Head-capsule and postclypeus pale to deep golden brown; antennae, labrum, thorax and legs pale golden yellow; mandibles dark reddish brown; abdomen pale yellowish. Head and pronotum fairly and abdomen and legs moderately densely hairy. Total body-length 6.20-6.30 mm. Head-capsule subrectangular, much longer than wide (length to base of mandibles 1.70-1.76, max. width 0.98-1.08 mm). Fontanelle indistinct. Antennae with 13 segments, segment 3 shortest; 4 subequal to 2. Postclypeus hairy, clearly separated from frons by semicircular demarcation; anteclypeus hyaline, apilose, strip-like. Labrum subpentagonal with a median tip; sparsely hairy on body (length 0.25-0.28, width 0.33-0.34 mm). Mandibles sickle-shaped, thick, stout and short (length 0.90-0.95 mm); finely serrated on inner margin and with a larger denticle on basal third; a little longer than half of head-length without mandibles (index mandible-length/head-length 0.53-0.54). Postmentum vase-shaped, with a waist in posterior 1/3 (length 1.0-1.08, max. width 0.30-0.35, width at waist 0.20-0.23 mm). Pronotum saddle-shaped; anterior margin without or with a faint median notch; posterior margin substraight, without emargination (length 0.38-0.42, width 0.62-

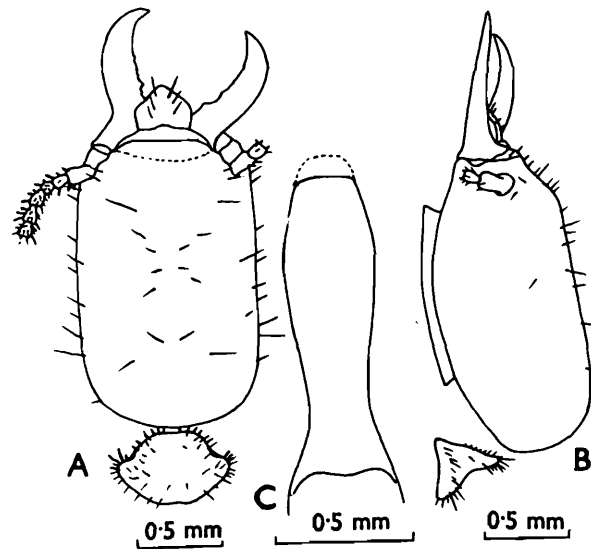


Fig. 96 : *Microcerotermes nicobarensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum. (Ex Roonwal and Bose, 1970).

0.63 mm). Mesonotum almost as wide as pronotum or slightly wider. Metanotum wider than pronotum.

WORKER : Dimorphic. *Worker major* : Head-capsule, antennae, labrum and postclypeus yellowish; thorax, legs and abdomen pale yellow. Head and body moderately hairy. Total body-length c 4.5-5.30 mm. Head-capsule subsquarish with rounded posterior margin (length to base of mandibles 0.90-0.98, max. width 0.93-0.95 mm). Fontanelle indistinct. Eyes present as small brown patches. Antennae with 13 segments; segment 3 shortest. Postclypeus swollen, pilose; length about half of width; separated from frons by semicircular demarcation. Anteclypeus hyaline, apilose; projected in front medially at anterior margin. Mandibles as in genus. Pronotum saddle-shaped; weakly notched at anterior margin; posterior margin substraight (length 0.33-0.34, width 0.60-0.63 mm). *Worker minor* : As worker major but smaller. Total body--length 4.2-4.6, length of head to base of mandibles 0.73-0.78, max. width of head 0.80-0.83, length of pronotum 0.23-0.26 and max. width of pronotum 0.45-0.50 mm.

Distribution : INDIA : Andaman and Nicobar Islands : South Andamans, Car Nicobar, Camorta Island and Great Nicobar Island.

158. *Microcerotermes pakistanicus* Akhtar

(Fig. 97)

1. *Microcerotermes pakistanicus* Chaudhry, et al. Nom nud. :
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 49. Nom. nud.
2. *Microcerotermes pakistanicus* Akhtar :
1974. Akhtar, *Biologia*, Lahore, **20**(1) : 54-56. S only. Holotype : S, in PU. Type-locality : Parachinar, N.W.F.P., Pakistan.
1974. Akhtar, *Pakistan J. Zool.*, **6**(1&2) : 102.
1976. Morimoto, *Nat. Life S-E Asia*, **7** : 323-326.
1986. Verma, *Ann. Ent.*, **3**(1) : 53-57. Im and W described.
1982. Akhtar, et al. *Pakistan J. Zool.*, **24**(2) : 92-93.

IMAGO : Head, pronotum and abdominal tergites castaneous brown; antennae and legs yellowish brown; wings brownish, translucent. Head and body densely hairy. Total body-length with wings 6.6-8.0, without wings 5.18-6.0 mm. Head-capsule subsquarishly rounded (length to base of mandibles 0.72-0.75, width with eyes 0.83-0.86 mm); Y-suture absent. Eyes subcircular (max. diameter 0.25-0.28, min. diameter 0.22-0.25 mm); separated from lower margin of head by 1/3 of max. diameter. Ocelli oval (long diameter 0.083, short diameter 0.056 mm); close to eyes, separated by about half of short diameter (0.027 mm). Antennae 14-segmented ; segment 2 equal to 3+4, 3 shortest. Postclypeus of same colour as head, hairy ; length a little less than half of width (length 0.19, width 0.44-0.47 mm). Pronotum subtrapezoidal (length 0.39, width 0.64-0.67 mm); anterior margin slightly convex and with a faint median notch; posterior margin weakly convex and slightly emarginate medially. Wings hairy along margin, and sparsely so on membrane ; microsculpture consists of 2-3 rows of papillae on anterior margin and of a single row on posterior margin and asteroid and non-asteroid micrasters on wing membrane.

SOLDIER (Fig. 97) : Head-capsule brownish yellow ; antennae yellow with brownish tinge; mandibles dark reddish brown ; pronotum yellow; legs and abdomen yellowish white. Head sparsely hairy with few scattered bristles and short hairs; pronotum with a few hairs and bristles on margins and body. Head elongate, subrectangular (length to base of mandibles 1.44-1.64, max. width 0.83-0.98 mm); width about half of length (index

max. width/length to base of mandibles 0.50-0.56); sides almost parallel. Fontanelle indistinct. Antennae 13-segmented; segment 2 equal to 3+4, 3 shortest. Labrum pentagonal, tip broadly rounded; with a few long and several short hairs. Mandibles short, strong and apically strongly incurved (length 0.76-0.89 mm); a little shorter to a little longer than half of head-length (index left mandible-length/head-length to base of mandibles 0.46-0.56) ; coarsely serrated with one little larger serration slightly below middle. Postmentum club-shaped, with a long waist (length 0.83-1.00, max. width 0.30-0.35, width at waist 0.18-0.20 mm). Pronotum saddle-shaped; anterior margin weakly notched ; posterior margin substraight or slightly emarginate; length 0.25-0.35, width 0.53-0.60 mm.

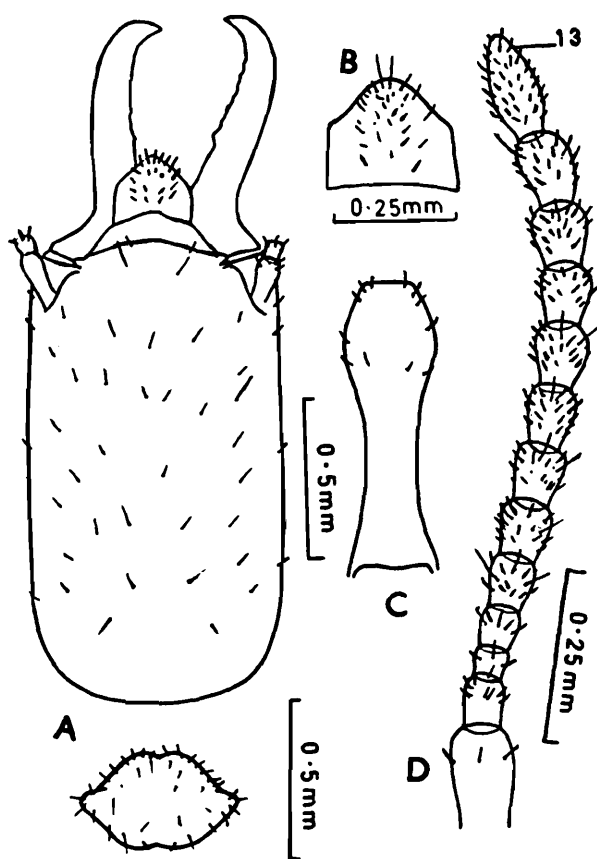


Fig. 97 : *Microcerotermes pakistanicus*. Soldier. (A) Head and pronotum, dorsal view. (B) Labrum. (C) Postmentum. (D) Antenna (After Akhtar, 1974a).

WORKER : Head-capsule and pronotum pale yellow ; antennae yellowish; legs and abdomen whitish yellow. Head and body fairly hairy. Total body-length 3.20-3.40 mm. Head-capsule subsquarish (length to base of mandibles 0.83-0.89, max. width 0.89 mm). Fontanelle plate a

small, circular, translucent spot. Antennae 13-segmented; segment 3 smallest. Postclypeus swollen; length slightly less than half of width. Pronotum saddle-shaped; anterior margin indistinctly notched; posterior margin weakly convex ; length 0.19, width 0.50 mm.

Distribution : INDIA : Kerala state. PAKISTAN : N.W.F.P. MALAYSIA (Pasoh Forest Reserve).

159. *Microcerotermes palestinensis* Spaeth

(Figs. 98, 99)

Microcerotermes palestinensis Spaeth :

1964. Spaeth, *Israel J. Zool.*, **13** : 30-32. Im and S. Holotype : S, in AMNH. Type-locality : Wadi Abyad (Nahal Lavan), Israel. Paratype colony imago examined.
1974. Roonwal, *J. zool. Soc. India*, **24** : 193-194.
1974. Roonwal, et al. *Z. zool. Syst. Evolut-forsch.*, **12** : 57, 60, 62, 64, 65, 69, 74. Wing microsculpture
1976. Roonwal, *Zool. Jb. Syst.*, **103** : 486, 487.
1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 427, 439-440.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46**(3) : 259-260.

IMAGO (Fig. 98) : Description drawn from a single paratype colony imago from Benshemen Herzl Forest Israel; it differs appreciably from the original description. Head dark brown with reddish tinge ; antennae brown; postclypeus reddish brown, paler than head; pronotum dark brown; abdominal tergites reddish brown as postclypeus; sternites mainly brown, paler medially. Head and body fairly densely pilose. Head-capsule subsquarish, widest anteriorly (length to base of mandibles 0.88, max. width 0.88 mm) ; Y-suture and fontanelle not distinct. Eyes broad, oval (max. diameter 0.25, min. diameter 0.18 mm); situated at less than their minimum diameter (0.13 mm) from lower margin of head. Ocelli small, broad, oval (long diameter 0.08, short diameter 0.05 mm); separated from eyes by about their long diameter (0.08 mm). Antennae 14-segmented, segment 3 shortest; 2 almost equal to 3+4. Postclypeus weakly swollen and hairy; length more than half of width (length 0.25, width 0.45 mm) and projecting posteriorly into frons. Pronotum subsemicircular (length

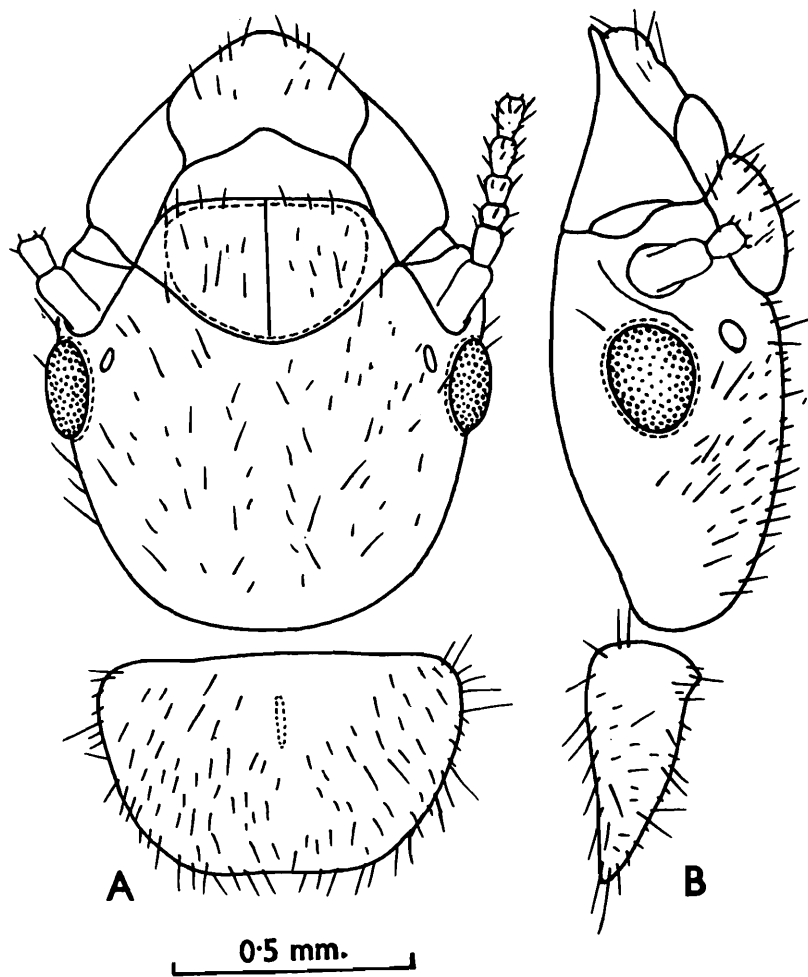


Fig. 98 : *Microcerotermes palestinensis*. Imago (Paratype). (A) Head and pronotum, in dorsal view. (B) Same, side view.

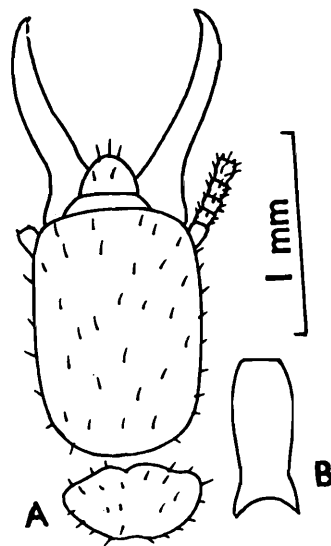


Fig. 99 : *Microcerotermes palestinensis*. Soldier. Head and pronotum, dorsal view. (B) Postmentum. (After Roonwal and Verma, 1977b).

0.48, width 0.78 mm). Wing microsculpture consists of a row of papillae on anterior and posterior margins and asteroid and non-asteroid micrasters (mostly non-asteroid) on membrane (cf. Roonwal, 1974).

SOLDIER (Fig. 99) : Head and pronotum yellow and moderately pilose. Total body-length 5.0-5.3 mm. Head-capsule subrectangular, sides slightly convex (length to base of mandibles 1.26, width 0.87-1.00 mm). Fontanelle indistinct. Antennae with 13 segments; segment 3 shortest. Labrum subsquarish, anterior margin rounded. Mandibles long, thin and finely serrated; length a little less than head-length (length 0.93-1.12 mm, index left mandible-length/head-length about 0.79-0.80). Postmentum club-shaped (length 0.57-0.71, max. width 0.31-0.34, width at waist 0.23-0.26 mm); waist lying near hind margin. Pronotum saddle-shaped (length 0.28-0.34, width 0.57-0.68 mm).

WORKER : Head pale yellowish brown ; antennae, legs and body creamish yellow; postclypeus slightly paler than head. Head and body moderately hairy. Total body-length c 3.30 mm. Head subsquarish (length to base of mandibles 0.73, max. width 0.73 mm). Antennae with 13 segments; segment 2 equal to 3+4, 3 shortest. Postclypeus weakly swollen, longer than half of width (length 0.25, width 0.40 mm). Pronotum weakly saddle-shaped (length 0.25, width 0.48 mm); anteriorly faintly emarginate, posteriorly substraight.

Distribution : INDIA : Rajasthan. ISRAEL.

160. *Microcerotermes prochampioni* Akhtar

(Fig. 100)

1. *Microcerotermes prochampioni* Chaudhry, et al. (Nom. nud.) :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 49-50. Nom. nud.

2. *Microcerotermes prochampioni* Akhtar :

1974. Akhtar, *Biologia*, Lahore, 20(1) : 56-58. S only. Holotype : S, in PU. Type-locality : Hyderabad, Sind, Pakistan.

1974. Akhtar, *Pakistan J. Zool.*, 6(1&2) : 102.

IMAGO : Unknown.

SOLDIER (Fig. 100) : Head pale brown with reddish tinge; antennae brownish yellow; mandibles dark reddish brown; pronotum yellowish; abdomen yellowish white. Head with a few scattered bristles ; pronotum with a few hairs on margins and body. Head-capsule subrectangular, sides widening slightly anteriorly (length to base of mandibles 1.44-1.54, max. width 0.89-0.96 mm). Antennae with 13 segments; segment 3 shortest, much shorter than 2. Labrum wider than long; anterior margin with broadly rounded tip. Mandibles long, delicate, coarsely serrated; slightly incurved at tip (left mandible-length 1.03-1.07 mm). Postmentum club-shaped, with waist lying near posterior margin (length 0.82, max. width 0.32-0.35, width at waist 0.18-0.20). Pronotum saddle-shaped; anterior margin indistinctly notched, posterior margin straight or slightly emarginate (length 0.30-0.32, width 0.57-0.65 mm).

Distribution : PAKISTAN : Hyderabad, Sind (Type-locality).

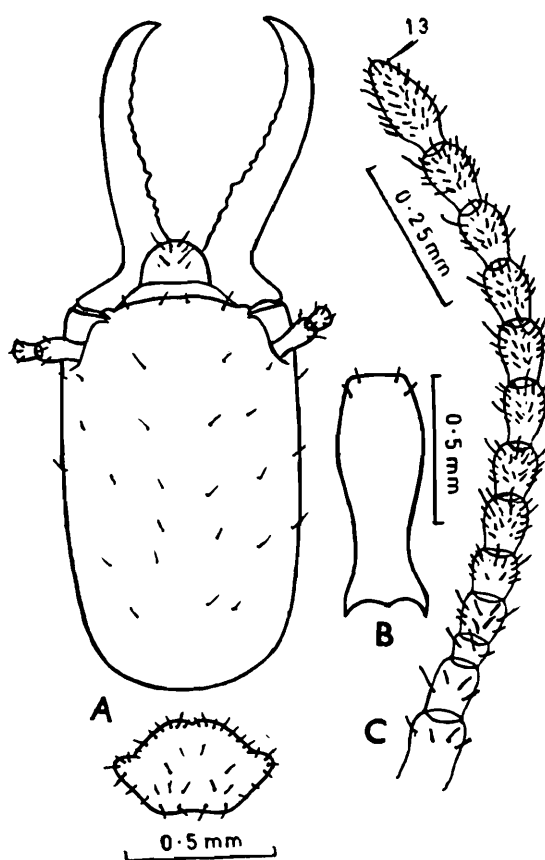


Fig. 100: *Microcerotermes prochampioni*. Soldier. (A) Head and pronotum, in dorsal view. (B) Postmentum. (C) Antenna (After Akhtar, 1974a)

161. *Microcerotermes raja* Roonwal and Bose

(Figs. 101, 102)

1. *Microcerotermes championi raja* Roonwal and Bose :

1964. Roonwal and Bose, *Zoologica*, **40**(113) : 5, 25, 26-28, Pl. 3. S and W. Holotype : S, in ZSI. Type-locality : Balsamand, nr. Jodhpur, Rajasthan, India. Types examined.
1969. Roonwal and Bose, *Rec. zool. Surv. India*, **61** : 441, Pl. 22, fig. 5.
1977. Roonwal, In : *Natural Resources of Rajasthan* (Ed Roonwal) : 375, Pl. 3, fig. i.

2. *Microcerotermes raja* Roonwal and Bose :

1973. Roonwal and Verma, *Ann. Arid Zone*, **12**(3&4) : 109-111.
1973. Roonwal, Verma and Rathore, *J. Indian Acad. Wood. Sci.*, **4**(1) : 22-30.
1974. Roonwal, Verma and Rathore, *Z. zool. Syst. Evolut-forsch.*, **12** : 62, 64, 66, 69, 72, 74.
1976. Roonwal, *Zool. Jb. Syst.*, **103** : 486, 487.
1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 427, 440-441, 461.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 31.
1978. Roonwal and Bose, *Proc. Indian natn. Sci. Acad.*, **44** : 325.
1980. Roonwal and Verma. *Proc. Indian natn. Sci. Acad.*, (B) **46** (3) : 257, 260.

IMAGO (Fig. 101) : Head, thorax and abdomen dark castaneous brown; postclypeus pale brown. Head and body densely hairy with minute and long hairs. Total body-length with wings 8.0-9.8, without wings 5.2-6.2 mm. Head-capsule subsquarish with substraight sides (length to base of mandibles 0.95-1.00, max. width with eyes 1.01-1.10 mm). Fontanelle minute, not easily discernible. Eyes roundly oval (max. diameter 0.18, min. diameter 0.16 mm); not much projecting out; well away from lower margin of head. Ocelli small, oval (long diameter 0.072, short diameter 0.045 mm); separated from eyes by their long diameter or slightly more 0.07-0.08 mm). Antennae with 14 segments; segment 2 as long as 3+4; 3 smallest. Postclypeus swollen, about half as long as its width. Pronotum semicircular, with a whitish speck a little above middle (length 0.47, width 0.74-0.79 mm) ; anterior margin with a weak median notch, posterior margin rounded. Wings transparent; forewing-length 6.00 mm ;

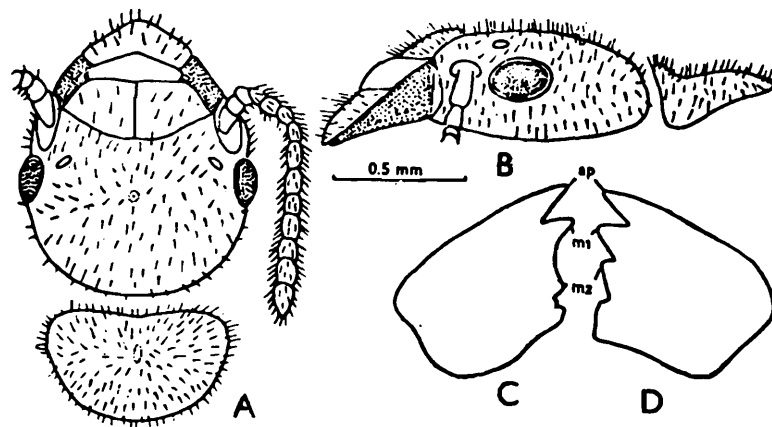


Fig. 101: *Microcerotermes raja*. Imago. (A) Head and pronotum in dorsal view. (B) Same, in side view. (C) and (D) Left and right mandibles (After Roonwal, Verma and Rathore, 1973)

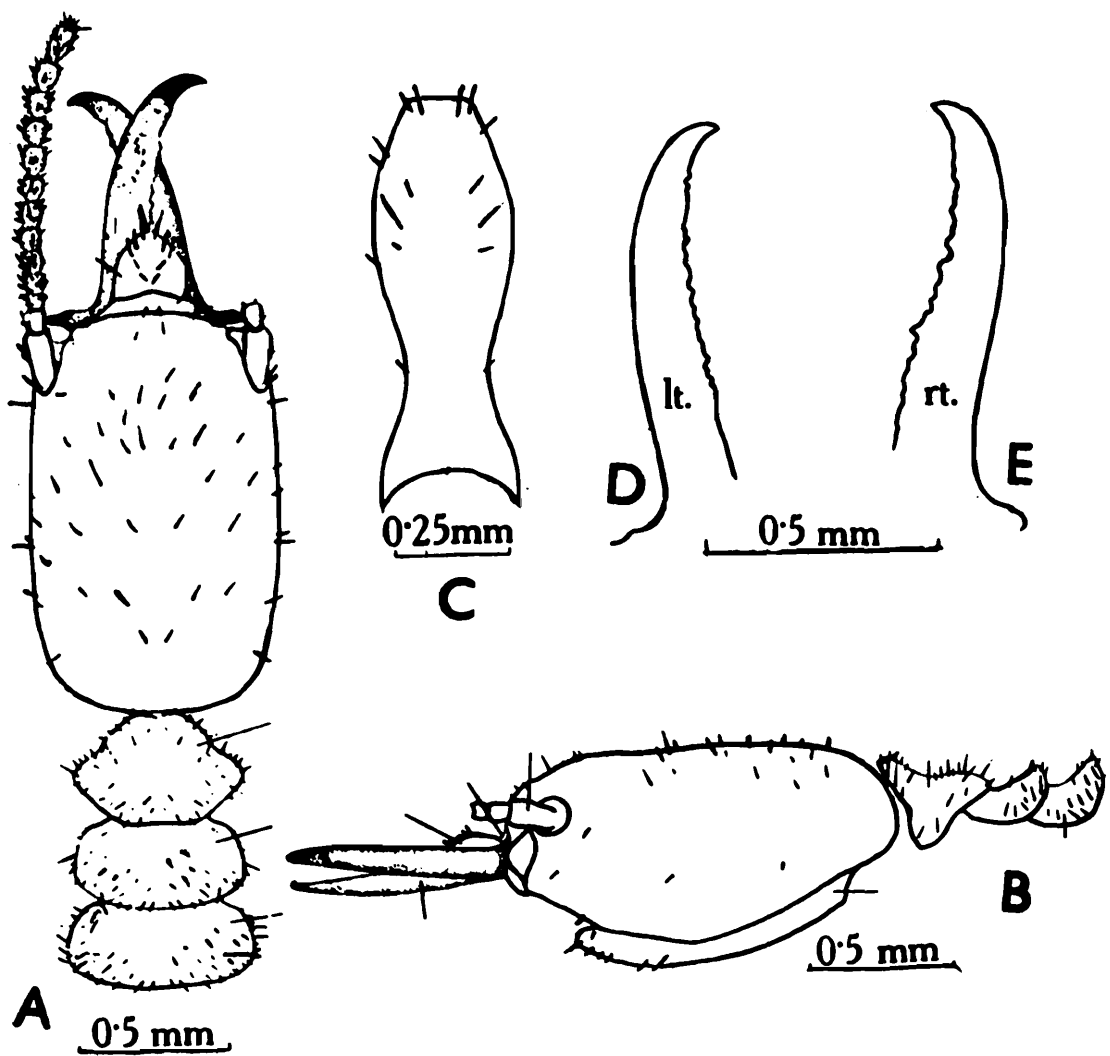


Fig. 102 : *Microcerotermes raja*. Soldier. (A) Head and thorax, in dorsal view. (B) Same, side view. (C) Postmentum. (D) and (E). Left and right mandibles respectively. (Ex Roonwal and Bose, 1964).

microsculpture (consists of asteroid (5-6 arms) and non-asteroid (1-6 arms) micrasters on membrane and pointed papillae on anterior and posterior margins.

SOLDIER (Fig. 102) : Head-capsule yellow; antennae and labrum pale yellow; mandibles dark reddish brown, paler basally; legs and body yellowish white. Head sparsely and body moderately hairy. Total body-length 4.5-5.0 mm. Head-capsule subrectangular (length to base of mandibles 1.33, max. width 0.83 mm); sides subparallel, slightly convex medially. Fontanelle indistinct. Antennae with 13 segments; segment 2 equal to 3+4, 3 shortest. Postclypeus indistinctly separated from frons, with a few bristles. Labrum tongue-shaped, pentagonal; a little wider than long (length 0.23, width 0.25 mm). Mandibles long, thin, sabre-shaped; length (0.83-0.85 mm) a little less than 2/3 of head-length (index left mandible-length/head-length 0.639); coarsely serrated, without any large tooth. Postmentum vase-shaped, with a narrow waist in posterior third (length 0.80, max. width 0.32, width at waist 0.18 mm). Pronotum saddle-shaped; anterior margin convex, with a prominent median notch; length 0.35, width 0.55 mm.

WORKER : Head-capsule pale yellow ; antennae and body pale yellowish white. Head and body moderately hairy. Total body-length 3.25-4.70 mm. Head-capsule subsquarish (length to base of mandibles 0.65-0.88, max. width 0.70-0.88 mm). Antennae with 12-13 segments; segment 2 equal to 3+4, 3 shortest. Postclypeus swollen, hairy; length about 1/2 of width; anterior margin substraight, posterior margin rounded and medially projecting behind. Pronotum saddle-shaped (length 0.20-0.28, width 0.40-0.50 mm); anterior margin convex, without median notch; posterior margin straight. Apical tibial spurs 3 : 2 : 2 or 2 : 2 : 2 (dorsal spur of foretibia often weakly developed or sometimes absent).

Distribution : INDIA : Rajasthan.

162. *Microcerotermes rambanensis* Chatterjee and Thakur

(Fig. 103)

Microcerotermes rambanensis Chatterjee and Thakur :

1964. Chatterjee and Thakur, *Bull. Ent.*, No. 5 : 1-6. S and W. Holotype :

S, in FRI. Type-locality : Maitra Forest, Ramban, Jammu and Kashmir, India.

1967. Chatterjee and Thakur, *Indian For. Rec. (N. S.) Ent.*, 11(1) : 6, 24-27.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 31.

IMAGO : Unknown.

SOLDIER (Fig. 103) : Head-capsule brownish yellow, darker anteriorly; antennae as brownish as anterior portion of head ; pronotum brownish yellow as head and rest of body pale. Head sparsely and body moderately hairy. Total body-length 4.75-5.00 mm. Head-capsule long, rectangular (length to base of mandibles 1.58-1.60, max. width 0.88-0.90 mm); width a little more than half of length (index width/length 0.56). Fontanelle

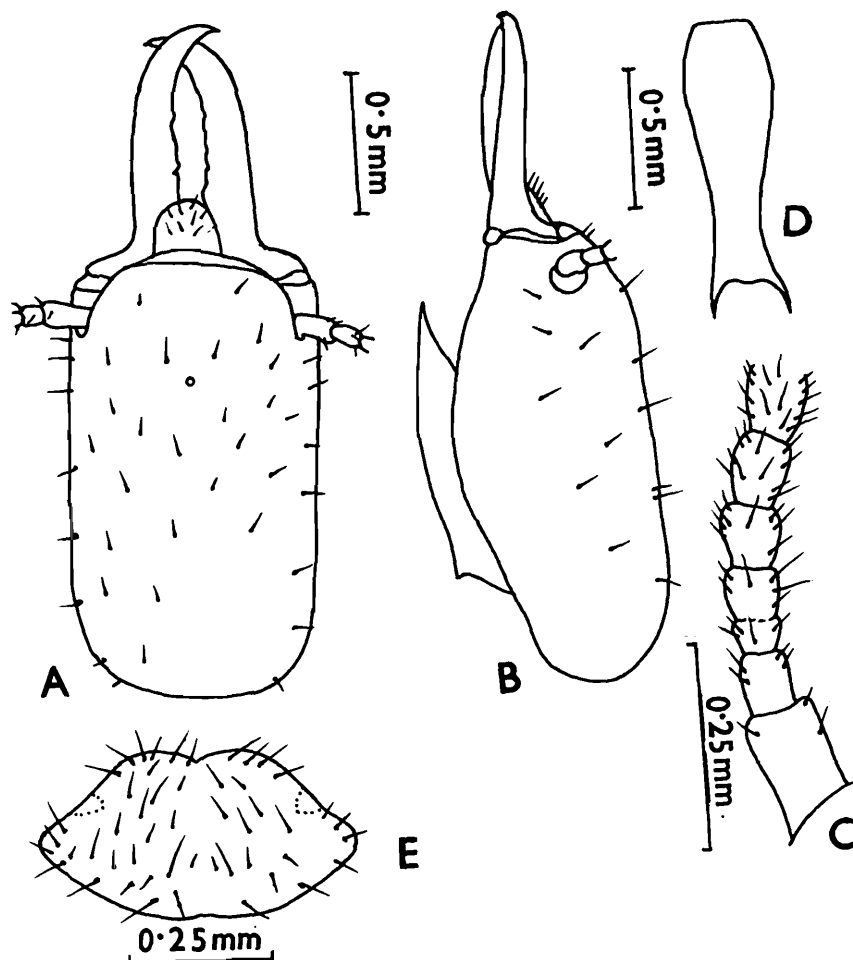


Fig. 103 : *Microcerotermes rambanensis*. Soldier. (A) Head, in dorsal view. (B) Same, in side view. (C) Antenna. (D) Postmentum. (E) Pronotum. (Ex Chatterjee and Thakur, 1964a)

minute, circular; situated at about anterior third. Antennae with 13 segments; segment 3 smallest; 4 subequal to 2. Labrum broader than long; anteriorly broadly rounded (length 0.18-0.20, width 0.28 mm). Mandibles short and strong, finely serrated (length 0.88-0.90 mm); a little longer than half of head-length (index left mandible-length/head-length 0.56). Postmentum club-shaped; waist lying in posterior third (length 0.88-0.98, max. width 0.34-0.35, width at waist 0.18-0.20 mm). Pronotum saddle-shaped; anterior margin indistinctly notched, posterior margin weakly convex (length 0.28-0.30, width 0.55-0.58 mm).

WORKER : Head-capsule pale yellow to reddish brown ; antennae, labrum and postclypeus pale yellow to brownish yellow. Head sparsely and body moderately hairy. Total body-length 3.70-4.75 mm. Head subsquarish (length to base of mandibles 0.85-1.00, max. width 0.80-0.95 mm). Fontanelle plate a small, circular spot, situated medially. Antennae with 13 segments; 3rd segment smallest. Postclypeus swollen, length a little more than half of width. Pronotum saddle-shaped; length 0.23-0.25, width 0.45-0.53 mm.

Distribution : INDIA : Jammu and Kashmir (Ramban, type-locality). Known only from the type-locality.

163. *Microcerotermes sakesarensis* Ahmad

(Fig. 104)

Microcerotermes sakesarensis Ahmad :

- 1955. Ahmad, *Biologia*, Lahore, **1** : 238, 247-248. S only. Holotype : S, in PU. Type-locality : Sakesar (Dist. Sargodha), Panjab, Pakistan.
- 1958. Ahmad, *Biologia*, Lahore, **4** : 172.
- 1965. Krishna, *Am. Mus. Novit.*, No. 2210. 9.
- 1966. Prashad, et al. *Indian For. Bull.*, No. 264 : 1, 6, 51-52, fig. 32.
- 1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL. 480 Proj. No. A17-FS-12) : 50, fig. 58.
- 1974. Akhtar, *Biologia*, Lahore, **20**(1) : 47, 55.
- 1974. Akhtar, *Pakistan J. Zool.*, **6**(1&2) : 102.
- 1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 428, 441-442, 461, 467, 474.
- 1982. Verma and Thakur, *Rec. zool. Surv. India*, **79** : 313.

IMAGO : Unknown.

SOLDIER (Fig. 104) : Head brownish yellow ; antennae paler than head; mandibles dark reddish brown; rest of body yellow. Head sparsely and pronotum slightly more densely hairy. Total body-length c 4.3-5.3 mm. Head-capsule subrectangular, sides subparallel (length with mandibles 2.29-2.58, length to base of mandibles 1.48-1.74, max. width 0.81-0.95 mm). Antennae with 13 segments, 2nd segment as long as 3rd and 4th combined, 3rd shortest. Labrum as long as wide, sides substraight posteriorly and narrowed in front to a broad tip. Mandibles short, strongly hooked and coarsely serrated; much shorter than head (length 0.89 mm). Postmentum club-shaped (length 0.81-0.89, max. width 0.29-0.31, width at waist 0.21 mm). Pronotum saddle-shaped; weakly to distinctly notched anteriorly and posteriorly (length 0.28-0.37, width 0.55-0.63 mm).

Distribution : INDIA : Rajasthan, Madhya Pradesh. PAKISTAN : Panjab, N.W.F.P.

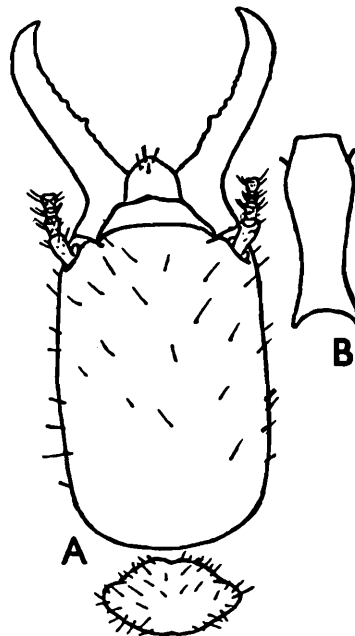


Fig. 104 : *Microcerotermes sakesarensis*. Soldier. (A) Head and pronotum, in dorsal view. (B) Postmentum. (After Ahmad, 1955b).

164. *Microcerotermes tenuignathus* Holmgren

(Figs. 105, 106)

Microcerotermes tenuignathus Holmgren :

1913. Holmgren, *J. Bombay nat. Hist. Soc.*, **22**(1) : 116, 177. S and W (maj. & min.). Syntypes : In Riksmus., Stockholm. Type-locality : Vadtal (Gujarat, India).
1958. Ahmad, *Biologia*, Lahore, **4** : 164, 169.
1964. Roonwal and Bose, *Zoologica*, **40** (113) : 25, 28-29.
1964. Chatterjee and Thakur, *Bull. Ent.*, No. 5 : 6.
1967. Prashad, et al. *Indian For. Bull.*, No. 246 : 5, 7, 52-55, figs. 33-35. Synonymy, descriptions, etc.
1969. Roonwal and Bose, *Rec. zool. Surv. India*, **61** (3&4) : 441, 445, Pl. 23 fig. 1.

IMAGO (Fig. 105) : Head and pronotum dark brown ; antennae, postclypeus and abdomen above brown. Head moderately and pronotum more hairy than head. Head-capsule subsquarish, sides substraight (length to base of mandibles 0.77-0.84, width with eyes 0.83-0.93 mm). Eyes subcircular, small, not much projecting out (max. diameter 0.18-0.21, min. diameter 0.17-0.18 mm); separated from lower margin of head by about their diameter. Ocelli small, dot-like (diameter 0.05-0.06 mm); separated from eyes by twice their diameter (0.09-0.12 mm). Antennae 14-segmented; segment 3 shortest; 2 longer than 3+4. Postclypeus hairy, swollen, half as long as wide. Pronotum subtrapezoid (length 0.44-0.48, width 0.64-0.76 mm); anterior margin slightly raised at middle and faintly emarginate; posterior margin weakly emarginate.

SOLDIER (Fig. 106) : Head-capsule yellow ; antennae paler than head; mandibles dark reddish brown, paler basally; body yellowish white. Head sparsely and body fairly hairy. Total body-length 4.0-5.0 mm. Head-capsule subrectangular, sides weakly convex (length to base of mandibles 1.0-1.27, max. width 0.75-0.90 mm); width generally less than $\frac{3}{4}$ of length (index width/length 0.68-0.75). Fontanelle indistinct. Antennae 13-segmented; segment 3 shortest. Labrum subpentagonal, anteriorly projecting out medially (length 0.17-0.22, width 0.15-0.27 mm). Mandibles long and strongly incurved apically (length 0.70-0.95 mm); about $\frac{3}{4}$ of head-length (index left mandible-length/head-length 0.70-0.79) ; finely

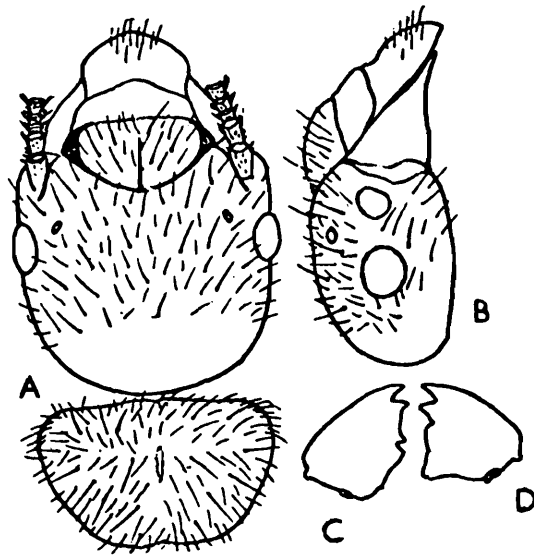


Fig. 105 : *Microcerotermes tenuignathus*. Imago. (A) Head and pronotum, in dorsal view. (B) Head, side view. (C) and (D) Left and right mandibles, respectively. (After Ahmad, 1955b).

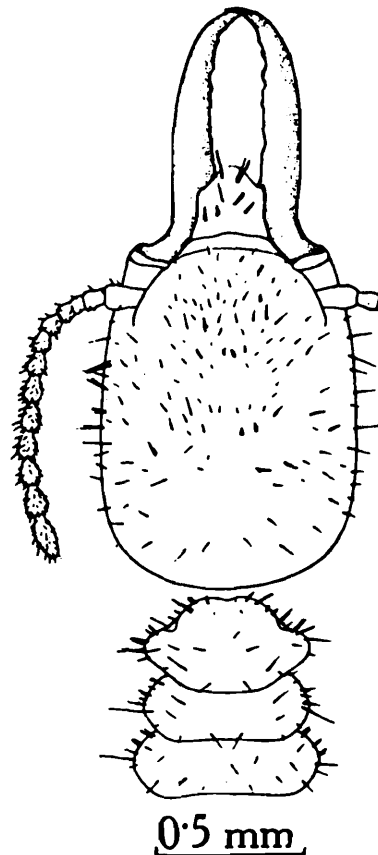


Fig. 106 : *Microcerotermes tenuignathus*. Soldier. Head and pronotum, in dorsal view.

serrate. Postmentum club-shaped, weakly incurved at waist and slightly longer than half of head-length (length 0.60-0.65, max. width 0.30-0.32, width at waist 0.24-0.26 mm). Pronotum saddle-shaped; distinctly notched anteriorly and weakly emarginate posteriorly (length 0.23-0.30, width 0.51-0.60 mm).

WORKER : Head yellow ; body pale whitish yellow. Head and body moderately hairy. Total body-length 4.4-4.8 mm. Head subsquarish (length to base of mandibles 0.85-0.90, max. width 0.85-0.87 mm). Fontanelle indistinct. Antennae 13 segmented, segment 2 equal to 3+4. Postclypeus swollen, hairy ; as long as or slightly longer than half its width. Pronotum saddle-shaped (length 0.17-0.25, width 0.50-0.59 mm) ; anterior margin weakly notched, posterior margin weakly invaginated medially.

Distribution : INDIA : Gujarat, Maharashtra, Rajasthan. PAKISTAN : Panjab, Sind, N.W.F.P. and Baluchistan.

165. *Microcerotermes uncatus* Krishna

(Fig. 107)

Microcerotermes uncatus Krishna :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 8-9. S only. Holotype : S, in AMNH. Type-locality : Maymyo, 24 miles east of Mandalay, Burma.

1974. Akhtar, *Biologia*, Lahore, **20** (1) : 47.

IMAGO : Unknown.

SOLDIER (Fig. 107) : Paratype examined. Head yellow, darker a little anteriorly; antennae and labrum yellowish ; mandibles reddish brown ; pronotum and legs paler than head ; abdomen dirty white. Head and pronotum sparsely hairy with short bristles. Head subrectangular with sides incurving slightly in middle ; frons slightly depressed and wrinkled (length to base of mandibles 1.57-1.63, max. width 0.89-0.91 mm). Antennae with 13 segments; segment 3 shortest, 4 equal to 2. Labrum subrectangular; anterior margin convex with a faint point. Mandibles short, stout and strongly hooked (length of left mandible 0.89-0.94 mm) ; coarsely serrated. Postmentum club-shaped and strongly incurved at waist lying posteriorly (length 0.97-1.05, max. width 0.32-0.33, width at waist 0.17-0.19 mm). Pronotum saddle-shaped; anterior

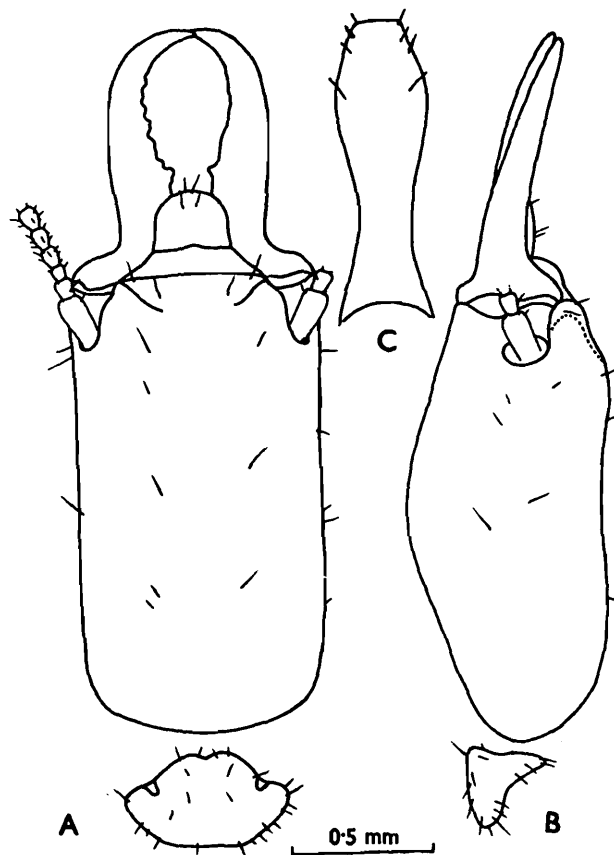


Fig. 107 : *Microcerotermes uncatus*. Soldier (Paratype). (A) Head and pronotum, in dorsal view. (B) Same, in side view. (C) Postmentum.

margin notched and posterior margin slightly emarginate (length 0.31-0.33, width 0.59-0.61 mm).

Distribution : BURMA (24 miles east of Mandalay (type-locality) ; known only from the type-locality.

Subfamily (ii) TERMITINAE Sjöstedt

1. Subfamily Termitinae Sjöstedt :

- 1926. Sjöstedt, *K. Svenska Vetensk.-Akad. Handl.*, (3) 3(1) ; 8, 72.
- 1949. Snyder, *Smiths. misc. Colls.*, 112 : 148-149. See for synonymy and genera included.
- 1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, 95 (Art. 2) : 68-75.
- 1955. Emerson, *Fieldiana : Zool.*, 37 : 480, 483, 485-486, 487, 488-489, 494-495, 502, 505, 506, 511-512, 516, 517.
- 1965. Bouillon and Mathot, *Zooleo*, No. 1, 23-31.

1966. Bouillon and Mathot, *Zooleo*, No. 1 (Suppl. No. 1) : Table.
1970. Weidner, *Handb. Zool.*, 4 (Sect. 2, Pt. 2, Lief. B, No. 14, Isoptera) : 11, 12, 24.
1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 143-145.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 350-356.
1971. Bouillon and Mathot, *Zooleo*, No. 1, (Suppl. 2) : 6, 9-11. Table of genera.
1972. Coaton and Sheasby, *Cimbebasia*, Mem. No. 2 : 67.
1973. Chhotani and Bose, *Zool. Anz.*, 190 : 235.
1974. Akhtar, *Pakistan J. Zool.*, 6 (1&2) : 93-95, 99, 100-102-103.
1979. Roonwal, *Termite Life & Termite Control South Asia* : 81.
1983. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) 49 (5) : 367, 381, 384, 387, 388.
1985. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) 51 (2) : 152.
2. Family Termitidae (Part) :
1953. Rattan Lal and Menon, *Cat. Indian Insects Pt. 27 Isoptera* : 34-86. Part of the genera included in the family.
3. Subfamily Termitinae (Part) :
1972. Sands, *Bull. Br. Mus. (nat. Hist.) Ent.*, Suppl. 18 : 32-37. Divides Amitermitine genera between Apicotermitinae and Termitinae.
1977. Mathews, *Studies Termites Mato Grosso* : 103-141.
1977. Araujo, *Cat. Isoptera Novo Mundo* : 56-67.
1987. Chhotani, *Beitr. Ent.*, 37 : 408-411, 416-417. Part of the genera included in the subfamily.
- Type genus : *Termes* Linn.

1. Characters of Subfamily Termitinae

The Termitinae are humus feeders and make their nests in the form of galleries and chambers in soil under ground-level, sometimes they nest in walls of the mounds of *Odontotermes* species.

Imago : Medium sized, densely hairy. Head subcircular. Fontanelle situated at about middle of head. Antennae 14 to 17-segmented. Postclypeus swollen, hairy. Mandibles each with an apical and two marginal teeth; apical large and with a wide angle between it and 1st marginal; marginals gradually reduced. Left mandible : 1st marginal

with long posterior cutting edge; 2nd marginal separated from 1st by a notch or without any notch and sometimes very much reduced. Right mandible : 1st marginal triangular; 2nd marginal small, with incurved posterior margin. Apical tibial spurs generally 3 : 2 : 2, dorsal-spur of foreleg sometimes very much reduced.

Soldier : Small to fairly large and sparsely to fairly hairy. Head subsquarish to subrectangular; sometimes with frontal projection. Fontanelle open situated anteriorly or below frontal projection. Antennae 13 to 17-segmented. Mandibles thin, long, rod-like or snapping-type and highly asymmetrical. Labrum broadly or sharply incurved ; antero-lateral corners sometimes produced into pointed, spine-like processes. Pronotum saddle-shaped. Legs generally with 3 : 2 : 2 apical tibial spurs; dorsal spur of foreleg sometimes very much reduced or not discernible.

Worker : Small to fairly large and moderately densely hairy. Head subcircular. Fontanelle plate translucent white, situated medially, sometimes hardly discernible. Antennae 13 to 15-segmented. Mandibles and postclypeus as in imago. Pronotum and legs as in soldier.

2. *Distribution and Composition of Termitinae*

(Figs. 108, 109)

Distribution : The subfamily Termitinae is known from all (except Nearctic) the zoogeographical regions. From the Oriental Region, according to Chhotani (1987), it is known by 24 genera and 166 species (including some of the genera now referred to the subfamily Amitermitinae). The distribution of the genera occurring in the Indian subregion is discussed under the various genera.

Composition : Presently 16 genera (including 2 new described here) are now taken to be occurring in the Oriental Region; of these 11 genera (including 52 species) as follows are found in the Indian subregion.

1. *Angulitermes* Sjöstedt—Ethiopian, Oriental
2. *Termes* Linn.—All regions except Palaeartic and Nearctic
3. *Homalotermes* John—Oriental
4. *Dicuspiditermes* Krishna—Oriental
5. *Pericapritermes* Silvestri—Ethiopian, Oriental

6. *Indocapritermes* n. gen.—Oriental (Indian)
7. *Krishnacapritermes* n. gen.—Oriental (Indian)
8. *Labiocapritermes* Krishna—Oriental (Indian)
9. *Malaysiocapritermes* Ahmad and Akhtar—Oriental
10. *Pseudocapritermes* Kemner—Oriental

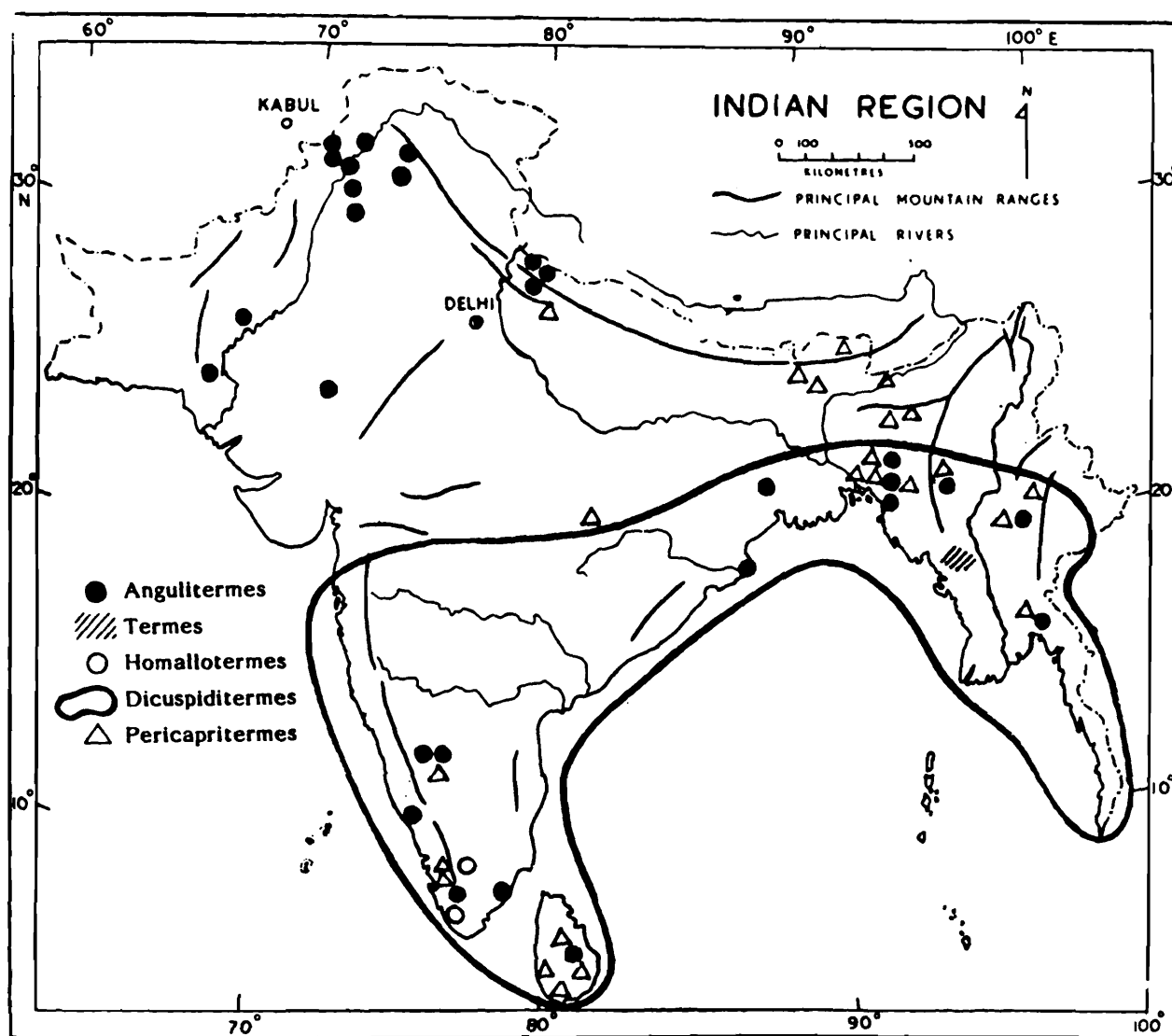


Fig. 108 : Map of Indian Region, showing distribution of Termitinae genera *Angulitermes*, *Termes*, *Homalotermes*, *Dicuspiditermes* and *Pericapritermes*.

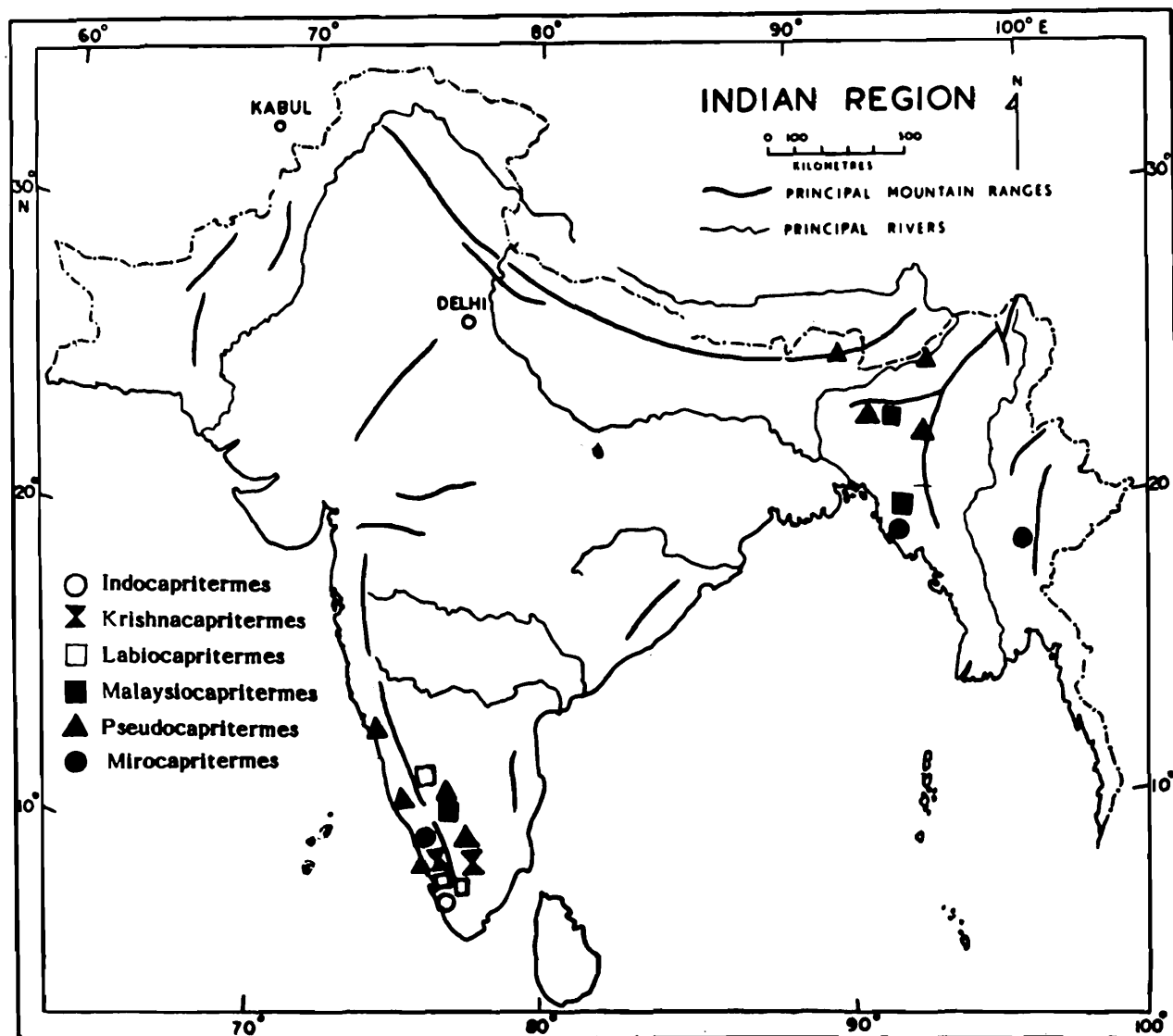


Fig. 109 : Map of Indian Region, showing distribution of Termitinae genera *Indocapritermes*, *Krishnacapritermes*, *Labiocapritermes*, *Malaysiocapritermes*, *Pseudocapritermes* and *Miropapritermes*.

11. *Miropapritermes* Holmgren—Oriental

3. Keys to Indian Genera of Termitinae

IMAGOES

The imagoes of *Indocapritermes* and *Miropapritermes* are not known and that of *Pseudocapritermes* was not available to me.

- 1(10) Second marginal of left mandible well developed, pointed and separated from 1st marginal by a deep cut or notch
- 2(5) First and 2nd marginals of left mandible close to each other ; posterior margin of 1st marginal shorter
- 3(4) Second marginal of right mandible prominent and with strongly incurved posterior margin*Angulitermes*
- 4(3) Second marginal of right mandible smaller and with weakly incurved posterior margin*Termes*
- 5(2) First and 2nd marginals of left mandible far apart ; posterior margin of 1st marginal longer
- 6(7) Fontanelle large, oval. (Coupled with strongly twisted left mandible of soldier) *Pericapritermes*
- 7(6) Fontanelle generally, long and narrow, rarely large. (Coupled with less so twisted left mandible of soldier)
- 8(9) Head moderately hairy. Posterior margin of 1st right marginal short and 2nd right marginal large, pointed and subequal to 1st *Homallotermes*
- 9(8) Head densely hairy. Posterior margin of 1st right marginal longer and 2nd right marginal comparatively smaller *Dicuspiditermes*
- 10(1) Second marginal of left mandible reduced and not differentiated from 1st by cut or notch
- 11(12) Postclypeus longer, half as long as wide*Labiocapritermes*
- 12(11) Postclypeus shorter, less than half as long as wide
- 13(14) Second left marginal tooth very much reduced, hardly perceptible. Postclypeus divided by median line. (Soldier left mandible strongly twisted) *Krishnacapritermes*
- 14(13) Second left marginal tooth reduced but distinct. Postclypeus not clearly divided into two halves. (Soldier left mandible weakly twisted)*Malaysiocapritermes*

SOLDIERS

- 1(4) Mandibles long, slender, rod-like and slightly asymmetrical
- 2(3) Labrum with convex to rounded sides and weakly to strongly incurved at anterior margin *Angulitermes*
- 3(2) Labrum with straight sides, narrowed behind slightly and straight or weakly incurved at anterior margin *Termes*
- 4(1) Mandibles weakly to strongly asymmetrical; left mandible weakly to very strongly twisted at middle
- 5(6) Antero-lateral corners of head produced into tubercle-like projections *Dicuspiditermes*
- 6(5) Antero-lateral corners of head rounded, not produced into tubercle-like projections
- 7(8) Head with frontal projection *Mirocapritermes*
- 8(7) Head without frontal projection
- 9(14) Left mandible moderately twisted at middle ; sharply pointed at tip or forming a beak; subequal to head-length
- 10(11) Antennae with 13 segments. Mandibles thin, slender and weakly bent at middle..... *Homallotermes*
- 11(10) Antennae with 14 segments. Mandibles thick and somewhat strongly bent at middle
- 12(13) Distal tip of left mandible bent like a beak..... *Pseudocapritermes*
- 13(12) Distal tip of left mandible slightly incurved, not bent like a beak *Malaysiocapritermes*
- 14(9) Left mandible strongly twisted at middle ; blunt at tip and shorter than head-length
- 15(16) Labrum greatly swollen and enlarged *Labiocapritermes*
- 16(15) Labrum tongue-shaped, without lateral points or weakly to fairly incurved at anterior margin and with antero-lateral points or processes

- 17(18) Head moderately hairy; frons sharply inclining in front
 *Indocapritermes*
- 18(17) Head sparsely hairy; frons gradually inclining in front
- 19(20) Labrum tongue-shaped, without antero-lateral points. Fontanelle
 transverse, fontanelle gland large *Krishnacapritermes*
- 20(19) Labrum straight at anterior margin and with small antero-lateral
 points. Fontanelle dot-like, fontanelle gland small
 *Pericapritermes*

Genus 31. *Angulitermes* Sjöstedt

1. Genus/subgenus *Mirotermes* Wasmann :

1912. Holmgren, *K. Svenska Vetensk. Akad. Handl.*, **48**(4) : 107-108. (Part).
 1953. Rattan Lal and Menon, *Cat Indian Insects, Isoptera*, Pt. 27 : 50-51.

2. Genus/subgenus *Angulitermes* Sjöstedt :

1924. Sjöstedt, *Rev. Zool. Afr.*, **12**(9) : 257.
 1926. Sjöstedt, *K. Svenska Vetensk. Akad. Handl.*, (3) **3**(1) : 280.
 1928. Emerson, *Bull. Am. Mus. nat. Hist.*, **57** (Art. 7) : 408.
 1949. Snyder, *Smiths. misc. Colls.*, **112** : 174. Synonymy.
 1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** (Art. 2) : 72, 73.
 1955. Emerson, *Fieldiana : Zool.*, **37** : 485-486, 501, 512.
 1955. Ahmad, *Biologia*, Lahore, **1** : 259, 260.
 1958. Ahmad, *Biologia*, Lahore, **4** : 91, 181-182. Keys.
 1962. Harris, *Ann. Mag. nat. Hist.*, (13) **5** : 311-312.
 1965. Bouillon and Mathot, *Zooleo*, No. 1 : 31, 45, 110.
 1966. Bouillon and Mathot, *Zooleo*, No. 1 (Suppl. 1) : Table.
 1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, **63** : 209-210, 218-219.
 1971. Bouillon and Mathot, *Zooleo*, No. 1 (Suppl. 2) : Table.
 1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 61.
 1973. Chhotani and Bose, *Zool. Anz.*, **190** : 234, 235.
 1974. Roonwal, Verma and Rathore, *Z. zool. Syst. Evolut.-forsch.*, **12** : 67, 70, 71, 73, 75. Wing microsculpture.

1974. Akhtar, *Pakistan, J. Zool.*, **6** (1&2) : 95, 96, 97, 103.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 4, 9, 13.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 60.
1977. Roonwal and Verma, *Ent. mthly. Mag.*, **112** (1976) : 5.
1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 15.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (4) : 461, 468.
1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 201.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 24.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 102, 138.
1984. Verma, *Rec. zool. Surv. India*, **81** (3&4) : 343-348.
1987. Chhotani, *Beitr. Ent.*, **37** : 409, 410, 416, 418.

3. Genus *Termes* Linn. (Part) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 178-187.

Type of genus : *Mirotermes frontalis* Silvestri

1. Characters of Genus *Angulitermes*

Imago : Small, brown and densely hairy with short and long hairs. Head-capsule subcircular. Fontanelle plate minute to long, slit-like. Eyes round, medium sized. Ocelli oval, well separated from eyes. Antennae with 15 segments. Postclypeus swollen, length about half of width. Mandibles each with an apical and two marginal teeth; apical larger than first marginal; posterior margin of 1st marginal of left only a little longer than anterior and 2nd marginal separated by a notch; first marginal of right mandible with subequal anterior and posterior margins and 2nd marginal with incurved posterior margin. Pronotum semicircular or subtrapezoidal, slightly narrower than head with eyes. Apical tibial spurs 3 : 2 : 2. Wings pale brown, membrane somewhat hairy; microsculpture consists of papillae on anterior and posterior margins and asteroid and non-asteroid micrasters on membrane. Costa thick, running along anterior margin; radius as thick as costa and running close to and parallel with

it; media weak with a few branches, arising independently in forewing and from radius in hindwing; cubitus with 10-12 branches.

Soldier : Small, delicate, pale and sparsely or fairly hairy. Head subrectangular, with frontal protuberance. Fontanelle situated under frontal protuberance. Antennae with 14 segments. Labrum incurved at anterior margin and with antero-lateral corners produced into horn-like processes. Mandibles long, slender, rod-like; incurved at tip and slightly snapping-type; as long as or longer than head. Postmentum short, club-like. Pronotum strongly saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs; dorsal spur minute, sometimes not very clear.

Worker : Small, delicate, pale and fairly densely hairy. Head-capsule subcircular. Fontanelle plate indistinct, a round, translucent spot present. Antennae with 14 segments. Postclypeus strongly swollen, length about half or slightly more than half of width. Mandibles as in imago, posterior margin of 2nd marginal of right mandible more incurved. Pronotum strongly saddle-shaped, anterior margin with a faint or without any notch. Apical tibial spurs 3 : 2 : 2, dorsal spur on fore-tibia very minute, sometimes hardly discernible.

Remarks : Mathur and Sen-Sarma (1961) and Roonwal and Verma (1977) give the apical tibial spurs as 2 : 2 : 2. I have examined the types of the species described by them and find that they are 3 : 2 : 2. The dorsal spur on the foreleg of different castes is sometimes very minute and can only be seen under high power in a particular position. Roonwal and Verma (1977) mention media to be arising from radius (their radial sector). I have examined the paramorphotype imago and find that the media arises independently from the scale in forewing and from radius just outside the scale in hindwing.

2. *Distribution and Composition of Angulitermes*

(Fig. 108)

Distribution : Snyder (1949) listed 4 species of the genus *Angulitermes*, all from the Ethiopian Region. Ahmad (1955b) recorded the genus from the Oriental region by describing the species *hussaini* from Pakistan and transferring *Mirotermes dehraensis* and *M. obtusus*,

which were listed under the genus *Termes* by Snyder (1949), to *Angulitermes*. Weidner (1960) reported the genus from the Palaearctic Region from Afghanistan for the first time by recording *A. dehraensis* and Harris (1964) described another species from Israel from this zoogeographical region. Thus the genus is now known from the Ethiopian, the Oriental and the Palaearctic zoogeographical regions. Harris (1962) has given the distribution of the genus in the African continent and Chhotani and Bose (1979), (1983) and (1985) have reported it from the Arabian Peninsula.

Composition : According to Harris (1962) and Bouillon and Mathot (1971) five species are known from the Ethiopian Region and Chhotani and Bose (1979-85) have reported two species from the Arabian Peninsula including one already described, thus 6 species are known from the Ethiopian region; two from the Palaearctic (one common with Oriental) and as many as 18 species (one common with Palaearctic), as follows, from the Indian subregion of the Oriental zoogeographical region and are dealt with here.

1. *Angulitermes acutus* Mathur and Sen-Sarma—India
2. *A. akhorisainensis* Chatterjee and Thakur—India
3. *A. ceylonicus* (Holmgren)—Sri Lanka
4. *A. dehraensis* (Gardner)—India, Pakistan, Afghanistan
5. *A. emersoni* Akhtar—Bangladesh
6. *A. fletcheri* (Holmgren and Holmgren)—India
7. *A. hussaini* Ahmad—Pakistan
8. *A. jodhpurensis* Roonwal and Verma—India
9. *A. kashmirensis* Roonwal and Chhotani—India
10. *A. keralai* Verma—India
11. *A. longifrons* Maiti—India
12. *A. mishrai* Sen-Sarma and Thakur—India
13. *A. obtusus* (Holmgren and Holmgren)—India
14. *A. paanensis* Krishna—Burma
15. *A. punjabensis* Akhtar—Pakistan
16. *A. ramanii* Bose and Das—India

17. *A. resimus* Krishna—Burma
18. *A. tilaki* Roonwal and Chhotani—India

3. Remarks on Some *Angulitermes* Species

Of the species listed above, the species *ceylonicus*, *dehraensis*, *fletcheri* and *obtusus* were described under genus *Mirotermes*. All these were, however, catalogued by Snyder (1949) under the genus *Termes* Linn. The species *ceylonicus* was given a new name *Termes lighti* Snyder and Emerson (in Snyder, 1949) on the basis that the name *Termes ceylonicus* Wasmann (1902) was preoccupied (by the *Odontotermes* now). The species *dehraensis* and *obtusus* were transferred to the genus *Angulitermes* by Ahmad (1955b) while reporting *dehraensis* from Pakistan, when he also described the species *hussaini* in the same publication. The species *fletcheri* and *ceylonicus* as *lighti*, were retained in *Termes* Linn. by Ahmad (1958a, b) in his key to the Indomalayan termites. The former species i.e. *fletcheri*, however, was transferred to *Angulitermes* by Krishna (1965) in his comparison of his species *resimus* while the latter species i.e. *ceylonicus* stayed in literature as *lighti* Snyder and Emerson.

During perusal of literature, it is noticed that Holmgren and Holmgren (1917) while describing the species *fletcheri* mention as follows: "Soldier. Very closely allied to *Mirotermes* (*M.*) *ceylonicus*, but is smaller and with the head more depressed anteriorly" and *Worker*. Agrees completely with *Mirotermes* (*M.*) *ceylonicus*." Now since *fletcheri* belongs to *Angulitermes*, the species *ceylonicus* should be taken as belonging to the genus *Angulitermes* and not as *Termes lighti*. In support of this it may be added that the genus *Termes*, under which the species *ceylonicus* was referred to as *lighti*, does not occur or has not been reported from the Indian Region ever since Snyder (1949) even though extensive studies and surveys have been undertaken in the Indian Region. Thus, with the transfer of *Mirotermes* (*M.*) *ceylonicus* Holmgren to *Angulitermes*, the contention of Snyder and Emerson (in Snyder, 1949) that the name *Termes ceylonicus* Wasmann (1902) is preoccupied does not hold good and the name *ceylonicus* Holmgren, therefore, is resurrected under the genus *Angulitermes*.

4. Keys to the Indian Region Species of *Angulitermes*

IMAGOS

- 1(2) Smaller in size. Head-width with eyes 0.78-0.81 mm, pronotum width 0.65-0.71 mm *emersoni*
- 2(1) Larger in size. Head-width with eyes 0.90-1.00 mm, pronotum width 0.75-0.95 mm
- 3(4) Ocellus separated from eye by less than its short diameter. Fontanelle minute, round *jodhpurensis*
- 4(3) Ocellus separated from eye by its short diameter or more. Fontanelle long, linear, slit-like
- 5(6) Fontanelle prominent and elongate *dehraensis*
- 6(5) Fontanelle less so prominent and shorter *akhorisainensis*

SOLDIERS

- 1(8) Head with long, conical, sharply pointed frontal projection (figs. 117, 123, 124, 130)
- 2(5) Larger species. Head-length to base of mandibles 1.20-1.45, to tip of frontal projection 1.35-1.63 and max. width of head 0.91-1.06 mm
- 3(4) Antero-lateral angles of head prominent and sharp and frontal projection raised at tip. Head-length to base of mandibles 1.38-1.45, max. head-width 1.02-1.05 mm. Mandibles in comparison to head-length shorter, index left mandible-length/head-length to base of mandibles c 1.00-1.05 *resimus*
- 4(3) Antero-lateral angles of head not prominent and frontal projection not raised at tip. Head-length to base of mandibles 1.20, max. head-width 0.91-0.95 mm. Mandibles in comparison to head-length longer, index left mandible-length/head-length to base of mandibles 1.208 *fletcheri*
- 5(2) Smaller species. Head-length to base of mandibles 1.00-1.15, to tip of frontal projection 1.22-1.44 and max. width 0.80-0.88 mm
- 6(7) Antero-lateral angles of head prominent and projecting in front. Frontal projection elongate, covering the labrum. Larger species :

- Head-length to base of mandibles 1.10-1.14, to tip of frontal projection 1.34-1.44, max. width of head 0.85-0.88 mm *longifrons*
- 7(6) Antero-lateral angles not prominent. Frontal projection covering part of labrum. Smaller species : head-length to base of mandibles 1.00-1.03, to tip of frontal projection 1.22-1.25, max. width of head 0.80-0.83 mm *keralai*
- 8(1) Head with short, round and blunt frontal projection (figs. 116, 118, 120, 121, etc.)
- 9(16) Smaller species. Head-length to base of mandibles generally up to 1.00 mm or slightly more
- 10(13) Mandibles much longer than head, index mandible-length/head-length to base of mandibles 1.15-1.21
- 11(12) Frontal projection incurved/notched at anterior margin. Head broader anteriorly and less hairy *hussaini*
- 12(11) Frontal projection not incurved/notched at anterior margin. Head broader posteriorly and more hairy *paanensis*
- 13(10) Mandibles smaller, a little longer than head, index 1.00-1.15
- 14(15) Frontal projection of head rounded and postmentum very slightly narrowed at waist *mishrai*
- 15(14) Frontal projection of head straighter at anterior margin and postmentum strongly narrowed at waist..... *emersoni*
- 16(9) Larger species : Head-length to base of mandibles more than 1.00 mm
- 17(24) Head-length to base of mandibles generally less than 1.20 mm
- 18(21) Mandibles comparatively longer than head (1.40-1.50 mm); index mandible-length/head-length to base of mandibles 1.18-1.25
- 19(20) Head comparatively wider; index max. width/length to base of mandibles 0.93. Frontal projection pushed back..... *punjabensis*
- 20(19) Head comparatively narrower; index max. width/length to base of mandibles 0.81. Frontal projection not pushed back..... *obtusus*

- 21(18) Mandibles comparatively shorter (1.18-1.27 mm); index mandible-length/head-length to base of mandibles 1.04-1.12
- 22(23) Head uniformly wide and comparatively narrower; index max. width/length to base of mandibles 0.74-0.75. Frontal projection raised at tip in side view and straight at anterior end..... *ramanii*
- 23(22) Head wider anteriorly and comparatively wider; index max. width/length to base of mandibles 0.83-0.85. Frontal projection rounded at tip and at anterior margin.....*tilaki*
- 24(17) Head-length to base of mandibles generally more than 1.20 mm
- 25(26) Head sides weakly incurved at middle; antero-lateral corners of head sharply angulate. Frontal projection of head longer (0.13-0.17 mm)*dehraensis*
- 26(25) Head sides sinuate, wavy or substraight and narrowing behind ; antero-lateral corners of head rounded. Frontal projection shorter (0.10-0.12 mm)
- 27(28) Labrum broadly incurved at anterior margin. Frontal projection of head sharp and raised in side view.....*acutus*
- 28(27) Labrum deeply incurved at anterior margin. Frontal projection of head round and slightly raised in side view
- 29(30) Head longer (length to base of mandibles 1.35-1.40 mm). Mandibles shorter in comparison to head, index left mandible-length/head-length to base of mandibles 1.0-1.04.....*akhorisainensis*
- 30(29) Head shorter (length to base of mandibles 1.11-1.32 mm). Mandibles comparatively longer, index left mandible-length/head-length to base of mandibles 1.10-1.32
- 31(32) Head sides wavy, sinuate. Mandibles longer (1.47 mm) and somewhat more wavy and less so bow-like in side view*kashmirensis*
- 32(31) Head sides straighter and narrowed posteriorly. Mandibles shorter (1.32-1.42 mm) and less so wavy and more so bow-like in side view.....*jodhpurensis*

166. *Angulitermes acutus* Mathur and Sen-Sarma

(Fig. 110)

Angulitermes acutus Mathur and Sen-Sarma :

1961. Mathur and Sen-Sarma, *Ann. Mag. nat. Hist.*, (13) 3(31) : 401-406.
S and W. Holotype : S. in FRI. Type-locality : Palayamcottah,
Tinnevely Dist., Tamil Nadu.
1962. Mathur and Thapa. *Indian For. Leaflet*, No. 167 : 106.
1964. Chatterjee and Thakur, *J. Bombay nat. Hist. Soc.*, 61(2) : 353.
1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 13.
1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, 63 : 210, 218.
1974. Akhtar, *Biologia*, Lahore, 20 : 61.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, (N.S.), Art. 7 : 166.
1975. Sen-Sarma, et al., *Wood Destroying Termites of India* (Final Tech.
Rep. PL 480 Proj. No. A7-FS-58) : 13, 63.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 32.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 81.
1984. Verma, *Rec. zool. Surv. India*, 81 (3&4) : 243, 246-247.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 92, 138-139.
1989. Verma, *Indian J. For.*, 12 (4) : 297.

IMAGO : Unknown.

SOLDIER (Fig. 110) : Head and pronotum straw coloured; antennae slightly paler; mandibles reddish brown; legs pale yellow; abdomen slightly paler than head. Head and thorax sparsely and abdomen densely pilose. Total body-length 3.30-3.40 mm. Head-capsule subrectangular, longer than wide; widest anteriorly (length to base of mandibles 1.20-1.35, max. width 0.95 mm); sides wavy; frontal projection prominent, pointed and raised at tip, extending beyond base of mandibles and sharply sloping anteriorly. Fontanelle situated below frontal projection; fontanelle gland large and prominent. Antennae with 14 segments; 3 longer than 2; 4 shorter than 3 and subequal to 2. Mandibles long, slender, rod-like; weakly incurved and pointed at tip; longer than head (1.40 mm, index left mandible-length/head-length to base of mandibles 1.05-1.17). Labrum subquadrate; anteriorly broadly incurved; length with horns 0.30, median length 0.20, width 0.30 mm). Postmentum club-shaped (length 0.45, max. width 0.30-0.35 mm). Pronotum strongly saddle-shaped; anterior margin with a weak,

median notch; posterior margin substraight (length 0.20, max. width 0.50 mm).

WORKER : Paratype examined. Head-capsule creamish; body whitish. Head and body densely pilose. Total body-length 3.0-4.0 mm. Head capsule subcircular (length to base of mandibles 0.65-0.70, max. width 0.80 mm). Fontanelle indistinct. Antennae with 14 segments; segment 3 subequal to 2; 4 shortest. Postclypeus swollen, hairy; length a little more than half width (length 0.24-0.25, width 0.41-0.43 mm). Pronotum strongly saddle-

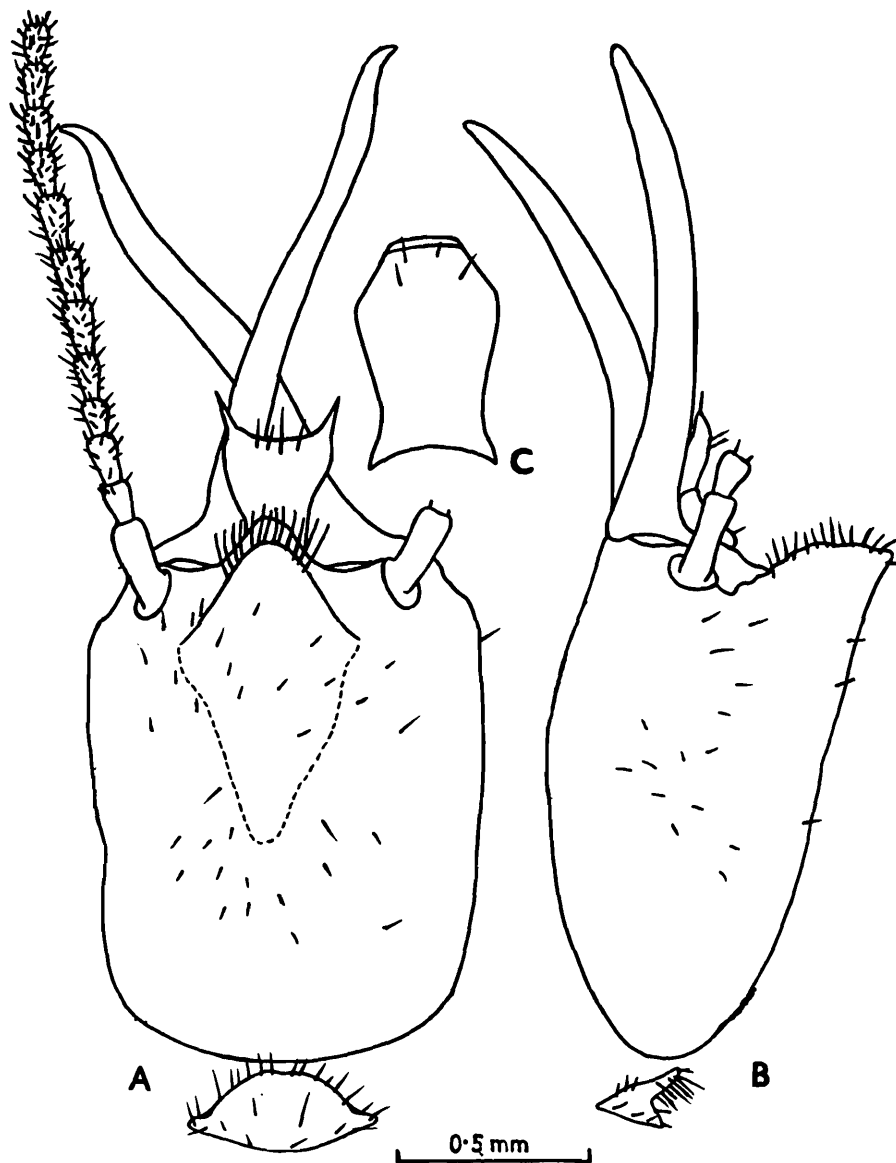


Fig. 110 : *Angulitermes acutus*. Soldier (Paratype) (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

shaped, length 0.25, width 0.48 mm. Apical tibial spurs 3 : 2 : 2 in the paratype not 2 : 2 : 2 as mentioned by Mathur and Sen-Sarma 1961.

Distribution : INDIA : Tamil Nadu (Palyamcottah, type-locality) and Uttar Pradesh (Sen-Sarma, et al. 1975).

167 *Angulitermes akhorisainensis* Chatterjee and Thakur

(Figs. 111, 112)

Angulitermes akhorisainensis Chatterjee and Thakur :

1964. Chatterjee and Thakur, *J. Bombay nat. Hist. Soc.*, **61**(2) : 348-353, 3 pls. Im, S and W. Holotype : S, in FRI. Type-locality : Akhorisain Block, Tehri Range, Tehri Garhwal Forest Div., Uttar Pradesh, India.
1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, **63** : 210, 219.
1974. Roonwal, Verma and Rathore, *Z. zool. Syst. Evolut.forsch.*, **12** : 67, 68. Wing microsculpture.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 166.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 13, 63.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India.*, No. 9 : 32.
1977. Roonwal and Verma, *Ent. month. Mag.*, **112** : 9.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46**(4) : 460, 461.
1984. Verma, *Rec. zool. Surv. India*, **81** (3&4) : 243, 244, 248.

IMAGO (Fig. 111) : Paratype examined. Head-capsule brown (chocolate with greenish tinge vide original description); antennae infusate paler distally; postclypeus pale castaneous brown; pronotum slightly paler than head and with a pale yellow T-marking; abdominal tergites and sternites pale castaneous brown. Head and body densely hairy. Total body-length with wings 11.00-11.50 and without wings 6.00-8.90 mm. Head-capsule subcircular, wider than long (length to base of mandibles 0.75-0.85, width with eyes 0.90-0.95 mm). Fontanelle plate small, longitudinal, slit-like. Antennae with 15 segments; segment 3 shorter than 2, subequal to 4. Eyes subcircular (max. diameter 0.18-0.20, min. diameter 0.15-0.18 mm); from lower margin situated at about half their short diameter. Ocelli oval (length 0.10-0.12, width 0.08-0.09 mm); separated from eyes by their width. Postclypeus swollen, hairy; about half of its width in length and

divided into two halves by median line. Pronotum a little narrower than head (length 0.48-0.55, width 0.75-0.80 mm); anterior margin slightly elevated, concave and with weak, median notch; posterior margin prominently notched. Wings dark greyish; hairy along margins and weakly so on membrane; microsculpture consists of a row of papillae on anterior margin and a row of smaller ones on posterior margin and non-asteroid (5-6 arms) and asteroid (6-8 arms) micrasters on surface.

The paramorphotype imago examined is much paler than the colouration given in original description; the head is pale brownish, antennae yellow, postclypeus a little paler than head and pronotum, abdomen and wings pale brownish.

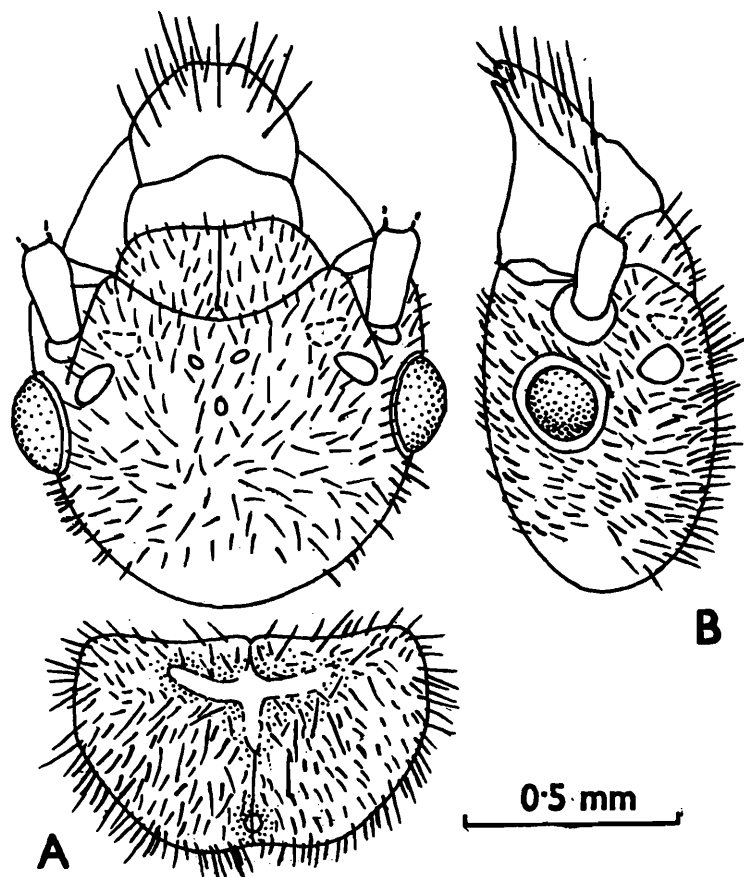


Fig. 111 : *Angulitermes akhorisainensis*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (Ex Chatterjee and Thakur, 1964c).

SOLDIER (Fig. 112) : Head-capsule pale yellow to straw yellow; antennae and labrum slightly paler than head; mandibles dark reddish brown; body whitish. Head sparsely and body fairly densely hairy. Total

body-length 4.10-5.60 mm. Head-capsule subrectangular (length to base of mandibles 1.35-1.40, max. width 1.00-1.05 mm, index width/length 0.72-0.75); sides wavy; frontal projection bluntly rounded and straight and more hairy at anterior margin when viewed laterally. Antennae with 14 segments; segments 2 and 3 subequal, 4 shortest. Labrum with anterior margin deeply incurved and having pointed, horn-like projections laterally (length 0.35, median length 0.18-0.23, max. width 0.25-0.30 mm). Mandibles long, slender, rod-like; subequal to or slightly longer than head (length 1.35-1.45 mm, index left mandible-length/head-length to base of mandibles 1.00-1.04); distally pointed and incurved weakly.

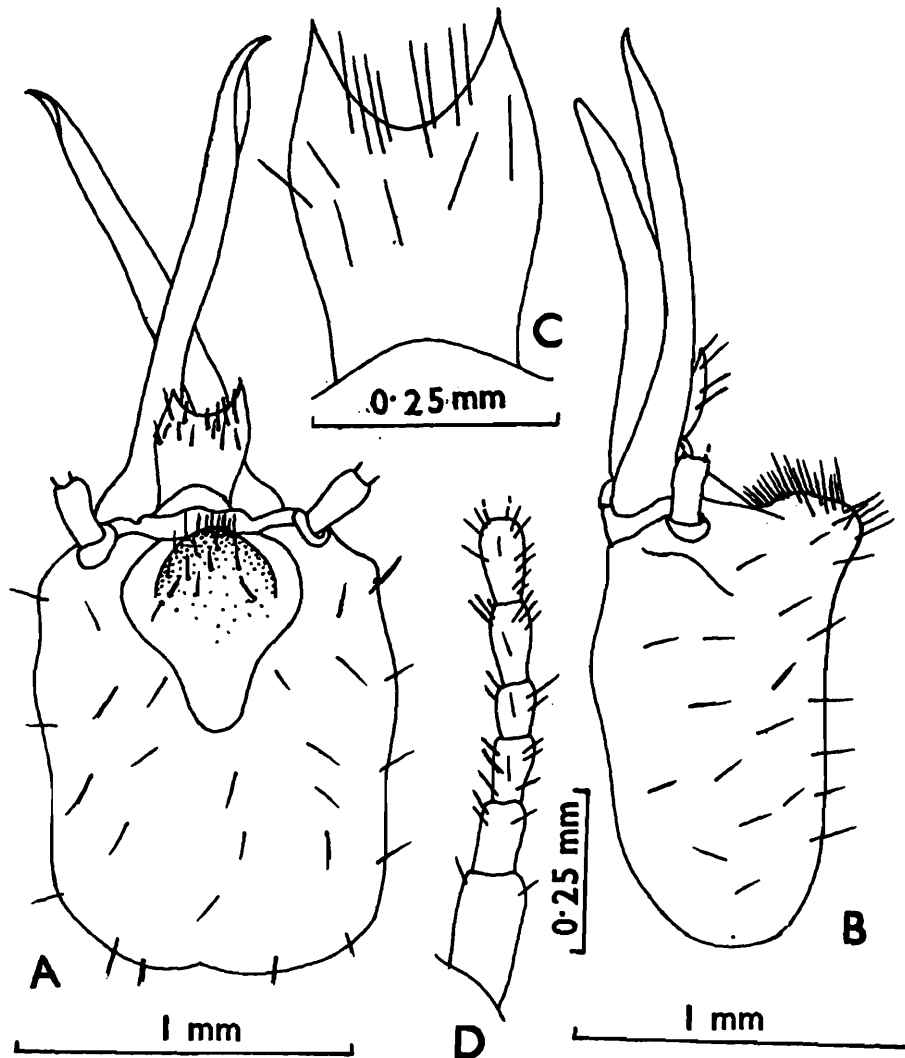


Fig. 112 : *Angulitermes akhorisainensis*. Soldier. (A) Head, dorsal view. (B) Head, side view. (C) Labrum. (D) Basal part of antenna. (Ex Chatterjee and Thakur, 1964c).

Postmentum club-shaped (length 0.45-0.48, max. width 0.28-0.33, min. width 0.18-0.20 mm). Pronotum strongly saddle-shaped; both anteriorly and posteriorly weakly notched.

WORKER : Head-capsule pale yellow to straw yellow; antennae, labrum and legs paler than head; postclypeus of same colour as head. Head moderately and body densely hairy. Total body-length 4.00-4.50 mm. Head-capsule subcircular (length to base of mandibles 0.70-0.80, max. width 0.80-0.90 mm). Antennae with 14 segments; segments 3 and 4 subequal and shortest. Postclypeus swollen, hairy; length more than half of its width (length 0.25-0.30, width 0.45-0.50 mm). Pronotum as in soldier but without any notch at anterior and posterior margins (length 0.20-0.25, width 0.50-0.55 mm).

Distribution : INDIA : Uttar Pradesh.

168. *Angulitermes ceylonicus* (Holmgren)

1. *Mirotermes (Mirotermes) ceylonicus* Holmgren :

1914. Holmgren, *Zool. Jb. Syst.*, **36** : 276. S and W. Syntypes : Probably in Holmgren Coll., at Riksmuseum, Stockholm. Type-locality : Mahalluppalama, Sri Lanka.

1917. Holmgren and Holmgren, *Mem. Dept. Agric. India*, **5** : 168.

2. *Termes lighti* Snyder and Emerson :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 183.

As the specimens of this species were not available to me, English translation of the original description is reproduced here as under :

“Imago unknown.

“Soldier : Head yellow. Mandibles brown. Body whitish.

“Head thinly clothed with straight hairs. Abdominal tergites somewhat hairy with long hairs on hind end.

“Head seen from above squarish, a little longer than broad. Frontal projection broadly conical when seen from above, on the sides somewhat uneven. In lateral view frontal projection prominent straight above and bow-shaped below. Fontanelle situated at base of inner margin of frontal projection, transverse, large. Postclypeus short. Labrum moderately wide

with rounded side margins, bilobed, with pointed anterior corners. Mandibles almost as long as head, rod-like. Antennae with 14 segments. 2. and 3. segments subequal, 4. somewhat shorter.

“Pronotum somewhat emarginate anteriorly.

“Body length	...	3.3 - 3.5 mm
Head with mandibles	...	2.47
Head without mandibles (to tip of frontal projection)	...	1.63
Head width	...	1.06
Width of pronotum	...	0.57

“Worker : Head yellowish white. Body white with dark intestinal contents showing through.

“Head and abdominal tergites thinly hairy.

“Head pentagonally rounded. Head-suture and fontanelle very indistinct. Postclypeus so long as half of width, fairly strongly swollen. Antenne 14-segmented. 2. segment so long as 3. + 4.; 3. as long as 4.

“Pronotum strongly saddle-shaped, not emarginate anteriorly.

“Body length	...	3.5 - 3.8 mm
Head width	...	0.87
Width of pronotum	...	0.53”

Distribution : SRI LANKA : Maha-Illupalama, type-locality.

169. *Angulitermes dehraensis* (Gardner)

(Figs. 113, 114)

1. *Mirotermes dehraensis* Gardner :

1945. Gardner, *Indian J. Ent.*, **6** : 108-110. Im and S. Syntypes : Im, S and W in FRI, BM, ZSI. Type-locality : Dehradun, Uttar Pradesh, India.

1953. Rattan Lal and Menon, *Cat. Indian Insects, (Isoptera) Pt. 27* : 51.

2. *Termes dehraensis* (Gardner) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 179.

3. *Angulitermes dehraensis* (Gardner) :

1955. Ahmad, *Biologia*, Lahore, **1** : 259-260.
1958. Ahmad, *Biologia*, Lahore, **4** : 181, 182.
1959. Mathur and Sen-Sarma, *J. Timb. Dry. Pres. Assoc. India*, **5** (3) : 4.
1960. Weidner, *Abh. Verh. Naturw. Ver. Hamburg*, **4** (1959) : 63, 64.
1961. Mathur and Sen-Sarma, *Ann. Mag. nat. Hist.*, (13) **3** (31) : 406.
1962. Harris, *Ann. Mag. nat. Hist.*, (13) **5** : 311, 312.
1962. Mathur and Thapa, *Indian For. Leaflet*, No. 167 : 106.
1964. Chatterjee and Thakur, *J. Bombay nat. Hist. Soc.*, **61**(2) : 353.
1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, **63** : 218.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 62.
1974. Roonwal, Verma and Rathore, *Z. zool. Syst. Evolut.-forsch.*, **12** : 55, 61, 64, 68, 69, 73, 74, 75.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 164.
1977. Roonwal and Verma, *Ent. mthly. Mg.*, **112** : 9.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (4) : 460, 461.
1984. Verma, *Rec. zool. Surv. India*, **81** (3&4) : 244-245, 247.

IMAGO (Fig. 113) : Syntypes examined. The specimens are somewhat paler than the colouration mentioned by Gardner, 1944. Head-capsule brown; postclypeus yellowish brown; antennae pale yellowish brown, paler than postclypeus; pronotum and abdominal tergites a little paler than head, sternites paler than tergites; wings brown, transparent. Head and body densely hairy with a coat of short, minute hairs and several longer bristles; wings hairy along margins and sparsely so on membrane. Total body-length with wings 10.0-12.3, without wings 5.5-6.20 mm. Head-capsule subcircular, with eyes wider than its length to base of mandibles (length to tip of labrum 1.05-1.13, to base of mandibles 0.75, max. width with eyes 0.80-0.93 mm). Fontanelle plate long, linear, slit-like; dorsum around fontanelle somewhat depressed. Antennae with 15 segments; segment 3 shortest or subequal to 4. Postclypeus swollen, straight anteriorly; length slightly less than half of width (length 0.20-0.21, width 0.43-0.45 mm). Eyes subcircular (max. diameter 0.20, min. diameter 0.18 mm). Ocelli oval (long diameter 0.08-0.12, short diameter 0.05-0.08 mm);

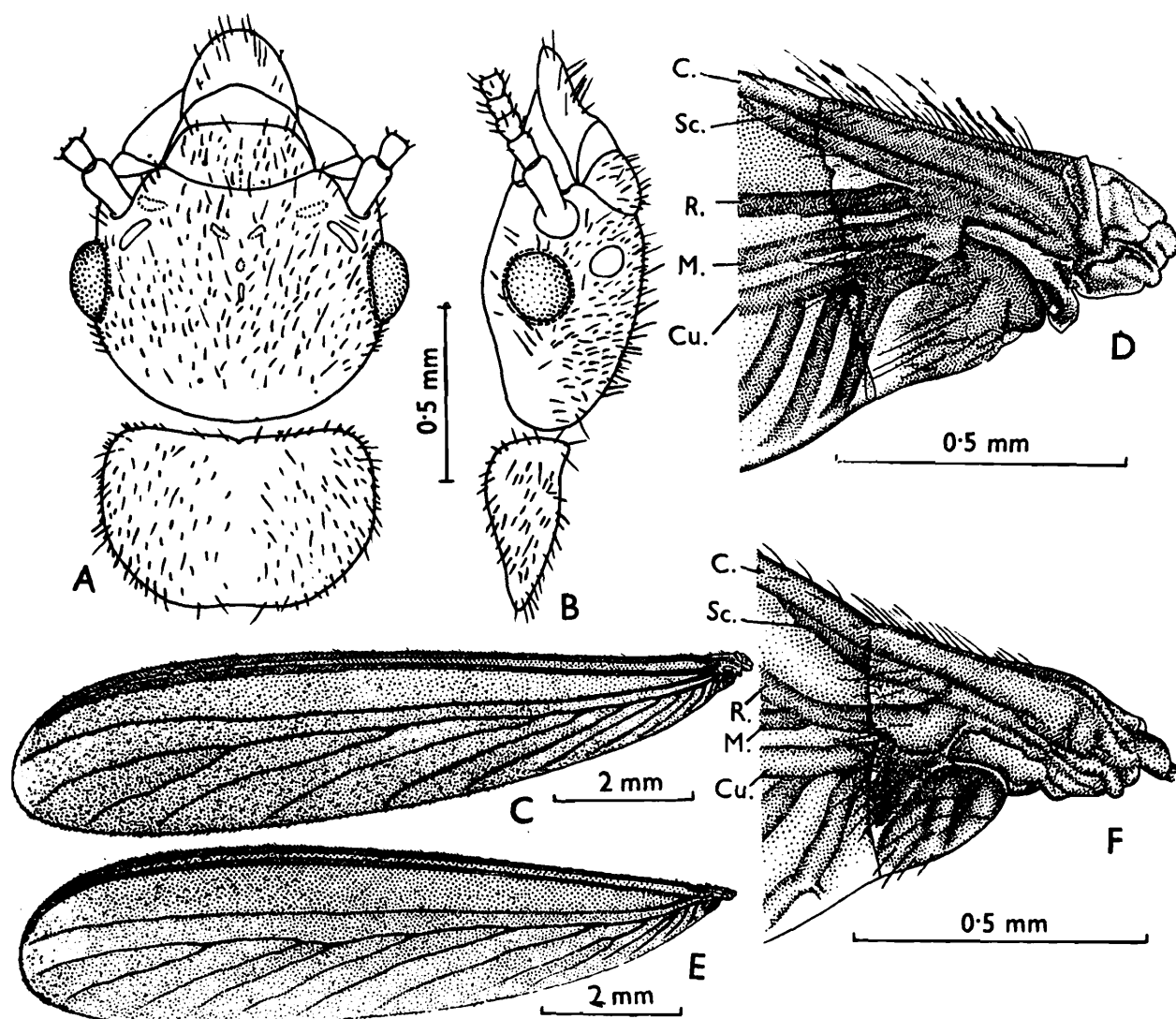


Fig. 113 : *Angulitermes dehraensis*. Syntype imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Forewing. (D) Same, basal part enlarged. (E) Hindwing. (F) Same, basal part enlarged.

situated from eye at a distance of their short diameter or slightly more. Pronotum semicircular (length 0.48-0.52, width 0.70-0.80 mm). Wings as in genus; forewing-length 9.5-9.8 and hindwing-length 8.8-9.00 mm.

SOLDIER (Fig. 114) : Syntypes examined. Head-capsule yellowish; antennae pale brown; legs and body pale yellow; mandibles reddish brown. Head fairly and body densely hairy; frontal projection more hairy with long and curved hairs. Total body-length 3.9-4.6 mm. Head-capsule subrectangular; sides substraight, slightly incurved medially and widest anteriorly (head-length with mandibles 2.54-2.75, to base of mandibles

1.12-1.40, max. width 0.89-1.06 mm); frontal projection broad, anteriorly medially notched (length of frontal projection 0.10-0.13 mm) and extending beyond base of mandibles. Antennae with 14 segments, segments appear thinner and longer; segment 3 longer than 2; 4 shortest. Labrum deeply notched at anterior margin (length 0.33, width 0.30 mm). Mandibles long, slender, rod-like, longer than head (1.34-1.45 mm, index left mandible-length/head-length to base of mandibles 1.16-1.25). Postmentum club-shaped (length 0.43-0.45, max. width 0.30, width at waist 0.25 mm). Pronotum strongly saddle-shaped (length 0.23, width 0.50 mm); anterior margin weakly notched.

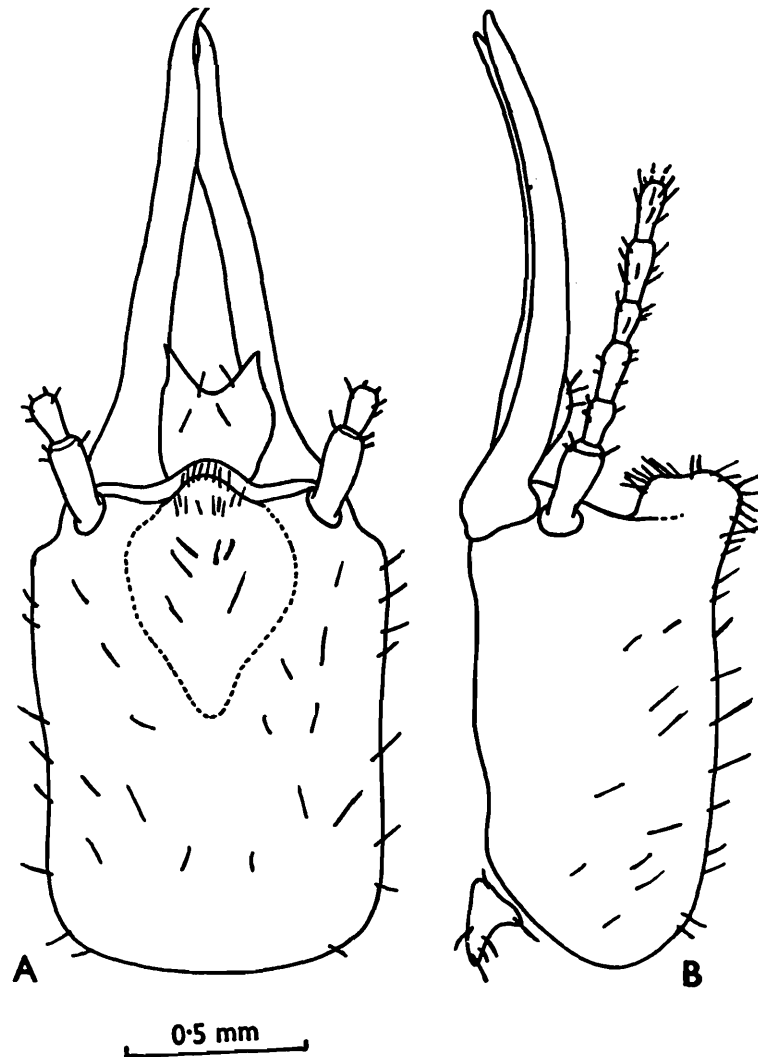


Fig. 114 : *Angulitermes dehraensis*. Syntype Soldier. (A) Head, dorsal view. (B), Head and pronotum, side view.

WORKER : Head pale yellow; antennae, legs, and body whitish. Head and body fairly pilose. Total body-length c 4.5 mm. Head-capsule subcircular (length to tip of labrum 1.0-1.08, to base of mandibles 0.65-0.73, max. width 0.83 mm). Fontanelle plate translucent white, circular. Antennae with 14 segments; segment 3 little smaller than 2, 4 shortest. Postclypeus strongly swollen (length 0.25, width 0.45 mm). Pronotum strongly saddle-shaped (length 0.20, width 0.45-0.50 mm); anterior margin not notched.

Distribution : INDIA (Uttar Pradesh). PAKISTAN, AFGHANISTAN.

170. *Angulitermes emersoni* Akhtar

(Figs. 115,116)

1. *Angulitermes emersoni* Chaudhry, et al. (Nom. nud.) :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. A 17-FS-12) : 62 (nom. nud.)

2. *Angulitermes emersoni* Akhtar :

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab* (N.S.) , Art. 7 : 162-166, 194. Im and S. Holotype : S, in PU. Type-locality : Dariadighi, Bangladesh.

1984. Verma, *Rec. zool. Surv. India*, **81** (3 & 4) : 244, 246.

IMAGO (Fig. 115) : Head dark brown, yellowish around fontanelle; antennae light brown; postclypeus and pronotum yellowish brown. Head and pronotum covered with a dense coat of short hairs and scattered long bristles. Head-capsule subcircular, wider than long (length to tip of labrum 0.93-0.97, to base of mandibles 0.57-0.60, max. width with eyes 0.78-0.81 mm). Fontanelle distinct. Eyes subcircular (max. diameter 0.21-0.23) ; from lower margin situated at a distance of about 1/4th (0.05-0.06 mm) of its diameter. Ocelli oval (long diameter 0.09-0.10, short diameter 0.07); from eyes situated at a distance of slightly less than their short diameter (0.05 mm). Antennae with 15 segments; segment 3 shortest. Postclypeus weakly swollen, hairy (length 0.14-0.18, width 0.35-37 mm). Pronotum narrower than head, anterior and posterior margins weakly emarginate medially; lateral margins rounded (length 0.43- 0.45, width 0.65-0.71 mm).

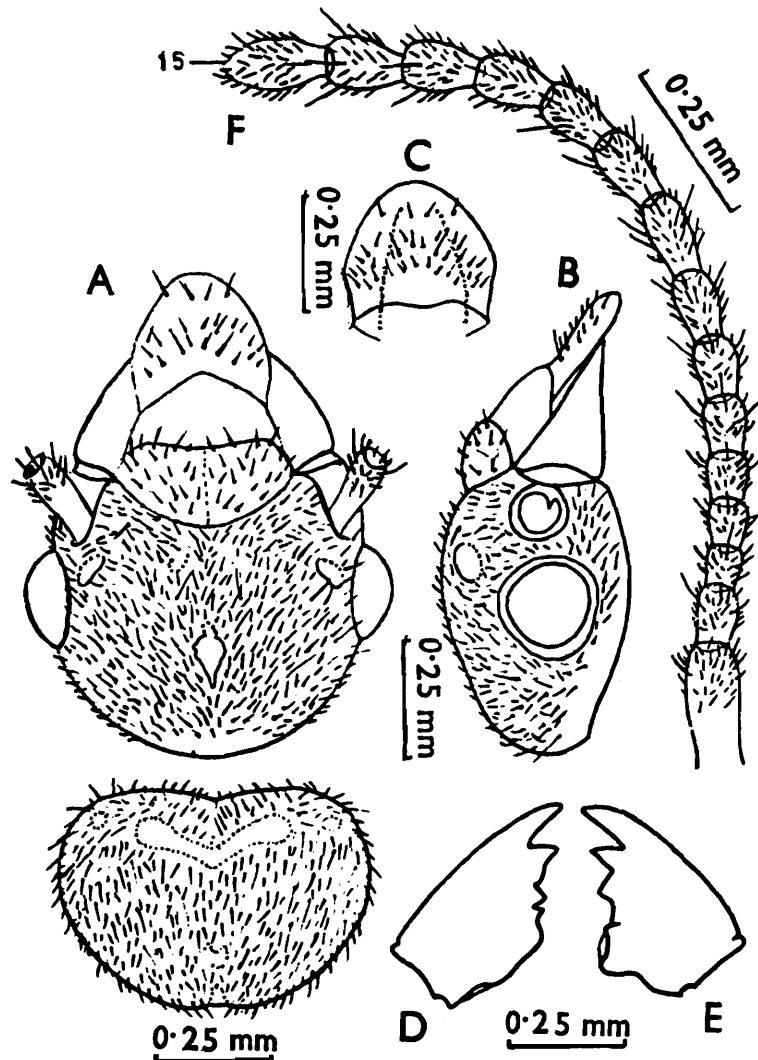


Fig. 115 : *Angulitermes emersoni*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Labrum. (D)-(E) Mandibles, left and right. (F) Antenna. (After Akhtar, 1975).

SOLDIER (Fig. 116) : Head yellowish brown; antennae brownish yellow; mandibles reddish brown; pronotum yellowish; legs and abdomen yellowish white. Head moderately hairy, more so on frontal projection. Pronotum less hairy than head; abdomen densely hairy. Head subrectangular (length to base of mandibles 0.84-0.98, max. width 0.75-0.79 mm); frontal projection with a broad rounded tip; in profile anterior margin slightly depressed and head without any depression behind frontal projection. Fontanelle gland large. Antennae with 14 segments; segments 2 and 3 subequal; 4 shortest. Labrum with deeply incurved anterior margin; antero-lateral corners pointed; with a single bristle on either

side. Mandibles long, slender, rod-like, hooked at tips; length more than head-length to base of mandibles (left mandible-length 1.0-1.06 mm); in profile very slightly incurved. Postmentum short, club-shaped, strongly arched (length 0.33-0.38, max. width 0.24-0.25 mm). Pronotum saddle-shaped; anterior margin weakly emarginate and posterior margin convex (length 0.14-0.17, width 0.35-0.40 mm).

Distribution : BANGLADESH.

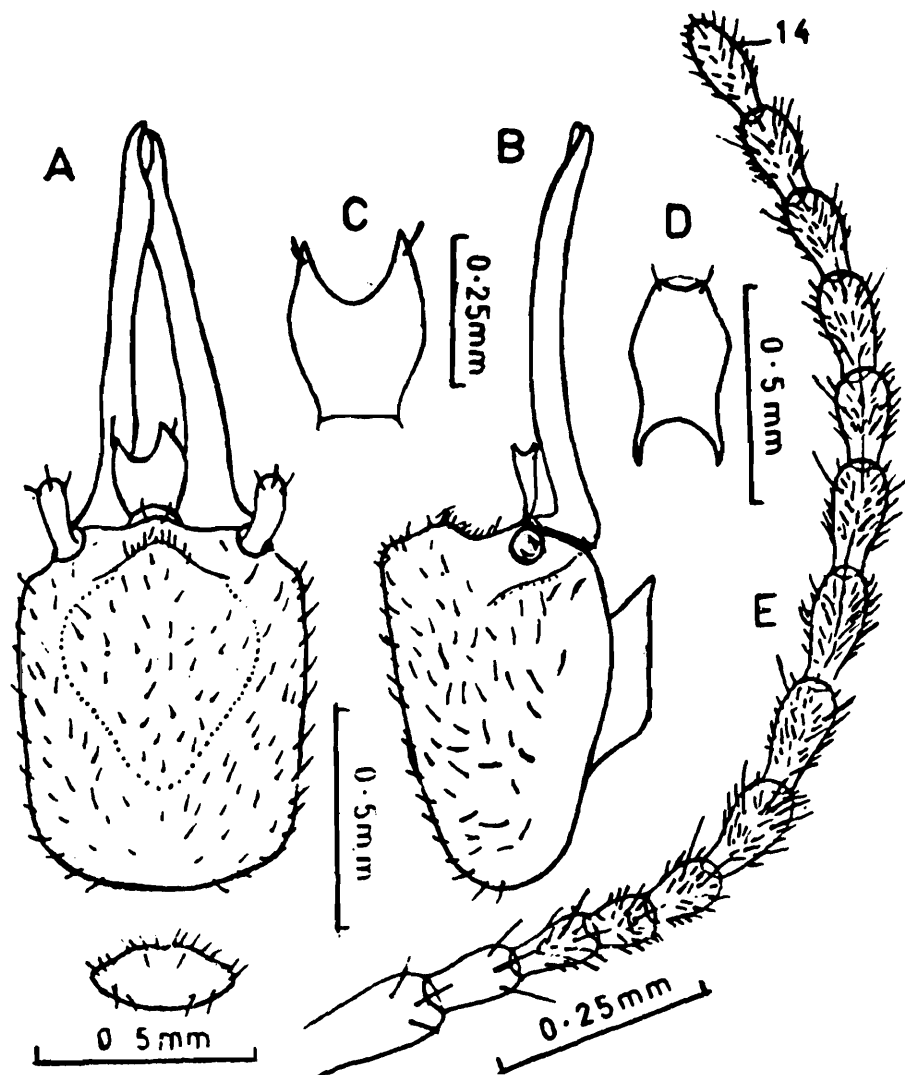


Fig. 116 : *Angulitermes emersoni*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Labrum. (D) Postmentum. (E) Antenna. (After Akhtar, 1975).

171. **Angulitermes fletcheri** (Holmgren and Holmgren)

(Fig. 117)

1. *Mirotermes fletcheri* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dep. Agric. India*, **5** : 168. S and W.
 Syntypes : In ZSI and probably in Riksmuseum, Stockholm. Type-
 localities : Hampi Ruins, Hospet Taluq and Hadagalli (Bellary Dist.),
 Karnataka, India,

1934. Margabandhu, *J. Bombay nat. Hist. Soc.* , **37** (3) : 710.

1953. Rattan lal and Menon, *Cat. Indian Insects, Pt. 27, Isoptera* : 51.

2. *Termes fletcheri* (Holmgren and Holmgren) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 180.

1958. Ahmad, *Biologia*, Lahore, **4** : 181.

3. *Angulitermes fletcheri* (Holmgren and Holmgren) :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 13. Referred to genus
Angulitermes for first time.

1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, **63** : 210, 218.

1977. Roonwal and Verma, *Ent. mthly. Mag.*, **112** : 9.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42: 81.

1984. Verma, *Rec. zool. Surv. India*, **81** (3 & 4) : 243, 245.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 138, 140, 141.

IMAGO : Unknown.

SOLDIER (Fig. 117) : Syntypes examined. Head-capsule pale yellow; antennae legs and body creamish; mandibles brown. Head sparsely and body fairly hairy, most of the hairs seem to have fallen off in the lectotype designated here. Total body-length 3.8-4.8 mm. Head-capsule subrectangular, sides substraight (length to tip of frontal projection 1.35-1.37, to base of mandibles 1.20, width 0.91-0.95 mm); frontal projection sharp, conical extending much beyond base of mandibles (length of frontal projection 0.22 mm). Antennae with 14 segments; segment 3 longer than 2; 4 slightly shorter than 2; segments long and narrow. Labrum with anterior margin deeply incurved (length 0.33, width 0.30 mm). Mandibles long, rod-like, hooked at tips; much longer than head-length to base of mandibles (1.43-1.45 mm, index left mandible-length/head-length 1.208).

Postmentum club-shaped (length 0.45, max. width 0.30, width at waist 0.25 mm). Pronotum strongly saddle-shaped (length 0.20, width 0.53 mm).

WORKER : Head-capsule pale yellow; antennae, legs and body whitish. Head moderately and body fairly densely hairy. Total body-length 3.8 mm. Head subcircular (length to tip of labrum 0.95-1.00, to base of mandibles 0.65-0.70, max. width 0.75-0.80 mm). Fontanelle plate pale, round, translucent. Antennae with 14 segments; segment 3 shorter than 2,4 shortest. Postclypeus strongly swollen; length slightly more than half of width (length 0.23, width 0.40 mm). Pronotum strongly saddle-shaped (length 0.18-0.20, width 0.45-0.49 mm).

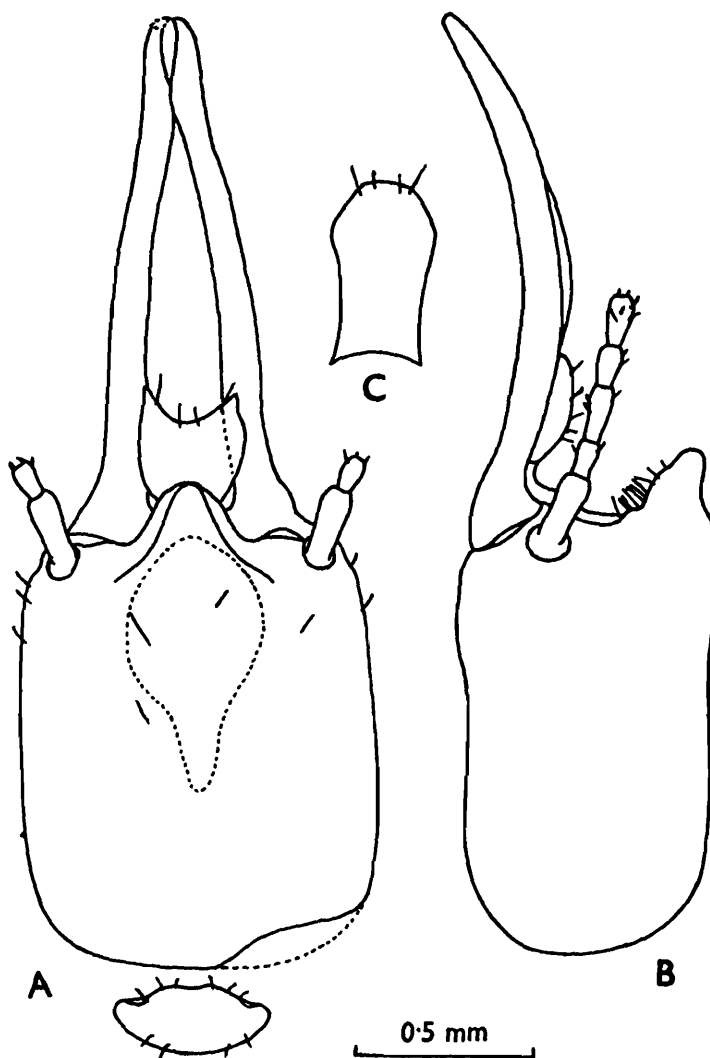


Fig. 117 : *Angulitermes fletcheri*. Lectotype soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Postmentum.

Lectotype : Soldier from Hadagalli, Bellary Dist., Karnataka, coll. T.B. Fletcher, 2.ix.1912, present in ZSI, is designated as lectotype, It measures as follows: Total body-length c 4.8, length of head with mandibles 2.60, length of head to base of mandibles 1.20, length of head to tip of frontal projection 1.35, max. width of head 0.95, max. height of head 0.68, length of frontal projection 0.22, length of mandibles : left 1.45, right 1.43, length of postmentum 0.45, max. width of postmentum 0.30, width of postmentum at waist 0.25, length of pronotum 0.20, max. width of pronotum 0.53 mm.

Distribution and type-locality : Since the lectotype designated is from Hadagalli in District Bellary, Karnataka, India, it may be taken as the type-locality. The species is known from Hadagalli and Hospet in Bellary Dist.

172. *Angulitermes hussaini* Ahmad

(Fig. 118)

Angulitermes hussaini Ahmad :

1955. Ahmad, *Biologia*, Lahore, **1** : 259, 260-261. S only Holotype: S, in PU. Type-locality : Larkana, Sind, Pakistan.
- 1958, Ahmad, *Biologia*, Lahore, **4** : 182.
1961. Mathur and Sen-Sarma, *Ann. Mag. nat. Hist.*, (13) **3** (31) : 405-406.
1962. Roonwal, *Termites Humid Tropics* : **41**. (UNESCO).
1962. Harris, *Ann. Mag. nat. Hist.*, (13) **5** (31) : 311, 312.
1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 11.
1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, **63** : 210,218.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A-17-FS-12) : 63, fig. 76.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab* (N.S.), Art. 7: 165-166.
1977. Roonwal and Verma, *Ent. mthly. Mag.*, **112** (1976) : 9.
1984. Verma, *Rec. zool. Surv. India*, **81** (3 & 4) : 243, 246.

IMAGO : Unknown.

SOLDIER (Fig. 118) : Head-capsule yellowish brown; antennae pale brown; mandibles light reddish brown; pronotum slightly paler than head. Sparsely hairy. Head-capsule subrectangular, widest anteriorly (length

to base of mandibles 0.87-1.16, max. width 0.81-0.90 mm); frontal projection narrowly rounded at tip and insinuate in middle at anterior margin, not extending beyond base of mandibles. Antennae with 14 segments; segment 3 a little longer than 2, 4 shortest. Labrum weakly narrowed at anterior margin. Mandibles long, slender, rod-like and incurved at tip; longer than head-capsule (length of left mandible 1.25-1.33 mm). Postmentum club-shaped, short (length 0.44, max. width 0.25-0.27 mm). Pronotum strongly saddle-shaped (length 0.16-0.29, max. width 0.39-0.46 mm); anterior margin not or weakly emarginate.

Distribution : PAKISTAN : Panjab, Sind.

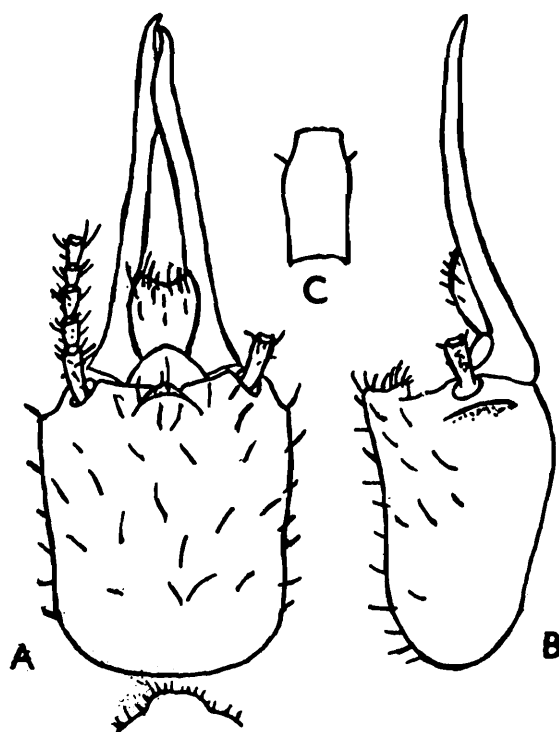


Fig. 118 : *Angulitermes hussaini*. Soldier. (A) Head and part pronotum, in dorsal view. (B) Head, side view. (C) Postmentum. (After Ahmed, 1955b).

173. *Angulitermes jodhpurensis* Roonwal and Verma

(Figs. 119,120)

1. *Angulitermes jodhpurensis* Roonwal and Verma (in Roonwal, Verma and Rathore and Roonwal) :

1974. Roonwal and Verma (in Roonwal, et al.), *Z. zool. Syst. Evolut.-forsch.*, **12**: 68, 69. Wing microsculpture.

1976. Roonwal and Verma (in Roonwal) *Zool. Jb. Syst.*, **103** : 464, 465, 467, 470, 474, 475, 477, 478, 479, 480, 488, 489. No description; only figure of soldier given on p. 465 and ecology and biology discussed.

2. *Angulitermes jodhpurensis* Roonwal and Verma :

1977. Roonwal and Verma, *Ent. mthly. Mag.*, **112** (1976) : 5-12, Im, S and W. Holotype: S, in ZSI. Type-locality: Jodhpur, Rajasthan, India.

1977. Roonwal and Verma, *Rec. zool. Surv. India.* **72** : 425, 428, 442-444.

1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (4) : 460, 461. Wing microsculpture.

IMAGO (Fig. 119) : Head brown, postclypeus paler than head; pronotum pale brown; body brownish yellow dorsally, paler ventrally; antennae and legs paler; wings pale brown, transparent. Head and

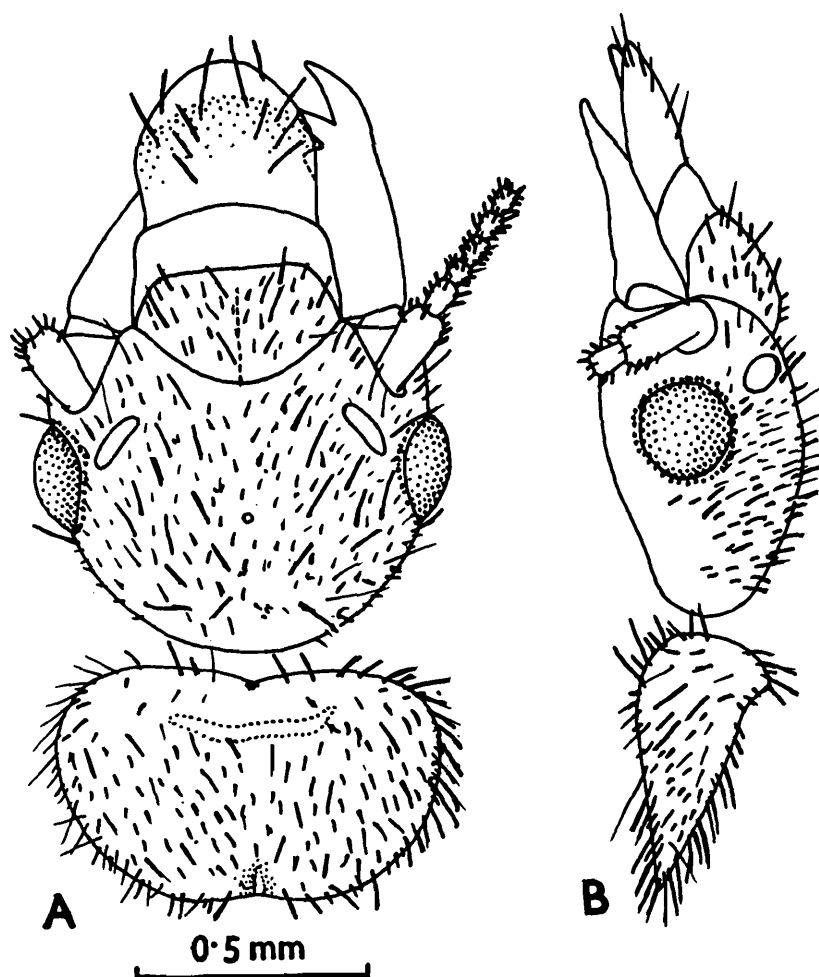


Fig. 119 : *Angulitermes jodhpurensis*. Paratype Imago. (A) Head and pronotum, in dorsal view. (B) Same, in side view.

pronotum moderately and abdomen densely hairy; wings with a few small hairs all over. Total body-length with wings 10.0-11.0 and without wings 6.0-7.0 mm. Head-capsule subcircular (length to tip of labrum 1.00-1.10, to base of mandibles 0.68-0.84, max. width with eyes 0.95-1.00 mm) ; Y-suture absent. Fontanelle plate minute, round, situated mid-dorsally. Eyes round, well projecting out (max. diameter 0.23-0.25, min. diameter 0.20-0.22 mm). Ocelli small, oval (length 0.09-0.11, width 0.06-0.09 mm) ; eye-ocellus distance half of width (0.036-0.045 mm). Antennae with 15 segments; segment 3 shortest; 4 slightly longer than 3 but shorter than 2. Postclypeus paler than head, pilose; swollen (length 0.25, width 0.48 mm). Pronotum almost as wide as head, subtrapezoidal (length 0.47-0.53, width 0.89-0.95 mm); anterior margin weakly incurved and with a faint notch; posterior margin convex, with a well marked notch. Wings pale brown with a few short hairs and numerous micrasters; forewing length 9.5, hindwing length 9.0 mm; venation as in genus; wing-microsculpture consists of papillae and non-asteroid (2-6 arms) and asteroid (5-7 arms) micrasters present all over membrane. Legs with 3:2:2 apical tibial spurs in the paramorphotype (Roonwal and Verma, 1977 mention 2:2:2).

SOLDIER (Fig 120) : Head dirty yellow to yellowish brown; antennae, legs and body paler; mandibles dark brown. Head and body sparsely hairy. Total body-length 3.70-4.70 mm. Head-capsule subrectangular, broader anteriorly (length with mandibles 2.42-2.74, length to base of mandibles 1.11-1.32, max. width 0.95-1.00 mm); frontal projection broadly rounded, reaching upto base of mandibles. Antennae with 14 segments; segment 3 as long as 2, 4 shortest. Labrum subrectangular with 2 or 3 short hairs; anterior margin weakly incurved, with sharply pointed, horn-like, lateral projections (length 0.25, width 0.21 mm). Mandibles slender, rod-like, slightly wavy and with weakly incurved distal tip; a little longer than head (length 1.32-1.42 mm, index left mandible-length/head-length 1.10-1.19). Postmentum short, club-like (length 0.32, max. width 0.27, min. width 0.23 mm). Pronotum strongly saddle-shaped; anterior margin distinctly emarginate (length 0.21, max. width 0.58-0.63 mm). Legs with 3:2:2 apical tibial spurs (not 2:2:2 as given by Roonwal and Verma, 1977).

WORKER : Head-capsule pale yellow; antennae, legs and thorax whitish; abdomen transparent. Head and body moderately hairy. Total body-length 3.30-4.20 mm. Head-capsule subcircular (length to base of mandibles 0.68-0.74, max. width 0.78-0.79 mm). Fontanelle indistinct. Antennae with 14 segments; segment 4 shortest. Postclypeus swollen, fairly hairy; length about half of width; not divided into two halves. Pronotum strongly saddle-shaped (length 0.21, max. width 0.53 mm); anterior and posterior margins not notched. Legs with 3:2:2 apical tibial spurs (not 2:2:2 as given by Roonwal and Verma, 1977).

Distribution : INDIA : Rajasthan (Jodhpur, type-locality), known only from the type-locality.

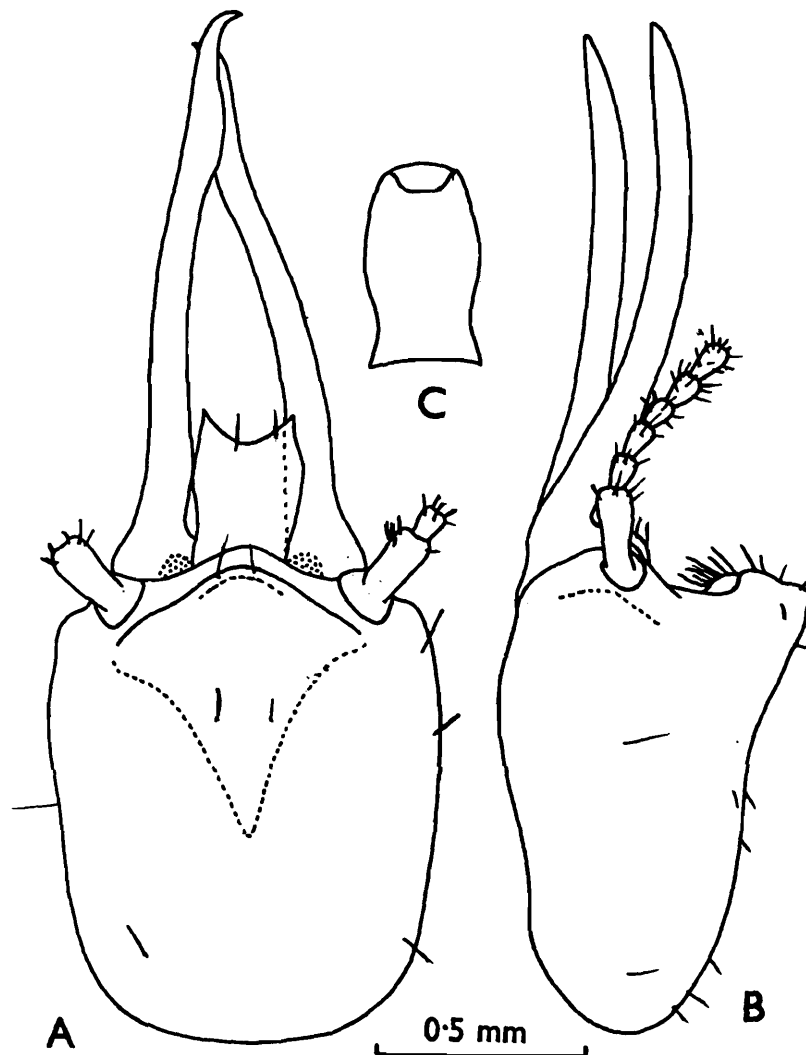


Fig. 120 : *Angulitermes jodhpurensis*. Paratype soldier. (A) Head, in dorsal view. (B) Head, in side view. (C) Postmentum.

174. *Angulitermes kashmirensis* Roonwal and Chhotani

(Figs. 121,122)

1. *Angulitermes kashmirensis* Roonwal and Chhotani :

1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, **63** : 210-213, 219, 220-222. S and W. Holotype : S, in ZSI. Type-locality About 10 km E of Chineni near confluence of River Tawi and Binisangh Nallah, Dist. Udhampur (J. & K. State, India).

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*. No. 9 : 32.

1984. Verma, *Rec. zool. Surv. India*, **81** (3 & 4) : 243, 247-248.

IMAGO : Unknown.

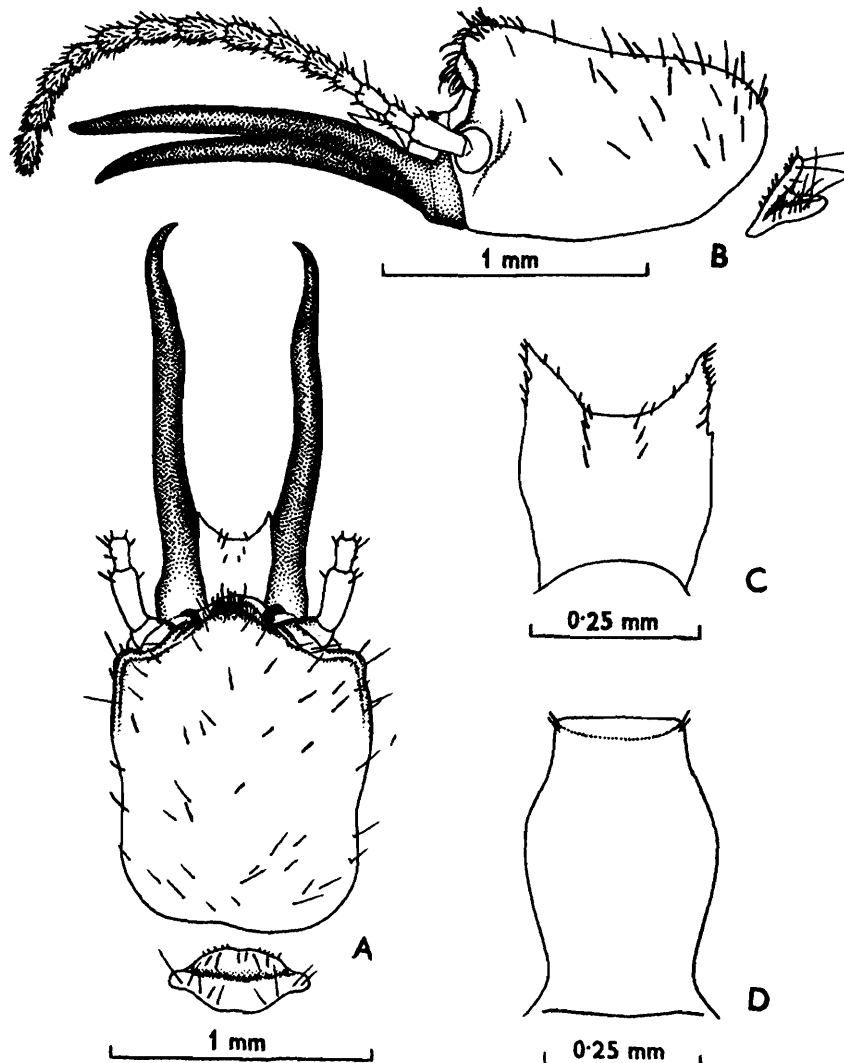


Fig. 121 : *Angulitermes kashmirensis*. Holotype soldier. (A) Head and pronotum, in dorsal view. (B) Same, in side view. (C) Labrum. (D) Postmentum. (After Roonwal and Chhotani, 1971).

SOLDIER (Fig. 121) : Head-capsule pale yellow to light orange yellow; antennae, body and legs paler; mandibles dark brown. Head moderately and body fairly densely hairy, frontal projection and fontanelle region more hairy than rest of head. Total body-length 5.2 mm. Head-capsule subrectangular, sides wavy; broadest at anterior one-third; frontal projection broad, projected a little and indented (length to base of mandibles 1.20-1.30, length upto frontal projection 1.17-1.29, max. width 1.00 mm). Antennae with 14 segments; segment 3 club-shaped and longer than 2; 4 subequal to 2. Labrum subrectangular; anterior margin deeply and broadly incurved; antero-lateral margins projected in front, horn-like and faintly serrated on outer side (length 0.30-0.33, width 0.27-0.28 mm). Mandibles long, slender, rod-like; much longer than head (1.43-1.47 mm, index left mandible-length/head-length to base of mandibles 1.14-1.23). Postmentum short, club-shaped; widest a little above middle; waist near posterior end (length 0.47, max. width 0.31-0.33, width at waist 0.23-0.27 mm). Pronotum strongly saddle-shaped; anterior margin weakly notched (length 0.20, width 0.47-0.50 mm).

WORKER (Fig. 122) : Head-capsule pale yellow; antennae, thorax and legs whitish; abdomen semi-transparent. Head and body fairly densely

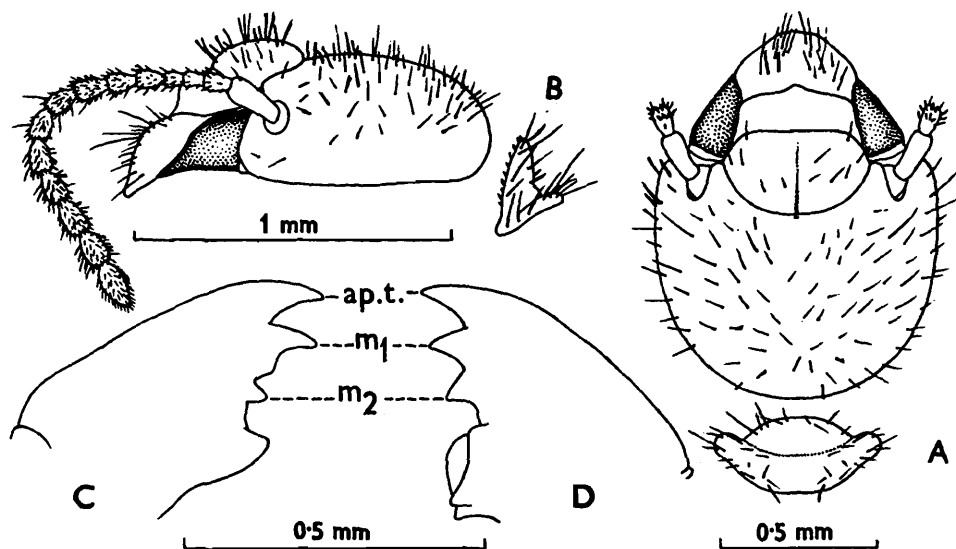


Fig. 122 : *Angulitermes kashmirensis*. Morphotype worker. (A) Head and pronotum, in dorsal view. (B) Same, in side view. (C) and (D) Left and right mandibles. (After Roonwal and Chhotani, 1971).

hairy. Total body-length 3.9-4.5 mm. Head-capsule subcircular (length to tip of labrum 1.10-1.17, to base of mandibles 0.70-0.80, max. width 0.87-0.90 mm). Antennae with 14 segments; segment 4 shortest. Postclypeus strongly swollen, hairy; length half of width (length 0.23-0.25, width 0.47-0.50 mm). Pronotum strongly saddle-shaped; notched at anterior and posterior margins (length 0.20-0.23, width 0.47-0.50 mm).

Distribution : INDIA : Jammu and Kashmir (Udhampur Dist.) , known only from type-locality i.e. 10 km east of chineni.

175. *Angulitermes keralai* Verma

(Fig. 123)

Angulitermes keralai Verma :

1984. Verma, *Rec. zool. Surv. India*, **81** (3 & 4) : 239-243, 245. S and W.
Holotype : S, in ZSI. Type-locality Kondazhi, Kerala. (Spellings of genus wrongly printed as *Augulitermes*).

IMAGO : Unknown.

SOLDIER (Fig. 123) : Head-capsule yellowish; antennae, labrum and legs pale yellow; thorax and abdomen whitish. Head fairly and body moderately hairy. Total body-length 3.5-3.75 mm. Head-capsule subrectangular; sides slightly convex; frontal projection sharply pointed and long, extending much beyond base of mandibles (length of head to base of mandibles 1.00-1.08, length to tip of frontal projection 1.22-1.25, max. width 0.80-0.88 and length of frontal projection 0.22 mm). Antennae with 14 segments; segment 3 slightly longer than 2; 4 shortest. Labrum deeply incurved at anterior margin (length median 0.22, max. width 0.28 mm). Mandibles longer than head (length 1.11 mm, index mandible-length/ head-length 1.08), otherwise as in genus. Postmentum club-shaped (length 0.42, max. width 0.28, width at waist 0.22 mm). Pronotum saddle-shaped, without any emargination on anterior and posterior margins (length 0.14, width 0.42 mm).

WORKER : Head-capsule pale yellow; antennae, thorax, legs and abdomen whitish. Head-capsule and body fairly hairy. Total body-length 3.30 mm. Head-capsule subcircular (length to tip of labrum 0.94, to base of mandibles 0.61, max. width 0.80 mm). Antennae with 10+ segments; segment 3 shortest. Postclypeus half as long as wide, swollen and hairy

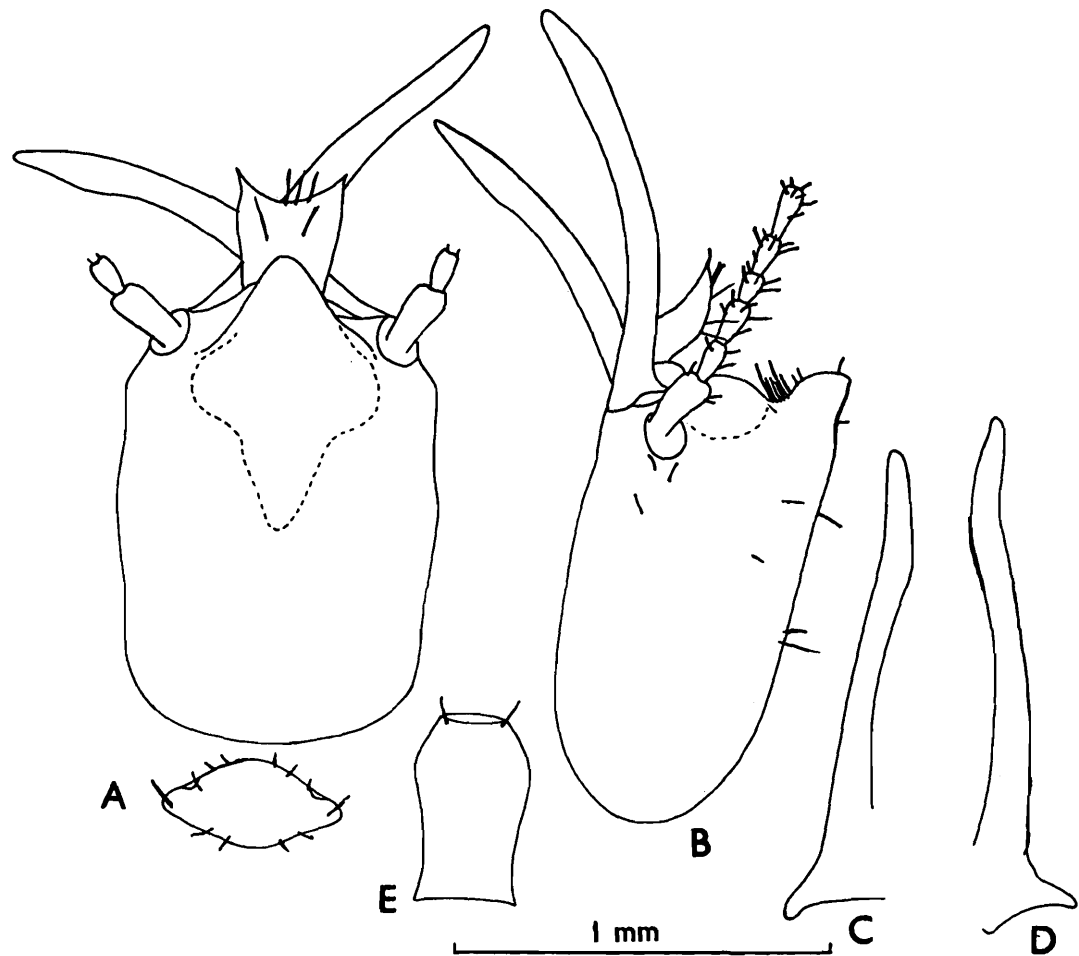


Fig. 123 : *Angulitermes keralai*. Paratype soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) and (D) Left and right mandibles. (E) Postmentum.

(length 0.19, width 0.36 mm). Pronotum saddle-shaped (length 0.28, width 0.53 mm); without any emargination on anterior and posterior margins.

Distribution : INDIA : Kerala : Kondazhi, type-locality. Known only from the type-locality.

176. *Angulitermes longifrons* Maiti

(Fig. 124)

Angulitermes longifrons Maiti :

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 77-82, maps 1 & 3. S and W. Holotype : S, in ZSI. Type-locality: Gidhni (Dist. Midnapur, West Bengal, India).

IMAGO : Unknown.

SOLDIER (Fig. 124) : Holotype examined. Head-capsule bright yellow; antennae yellowish; mandibles dark reddish brown; body and legs whitish. Head-capsule fairly and body densely hairy. Total body-length 3.7-4.10 mm. Head-capsule subrectangular and antero-lateral corners prominently projecting in front; frontal projection prominent, sharp, cone-like, extending much beyond base of mandibles and covering almost whole of labrum (length to base of mandibles 1.10-1.15, length to tip of frontal projection 1.34-1.44, max. width 0.85-0.88 mm). Fontanelle gland large. Antennae with 14 segments; segment 3 slightly longer than 2; 4 shortest. Labrum deeply incurved at anterior margin (length 0.23-0.27, width 0.21-0.23 mm). Mandibles longer than head, long, slender, rod-like (length 1.24-1.38 mm, index left mandible-length/ head-length 1.10-1.21).

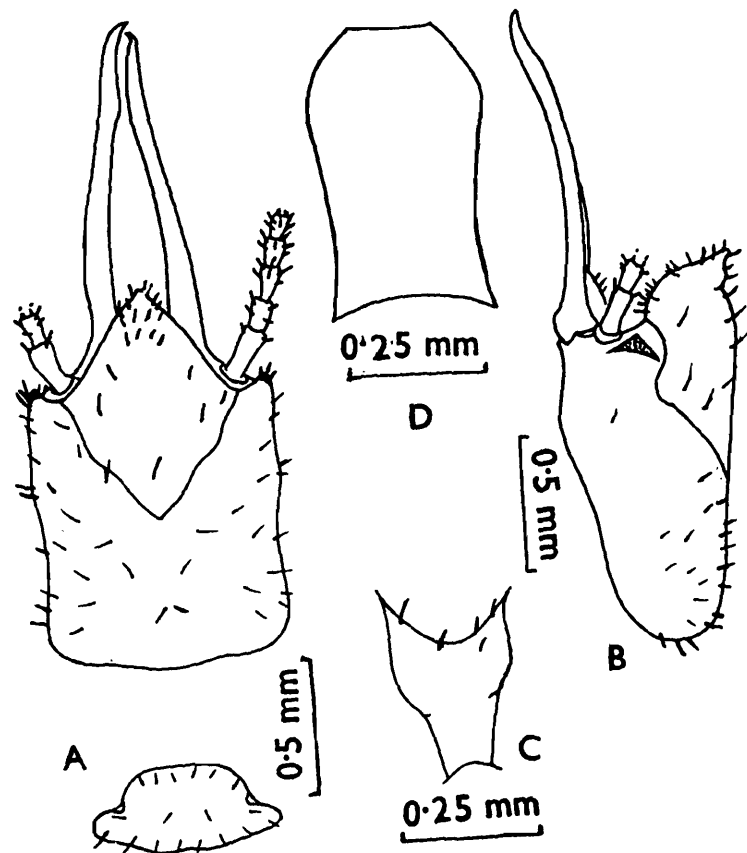


Fig. 124 : *Angulitermes longifrons*. Holotype soldier. (A) Head and pronotum, in dorsal view. (B) Head, side view. (C) Labrum. (D) Postmentum. (Ex Maiti, 1983).

Postmentum short, club-shaped, weakly narrowed at waist (length 0.36-0.40, max. width 0.28-0.34, min. width 0.20-0.24 mm, contraction index 0.70-0.85). Pronotum strongly saddle-shaped, anterior margin without notch (length 0.11-0.15, max. width 0.38-0.44 mm). Legs and abdomen as in genus.

WORKER : Head-capsule pale yellow; thorax and legs whitish. Head and body fairly densely pilose. Total body-length 3.90-4.10 mm. Head-capsule subcircular (length to tip of labrum 0.90-0.98, length to base of mandibles 0.70, max. width 0.80 mm). Antennae with 14 segments; segments 3 and 4 subequal. Postclypeus swollen, hairy; length about half of width (length 0.18-0.24, width 0.36-0.42 mm). Pronotum strongly saddle-shaped (length 0.18-0.24, width 0.40-0.45 mm).

Distribution : INDIA : West Bengal (Gidhni, Midnapur Dist., type-locality). Known only from the type-locality.

177. *Angulitermes mishrai* Sen-Sarma and Thakur

(Fig. 125)

Angulitermes mishrai Sen-Sarma and Thakur :

1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 18-20. S and W. Holotype : S, in FRI. Type-locality: Zoelchara, Ambasa, Tripura, India.

1984. Verma, *Rec. zool. Surv. India*, **81** (3 & 4) : 246.

IMAGO : Unknown.

SOLDIER (Fig. 125) : Head-capsule pale yellow; antennae yellowish; mandibles reddish brown. Head fairly and body densely hairy. Total body-length 2.83-3.30 mm. Head-capsule subrectangular, widest anteriorly (length to base of mandibles 0.90-1.00 mm, to tip of frontal projection 0.88-1.03, max. width 0.68-0.78 mm, index width/length 0.75-0.85); frontal projection broadly rounded and round at anterior margin, extending upto about base of mandibles. Antennae with 14-segments; segment 3 slightly shorter than 2,4 shortest. Labrum broadly incurved at anterior margin (length 0.20, width 0.18 mm). Mandibles long, slender, rod-like; about as long as head (length 0.93-1.00 mm, index left mandible-length/head-length

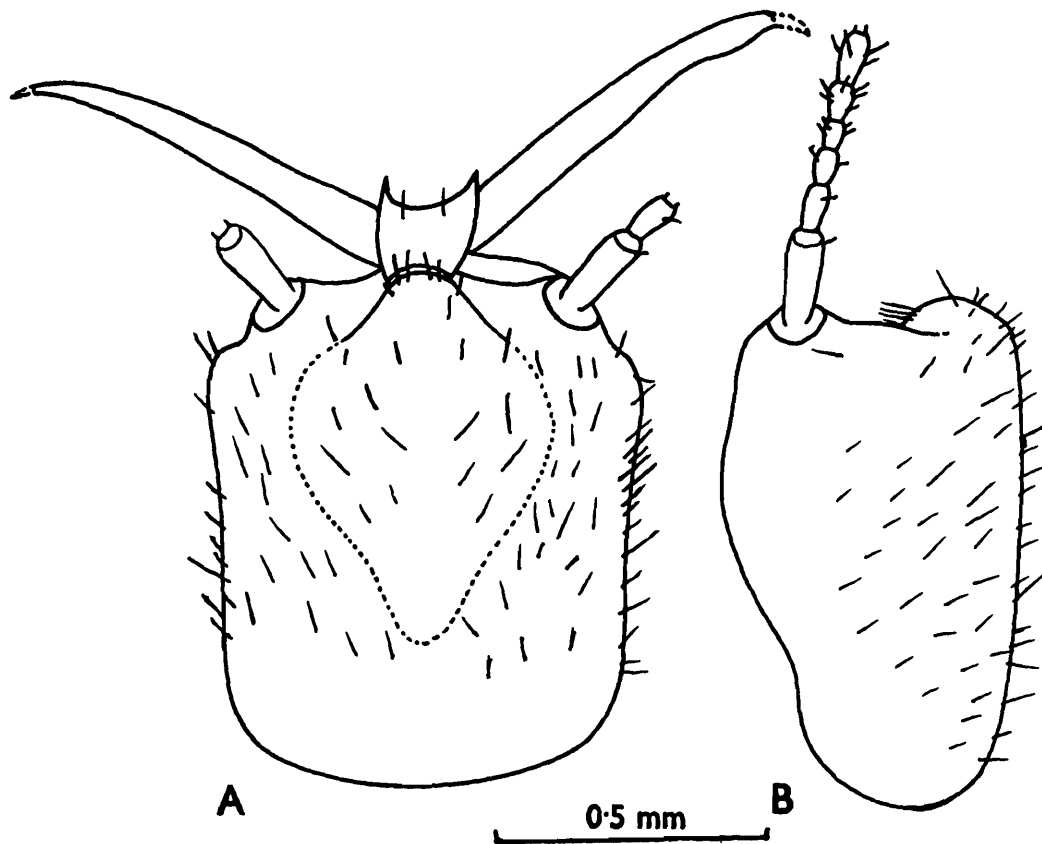


Fig. 125 : *Angulitermes mishrai*. Paratype soldier. (A) Head, in dorsal view. (B) Head-capsule, in side view (mandibles not shown).

1.00-1.10). Postmentum club-shaped, weakly incurved at waist (length 0.35-0.40, max. width 0.25-0.28, width at waist 0.21-0.25 mm). Pronotum strongly saddle-shaped (length 0.13-0.18, width 0.30-0.38 mm); anterior margin without any notch.

WORKER : Head-capsule yellowish white to pale yellow; antennae and body paler than head. Head and body fairly pilose. Total body-length 2.75-3.40 mm. Head-capsule subcircular (length to tip of labrum 0.80-0.90, length to base of mandibles 0.50-0.63, max. width 0.65-0.70 mm). Antennae with 14 segments; segment 2 longer than 3; 4 subequal to or slightly shorter than 3. Postclypeus swollen, hairy; length about half of width. Pronotum strongly saddle-shaped (length 0.13-0.15, max. width 0.33-0.38 mm).

Distribution : INDIA : Tripura : (Zoelchara, Ambasa, type-locality and Tiliamura).

178. *Angulitermes obtusus* (Holmgren and Holmgren)

(Fig. 126)

1. *Mirotermes obtusus* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dep. Agric. India*, **5** : 168. S and W. Syntypes : S and W, in ZSI. Type-locality; Hospet (Bellary Dist.), Karnataka, India.

1934. Margabandhu, *J. Bombay nat. Hist. Soc.* , **37** (3) : 170.

1944. Gardner, *Indian J. Ent.*, **6** : 110.

1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27, Isoptera* : 51.

2. *Termes obtusus* (Holmgren and Holmgren) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 184.

3. *Angulitermes obtusus* (Holmgren and Holmgren) :

1955. Ahmad, *Biologia*, Lahore, **1** : 260.

1962. Harris, *Ann. Mag. nat. Hist.*, (13) **5** (31) : 311, 312.

1962. Mathur and Thapa, *Indian For. Leaflet*, No. 167 : 107.

1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, **63** : 210,218.

1974. Akhtar, *Biologia*, Lahore, **20** : 61.

1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 13, 63.

1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 204-205.

1984. Verma, *Rec. zool Surv. India*, **81** : 243, 247.

IMAGO : Unknown.

SOLDIER (Fig. 126) : Syntypes examined. Head-capsule pale yellow; antennae, labrum and legs whitish; abdominal tergites and sternites transparent. Head scantily hairy, frontal projection however with several long hairs; body fairly hairy; hairs seem to have fallen off in the syntypes, Total body-length 4.5-4.8 mm. Head-capsule subrectangular, wider anteriorly (length with mandibles 2.60-2.65, to base of mandibles 1.15-1.18, to tip of frontal projection 1.20, max. width 0.90-0.93 mm); frontal projection broadly rounded in dorsal view, in side view slightly raised and substraight at anterior margin (length 0.08-0.10 mm). Fontanelle lying below frontal projection; fontanelle gland large. Antennae with 14

segments; segment 3 subequal to 2; 4 shortest. Labrum deeply incurved at anterior margin (length 0.25-0.28, width 0.20-0.25 mm). Mandibles long, slender, rod-like, much longer than head (length : left 1.45-1.48, right 1.43 mm, index left mandible-length/head-length to base of mandibles 1.28). Postmentum club-shaped, very slightly narrowed at waist.

Measurements (in mm, of Lectotype, selected here) : Total body-length 4.60, head-length to base of mandibles 1.15, head-length to tip of frontal projection 1.20, max. width of head 0.90, length of frontal projection 0.10, length of labrum 0.25, width of labrum 0.20, length of left mandible 1.475, length of right mandible 1.43, length of postmentum 0.43, max. width of postmentum 0.275, width of postmentum at waist 0.25, length of pronotum 0.25, max. width of pronotum 0.50 mm.

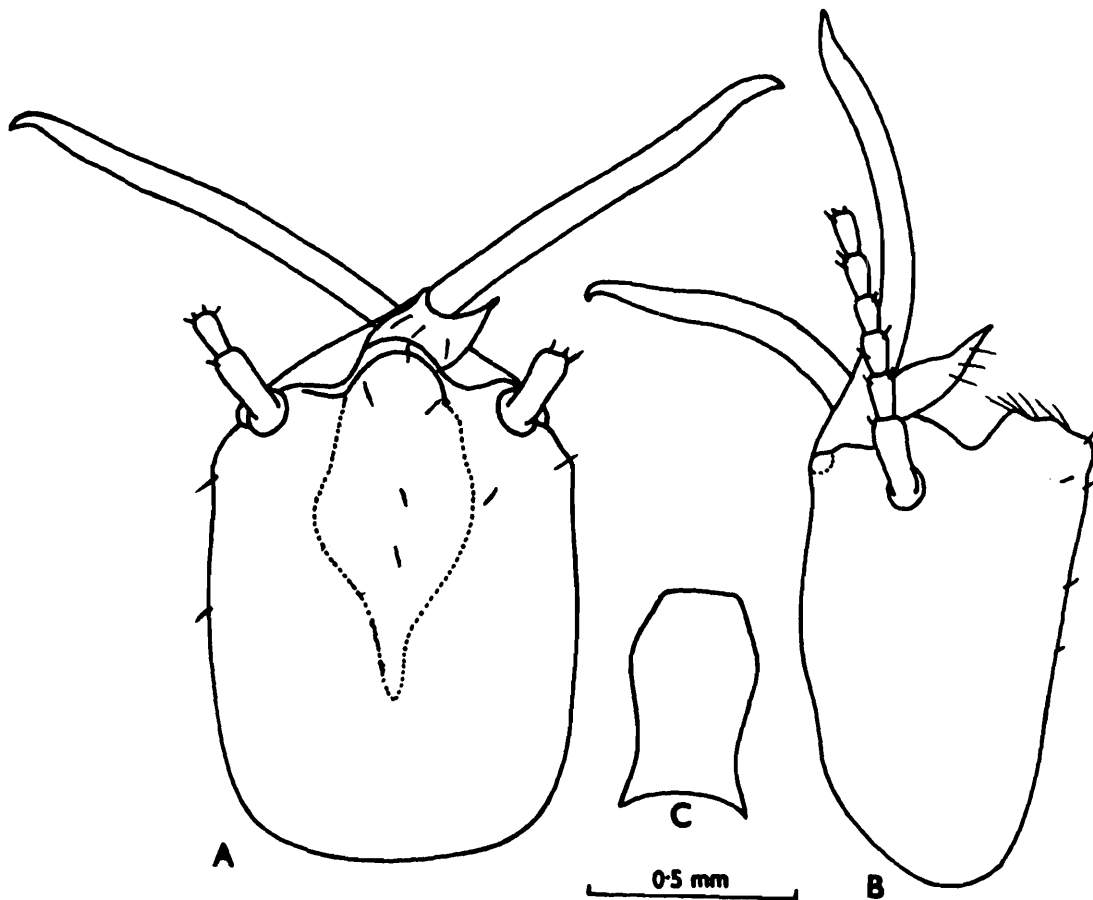


Fig. 126 : *Angulitermes obtusus*. Lectotype soldier. (A) Head, dorsal view. (B) Head, side view. (C) Postmentum.

WORKER : Head creamish; thorax, legs and antennae whitish; abdomen transparent. Head and body fairly hairy. Total body-length 3.4-3.5 mm. Head subcircular (length to tip of labrum 1.0, length to base of mandibles 0.65, max. width 0.80-0.89 mm). Fontanelle plate small, oval. Antennae with 14 segments; segment 3 shorter than 2, 4 shortest. Postclypeus swollen (length 0.18, width 0.45-0.49 mm). Dorsal spur of foreleg tibia indistinct in syntypes examined.

Distribution : INDIA : Karnataka : Hospet (Bellary Dist.), type-locality and Siddapur.

179. *Angulitermes paanensis* Krishna

(Fig. 127)

Angulitermes paanensis Krishna :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 10-11. S. Holotype : S, in AMNH. Type-locality: Yegaw, Paan, Karen State, Burma.

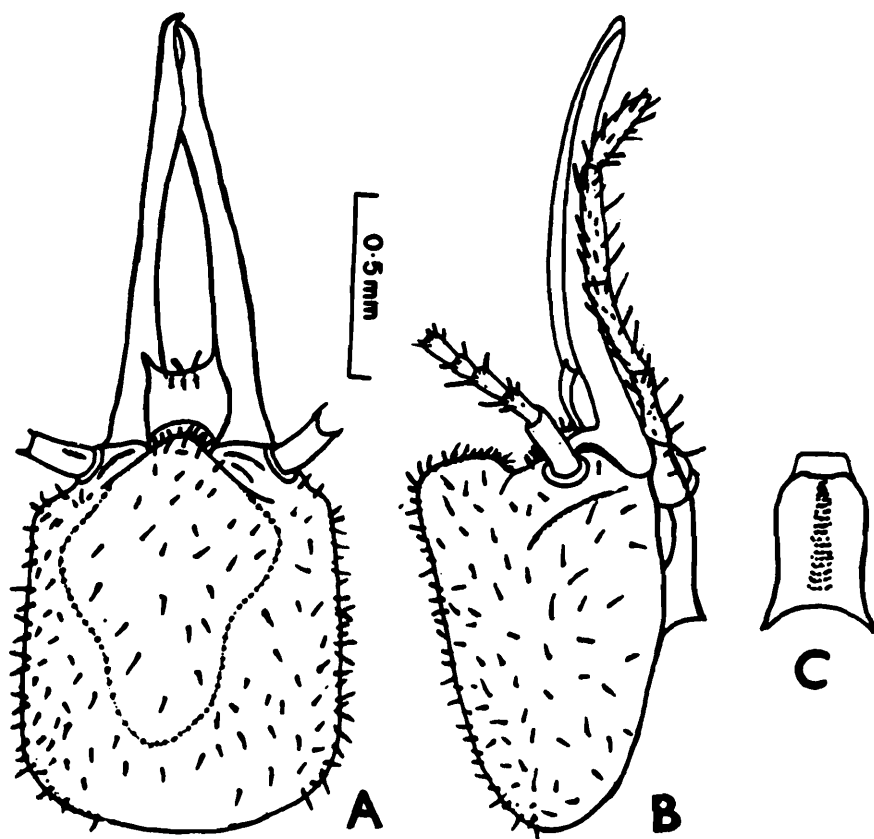


Fig. 127 : *Angulitermes paanensis*. Holotype soldier. (A) Head, dorsal view. (B) Head, side view. (C) Postmentum. (After Krishna, 1965b).

1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, **63** : 218.
 1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 32.
 1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 20.
 1984. Verma, *Rec. zool. Surv. India*, **81** (3 & 4) : 243, 246.

IMAGO : Unknown.

SOLDIER (Fig. 127) : Head-capsule pale yellow; antennae, labrum and pronotum paler than head; mandibles reddish brown. Head fairly densely and abdomen densely hairy. Head-capsule subrectangular, wider near posterior margin (length to base of mandibles 1.00, max. width 0.84 mm); frontal projection short, rounded, weakly convex at anterior margin and reaching upto base of mandibles. Antennae with 14 segments; 3 subequal to 2, 4 shortest. Labrum broadly incurved at anterior margin. Mandibles rod-like, slender and weakly incurved at tip; longer than head-capsule (left mandible- length 1.21 mm, index mandible-length/head-length 1.21). Postmentum club-shaped, weakly narrowed at waist (length 0.43, max. width 0.14, width at waist 0.12 mm). Pronotum saddle-shaped (length 0.15, width 0.33 mm).

Distribution : BURMA : Karen State (Yegaw, Paan, type-locality).
 Known only from the type-locality.

180. *Angulitermes punjabensis* Akhtar

(Fig. 128)

1. *Angulitermes punjabensis* Chaudhry, et al. (Nom. nud.) :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12): 63.

2. *Angulitermes punjabensis* Akhtar :

1974. Akhtar, *Biologia*, Lahore, **20** (1) : 59-61. S only. Holotype: S, in PU.
 Type locality: Choa Saidan Shah, Pakistan.

1984. Verma, *Rec. zool. Surv. India*, **81** (3 & 4) : 246.

IMAGO : Unknown.

SOLDIER (Fig. 128) : Head, antennae and labrum yellow with brownish tinge; mandibles dark brown; thorax and abdomen yellowish. Sparsely hairy. Head-capsule subquadrate, widest anteriorly and very

slightly longer than wide (length to base of mandibles 1.13, max. width 1.05 mm); frontal projection rounded, raised and pushed back at tip and convex at anterior margin, extending upto base of mandibles. Antennae with 14 segments; 2 and 3 subequal, 4 shortest. Labrum weakly and broadly incurved at anterior margin. Mandibles long, slender, rod-like, incurved at tip; much longer than head (length of left mandible 1.42 mm, index length of left mandible/head-length 1.256). Postmentum club-shaped (length 0.40, max. width 0.30 mm). Pronotum strongly saddle-shaped (length 0.18, width 0.49 mm); not emarginate at anterior or posterior margins.

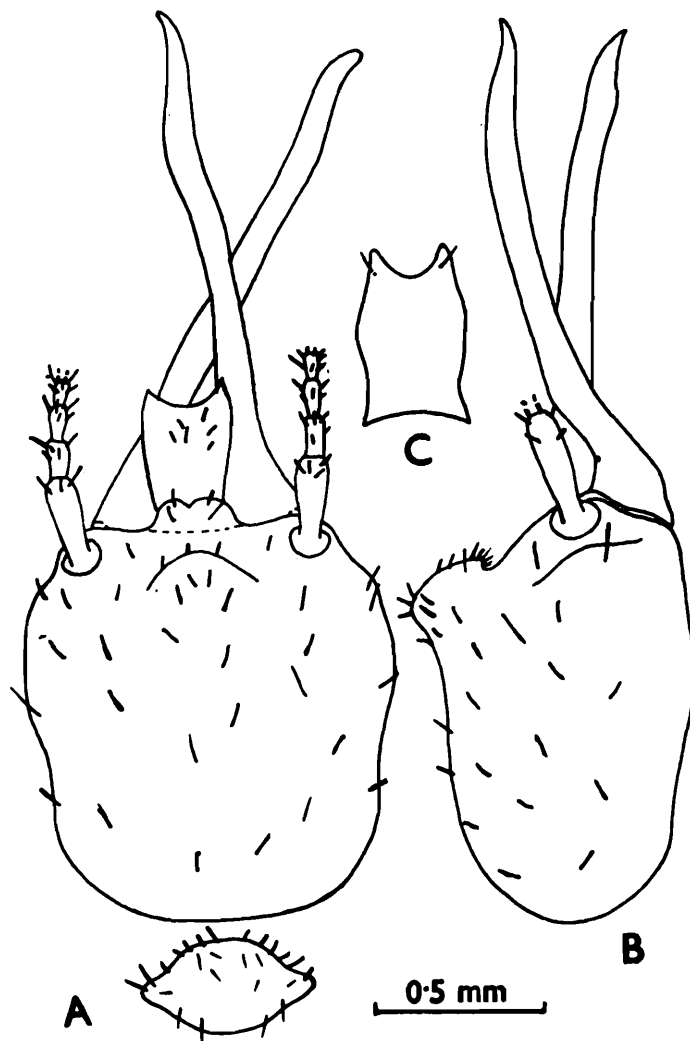


Fig. 128 : *Angulitermes punjabensis*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Postmentum. (Ex Akhtar, 1974a).

Distribution : PAKISTAN : Panjab (Choa Saiden Shah, type-locality), known only from the type-locality.

181. **Angulitermes ramanii** Bose and Das

(Fig. 129)

1. *Angulitermes ramanii* Bose and Das :

1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 198, 203-205. S Only.
Holotype: S, in ZSI. Type-locality : Barkuda Island, Chilka Lake, Orissa, India.

1987. Bose and Das, *Fauna of Orissa (State Fauna Sr. 1)* Pt. 1 : 105, 110.

IMAGO : Unknown.

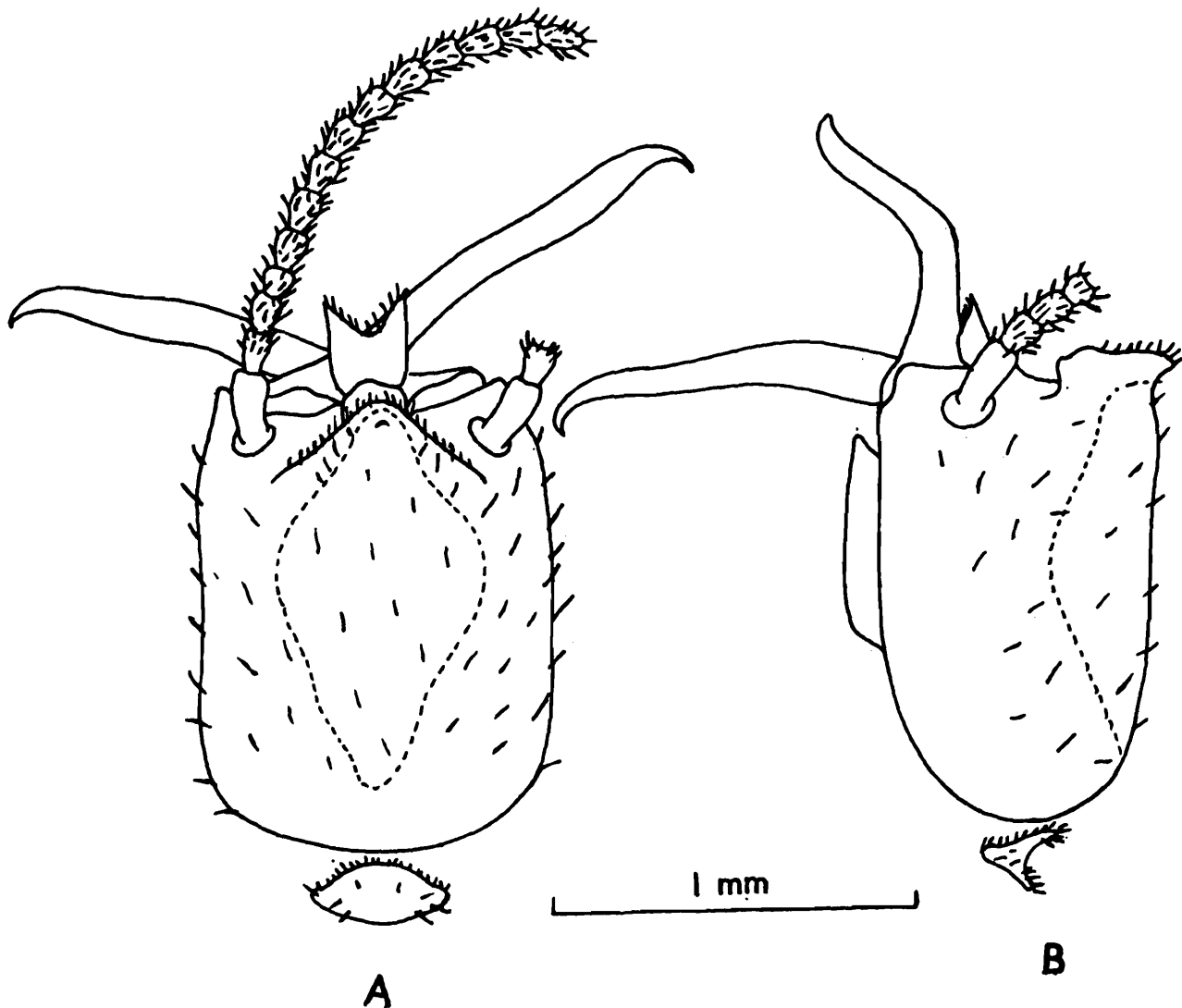


Fig. 129 : *Angulitermes ramanii*. Paratype soldier. (A) Head and pronotum, in dorsal view. (B) Same, in side view. (After Bose and Das, 1982).

SOLDIER (Fig. 129) : Head-capsule bròwnish yellow; antennae, labrum, legs and body pale yellow; mandibles dark reddish brown. Head and body fairly hairy. Total body-length 4.20-4.75 mm. Head-capsule subrectangular (length 1.18-1.20, max. width 0.88-0.91 mm); frontal projection conical, raised at tip and extending slightly beyond base of mandibles (length of head to frontal projection 1.28-1.33, length of frontal projection 0.13-0.15 mm). Antennae with 14 segments; segments 2 and 3 subequal, 4 shortest. Labrum deeply incurved at anterior margin (length 0.23-0.26, width 0.23 mm). Mandibles long, slender, rod-like, pointed and incurved at tip; slightly longer than head (length : left mandible 1.25, right mandible 1.18-1.23 mm, index left mandible-length/head length 1.04-1.05). Postmentum club-shaped, slightly narrowed at waist (length 0.50, max. width 0.31-0.32, width at waist 0.26-0.28 mm). Pronotum saddle-shaped (length 0.19-0.20, width 0.48-0.50 mm).

WORKER : Unknown.

Distribution : INDIA : Orissa (Barkuda Island, Chilka Lake, type-locality), known only from type-locality.

182. **Angulitermes resimus** Krishna

(Fig. 130)

Angulitermes resimus Krishna :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 11-13.

1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, **63** : 218.

1977. Chhotani, *Occ. Pap. Rec. zool. surv. India*, No. 9 : 32.

1983. Maiti, *Occ. Pap. Rec. zool. surv. India.*, No. 42 : 82.

1984. Verma, *Rec. zool. Surv. India* , **81** (3 & 4) : 247.

IMAGO : Unknown.

SOLDIER (Fig. 130) : Head-capsule pale yellow; antennae yellowish; mandibles reddish brown; pronotum and labrum paler than head and legs and abdomen whitish. Head and pronotum sparsely and body densely hairy. Head-capsule subrectangular, widest anteriorly; antero-lateral corners angular; frontal projection sharp, conical, raised at tip and sinuate at anterior margin, extending beyond base of mandibles (head-length to

base of mandibles 1.37-1.38, max. width 0.96-0.97 mm). Antennae with 14 segments; segment 3 longer than 2, 4 subequal to 2. Labrum deeply

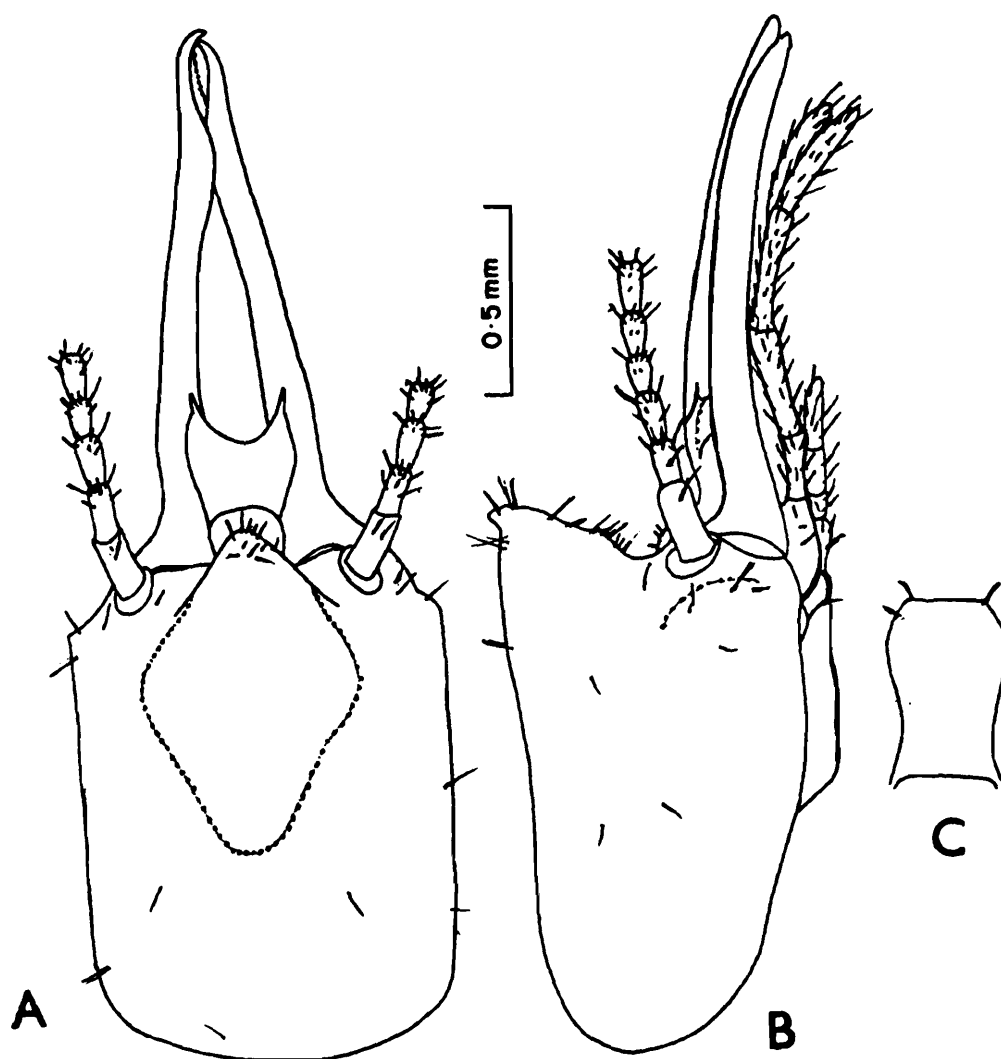


Fig. 130 : *Angulitermes resimus*. Holotype soldier. (A) Head, dorsal view. (B) Head, side view (C) Postmentum. (After Krishna, 1965b).

incurved at anterior margin. Mandibles long, slender, rod-like and incurved at tip (length of left mandible 1.38 and of right mandible 1.30-1.33 mm); subequal to head-length. Postmentum club-shaped, short (length 0.64-0.65, max. width 0.26-0.27, width at waist 0.20-0.21 mm). Pronotum saddle-shaped (length 0.23-0.26, max. width 0.55-0.57 mm); anterior margin without notch.

Distribution : BURMA : Maymyo, 20 miles east of Mandalay, type-locality. Known only from type-locality.

183. *Angulitermes tilaki* Roonwal and Chhotani

(Figs. 131-133)

Angulitermes tilaki Roonwal and Chhotani :

1971. Roonwal and Chhotani, *Rec. zool. Surv. India*, **63** (1-4) : 210, 213-217, 218, 220-222. S and W. Holotype : S, in ZSI. Type-locality: Approx. one km West of Chineni near confluence of River Tawi and Motorshed Nallah, Dist. Udhampur (J. & K. State, India).

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 32.

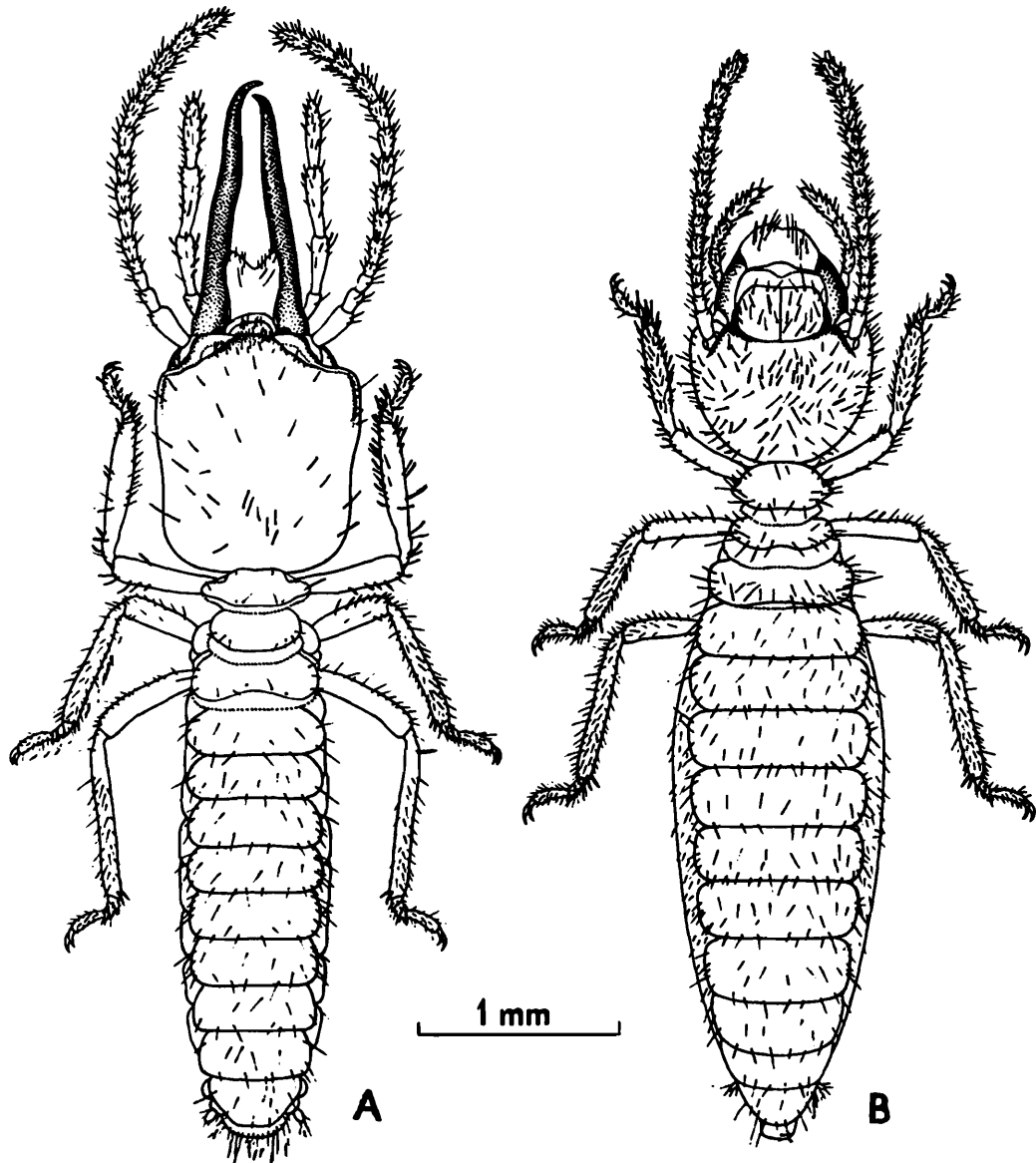


Fig. 131 : *Angulitermes tilaki*. (A) Holotype soldier, in dorsal view. (B) Morphotype worker, in dorsal view. (After Roonwal and Chhotani, 1971).

1984. Verma, *Rec. zool. Surv. India*, **81** (3 & 4) : 244, 247.

IMAGO : Unknown.

SOLDIER (Figs. 131A, 132) : Head-capsule pale yellow; antennae, labrum, legs and body whitish; mandibles dark brown. Head and body fairly pilose. Total body-length 4.60-4.90 mm. Head-capsule subrectangular, broader anteriorly; sides weakly incurving behind middle; frontal projection broadly rounded, not indented anteriorly (length to base of mandibles 1.13-1.20, length upto frontal projection 1.10-1.17, max. width 0.97-1.00 mm). Antennae with 14 segments; segment 3 shorter

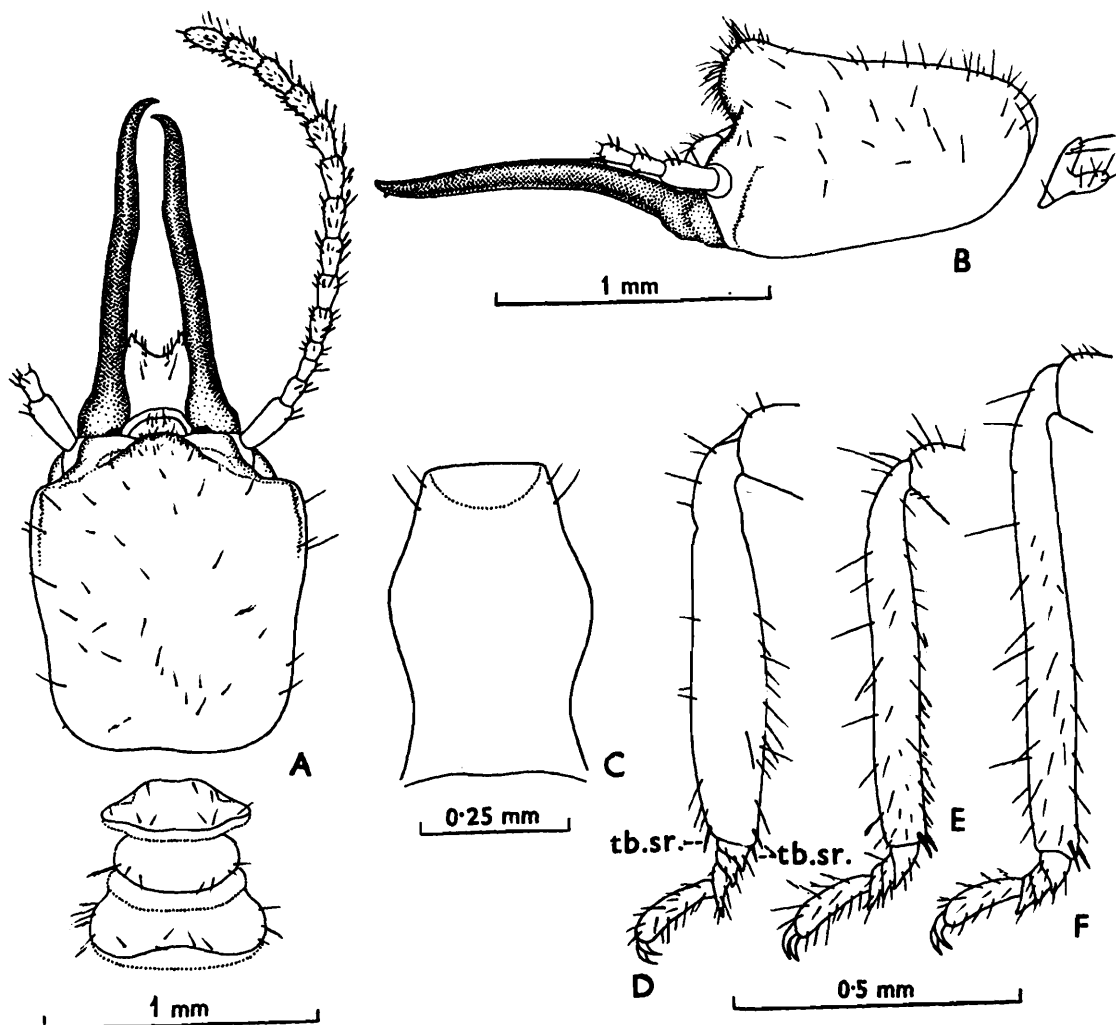


Fig. 132 : *Angulitermes tilaki*. Holotype soldier. (A) Head and thorax, in dorsal view. (B) Head and pronotum, in side view. (C) Postmentum. (D)-(F) Fore, middle-and hindlegs, tibia and tarsi only. (After Roonwal and Chhotani, 1971).

than 2; 4 shortest. Labrum subrectangular, deeply incurved at anterior margin, without serrations on side margins (length 0.28-0.31, width 0.25 mm). Mandibles rod-like, weakly incurved distally; length little more than head-length (length 1.27 mm, index left mandible-length/head-length 1.06-1.12). Postmentum club-shaped, short (length 0.47-0.50, max. width 0.33, width at waist 0.27 mm); waist situated posteriorly. Pronotum strongly saddle-shaped; anteriorly faintly notched medially (length 0.17, width 0.50 mm).

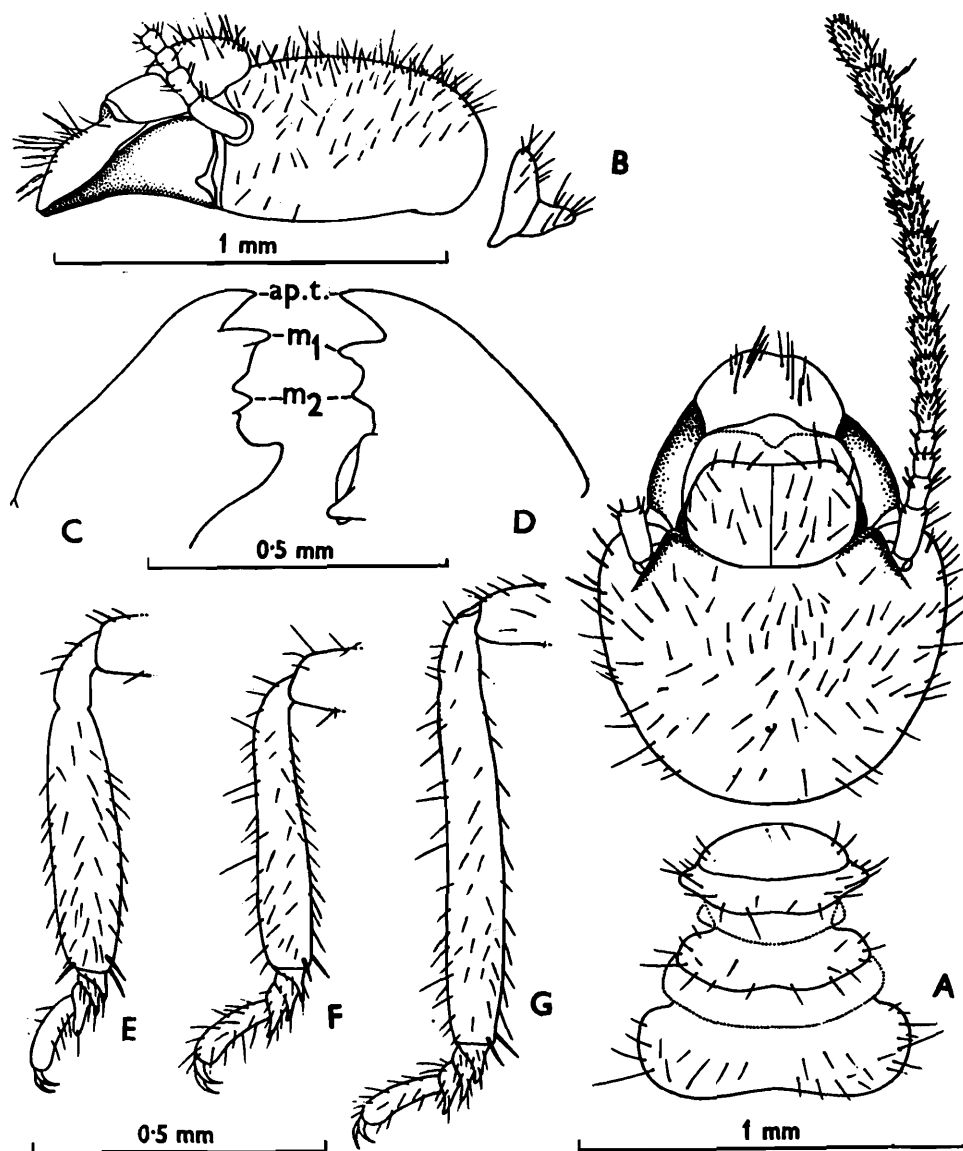


Fig. 133 : *Angulitermes tilaki*. Morphotype worker. (A) Head and thorax in dorsal view. (B) Head and pronotum, in side view. (C) and (D) Left and right mandibles. (E) - (G) Fore-middle-and hindlegs tibiae and tarsi only, (After Roonwal and Chhotani, 1971).

WORKER (Figs. 131B, 133) : Head-capsule pale yellow; antennae, labrum, legs and thorax whitish; abdomen semi-transparent. Head and body fairly densely hairy. Total body-length 4.40-5.00 mm. Head-capsule subcircular, broader than long (length to tip of labrum 1.10-1.17, length to base of mandibles 0.73-0.80, max. width 0.87-0.90 mm). Antennae with 14 segments; segment 3 shorter than 2; 4th shortest. Postclypeus strongly swollen, length a little more than half of width (length 0.25-0.27, width 0.43-0.47 mm). Pronotum strongly saddle-shaped, without any notch anteriorly (length 0.20, width 0.50 mm). The worker is very similar to that of *A. kashmirensis* but differs for its postclypeus being more swollen and longer than half the width (half its width in *A. kashmirensis*).

Distribution : INDIA : Jammu and Kashmir : One km west of Chineni (Udhampur Dist.), type-locality, known only from type-locality.

Genus 32. *Termes* Linn.

[Synonyms : *Termes* (*Eutermes*) part, *Eutermes* part and *Mirotermes* Wasmann]

1. Genus *Termes* Linn. :

1758. Linnaeus, *Systema Naturae*, 10th Ed. Vol. 1 : 609.
 1949. Snyder, *Smiths. misc. Colls.* **112** : 178. See for synonymy.
 1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** (Art. 2) : 72, 73.
 1955. Emerson, *Fieldiana : Zool.*, **37** : 477, 478, 480, 485, 488, 494, 512.
 1958. Ahmad, *Biologia*, Lahore, **4** (1 & 2) : 87, 91.
 1965. Bouillon and Mathot, *Zooleo*, No. 1 : 31.
 1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 8.
 1970. Weidner, *Handb. Zoologie*, **4** (Arthropoda-2 Halfte : Insecta) : 24.
 1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 143, 144.
 1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 351.
 1973. Chhotani and Bose, *Zool. Anz.*, **190** : 234, 235.
 1978. Coaton and Sheasby, *Ent. Mem. Dept. agric. Tech. Ser.*, No. 48: 1,2.
 1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (4) : 462, 463. Microsculpture.
 1982. Thapa, *Sabah For. Rec.*, No. 12: 7, 9.

1987. Chhotani, *Beitr. Ent.*, **37** : 409, 410.

Type of genus : *Termes fatalis* Linn.

1. *Characters of Genus Termes*

Imago : Medium sized, fairly hairy. Head subcircular. Fontanelle hyaline, elongate, narrow, slit-like. Eyes medium sized. Ocelli oval, situated close to eyes. Antennae with 15 segments. Postclypeus swollen, about 1/2 of width. Mandibles each with an apical and two marginals; apical large and widely separated from 1st marginal. Left mandible: 1st marginal with subequal anterior and posterior margins; 2nd marginal small, separated by a cut or notch; cutting edge between 1st and 2nd marginal much reduced; molar region projecting upto 1st marginal. Right mandible : 1st marginal with shorter posterior margin; 2nd marginal reduced, small and with a straight posterior margin; molar plate longer than posterior margin of 2nd marginal. Pronotum a little narrower than head and slightly raised at anterior margin. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Wings small narrow, transparent, punctate; hairy along margins and some hairs on membrane; microsculpture consists of papillae and micrasters; costa and radius thick, media and cubitus thin; media arising independently in forewing and jointly with radius in hindwing.

Soldier : Small, delicate, fairly hairy. Head-capsule subrectangular or subsquarish, frons produced into frontal pojection. Fontanelle transverse, situated below frontal projection. Antennae 14-segmented. Labrum with substraight or weakly incurved anterior margin and straight lateral margins; antero-lateral corners pointed. Mandibles rod-like, elongate, pointed apically and bow-shaped, bending down anteriorly. Pronotum saddle-shaped. Legs with 3: 2: 2 apical tibial spurs; tarsi 4-jointed.

Worker : Monomorphic. Small, pale, fairly hairy. Head subcircular. Mandibles as in imago. Pronotum and legs as in soldier.

2. *Distribution and Composition of Termes*

(Fig. 108)

Distribution : Genus *Termes* is cosmotropical in distribution, found in all the zoogeographical regions except the Palaeartic and the nearctic

regions. In the Oriental Region it is known from Burma, Thailand, Vietnam, Southern China, Malaysia, Singapore and Indonesia.

Composition : According to Coaton and Sheasby (1978), 46 species of the genus were known by the year 1977, of which 20 occurred in Australian, one in Papuan, 8 in Oriental, 5 in Ethiopian and 11 in Neotropical, regions. Chhotani (1987) had taken into account 53 species of which 11 were reported found in the Oriental Region and of these, only two (viz. *Termes lighti* Snyder and Emerson from Sri Lanka and *T marjoriae* Snyder from Burma) were taken to be from the Indian subregion. The species *T lighti* which was described as *Mirotermes (Mirotermes) ceylonicus* by Holmgren (1914b) has now been seen to belong to the genus *Angulitermes* vide supra, see "Remarks" under *Angulitermes ceylonicus* (Holmgren). Thus, only one species viz. *Termes marjoriae* Snyder is taken into account here under this genus.

184. *Termes marjoriae* Snyder

(Figs. 134,135)

1. *Mirotermes (Mirotermes) marjoriae* Snyder :

1934. Snyder, *Indian For. Rec.*, **20** (11) : 18-20. Im and S. Syntypes in BM, FRI and USNM. Type-locality : Selen, Burma.

2. *Termes marjoriae* Snyder :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 183.

1953. Roonwal and Pant, *Indian For. Leaflet*, No. 121(Pt. 3) : 60.

1962. Mathur and Thapa, *Indian For. Leaflet*. (Ent.) , No. 167 : 121.

1986. Gao and Lam, *Mem. Hongkong nat. Hist. Soc.*, **17** : 8.

IMAGO (Fig. 134) : Head-capsule light castaneous brown ; antennae, postclypeus, body and legs yellowish brown. Head and body densely hairy with fairly long hairs (hairs fallen off in syntype imago available here). Total body-length with wings c 10.0, without wings 6.25 mm. Head-capsule subcircular (length to base of mandibles 0.75, max. width 0.95-1.00 mm). Fontanelle hyaline, narrow, elliptical spot at middle of head. Eyes subcircular, fairly large, max. diameter 0.35 mm; very close to lateral margin of head. Ocelli small, hyaline, suboval (long diameter 0.10, short

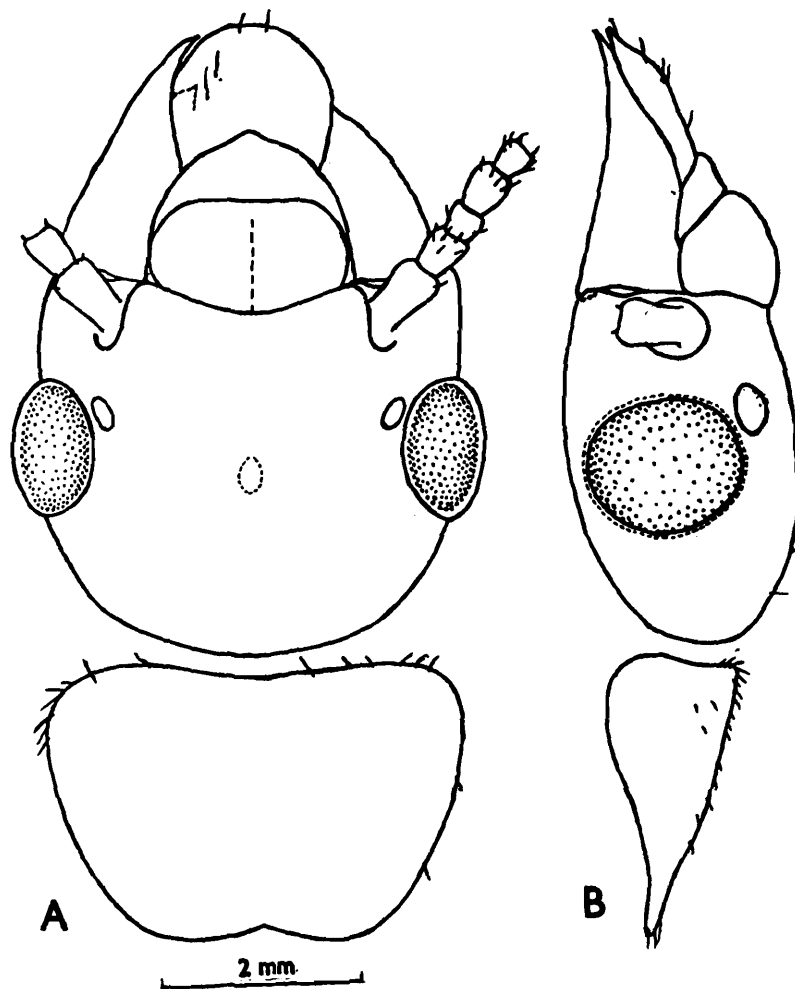


Fig. 134 : *Termes marjoriae*. Imago (syntype). (A) Head and pronotum, dorsal view. (B) Same, side view. Note that hairs seem to have fallen off due to wrong preservation.

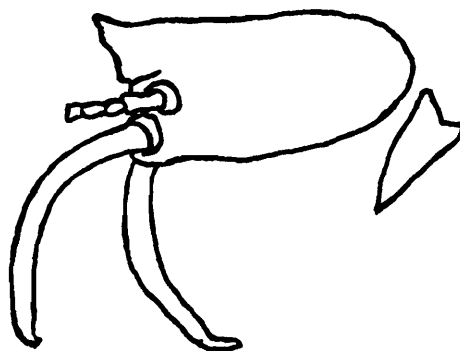


Fig. 135 : *Termes marjoriae*. Soldier. Head, in side view. (After Snyder, 1934).

diameter 0.08); situated very close to eyes, almost touching. Antennae with 15(14 in the syntype available) segments; segment 3 shortest; 2 and 4 subequal. Pronotum slightly narrower than head (length 0.55-0.60, width 0.88-0.90 mm); anterior margin shallowly concave; posterior margin emarginate. Wings greyish; membrane finely punctate with micrasters; forewing-length 8.5 mm.

SOLDIER (Fig. 135) : Head-capsule light castaneous brown; antennae yellowish brown; mandibles black, with reddish tinge; body and legs yellow. Head with a few scattered, short and long hairs; thorax and body also with short and long hairs, with a row of long hairs near base of each tergite. Total body-length 6.5 mm. Head-capsule subrectangular, with frontal projection turned up and pointed (length with mandibles 2.80, length without mandibles 1.60, length upto frontal tip 1.60-1.80, width 1.10 mm). Fontanelle situated below frontal projection. Antennae with 14 segments; segment 3 slightly longer than 2 or 4. Labrum narrow, with parallel side margins; anterior margin emarginate with a point on each side. Mandibles long, slender, rod-like and slightly bowed; incurved and pointed at tip; length (1.60 mm) subequal to head-length. Pronotum saddle-shaped (length 0.30, width 0.60 mm); convex at anterior margin and with a faint notch; posterior margin emarginate.

Distribution : BURMA (Selen, type-locality). CHINA.

Genus 33. *Homalotermes* John

(Synonym Genus *Microcapritermes* Mathur and Thapa)

1. Genus *Homalotermes* John :

- 1925. John, *Treubia*, **6** (3-4) : 412-413.
- 1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 266, 267, 268, 269, 270, 271, 284-286, 292. Detailed synonymy, characters, etc.
- 1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 144-145.
- 1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 353.
- 1972. Krishna, *Am. Mus. Novit.*, No. 2489: 1-23. Revision of genus.
- 1973. Chhotani and Bose, *Zool. Anz.*, **190**:235. Ecology.
- 1981. Ahmad and Akhtar, *Pakistan J. Zool.*, **13** (1&2) : 2,3.
- 1982. Thapa, *Sabah For. Rec.*, No. 12 : 7,9,184.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49: 101, 142.

1987. Chhotani, *Beitr. Ent.*, **37** : 409, 410. Distribution.

2. Genus *Microcapritermes* Mathur and Thapa :

1962. Mathur and Thapa, *Indian Forester*, **88** (4) : 370-375.

1968. Krishna, *Bull. Am. Mus. nat. Hist.* , **138** (Art. 5) : 284. Treated as a synonym of *Homallotermes*.

Type of Genus : *Termes foraminifer* Desneux

1. Characters of Genus *Homallotermes*

Imago : Head brown to reddish brown. Head and pronotum densely hairy. Head round, area around fontanelle depressed; Y-suture either present or absent. Fontanelle minute, punctate to large and oval. Eyes moderately large. Ocelli oval, not touching eyes. Postclypeus weakly swollen. Antennae with 15 segments; segment 3 shortest. Mandibles each with an apical and two marginals; apical either as long as 1st marginal or slightly shorter. Left mandible : 1st marginal with long posterior margin; 2nd marginal short, triangular; molar projection stopping short of 1st marginal. Right mandible : 1st marginal shorter or as long as apical; 2nd marginal short with incurved posterior margin; molar plate large, incurved. Pronotum narrower than head; anterior margin faintly notched and posterior margin prominently notched. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed.

Soldier : Head pale yellow; body whitish. Head subrectangular, moderately hairy; in profile frons sloping at about 45° angle. Fontanelle circular, situated on frontal slope. Labrum weakly asymmetrical; anterior margin weakly to appreciably incurved. Antennae with 13 segments. Mandibles asymmetrical, thin and slender; weakly incurved at tip and a little longer than head. Left mandible weakly twisted, convex in distal half and incurved in basal half at outer margin and with a prominent basal projection on inner side. Right mandible blade-like; slightly shorter than left mandible. Postmentum short, rectangular; sides weakly incurved in posterior region. Pronotum saddle-shaped, with a faint notch on anterior margin. Legs with 3:2:2 apical tibial spurs; tarsi 4-jointed.

Worker : Head and body pale yellow; densely hairy. Head subcircular. Fontanelle indistinct. Antennae with 14 segments. Postclypeus swollen. Mandible as in imago. Pronotum and legs as in soldier.

2. *Distribution and Composition of Homallotermes*

(Fig. 108)

Distribution : Genus *Homallotermes* is endemic to the Oriental Region and is known from Sarawak, Sabah and Malay Peninsula (Malaysia); East Sumatra (Indonesia); and southern India.

Composition : Of the four species known in the genus, only one i.e. *H. pilosus* Mathur and Thapa occurs in southern India in the Indian Region.

185. *Homallotermes pilosus* (Mathur and Thapa)

(Figs. 136-138)

1. *Microcapritermes pilosus* Mathur and Thapa :

1962. Mathur and Thapa, *Indian Forester*, **88** (4) : 370-375. S and W. Holotype : S, in FRI. Type-locality : Top Slip, Tamil Nadu, India. Paratype examined.

2. *Homallotermes pilosus* (Mathur and Thapa) :

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 285.

1972. Krishna, *Am. Mus. Novit.*, No. 2489 : 18-22.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 32.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49: 142-143.

IMAGO (Fig. 136) : Head-capsule brown; antennae, postclypeus and pronotum somewhat paler brown; area around Y-suture on head darker. Head and pronotum densely hairy. Head subcircular, length to base of mandibles 0.55-0.57, max. width 0.71-0.73 mm; with a faint triangular depression behind epistomal suture; Y-suture distinct. Fontanelle minute, punctate. Postclypeus swollen, faintly bilobed; about half as long as wide. Eyes rounded, 0.20-0.21 mm in diameter, not much projecting out. Ocelli oval (long diameter 0.08, short diameter 0.06 mm); separated from eyes by half their short diameter (0.03 mm). Antennae with 13 + segments; segment 3 very short; 4 shorter than 2 and 5 shorter than 4. Pronotum with anterior margin slightly raised; length 0.33-0.38, width 0.51-0.56 mm; anterior margin with a faint notch; posterior margin moderately indented.

SOLDIER (Fig. 137) : Head-capsule, antennae, labrum, pronotum and legs pale yellow; mandibles reddish brown. Head moderately and body

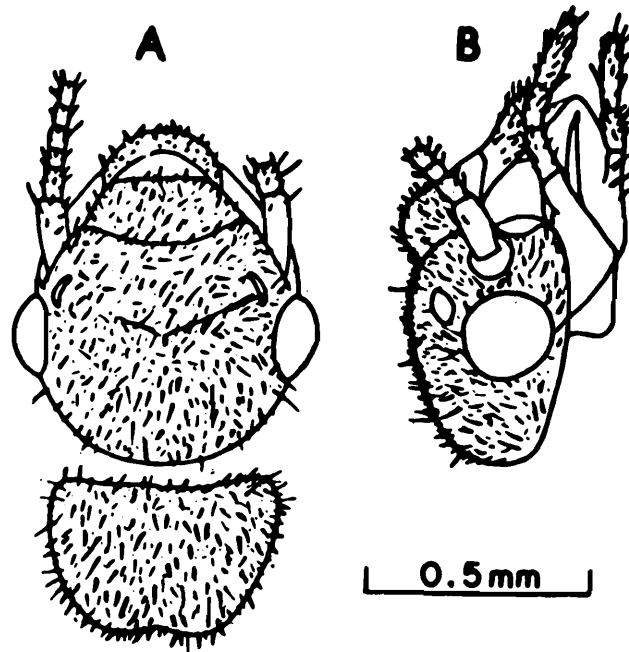


Fig. 136 : *Homalotermes pilosus*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (After Krishna, 1972).

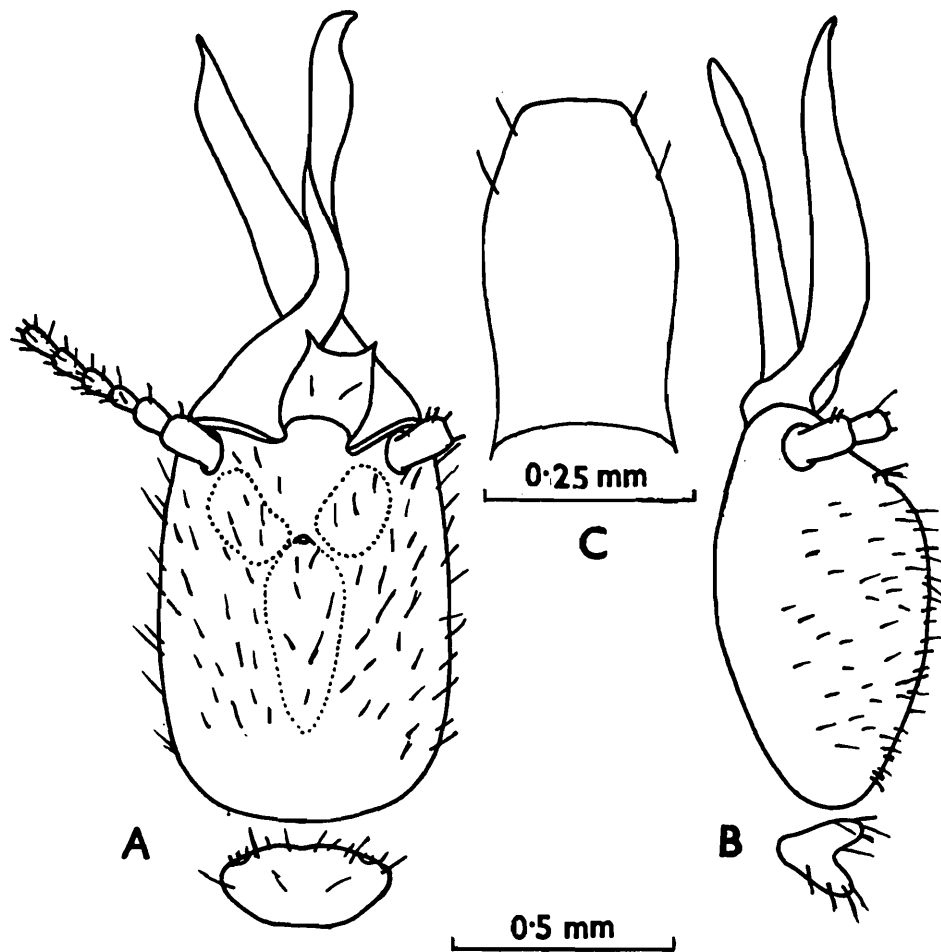


Fig. 137 : *Homalotermes pilosus*. Soldier. (A) Head and pronotum, in dorsal view. (B) Same, in side view. (C) Postmentum.

densely hairy. Total body-length 3.17-3.55 mm. Head subrectangular, sides convex weakly narrowing in distal one-third; length to base of mandibles 0.82-0.90 mm, max. width 0.61-0.71 mm; width about $\frac{3}{4}$ of length, index width/length 0.73-0.74; in profile frons inclined at about 45° ; Y-suture not clearly demarcated, sometimes only part of median suture near posterior margin indicated. Fontanelle situated at base of inclination in a faint depression; minute and circular. Antennae with 13 segments; segment 3 smallest. Labrum slightly asymmetrical, sides weakly convex; anterior margin broadly concave and corners moderately projected into pointed processes. Mandibles asymmetrical, long and thin, slightly longer than head. Left mandible weakly twisted and moderately to

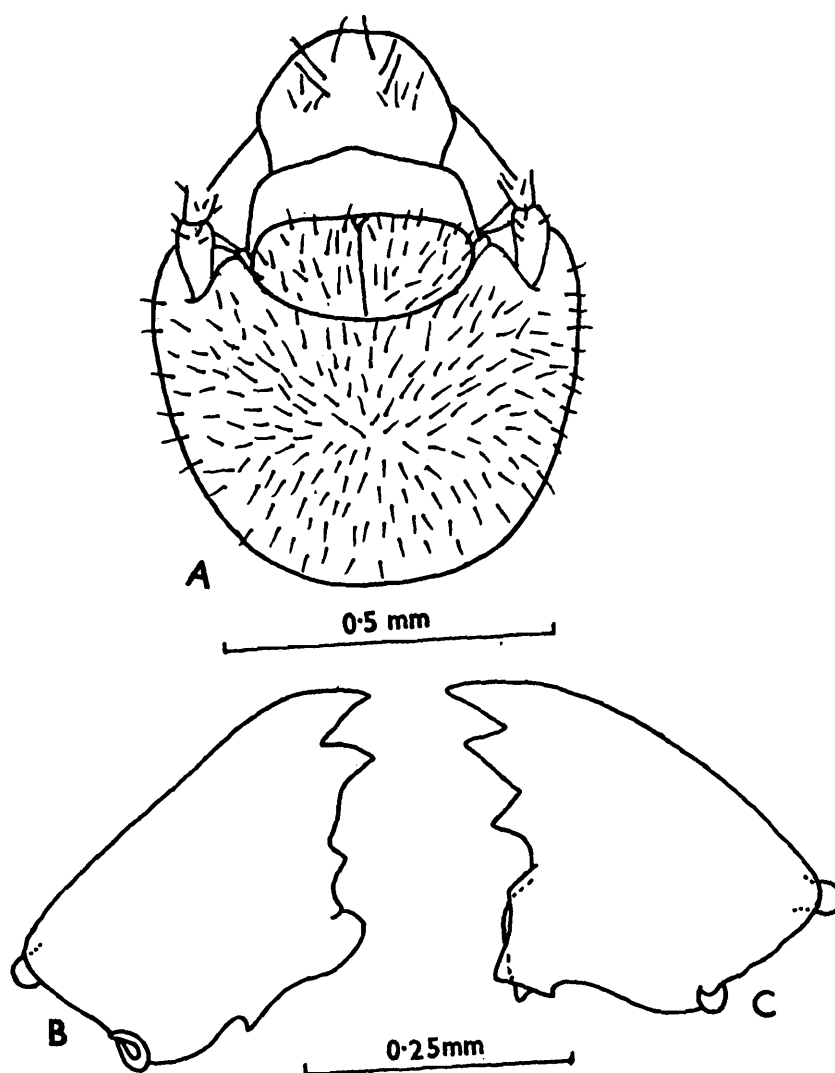


Fig. 138 : *Homalotermes pilosus*. Worker. (A) Head dorsal view. (B) and (C) Left and right mandibles. (Ex Mathur and Thapa, 1962a).

appreciably incurved at tip; a little longer than right mandible and head without mandibles (length 0.92-0.98 mm, index mandible-length/head-length 1.12-1.14). Right mandible blade like, with a pointed and slightly incurved tip (length 0.89-0.94 mm). Postmentum short, rectangular; sides weakly narrowed near posterior end (length 0.31-0.36, max. width 0.20-0.24, min. width 0.17-0.22 mm). Pronotum saddle-shaped (length 0.11-0.18, width 0.30-0.36 mm); width a little less than half of head-width.

WORKER (Fig. 138) : Head and body pale yellow and densely hairy. Total body-length 3.0-3.40 mm. Head subcircular; wider than long (length to base of mandibles 0.57-0.67, max. width 0.62-0.80 mm). Postclypeus swollen, appreciably hairy; length less than half of width. Mandibles, pronotum and legs as in genus (pronotum : length 0.10-0.15, max. width 0.30-0.40 mm).

Distribution : INDIA : Tamil Nadu (Top slip, type-locality) and Kerala (Periyar lake area).

Genus 34. *Dicuspiditermes* Krishna

1. Genus *Dicuspiditermes* Krishna :

1965. Krishna, *Am. Mus. Novit.*, No. 2210: 16-18.
1965. Ahamad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 8,9,100.
1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art.5) : 265, 267, 268, 269, 270, 271, 286-290, 291, 292, 320. See for upto date synonymy, characters, species included, etc.
1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 144.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 353.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12): vii, 65-66.
1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235.
1974. Akhtar, *Pakistan J. Zool.* , **6** (1-2) : 95, 96, 98, 100.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 59, 60.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58): 2,4,9.
1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 5,20-21.

1981. Ahmad and Akhtar, *Pakistan J. Zool.*, **23** : 2,3.
 1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 201.
 1982. Thapa, *Sabah For. Rec.* , No. 12 : 7,9.
 1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 18,24.
 1984. Bose *Occ. Pap Rec. zool. Surv. India*, No. 49: 101, 103.
 1987. Bose and Das, *Fauna of Orissa*, Pt. 1 : 110.
 1987. Chhotani, *Beitr. Ent.* , **37** : 409-411.

2. Genus *Capritermes* Wasmann (Part) :

1953. Rattan Lal and Menon, *Cat. Indian Insects*, Pt. 27 : 36, 45-50.
 synonymy, Indian spp. catalogue.

Type of Genus : *Capritermes obtusus* Silvestri

1. Characters of Genus *Dicuspidermes*

Imago : Medium sized, dark brown species; covered with a thick coat of fine, short hairs and several longer bristles. Head subcircular. Fontanelle long, narrow, slit-like to oval and ocellus-like. Ocelli not touching eyes. Antennae with 14-15 segments. Mandibles each with an apical and two marginal teeth. Left mandible : 1st marginal with long and sinuate posterior margin, shorter than apical; 2nd marginal prominent; molar projection not extending upto level of 1st marginal. Right mandible : 1st marginal triangular with slightly longer posterior margin; 2nd marginal prominent and with incurved posterior margin; distance between 1st and 2nd marginals subequal to distance between apical and 1st marginal. Pronotum semicircular or subtrapezoid. Legs with 3:2:2 apical tibial spurs; tarsi 4-jointed. Wings brown; microsculpture consists of papillae and micrasters.

Soldier : Head subrectangular, with antero-lateral corners extending into tubercle-like projections and frons sloping in front. Fontanelle generally transverse with dark brown rim, sometimes minute and circular (*nemosus* and *santschii*) ; with a small tube running into fontanelle gland; fontanelle gland variable in size. Antennae with 14 segments. Labrum asymmetrical with anterior margin deeply incurved; antero-lateral corners produced into needle-like, long processes; lateral margins with or without serrations anteriorly. Mandibles asymmetrical; left mandible strongly twisted at middle and with or without a beak at tip; right mandible blade-like. Pronotum strongly saddle-shaped. Legs with 3:2:2 apical tibial spurs; tarsi 4-jointed.

Worker : Pale, delicate species. Head-capsule subcircular. Fontanelle plate translucent, round or oval. Antennae with 14 segments. Mandibles as in imago; molar projection of left mandible however more prominent and 2nd marginal of right mandible more incurved at posterior margin. Pronotum strongly saddle-shaped. Legs with 3:2:2 apical tibial spurs; foreleg femur somewhat swollen; tarsi 4-jointed.

2. *Distribution and Composition of Dicuspiditermes*

(Fig. 108)

Distribution : The genus *Dicuspiditermes* is restricted to the Oriental Region and is so far reported from India, Sri Lanka, Pakistan, Bangladesh, Burma, Thailand, Malay Peninsula, Borneo and Sumatra.

Composition : Krishna (1968) recognises 11 species in the genus *Dicuspiditermes* and Chhotani (1987) has taken into account 16 species described by various authorities including those after Krishna 1968, while discussing the distribution and zoogeography of Oriental termites. One more species has been described by Verma (1986) from southern India recently. During the present study of the genus from the Indian subregion some species have been relegated to the synonymy of others and presently the following species have been recognised.

1. *Dicuspiditermes achankovili* Verma—India
2. *D. boseae* n. sp. —India
3. *D. cornutella* (Silvestri)—India
4. *D. fontanellus* Thakur and Chatterjee— India
5. *D. gravelyi* (Silvestri) —India
6. *D. hutsoni* (Kemner) —Sri Lanka
7. *D. incola* (Wasmann)

(Synonyms : *Capritermes longicornis* Wasmann and *Dicuspiditermes pername* Thakur and Chatterjee) —India, Sri Lanka

8. *D. laetus* (Silvestri)

(Synonyms : *Cpritermes garthwaitei* Gardner and *Dicuspiditermes tripurensis* Sen-Sarma and Thakur) —India, Bangladesh, Burma, Thailand

9. *D. obtusus* (Silvestri)
(Synonym : *Capritermes obtusus* var. *abbreviatus* Silvestri) —
India
10. *D. punjabensis* (Holmgren and Holmgren) —Pakistan
11. *D. sisiri* n.sp.—India

3. Keys to Indian Species of *Dicuspidermes*

IMAGOES

- 1(6) Smaller species : Head-width with eyes 0.90-1.23 mm
- 2(3) Head-width about 1 mm (0.90-1.03 mm); pronotum-width 0.80-0.86.....*punjabensis*
- 3(2) Head-width more than 1 mm (1.15-1.23 mm); pronotum-width 0.88-1.15 mm
- 4(5) Head-width 1.15-1.17 mm. Fontanelle plate long, narrow, slit-like (0.08 mm long). Antennae 14 to 15 segmented ; segment 3 in 14-segmented antenna much longer than 2. Eyes closer to lower margin of head (0.05-0.06 mm). Ocelli separated from eyes by less than their width (0.08 mm).....*gravelyi*
- 5(4) Head-width 1.20-1.23 mm. Fontanelle long, narrow, slit-like (0.05-0.06 mm). Antennae 14 segmented, segment 3 little longer than 2. Eyes farther from lower margin (0.08 mm). Ocelli separated from eyes by more than their width (0.125 mm).....*obtusus*
- 6(1) Larger species : Head-width with eyes 1.25-1.40 mm
- 7(8) Fontanelle plate large, oval, ocellus-like (0.13 x 0.10 mm).....*achankovili*
- 8(7) Fontanelle plate long, narrow (0.08-0.10 x 0.03-0.04 mm)
- 9(10) On the whole larger and darker species. Wings longer, forewing length 12.2-12.8, hindwing length 12.0-12.5 mm. Head depressed around fontanelle plate.....*laetus*
- 10(9) On the whole smaller and somewhat paler species. Wings shorter, forewing length 10.3-11.2, hindwing length 10.0-11.0 mm. Head not depressed around fontanelle plate.....*incola*

SOLDIERS

- 1(2) Head with frontal protuberance; frons sharply inclining in front at angle of about 75° Fontanelle gland large. Median suture of head short, extending upto 1/4 of head-length from posterior margin. Labrum without any serrations on antero-lateral margins.....*laetus*
- 2(1) Head without frontal protuberance; frons weakly and gradually inclining in front at angle of about 45°-60° Fontanelle gland smaller. Median suture extending beyond 1/4 of head-length from posterior margin. Labrum with serrations on antero-lateral margins
- 3(4) Antero-lateral processes of head short and blunt.....*obtusus*
- 4(3) Antero-lateral processes of head horn-like or long and pointed
- 5(6) Small in size. Head-length to base of mandibles 1.84, head-width 1.20 mm. Mandibles as long as head.....*cornutella*
- 6(5) Large in size. Head-length to base of mandibles 1.85-2.55, head-width 1.15-1.50 mm. Mandibles as long as or little shorter than head
- 7(10) Head smaller (length 1.85-2.10, head-width 1.15-1.30 mm). Head sharply inclined in front at about 50°-60° angle
- 8(9) Head sides straighter; antero-lateral tubercles of head somewhat smaller. Side bases of labrum with serrations*gravelyi*
- 9(8) Head sides somewhat convex and narrowed in front; antero-lateral tubercles of head longer. Side bases of labrum either round or faintly serrate*fontanellus*
- 10(7) Head larger (length 1.98-2.55, head-width 1.15-1.55 mm). Head weakly inclined in front at about 45° angle
- 11(14) Left mandible with a beak at tip and right mandible with a long and thin apex and strongly incurved apical blade
- 12(13) Smaller in size. Head shorter and narrower (head-length to base of mandibles 2.00-2.13, width 1.15-1.20 mm, index width/length 0.565-0.580). Left mandible more twisted and shorter both absolutely and in comparison to head-length (left mandible-length

- 1.65-1.70 mm, index left mandible-length/ head-length 0.814). Antero-lateral corners of head longer and thinner. Antennal segments thinner and longer*boseae*
- 13(12) Larger in size. Head longer and wider (head-length to base of mandibles 2.08-2.40, width 1.33-1.50 mm, index width/length 0.589-0.625). Left mandible less so twisted and longer both absolutely and in comparison to head-length (left mandible-length 1.85-2.20 mm, index left mandible-length/head-length 0.844-0.933). Antero-lateral corners of head somewhat shorter and thicker. Antennal segments thicker.....*incola*
- 14(11) Left mandible without beak, with or without a point and right mandible with shorter apex and less so incurved apical blade
- 15(16) Smaller species. Head-length with mandibles 3.80-4.00, head-length without mandibles 1.98-2.05, head-width 1.16-1.23, pronotum-width 0.70-0.77 mm.....*hutsoni*
- 16(15) Larger species. Head-length with mandibles 4.00-5.60, head-length without mandibles 2.22-2.55, head-width 1.38-1.55, pronotum width 0.70-0.83 mm
- 17(18) Smaller : Head-length with mandibles 4.00-4.40, head-length without mandibles 2.22-2.40, pronotum-width 0.70-0.75 mm. Vertex of head inclining behind and antero-lateral tubercles shorter. Left mandible strongly twisted and comparatively shorter (length 1.88-2.00 mm).....*achankovili*
- 18(17) Larger : Head-length with mandibles 4.40-5.60, head-length without mandibles 2.40-2.55, pronotum width 0.78-0.85 mm. Vertex of head not inclining behind and antero-lateral tubercles longer and more spinose. Left mandible less so twisted and comparatively longer (length 1.98-2.10 mm).....*sisiri n.sp.*

186. **Dicuspiditermes achankovili** Verma

(Figs. 139,140)

Dicuspiditermes achankovili Verma :

1985. Verma, *Ann.Ent.*, **3** (2) : 7-12. Holotype : S, in NRS, ZSI, Dehra Dun. Type-locality: Achankovil, Kerala, India. Type examined.

The unknown imago and worker castes are described here from a collection from Thekkadi, Kerala.

IMAGO (Fig. 139) : Head, pronotum and abdomen above brown; antennae and postclypeus yellowish brown; legs and abdomen below yellowish; wings pale brown. Head and body covered with a dense coat of fine, short hairs and several long hairs; wings hairy along margins and membrane with a few hairs near distal end. Total body-length with wings 13.0-13.50, without wings 7.30-7.60 mm. Head-capsule subcircular, broader than long (length to tip of labrum 1.30-1.40, to base of mandibles 0.90-0.95, width with eyes 1.35-1.40 mm). Fontanelle plate large, oval, ocellus-like (max. diameter 0.13, min. diameter 0.10 mm); dorsum of head around fontanelle not depressed. Antennae with 15 segments; segment 3 shortest, 4 shorter than 2; in a slightly immature specimen antennae with 14 segments and segment 3 longer than 2 and in the process of division.

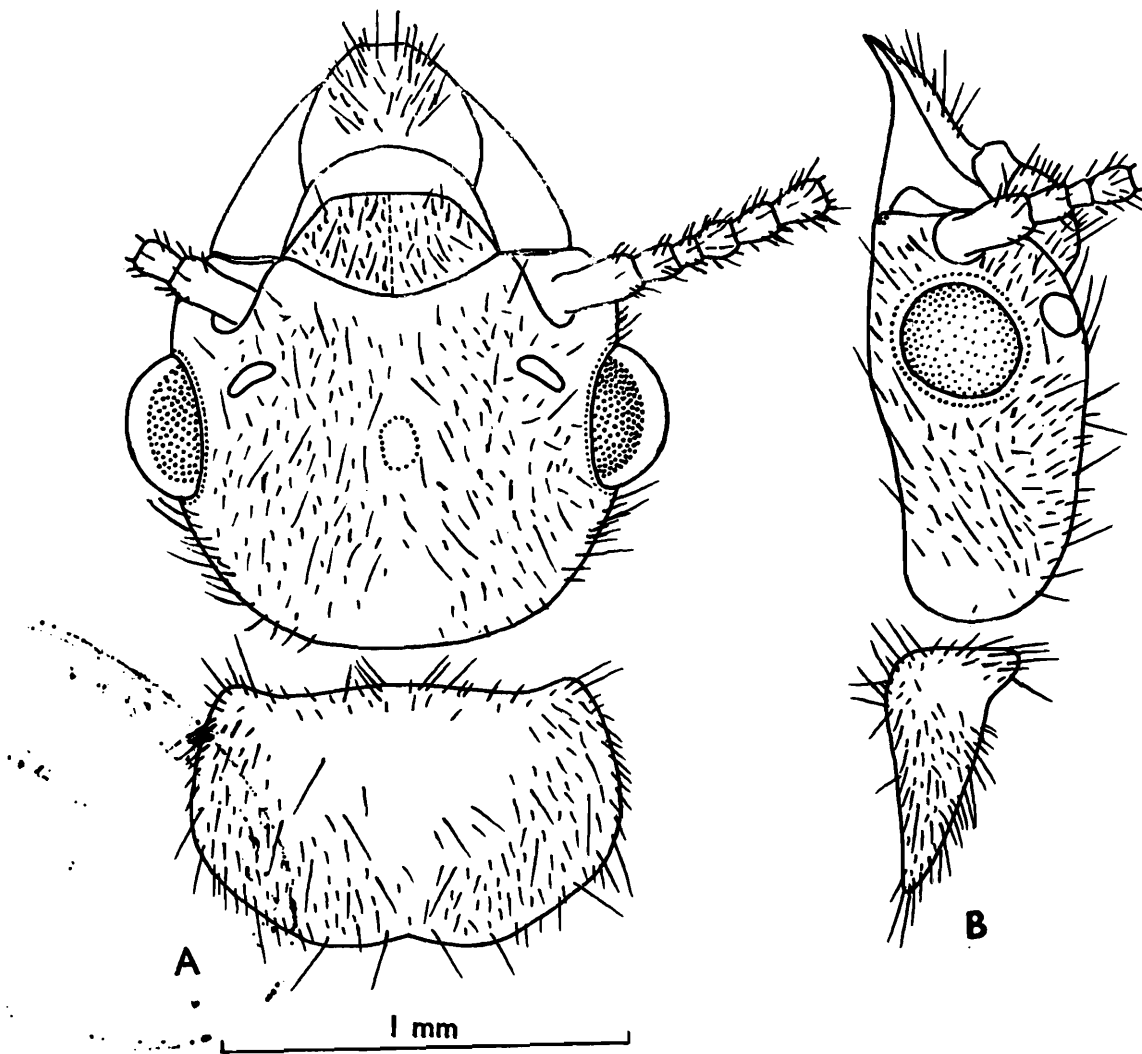


Fig. 139 : *Dicuspiditermes achankovili*. Imago. (A) Head and pronotum, in dorsal view. (B) Ditto, side view.

Eyes subcircular (max. diameter 0.35-0.37, min. diameter 0.32-0.35 mm). Ocelli broadly oval; situated at about their short diameter from eyes and antennae. Postclypeus swollen, hairy; length half of width or slightly less. Mandibles as in genus. Pronotum semicircular; anterior margin medially projected and faintly notched; posterior margin with a fairly prominent median incurving; sides substraight to weakly convex. Wing membrane thickly covered with micrasters.

SOLDIER (Fig. 140) : Type examined. Head-capsule brownish yellow to light brown; antennae pale brown; left mandible black, right reddish

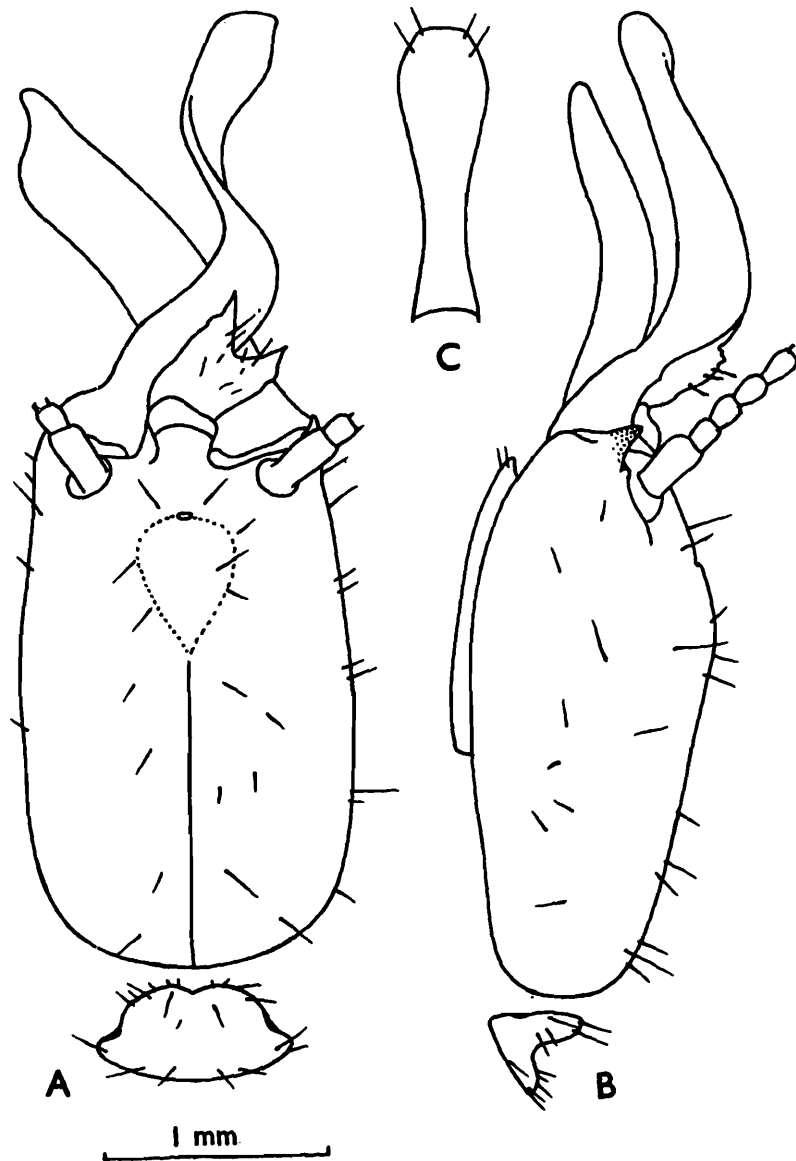


Fig. 140 : *Dicuspiditermes achankovili*. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Postmentum.

black; legs and body pale yellow. Head sparsely and body fairly densely hairy. Total body-length 6.50-7.60 mm. Head-capsule subrectangular, sides substraight to very weakly convex; antero-lateral corners produced into short and pointed cusps; length 1.58-1.65 times of width; in profile frons inclining anteriorly at an angle of 45° and posteriorly weakly sloping; median suture distinct extending beyond middle of head from posterior margin; length with mandibles 4.00-4.40, length to base of mandibles 2.22-2.40, max. width 1.38-1.55 mm. Fontanelle transverse; situated at base of inclination of frons; occipito-fontanelle distance 1.92-2.00 mm; fontanelle gland small. Antennae with 14 segments; segments 2, 3 and 4 subequal, sometimes 3 slightly longer. Labrum broader than long, asymmetrical; broadly incurved at anterior margin; antero-lateral margins at base of spine-like processes with weak serrations. Mandibles asymmetrical, shorter than head. Left mandible strongly twisted at middle and with a short point at tip. Right mandible blade-like, apical part weakly incurved and with a short apex; length of left mandible 1.88-2.00, length of right mandible 1.88-1.93 mm. Postmentum club-like, waist narrow and long (length 1.11-1.20, max. width 0.36-0.45, width at waist 0.14-0.18 mm). Pronotum saddle-shaped, with a prominent notch on anterior margin (length 0.25-0.31, width 0.70-0.75 mm).

WORKER : Head pale yellow; antennae and legs paler; abdomen translucent. Head fairly and body densely pilose. Total body-length 4.00-4.60 mm. Head subcircular, broader than long (length to tip of labrum 1.33-1.40, length to base of mandibles 0.85-0.95, max. width 1.08-1.10 mm). Fontanelle plate round, diameter 0.075-0.10 mm. Antennae with 14 segments; segments 2 and 3 subequal, 4 shortest. Postclypeus strongly swollen, length about half of width (length 0.25-0.26, width 0.50-0.53 mm). Pronotum saddle-shaped, with weakly notched anterior margin (length 0.25-0.28, width 0.57-0.60 mm).

Distribution : INDIA : Tamil Nadu (Suranganar Reserve Forest and Sholayar Dam Forest) and Kerala (Achankovil, type-locality; Thekkadi, Periyar Lake area and Trichur).

187. *Dicuspiditermes boseae** n. sp.

(Fig. 141)

IMAGO : Unknown.

SOLDIER (Fig. 141) : Head-capsule yellow, slightly paler posteriorly and around fontanelle ; antennae pale brown ; left mandible blackish, right reddish black ; body and legs creamy white. Head very sparsely and body fairly densely pilose. Total body-length 5.0-6.0 mm. Head-capsule subrectangular, length 1.723-1.771 times that of width ; width

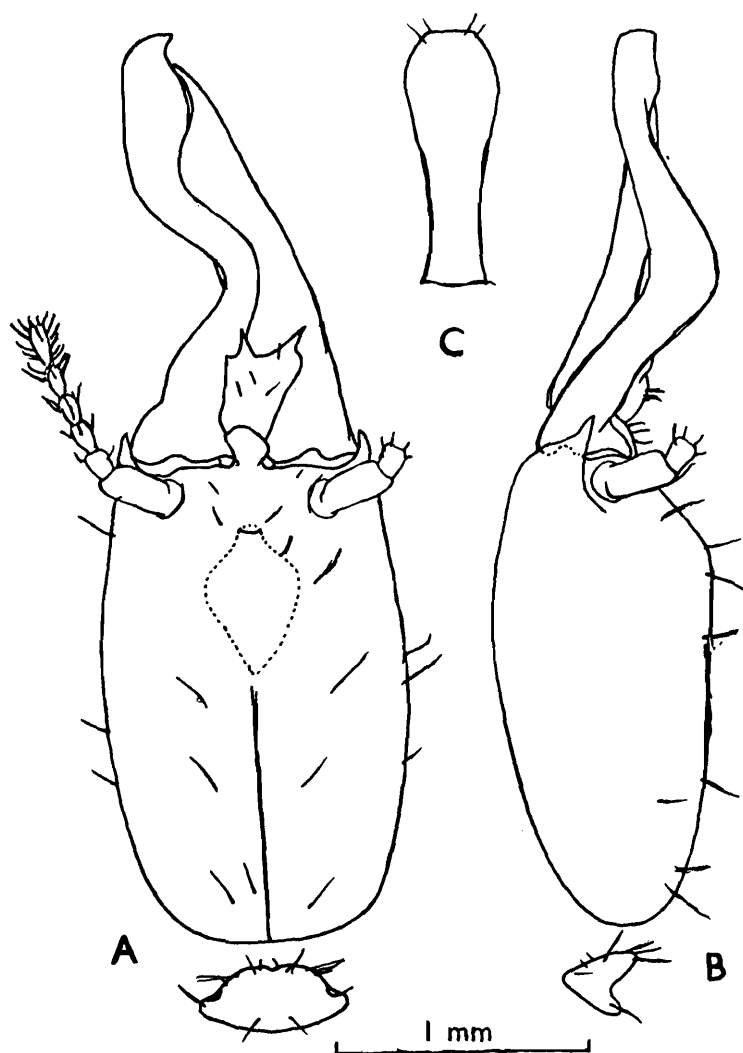


Fig. 141 : *Dicuspiditermes boseae*. Soldier (Holotype). (A) Head and pronotum, in dorsal view. (B) Ditto, side view (C) Postmentum.

* Named after Dr. Mrs. G. Bose who has contributed extensively to the study of Indian termites.

Table 1. Measurements (mm), etc. of soldier of *Dicuspiditermes boseae* n. sp.

	Range (8 exs)	Holotype
Total body-length.....	5.00-6.00	5.80
Length of head with mandibles.....	3.30-3.50	3.50
Length of head to base of mandibles...	2.00-2.13	2.00
Max. width of head.....	1.15-1.20	1.15
Max. height of head.....	0.88-0.98	0.88
Head index I (width/length to base of mandibles).....	0.565-0.580	0.580
Head index II (height/length to base of mandibles).....	0.435-0.464	0.440
Head index III (height/width).....	0.765-0.813	0.765
Occipito-fontanelle distance.....	1.58-1.70	1.63
Fontanelle-head index (Occipito-fontanelle distance/ head-length to base of mandibles).....	0.778-0.815	0.815
Length of labrum.....	0.35-0.40	0.35
Width of labrum.....	0.25	0.25
Length of mandibles: Left.....	1.65-1.70	1.70
Right.....	1.65-1.70	1.70
Mandibles-head index (left mandible length/head-length to base of mandibles).....	0.814-0.850	0.850
Length of postmentum.....	0.98-1.00	1.00
Max. width of postmentum.....	0.35-0.38	0.35
Width of postmentum at waist.....	0.14-0.16	0.16
Length of pronotum.....	0.23-0.25	0.23
Max. width of pronotum.....	0.55-0.58	0.57

comparatively narrower than in other species; frons inclining at 45° angle; antero-lateral cusps sharp and moderately long; median suture running upto about half of head-length. Fontanelle transverse; situated anteriorly

at about 4/5 of head-length from posterior margin. Antennae thinner than in other species; with 14 segments; segments 2,3 and 4 subequal; 3 sometimes slightly longer. Labrum asymmetrical, anterior margin deeply incurved and lateral margins with serrations. Mandibles asymmetrical, a little shorter than head. Left mandible strongly twisted and tip with a small incurved beak. Right mandible blade-like, apical part incurved and apex elongate and pointed, outer and inner margins weakly incurved in distal half. Postmentum club-shaped; waist about 1/3rd of maximum width and lying below middle. Pronotum saddle-shaped, anteriorly weakly notched. Foretibia with 8-9 spines on inner margin.

WORKER : Head-capsule and postclypeus pale yellow; antennae, legs and thorax creamy white. Head moderately and body fairly densely hairy. Total body-length 3.70-4.80 mm. Head-capsule subcircular, wider than long. Fontanelle plate small, oval, depressed; 0.05-0.075 mm long. Antennae with 14 segments, segments 2, 3 and 4 variable; 3 generally subequal to 4, sometimes longer; 2 a little longer than 3 or 4. Postclypeus strongly swollen, length about half of width.

Total body-length.....	3.70-4.80
Length of head to tip of labrum.....	1.10-1.15
Head-length to base of mandibles.....	0.75-0.80
Max. width of head.....	0.93-0.95
Length of postclypeus.....	0.23-0.25
Width of postclypeus.....	0.45-0.50
Length of pronotum.....	0.18-0.25
Max. width of pronotum.....	0.40-0.50 mm

Type-specimens : Holotype, : S, Mylar, Kulasekaram Forest Range, c 50 km NW of Nagercoil, Tamil Nadu, 1000 ft. alt., O. B. Chhotani, 28.ii.1969, ex. soil. Paratype S (2) and Paramorphotype W (sev.) with same data as Holotype and from same colony. Paratype S (6) and paramorphotype W (4) with same data as Holotype but different colony. All deposited in ZSI.

Type-locality and distribution : INDIA : Tamil Nadu, Mylar, Kulasekaram (type-locality). Known only from type-locality.

188. **Dicuspiditermes cornutella** (Silvestri)

(Fig. 142)

1. *Capritermes longirostris** Wasm. var. *cornutella* Silvestri :1922. Silvestri, *Rec. Indian Mus.*, **24** (4) : 537-538. S and W. Syntypes : Probably in Silvestri Coll. Portici, Italy. Type-locality: Akalpa, Randal Valley, Ratnagiri Dist., Maharashtra, India.2. *Capritermes incola* var. *cornutella* Silvestri :1949. Snyder, *Smiths. misc. Colls.*, **112** : 194.3. *Dicuspiditermes incola* var. *cornutella* (Silvestri) :1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 18.4. *Dicuspiditermes cornutella* (Silvestri):1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 290.

IMAGO : Unknown.

SOLDIER (Fig. 142) : Since no specimens of this species were available, the following description is drawn from the original description and figures given by Silvestri (1922) :—

Head rusty brownish yellow; mandibles blackish; body creamish. Head fairly hairy and body densely hairy with long and short hairs. Total body-length 4.60 mm. Head-capsule subrectangular, length c 1.5 times that of width (length without mandibles 1.84, width 1.20 mm); sides slightly converging anteriorly; frons gradually inclining in front; antero-lateral tubercles of head short, conical; only part of median suture distinct. Fontanelle small; situated anteriorly on frontal slope. Antennae with 14 segments; segment 3 equal to 2 and slightly longer than 4. Labrum asymmetrical; with long, horn-like apices; median length equal to width; antero-lateral margin with small serrations. Mandibles asymmetrical. Left mandible strongly twisted, as long as head (length 1.84 mm). Right mandible blade-like with long apical blade. Pronotum narrower than head; anterior lobe weakly emarginate. Foreleg with shorter dorsal spur.

* Wasmann described the species *Capritermes longicornis* and not *longirostris*. Evidently by mistake, Silvestri (1922) described the variety *cornutella* under *longirostris* Wasm.

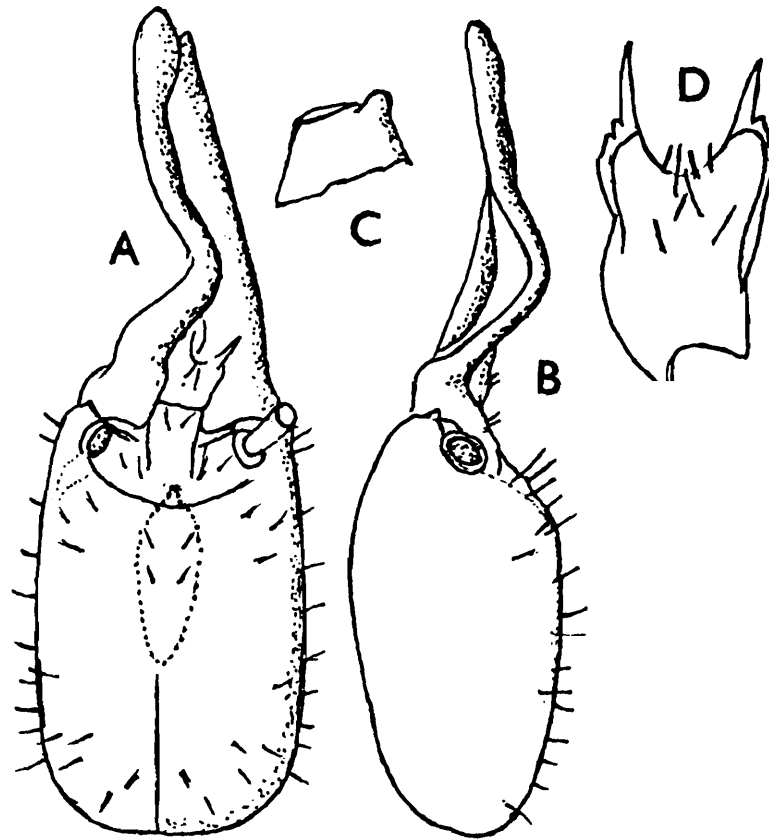


Fig. 142 : *Dicuspiditermes cornutella*. Soldier. (A) Head, in dorsal view. (B) Ditto, side view. (C) Antero-lateral portion of head showing lateral tubercle. (D) Labrum. (Ex Silvestri, 1922).

WORKER : Head pale ochraceous; body creamish. Head fairly hairy with short and long hairs. Total body-length 4.00 mm. Head wider than long (length 0.90, width 1.10 mm). Antennae with 14 segments; segment 3 about $\frac{1}{3}$ shorter than 2 and slightly longer than 4. Postclypeus well swollen; about $\frac{1}{2}$ as long as wide. Pronotum with anterior lobe hardly incised. Outer spur of foretibia much smaller, almost as in soldier.

Distribution : INDIA : Maharashtra state, known only from type-locality.

Remarks : In size, the soldier of this species comes very close to that of *D. gravelyi* Silvestri except that the frons seems to be not as sharply inclining in front. In the absence of types of this species and longer series of *gravelyi* in our collections, it has not been feasible for me to give a definite opinion as to whether it will stand validity or not.

189. *Dicuspiditermes fontanellus* Thakur and Chatterjee

(Fig. 143)

Dicuspiditermes fontanellus Thakur and Chatterjee :

1971. Thakur and Chatterjee, *Zool. Anz.*, 187 : 72-77. Holotype : S, in FRI. Type-locality : Satida Mixed Forest, Sangeum For. Range, South Goa For. Div., Goa, India.

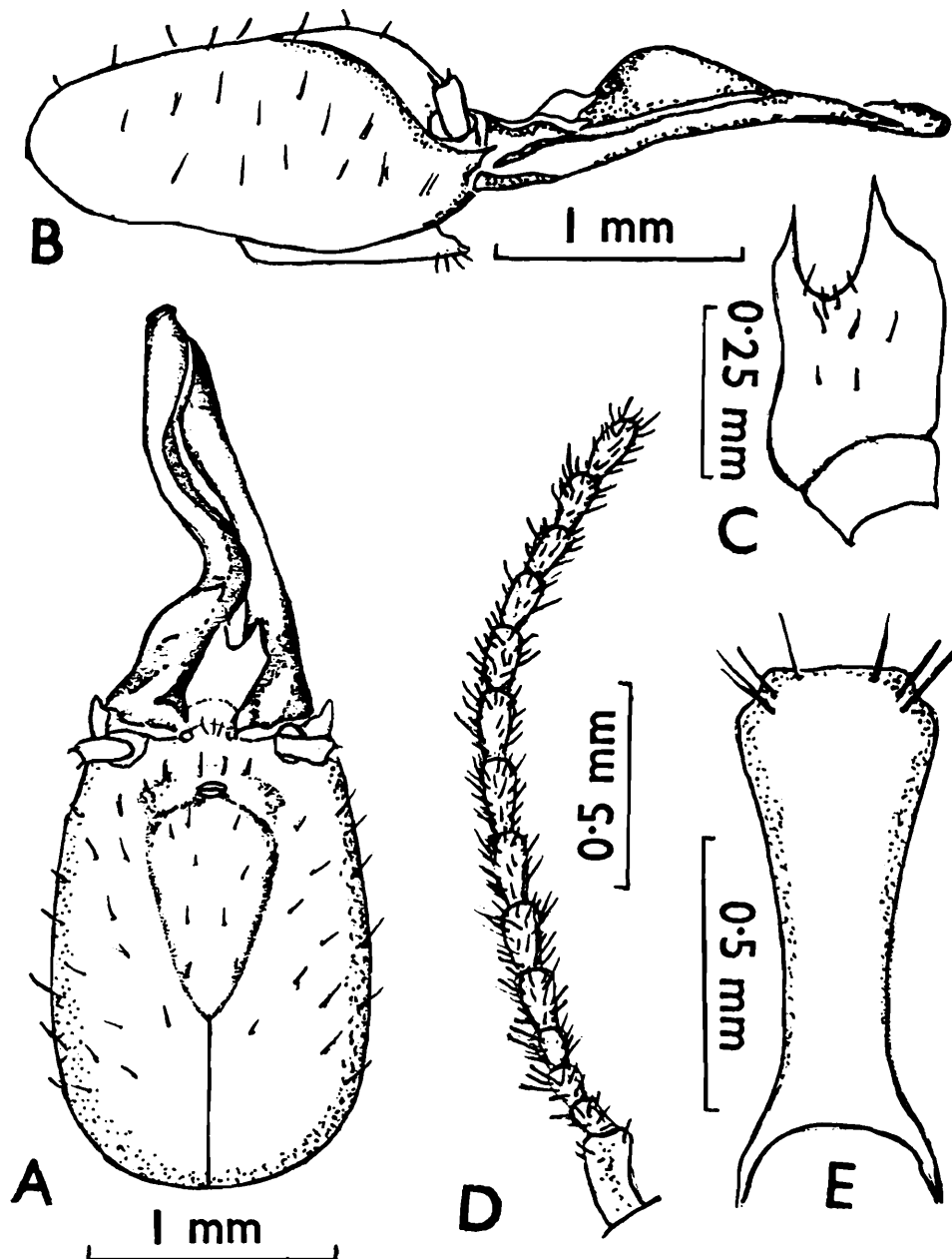


Fig. 143 : *Dicuspiditermes fontanellus*. Soldier. (A) Head, in dorsal view. (B) Ditto, in side view. (C) Labrum. (D) Antenna. (E) Postmentum. (Ex Thakur and Chatterjee, 1971).

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 32.

IMAGO : Unknown.

SOLDIER (Fig. 143) : The soldier of this species has been described in detail by Thakur and Chatterjee (1971) and figured adequately. It is very close to that of *D. gravelyi* Silvestri in size, in shape of mandibles and labrum and in frontal inclination. It differs only by minor characters such as head-sides somewhat convex and weakly converging anteriorly; in having slightly longer antero-lateral tubercles of head and convex vs faintly serrated anterolateral side bases of labrum.

WORKER : The worker is very much like that of *gravelyi*.

Distribution : India : Goa (known only from the type-locality).

Remarks : The species *fontanellus* and *gravelyi* have been kept as separate species since the types of *gravelyi* were not available and the soldier specimens in the collections of the species, available to me, were very few, as such variation in that species could not be studied. It is possible that when a longer series of *gravelyi* is available these particular characters for separation of the species *fontanellus* and *gravelyi* may not stand.

190. *Dicuspiditermes gravelyi* (Silvestri)

(Figs. 144, 145)

1. *Capritermes gravelyi* Silvestri :

1922. Silvestri, *Rec. Indian Mus.*, **24**(4) : 535-537. S and W. Syntypes : Probably in Silvestri Coll., Portici, Italy. Type-locality : Kas, Satara District, Maharashtra, India.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 194.

1958. Ahmad, *Biologia*, Lahore, **4** (1-2) : 191.

3. *Dicuspiditermes gravelyi* (Silvestri) :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 18.

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 290.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 93, 144, 148-149.

IMAGO (Fig. 144) : The so far unknown imago caste of the species is described here as follows :— Head-capsule dark reddish brown; antennae, postclypeus and pronotum brownish; abdominal tergites reddish brown, sternites brownish and yellowish brown medially; wings pale brownish, transparent. Head and body thickly hairy with a coat of short, minute hairs and several longer bristles; wings hairy along margins and a few hairs present on membrane. Total body-length with wings 12.70-

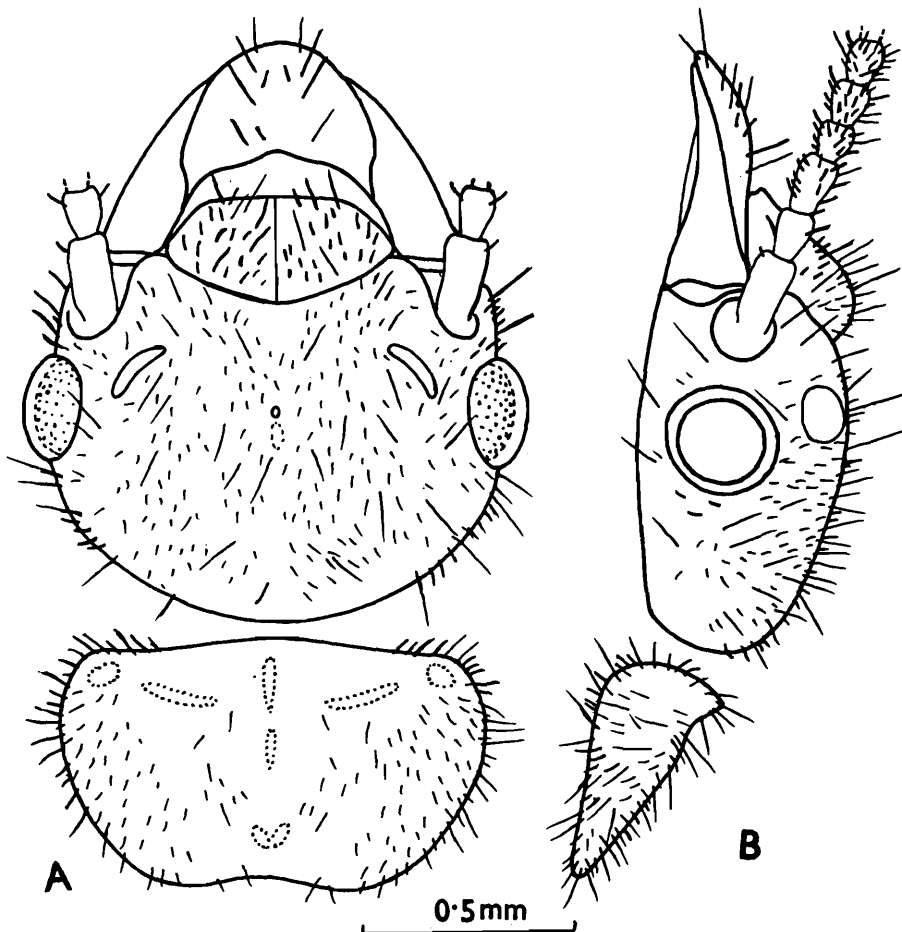


Fig. 144 : *Dicuspiditermes gravelyi*. Imago. (A) Head and pronotum, in dorsal view. (B) Ditto, in side view.

13.30, without wings c 7.00-7.50 mm. Head-capsule subcircular (length to tip of labrum 1.25-1.30, length to base of mandibles 0.80-0.83, width with eyes 1.15-1.17 and interocular width 0.85-0.90 mm); area around fontanelle not depressed. Fontanelle plate elongately oval (length 0.08, width 0.04 mm). Antennae with 14-15 segments; in 14-segmented ones, segment 3 longer than 2 and sometimes in the process of division and in

15-segmented condition 3 very short. Eyes round (max. diameter 0.28, min. diameter 0.25-0.28 mm); from lower margin of head situated at a distance of about 1/5 their diameter (0.05-0.06 mm) and from antennae by 0.05-0.07 mm. Ocelli broadly oval (length 0.125-0.15, width 0.10 mm); separated from eyes by less than their width (0.08 mm) and from antennae by about their width (0.10-0.12 mm). Pronotum subtrapezoidal (length 0.53-0.55, width 0.88-1.00 mm); anterior margin faintly convex medially and with weak notch; posterior margin slightly invaginated medially. Wings with papillae and micrasters; forewing length 10.2-11.10, hindwing length 9.7-10.4 mm.

SOLDIER (Fig. 145) : Head-capsule brownish yellow; antennae pale brown; left mandible blackish, right reddish brown; legs pale yellow; body creamish. Head sparsely and body densely hairy. Total body-length 5.3-7.0 mm. Head-capsule subrectangular, length 1.57-1.65 times that of width (length with mandibles 3.6-3.80, length to base of mandibles 1.85-2.10, max. width 1.15-1.30 mm); sides substraight, slightly narrowed in front; frons weakly to somewhat sharply inclined in front, angle of inclination 50°-60°; antero-lateral corners weakly to fairly well projected in front as tubercles; median suture extending upto a little below middle. Fontanelle transverse; fontanelle gland fairly large, extending to a little beyond middle of head. Antennae with 14 segments; segments 2, 3 and 4 subequal. Labrum asymmetrical, elongate, deeply incurved at anterior margin; lateral margins with small serrations. Mandibles a little shorter than to as long as head without mandibles (length : left mandible 1.50-2.10, right 1.5-1.70 mm, index left mandible length/head-length to base of mandibles 0.80-1.00). Left mandible twisted at middle and with a weak beak at tip; tip sometimes broken and beak not marked. Right mandible slightly shorter than left; outer and inner margins weakly incurved in distal half; apical portion strongly incurved on inner margin and tip elongately projected. Postmentum club-shaped; waist below middle (length 0.75-0.95, max. width 0.30-0.375 and width at waist 0.13-0.20 mm). Pronotum strongly saddle-shaped (length 0.20-0.35, width 0.55-0.75 mm); anterior lobe semicircular, with a faint notch; posterior margin without notch.

WORKER : Head-capsule and postclypeus pale brownish yellow; antennae, legs and thorax creamy white; abdomen transparent. Head

and body fairly densely hairy. Head subcircular (length to tip of labrum 1.18-1.30, length to base of mandibles 0.75-0.90, max. width 0.93-1.05 mm). Antennae with 14 segments; segment 3 shorter than 2, 4 shortest. Postclypeus strongly swollen, hairy; length about half of width (length 0.23-0.26, width 0.45-0.50 mm). Pronotum strongly saddle-shaped (length 0.20-0.25, width 0.50-0.60 mm); without any emargination on anterior and posterior margins.

Distribution : INDIA : Maharashtra and Karnataka states.

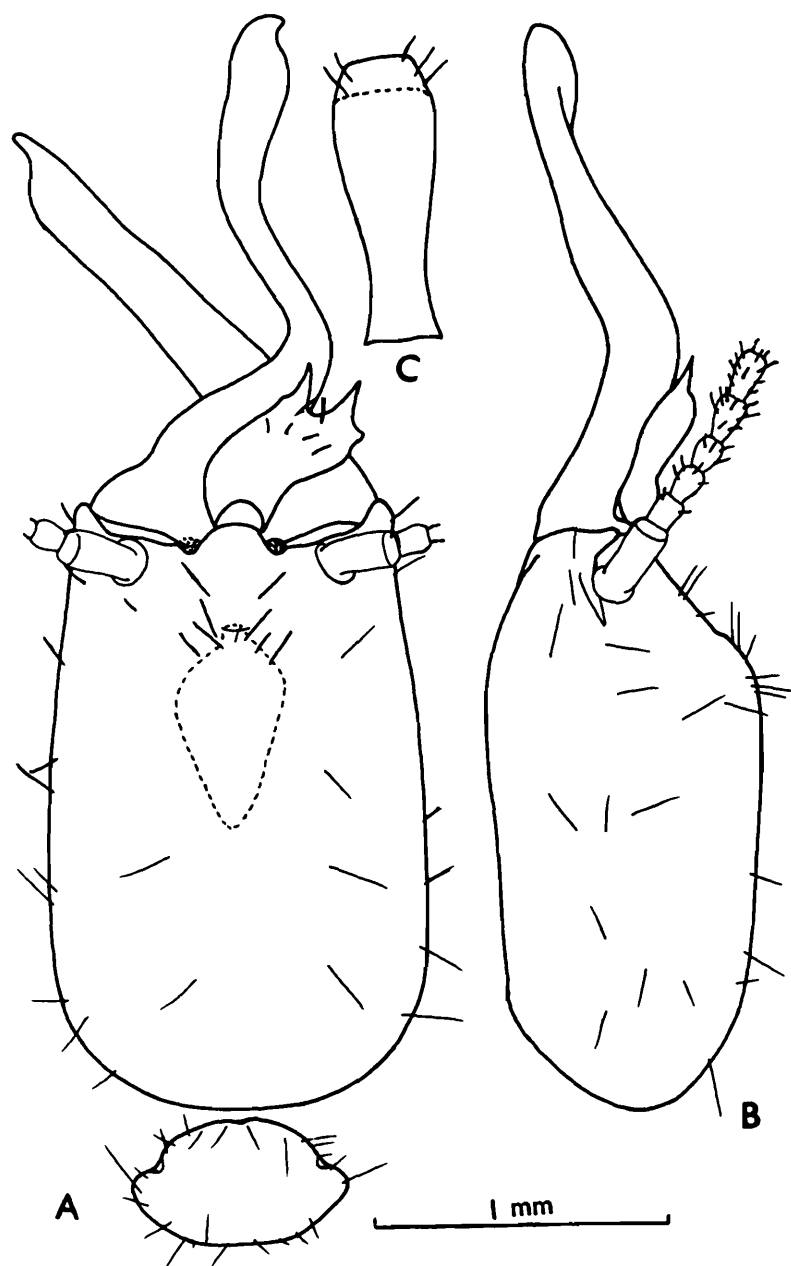


Fig. 145 : *Dicupiditermes gravelyi*. Soldier. (A) Head and pronotum, in dorsal view. (B) Head, in side view. (C) Postmentum.

191. *Dicuspiditermes hutsoni* (Kemner)

(Fig. 146)

1. *Capritermes hutsoni* Kemner :

1926. Kemner, *Bull. ent. Res.*, **16**(4) : 391-392. S and W. Syntypes : Probably in Lund Mus., Lund, Sweden, Type-locality : Pelmadulla, Sri Lanka.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 194.

1953. Roonwal and Pant, *Indian For. Leaf.*, No. 121 (3) : 60.

1962. Mathur and Thapa, *Indian For. Leaf.*, No. 167 : 108.

2. *Dicuspiditermes hutsoni* (Kemner) :

1965. Krishna, *Am. Mus. Novit*, No. 2210 : 18.

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 290.

IMAGO : Unknown.

SOLDIER (Fig. 146) : Since the material of this species was not available, the original description and figure are reproduced here as follows :—

“*Soldier*.—Head comparatively short and broad, dorsoventrally depressed; fontanelle small, puncture-shaped. Labrum of the usual obliquely twisted shape, anteriorly with a rather deep median incision



Fig. 146 : *Dicuspiditermes hutsoni*. Soldier head. (Redrawn from Kemner, 1926).

and long lateral angles. Left mandible nearly as long as the head, obtusely truncated at the tip, not pointed as in *ceylonicus*, Holmgr., or bent inwards like a beak, as in *incola*, Wasm. (comp. photographs in Escherich's *Termitenleben auf Ceylon*, pl. ii, figs. Q and R). Antennae long, measuring 2.30 mm., 14-jointed*, with joints 2, 3 and 4 subequal. Hind tibiae 1 mm long.

“Length of body.....	5.96-6.00 mm
Length of head with mandibles.....	3.80-4.00
Length of head without mandibles.....	1.98-2.05
Width of head.....	1.16-1.23
Width of pronotum.....	0.70-0.77

“Worker.—Head broadly oval, flat, fontanelle very conspicuous, forming an oval depression with a flat bottom. Clypeo-basal large, fairly convex. Antennae 14-jointed; 3rd and 4th joint subequal, a little shorter than joint 2. Anterior margin of pronotum without incision.

“Length of body.....	4.30-4.50 mm
Width of head.....	0.99
Width of pronotum.....	0.53

“As already pointed out, the soldier of this species is easily distinguished from other species from Ceylon by the shape of the labrum and the left mandible, as well as by its size. It resembles *C. obtusus* described by Silvestri (1923) from Barkuda Island in Chilka Lake, India, which is, however, of different size, with shorter antennae and longer posterior tibiae.”

Distribution : SRI LANKA : Pelmadulla.

192. *Dicuspitermes incola* (Wasmann)

[Synonyms : *Capritermes longicornis* Wasmann and *Dicuspitermes pername* Thakur and Chatterjee]

(Figs. 147-150)

1. *Eutermes incola* Wasmann :

1893. Wasmann, *Wien Ent. Zeit.*, 12(7) : 242. Holotype : Im, In NHM, Maastricht. Type-locality : Colombo, Sri Lanka. Paratype examined.

* The same number of joints is sometimes also found in the antennae of *ceylonicus*, Holmgr. which H. describes as 13-jointed, as I have ascertained by examining his type specimens.

2. *Dicuspiditermes incola* (Wasmann):

1993. Chhotani, *Rec. zool. Surv. India.*, **92** : 302-309. See for detailed synonymy of the species and its synonyms, description, etc.

IMAGO (Fig. 147) : Paratypes examined : Head-capsule dark brown; postclypeus yellowish brown; antennae pale brown; pronotum brown; legs brownish yellow; wings pale brown, abdomen brown above and little paler below. Head and body covered with a thick coat of minute hairs and several long hairs. Total body-length with wings 12.5-14.2 and without wings 5.6-8.5 mm. Head-capsule subcircular, with eyes broader than long (length to tip of labrum 1.35-1.57, to base of mandibles 0.88-1.00 and max. width 1.25-1.38 mm); Y-suture absent. Fontanelle plate translucent, long and narrow (length 0.075-0.10 mm). Eyes round, fairly projected;

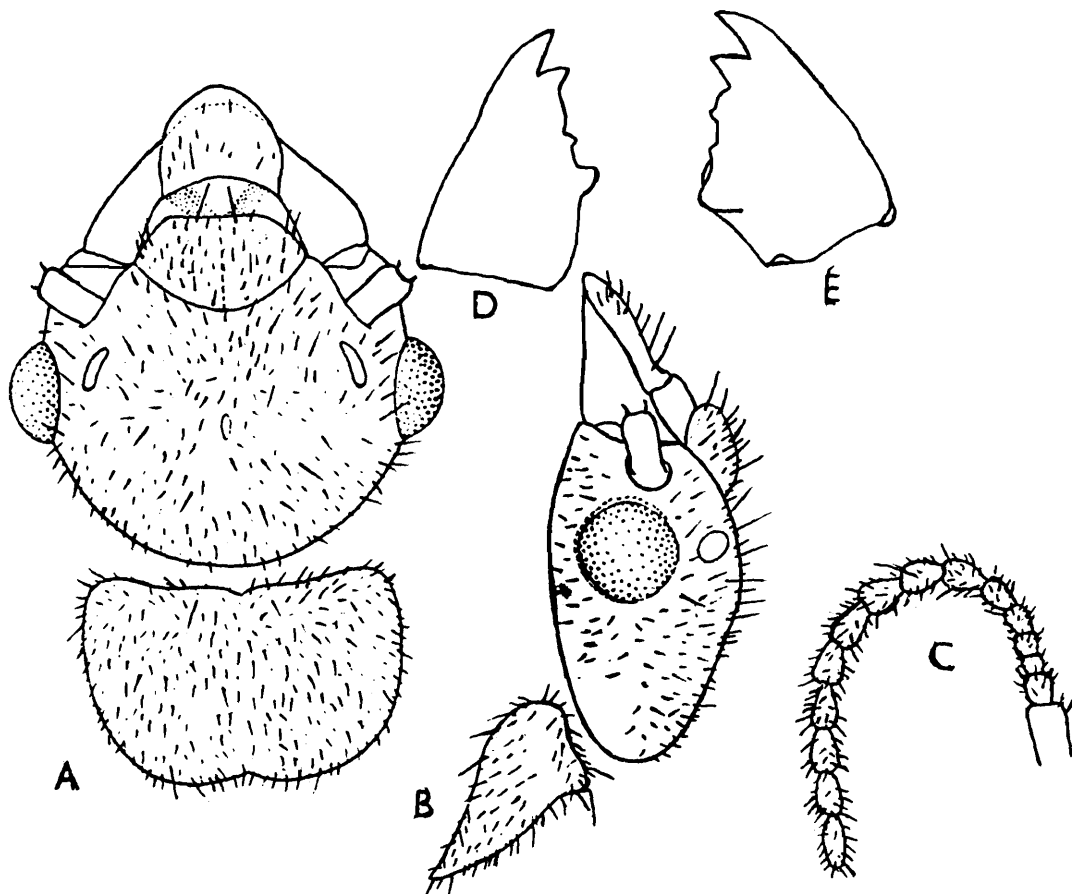


Fig. 147 : *Dicuspiditermes incola*. Imago (*paratype*). (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Antenna. (D) and (E) (Imago from another source). Left and right mandibles respectively.

equidistant from lower margin and antennal socket (max. diameter 0.30-0.33 mm). Ocelli broadly oval (long diameter 0.13-0.18, short diameter 0.10-0.15 mm); situated at half to about their long diameter from eyes (minimum eye-ocellus distance 0.08-0.13 mm). Antennae with 14-15 segments; segment 3 short; in 14-segmented antennae, segments 4 & 5 subequal and in 15-segmented ones, 5 slightly shorter than 4. Postclypeus swollen, hairy; length about half of width (length 0.25-0.30, width 0.50-0.60 mm); divided into two halves by a faint line. Mandibles as in genus. Pronotum flat, slightly raised at anterior margin; narrower than head (length 0.58-0.63, maximum width 0.88-1.00 mm); anterior margin weakly incurved and with a median notch; posterior margin rounded, with a prominent notch. Wings pale brown, hairy along margins and scantily so on membrane; microsculpture consists of papillae on margins and micrasters on membrane; venation as in genus; forewing with scale 10.3-11.2 and hindwing with scale 10.0-11.0 mm long. Legs and abdomen as in genus.

SOLDIER (Figs. 148, 149) : Paratype of *Capritermes longicornis* Wasmann from Khandala, examined. Head-capsule yellowish to yellowish brown; antennae yellowish brown to pale brown; labrum translucent, weakly chitinized medially; left mandible blackish, right reddish brown; legs and body creamy white to pale yellow. Head and body fairly pilose. Total body-length 5.5-8.5 mm. Head-capsule subrectangular, sides substraight or slightly converging in front; antero-lateral corners projected into medium sized lateral tubercles (length with mandibles 3.9-4.4, to base of mandibles 2.08-2.45, maximum width 1.33-1.50 mm, index width/length 0.589-0.652); median suture extending upto half of head-length from posterior margin; frons inclined at 45° angle. Fontanelle transverse, situated anteriorly at about 4/5 of head-length from posterior margin on the frontal inclination. Antennae with 14 segments, segments 2, 3 and 4 subequal, 3 sometimes longer than 2 or 4. Labrum asymmetrical, deeply incurved at anterior margin; antero-lateral corners produced into long, needle-like processes and antero-lateral margins with 1 or 2 tooth-like projections or serrations; length 0.40-0.60, width 0.30-0.40 mm. Mandibles asymmetrical, only a little shorter than head (length of left mandible 1.85-2.20 mm, right mandible 1.87-2.15 mm, index left mandible-length/head-length to base of mandibles 0.844-0.933). Left mandible twisted at

middle and with a prominent beak at tip. Right mandible blade-like, weakly incurved on inner and outer margins; apical part strongly incurved and with a long, pointed apex. Postmentum club-like; waist long and narrow, lying below middle (length 1.0-1.2, maximum width 0.33-0.43, minimum width at waist 0.18-0.22 mm). Pronotum saddle-shaped and

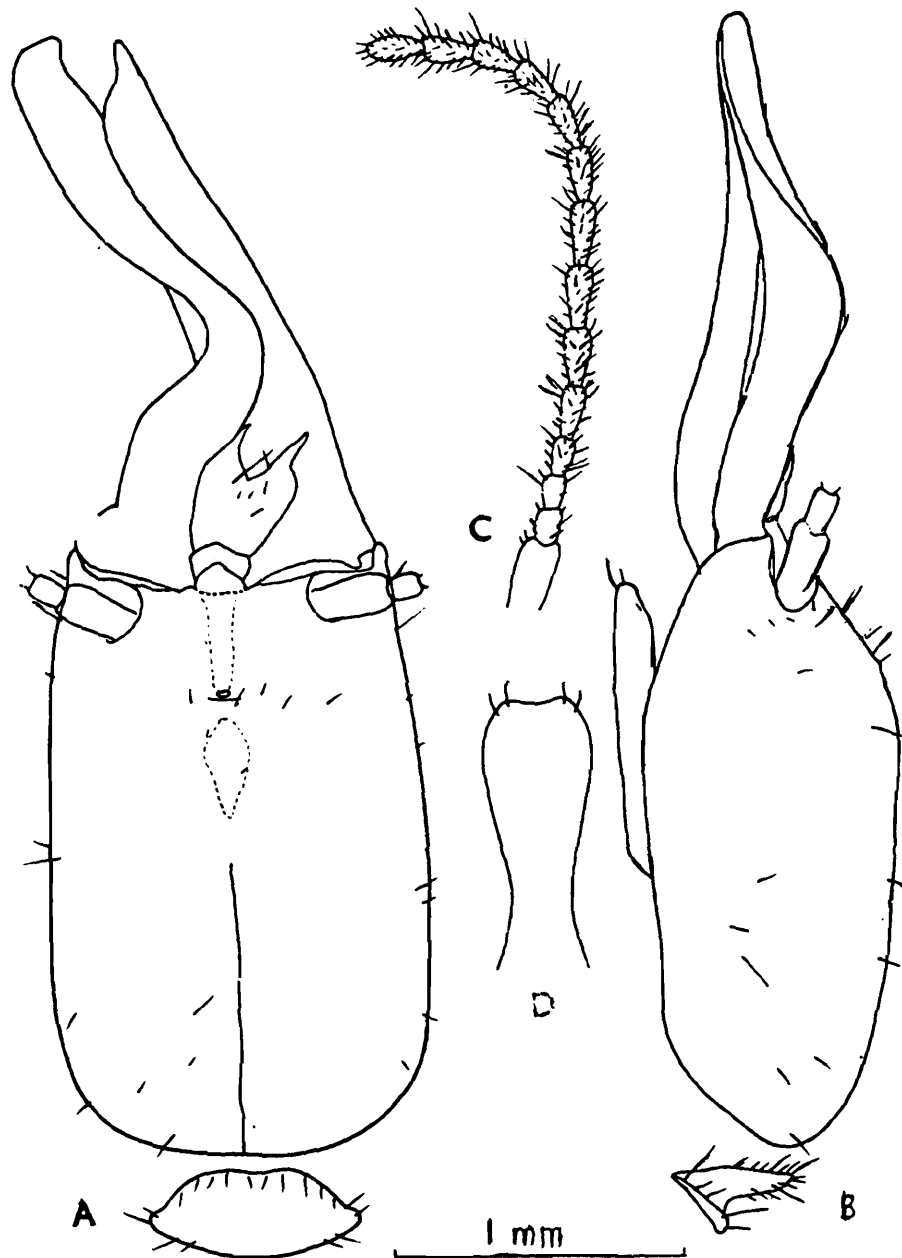


Fig. 148 : *Dicuspidermes incola*. Soldier (Paratype of *Capritermes longicornis*). (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Antenna (D). Postmentum.

weakly notched at anterior margin (length 0.25-0.35, width 0.75-0.88 mm).

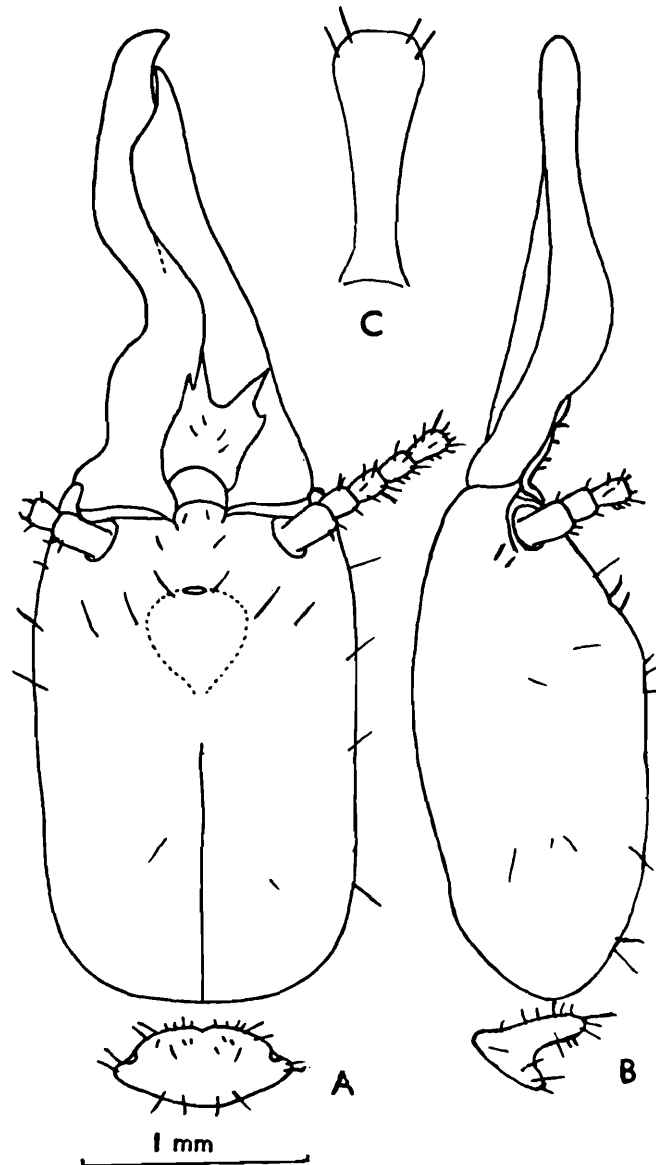


Fig. 149 : *Dicuspiditermes incola*. Soldier (Syntype of *C. fletcheri* from Bababudin Hills. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Postmentum.

WORKER (Fig. 150) : Head, antennae and postclypeus creamish to yellowish; legs and thorax a little paler; abdomen transparent with intestinal contents showing through. Head and body fairly pilose. Total body-length 3.60-5.50 mm. Head-capsule subcircular (length to tip of labrum 1.33-1.40, to base of mandibles 0.85-0.93 and width 1.05-1.13 mm); slightly depressed in region of fontanelle. Fontanelle plate oval to round, 0.10-0.17 mm in diameter. Antennae with 14 segments; segment 3 slightly shorter than 2 and 4 slightly shorter than 3. Postclypeus swollen,

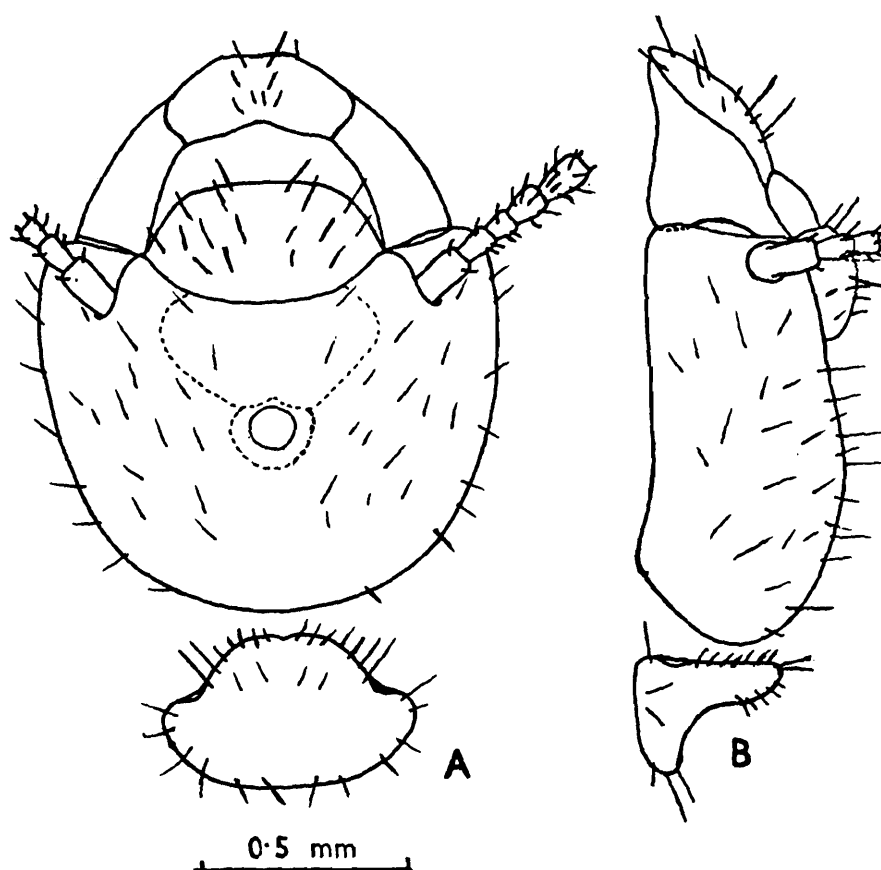


Fig. 150 : *Dicuspiditermes incola*. Worker (Syntype of *Capritermes fletcheri* from Bababudin Hills). (A) Head and pronotum, in dorsal view. (B) Ditto, side view.

hairy, length about half or a little more than half of width (length 0.26-0.28, width 0.50-0.55 mm). Mandibles, pronotum, legs and abdomen as in genus (pronotum length 0.25-0.30, width 0.50-0.60 mm).

Distribution : SRI LANKA and INDIA (Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala states).

193. *Dicuspiditermes laetus* (Silvestri)

(Synonyms : *Capritermes garthwaitei* Gardner and *Discuspiditermes tripurensis* Sen-Sarma and Thakur)

(Figs. 151, 152)

1. *Capritermes laetus* Silvestri :

1914. Silvestri, *Rec. Indian Mus.*, **8** : 434-435. S only. Syntype : Silv. Coll.
Type-locality : Sukli, E. side of Dawna Hills, Lower Burma.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 195.

1958. Ahmad, *Biologia*, Lahore, **4** : 191.

2. *Dicuspitermes laetus* (Silvestri) :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 18.

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 290. Treats *garthwaitei* as a synonym of *laetus*.

1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46**(4) : 465, 466.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

3. *Capritermes garthwaitei* Gardner :

1945. Gardner, *Indian J. Ent.*, **6** : 106-108.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 194.

1953. Roonwal and Pant, *Indian For. Leaflet*, No. 121 (3) : 60.

1958. Ahmad, *Biologia*, Lahore, **4** : 185, 191.

1962. Mathur and Thapa, *Indian For. Leaflet*, No. 167 : 108.

4. *Dicuspitermes garthwaitei* (Gardner) :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 18-19.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 100, 102-103.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 66.

1975. Akhtar, *Bull. Dep. Zool. Univ. Panjab (N.S.)*, Art. 7 : 175-179, 194.

5. *Dicuspitermes tripurensis* Sen-Sarma and Thakur (New synonym) :

1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13**(1) : 21-23, 47, 48, 66, 67.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO (Fig. 151) : Head-capsule blackish; postclypeus, antennae and pronotum dark brown, slightly paler than head; labrum brownish yellow; wings pale brown; legs yellowish brown; abdomen dark brown above, paler below and medially yellowish. Head-capsule and body with a dense coat of short, fine hairs and several longer bristles interspersed; wings hairy along margins and scantily hairy on membrane. Total body-length with wings 14.00-15.20, without wings 6.50-9.50 mm. Head-capsule

subcircular, depressed in region of fontanelle; with eyes broader than long; median suture present, lateral arms not distinct (length to tip of labrum 1.31-1.55, length to base of mandibles 0.90-1.05, max. width with eyes 1.35-1.40 mm (1.18-1.30 mm for *garthwaitei* in literature). Fontanelle plate long, narrow, slit-like (length 0.10, width 0.04-0.06 mm). Postclypeus fairly swollen; hairy as head; length slightly less than half of width (length 0.23-0.25, width 0.50-0.57 mm). Eyes subcircular, projecting out prominently (diameter max. 0.28-0.37 mm). Ocelli oval, translucent (max. diameter 0.11-0.20, min. diameter 0.09-0.14 mm); eye-ocellus distance

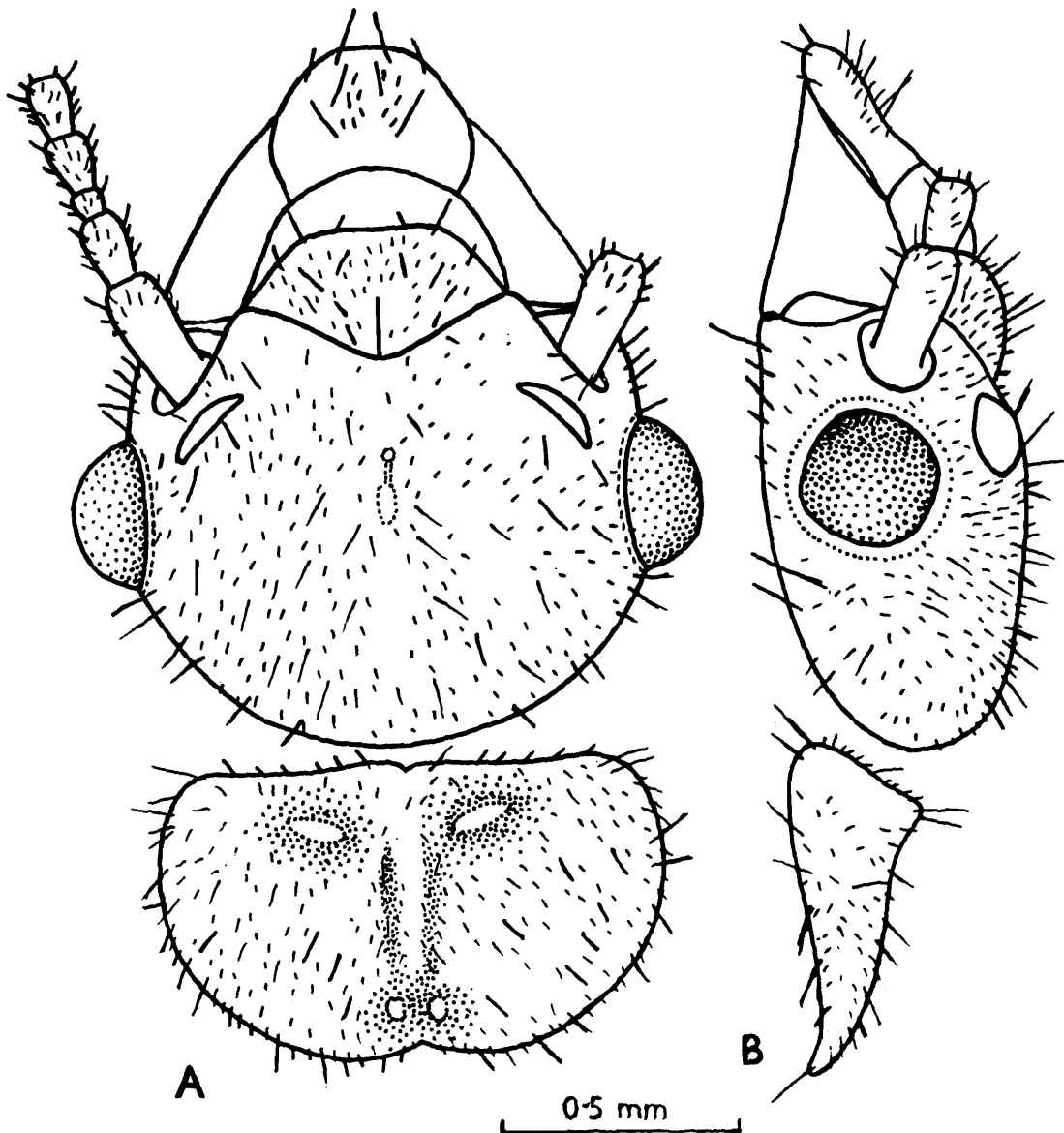


Fig. 151 : *Dicuspiditermes laetus*. Imago. (A) Head and pronotum, in dorsal view. (B) Ditto. in side view.

slightly less than short diameter to slightly more than long diameter (0.08-0.16 mm). Antennae with 14-15 segments; in 14 segmented antennae segment 3 slightly shorter than 2 and in 15 segmented very short. Labrum dome-shaped, with short and long hairs. Mandibles as in genus. Pronotum slightly paler medially, with a faint T-mark and shoulder spots; weakly raised anteriorly; anterior margin substraight or weakly incurved, medially faintly notched; posterior margin outcurved and prominently notched medially; narrower than head (width 0.96-1.15, length 0.59-0.75 mm). Forewing-length 12.2-12.8, hindwing-length 12.0-12.5 mm.

SOLDIER (Fig. 152) : Head yellow to pale reddish yellow, somewhat brownish yellow near base of mandibles; antennae pale brown; labrum translucent, pale yellow medially; left mandible black, right reddish; body and legs creamish. Head sparsely and body densely hairy. Total body-length 6.00-6.90 mm. Head-capsule subrectangular, very slightly converging near anterior end; length slightly less than 1.5 times of width (length with mandibles 4.0-4.25, without mandibles 2.02-2.23, max. width 1.28-1.52 mm, index width/length 0.673-0.682); median suture very short; frontal protuberance well marked; in profile frons sharply sloping in front at angle of about 75°. Fontanelle transverse, lying in front and below frontal protuberance; occipito-fontanelle distance 1.90-1.93 mm, index occipito-fontanelle distance/head-length to base of mandibles 0.864-0.866; fontanelle gland large. Antennae with 14 segments; segments 2, 3 and 4 subequal. Labrum asymmetrical, with long, needle-like antero-lateral processes; lateral margin rounded without any serrations; anterior margin deeply incurved; length variable either subequal to or more than width. Mandibles asymmetrical; almost as long as head-capsule (length : left mandible 1.77-2.15 and right mandible 1.73-2.21 mm, index left mandible-length/head-length 0.923-0.930); left mandible twisted at middle and with a weak, beak-like tip; right mandible blade-like, apical part incurved, tip sharp and pointed. Postmentum club-like, about half of head-length (length 0.70-1.04, max. width 0.36-0.45, min. width at waist 0.17-0.23 mm). Pronotum strongly saddle-shaped; anterior margin weakly notched, posterior margin indistinctly emarginate (length 0.23-0.40, max. width 0.54-0.83 mm). Fore-tibia with 11 spines on inner margin.

WORKER : Head and antennae creamy white to pale yellow; thorax and legs creamy white; abdomen transparent with intestinal contents showing through. Head moderately and body densely hairy. Total body-



Fig. 152 : *Dicuspiditermes laetus*. Soldier. (A) Head and pronotum, in dorsal view. (B) Head, in side view. (C) Postmentum.

length 5.00-5.50 mm. Head-capsule subcircular, broader than long (length to tip of labrum 1.43-1.50, length to base of mandibles 1.00-1.05, max. width 1.20-1.27 mm). Fontanelle plate round, translucent, 0.125 mm in diameter. Antennae with 14 segments; segments 2 and 3 subequal, 4 shortest. Postclypeus swollen, hairy, length about 1/2 of width (length 0.26-0.28, width 0.60 mm). Labrum, mandibles, pronotum (length 0.28-0.33, width 0.60-0.63 mm) and legs as in genus.

Distribution : INDIA (Arunachal Pradesh and Tripura states).
BANGLADESH, BURMA and THAILAND.

194. **Dicuspiditermes obtusus** (Silvestri)

(Synonym : *Capritermes obtusus* var. *abbreviatus* Silvestri)

(Figs. 153-155)

1. *Capritermes obtusus* Silvestri :

1923. Silvestri, *Rec. Indian Mus.*, **25**(2) : 229-231. Im, S and W. Syntypes : Im, S and W. in ZSI, FRI, AMNH and Silv. Coll. One S designated as Lectotype now from ZSI collection. Type-locality : Barkuda Island, Chilka Lake, Orissa, India.
1949. Snyder, *Smiths. misc. Colls.*, **112** : 196.
1958. Ahmad, *Biologia*, Lahore, **4** : 185, 190.
1962. Mathur and Thapa, *Indian For. Leaf.*, No. 167 : 109.

2. *Dicuspiditermes obtusus* (Silvestri) :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 17, 18, 19.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 101, 102.
1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 286, 287, 288, 289, 290.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 354.
1977. Chhotani, *Rec. zool. Surv. India*, **72** : 371-372.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (4) : 466.
1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 201, 210, 212.
1987. Bose and Das, *Fauna of Orissa. Pt. 1 State Fauna Series 1* : 105.

3. *Capritermes obtusus* var. *abbreviatus* Silvestri :

1923. Silvestri, *Rec. Indian Mus.*, **25**(2) : 231-232.
1949. Snyder, *Smiths. misc. Colls.*, **112** : 196.

4. *Dicuspiditermes obtusus* var. *abbreviatus* (Silvestri) :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 18.
1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 290. Treats it as a synonym of *D. obtusus* (Silvestri).

IMAGO (Fig. 153) : Paralectotypes examined. Head-capsule dark brown; postclypeus, antennae, labrum and pronotum a little paler than

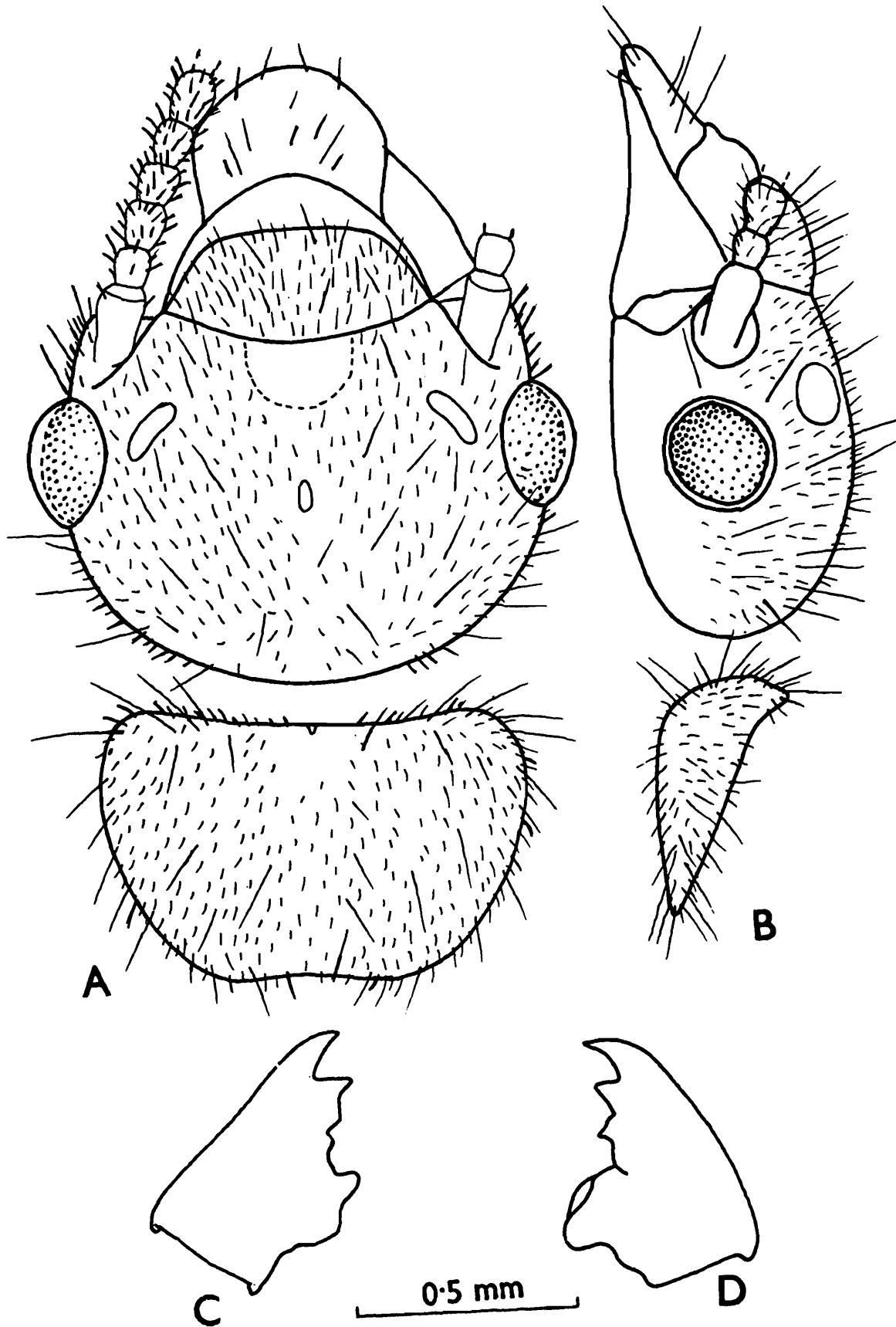


Fig. 153 : *Dicuspiditermes obtusus*. Imago (Paralectotype). (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) and (D) Left and right mandibles, respectively.

head; legs yellowish brown; abdominal tergites as brown as pronotum, sternites pale brown and medially brownish yellow; wings pale brown, transparent. Head and body with a thick coat of short, fine hairs and several longer bristles; wings hairy along margins and with a few hairs on membrane. Total body-length with wings 10.8-12.0, without wings 6.5-7.0 mm. Head-capsule subcircular (length to tip of labrum 1.25-1.35, length to base of mandibles 0.85-0.90, max. width with eyes 1.20-1.23 mm); depressed a little just behind postclypeus; Y-suture not distinct. Fontanelle plate narrow, slit-like, translucent, 0.05-0.06 mm long. Eyes round (max. diameter 0.28-0.30, min. diameter 0.25-0.28 mm). Ocelli broadly oval (length 0.14-0.15, width 0.10 mm); equidistant from eyes and antennae and separated by a distance of little less than their length (0.125 mm). Antennae with 14 segments; segment 3 longer than 2; 4 shortest. Postclypeus swollen, as hairy as head; length a little less than half of width (length 0.23-0.25, width 0.55-0.60 mm). Labrum dome-shaped (length 0.33-0.35, width 0.40-0.43 mm). Mandibles as in figure. Pronotum sub-semicircular (length 0.58-0.60, width 0.95-1.00 mm); anterior margin slightly incurved, without or with a faint median notch, posterior margin slightly incurved medially. Wing microsculpture consists of papillae and micrasters. Forewing-length 9.5-10.0, hindwing-length 9.0-9.5 mm.

SOLDIER (Fig. 154) : Lectotype and paralectotypes examined. Head-capsule pale brownish yellow, brownish yellow near base of mandibles; labrum yellowish translucent; left mandible blackish, right reddish brown; body and legs creamish yellow. Head sparsely and body fairly hairy. Total body-length c 4.5-7.0 mm. Head-capsule subrectangular; sides substraight, very slightly narrowed in front (length with mandibles 3.8-4.40, length to base of mandibles 1.70-2.33, max. width 1.15-1.40 mm); frons inclining at 45° angle; antero-lateral corners bluntly projected in front; median suture running upto half of head-length. Fontanelle transverse; situated at base of frontal inclination. Antennae with 14 segments; segments 2, 3 and 4 subequal; 2 or 4 sometimes slightly shorter than 3. Labrum asymmetrical, deeply incurved at anterior margin; antero-lateral margins with a few serrations (length 0.45-0.50, width 0.27-0.35 mm). Mandibles asymmetrical, almost as long as head-length to base of mandibles (left mandible-length 1.70-2.00 mm, right slightly smaller; index left mandible-length/head-length 0.90-1.00). Left mandible weakly twisted and with a beak-like tip, beak sometimes damaged. Right mandible blade-

like; weakly incurved on outer and inner margins in distal half; apical blade elongate and incurved appreciably on inner margin. Postmentum club-shaped, with a long and narrow waist; minimum width of waist lying near posterior end (length 1.0, max. width 0.35, width at waist 0.14 mm). Pronotum strongly saddle-shaped; anterior lobe semi-circular, with a weak notch; posterior margin rounded; length 0.25, width 0.73-0.90 mm.

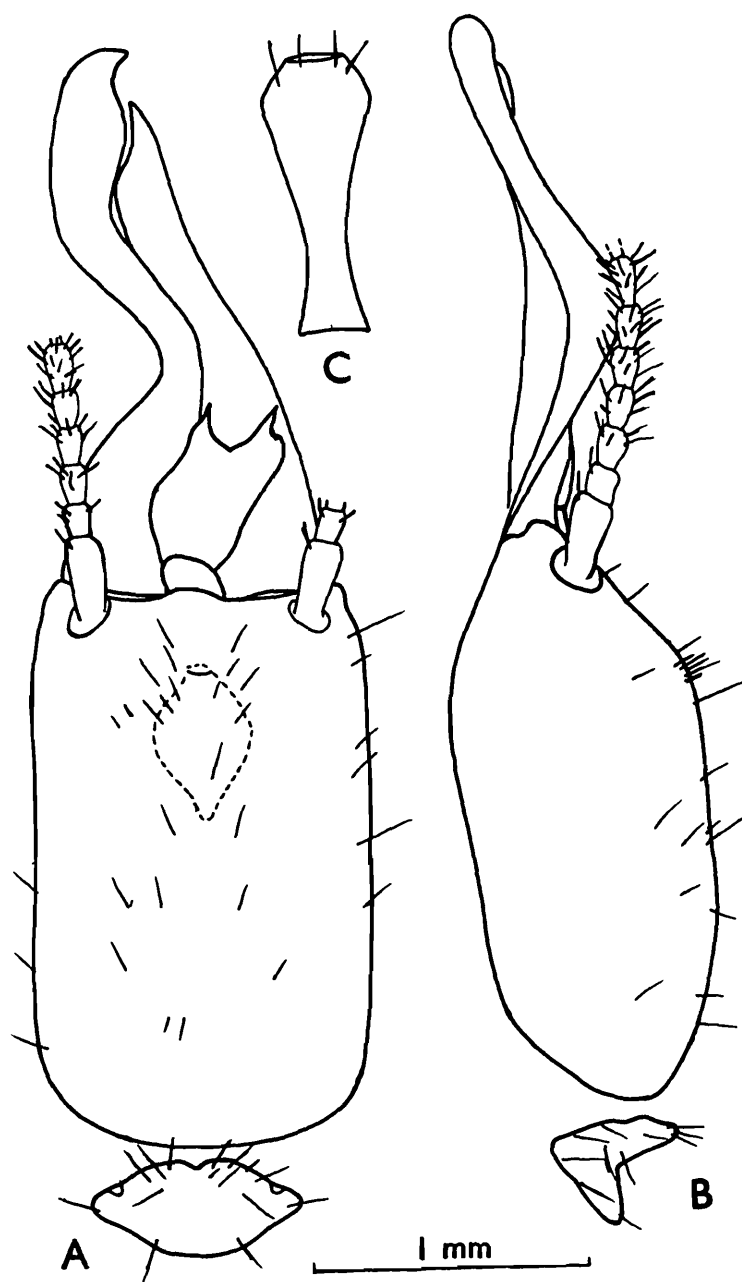


Fig. 154 : *Dicuspidermes obtusus*. Soldier (Lectotype). (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Postmentum.

WORKER (Fig. 155) : Paralectotypes examined. Head-capsule yellowish; labrum and postclypeus slightly paler; antennae, thorax and legs creamish white; abdomen transparent, contents showing through. Head and body fairly densely hairy. Total body-length 4.00-4.70 mm. Head subcircular (length to tip of labrum 1.05-1.25, length to base of mandibles 0.80-0.85, max. width 1.00-1.03 mm). Fontanelle plate round to oval, translucent spot; 0.05-0.07 mm in diameter. Antennae with 14-segments; segment 3 shorter than 2, 4 shortest. Postclypeus swollen, hairy; length about half of width (length 0.25-0.26, width 0.53-0.55 mm). Mandibles as in figure. Pronotum strongly saddle-shaped; anterior margin without notch. Foreleg with the dorsal spur very minute, sometimes not clear.

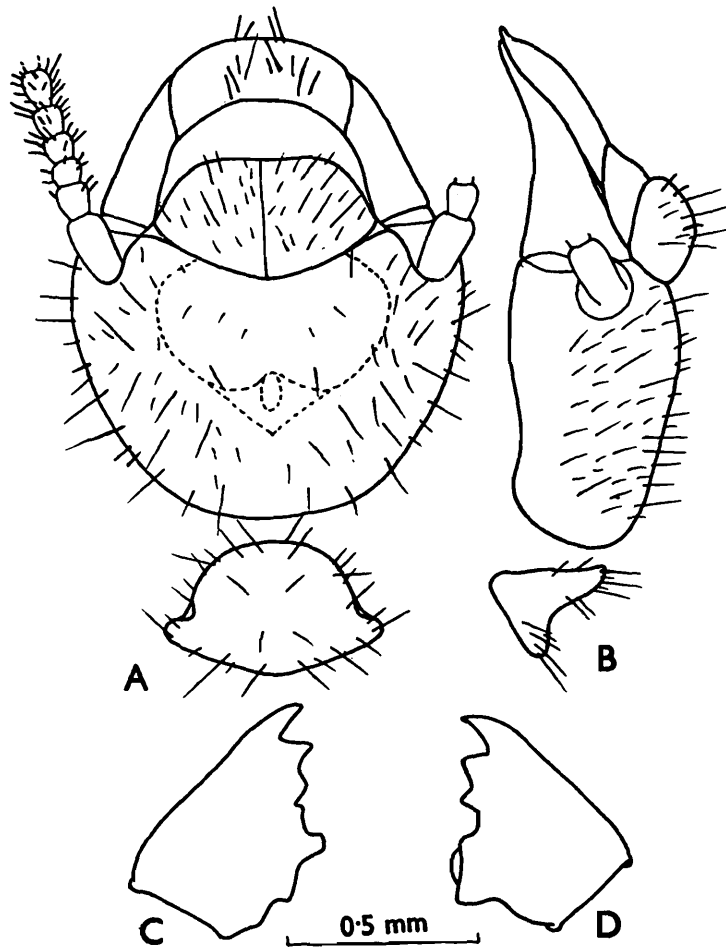


Fig. 155 : *Dicuspiditermes obtusus*. Worker (Paralectotype). (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) and (D) Left and right mandibles respectively.

Measurements (in mm), etc. of Lectotype S, designated here : Total body-length c 6.90, head-length including mandibles 4.00, head-length to base of mandibles 2.10, max. head-width 1.25, head-height 0.88, length of labrum 0.50, width of labrum 0.35, length of left mandible 1.90, length of right mandible 1.85, length of postmentum 1.00, max. width of postmentum 0.35, width of postmentum at waist 0.14, length of pronotum 0.25, width of pronotum 0.75 mm. Head index (width/length to base of mandibles) 0.595 and mandible/head-length index (left mandible-length/head-length to base of mandible) 0.904.

Distribution : INDIA : Orissa, Madhya Pradesh and Karnataka states. Recorded from Karnataka for the first time.

195. *Dicuspiditermes punjabensis* (Holmgren and Holmgren)*

(Figs. 156)

1. *Capritermes punjabensis* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. Agric. India*, **5**(3) : 170. Im.
Syntypes in Riksmus., Stockholm. Type-locality : Lyallpur, Pakistan.
1934. Margabandhu, *J. Bombay nat. Hist. Soc.*, **37** (3) : 711.
1949. Snyder, *Smiths. misc. Colls.*, **112** : 197.
1955. Ahmad, *Biologia*, Lahore, **1** : 262.
1958. Ahmad, *Biologia*, Lahore, **4** (1-2) : 186.

2. *Dicuspiditermes punjabensis* (Holmgren and Holmgren) :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 18.
1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 18.
1974. Akhtar, *Pakistan J. Zool.*, **6** (1 & 2) : 95, 103.
1987. Chhotani, *Beitr. Ent.*, **37** : 411.

IMAGO (Fig. 156) : Description drawn from Holmgren and Holmgren, 1917 and Ahmad, 1955. Head brown to chestnut brown; antennae and postclypeus yellowish brown; pronotum and abdomen above a little paler than head and abdominal sternites paler. Head with plentiful short and long hairs. Head-capsule subcircular (length to tip of labrum 0.91-1.09, length to base of mandibles 0.70-0.77, width 0.90-1.03 mm). Eyes of

* See remarks below.

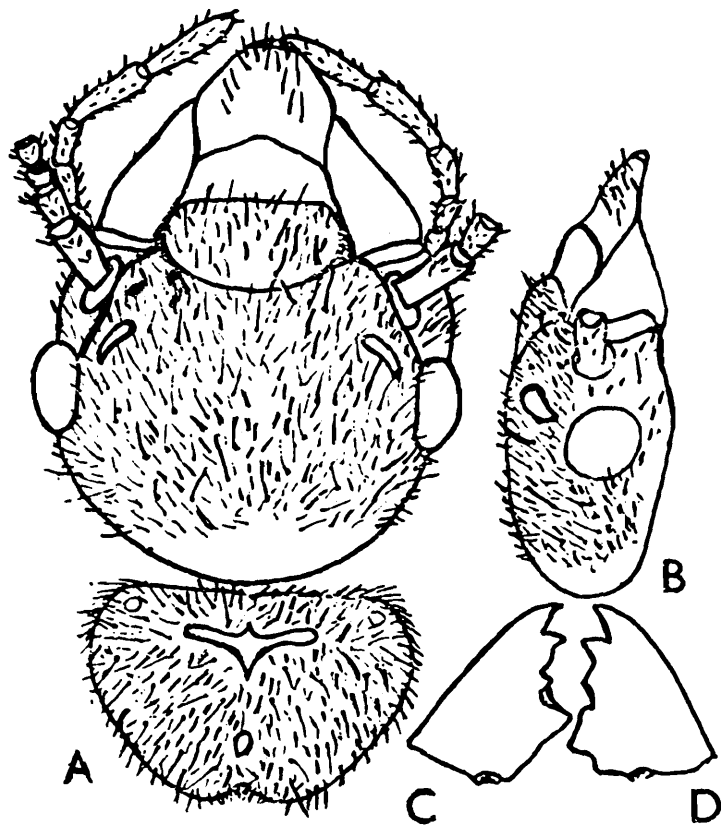


Fig. 156 : *Dicuspiditermes punjabensis*. Imago. (A) Head and pronotum, in dorsal view. (B) Head, in side view. (C) and (D) Left and right mandibles, respectively. (After Ahmad, 1955b).

medium size, projecting, separated from lower margin of head by less than half of their diameter (max. diameter 0.19-0.21, eye from lower margin 0.09 mm). Ocelli oval, rather large (long diameter 0.09-0.12, short diameter 0.07-0.09 mm); from eyes situated at distance of about half their long diameter. Antennae with 15 segments; segment 2 nearly as long as 3 + 4; 3 shorter than to subequal to 4. Postclypeus shorter than or nearly as long as half of width; hairy. Mandibles each with 2 marginal teeth (Fig. 156 C, D). Pronotum semicircular; with paler T-shaped marking and shoulder spots and median marking just above median emargination of posterior margin; anterior margin straight; posterior margin deeply emarginate (length 0.50-0.54, width 0.80-0.86 mm).

SOLDIER : Unknown.

WORKER : Unknown.

Distribution : PAKISTAN (Lyallpur = Faizlabad, type-locality and Lahore and Kohat).

Remarks : Ahmad (1955b) and Krishna (1965b, 1968) recognized this species under *Capritermes* and *Dicuspiditermes*, respectively but Chhotani (1987) had some doubts and thought it to probably belong to the genus *Angulitermes*. As no types of the species were available, it has been retained in the genus *Dicuspiditermes* as was done by Krishna (1965, 1968), for the time being. The imago, however, as seen from the measurements given in literature, is much smaller than the imago of all the other species of the genus *Dicuspiditermes* and the postclypeus is shorter than half of its width, where as in *Dicuspiditermes* it is as long as half of its width. Only examination of the syntypes can solve this question. The syntypes, however, are not present/ traceable in the IARI, New Delhi and it has not been possible to get them from Holmgren's collection at Riksmuseum, Stockholm.

196. *Dicuspiditermes sisiri** n. sp.

(Fig. 157)

IMAGO : Unknown.

SOLDIER (Fig. 157) : Head-capsule yellow, area around fontanelle whitish; antennae pale brown; body and legs creamish white; left mandible blackish, right dark reddish. Head sparsely and body fairly densely hairy. Total body-length 6.30-7.00 mm. Head-capsule subrectangular, sides substraight or slightly convex; length 1.622-1.771 times that of width; in profile frons inclining at 45° angle anteriorly and head posteriorly straight; antero-lateral cusps very long and spinose, longer than in other species; median suture running upto little beyond middle of head. Fontanelle transverse, chitinoid; situated anteriorly on frontal inclination at about 5/6th of head length from posterior margin. Antennae with 14 segments; segments 2, 3, 4 subequal, 2 or 4 sometimes shorter. Labrum asymmetrical with broad and deep incurved anterior margin; lateral margins produced into long, thin, spine-like processes and with a few serrations on antero-lateral margins at base of spines. Mandibles asymmetrical, shorter than head-length, index mandible-length/head-length to base of mandibles 0.820-0.857 Left mandible strongly twisted at middle and with a minute

* Named after the collector Dr. Sisir Kumar Bhattacharyya.

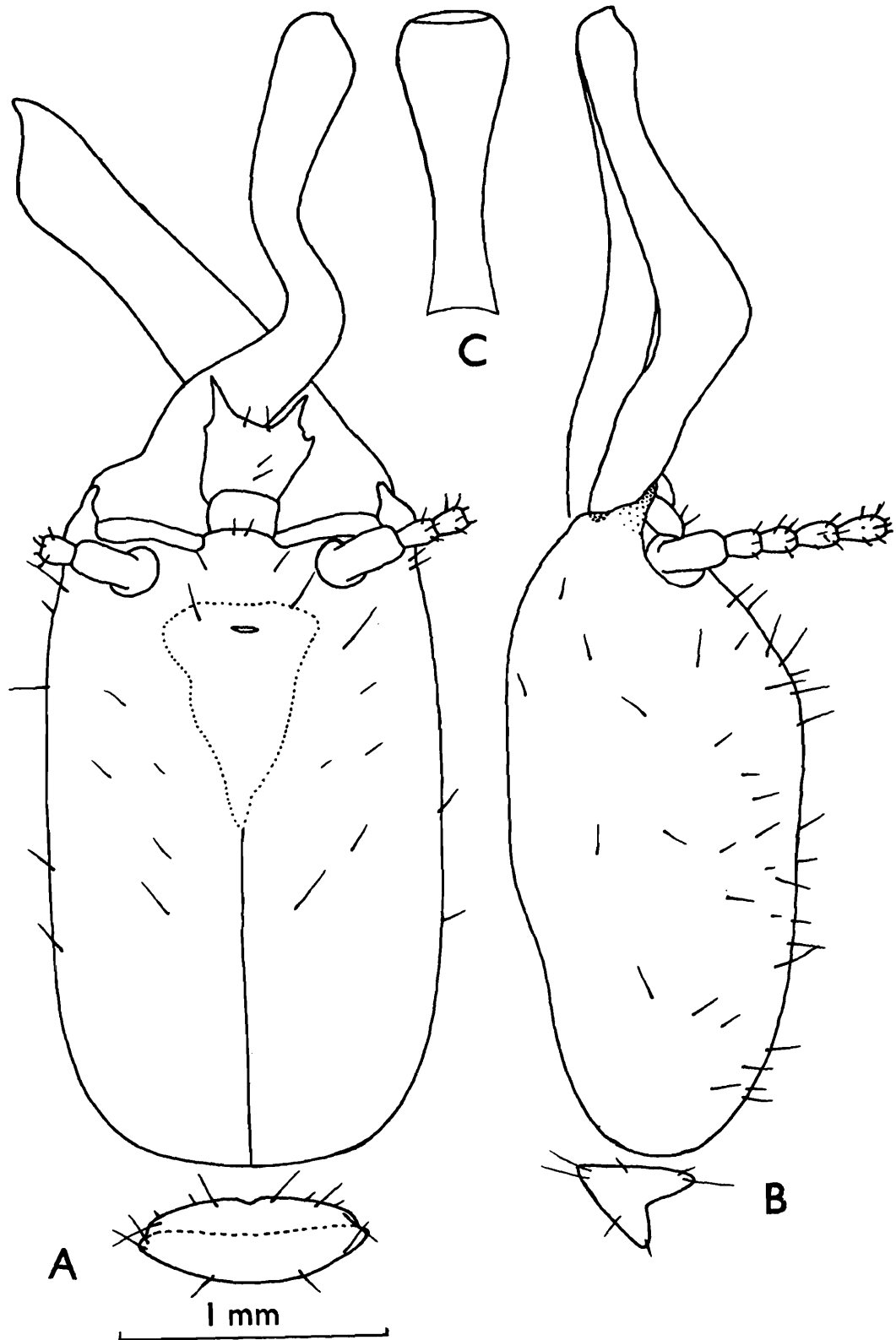


Fig. 157 : *Dicuspiditermes sisiri*. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, in side view. (C) Postmentum.

impression of a pointed tip distally. Right mandible blade-like ; apical part short and weakly incurved on inner margin; apex short and pointed. Postmentum club-shaped; waist long and narrow, lying below middle. Pronotum saddle-shaped, with a notch on anterior margin. Foretibia with 12-15 spines on inner margin.

Table. 2 : Measurements (mm), etc. of soldier of *Dicuspiditermes sisiri* n. sp.

	Range (8 exs)	Holotype
Total body-length.....	6.30-7.00	6.60
Length of head with mandibles.....	4.40-5.60	4.60
Length of head without mandibles.....	2.40-2.55	2.55
Max. width of head.....	1.40-1.55	1.50
Max. height of head.....	1.10-1.20	1.18
Head index I (width/length to base of mandibles).....	0.580-0.590	0.588
Head index II (height/length to base of mandibles).....	0.443-0.464	0.461
Head index III (height/width).....	0.729-0.821	0.783
Occipito-fontanelle distance.....	1.98-2.15	2.08
Fontanelle-head index (Occipito-fontanelle distance/head-length to base of mandibles)...	0.812-0.867	0.814
Length of labrum.....	0.48-0.55	0.55
Width of labrum.....	0.35-0.40	0.40
Length of mandibles : Left.....	2.00-2.10	2.03
Right.....	1.98-2.10	2.03
Mandible-head length index (left mandible-length/head-length to base of mandibles).....	0.820-0.857	0.833
Length of postmentum.....	1.05-1.25	1.15
Max. width of postmentum.....	0.38-0.40	0.40
Width of postmentum at waist.....	0.15-0.18	0.15
Length of pronotum.....	0.25-0.35	0.28
Max. width of pronotum.....	0.78-0.83	0.83

WORKER : Head-capsule and postclypeus pale yellow; antennae, thorax and legs creamy white. Head moderately and body fairly densely hairy. Total body-length 4.6-5.4 mm. Head subcircular broader than long (length to tip of labrum 1.3-1.4, length to base of mandibles 0.9-1.0 and maximum width 1.08-1.15 mm). Antennae with 14 segments, segments 3 and 4 subequal, 2 slightly longer. Postclypeus strongly swollen, length about half of width (length 0.25-0.28, width 0.53-0.57 mm). Labrum dome-shaped (length 0.30-0.38, width 0.45-0.48 mm). Mandibles, thorax and legs as in genus. Pronotum strongly saddle-shaped (length 0.25-0.33, width 0.57-0.60 mm).

Type specimens : Holotype : S and 2 paratype S and several paramorphotype (= paratype) W, near Hydro-electric site, Silent Valley (Kerala), S. K. Bhattacharyya coll., 16. i. 1980. One S (paratype) and several paramorphotype W, Valiyaparathoda, Silent Valley, S. K. Bhattacharyya coll., 26. i. 1980. One S paratype and several paramorphotype W, 18. i. 1980, other data same as above. Five S (paratype) and two W (paramorphotype), 28. i. 1980, ex below timber chips, other data same as above. Two S (paratype) and four W (paramorphotype), 22. i. 1980, ex "leaf litter", other data same as above. All deposited in NZC, ZSI, Calcutta.

Type-locality and distribution : INDIA : Silent Valley, Kerala (type-locality). Known only from type-locality.

Genus 35. **Pericapritermes** Silvestri

1. Genus *Pericapritermes* Silvestri :

- 1914. Silvestri, *Boll. Lab. Zool. Gen. Agr.*, **9** : 134.
- 1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 256, 267, 268, 270-271, 290, 294. Detailed synonymy, description, etc.
- 1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 144, 145.
- 1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 355-356.
- 1971. Bouillon and Mathot, *Zooleo*, No. 1 (Suppl. 2) : 11.
- 1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 64.
- 1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 59, 60, 187.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 9.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 42.
1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13**(1) : 5.
1980. Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46**(4) : 467.
1981. Ahmad and Akhtar, *Pakistan J. Zool.*, **13** : 1, 2, 3, 11, 12.
1982. Thapa, *Sabah For. Rec.*, No. 12 : 7, 9, 204, 205.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 24.
1983. Verma, *Indian J. Forestry*, **6**(4) : 296, 298, 300.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 93, 101, 103, 151.
1987. Chhotani, *Beitr. Ent.*, **37** : 410, 411.
1991. Miller, *Invertebrate Taxonomy*, **4** (*vide* Termite Abstr. :)

Type of genus : *Pericapritermes urgens* Silvestri.

1. Characters of Genus *Pericapritermes*

Imago : Dark brown, densely hairy, medium sized. Head-capsule subcircular; epicranial suture present, faint. Fontanelle large, oval or round. Eyes large, round, projecting out. Ocelli large, oval; not touching eyes. Antennae with 14-15 segments; segment 4 shortest in 14-segmented antennae. Postclypeus swollen, hairy; length a little less than 1/2 width. Mandibles each with an apical and two marginals; apical shorter or almost as long as 1st marginal. Left mandibles : 1st marginal with long sinuate posterior margin; 2nd marginal separated from 1st by distinct cut. Right mandible : Posterior margin of 1st marginal slightly longer than anterior margin; 2nd marginal with weakly incurved posterior margin. Pronotum subtrapezoidal; anterior margin slightly raised. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed.

Soldier : Head-capsule subrectangular, sparsely hairy; without frontal projection; frons gradually and weakly inclining in front. Fontanelle minute, dot-like; situated at base of inclination and leading into a small tube. Antennae with 14 segments. Labrum with substraight or faintly incurved anterior margin; antero-lateral corners short, point-like or extending into small processes. Mandibles asymmetrical. Left strongly twisted at middle; without beak or tip. Right mandible blade-like, with

a pointed tip bending outwards. Pronotum saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed.

Worker : Head subcircular. Fontanelle plate large, prominent, oval or round. Antennae with 14 segments. Postclypeus swollen, hairy; length about 1/2 width. Mandibles generally as in imago; apical longer than 1st marginal and 2nd marginal of right mandible with more strongly incurved posterior margin. Pronotum and legs as in soldier.

2. *Distribution and Composition of Pericapritermes*

(Fig. 108)

Distribution : The genus *Pericapritermes* is known from the Ethiopian, Oriental, Papuan and Australian (reported recently by Miller, 1991) zoogeographical regions.

Composition : Krishna (1968) has listed 32 species under the genus *Pericapritermes* and Chhotani (1987) takes into account 31 species. Of these, according to the latter, 18 species occur in the Oriental Region of which the following 8 are known from the Indian Region.

1. *Pericapritermes assamensis* (Mathur and Thapa)—India
2. *P. dunensis* (Roonwal and Sen-Sarma)—India
3. *P. durga* (Roonwal and Chhotani)—India
4. *P. latignathus* (Holmgren)—Bangladesh, Thailand, Kampuchea, Vietnam, China, Malaysia (Sabah), Java
5. *P. perparvus* (Holmgren)—Sri Lanka
6. *P. semarangi* (Holmgren)—Bangladesh, Thailand, Malaysia, Indonesia, China
7. *P. tetraphilus* (Silvestri)—India, Bangladesh, Burma, China
8. *P. topslipensis* Thakur—India

3. *Keys to Indian Species of Pericapritermes*

IMAGOES

- 1(4) Smaller species : Head-length to tip of labrum 1.03-1.18, head-width 0.87-1.18, pronotum-width 0.68-1.03 mm
- 2(3) Head-width 1.14-1.18, pronotum-width 0.95-1.03 mm. Antennae with 15 segments. Forewing 8.0 mm long.....*perparvus*

- 3(2) Head-width 0.87-0.93, pronotum width 0.68-0.81 mm. Antennae with 14-15 segments. Forewing 7.88-8.36 mm long.....*semarangi*
- 4(1) Larger species : Head-length to tip of labrum 1.26-1.51, head-width 1.27-1.40, pronotum-width 0.93-1.15 mm
- 5(6) Fontanelle plate smaller. Y-suture present, faint, lateral arms sometimes not distinct. Ocellus larger and closer to eye (long diameter 0.17-0.20, eye-ocellus distance 0.05-0.07 mm)...*dunensis*
- 6(5) Fontanelle plate larger. Y-suture absent. Ocellus smaller and farther from eye (long diameter 0.15-0.18, eye-ocellus distance 0.06-0.08 mm).....*tetraphilus*

SOLDIERS

- 1(6) Smaller species : Head-length with mandibles less than 4.0 mm, head-length without mandibles less than 2.30, head-width generally less than 1.25 and mandible-length less than 1.40 mm
- 2(3) Head-length without mandibles less than 2.00 mm. Head-length 1.67-1.97, head-width 0.92-1.04, mandible-length 1.05-1.14, pronotum-width 0.54-0.75 mm.....*semarangi*
- 3(2) Head-length without mandibles more than 2.0 mm. Head-length 2.09-2.28, head-width 1.06-1.25, mandible-length 1.24-1.37, pronotum-width 0.72-0.91 mm
- 4(5) Head narrower (width 1.06-1.25 mm) in comparison to length. Mandibles shorter, 1.24 mm long.....*perparvus*
- 5(4) Head wider (width 1.19-1.27 mm) in comparison to length. Mandibles longer, 1.32-1.37 mm long.....*assamensis*
- 6(1) Larger species : Head-length with mandibles more than 4.0 mm, head-length without mandibles more than 2.30, head-width more than 1.25 and mandible-length more than 1.40 mm
- 7(8) Generally smaller in size. Head-length with mandibles 4.0-4.25, head-length without mandibles 2.30-2.50, head-width 1.30-1.45, left mandible-length 1.43-1.70 mm. Antero-lateral corner of labrum more prominent and produced anteriorly.....*dunensis*
- 8(7) Generally larger in size. Head-length with mandibles 4.5-5.0, head-length without mandibles 2.45-3.05, head-width 1.45-2.00, left

mandible-length 1.45-2.00 mm. Antero-lateral corners of labrum small, less so produced anteriorly

- 9(12) Body weakly hairy, with fewer longer hairs
- 10(11) Head-capsule generally larger (length without mandibles 2.45-3.06, width 1.48-1.70 mm). Mandibles longer (1.60-1.84 mm). Antennae with segment 4 subequal to 2.....*tetraphilus*
- 11(10) Head-capsule generally smaller (length without mandibles 2.5-2.75, width 1.32-1.41 mm). Mandibles shorter 1.45-1.48 mm). Antennae with segment 4 shorter than 2.....*topslipensis*
- 12(9) Body densely hairy with many long hairs
- 13(14) Labrum with anterior margin convex and antero-lateral corners minute. Segment 4 of antennae shorter than 2. Pronotum not emarginate anteriorly.....*durga*
- 14(13) Labrum with anterior margin straight or incurved and antero-lateral corners more prominent. Segment 4 of antenna subequal to 2. Pronotum emarginate anteriorly.....*latignathus*

197. *Pericapritermes assamensis* (Mathur and Thapa)

(Fig. 158)

1. *Capritermes assamensis* Mathur and Thapa :

1965. Mathur and Thapa, *Bull. Ent.*, No. 6 : 10-12, Holotype : S, in FRI, Type-locality : Polo Block, Central Range, Goalpara Divn., Assam.

2. *Pericapritermes assamensis* (Mathur and Thapa) :

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, 138 (Art. 5) : 293.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 33.

1983. Verma, *Indian J. Forestry*, 6(4) : 298, 300.

3. *Pericapritermes ceylonicus* (wrong determination) :

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 24, 87-89.

IMAGO : Unknown.

SOLDIER (Fig. 158) : Head-capsule yellowish brown, darker anteriorly; antennae and labrum yellowish brown; mandibles reddish brown to

blackish. Head sparsely and body fairly densely hairy. Total body-length c 5.0-6.0 mm. Head-capsule subrectangular, sides slightly convex (length to base of mandibles 2.05-2.20, width 1.19-1.27 mm, index width/length 0.56-0.58); in profile frons sloping in front and shallowly depressed medially; median suture present, not extending upto fontanelle. Fontanelle minute, circular; situated anteriorly at about distal 1/5 of head dorsum. Antennae 14-segmented; segment 4 smallest. Labrum asymmetrically



Fig. 158 : *Pericapritermes assamensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

subsquarish; anterior margin straight; antero-lateral corners produced into small, pointed tips. Mandibles strongly asymmetrical; a little longer than half the length of head-capsule (length : left 1.32-1.37, right 1.30-1.35 mm, index left mandible-length/head-length c 0.63); left mandible strongly twisted at middle, without a point at tip; right blade-like, tip pointed and weakly outcurved apically. Postmentum long, club-shaped; widest at anterior 1/3 and waist narrowest at posterior 1/3. Pronotum saddle-shaped; anterior margin convex, with a distinct notch; posterior margin convex, without notch.

WORKER : Head-capsule, antennae and labrum pale yellow; body creamish. Head and body fairly hairy. Head-capsule subcircular (length to base of mandibles 0.70-0.75, width 0.90-1.00 mm). Fontanelle plate oval, whitish spot. Antennae 14-segmented, segment 4 smallest. Postclypeus swollen, hairy; length a little less than half of width. Labrum dome-shaped, hairy. Pronotum saddle-shaped; anterior margin strongly convex; length 0.20-0.25, width 0.55 mm.

Distribution : INDIA : Assam (Polo Block, Central Range, Goalpara Div., type-locality). West Bengal.

198. *Pericapritermes dunensis* (Roonwal and Sen-Sarma)

(Figs. 159, 160)

1. *Capritermes dunensis* Roonwal and Sen-Sarma :

1960. Roonwal and Sen-Sarma, *Contr. Syst. Orient. Termites (ICAR Ent. Monogr., 1)* : 28-33, Pl. 4. Holotype : S, in FRI. Type-locality : Dehradun (New Forest), U.P., India.

1962. Mathur and Thapa, *Indian For. Leaflet*, No. 167 : 108.

2. *Pericapritermes dunensis* (Roonwal and Sen-Sarma) :

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 294.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 33.

1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 64-68. Imago described.

1983. Verma, *Indian J. Forestry*, **6**(4) : 298, 299, 300.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO (Fig. 159) : Head dark brown; postclypeus, labrum, antennae and legs golden yellow; pronotum brownish yellow, darker posteriorly;

wings brownish; abdomen dark brown above and yellowish below. Head and body densely pilose with a coat of fine, short, hairs and several long hairs; abdominal pleura sparsely hairy in male and densely hairy in females; wing-membrane with a few short hairs on distal part. Total

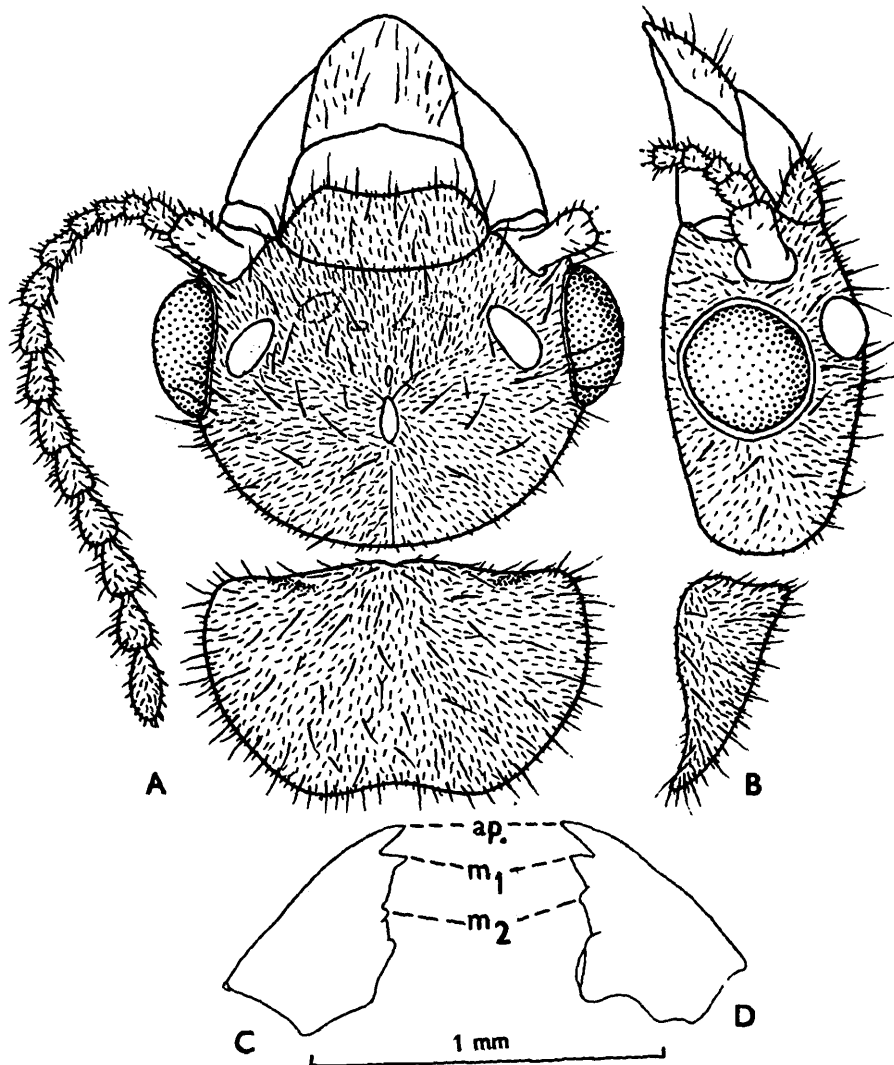


Fig. 159 : *Pericapritermes dunensis*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view (C) and (D) Left and right mandibles. (After Roonwal and Chhotani, 1977).

body-length with wings 14.10-15.10 and without wings 7.40-8.00 mm. Head-capsule subcircular (length to base of mandibles 0.90-1.00, width with eyes 1.27-1.38 mm); slightly depressed around fontanelle; epicranial suture faint, lateral arms sometimes not discernible; a whitish, linear spot in front of fontanelle and a few oval, paler spots in front of ocelli present. Fontanelle plate large, oval (0.08-0.12 mm long and 0.05 mm

wide). Eyes round, strongly projecting; nearly equidistant from antennae, ocelli and lower margin of head (max. diameter 0.35-0.40 mm). Ocelli oval, 0.17-0.20 mm long and 0.10-0.13 mm wide; separated from eyes by about half their short diameter (0.05-0.07 mm). Postclypeus swollen, hairy; length about 1/3 of width (length 0.20, width 0.57 mm). Antennae with 15 segments; segment 3 shortest; 4 and 5 subequal. Mandibles as in figure. Pronotum flat, only slightly raised anteriorly; length 0.61-0.68, width 1.03-1.15 mm; anteriorly weakly notched medially and posteriorly strongly emarginate. Meso- and metanotum with a deep angular notch posteriorly. Wings brownish, densely covered with 5-7 armed micrasters; all veins arising independently from scale in forewing, in hindwing media arising from radius inside wing-membrane; forewing-length 12.7-13.2, hindwing-length 12.0 mm.

SOLDIER (Fig. 160) : Head-capsule yellowish brown to brown, sometimes somewhat paler posteriorly; antennae and labrum brownish; pronotum creamish; legs and abdomen creamish white. Head and body sparsely hairy. Total body-length 5.50-7.20 mm. Head capsule subrectangular, length about twice of width; sides slightly narrowing in front of antennae (length to base of mandibles 2.30-2.50, width 1.30-1.45 mm, index width/length 0.56-0.59); frons sloping in front a little; median suture running almost upto fontanelle. Fontanelle small, situated anteriorly at about 4/5 of head-length from posterior margin; length of head to fontanelle 1.95-2.10 mm, index fontanelle-head length/head-length to base of mandibles 0.80-0.82); fontanelle gland small, sometimes not distinct. Antennae with 14 segments; segment 3 longer than either 2 or 4, the latter shortest. Labrum asymmetrical, subsquarish; anterior margin slightly incurved; with short, horn-like projections at antero-lateral corners (length 0.20-0.25, width 0.25-0.30 mm). Mandibles asymmetrical. Left mandible strongly twisted and much shorter than head (length 1.43-1.70 mm, index mandible-length/head-length 0.56-0.63). Right mandible blade-like, bending outwards near tip (length 1.37-1.50 mm). Postmentum long club-shaped; weakly narrowed at waist (length 1.40-1.50, max. width 0.40-0.50, width at waist 0.25 mm). Pronotum saddle-shaped; anterior margin with a weak median notch; posterior margin convex without any emargination (length 0.33-0.40, width 0.80-0.88 mm). Mesonotum narrower and metanotum as wide as pronotum, both not sinuate at posterior margin.



Fig. 160 : *Pericapritermes dunensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

WORKER : Head-capsule pale straw-coloured; antennae, pronotum and legs creamish; abdomen greyish due to intestinal contents. Head sparsely and body moderately hairy. Total body-length 3.2-4.0 mm. Head-capsule subcircular (length to base of mandibles 0.85-0.90, max. width 0.95-1.05 mm). Fontanelle indistinct. Antennae with 14 segments; segment 3 shorter than 2 and longer than 4, the latter shortest. Postclypeus swollen, length half of width. Pronotum saddle-shaped; length 0.20-0.25, width 0.40-0.55 mm; anterior margin rounded, not notched; posterior margin

convex, not notched. Mesonotum broader than pronotum and metanotum broader than mesonotum.

Distribution : INDIA : Meghalaya, Arunachal Pradesh, Uttar Pradesh and West Bengal. BHUTAN.

199. **Pericapritermes durga** (Roonwal and Chhotani)

(Fig. 161)

1. *Capritermes latignathus durga* Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 325-329, Pls. 22, 23. S and W. Holotype : S, in ZSI. Type-locality : Cherrapunji, Meghalaya, India.

2. *Pericapritermes latignathus durga* (Roonwal and Chhotani) :

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 294.

3. *Pericapritermes durga* (Roonwal and Chhotani) :

1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 64, 66, 68.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 33.

1983. Verma, *Indian J. For.*, **6** (4) : 298, 300.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER (Fig. 161) : Head-capsule yellow to pale brown; antennae pale brown to brown; labrum brown, medially hyaline; mandibles reddish brown to dark brown, right a little paler than left; thorax paler than head; abdomen and legs yellowish white. Head sparsely and body densely hairy. Total body-length 6.5-8.0 mm. Head-capsule subrectangular, length a little less than twice its width (length to base of mandibles 2.45-3.00, width 1.45-1.60 mm); sides subparallel, slightly narrowing in front of antennae; frons weakly inclining in front; median suture a dark line present between fontanelle and posterior margin of head. Fontanelle minute, round, with a small tube leading inside; situated at base of frons at about distal 1/4 of head-capsule (Occipito-fontanelle distance 2.03-2.07 mm, index occipito-fontanelle distance/head-length 0.75-0.78). Antennae with 14 segments; segment 3 longer than 2, club-shaped; 4 shortest. Labrum subsquarish; with lateral sides swollen (length 0.20-0.25, width

0.28-0.35 mm); weakly asymmetrical; anterior margin substraight or slightly convex; antero-lateral corners with minute points. Mandibles strongly asymmetrical; shorter than head (length : left 1.75-2.00, right 1.60-1.80 mm, index left mandible-length/head-length 0.65-0.68). Left mandible strongly twisted, tip broad and spatulate. Right mandible blade-like, bending a little outwards near tip. Postmentum long, club-shaped;

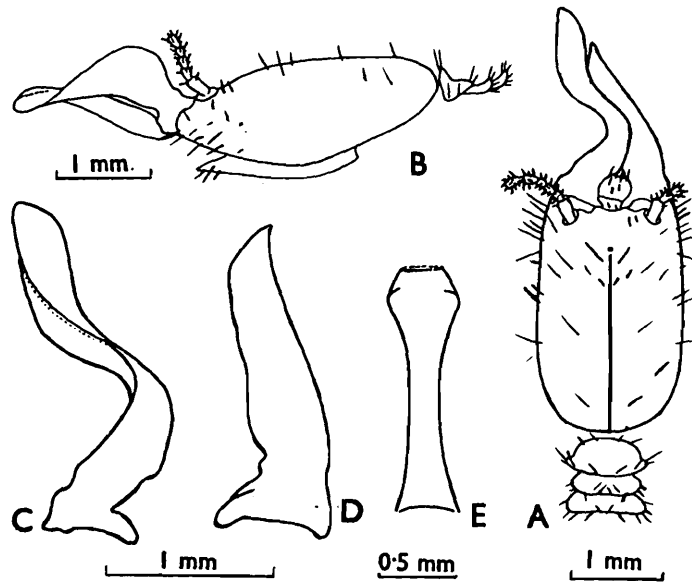


Fig. 161 : *Pericapritermes durga*. Soldier. (A) Head and thorax, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles. (E) Postmentum. (Ex Roonwal and Chhotani, 1962c).

with a long, narrow waist (length 1.57-1.83, max. width 0.47-0.50 and width at waist 0.20-0.23 mm). Pronotum strongly saddle-shaped; anterior lobe strongly upturned, rounded at anterior margin and without notch; posterior margin convex, without notch. Mesonotum narrower and metanotum as wide as or slightly wider than pronotum.

WORKER : Head-capsule creamish; antennae, legs and thorax somewhat paler; abdomen greyish due to intestinal contents showing through. Head and body moderately hairy. Total body-length 3.90-4.63 mm. Head-capsule subcircular (length to base of mandibles 0.83-0.97, max. width 1.03-1.13 mm); broadest near antennae. Fontanelle plate large, oval, whitish spot (diameter 0.13-0.16 mm). Antennae with 14 segments; segment 3 generally smaller but sometimes subequal to 2; 4 shortest. Postclypeus swollen, length less than half of width. Labrum, mandibles

and pronotum as in genus (pronotum-length 0.25-0.27 and width 0.57-0.67 mm).

Distribution : INDIA : Meghalaya, Arunachal Pradesh and Manipur.
BHUTAN.

200. *Pericapritermes latignathus* (Holmgren)

(Fig. 162)

1. *Capritermes (Capritermes) latignathus* Holmgren :

1914. Holmgren, *Zool. Jb. Syst.*, **36** : 280-281. S and W. Syntypes : Probably in Holmgren Coll., Riksmus., Stockholm. Type-locality. Tjibodas, Java, Indonesia.

2. *Capritermes latignathus* Holmgren :

1934. Kemner, *K. Svenska Vetensk.-Akad. Handl.*, (3) **13** : 174-175.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 195.

1958. Ahmad, *Biologia*. Lahore, **4**(2) : 188.

1962. Mathur and Thapa, *Indian For. Leaflet*, No. 167 : 109.

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 329.

3. *Pericapritermes latignathus* (Holmgren) :

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 98.

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 294.

1968. Harris, *Opusc. Ent.*, **33** : 153, 154.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A-17-FS-12) : 64, fig. 77.

1973. Morimoto, *Bull. Gov. For. exp. Sta.*, No. 257 : 66, 78.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 168-170, 194.

1982. Thapa, *Sabah For. Rec.*, No. 12 : 205, 208-209.

1983. Li and Ma, *Acta ent. Sinica*, **26** : 331, 333.

1986. Gao and Lam, *Mem. Hongkong nat. Hist. Soc.*, **17** : 83.

IMAGO : Unknown.

SOLDIER (Fig. 162) : Head-capsule yellowish to yellowish brown; antennae pale brown; mandibles dark brown; body pale yellowish. Head and pronotum sparsely hairy and body fairly densely hairy with short

and long hairs. Total body-length 6.3-6.7 mm. Head-capsule subrectangular, sides subparallel (length with mandibles 4.4-4.9, length to base of mandibles 2.39-3.17, width 1.40-1.72 mm); median arm of Y-suture reaching almost upto fontanelle. Fontanelle point-like, situated anteriorly; gland small. Antennae with 14 segments; segment 3 a little longer than 2; 4 subequal to 2. Labrum slightly asymmetrical; anterior margin substraight or weakly incurved; antero-lateral corners with short,

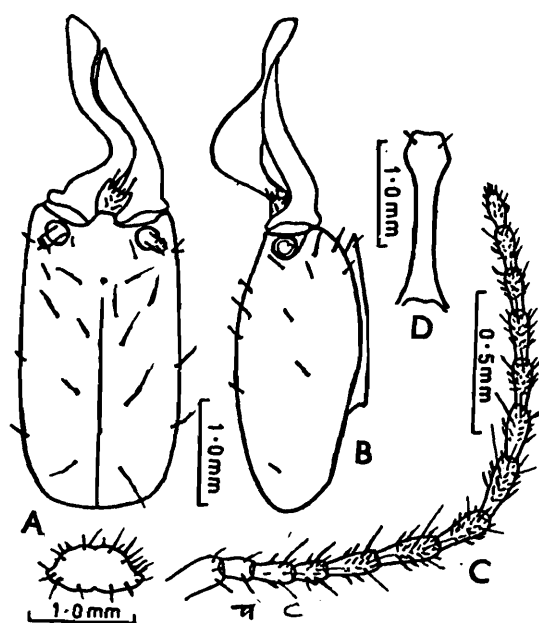


Fig. 162 : *Pericapritermes latignathus*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Antenna. (D) Postmentum. (Ex Akhtar, 1975).

pointed processes. Mandibles strongly asymmetrical; about 2/3-3/4 of head-length. Left mandible strongly twisted at middle; right blade-like, apically outcurved (length : Left mandible 1.76-2.08, right 1.61-1.92 mm; index left mandible-length/head-length 0.655-0.77). Postmentum long, club-shaped with a long waist (length 1.76-1.97, max. width 0.46-0.55, width at waist 0.20-0.28 mm). Pronotum saddle-shaped; anterior margin notched medially and posterior margin convex and medially depressed (length 0.36-0.49, width 0.88-1.06 mm).

WORKER : Head whitish yellow to pale brownish yellow; body whitish with intestines showing through. Head and body fairly hairy. Total body-length 4.0-4.5 mm. Head broadly oval (length to tip of labrum 1.41-1.55, width 1.06-1.13 mm). Fontanelle plate at middle of head. Antennae with

14 segments; 2, 3 segments subequal, 4 a little shorter. Postclypeus shorter than 1/2 width. Pronotum saddle-shaped; anteriorly notched at middle; width 0.63-0.68 mm.

Distribution : BANGLADESH. Also THAILAND, KAMPUCHEA, VIETNAM, MALAYSIA, CHINA.

201. *Pericapritermes perparvus* (Holmgren)

(Synonyms : *Capritermes ceylonicus* Holmgren and *Capritermes distinctus* Holmgren)

(Fig. 163)

1. *Eutermes perparvus* Holmgren :

1911. Holmgren, In : Escherich's *Termitenleben auf Ceylon* : 201. Im only. Syntypes : Im, in Mus. Wien, Vienna. Type-localities : Heneratgoda and Peradeniya, Sri Lanka.

2. *Capritermes ceylonicus* Holmgren* :

1911. Holmgren, In : Escherich's *Termitenleben auf Ceylon* : 204-205, Pl. 2 fig. Q.

1913. Holmgren, *K. Svenska Vetensk.-Akad. Handl.*, **50**(2) : 242, 244-246. Treats *Eutermes perparvus* as synonym of *Capritermes ceylonicus*.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 193. Synonymy.

1953. Rattan Lal and Menon, *Cat. Indian Insects-Isoptera, Pt. 27* : 46.

1958. Ahmad, *Biologia*, Lahore, **4** : 185, 189.

1962. Mathur and Thapa, *Indian For. Leaflet*, No. 167 : 108.

3. *Pericapritermes ceylonicus* (Holmgren) :

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 294.

1983. Verma, *Indian J. Forestry*, **6** (4) : 298, 299, 300.

4. *Pericapritermes ceylonicus* (Holmgren). Wrong determinations :

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 18, 24, 86.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 93, 151-153.

5. *Capritermes distinctus* Holmgren :

1913. Holmgren, *K. Svenska Vetensk.-Akad. Handl.*, **50**(2) : 246.

* See remarks on "Nomenclature" below.

1949. Snyder, *Smiths. misc. Colls.*, 112 : 183.
1953. Rattan Lal and Menon, *Cat. Indian Insects-Isoptera*, Pt. 27 : 46.
1958. Ahmad, *Biologia*, Lahore, 4(2) : 184, 189.
1968. Krishna, *Bull. Am. Mus. nat. Hist.*, 138 (Art. 5) : 294. Treats as a synonym of *P. ceylonicus* (Holmgren).

IMAGO : Head-capsule dark brown; antennae, postclypeus, legs and meso- and metanota yellow; pronotum paler than head somewhat; abdominal segments of same colour as pronotum, anterior sternites paler medially. Head densely hairy, with short hairs mixed with long hairs; remaining parts densely hairy; wings thickly punctate. Total body-length with wings 10.0 and without wings 4.5 mm. Head broad, oval, narrowed in front (length to tip of labrum 1.14-1.18, width 1.14-1.18 mm). Fontanelle oval, moderately large. Eyes medium sized, projecting out. Ocelli moderately large; separated from eyes by its average diameter (half diameter vide Ahmad 1958). Antennae with 15 segments; segments 2, 3 and 4 subequal or 3 shorter than 2. Postclypeus shorter than 1/2 width. Pronotum moderately wide and long (length 0.57, width 0.95-1.03 mm); anteriorly faintly emarginate. Forewing 8.0 mm long.

SOLDIER (Fig. 163) : Head whitish yellow; left mandible blackish, right reddish brown; body whitish. Head with scattered hairs; abdominal tergites moderately thickly hairy together with long hairs posteriorly. Total body-length 4.0-4.5 mm. Head-capsule flat, rectangular, cylindrical; about twice as long as wide (length with mandibles 3.5-3.8, without mandibles 2.09-2.18, width 1.06-1.25 mm). Fontanelle dot-like. Antennae with 13(?) -14 segments; segment 3 as long as 2; 4 somewhat shorter. Labrum short, broad anteriorly, anterior margin faintly concave, with very small antero-lateral corners. Mandibles asymmetrical, shorter than head. Left mandible strongly twisted, 1.24 mm long. Right mandible blade like. Pronotum weakly saddle-shaped; length 0.30, width 0.72-0.91 mm.

WORKER : Head yellowish white, body whitish. Moderately hairy. Total body-length 2.7-3.5 mm. Head broadly oval, narrowed anteriorly (width 0.87-0.91 mm). Fontanelle indistinct but present. Antennae with 14 segments; segment 3 slightly shorter than 2, 4 somewhat shorter than 3. Postclypeus moderately swollen, a little shorter than 1/2 width. Pronotum saddle-shaped; not notched anteriorly; width 0.49 mm.

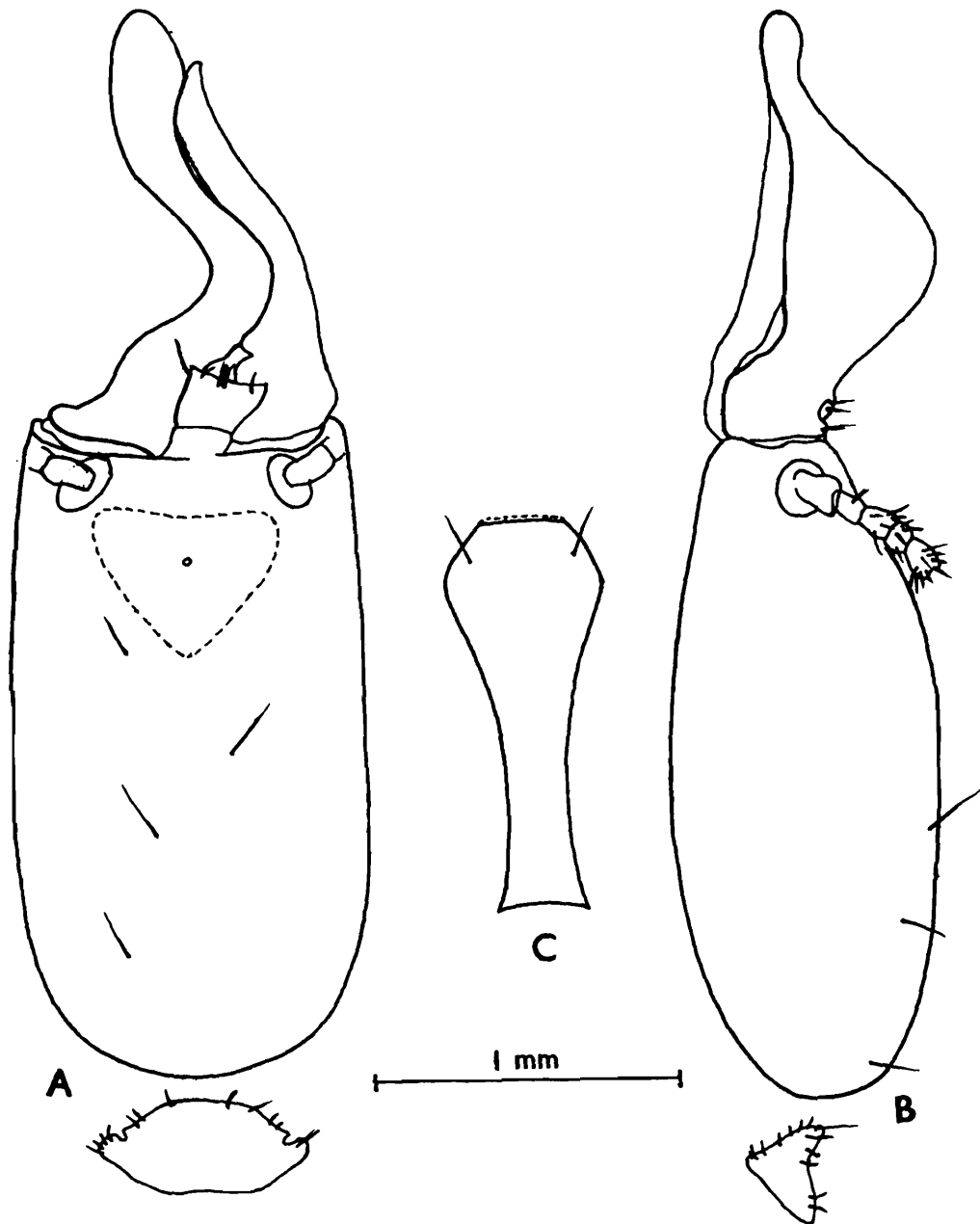


Fig. 163 : *Pericapritermes perparvus*. Soldier. (Syntype of *Capritermes ceylonicus*).
 (A) Head and pronotum, dorsal view. (B) Same, side view. (C)
 Postmentum.

Distribution : SRI LANKA.

Remarks on distribution and nomenclature : *Distribution* : Maiti (1983) records *P. ceylonicus* (Holmgren) (taken here as a synonym of *perparvus* Holmgren) from West Bengal, India, but on re-examination of the specimens it is found that they belong to the species *P. assamensis* (Mathur and Thapa). Bose (1984) records *P. ceylonicus* (Holmgren) from

South India but her specimens appear to be closer to *P. topslipensis* Thakur than to *ceylonicus*. Of course, she mentions about variation in size and shape of head of soldier in collections of *ceylonicus* from Sri Lanka, but in my opinion this question of variation needs to be gone through again since the differences in size as given in the original description of Holmgren and the specimens from India is appreciably great.

The above description, therefore, has been drawn up from Holmgren (1911b and 1913b) and the species is restricted only to Sri Lanka.

Nomenclature : Holmgren 1911 (*Termitenleben auf Ceylon* : 201) described the species *Eutermes perparvus* from imago but gave an indication that it is probably the imago of '*E. Escherichi*' of which the imago is not known. Later, he (Holmgren 1913, *K. Svenska Vetensk.-Akad. Handl.*, 50(2) : 244) treated *E. perparvus* Holmgren as a synonym of *Capritermes ceylonicus* Holmgren and this was followed accordingly by Snyder (1949). *Eutermes perparvus* Holmgren, in accordance with Law of Priority, has page precedence over *Capritermes ceylonicus* Holmgren, the species which was described on page 204-205 in the same publication as *E. perparvus* Holmgren on page 201. Accordingly the name *perparvus* is resurrected and the name *Capritermes ceylonicus* Holmgren (*Pericapritermes ceylonicus*) is treated here as a synonym of the former name.

202. *Pericapritermes semarangi* (Holmgren)

(Synonyms : *Capritermes javanicus* Holmgren and *Capritermes sumatrensis* John)

(Fig. 164)

1. *Capritermes semarangi* Holmgren :

- 1913. Holmgren, *K. Svenska Vetensk.-Akad. Handl.*, 50(2) : 247. Im, S and W. Syntypes in Riksmus., Stockholm. Type-locality : Semarang, Java, Indonesia.
- 1949. Snyder, *Smiths. misc. Coll.*, 112 : 197. See for synonymy.
- 1958. Ahmad, *Biologia*, Lahore, 4(2) : 186, 188.
- 1962. Mathur and Thapa, *Indian Forest Leaflet*, No. 167 : 110.

2. *Pericapritermes semarangi* (Holmgren) :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 15.
 1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 99-100. See for synonymy, description, etc.
 1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 294.
 1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rept. PL 480 Project A 17-FS-12) : 64-65, fig. 78.
 1973. Morimoto, *Bull. Govt. For. exp. Sta.*, No. 257 : 66, 78.
 1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 168, 170-171.
 1982. Thapa, *Sabah For. Rec.*, No. 12 : 204, 205, 219-222. Synonymy, description.
 1983. Verma, *Indian J. Forestry*, **6**(4) : 298, 299. Key.
 1986. Gao and Lam, *Mem. Hongkong nat. Hist. Soc.*, **17** ; 83.

3. *Capritermes javanicus* Holmgren :

1913. Holmgren, *K. Svenska Ventensk.-Akad. Handl.*, **50**(2) : 255-256.
 1949. Snyder, *Smiths. misc. Colls.*, **112** : 197.

4. *Capritermes sumatrensis* John :

1925. John, *Treubia*, **6**(3-4) : 415-416.
 1949. Snyder, *Smiths. misc. Coll.*, **112** : 198.
 1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 294. Treats *sumatrensis* as a synonym of *semarangi*.

IMAGO : Head brown; antennae and postclypeus paler; pronotum and abdominal tergites pale brownish, anterior abdominal sternites paler at middle; wings dark grey or brownish; legs brownish yellow. Head and body densely hairy. Total body-length with wings 9.0-9.5. Head broadly oval; with eyes broader than length to base of mandibles (length to tip of labrum 1.03-1.13, length to base of mandibles 0.67, width with eyes 0.87-0.93 mm). Fontanelle oval, whitish; situated below level of eyes. Eyes large, 0.26 mm in diameter; situated close to lower margin of head (distance 0.065 mm). Ocelli fairly large, oval (long diameter 0.13, short diameter 0.078 mm); separated from eyes by nearly their short diameter (0.067 mm). Antennae 14 to 15-segmented; in 14-segmented antennae segment 2 and 3 subequal; in 15-segmented ones 2 equal to 3+4, 3 very short. Postclypeus flatly swollen; length less than half of width. Pronotum

flat (length 0.42-0.46, width 0.68-0.81 mm); anterior margin substraight, faintly emarginate medially; posterior margin rounded and weakly emarginate. Mesonotum and metanotum angularly and sharply emarginate with sharp pointed hind corners. Wings densely covered with micrasters; forewing-length 7.88-8.36, hindwing-length 7.79-7.88 mm.

SOLDIER (Fig. 164) : Head yellow to reddish yellow; mandibles dark brown; antennae paler than head; pronotum yellowish white; body and legs whitish. Head sparsely and body densely hairy. Total body-length 3.55-4.0 mm. Head-capsule subrectangular, sides subparallel (length to base of mandibles 1.60-1.97, width 0.85-1.04 mm); median suture extending to little behind fontanelle. Fontanelle small, minute; situated anteriorly at about 4/5 of head-length from posterior margin. Antennae with 14 segments; segment 2 slightly longer than 3, 4 shortest. Labrum substraight anteriorly with short lateral points. Mandibles asymmetrical; a little longer than 1/2 of head-length (left 1.02-1.16 and right 0.90-1.04 mm long, index left mandible-length/head-length to base of mandibles 0.57-0.68); left

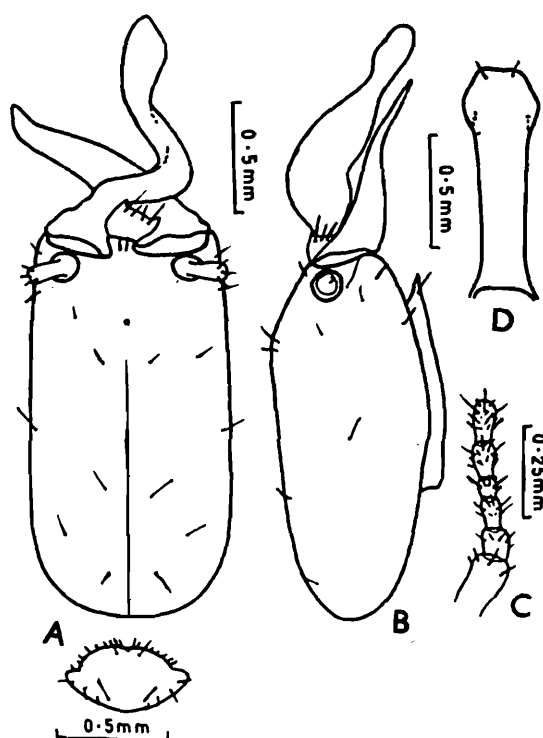


Fig. 164 : *Pericapritermes semarangi*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Part of antenna. (D) Postmentum. (Ex Akhtar, 1975).

mandible strongly twisted at middle, right blade-like. Postmentum long, club-shaped; length 1.0-1.30, max. width 0.31-0.33, width at waist 0.13-0.21 mm. Pronotum saddle-shaped (length 0.22-0.31, width 0.51-0.75 mm); anterior margin faintly or not notched; posterior margin convex not notched.

WORKER : Head whitish to yellowish; body whitish with intestinal contents showing through. Head moderately and body densely hairy. Total body-length 3.2-3.3 mm. Head oval (width 0.74-0.80 mm); epicranial suture indistinct. Fontanelle plate oval, small. Antennae with 13 to 14 segments; segment 2 longer than 3, 4 shortest. Postclypeus swollen; straight anteriorly and rounded posteriorly. Pronotum saddle-shaped; not notched at anterior margin; width 0.38-0.49 mm.

Distribution : BANGLADESH, THAILAND, MALAYSIA (Sabah), INDONESIA (Java, Sumatra), CHINA.

203. *Pericapritermes tetrphilus* (Silvestri)

(Synonym : *Capritermes orientalis* Mathur and Sen-Sarma)

(Pl. 1A, Figs. 165, 166)

1. *Capritermes tetrphilus* Silvestri :

1922. Silvestri, *Rec. Indian Mus.*, **24**(4) : 543-545. S and W. Syntypes : Probably in Silv. Coll. Type-locality : Rangamati, Chittagong Hill Tracts, Bangladesh.
1949. Snyder, *Smiths. misc. Colls.*, **112** : 198.
1953. Rattan Lal and Menon, *Cat. Indian Insects-Isoptera Pt. 27* : 50.
1958. Ahmad, *Biologia*, Lahore, **4** : 188.
1965. Mathur and Thapa, *Bull. Ent.*, No. 6 : 12.

2. *Pericapritermes tetrphilus* (Silvestri) :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 15-16.
1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 294.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Project No. A17-FS-12) : 65, fig. 79.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 168, 172-175.
1977. Chhotani, *Rec. zool. Surv. India*, **72** : 372.
1979. Chhotani and Bose, *Zoologiana*, No. 2 : 21, fig. 3B.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 24, 87-89.

1983. Verma, *Indian J. Forestry*, 6(4) : 298, 299, 300.

1986. Gao and Lam, *Mem. Hongkong nat. Hist. Soc.*, 17 : 83.

3. *Capritermes orientalis* Mathur and Sen-Sarma :

1961. Mathur and Sen-Sarma, *Bull. Ent.*, No. 2 : 1-4.

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, 138 (Art. 5) : 294. Treated as a synonym of *tetraphilus*.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 38.

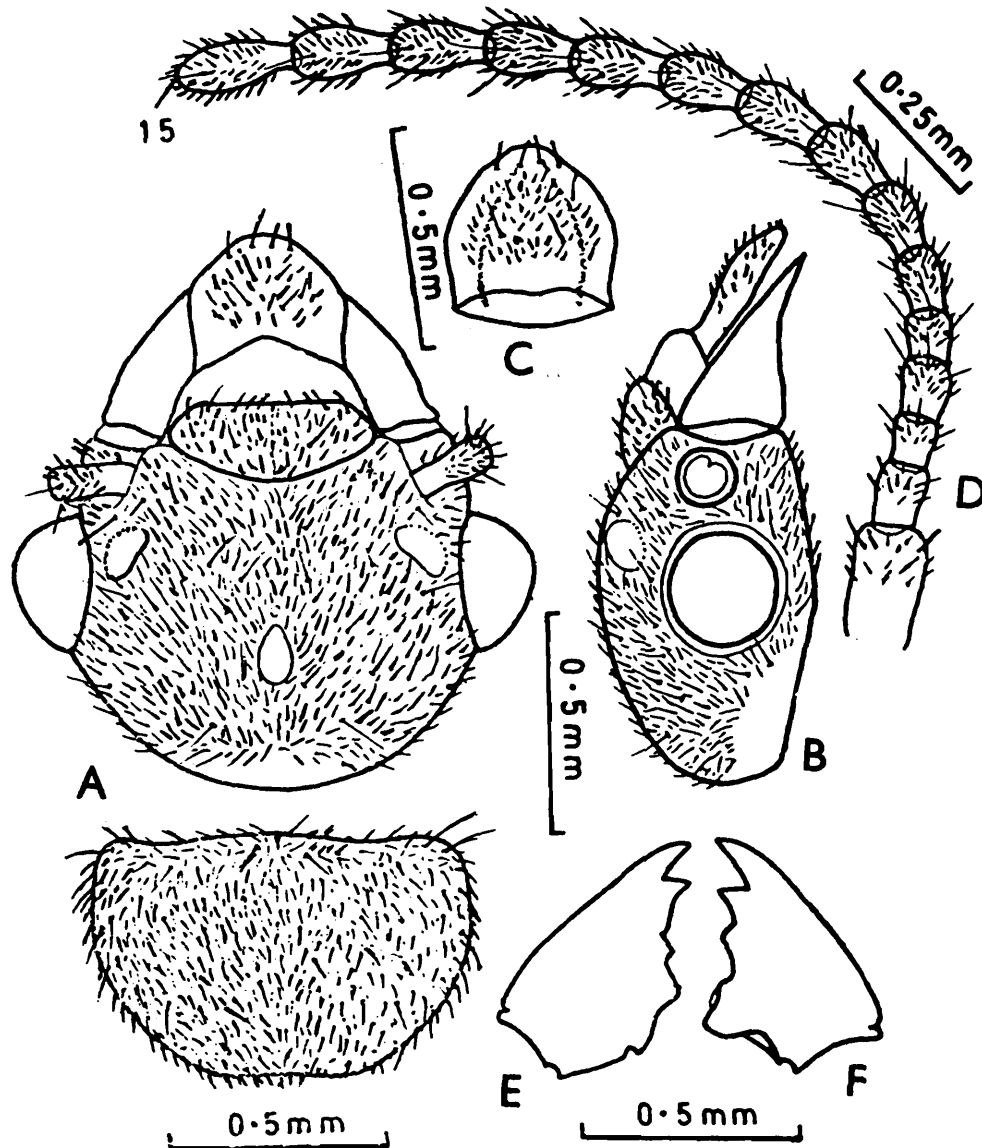


Fig. 165 : *Pericapritermes tetraphilus*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Labrum. (D) Antenna. (E)-(F) Left and right mandibles. (After Akhtar, 1975)

IMAGO (Fig. 165) : Head-capsule reddish brown with slight smoky tinge, whitish around fontanelle; postclypeus pale brown; labrum brownish yellow, tip whitish; pronotum a little paler than head; legs light brown; abdomen light reddish brown above. Head and pronotum densely hairy with short and scattered long hairs. Head-capsule subcircular, wider than long (length to tip of labrum 1.26-1.51, length to base of mandibles 0.88-0.94, width 1.31-1.38 mm). Fontanelle plate oval, large, ocellus-like. Eyes subcircular (max. diameter 0.35-0.38, min. diameter 0.33-0.35 mm); close to lower margin of head (eye-lower margin of head distance 0.06-0.07 mm). Ocelli oval; separated from eyes by half their long diameter (long diameter 0.15-0.18, short diameter 0.10-0.12, eye-ocellus distance 0.06-0.08 mm). Antennae with 15 segments; segment 3 shorter than 2 : 4 subequal to 2. Postclypeus swollen, as hairy as head; length a little less than 1/2 width (length 0.20-0.21, width 0.47-0.51 mm). Pronotum subsemicircular; anterior margin almost straight, without median notch; posterior margin fairly emarginate medially (length 0.57-0.66, width 0.93-1.10 mm).

SOLDIER (Fig. 166) : Head-capsule yellow to reddish yellow; antennae pale brown; labrum paler than antennae; mandibles blackish brown;

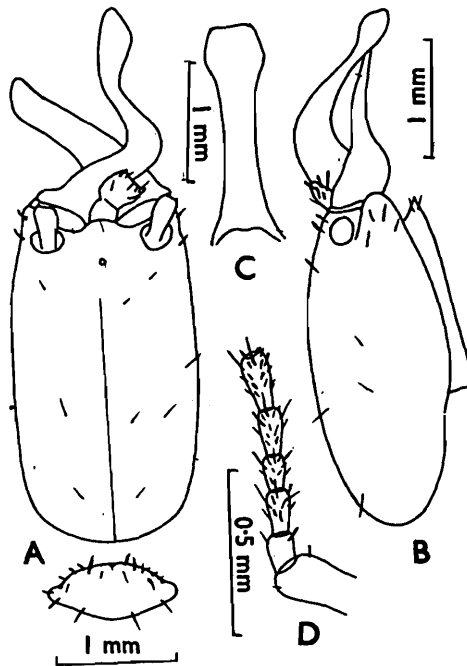


Fig. 166 : *Pericapritermes tetraphilus*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Postmentum. (D) Antenna.

pronotum and legs pale brownish yellow; abdomen creamish. Head and pronotum sparsely hairy; abdomen with many short and a few (2 pairs) long hairs on each tergite. Total body-length c 7.0-8.5 mm. Head-capsule subrectangular (length with mandibles 4.6-4.8, length to base of mandibles 2.45-3.05, max. width 1.48-1.70 mm); median arm of Y-suture extending almost upto fontanelle. Fontanelle dot-like; situated anteriorly; fontanelle gland small. Antennae with 14 segments; segment 3 longer than 2; 4 subequal to 2. Labrum slightly asymmetrical; anterior margin straight or slightly incurved; antero-lateral corners with short, pointed processes (length 0.20-0.23, width 0.30-0.33 mm). Mandibles strongly asymmetrical. Left mandible strongly twisted at middle, tip without any beak or point; shorter than 2/3 of head-length (length 1.60-1.84 mm, index left mandible-length/head-length 0.55-0.61). Pronotum saddle shaped (length 0.40-0.45, width 0.90-1.13 mm).

WORKER : Head creamish yellow; body straw coloured; abdominal contents greyish, showing through. Head with few short and minute hairs; abdominal tergites and sternites with few long and several short hairs; pronotum with few long and short hairs. Total body-length c 4.0 mm. Head-capsule subcircular, slightly wider than long (length 1.02, width 1.08 mm). Fontanelle large, stramineous. Antennae with 14 segments; segment 3 shorter than 2, 4 shortest. Postclypeus swollen, length less than 1/2 width. Pronotum saddle-shaped; with rounded anterior margin, without any notch.

Distribution : INDIA : Assam, West Bengal, Madhya Pradesh. BANGLADESH, BURMA, CHINA.

204. *Pericapritermes topslipensis* Thakur

(Fig. 167)

Pericapritermes topslipensis Thakur :

1976. Thakur, *J. Timb. Dev. Assoc. India*, **22** (2) : 11-14, S and W. Holotype : S, in FRI. Type-locality : Top slip, South Coimbatore For. Div., Tamil Nadu, India. Paratype examined.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 33.
1983. Verma, *Indian J. Forestry*, **5** (4) : 298, 300.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 93, 151, 153-154.

IMAGO : Unknown.

SOLDIER (Fig. 167) : Paratype examined. Head-capsule pale yellow to deep straw yellow ; antennae yellowish brown ; left mandible dark greyish brown, right reddish brown ; body and legs yellowish white. Head and pronotum sparsely and body densely hairy. Total body-length 6.25-6.60 mm. Head-capsule subrectangular, length about double of width (length with mandibles 4.0-4.25, length to base of mandibles 2.50-2.75, width 1.32-1.41 mm, index width/length 0.52-0.54) ; median arm of Y-suture prominent ; sides subparallel and straight. Fontanelle minute ; situated at about $\frac{4}{5}$ of head-length from posterior margin. Antennae with 14-segments ; segment 2 subequal to or slightly shorter than 3 ; 4

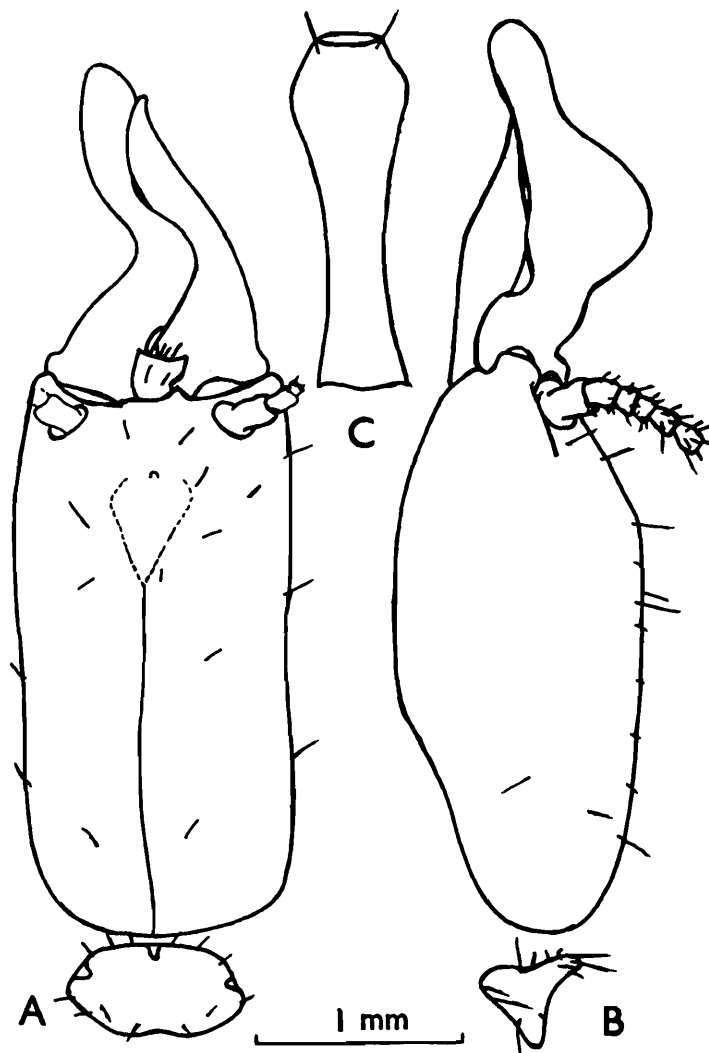


Fig. 167 : *Pericapritermes topslipensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

shortest. Labrum subsquarishly asymmetrical ; anterior margin faintly incurving, almost straight ; antero-lateral projections very minute. Mandibles strongly asymmetrical, a little longer than half of head-length (length : left mandible 1.45-1.48, right 1.40-1.45 mm, index left mandible-length/head-length 0.56-0.58). Left mandible strongly twisted at middle ; apically broad rounded. Right mandible blade-like, narrowing distally and pointed at tip. Postmentum long, club-like, widest in anterior 1/4 ; waist long and narrow, minimum width at mid-point between widest part and posterior margin (length 1.5-1.65, max. width 0.48-0.53, width at waist 0.25-0.28 mm). Pronotum saddle-shaped (length 0.30-0.35, width 0.85-0.90 mm) ; anterior margin faintly notched, posterior margin straight.

WORKER : Head-capsule pale yellow ; antennae, labrum, postclypeus, thorax and legs yellowish white ; abdomen translucent, with contents showing through. Head and pronotum moderately and abdomen densely hairy. Total body-length 4.0-4.6 mm. Head-capsule subcircular, widest near antennae (length to base of mandibles 0.80-0.95, width 0.95-1.0 mm). Fontanelle plate small, circular (0.10 mm diameter), visible under strong light. Antennae with 14 segments ; segment 3 slightly shorter than 2 ; 4 shortest. Postclypeus weakly swollen ; length almost 1/2 of width ; posterior margin convex and medially invaginated. Pronotum saddle-shaped (length 0.23-0.30, width 0.53-0.56 mm).

Distribution : INDIA : Tamil Nadu, Karnataka.

Genus 36. *Indocapritermes* n.gen.

1. *Characters of Genus Indocapritermes n. gen.*

Imago : Unknown.

Soldier : Small, moderately hairy. Head subrectangular ; frons sharply inclining in front. Fontanelle transverse ; fontanelle gland large. Antennae 14 segmented. Labrum asymmetrical ; with substraight anterior margin and short, lateral points. Mandibles asymmetrical ; left strongly twisted, with a round blunt apex and sharply pointed basal projection ; right blade-like. Postmentum club-like. Pronotum saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs ; dorsal spur sometimes not distinct.

WORKER : Small, delicate, fairly hairy. Head subcircular. Fontanelle plate round, translucent. Antennae 13 to 14-segmented. Postclypeus

swollen, length less than 1/2 width. Mandibles each with a large, finger-like apical and two marginals. Left mandible : 1st marginal with long posterior margin ; 2nd marginal rudimentary not separated from posterior margin of 1st by any cut or notch. Right mandible : Posterior margin of 1st marginal little longer than anterior margin ; 2nd marginal short with incurved posterior margin ; molar plate longer than posterior margin of 2nd marginal. Pronotum saddle-shaped. Foreleg swollen ; apical tibial spurs 3 : 2 : 2, dorsal spur sometimes absent or not distinct.

Type of Genus : *Indocapritermes aruni* n. sp.

Affinities : The soldier mandibles appear to be very close to those of *Pericapritermes* but the shape of labrum, transverse fontanelle and large fontanelle gland and head being fairly densely hairy separate it from *Pericapritermes*. The worker mandibles are also very different in the 2nd marginal of left being extremely minute and not being separated from 1st by any cut or notch as in *Pericapritermes*. From *Labiocapritermes*, which has similar worker mandibles, its soldier differs in not having swollen labrum (a characteristic feature of *Labiocapritermes*) and different right mandible and less so twisted left mandible. From other genera, such as *Pseudocapritermes* and *Malaysiocapritermes*, found in the Indian Region and which have similar worker mandibles, the soldier of *Indocapritermes* differs for shorter and strongly asymmetrical mandibles. From *Syncapritermes* to which also it appears close, the soldier differs in more twisted left mandible, transverse fontanelle and sharply inclining frons (vs weakly inclining) and the worker in having almost imperceptible 2nd marginal of left mandible (vs small but distinct).

2. *Distribution and Composition of Indocapritermes n. gen.*

(Fig. 109)

This new genus is endemic to southern India and is described from soldier and worker castes of the single species *I. aruni* n. sp. from Silent Valley, Kerala, India.

205. *Indocapritermes aruni* * n. sp.

(Figs. 168,169)

* Named after Mr. Arun K. Ghosh, Artist, in appreciation of his help in making of drawings for the fauna volumes.

IMAGO : Unknown.

SOLDIER (Fig. 168) : Head-capsule pale orange yellow, fontanelle gland area pale yellow ; antennae a little paler than head ; labrum translucent ; left mandible blackish brown, right reddish brown ; legs and body pale yellow. Head and body fairly densely hairy. Total body-length 4.3-4.7 mm. Head-capsule subrectangular, sides substraight ;

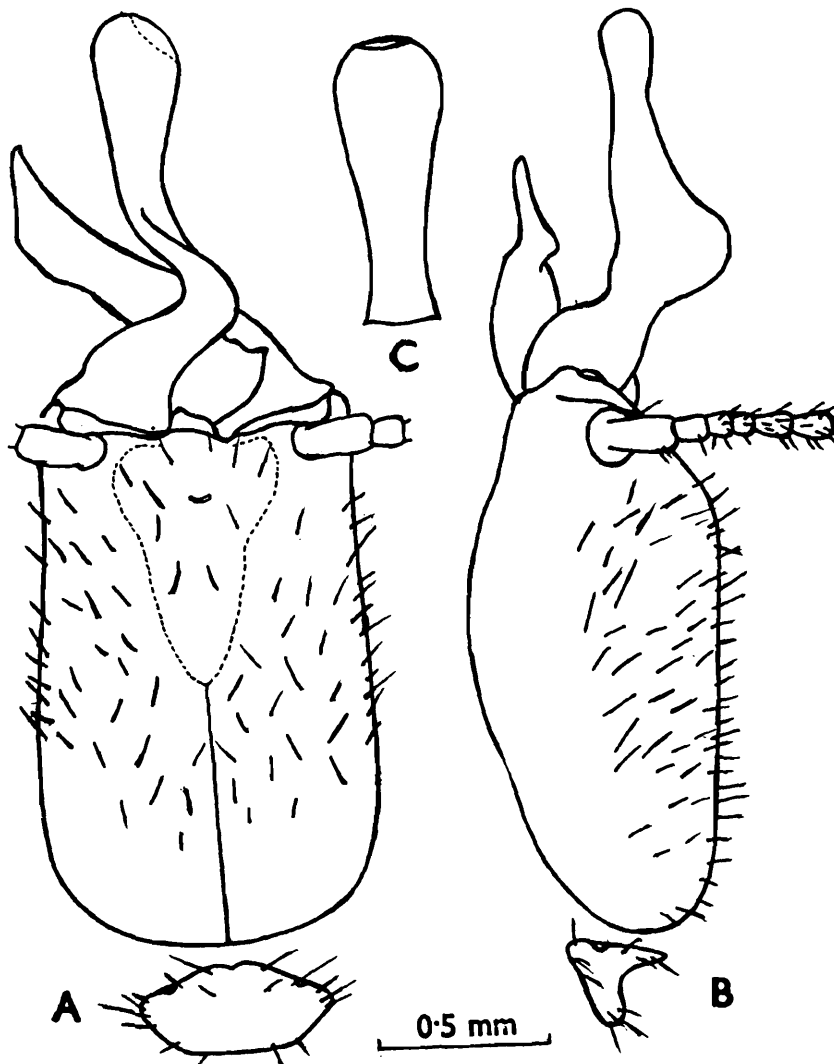


Fig. 168 : *Indocapritermes aruni* n. sp. Holotype soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

Table 3. Measurements (in mm), etc. of soldier of *Indocapritermes aruni* n.sp.

Body-parts	Range (3 exs)	Holotype
Total body-length	4.30-4.70	4.40
Head-length with mandibles	2.70-2.80	2.70
Head-length to base of mandibles	1.60-1.70	1.60
Max. head-width.	0.98-1.00	0.98
Max. head-height.	0.78-0.80	0.78
Occipito-fontanelle distance.	1.33-1.35	1.33
Head index (max. width/length to base of mandibles).	0.588-0.613	0.613
Fontanelle-head index (fontanelle-distance/head-length to base of mandibles).	0.794-0.831	0.831
Length of labrum.	0.25-0.26	0.26
Width of labrum.	0.25-0.26	0.26
Length of mandibles : Left.	1.10-1.15	1.13
Right.	1.10-1.13	1.10
Mandible-head-length index (left mandible-length/head-length to base of mandibles).	0.647-0.706	0.706
Length of postmentum.	0.80-0.83	0.80
Max. width of postmentum.	0.33-0.35	0.33
Width of postmentum at waist.	0.15	0.15
Postmentum-head-length index (postmentum-length/head-length to base of mandibles).	0.485-0.500	0.500
Postmentum contraction index. (width at waist/max. width).	0.429-0.454	0.454
Pronotum-length.	0.25	0.25
Pronotum-width.	0.55-0.58	0.55

length 1.63-1.70 times of width ; in profile frons sharply inclining in front at about 60° angle ; median arm of Y-suture distinct, reaching upto posterior end of fontanelle gland. Fontanelle transverse, situated anteriorly

at distal 1/5 of head (index occipito-fontanelle distance/head-length to base of mandibles 0.794-0.831) ; fontanelle gland large, extending beyond middle of head. Antennae with 14 segments ; segment 3 subequal to 2 or slightly shorter ; 4 shorter than 3 ; 5-9 gradually increasing in length and remaining segments subequal. Labrum slightly asymmetrical ; anterior margin substraight, with minute, antero-lateral points. Mandibles strongly asymmetrical ; about 2/3 of head-length (index left mandible-length/head-length 0.647-0.706). Left mandible strongly twisted a little behind middle ; with broadly rounded tip without beak and sharply pointed, basal projection on inner margin. Right mandible blade-like with sharp, pointed tip ; outer margin incurved in distal half and outcurved in basal half ; apical blade substraight. Postmentum club-shaped ; length about 1/2 of head-length (index postmentum-length/head-length 0.488-0.50) ; with a narrow waist lying posteriorly (index width at waist/max. width 0.429-0.454). Pronotum saddle-shaped ; anterior lobe small, with a weak notch ; posterior margin also faintly emarginate. Legs with 3 : 2 : 2 apical tibial spurs ; outer spur not very distinct.

WORKER (Fig. 169) : Head-capsule pale yellow with a translucent patch behind postclypeus ; antennae and legs pale yellow ; postclypeus paler than head ; abdomen translucent with intestinal contents showing

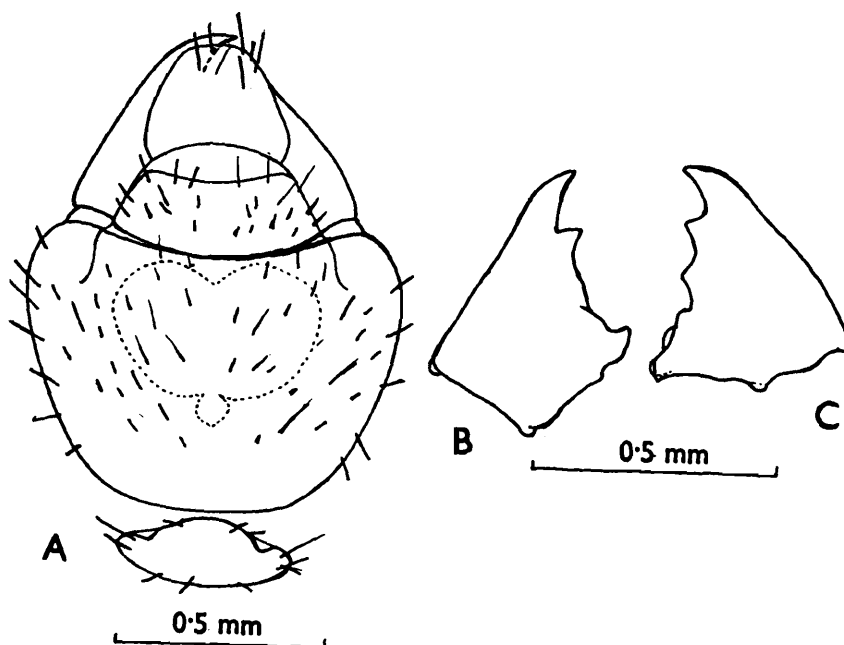


Fig. 169 : *Indocapritermes aruni* n. sp. Worker. (A) Head and pronotum, dorsal view. (B) and (C) Left and right mandibles.

through. Head and body fairly hairy. Total body-length c 3.0-3.5 mm. Head-capsule subcircular, widest at level of antennae (length to tip of labrum 1.0-1.1, length to base of mandibles 0.68-0.73, max. width 0.85-0.88 mm). Fontanelle plate translucent, whitish, spot little behind middle of head. Antennae with 13-14 segments ; in 13-segmented antennae segment 3, 4 and 5 subequal, in 14 segmented ones 4 shortest. Postclypeus swollen, hairy ; anterior margin straight ; length less than 1/2 width (length 0.17-0.18, width 0.45-0.50 mm). Mandibles as in genus. Pronotum saddle-shaped (length 0.18, width 0.43 mm).

Type-specimens and distribution : Holotype : S and paratypes (2 S and 3 W), from a single source, Silent Valley (Kerala State, India), coll. S. K. Bhattacharyya, 16.i.1980 ; deposited in NZC, ZSI.

Genus 37. **Krishnacapritermes*** n. gen.

1. *Characters of Genus Krishnacapritermes n.gen.*

Imago : Medium sized, dark brown and fairly densely hairy. Head subcircular, depressed around fontanelle plate. Fontanelle plate large, oval. Eyes medium sized, close to lateral margin of head. Ocelli broad, oval, separated from eyes. Antennae 15-segmented. Postclypeus swollen, 1/2 as long as wide. Mandibles each with a large, finger-like apical and two marginals. Left mandible : 1st marginal with a long posterior margin ; 2nd marginal very minute, just an impression of tooth ; molar process short of 1st marginal. Right mandible : 1st marginal smaller than apical, with a little longer posterior margin ; 2nd marginal small, triangular, with incurved posterior margin ; molar plate longer than posterior margin of 2nd marginal. Pronotum semicircular, raised a little anteriorly ; anterior margin incurved, with a faint notch. Wings hairy along margins and with micrasters on membrane ; costa thick, along anterior margin ; subcosta absent ; radius as thick as costa ; media and cubitus weak ; media arising independently in forewing and from radius in hindwing. Legs with 3 : 2 : 2 apical tibial spurs ; tarsi 4-jointed.

Soldier : Head-capsule subrectangular ; frons inclining at 45° angle. Fontanelle transverse, situated anteriorly. Antennae with 14 segments. Labrum tongue-shaped ; anterior margin substraight, without antero-

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

lateral points or processes. Mandibles strongly asymmetrical, generally as in *Pericapritermes*. Pronotum saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs ; tarsi 4-jointed.

Worker : Pale, fairly hairy. Head subcircular. Antennae with 14 segments. Mandibles as in imago. Postclypeus swollen, about 1/2 width. Pronotum and legs as in soldier ; forelegs swollen.

Type of Genus : *Krishnacapritermes maitii* n. sp.

Affinities : A glance at the soldier of this gives the impression of *Pericapritermes*, but it differs in having a more or less tongue-shaped labrum, without any points or horn-like anterolateral processes and its transverse fontanelle. The imago and worker mandibles are also very different from those of *Pericapritermes* in having a very minute and rudimentary 2nd marginal tooth of left mandible (vs prominent and well separated) and larger apical tooth in both the mandibles (shorter than 1st marginal in *Pericapritermes*). It is close to *Labiocapritermes* so far as its imago-worker mandibles are concerned but from this genus it differs in having less so twisted mandibles and not swollen labrum in the soldier. From other genera which have a rudimentary 2nd marginal of left mandible such as *Pseudocapritermes*, *Mirocapritermes*, *Procapritermes*, *Syncapritermes*, and *Malaysiocapritermes*, the soldier of *Krishnacapritermes* differs in soldier mandibles and shape of labrum.

2. *Distribution and Composition of Krishnacapritermes n. gen.*

(Fig. 109)

The new genus *Krishnacapritermes* is endemic to the southern Indian Peninsula and is known by two species described here as new.

3. *Key to the Indian Species of Krishnacapritermes n. gen.*

IMAGO

The imago is known only in case of the species *K. maitii* n. sp.

SOLDIERS

- 1 (2) Smaller : Head-length with mandibles 3.8-3.9, head-length to base of mandibles 2.23-2.25 and max. head-width 1.43 mm ; index width/length 0.635-0.641. Postmentum subrectangular, broader at waist (index width at waist/max. width 0.842-0.875).....*maitii*

- 2 (1) Larger : Head-length with mandibles 4.2-4.3, head-length to base of mandibles 2.50-2.55, max. width of head 1.30-1.60 mm, index width/length 0.520-0.627. Postmentum club-shaped, narrower at waist (index width at waist/max. width 0.45-0.55.....*thakuri*

206. **Krishnacapritermes maitii** * n. sp.

(Figs. 170,171)

IMAGO (Fig. 170A-D) : Head-capsule dark brown ; postclypeus slightly paler than head ; fontanelle plate darker ; labrum pale brownish yellow ;

Table 4. Measurements (in mm) of imago of *Krishnacapritermes maitii* n. sp.

Body - parts	Range (3 exs)
Total body-length with wings	Wings broken
Total body-length without wings	5.0-5.5
Length of head to tip of labrum	1.28-1.33
Length of head to base of mandibles	0.80-0.85
Max. width of head	1.20-1.25
Max. height of head	0.50-0.53
Diameter of fontanelle plate	0.11-0.15 x 0.08-0.11
Length of postclypeus	0.25-0.28
Width of postclypeus	0.53-0.55
Length of labrum	0.25-0.28
Width of labrum	0.33-0.38
Max. diameter of eye	0.30-0.33
Min. eye-lower margin of head distance	0.05-0.06
Max. diameter of ocellus	0.13-0.15
Min. diameter of ocellus	0.10
Min. eye-ocellus distance	0.08-0.12
Min. eye-antennal distance	0.07
Min. ocellus antennal distance	0.10-0.13
Length of pronotum	0.53-0.58
Width of pronotum	0.90-0.95

* Named after Dr. P. K. Maiti who has contributed extensively on Indian termites.

antennae brownish, paler than postclypeus ; pronotum paler than head, somewhat darker posteriorly ; abdominal tergites brown, paler than head ; sternites pale brown, anterior sternites paler medially ; legs pale brown ; wings pale brownish, hyaline. Head densely hairy with a coat of fine, short hairs and several long bristles ; pronotum and body also as densely hairy as head ; wings with a row of hairs along anterior and posterior margins, membrane without any hairs. Total body-length without wings c 5.0-5.5 mm (wings broken in the specimens). Head-capsule subcircular ; depressed around fontanelle ; Y-suture not distinct, sometimes there is an impression of median arm near posterior margin. Fontanelle plate large, oval, a little larger than ocellus and somewhat darker than head. Eyes subcircular (max. diameter 0.30-0.33, min. diameter 0.30 mm) ; situated very close to lateral margin of head. Ocelli oval, broad ; separated from eyes and antennae by about their short diameter. Antennae with 15 segments ; 2 a little smaller than 1 : 3 and 5 subequal, short ; 4 longer

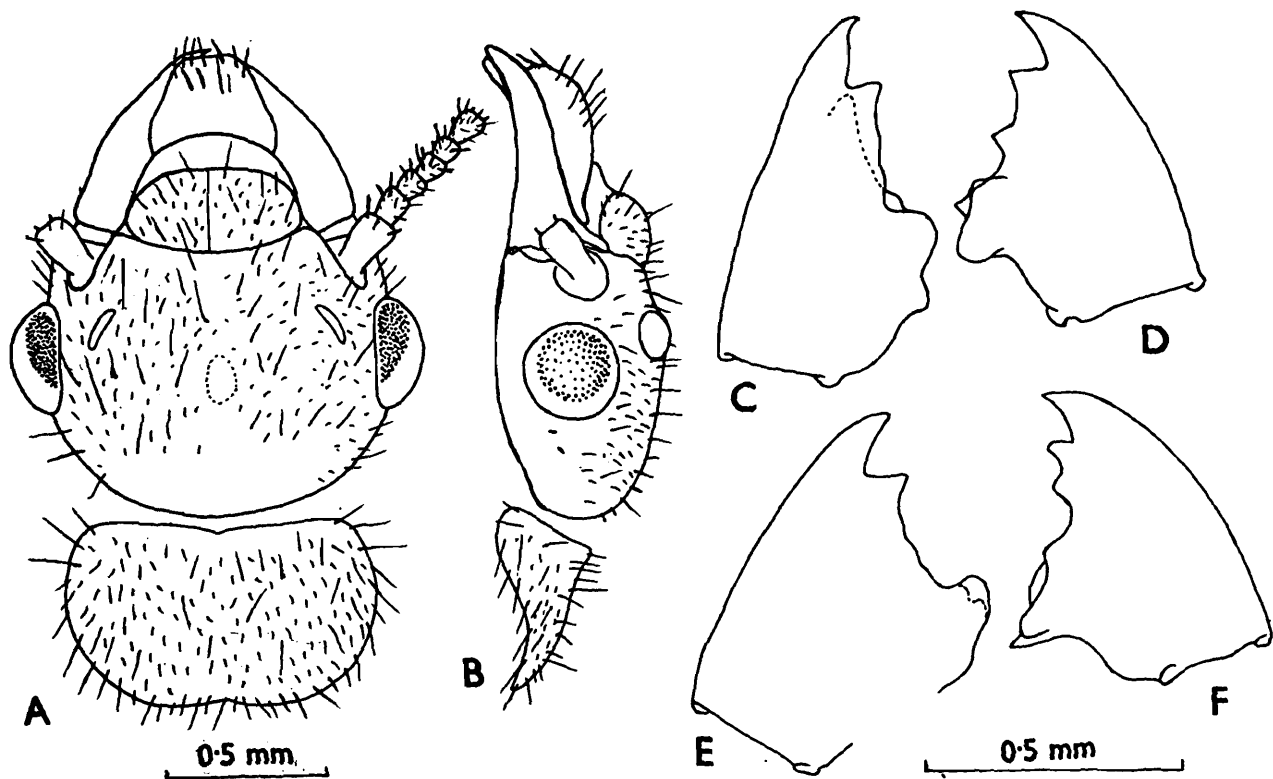


Fig. 170 : *Krishnacapritermes maitii* n. sp. Imago (Paratype). (A) Head and pronotum, dorsal view. (B) Head and pronotum side view. (C) and (D) Left and right mandibles. Worker. (E), (F) Left and right mandibles.

than either 3 or 5 ; 6-10 gradually increasing in length ; remaining segments subequal. Postclypeus swollen, hairy ; length $\frac{1}{2}$ width ; median line distinct, separating it to two halves ; anterior margin straight. Mandibles as in genus. Pronotum semicircular, raised anteriorly a little ; anterior margin incurved and with faint medial notch ; sides rounded ; posterior margin convex, with distinct median notch ; wings and legs as in genus.



Fig. 171 : *Krishnacapritermes maitii*. n. sp. Soldier (Paratype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

SOLDIER (Fig. 171) : Head-capsule pale brownish yellow to pale yellowish brown ; antennae pale yellow to pale brown ; labrum pale yellow, transparent near anterior margin ; left mandible brownish black, right brown to reddish brown ; legs and body pale yellowish. Head very scantily hairy (hairs fallen off due to long preservation) ; body fairly pilose. Total body-length 4.7-4.8 mm. Head-capsule subrectangular ; in profile frons inclining at about 45° angle ; median arm of Y-suture present, not reaching

Table 5. Measurements (in mm), etc. of soldier of *Krishnacapritermes maitii* n.sp.

Body-parts	Range (3 exs)	Holotype
Total body-length	4.70-4.8	4.7
Length of head with mandibles	3.80-3.90	3.80
Length of head to base of mandibles	2.23-2.25	2.23
Max. width of head	1.43	1.43
Max. height of head	1.05	1.05
Occipito-fontanelle distance	1.80-1.83	1.80
Index head-width/head-length to base of mandibles	0.635-0.641	0.641
Index occipito-fontanelle distance/head- length to base of mandibles	0.807-0.813	0.807
Suture extending from posterior margin of head	0.90	0.90
Length of labrum	0.28-0.30	0.28
Width of labrum	0.25	0.25
Length of left mandible	1.65-1.70	1.70
Length of right mandible	1.65-1.68	1.68
Index left mandible-length/head-length	0.733-0.762	0.762
Length of postmentum	1.00-1.05	1.05
Max. width of postmentum	0.38-0.40	0.40
Width of postmentum at waist	0.32-0.35	0.35
Length of pronotum	0.28-0.35	0.35
Width of pronotum	0.70-0.75	0.75

upto middle of head. Fontanelle transverse, situated anteriorly ; fontanelle gland large, extending beyond middle of head. Antennae with 14 segments ; segment 3 slightly longer than 2 ; 4 a little shorter than 3 and shortest ; 5-8 gradually increasing in length ; remaining subequal. Labrum tongue-shaped ; anterior margin substraight, without antero-lateral points or horn-like projections. Mandibles strongly asymmetrical, shorter than head. Left mandible strongly twisted ; tip rounded, without beak but with a faint impression of concavity at tip. Right mandible blade-like ; outer margin weakly incurved distally ; inner margin undulating ; apex straight with a bluntly pointed tip. Postmentum subrectangular ; anterior part weakly convex ; waist fairly broad (postmentum-contraction index 0.842-0.875). Pronotum saddle-shaped, without notch anteriorly.

WORKER (Fig. 170E, F) : Head-capsule pale yellow ; antennae, postclypeus, labrum and thorax paler than head ; abdomen transparent, with intestinal contents showing through. Head scantily and body fairly hairy (hairs probably have fallen off). Total body-length 3.0-3.5 mm. Head-capsule subcircular, widest at base of mandibles (length to tip of labrum 1.30-1.35, length to base of mandibles 0.80-0.85, max. width 1.08 mm) ; median suture partly visible. Fontanelle plate oval, not distinctly marked. Antennae with 14 segments. Postclypeus swollen ; length 1/2 width (length 0.23-0.25, width 0.50-0.55 mm) ; anterior margin straight. Mandibles as in imago. Pronotum as in soldier.

Type-specimens and distribution : Holotype S and paratypes (one soldier, 5 imagoes damaged and some workers) previously determined as *Pericapritermes ceylonicus* Holmgren and lying in ZSI collections in two vials). Pambarai, Palni Hills (6700 ft altitude), coll. S. Kemp, 1. ix. 1922. Deposited in NZC, ZSI.

Affinities : The soldier of this species differs from that of *K. thakuri* n. sp. described below for its somewhat smaller size and shape of postmentum and its contraction at waist.

207. *Krishnacapritermes thakuri n. sp.**

(Figs. 172,173)

IMAGO : Unknown.

* Named after Dr. M. L. Thakur, a termitologist friend.

SOLDIER (Fig. 172) : Head-capsule pale yellow to yellow with translucent fontanelle gland area ; antennae slightly paler than head ; labrum translucent ; left mandible blackish, right reddish brown ; legs and body pale yellow. Head and body rather sparsely hairy. Total body-length c 6.00-6.20 mm. Head-capsule subrectangular ; sides substraight ; width more than half of length to base of mandibles (index max. width/head-length 0.520-0.628) ; median arm of Y-suture not reaching upto half

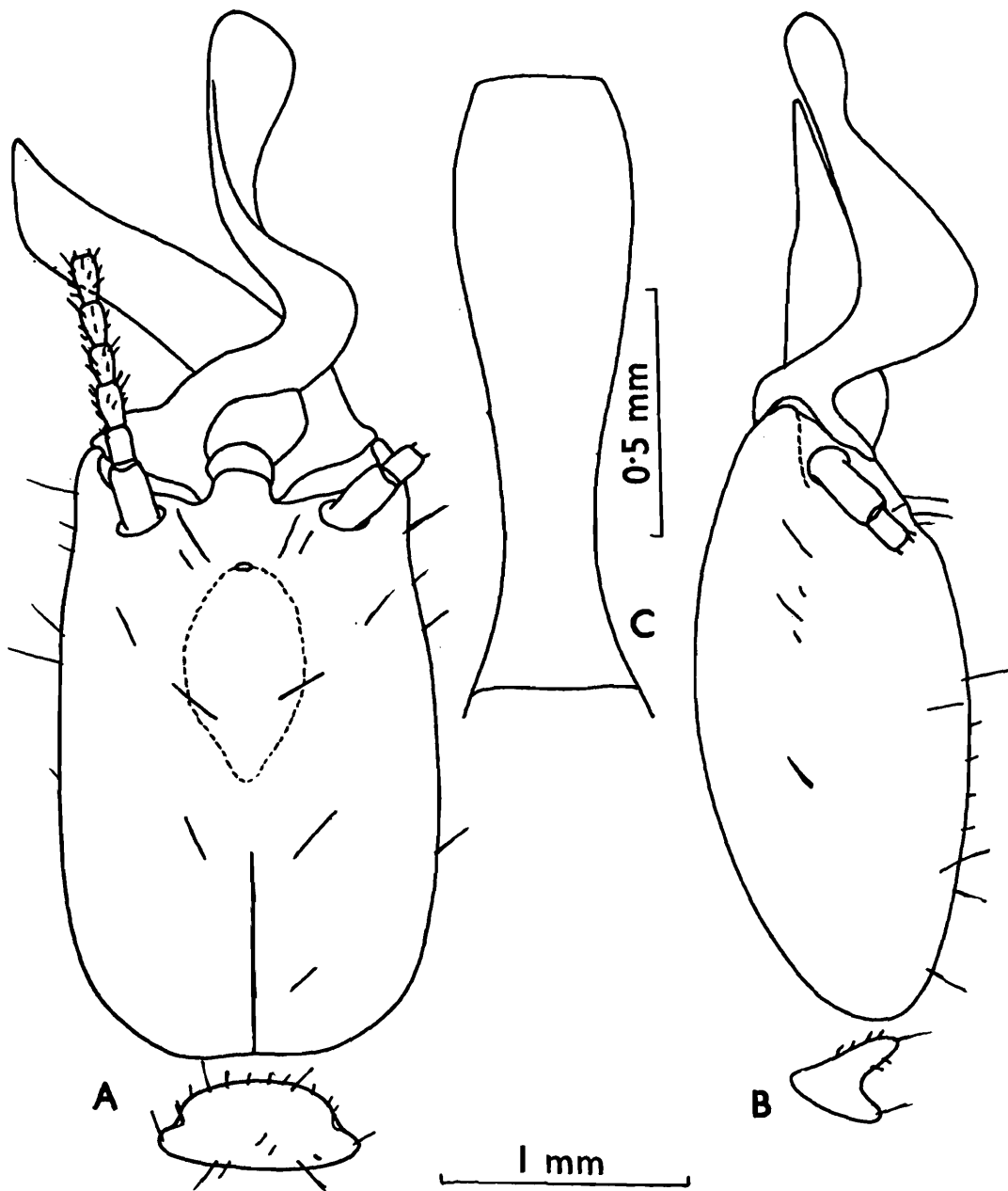


Fig. 172 : *Krishnacapritermes thakuri* n. sp. Paratype soldier. (A) Head and pronotum, dorsal view. (B) Same, side view, (C) Postmentum.

of head-length ; frons sloping in front in anterior 1/4 as viewed laterally. Fontanelle transverse ; situated just at inclination of frontal slope ; occipito-fontanelle distance/head-length index 0.78 ; fontanelle gland fairly large. Antennae with 14 segments ; segment 2 about 1/2 of 1 ; 3 longer than 2 ; 4 as long as 2 ; 5-8 gradually increasing and 9 onwards decreasing in length. Labrum asymmetrical, translucent and tongue-shaped ; without any antero-lateral points and hairs. Mandibles strongly asymmetrical.

Table 6. Measurements (in mm), etc. of soldier of *Krishnacaprithermes thakuri* n.sp.

Body-parts	Range (3 exs)	Holotype
Total body-length	6.00-6.20	6.20
Length of head with mandibles	4.20-4.30	4.30
Length of head to base of mandibles	2.50-2.55	2.55
Max. width of head	1.30-1.60	1.60
Max. height of head	1.10-1.13	1.13
Occipito-fontanelle distance	1.98-2.05	2.00
Index head-width/head length to base of mandibles	0.520-0.627	0.627
Index occipito-fontanelle distance/ head-length to base of mandibles	0.784-0.820	0.784
Suture extending from posterior margin of head	0.83-0.90	0.83
Length of labrum	0.28-0.33	0.33
Width of labrum	0.35-0.40	0.35
Length of left mandible	1.83-1.93	1.93
Length of right mandible	1.85-1.90	1.90
Index left mandible-length/head- length	0.732-0.757	0.757
Length of postmentum	1.25-1.30	1.25
Max. width of postmentum	0.40	0.40
Width of postmentum at waist	0.18-0.20	0.20
Length of pronotum	0.25-0.35	0.35
Width of pronotum	0.78-0.88	0.88
Width of mesonotum	0.65-0.68	0.68
Width of metanotum	0.80-0.88	0.88

Left mandible strongly twisted ; rounded at distal end and strongly swollen at middle (length 1.83-1.93 mm). Right mandible blade-like ; pointed at distal end (length 1.85-1.90 mm). Postmentum long, club-shaped ; gradually narrowed behind at waist, width at waist about 1/2 max. width. Pronotum strongly saddle-shaped, anterior lobe rounded, without any emargination ; mesonotum narrower and metanotum almost as wide as pronotum.

WORKER (Fig. 173) : Monomorphic. Head-capsule pale yellow ; antennae, legs and thorax whitish ; abdomen appearing greyish due to intestinal contents showing through. Head sparsely and body fairly densely hairy. Total body-length c 3.50-4.20 mm. Head-capsule subcircular ; widest at base of mandibles and narrowed behind (length to tip of labrum 1.30-1.38, length to base of mandibles 0.83-0.88, max. width 1.10-1.13 mm). Fontanelle plate translucent, oval (length 0.08-0.10, width 0.06-0.08 mm). Antennae with 14 segments ; segments 2 and 3 subequal and 4 a little shorter. Postclypeus swollen, length less than 1/2 width (length 0.20-0.23, width 0.55). Mandibles each with an apical and two marginals ; apical finger-like and longer than 1st marginal ; 2nd marginal of left

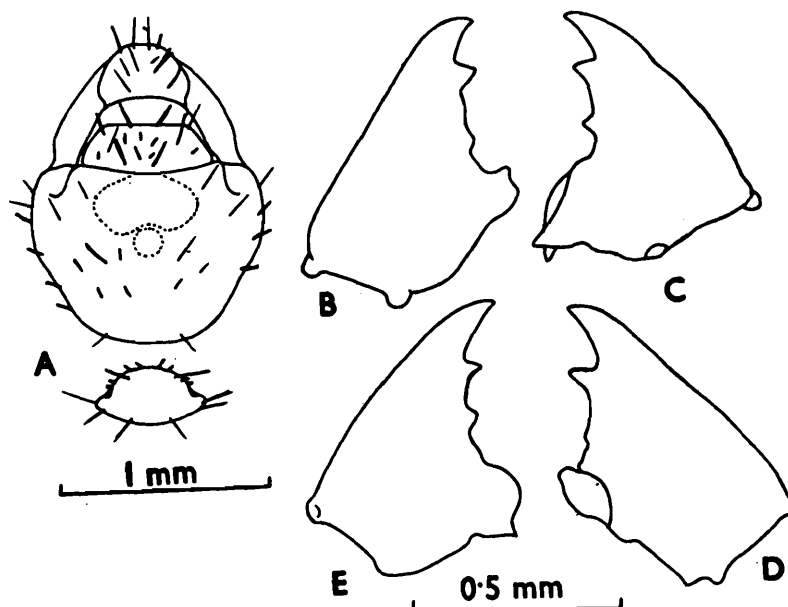


Fig. 173 : *Krishnacapritermes thakuri* n. sp. Paratype worker. (A) Head and pronotum, dorsal view. (B), (C) Left and right mandibles, in dorsal view. (D), (E), Same, in ventral view.

mandible weakly marked and without notch between the two marginals. Pronotum saddle-shaped ; anterior lobe without emargination medially (length 0.25, width 0.55-0.58 mm).

Type-specimens and distribution : Holotype S and paratype S (two) and workers (several), Silent Valley, Kerala, India, S.K. Bhattacharyya coll., 26. i. 1980.

Affinities : For differences from the other species of the genus *K. maitii*, see under that species (supra).

Genus 38. *Labiocapritermes* Krishna

1. Genus *Capritermes* Wasmann (Part) :

1949. Snyder, *Smiths., misc. Colls.*, **112** : 192.

2. Genus *Labiocapritermes* Krishna :

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 267, 304-305.
Detailed synonymy, diagnosis, distribution, etc.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 144.

1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 93, 101, 103, 156.

1987. Chhotani, *Beitr. Ent.*, **37** (2) : 410, 411.

Type of genus : *Capritermes distortus* Silvestri.

1. *Characters of Genus Labiocapritermes*

Imago : Brown, small. Head and body covered with thick coat of fine hairs and several longer bristles. Head-capsule subcircular, with eyes wider than length to base of mandibles. Fontanelle minute, ovoid, situated medially. Eyes large, subcircular. Ocelli broadly oval, not touching eyes. Postclypeus appreciably swollen, length almost half of width. Mandibles each with a large apical and two marginal teeth ; left mandible with 1st marginal having a long posterior margin and very much reduced second marginal ; right mandible with posterior margin of 1st marginal a little longer than its anterior margin and 2nd marginal well developed with strongly incurved posterior margin. Pronotum subsemicircular, little narrower than head. Legs with 3 : 2 : 2 apical tibial spurs and tarsi 4-jointed. Wings with micrasters of 6-7 arms ; costa and radius thick ;

subcosta not clear ; media arising independently in forewing and from radius in hindwing, with 3 to 4 branches near distal end ; cubitus with 9-10 branches.

Soldier : Head-capsule moderately hairy ; body fairly densely hairy. Head-capsule subrectangular, frons gradually inclined in front, frontal projection absent. Fontanelle minute, situated at base of frontal inclination. Antennae with 14 segments, segment 4 shortest. Labrum large, hyaline, greatly swollen and asymmetrical ; anterior margin substraight or faintly incurved, antero-lateral angles with short points. Mandibles asymmetrical ; left mandible strongly twisted, tip without beak or hook ; right mandible flat and shorter. Postmentum club-shaped. Pronotum saddle-shaped. Legs with 3:2:2 apical tibial spurs and tarsi 4-jointed.

Worker : Head and body fairly densely hairy. Head subcircular. Fontanelle plate translucent, large. Antennae with 14 segments ; segment 4 shortest. Postclypeus greatly swollen, length almost half of width. Mandibles as in imago. Pronotum saddle-shaped. Legs with 3:2:2 apical tibial spurs ; tarsi 4-jointed.

2. *Distribution and Composition of Labiocapritermes*

(Fig. 109)

Distribution : Genus *Labiocapritermes* is endemic to southern India.

Composition : The genus is known by a single species, *Labiocapritermes distortus* (Silvestri).

208. *Labiocapritermes distortus* (Silvestri)

(Synonym : *Pericapritermes vythirii* Verma)

(Figs. 174-176)

1. *Capritermes distortus* Silvestri :

1922. Silvestri, *Rec. Indian Mus.*, **24** : 451-543. Im, S and W. Syntypes : In ZSI and in Silvestri Coll. Type-locality : Kavalai, Kerala, India.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 193.

1958. Ahmad, *Biologia*, Lahore, **4** : 184, 188.

1962. Mathur and Thapa, *Indian For. Leaflet.*, No. 167 : 108.

2. *Labiocapritermes distortus* (Silvestri) :

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 304, 305.

1978. Roonwal, *Zeit. Ent.*, **85** : 19.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 93, 158-160.

3. *Pericapritermes vythirii* Verma (n. synonymy) :

1983. Verma, *Indian J. Forestry*, **6** (4) : 296-298, 299.

IMAGO (Fig. 174) : Syntypes examined. Head brown ; postclypeus, antennae, labrum and legs yellowish brown ; pronotum and abdomen above slightly paler than head, abdomen below brownish yellow ; wings pale transparent brownish. Head and body with a thick coat of minute hairs and several longer bristles ; wings hairy along margins and with a few short hairs on membrane. Total body-length with wings c 9.5-10.0, without wings 5.0-6.0 mm. Head-capsule subcircular (length to tip of labrum 1.00-1.03, length to base of mandibles 0.65, max. width with eyes 0.90-0.95 mm). Fontanelle small, dot-like, translucent. Antennae with 15 segments ; segment 3 shortest, 4 slightly larger than 3. Eyes strongly

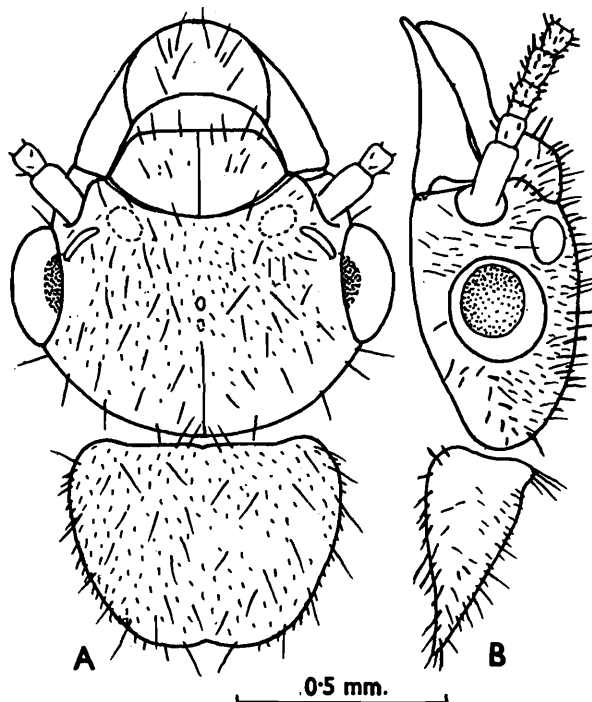


Fig. 174 : *Labiocapritermes distortus*. Syntytype Imago. (A) Head and pronotum, in dorsal view. (B) Same, in side view.

projecting, large, subcircular (max. diameter 0.28-0.30 mm) ; situated very close to lower margin of head (0.03 mm). Ocelli large, oval (length 0.11-0.13, width 0.08 mm) ; separated from eyes by almost half their width (0.03-0.04 mm) and about half their length from antennae (0.05-0.06 mm). Postclypeus swollen, as hairy as head ; about half as long as wide (length 0.18-0.225, width 0.43-0.45 mm). Pronotum semicircular ; anterior margin slightly incurved and with faint median notch ; posterior margin slightly incurved medially (length 0.47, width 0.65-0.67 mm). Wings covered with micrasters. Forewing length 8.0-8.5 mm.

SOLDIER (Fig. 175) : Head-capsule reddish yellow ; antennae pale brownish ; labrum translucent to yellowish ; left mandible blackish, right reddish black ; body creamish. Head moderately and body densely hairy. Total body-length c 4.0-5.0 mm. Head-capsule subrectangular, sides subparallel (length to base of mandibles 1.5-1.70, max. width 0.85-0.98 mm, index width/length 0.54-0.58) ; only median suture present, extending upto about 1/2 of head-length from posterior margin. Fontanelle minute, situated just at base of frontal inclination (fontanelle distance from hind margin of head 1.10-1.33 mm, index fontanelle-distance/head-length to base of mandibles 0.71-0.76). Antennae with 14 segments ; segment 4 shortest ; 3 almost as long as 2nd. Clypeus not clearly demarcated into anteclypeus and postclypeus. Labrum strongly swollen and asymmetrical ; with a few short bristles on body ; anterior margin slightly incurved (length 0.25-0.325, width 0.35-0.40 mm). Mandibles asymmetrical ; left mandible greatly twisted and widened at middle, tip blunt, without beak ; right mandible shorter and blade-like, at inner margin incurved at distal one-third (length : left mandible 1.0-1.15, right mandible 0.90-1.00 mm). Postmentum long, club-shaped ; strongly narrowed at waist, minimum width lying near posterior margin (length 0.88-1.08, max. width 0.30-0.35, min. width 0.125-0.15 mm). Pronotum saddle-shaped, without any notch at anterior or posterior margins (length 0.25-0.30, width 0.55-0.57 mm).

WORKER (Fig. 176). Head pale yellow ; antennae, legs and thorax creamish ; abdominal tergites and sternites transparent, greyish intestinal contents showing through. Head and body fairly densely hairy. Total body-length 3.40-3.50 mm. Head-capsule subcircular, wider than its length

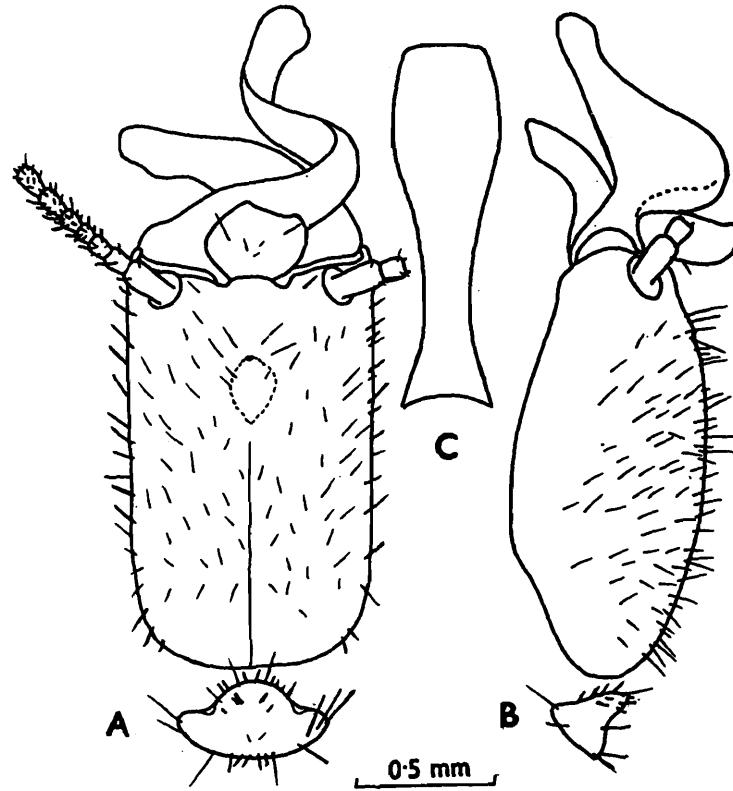


Fig. 175 : *Labiopritermes distortus*. Syntype Soldier. (A) Head and pronotum, in dorsal view. (B) Same, in side view. (C) Postmentum.

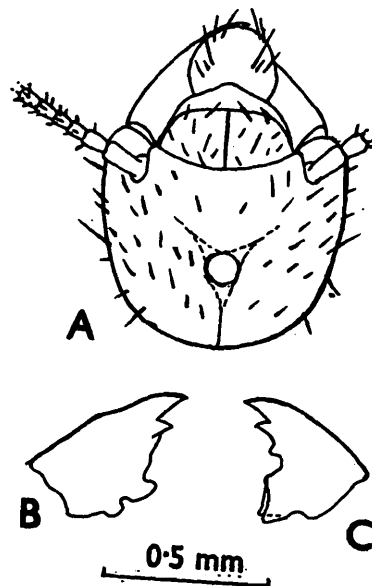


Fig. 176 : *Labiopritermes distortus*. Worker. (A) Head, in dorsal view. (B) and (C) Left and right mandibles.

to base of mandibles (length to base of mandibles 0.63-0.65, max. width 0.73-0.78 mm). Fontanelle plate fairly large, translucent, 0.09-0.10 mm in diameter. Antennae with 14 segments, segment 4 shortest. Postclypeus of same colour as head, swollen and hairy ; length almost half of width (length 0.17-0.18, width 0.375-0.40 mm). Labrum dome-shaped (length 0.25-0.27, width 0.30 mm). Mandibles each with a large apical and two marginal teeth. Left mandible with 1st marginal having a long posterior margin and 2nd marginal very much reduced. Right mandible with posterior margin of 1st marginal a little longer than its anterior margin ; 2nd marginal strongly incurved at posterior margin. Pronotum saddle-shaped ; not notched at anterior margin (length 0.18, width 0.38-0.40 mm).

Distribution : INDIA : Tamil Nadu, Kerala and Karnataka states in southern India.

Genus 39. *Malaysiocapritermes* Ahmad and Akhtar

Genus *Malaysiocapritermes* Ahmad and Akhtar :

1981. Ahmad and Akhtar, *Pakistan J. Zool.*, **13** (1-2) : 2, 8-10.

1987. Chhotani, *Beitr. Ent.*, **37** : 410, 411.

In press. Chhotani and Ferry, *Ann. Entom.*,

Type of genus : *Procapritermes holmgreni* Akhtar.

1. *Characters of Genus Malaysiocapritermes*

Imago : Head dark brown, densely covered with a coat of short hairs and a few long hairs. Head subcircular ; area around fontanelle depressed ; sutures not discernible. Fontanelle plate narrow; slit-like to oval. Eyes of medium size, subcircular. Ocelli oval, separated from eyes. Postclypeus swollen, length $\frac{2}{5}$ of width. Antennae with 15 segments, segment 3 shortest. Mandibles each with an apical and two marginal teeth ; apical long finger-like ; 1st marginal shorter than apical. Left mandible with 2nd marginal rudimentary ; distance between apical and 1st marginal equal to distance between 1st and 2nd marginals ; molar projection short of 1st marginal. Right mandible with 1st marginal having longer posterior margin ; posterior margin of 2nd marginal weakly

incurved; molar plate longer than posterior margin of 2nd marginal. Pronotum narrower than head ; anterior margin slightly raised and with a weak median notch. Apical tibial spurs 3:2:2*. Wings brown ; papillae single row on anterior and posterior margins and 5-6 armed asteroid micrasters present on membrane.

Soldier : Head subrectangular ; fairly hairy ; median suture partly distinct. Antennae with 14 segments ; 3rd segment longer than 2nd. Labrum elongate, deeply incurved at anterior margin ; side corners produced into long, pointed processes or horn-like. Mandibles slightly asymmetrical, long, rod-like, weakly incurved at tip. Postmentum subrectangular, weakly incurved at waist. Pronotum saddle-shaped ; anterior margin either not notched or weakly notched. Legs with 2:2:2 or 3:2:2* apical tibial spurs.

Worker : Head pale yellow, moderately hairy, subcircular. Antennae with 14 segments ; segment 4 shortest. Mandibles as in imago ; apical tooth however longer in comparison to others and molar projection of left mandible extending beyond 1st marginal. Postclypeus swollen ; length less than half of width. Pronotum saddle-shaped. Legs with 3:2:2 or 2:2:2* apical tibial spurs, dorsal spur very minute, point-like, sometimes not discernible.

2. *Distribution and Composition of Malaysiocapritermes*

(Fig. 109)

Distribution : Ahmad and Akhtar (1981) created the genus *Malaysiocapritermes* for the species *Procapritermes holmgreni* Akhtar from Bangladesh and *Procapritermes longignathus* Ahmad and *P. prosetiger* Ahmad from Thailand. Thus, the genus is restricted to the Oriental zoogeographical region. Of these three species, only *M. holmgreni* (Akhtar) was so far reported from the Indian subcontinent from Meghalaya in N-E India and Bangladesh. Recently Chhotani and Ferry (in press) have

* Akhtar (1975) gives the apical tibial spurs in imago and soldier as 2:2:2 in *Procapritermes holmgreni* Akhtar which was taken as the type of the genus *Malaysiocapritermes* by Ahmad and Akhtar (1981) who gave the apical spurs as 3:2:2 for imago and 2:2:2 for soldier and worker. In the species from India the tibial spurs have been found to be variable as such this character does not hold good for separation of genera as done by Ahmad and Akhtar (1981).

recorded the genus from southern India by describing the species *M. dakshinae* and *M. keralai*.

Composition : Five species of this genus are known from the Oriental Region of which the following three occur in the Indian subregion and are taken into account here.

1. *Malaysiocapritermes dakshinae* Chhotani and Ferry—India
2. *M. holmgreni* Akhtar—India, Bangladesh
3. *M. keralai* Chhotani and Ferry—India

3. Key to Indian Species of *Malaysiocapritermes*

IMAGOES

The imago of only *M. holmgreni* Akhtar is known.

SOLDIERS

- 1 (2) Larger species : Head-length with mandibles 3.95-4.00, head-length to base of mandibles 1.90-2.00, head-width 1.40-1.53 mm. Frons gradually inclining in front. Labrum sides angulated at posterior 1/4. Fontanelle circular.....*dakshinae*
- 2 (1) Smaller species : Head-length with mandibles 3.00-3.25, head-length to base of mandibles 1.49-1.66, head-width 1.08-1.23 mm. Frons abruptly inclining in front. Labrum sides convex. Fontanelle transverse.
- 3 (4) Sides of head weakly convex and median suture prominent. Antero-lateral corners of labrum drawn into sharp, fine, needle-like projections and sides weakly convex. Mandibles thinner. Postmentum with comparatively narrower waist. Pronotum with distinct emargination at anterior margin
..... *holmgreni*
- 4 (3) Sides of head substraight and median suture indicated only near posterior margin of head. Antero-lateral corners of labrum with short, horn-like processes and sides strongly convex. Mandibles thicker. Postmentum with comparatively wider waist. Pronotum with faint emargination at anterior margin..... *keralai*

209. *Malaysiocapritermes dakshinae* Chhotani and Ferry

(Figs. 177,178)

Malaysiocapritermes dakshinae Chhotani and Ferry :

In press. Chhotani and Ferry, *Ann. Entom.*, S and W. Holotype : S, in ZSI.
 Type-locality: Vicinity of village Arippal, on road from
 Kolattupuzha to Nedumangad, Kerala, India.

IMAGO : Unknown.

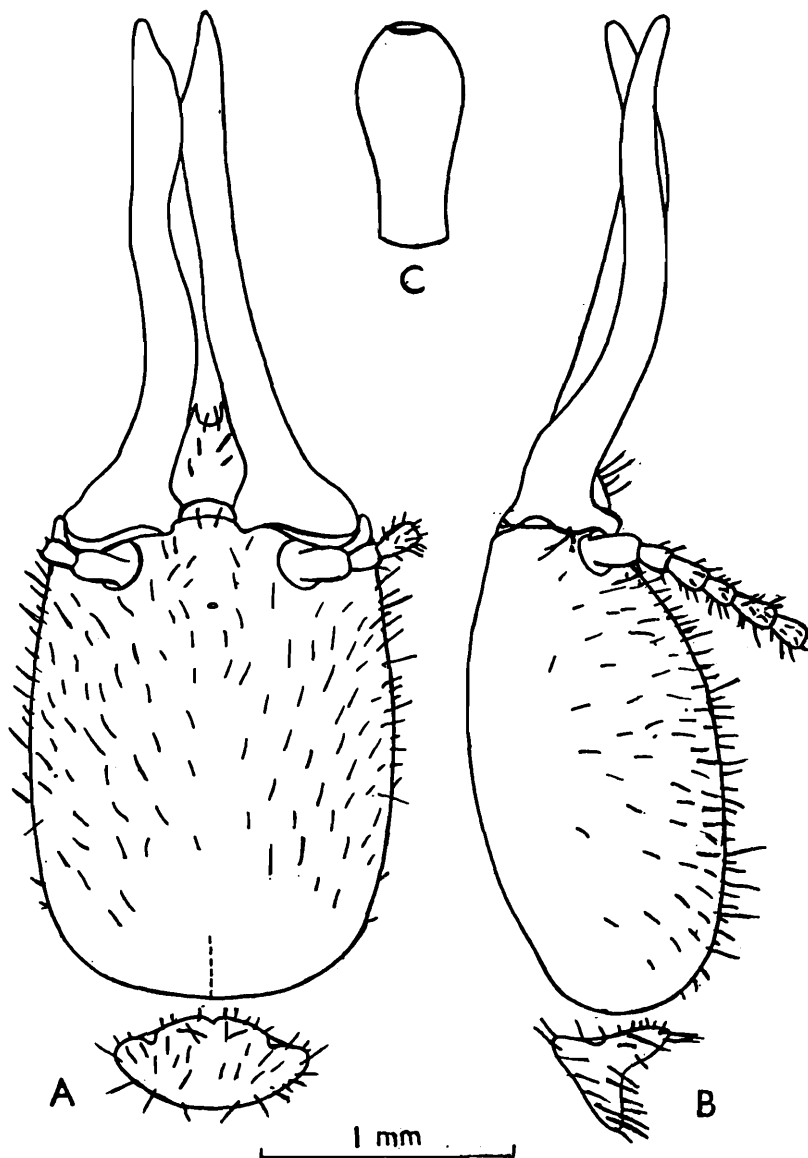


Fig. 177 : *Malaysiocapritermes dakshinae*. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, in side view. (C) Postmentum (After Chhotani and Ferry, 1n press).

SOLDIER (Fig. 177) : Head-capsule brownish yellow ; antennae pale brown ; mandibles blackish ; labrum pale yellowish white ; thorax and abdomen pale yellow. Head and body fairly densely hairy with short and long hairs. Total body-length 6.70-7.20 mm. Head-capsule subrectangular ; sides weakly convex ; width a little more than $\frac{3}{4}$ of length to base of mandibles (length to base of mandibles 1.90-2.00, max.width 1.40-1.53 mm) ; frons sloping in front gradually but fairly sharply ; only part of median suture distinct near posterior margin of head. Fontanelle minute, circular ; leading to a brownish tube ; situated at about $\frac{3}{4}$ of head-length from posterior margin (index fontanelle-distance/head-length 0.775-0.805). Antennae with 14 segments ; segments long and slender ; segment 3 longer than 2 ; 4 shortest. Labrum somewhat asymmetrical ; deeply incurved at anterior margin ; with sharp and pointed apices ; sides gradually widening posteriorly and angulated at posterior $\frac{1}{4}$ (length 0.33-0.35, width 0.33-0.38 mm). Mandibles long, asymmetrical (left mandible 2.10 and right 2.05-2.10 mm long) ; a little longer than head (index mandible-length/head-length 1.05) ; pointed at tips. Postmentum short, club-shaped (length 0.90-1.00, max. width 0.40-0.43, width at waist 0.25-0.26 mm, index width at waist/max. width 0.60-0.63). Pronotum saddle-shaped (length 0.38, width 0.78-0.80 mm) ; anterior lobe deeply emarginate medially. Legs with 3:2:2 apical tibial spurs, dorsal spur of foretibia minute, stump-like, sometimes indistinct.

WORKER (Fig. 178) : Head, postclypeus and legs pale yellowish brown ; antennae pale yellowish brown ; antennae pale yellow ; thorax paler than head ; abdomen translucent with intestinal contents showing through. Head and body fairly hairy. Total body-length 4.00-4.10 mm. Head subcircular (length to tip of labrum 1.03-1.10, length to base of mandibles 0.70-0.77, maximum width 0.85-0.90 mm). Fontanelle plate oval, translucent, fairly large (length 0.10-0.12, width 0.06-0.07 mm). Antennae with 14 segments ; segment 3 shorter than 2. Postclypeus swollen with short and long hairs ; length less than half of width (length 0.17, width 0.46 mm). Mandibles as in figure, each with an apical and 2 marginal teeth, apical larger than 1st marginal. Pronotum saddle shaped, anterior lobe without emargination. Legs thin, hairy ; foretibia swollen ; tibial spurs 2:2:2, dorsal spur of foreleg not distinct.

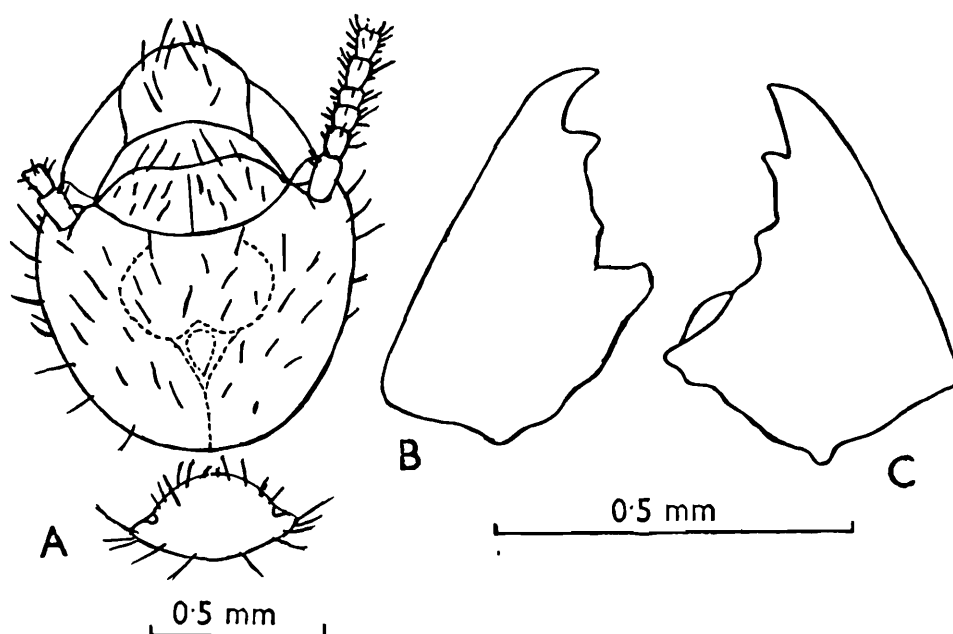


Fig. 178 : *Malaysiocapritermes dakshinae*. Worker. (A) Head and pronotum, in dorsal view.(B) and (C) Left and right mandibles, respectively (After Chhotani and Ferry, In press)

Distribution : India : Kerala state (known only from type-locality).

210. *Malaysiocapritermes holmgreni* (Akhtar)

(Figs. 179,180)

1. *Procapritermes holmgreni* Akhtar :

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab. (N.S.)*, Art 7 : 179-183, 194.

Im and S. Holotype : S, in PU. Type-locality : Dariadighi Forest, Bangladesh.

2. *Malaysiocapritermes holmgreni* (Akhtar) :

1981. Ahmad and Akhtar, *Pakistan J. Zool.*, **13** (1-2) : 10.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*,

In press. Chhotani and Ferry. *Ann. Entom.*,

IMAGO (Fig. 179) : Head-capsule dark brown ; postclypeus, antennae and pronotum brown ; wings brownish ; legs yellowish brown ; abdomen

dark brown above and paler below. Head with a coat of dense, short hairs and several longer bristles. Wings hairy along anterior and posterior margins and very few hairs on distal end of membrane. Total body-length with wings 12.4-12.6, without wings 6.10-6.5 mm. Head subcircular, depressed in region of fontanelle plate ; with eyes wider than long (length to base of mandibles 0.70-0.80, width with eyes 1.06-1.10 mm). Fontanelle plate small, narrow, slit-like to oval (length 0.07-0.09, width 0.03-0.04 mm). Eyes circular, bulging (maximum diameter 0.28-0.29 mm). Ocelli oval (length 0.10-0.15, width 0.05-0.10 mm) ; separated from eyes (eye-

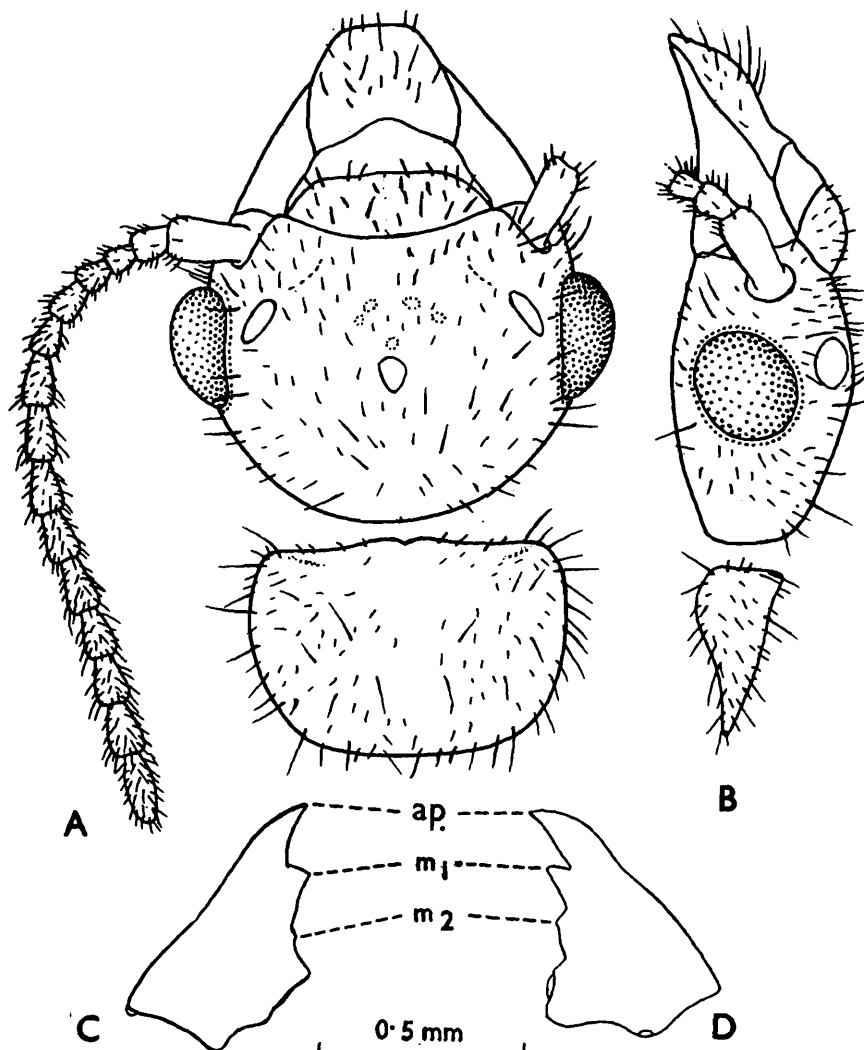


Fig. 179 : *Malaysiocapritermes holmgreni*. Imago. (A) Head and pronotum, in dorsal view. (B) Same, in side view. (C) and (D) Left and right mandibles.

ocellus distance 0.05-0.08 mm). Postclypeus swollen, hairy, without any median line (length 0.16-0.20, width 0.40-0.50 mm). Antennae with 15 segments ; segment 3 shortest. Labrum dome-shaped ; wider than long ; length 0.35, width 0.40 mm ; with a number of long and short hairs. Mandibles as in genus (Fig. 179 C, D). Pronotum narrower than head ; anterior margin slightly raised ; with a dark brown spot on either side of shoulders ; length 0.47-0.53, width 0.78-0.88 mm. Wings elongate, length of forewing with scale 9.20-10.60 and hindwing 8.20-9.80 mm. Forewing : Costa thick ; subcosta short meeting costa just outside scale ; radius thick, running parallel to costa all along ; media thin, running medially ; cubitus with 9-10 branches to posterior margin. Hindwing : Costa, subcosta and radius as in forewing ; media arising from radius just outside scale, with 5 branches ; cubitus as in forewing. Legs as in genus. Abdomen elongate ; cerci 2-jointed.

SOLDIER (Fig. 180) : Head-capsule golden yellow, anteriorly brownish yellow ; fontanelle area pale yellow ; antennae pale brown ; mandibles blackish ; body and legs creamy white. Head moderately and body densely hairy. Total body-length 5.3-5.6 mm. Head rectangular, sides weakly convex ; longer than wide (length to base of mandibles 1.49-1.66, maximum width of head 1.08-1.23 mm) ; median suture extending from posterior margin to a little short of middle of head-length ; head in profile convex, frons sloping anteriorly sharply at about 45° angle. Fontanelle transverse ; situated anteriorly a little below base of slope of frons ; rim brownish. Antennae thin, elongate, with 14 segments ; segments 2 and 3 subequal, 4 slightly shorter. Labrum subrectangular (length 0.38-0.45, width 0.20-0.23 mm) ; with deeply incurved anterior margin and with anterior corners produced into long, pointed processes and with a few hairs near anterior margin and on body. Mandibles weakly asymmetrical and pointed at tips ; longer than head-length without mandibles (length 1.75-1.90 mm). Postmentum short, club-like (length 0.63-0.78, maximum width 0.33-0.38, width at waist 0.21-0.30 mm) ; waist lying below middle ; with three pairs of hairs near anterior margin and a few short ones on body. Legs

thin and long, hairy ; apical tibial spurs 3:2:2. Abdomen elongate ; cerci 2-jointed ; styli absent.

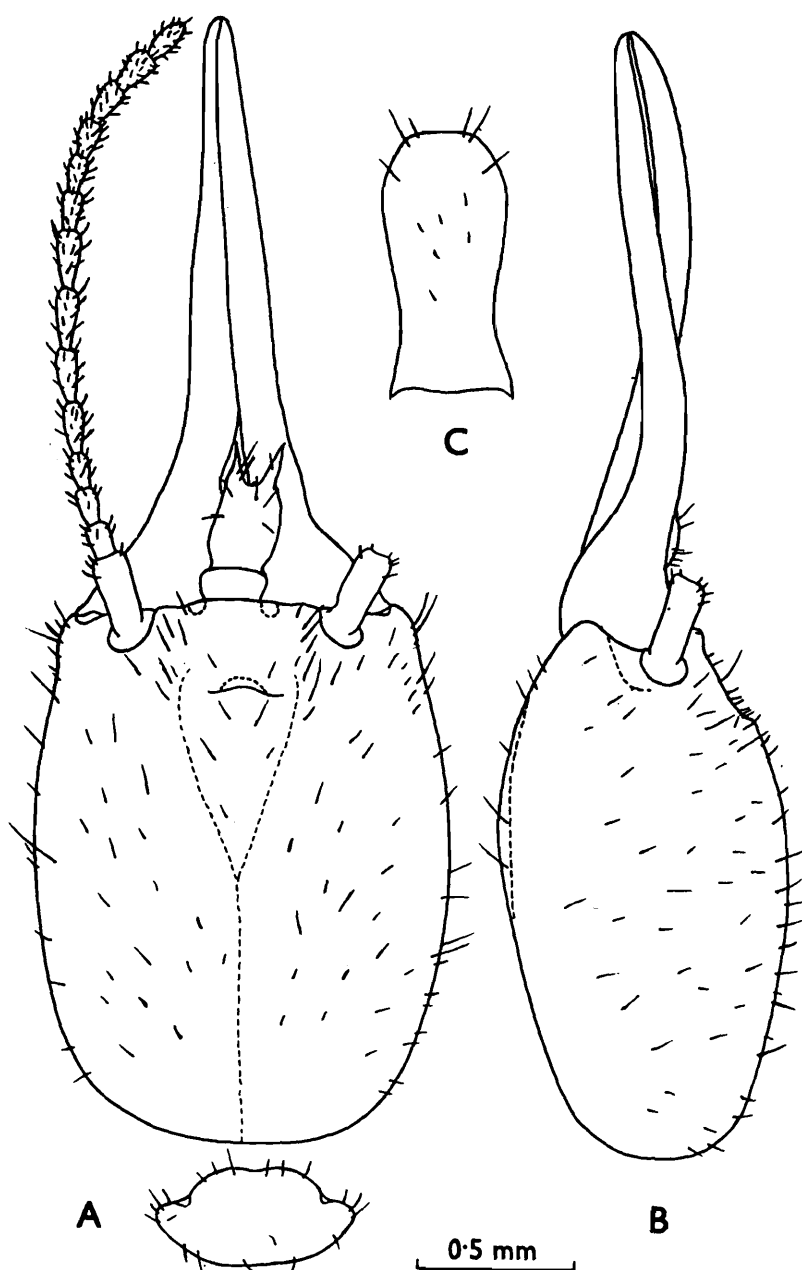


Fig. 180 : *Malysiocapritermes holmgreni*. Soldier. (A) Head and pronotum, in dorsal view. (B) Head, in side view. (C) Postmentum.

WORKER : Head, postclypeus, antennae and labrum pale yellow ; thorax creamish ; abdomen transparent, appearing greyish due to abdominal contents showing through. Head and body fairly densely hairy. Total body-length 3.80-5.00 mm. Head subcircular, broader than long, length to base of mandibles 0.70-0.80, width 0.95-1.00 mm. Fontanelle

plate small, oval, translucent spot present in middle. Postclypeus hairy, swollen, length about two fifths of width. Antennae with 14 segments ; segment 4 shortest, 3 a little shorter than 2. Mandibles, pronotum, legs and abdomen as in genus.

Distribution : INDIA : Meghalaya : Barrapani (near Shillong) and Arunachal Pradesh : Lake Ganga, Itanagar. *Elsewhere* : BANGLADESH.

211. *Malysiocapritermes keralai* Chhotani and Ferry

(Fig. 181)

Malysiocapritermes keralai Chhotani and Ferry :

In press. Chhotani and Ferry, Ann. Entom., S and W. Holotype : S, in ZSI. Type-locality : 5 km from road from Kothamanglam to Munnar, Kerala, India.

IMAGO : Unknown.

SOLDIER (Fig. 181) : Colour and pilosity as in *M. dakshinae*. Total body-length c 5.50 mm. Head-capsule subrectangular ; sides substraight ; width a little less than $\frac{3}{4}$ of length (length to base of mandibles 1.65, max. width 1.20 mm, index width/length 0.725) ; frons sharply inclining in front in distal $\frac{1}{4}$; median arm of Y-suture indicated only near posterior margin of head. Fontanelle transverse, rim chitinoid ; situated at about $\frac{3}{4}$ of head-length from posterior margin (occipito-fontanelle distance 1.23, index occipito-fontanelle distance/head-length 0.745). Antennae 13 + segmented (last segment probably broken) ; segments long, slender ; segment 3 longer than 2 ; 4 shortest. Labrum slightly asymmetrical ; incurved at anterior margin ; antero-lateral apices projecting like horns ; sides convexical (length 0.27, width 0.25 mm). Mandibles weakly asymmetrical, tips damaged (left mandible-length 1.83, right 1.80 mm) ; longer than head a little (index left mandible-length/head-length 1.109) ; outer margin of left mandible sinuate in posterior half ; right mandible rod-like. Postmentum club-shaped, weakly incurved at waist (length 0.80, max. width 0.35, width at waist 0.23 mm, index width at waist/max. width 0.657). Pronotum saddle-shaped (length 0.25, width 0.65 mm) ; anterior lobe faintly emarginate medially. Legs with 3:2:2 apical tibial spurs ; dorsal spur of foretibia weak but distinct.

WORKER : Head-capsule pale brownish yellow ; legs and thorax pale yellow ; postclypeus paler than head ; abdomen greyish due to intestinal

contents showing through. Head and body fairly hairy. Head-capsule subcircular (length to tip of labrum 0.90, length to base of mandibles 0.65, max. width 0.77 mm). Fontanelle plate not distinct. Antennae with 14 segments ; segment 3 shorter than 2 ; 4 shortest. Postclypeus swollen, hairy ; length less than 1/2 width (length 0.14, width 0.38 mm). Pronotum saddle-shaped (length 0.17, width 0.40 mm) ; anterior margin not

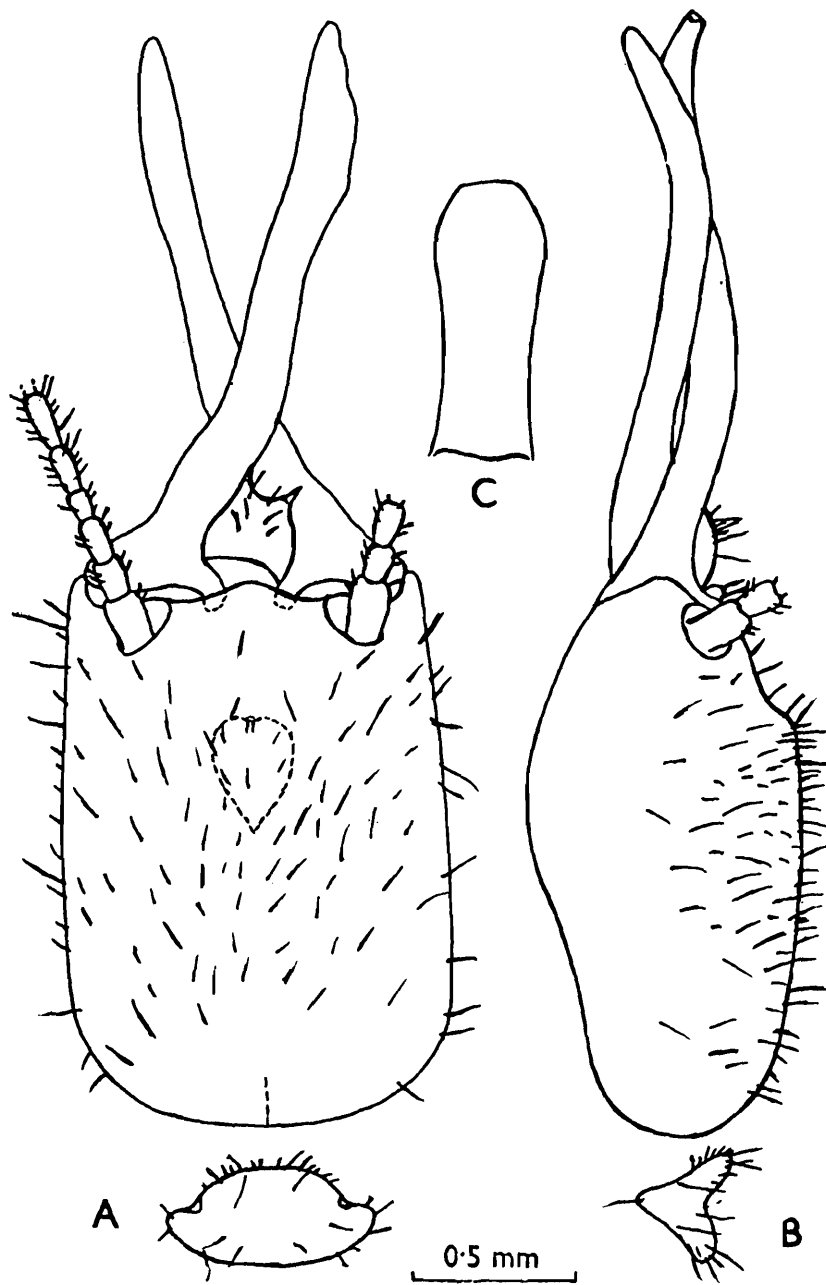


Fig. 181 : *Malaysiocapritermes keralai*. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, in side view. (C) Postmentum. (After Chhotani and Ferry, In press).

emarginate. Legs with 2:2:2 apical tibial spurs ; foretibia greatly swollen ; tarsi 4-jointed.

Distribution : INDIA : Kerala state (known only from type-locality).

Genus 40. **Pseudocapritermes** Kemner

1. Genus *Pseudocapritermes* Kemner :

1934. Kemner, K. *Svenska Vetensk. Akad. Handl.*, (3) **13** (4) : 167-168.
 1949. Snyder, *Smiths. misc. Colls.*, **112** : 191-192.
 1955. Emerson, *Fieldiana : Zool.*, **37** : 512.
 1962. Roonwal and Chhotani, *Proc. natn. Inst Sci. India*, (B) **28** (4) : 294, 319.
 1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 :145.
 1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 354-355.
 1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 9.
 1986. Ping and Xu, *Wuyi Sci.J.*, **6** : 1, 16, 17, 19-20.
 1987. Chhotani, *Beitr. Ent.*, **37** : 410, 411.

2. Genus *Procapritermes* Holmgren (Part) :

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 294-304.

3. Genus *Procapritermes* Holmgren (Wrong assignments) :

1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 43, 60.
 1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 103, 154, 155.

Type of genus : *Pseudocapritermes silvaticus* Kemner.

1. Characters of Genus *Pseudocapritermes*

Imago : Head brown, postclypeus and antennae slightly paler. Head subcircular, wider than long ; part of median suture clear. Fontanelle plate prominent, ovoid, raised. Postclypeus shorter than half of its width. Antennae with 13 + segments ; 3 shortest. Mandibles each with an apical and two marginals ; apical large and finger-like. Left mandible : 1st marginal smaller than apical and with a long posterior margin ; 2nd marginal small, rudimentary ; without cut or notch between 1st and 2nd marginals. Right mandible : 1st marginal as large as that in left mandible

but with shorter posterior margin ; 2nd marginal short with a slightly incurved posterior margin ; distance between apical and 1st marginal more than distance between 1st and 2nd marginals. Pronotum narrower than head ; both anterior and posterior margins weakly emarginate. Legs with 3:2:2 apical tibial spurs, tarsi 4-jointed.

Soldier : Head yellow ; body creamy white ; mandibles dark brown. Head subrectangular, longer than wide, flat ; frontal projection weak or absent. Fontanelle transverse, situated at about anterior 1/4 of head dorsum. Antennae with 14 segments. Labrum asymmetrical ; anterior margin fairly well incurved ; antero-lateral corners produced into pointed processes. Mandibles asymmetrical ; left mandible weakly to prominently twisted, tip beak-like and portion below variably swollen ; right mandible blade-like, with pointed tip. Postmentum club-like. Pronotum strongly saddle-shaped, weakly emarginate at anterior margin. Legs with 3:2:2 tibial spurs ; tarsi 4-jointed.

Worker : Head pale yellowish ; thorax and legs creamy white. Head subcircular, sides narrowing behind. Fontanelle plate large, circular. Antennae with 13-14 segments. Postclypeus swollen, length less than half of width. Mandibles as in imago, posterior margin of 2nd marginal of right mandible more incurved. Pronotum as in soldier. Legs as in soldier but shorter.

2. *Distribution and Composition of Pseudocapritermes*

(Fig. 109)

Distribution : The genus is endemic to the Oriental Region.

Composition : Kemner (1934) erected the genus *Pseudocapritermes* for his species *silvaticus* from Java. Holmgren (1914b) described *Capritermes* (*Capritermes*) *angustignathus* from Malacca and Snyder (1949) included these two species in his catalogue. Krishna (1968) has treated *Pseudocapritermes* as a synonym of *Procapritermes* and listed 16 species ; of which Ahmad and Akhtar (1981) transferred *Capritermes greeni* John to their *Syncapritermes* ; *Procapritermes longignathus* Ahmad, *P. holmgreni* Akhtar and *P. prosetiger* Ahmad to their *Malaysiocapritermes* ; and included five species viz. *Pseudocapritermes fontanellus* Mathur and Thapa, *P. goanicus* Thakur and Chatterjee, *P. parasilvaticus* Ahmad, *P. silvaticus* Kemner and *P. tikadari* Roonwal &

Chhotani (misspelt as *tikardi*) in *Pseudocapritermes*. They do not mention anything about the remaining species included by Krishna (1968) in *Procapritermes* except *T setiger* Haviland which they refer as *Procapritermes setiger* (Haviland). It is beyond the scope of this publication to give comments on these remaining species except those found in the Indian Region. During the study, the author (1993) has found that the species *P. fontanellus* Mathur and Thapa, *P. goanicus* Thakur and Chatterjee and *P. roonwali* Verma are junior synonyms of *P. fletcheri* (*Capritermes fletcheri* Holmgren and Holmgren). As such the following four species have been included here from the Indian Region :—

1. *Pseudocapritermes bhutanensis* (Roonwal and Chhotani) (= *Procapritermes bhutanensis* Roonwal & Chhotani)—Bhutan
2. *Pseudocapritermes fletcheri* (Holmgren and Holmgren) (= *Capritermes fletcheri* Holmgren and Holmgren)—India
3. *Pseudocapritermes karticki* Bose—India
4. *Pseudocapritermes tikadari* Roonwal and Chhotani—India

3. Key to Indian Species of *Pseudocapritermes*

SOLDIERS

- 1 (2) Smaller species : Head-length to base of mandibles 1.40-1.80, max. width of head 0.90-1.03 mm. Left mandible strongly twisted and much shorter than head-length, index left mandible-length/head-length 0.75-0.79 *fletcheri*
- 2 (1) Larger species : Head-length to base of mandibles 1.87-2.50, max. width of head 1.23-1.40 mm. Left mandible weakly twisted and only a little shorter than to subequal to head-length, index left mandible-length/head-length 0.82-1.07
- 3 (4) Head long and narrow, head-length to base of mandibles 1.97-2.50, width 1.17-1.36 mm, index width/length 0.53-0.55 ; sides substraight. Mandibles shorter ; left mandible more twisted and with a weak beak and convexly rounded swollen portion below beak ; index left mandible-length/head-length 0.82-0.87 *tikadari*
- 4 (3) Head shorter and wider, head-length to base of mandibles 1.87-2.18, max. width 1.35 mm, index width/length 0.64-0.722 :

sides slightly convex. Mandibles longer ; left mandible less so twisted and with a sharp and prominent beak and transversely convex swollen portion below beak ; index left mandible-length/head-length 0.96-1.07

5 (6) Head smaller and wider ; head-length to base of mandibles 1.87-2.00 ; index width/length 0.70-0.722. Left mandible with more prominently incurved beak..... *karticki*

6 (5) Head longer and narrower ; head-length to base of mandibles 2.18 ; index width/length 0.64. Left mandible with less prominently incurved beak*bhutanensis*

212. *Pseudocapritermes bhutanensis* (Roonwal and Chhotani) n. comb

(Fig. 182)

Procapritermes bhutanensis Roonwal and Chhotani :

1977. Roonwal and Chhotani, *Ent. Basil.*, 2 : 60-61. S. Holotype : S, in NHM, Basel. Type-locality : Thimphu, 2300-2500 m altitude, Bhutan. Type examined.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 33.

IMAGO : Unknown.

SOLDIER (Fig. 182) : Head-capsule yellowish golden, reddish near base of mandibles and on sides ; mandibles blackish ; body creamy white. Head and body densely hairy. Total body-length 7.8 mm. Head-capsule subrectangular ; sides slightly convex, width about 2/3 of length to base of mandibles (length with mandibles 3.8, length to base of mandibles 2.18 and max. width 1.40 mm, index width/length to base of mandibles 0.64) ; median suture not reaching even upto half of head-length. Fontanelle small, transverse, situated at about 3/4 of head-length from posterior margin ; fontanelle gland large prominent. Eyes and ocelli absent. Antennae with 14 segments ; segment 3 a little longer than 2 ; 4 shortest. Postclypeus not clearly demarcated from frons, hairy ; anteclypeus hyaline, apilose, subrectangular. Labrum asymmetrical ; antero-lateral corners produced into sharply pointed processes ; anterior margin incurved (length 0.33, width 0.30 mm). Mandibles asymmetrical, a little shorter than head (length : left 2.10, right 2.03 mm ; left mandible/head length index 0.96). Left mandible weakly bent and incurved in basal half ; tip with a

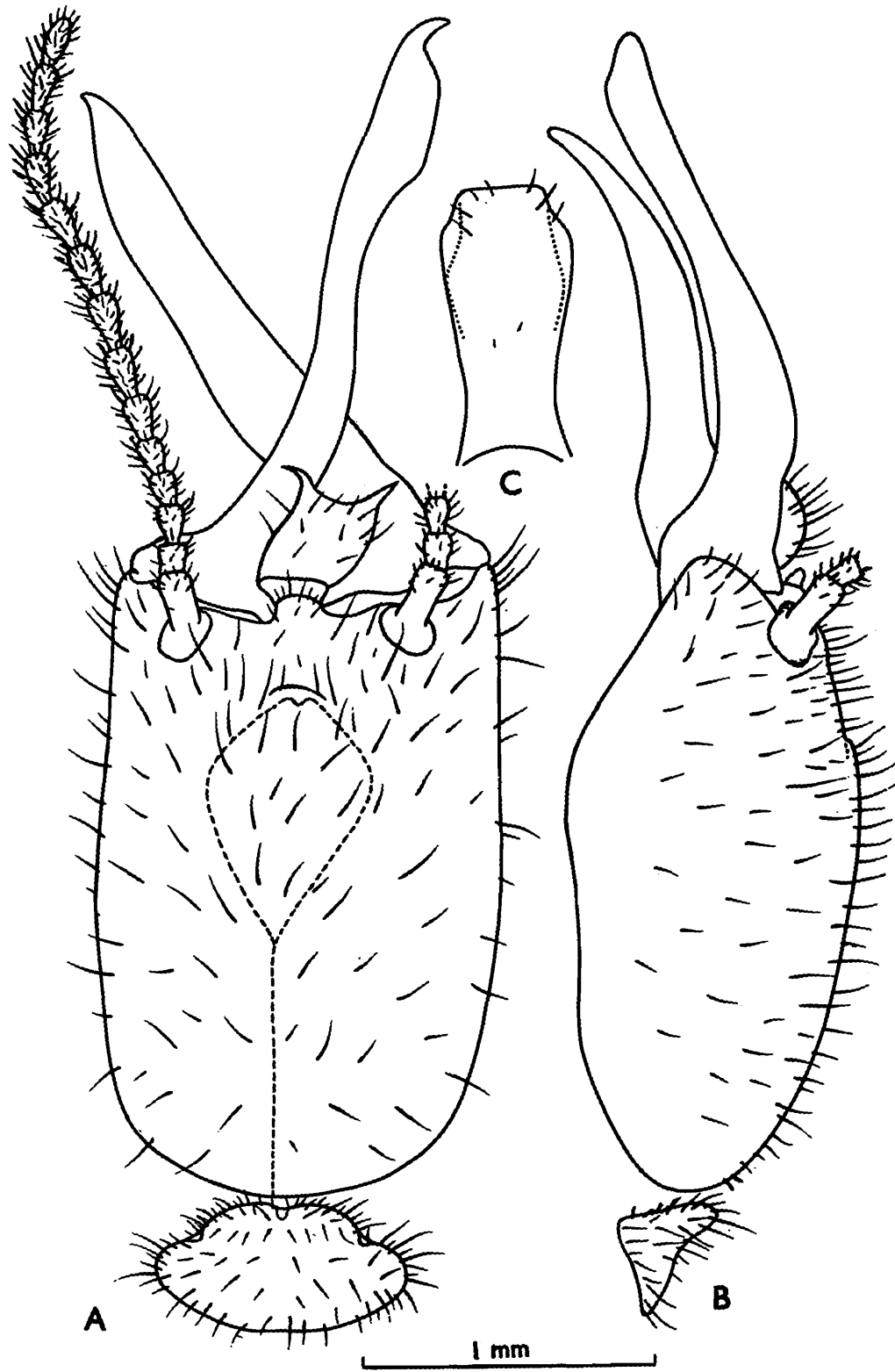


Fig. 182 : *Pseudocapritermes bhutanensis*. Soldier. (A) Head and pronotum, in dorsal view. (B) Same, side view. (C) Postmentum. (After Roonwal and Chhotani, 1977).

prominently incurved beak ; portion below beak strongly swollen and substraight on inner margin. Right mandible blade-like, tip pointed and weakly incurved. Postmentum short, club-like ; waist situated near posterior margin and weakly incurved at waist (length 0.83, max. width 0.43, min. width at waist 0.35 mm). Pronotum saddle-shaped ; anterior margin medially notched ; posterior margin faintly incurved medially (length 0.43, width 0.83 mm). Mesonotum narrower than and metanotum as wide as pronotum, both having a median notch at posterior margin. Apical tibial spurs 3:2:2, dorsal spur on foretibia weak ; tarsi 4-jointed. Abdomen oblong hairy ; cerci short, 2-jointed.

WORKER : Unknown.

Distribution : BHUTAN : Thimphu (type-locality), known only from the type-locality.

213. *Pseudocapritermes fletcheri* (Holmgren and Holmgren)

(Figs. 183, 184)

(Synonyms : *P. fontanellus* Mathur and Thapa, *P. goanicus* Thakur and Chatterjee and *P. roonwali* Verma)

1. *Capritermes fletcheri* Holmgren and Holmgren :

1917. *Capritermes fletcheri* Holmgren and Holmgren, *Mem. Dept. Agric. India*, **5** (3) : 169. S and W. Syntypes in ZSI, FRI, IARI, AMNH and Holmgren Coll. at Riksmuseet, Stockholm. Type-localities : Puthupadi Forest (Malabar, Kerala), Anamalai Hills (Tamil Nadu) and Bababudin Hills (Karnataka). Bababudin Hill specimens are *Dicuspitermes incola* (Wasmann), see Chhotani (1993)

2. *Pseudocapritermes fletcheri* (Holmgren and Holmgren) :

1993. Chhotani, *Rec. zool. Surv. India*, **92** : 297-302 Lectotype : S designated and deposited in ZSI. Type-locality restricted to Anamalai Hills (Tamil Nadu). See for status, synonyms and complete synonymy, description, etc.

IMAGO : Unknown.

SOLDIER (Fig. 183) : Head-capsule yellowish, fontanelle gland area creamy white ; antennae, legs and body creamish ; left mandible blackish, right reddish black. Head fairly and body densely hairy. Total body-length 4.00-5.00 mm. Head-capsule subrectangular, sides substraight ;

width a little more than $\frac{3}{4}$ of length to base of mandibles (length to base of mandibles 1.40-1.80, max. width 0.90-1.03 mm, index width/length 0.75-0.85) ; with a weak frontal projection and sharply inclined in front at frons and in profile slightly inclining posteriorly ; median suture present, extending from posterior margin to about $\frac{1}{3}$ to $\frac{1}{2}$ of head-length. Fontanelle small, situated below frontal projection ; fontanelle gland variable in size. Antennae with 14 segments ; segment 3 generally shorter

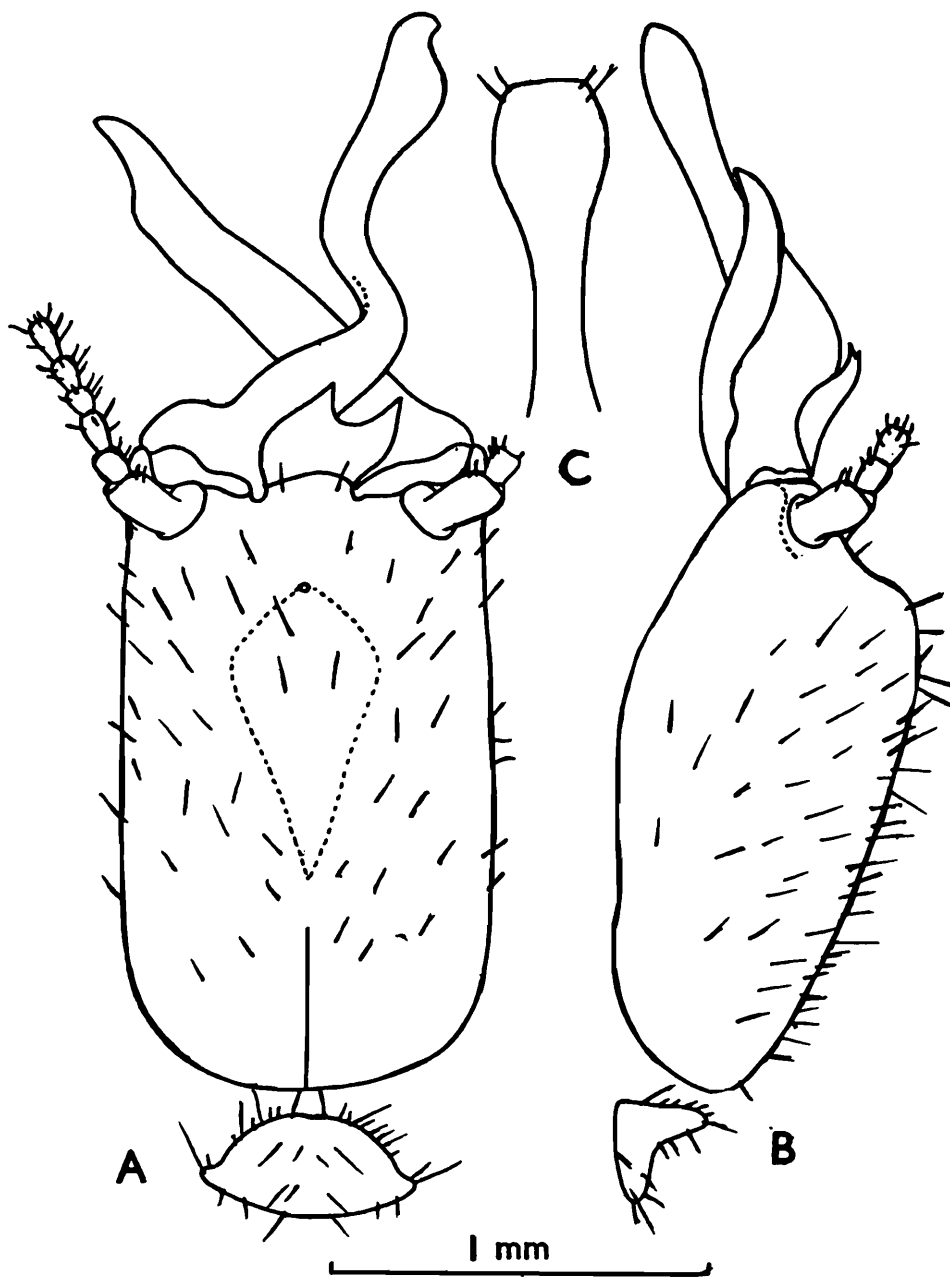


Fig. 183 : *Pseudocapritermes fletcheri*. Lectotype soldier. (A) Head and pronotum, in dorsal view. (B) Same, side view. (C) Postmentum.

than 2, club-like ; 4 generally shortest ; sometimes segments 2,3 subequal and 4 slightly shorter. Labrum asymmetrical, sides convex (length 0.25-0.33, width 0.20-0.25 mm) ; anterior margin deeply incurved with anterolateral corners sharp and projecting in front. Mandibles asymmetrical subequal ; shorter than head, about $\frac{3}{4}$ of head-length (length : left 1.10-1.35, right 1.15-1.35 mm ; index left mandible-length/head-length 0.750-0.819). Left mandible strongly twisted and with an incurved, beak-like tip ; portion below tip strongly and roundly swollen on inner margin ; and very broad at middle of twist. Right mandible blade-like with a long incurved apical part ; weakly incurved in anterior half at outer margin and near middle on inner margin. Postmentum club-like ; waist lying

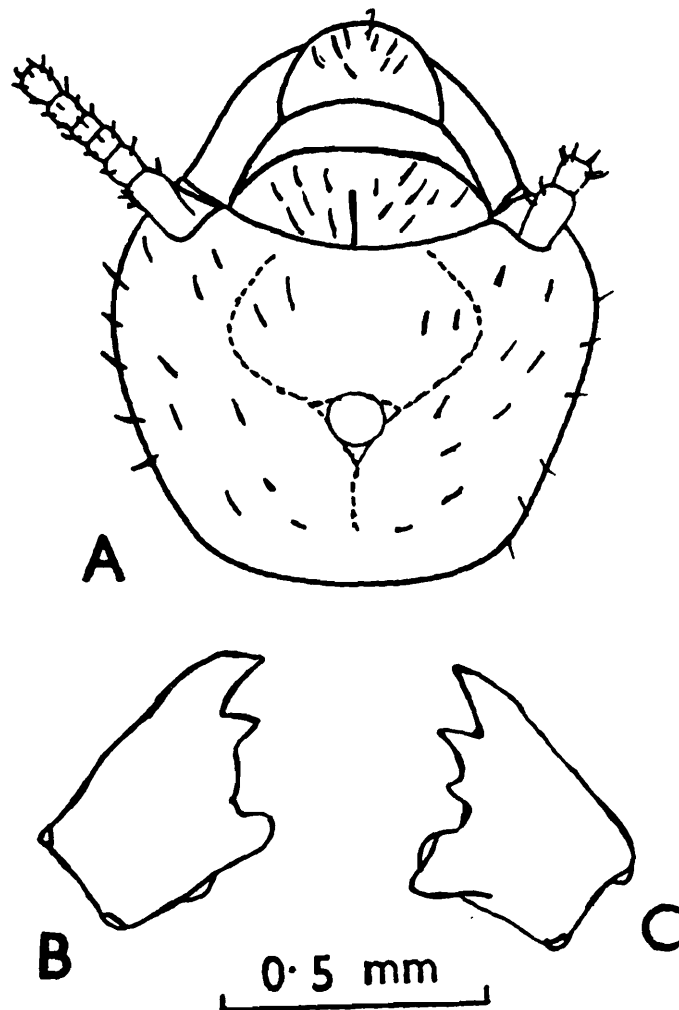


Fig. 184 : *Pseudocapritermes fletcheri*, Paralectotype worker. (A) Head, in dorsal view. (B) and (C) Left and right mandibles.

below mid-point (length 0.70-0.85, max. width 0.28-0.33, width at waist 0.10-0.15 mm). Pronotum strongly saddle-shaped, anterior and posterior margins faintly emarginate (length 0.25-0.28, max. width 0.55-0.60 mm). Legs thin, long, hairy ; apical tibial spurs 3 : 2 : 2, dorsal spur on fore-legs weak ; tarsi 4-jointed. Abdomen elongate, hairy ; cerci 2-jointed; styli absent.

WORKER (Fig. 184) ; Head, antennae and labrum pale yellow. Head and body densely hairy. Total body-length 3.25-4.00 mm. Head-capsule subcircular ; sides weakly narrowed behind (length to tip of labrum 1.05-1.18, length to base of mandibles 0.60-0.78, max. width 0.75-0.88 mm). Fontanelle plate oval to subcircular. Antennae with 13-14 segments ; segment 3 in 13-segmented antennae subdividing, in 14-segmented ones 3 and 4 short, 3 slightly longer than 4. Postclypeus swollen, a little less than 1/2 of width in length (length 0.16-0.18, width 0.45-0.50 mm). Pronotum strongly saddle-shaped ; anterior margin weakly notched ; length 0.13-0.20, max. width 0.40-0.55 mm.

Distribution : INDIA : Tamil Nadu, Kerala, Karnataka and Goa states.

214. *Pseudocapritermes karticki* Bose

(Fig. 185)

Pseudocapritermes karticki Bose :

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER (Fig. 185) : Head-capsule yellowish ; antennae pale brownish ; mandibles dark brown, paler near base ; thorax and abdomen creamish white. Head and body fairly densely hairy. Total body-length c 6.95-7.00 mm. Head-capsule subrectangular, sides subparallel (length to base of mandibles 1.87-2.00, max. width 1.35-1.40 mm, index width/length 0.70-0.722) ; frons weakly inclined anteriorly ; median suture short extending upto a little more than 1/4 of head-length from posterior margin. Fontanelle transverse situated at base of frons, at about 3/4 of head-length from posterior margin of head. Eyes and ocelli absent. Antennae with 14 segments ; segment 3 longer than 2 ; 4 shortest. Postclypeus semicircular, with a hair on either side anteriorly ; indistinctly separated from frons. Anteclypeus translucent, subtrapezoidal, apilose. Labrum translucent with

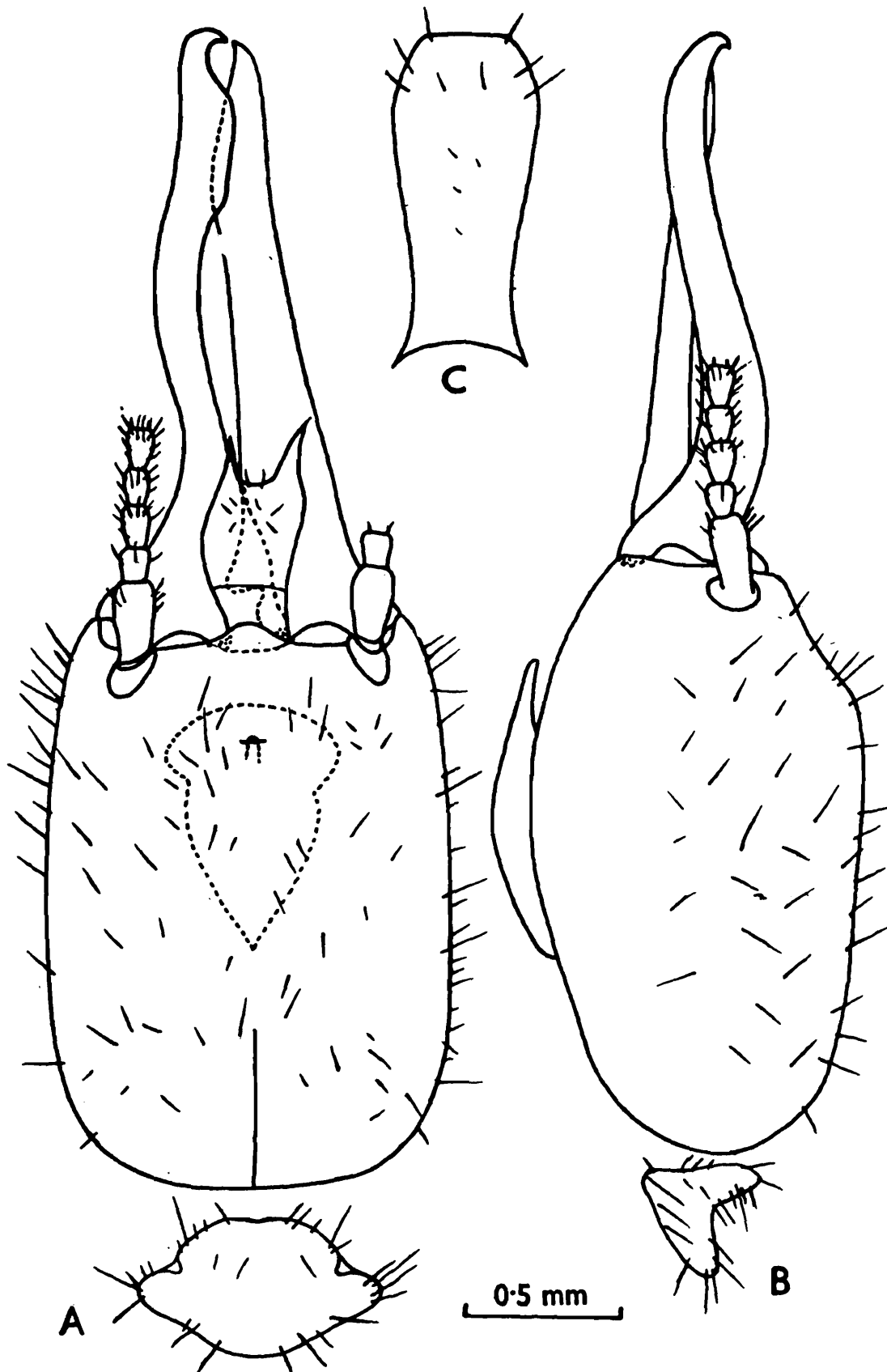


Fig. 185 : *Pseudocapritermes karticki*. Soldier. (A) Head and pronotum, in dorsal view. (B) Same, side view. (C) Postmentum. (After Bose, In press).

sharp, long, antero-lateral apices and short hairs on anterior margin and body ; anterior margin deeply incurved (length 0.35-0.40, width 0.28-0.33 mm). Mandibles asymmetrical, almost as long as head capsule (length : left mandible 1.87-2.00, right 1.88-2.00 mm, index left mandible-length/head-length 1.00-1.07). Left mandible with a short apical beak ; broad, transverse, blade-like just below beak and moderately incurved further behind. Right mandible with a sharp tip and long apical blade ; outer margin weakly incurved. Postmentum short, club-shaped (length 1.00-1.05, max. width 0.40-0.45, width at waist 0.25-0.30 mm) ; waist lying near posterior margin. Pronotum saddle-shaped ; anterior margin without any notch ; posterior margin also without any emargination (length 0.40-0.42, width 0.80-0.82 mm). Legs and abdomen as in genus ; dorsal spur on foreleg not discernible.

WORKER : Head-capsule creamy white and legs whitish ; abdomen appearing greyish due to intestinal contents showing through. Head and body fairly densely hairy. Total body-length 3.30-3.40 mm. Head subcircular (length to base of mandibles 0.75-0.85, max. width 0.95-1.03 mm). Fontanelle plate round, translucent (diameter 0.13 mm). Antennae with 14 segments ; segment 4 shortest. Postclypeus swollen, length a little less than half of width (length 0.20-0.22, width 0.53-0.55 mm), pilose ; anterior margin straight, posterior weakly notched. Anteclypeus trapezoidal, apilose ; anterior margin projecting in front medially. Pronotum saddle-shaped, without notch at anterior margin (length 0.25-0.28, width 0.55-0.60 mm).

Distribution : INDIA : Meghalaya : Mawphlong (type-locality), known only from the type-locality.

215. ***Pseudocapritermes tikadari*** Roonwal and Chhotani

(Synonym : *P. planus* Mathur and Thapa)

(Figs. 186,187)

1. *Pseudocapritermes tikadari* Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 319-323, Pls. 20, 21. S. and W. Holotype : S, in Z S I. Type-locality : Cherrapunji, Meghalaya, India.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 108.

1965. Mathur and Thapa, *Bull. Ent.*, No. 6 : 13. misspelt as *tikardari* and *tikardnri*.
1981. Ahmad and Akhtar, *Pakistan J. Zool.*, **13** (1 & 2) : 20. (misspelt as *P. tikardi*)
1986. Ping and Xu, *Wuyi Sci. J.*, **6** : 14, 20.
- In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

2. *Procapritermes tikadari* (Roonwal and Chhotani) :

1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 298, 300, 304.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 33.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 60, 62-63.

3. *Pseudocapritermes planus* Mathur and Thapa :

1965. Mathur and Thapa, *Bull. Ent.*, No. 6 : 12-13.
1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) 304. (Treats it as synonym of *tikadari* R. & C.)
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 33.

IMAGO : Unknown.

SOLDIER (Fig. 186) : Head-capsule straw yellow to yellowish brown, antennae yellowish; thorax, legs and abdomen yellowish white; mandibles dark brown to black, right paler than left. Head-capsule sparsely and body fairly pilose. Total body-length 5.70-7.20 mm. Head-capsule subrectangular, length a little less than double the width (length to base of mandibles 1.97-2.50, width 1.17-1.36 mm, index width/length 0.53-0.55); sides subparallel; posterior margin round, sometimes faintly incurved medially; median suture running from posterior margin to about middle of head. Fontanelle transverse, slit-like; leading into a small tube and a large gland; situated anteriorly (distance from posterior margin 1.80-2.03 mm, index occipito-fontanelle distance/head-length 0.80-0.88). Antennae with 14 segments; segment 3 longer than 2; 4 subequal to 2. Clypeus not differentiated into ante- and postclypeus. Labrum asymmetrical; longer than broad; with antero-lateral corners produced into sharply pointed processes; anterior margin incurved (length 0.35-0.46, width 0.23-0.30 mm). Mandibles asymmetrical, a little shorter than

head-capsule (length : left 1.80-2.06, right 1.75-2.13 mm, index left mandible-length/head-length 0.82-0.87). Left mandible twisted and incurved in basal half at outer margin ; tip with a weak beak ; inner margin with a tooth and a basal projection at basal fourth. Right mandible blade-like, tip straight and pointed ; outer margin straight, inner margin weakly incurved medially. Postmentum long, club-shaped, with a narrow waist lying halfway between widest part and posterior margin (length 1.07-1.23, max. width 0.37-0.40, min. width at waist 0.20 mm). Pronotum strongly saddle-shaped ; anterior margin with a weak median notch ; posterior margin weakly convex (length 0.23-0.33, width 0.70-0.80 mm). Mesonotum narrower and metanotum broader than pronotum ; posterior margin of both substraight.

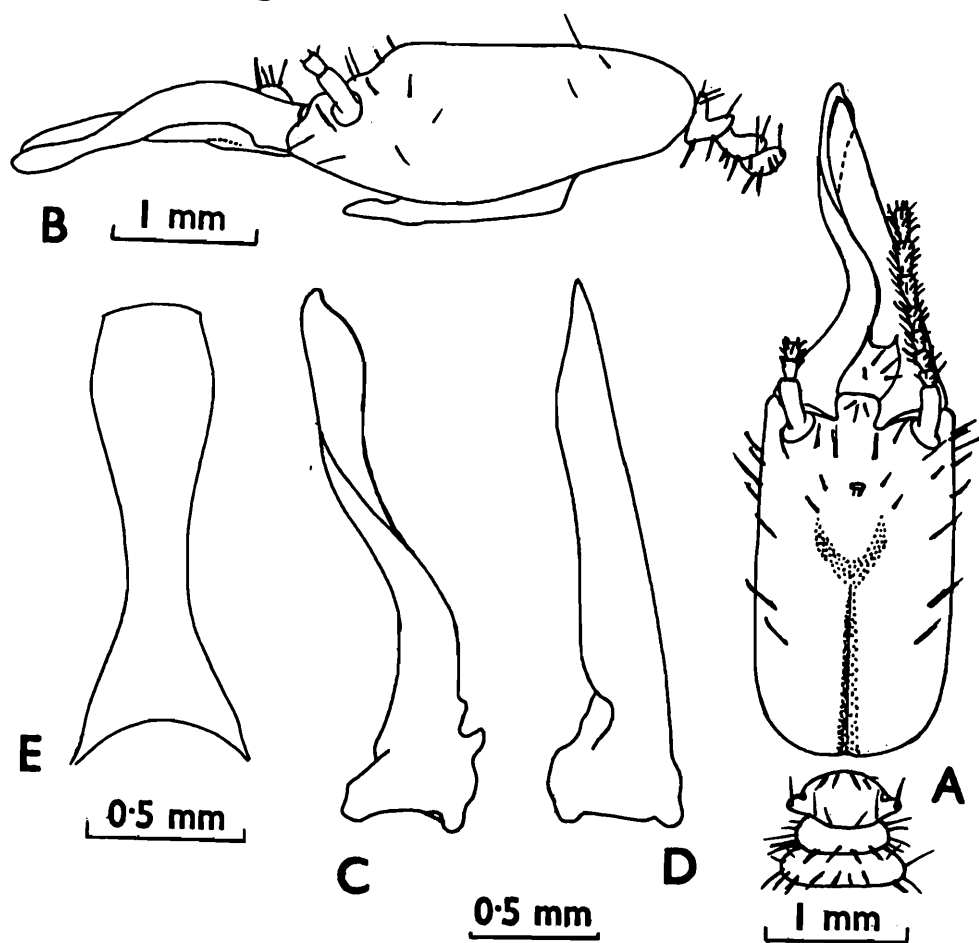


Fig. 186 : *Pseudocapritermes tikadari*. Paratype soldier. (A) Head and thorax, in dorsal view. (B) Same, in side view. (C), (D) Left and right mandibles. (E) Postmentum. (Ex Roonwal and Chhotani 1962c).

WORKER (Fig. 187) : Head and antennae pale yellow ; thorax and legs creamish white ; abdominal tergites and sternites transparent but abdomen looks greyish due to intestinal contents showing through. Head

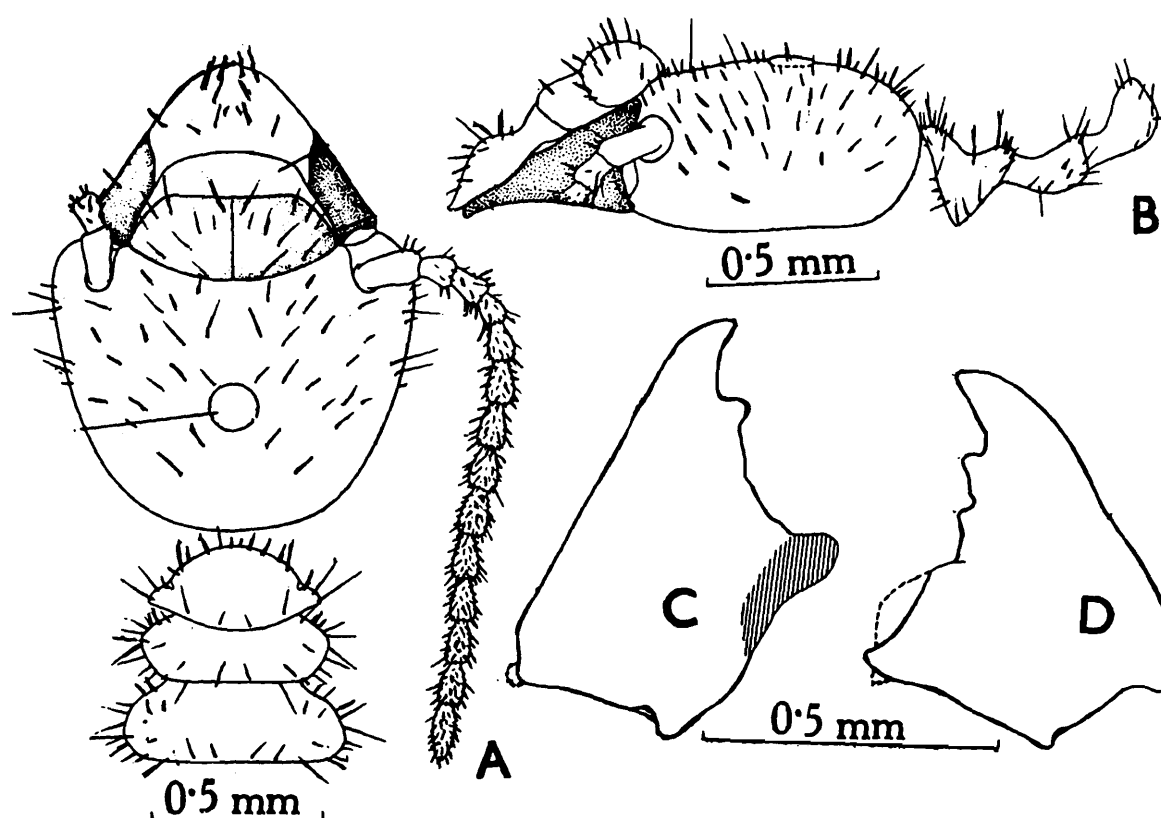


Fig. 187 : *Pseudocapritermes tikadari*. Paramorphotype worker. (A) Head and thorax, in dorsal view. (B) Same, in side view. (C), (D) Left and right mandibles. (Ex Roonwal and Chhotani 1962c).

and body moderately densely hairy. Total body-length c 4.00-5.00 mm. Head-capsule subcircular, wider than its length to base of mandibles (length 0.87-0.93, width 1.03-1.10 mm). Fontanelle plate large, translucent and circular (diameter 0.12-0.14 mm). Eyes and ocelli absent. Antennae with 14 segments ; segment 3 either subequal to or a little longer or shorter than 2 ; 4 either shorter or subequal to 3. Postclypeus pilose, greatly swollen and in length little shorter than half of width ; divided into 2 halves ; anterior margin straight, posterior margin convex. Anteclypeus subtrapezoid, hyaline, apilose, anterior margin weakly convex. Labrum dome-shaped ; with a few hairs near anterior margin and body. Pronotum strongly saddle-shaped (length 0.23-0.28, width 0.53-0.63 mm) ; anterior margin without notch.

Distribution : INDIA : Assam, Meghalaya and Arunachal Pradesh states. BHUTAN.

Genus 41. *Mirocapritermes* Holmgren

Genus *Mirocapritermes* Holmgren :

1914. Holmgren, *Zool. Jb. Syst.*, **36** : 277.
 1968. Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 265, 267, 269, 305-308. See for detailed synonymy, diagnosis, distribution, etc.
 1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab* (N. S.), Art. 7 : 60.
 1981. Ahmad and Akhtar, *Pakistan J. Zool.*, **13** (1 & 2) : 1, 2, 3.
 1987. Chhotani, *Beitr. Ent.*, **37** : 410, 411.

Type of genus : *Mirocapritermes connectens* Holmgren.

1. Characters of genus *Mirocapritermes*

Imago : Unknown.

Soldier : Head subrectangular ; fairly densely hairy ; frons projected into a blunt, broadly rounded frontal projection, not reaching upto base of mandibles. Fontanelle situated below frontal projection, small and circular ; fontanelle gland large, well developed. Antennae with 14 segments, 4th segment shortest. Labrum with antero-lateral corners projected as short spines, anterior margin incurved. Mandibles asymmetrical ; left mandible hooked at tip and moderately bent at middle ; right blade-like, at tip sharply pointed and sometimes weakly bent. Postmentum weakly narrowed at waist. Pronotum small, saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs ; tarsi 4-jointed.

Worker : Head and body densely hairy. Head oval. Antennae with 14 segments, segment 2 as long as 3 + 4. Postclypeus half as long as its width. Mandibles each with an apical and two marginal teeth ; apical large ; 1st marginal of left with a long posterior margin and 2nd marginal very much reduced, without any notch in front of it ; 1st marginal of right with a little longer posterior margin and posterior margin of 2nd marginal strongly incurved. Pronotum saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs ; tarsi 4-jointed.

2. Distribution and Composition of *Mirocapritermes*

(Fig. 109)

Distribution : This genus is known only from the Oriental zoogeographical region from Bangladesh, Burma, Thailand, China (Yunnan), and Sumatra.

Composition : Six species of the genus are known of which 3 occur in Thailand and one each in Burma, Bangladesh and Sumatra. The two species known from the Indian region are as follow :-

1. *Mirocapritermes snyderi* Akhtar—Bangladesh
2. *M. valeriae* Krishna—Burma

3. Key to Indian Species of *Mirocapritermes*

SOLDIERS

- 1 (2) Head larger (length to base of mandibles 1.37 and max. width 0.96 mm) ; mandibles longer (left 1.38 and right 1.30 mm long) ; frontal projection larger.....*valeriae*
- 2 (1) Head shorter (length 1.29, max. width 0.88 mm) ; mandibles shorter (left 1.21 and right 1.17 mm long) ; frontal projection shorter.....*snyderi*

216. *Mirocapritermes snyderi* Akhtar

(Fig. 188)

1. *Mirocapritermes snyderi* Chaudhry, et al. (Nom. nud.) :
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 63 (Nom. nud.)
2. *Mirocapritermes snyderi* Akhtar :
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab. (N.S.)*, Art. 7 : 166-168, 194.
S. Holotype : S, in Zool. Dept. Panjab Univ. Lahore. Type locality : Ukhia, Bangladesh.

IMAGO : Unknown.

SOLDIER (Fig. 188) : Head-capsule yellowish ; antennae pale ; labrum, pronotum, legs and abdomen yellowish white ; mandibles pale reddish brown. Head moderately hairy, frontal projection more hairy ; pronotum fairly and abdomen densely hairy ; labrum with a pair of hairs at anterior margin and two pairs on body. Head-capsule subrectangular, sides subparallel (length to base of mandibles 1.29, max. width 0.88 mm) ; frontal projection broadly rounded, short ; median suture short, slightly indicated near posterior margin. Fontanelle situated below frontal projection. Antennae with 14 segments ; segment 2 slightly longer than 3 ; 4 shortest. Labrum with antero-lateral margins produced to pointed

spines ; anterior margin almost straight. Mandibles asymmetrical ; left mandible moderately twisted with a pointed incurved beak at tip; right mandible blade-like, with a narrow and pointed tip (length : left mandible 1.21, right mandible 1.17 mm). Postmentum club-shaped with a weakly narrowed waist lying near base (length 0.73, max. width 0.32 and width at waist 0.22 mm). Pronotum saddle-shaped ; anterior margin rounded, not notched (max. width 0.48 mm).

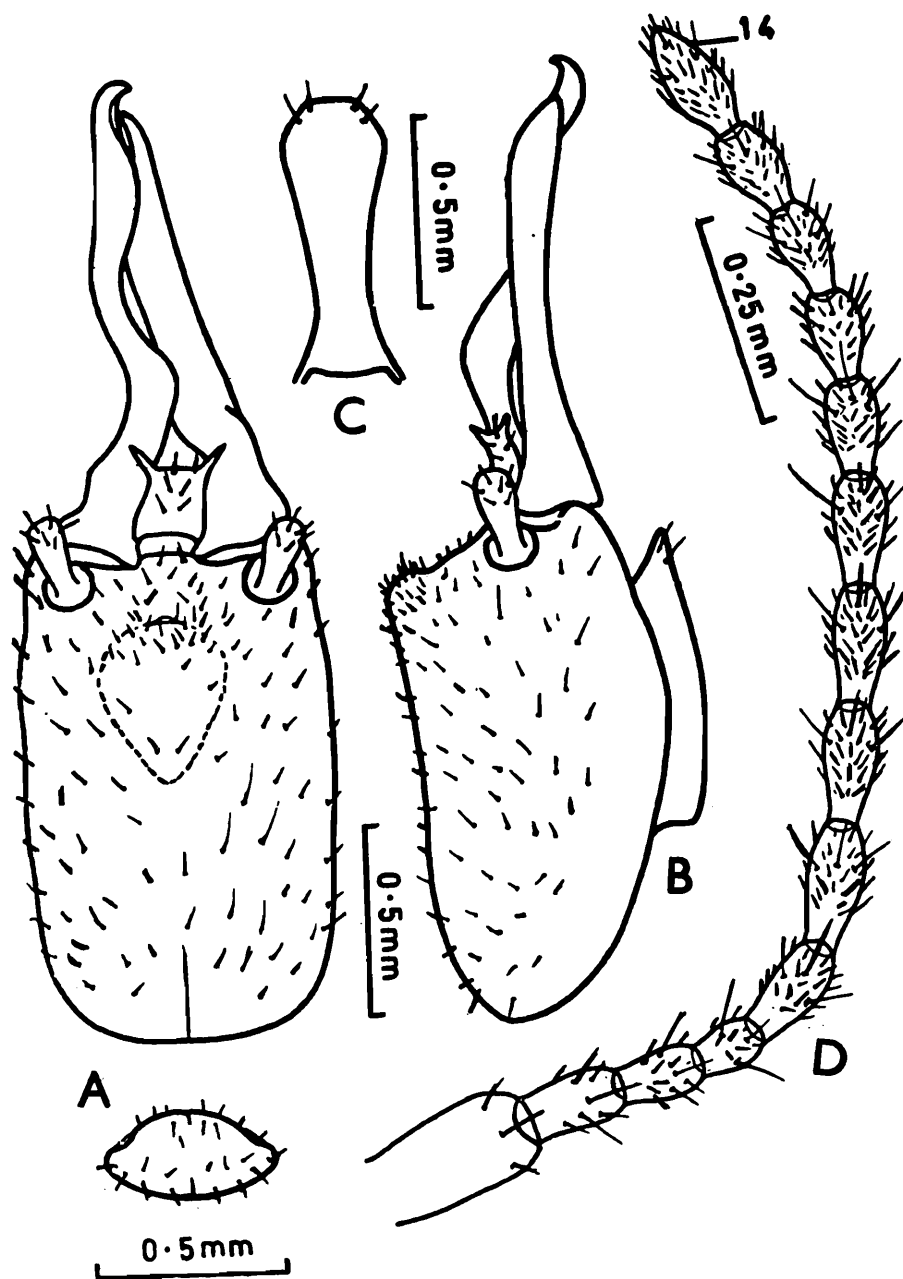


Fig. 188 : *Mirocapritermes snyderi*. Soldier. (A) Head and pronotum, in dorsal view. (B) Head, in side view. (C) Postmentum. (D) Antenna. (After Akhtar, 1975).

Distribution : BANGLADESH (Ukhia, type-locality). Known only from the type-locality.

217. *Mirocapritermes valeriae* Krishna

(Fig. 189)

1. *Mirocapritermes valeriae* Krishna :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 13-15. S. Holotype. S, in AMNH. Type-locality : Maymyo (Burma).

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, 131 (Art. 1) : 96, 98.

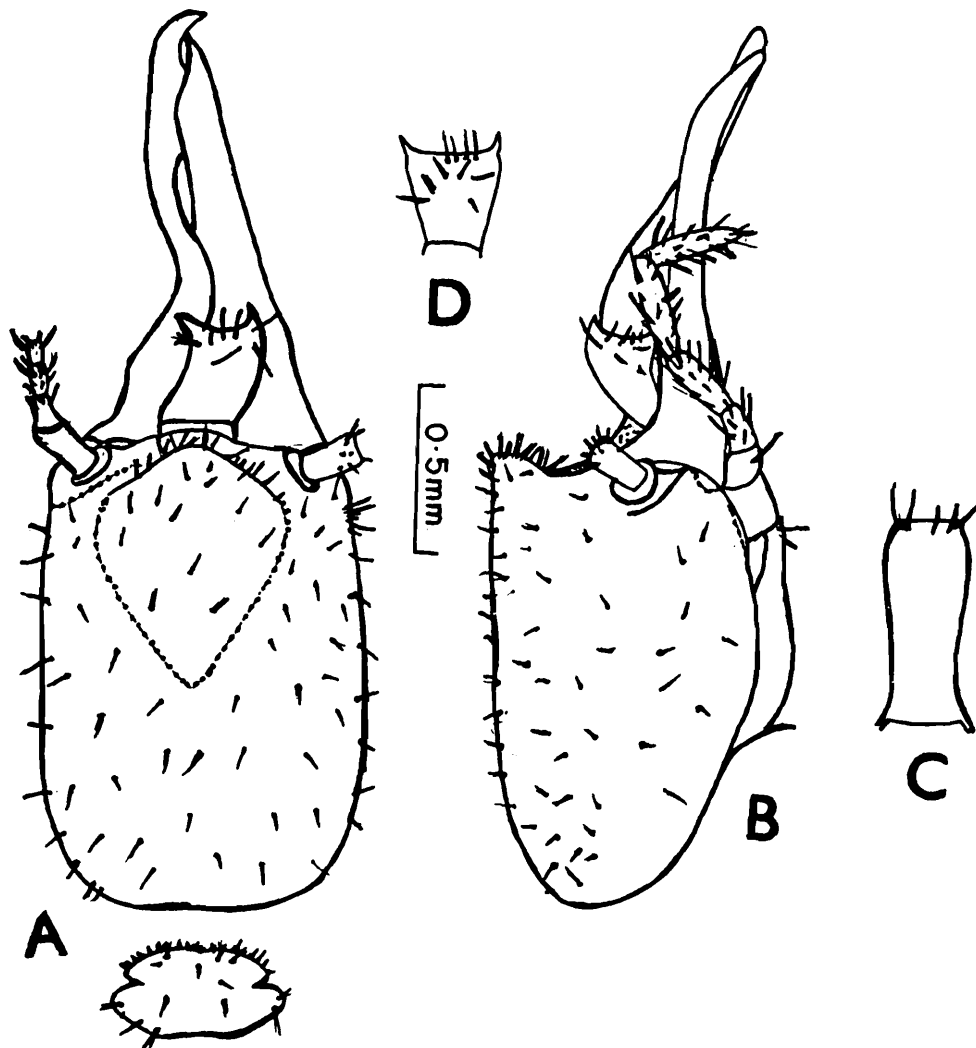


Fig. 189 : *Mirocapritermes valeriae*. Soldier. (A) Head and pronotum, in dorsal view. (B) Head, in side view. (C) Postmentum. (D) Labrum. (After Krishna, 1965b).

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 167.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 33.

IMAGO : Unknown.

SOLDIER (Fig. 189) : Head-capsule pale yellow, fontanelle gland area creamish; antennae yellowish; labrum, pronotum, legs and abdomen yellowish white; mandibles brown, right paler than left. Head moderately hairy, frontal protuberance more hairy. Head-capsule subrectangular (length to base of mandibles 1.37, max. width 0.96 mm); sides subparallel slightly converging in front; frontal projection prominent, blunt and rounded. Antennae with 14 segments; segment 2 subequal to 3; 4 shortest. Labrum with side margin projecting into pointed, spine-like, short processes; anterior margin slightly incurved. Mandibles asymmetrical; left mandible sharply pointed and beak-like; right mandible blade-like, with a sharp, pointed tip (left mandible-length 1.38, right mandible-length 1.30 mm). Postmentum club-shaped (length 0.64, max. width 0.26, width at waist 0.21 mm) ; very weakly narrowed at waist (contraction index 0.74-0.81), waist situated near posterior margin. Pronotum saddle-shaped; anterior margin faintly notched medially (length 0.23, max. width 0.55 mm).

Distribution : BURMA : Maymyo (Botanical Garden), type-locality. Known only from the type-locality.

Subfamily (iii) MACROTERMITINAE Kemner

Subfamily MACROTERMITINAE Kemner :

1934. Kemner, *K. Svenska Vetensk.-Akad. Handl.*, (3) 13 (4) : 69, 86.

1949. Snyder, *Smiths. misc. Colls.*, 112 : 202.

1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, 95 (Art. 1) : 55, 57-59.

1955. Emerson, *Fieldiana : Zool.*, 37 : 486, 513.

1965. Bouillon and Mathot, *Zooleo*, No. 1 : 21, 31-33.

1970. Weidner, In : *Handb. d. Zool.*, 4 (Sec. 2, pt. 2, Lief. 13, No. 14); 11, 12, 24-25, 42. Keys, nests, etc.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 145-146.

1973. Chhotani and Bose, *Zool. Anz.*, 190 : 235.

1974. Akhtar, *Pakistan J. Zool.*, 6(1&2) : 91-92, 99, 100.

1980. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **46** (2) : 150-162. Wing microsculpture.
1983. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) **49**(5) : 366, 367, 382, 383, 387, 388.
1986. Grasse , *Termitologia* Vol : 3 : 534-549.
1989. Roonwal and Chhotani, *Fauna of India-Isoptera (Termites)* Vol 1 : 109, 110, 114, 118.

Type genus : *Macrotermes* Holmgren.

1. Characters of Subfamily Macrotermitinae

The Macrotermitinae are fungus cultivating termites.

Imago : Medium to large, densely hairy. Head-capsule subcircular. Fontanelle minute, circular, situated medially; flush with head surface or slightly raised. Eyes prominently projecting out. Ocelli oval, either touching or separated from eyes. Mandibles each with an apical and two marginal teeth, sometimes a subsidiary tooth present at base of 1st marginal of right mandible (some primitive genera including *Macrotermes*); apical shorter than or as long as 1st marginal; 1st marginal of left mandible with long, sinuate posterior margin and 2nd small and separated from 1st by a cut; 1st marginal of right mandible finger-like and triangular; 2nd small, with long, straight posterior margin and molar plate as long as posterior margin of 2nd marginal. Postclypeus swollen, convexical. Labrum with transverse, chitinous band. Antennae with 15-20 segments. Pronotum subtrapezoidal or sub-semicircular. Wings long; membrane hairy (*Macrotermes*) or with microscopic cuticular rods (*Odontotermes*, *Microtermes*, *Hypotermes*); costa thick; subcosta (radius of some) short, meeting costa just outside scale; radius thick, parallel to costa-subcosta; radial streak present or absent; media thin, coming out of scale along with cubitus or separately in forewing and from radius in hindwing; cubitus thin with several branches.

Soldier : Monomorphic (*Odontotermes*, *Hypotermes*, *Microtermes*) or dimorphic (*Macrotermes*, *Pseudacanthotermes*) or trimorphic (*Acanthotermes*). Small to large, scantily to densely hairy. Head-capsule oval or subrectangular. Fontanelle indistinct or small, minute, circular. Eyes and ocelli absent or rudimentary. Antennae 12 to 21-segmented. Mandibles delicate and thin (*Microtermes*, *Ancistrotermes*) or thick and

stout (*Odontotermes*, *Macrotermes*); left mandible either with crenulations (*Acanthotermes*, *Macrotermes*, *Hypotermes*) or with a tooth (*Odontotermes*) or without any crenulations or teeth (*Sphaerotermes*, some *Microtermes*). Labrum with or without hyaline tip. Postmentum subrectangular or swollen and arched. Pronotum saddle-shaped, anterior and lateral margins with spines (*Acanthotermes*, *Pseudacanthotermes*) or without spines (*Odontotermes*, *Macrotermes*, *Hypotermes*, *Microtermes*). Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Cerci 2 jointed; styli either absent or single jointed.

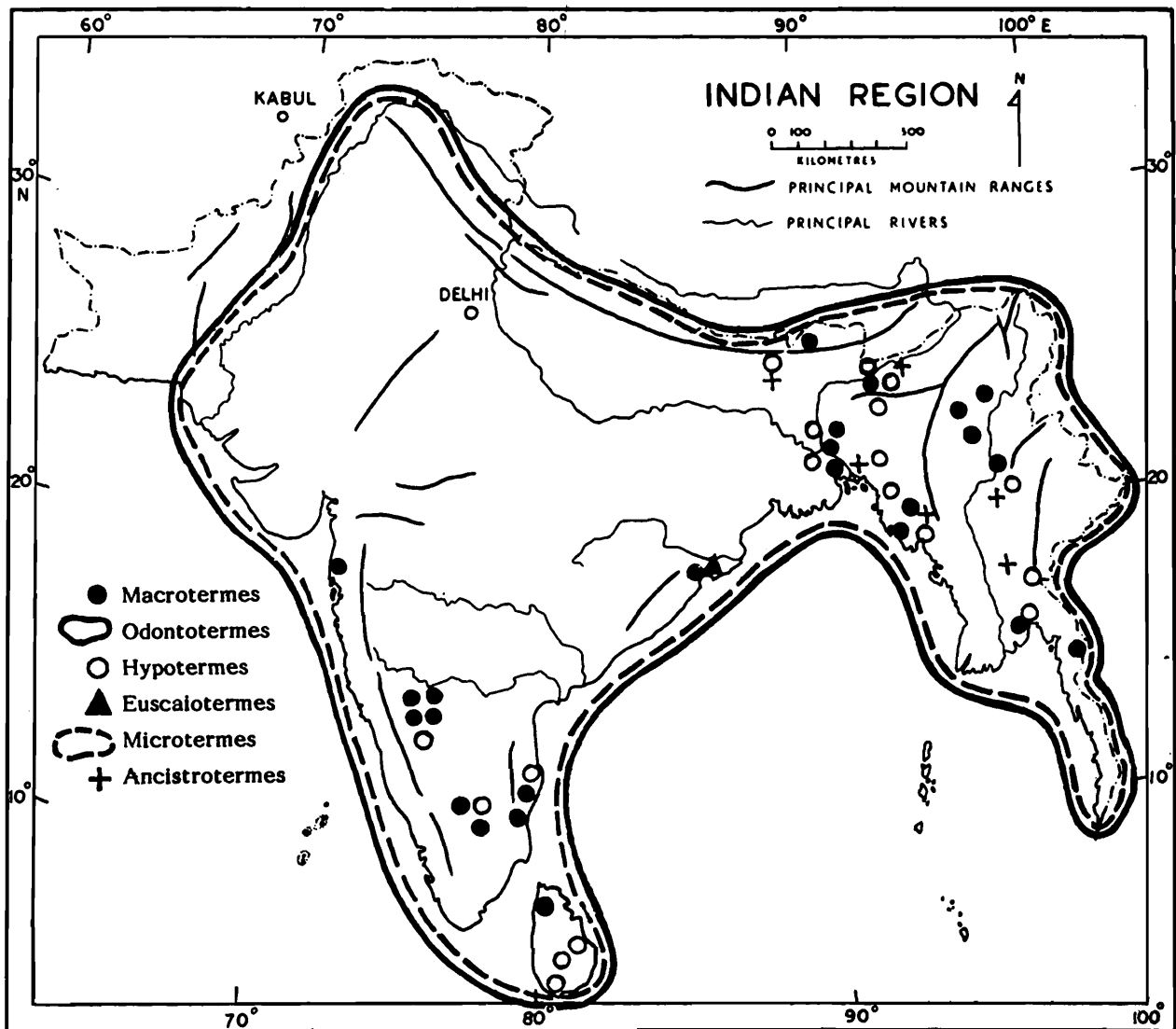


Fig. 190 : Map of Indian Region showing distribution of Macrotermitinae genera *Macrotermes*, *Odontotermes*, *Hypotermes*, *Euscaiotermes*, *Microtermes* and *Ancistrotermes*.

Worker : Monomorphic or dimorphic. Small to large, weakly to densely hairy. Head subcircular or subsquarish. Fontanelle plate hyaline, spot-like or triangular. Eyes generally absent, sometimes rudimentary and whitish. Ocelli absent, sometimes whitish spots present. Mandibles as in imago. Pronotum saddle-shaped; either without or with sharp anterior and lateral processes. Legs, cerci and styli as in soldier.

2. *Distribution and Composition of Macrotermitinae*

(Fig. 190)

Distribution : The subfamily Macrotermitinae is known to occur in the Ethiopian and Oriental zoogeographical regions. According to Emerson (1955), it originated in the Ethiopian Region during the Tertiary. The primitive endemic genera *Acanthotermes* and *Pseudacanthotermes* are endemic in the Ethiopian Region while the genera *Macrotermes*, *Odontotermes*, *Microtermes* and *Ancistrotermes* dispersed to the Oriental Region during Miocene. In the Oriental Region, the *Hypotermes* and *Euscaiotermes* evolved from *Odontotermes*.

Composition : The Macrotermitinae comprises 12 genera, viz. *Acanthotermes*, *Pseudacanthotermes*, *Synacanthotermes*, *Allodontermes*, *Protermes* and *Sphaerotermes*, occurring in the Ethiopian Region only; *Macrotermes*, *Odontotermes*, *Microtermes* and *Ancistrotermes* occurring in Ethiopian and Oriental regions; and *Hypotermes* and *Euscaiotermes* endemic to Oriental Region. In all, 62 species under 6 genera occur in the Indian subregion.

3. *Keys to Indian Genera of Macrotermitinae*

IMAGOES

The imago of *Euscaiotermes* is not known.

- 1(2) Right mandible with a small subsidiary tooth at base of 1st marginal tooth. Wing membrane fairly hairy, without cuticular rods. Very large species *Macrotermes*
- 2(1) Right mandible without any subsidiary tooth at base of 1st marginal tooth. Wing membrane without or with a few hairs, cuticular rods present. Medium to large species

- 3(7) Antennae with 19-20 segments. Postclypeus swollen, length less than to about 1/2 width and weakly convex posteriorly
- 5(6) Fontanelle raised..... *Odontotermes*
- 6(5) Fontanelle not raised *Hypotermes*
- 7(3) Antennae with 15-18 segments. Postclypeus swollen, about 1/2 or slightly more than 1/2 width and projecting more strongly into frons *Microtermes/Ancistrotermes*

SOLDIERS

- 1(2) Dimorphic. Labrum with a triangular, hyaline tip. Very large species *Macrotermes*
- 2(1) Monomorphic. Labrum without a hyaline tip. Small to fairly large species
- 3(6) Small and delicate species. Head moderately to densely hairy
- 4(5) Head oval, densely hairy. Mandibles thin, delicate, weakly incurved distally *Microtermes*
- 5(4) Head subsquarish, moderately hairy. Mandibles thin but strongly curved in distal half *Ancistrotermes*
- 6(3) Medium to fairly large species. Head sparsely hairy
- 7(8) Left mandible with a small to prominent tooth *Odontotermes*
- 8(7) Left mandible either with a cut at middle or with crenulations in basal half.
- 9(10) Medium size species. Left mandible with crenulations on inner margin in basal half..... *Hypotermes*
- 10(9) Large size species. Left mandible with a cut at middle of inner margin *Euscaiotermes*

Genus 42. *Macrotermes* Holmgren

1. Genus *Macrotermes* Holmgren :

1909. Holmgren, K. *Svenska Vetensk.-Akad. Handl.*, **44**(3) : 193.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 208. See for synonymy.

1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95**(2) : 55, 57.
1955. Emerson, *Fieldiana : Zool.*, **37** : 473, 486, 513.
1958. Ahmad, *Biologia*, Lahore, **4** : 84, 89.
1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 295.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 8.
1965. Bouillon and Mathot, *Zooleo*, No. 1 : 32.
1970. Ruelle, *Bull. Br. Mus. nat. Hist. (Ent.)*, **24**(9) : 368-370. Synonymy, description, distribution and discussion.
1971. Bouillon and Mathot, *Zooleo*, No. 1 (Suppl. 2) : 12.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 21.
1972. Coaton and Sheasby, *Cimbebasia*, Mem. No. 2 : 24, 83-87.
1973. Chhotani and Bose, *Zool. Anz.*, **190** (3/4) : 235.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 8, 39.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 59.
1977. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 3, 4.
1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 200.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 18, 25.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 100, 102.
1986. Chhotani, *Rec. zool. Surv. India*, **83**(3&4) : 24, 27.
1987. Chhotani, *Beitr. Ent.*, **37** : 411, 412, 417, 418.

1. Characters of Genus *Macrotermes*

Imago : Large, brown, moderately hairy. Head-capsule subcircular. Fontanelle faintly marked to prominent and raised. Eyes large, subcircular, projecting out. Ocelli large, oval; separated from eyes by less than half to more than their diameter. Postclypeus of same colour as head or paler, weakly to appreciably swollen. Antennae with 19 segments. Labrum with transverse, chitinoid band. Mandibles each with an apical and two marginal teeth; apical finger-like. Left mandible : 1st marginal with long posterior margin; 2nd small, separated from 1st by deep cut; molar process small. Right mandible : A minute subsidiary tooth present at base of 1st marginal; posterior margin of 1st marginal a little longer than anterior margin; 2nd marginal small with a long and straight posterior margin; molar plate a little longer than posterior margin of 2nd marginal. Pronotum subtrapezoidal. Wings large, translucent to smoky brown and

hairy; costa and radius thick; media weak, in forewing arising independently from scale and jointly with radius in hindwing; cubitus weak and with several branches to posterior margin. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Cerci 2-jointed; styli single jointed.

Soldier : Dimorphic. *Soldier major* : Large, yellowish brown to brown, sparsely hairy. Head-capsule subrectangular with sides weakly to appreciably converging in front. Fontanelle small, circular; situated near middle or slightly in front of middle. Eyes and ocelli small, rudimentary when present, or absent. Antennae with 17-18 segments. Labrum with a hyaline tip. Mandibles strong, short and sabre-like; left mandible with crenulations, right smooth without any crenulations. Postmentum long, subrectangular; with a long stalk (waist) posterior to max. width. Pronotum saddle-shaped; anteriorly and posteriorly notched medially; laterally rounded or sharply pointed. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4 jointed. Cerci 2-jointed; styli single jointed. *Soldier minor* : Similar to soldier major but paler in colour, with thinner and longer mandibles and proportionately longer antennae and legs.

Worker : Dimorphic. *Worker major* : Head-capsule subcircular. Fontanelle distinct, round, whitish. Eyes rudimentary, pale but distinct and slightly raised. Ocelli rudimentary or indistinct. Antennae with 17-20 segments. Postclypeus, labrum and mandibles as in imago. Pronotum and legs as in soldier. *Worker minor* : As in worker major but smaller in size.

2. *Distribution and Composition of Macrotermes*

(Fig. 190)

Distribution : The genus *Macrotermes* is known to occur in the Ethiopian and Oriental zoogeographical regions. It is mainly Ethiopian and originated there and got distributed to the Oriental Region. In the Oriental Region, it is reported from India, Bangladesh, Bhutan, Burma, Thailand, Vietnam, Kampuchea, Southern China, Malaysia, Singapore and Indonesia, in the semi-arid and rain forests.

Composition : Snyder (1949) recognised 49 species, subspecies and forms of this genus; 32 from the Ethiopian and 17 from the Oriental zoogeographical regions and Emerson (1955) 37 species (27 from Ethiopian, and 10 from Oriental, 3 undescribed ones). Since Snyder (1949) a number

of species were added but Ruelle (1970), in his latest study of Ethiopian *Macrotermes* recognises only 12 species, relegating the remaining into synonymy of others. According to Chhotani (1987) 21 species occur in the Oriental and 12 in the Ethiopian, regions and suggested "Whereas *Macrotermes* although is better represented in the Oriental than in the Ethiopian region but this probably is due to speciation in response to distribution and isolation in different parts of the region", in any case its origin was taken to be in the Ethiopian Region. It may also be proposed here that a thorough study of more extensive collections from the Oriental Region may tend to revise this opinion. The following 7 species are known to occur in the Indian Region :—

1. *Macrotermes aleemi* Akhtar—India, Bangladesh
2. *M. annandalei* (Silvestri)—Burma, Thailand, Southern China
3. *M. convulsionarius* (König)—India, Sri Lanka
4. *M. gilvus* (Hagen)—Burma, Thailand, Kampuchea, Vietnam, Malaysia, Singapore, Indonesia, Philippines
5. *M. hopini* Roonwal and Sen-Sarma—India, Burma
6. *M. khajuriae* Roonwal and Chhotani—India
7. *M. serrulatus* Snyder—Burma, India (Meghalaya), Bangladesh

3. Keys to Indian Species of *Macrotermes*

IMAGOES

- 1(2) Larger and darker (dark brown to blackish brown) species. Head-width 2.70-2.93, pronotum-width 2.60-2.88 mm. Ocellus farther from eye, separated from eye by 1/2 its short diameter*convulsionarius*
- 2(1) Smaller and paler (reddish brown) species. Head-width 2.23-2.75 mm. Ocellus closer to eye, separated from eye by less than 1/2 its short diameter
- 3(4) Ocellus much closer to eye, sometimes almost touching (eye-ocellus distance 0.02-0.15 mm) and eye farther from lower margin of head (0.15 mm)*gilvus*
- 4(3) Ocellus farther from eye (eye-ocellus distance 0.15-0.16 mm) and eye closer to lower margin of head (0.05 mm).....*serrulatus*

SOLDIERS MAJOR

- 1(2) Pronotum slightly narrower to almost as wide as head. Side margins of thoracical tergites round. Third segment of antennae as long as second or slightly longer.....*gilvus*
- 2(1) Pronotum much narrower than head. Side margins of thoracical tergites angular. Third segment of antennae much longer than second
- 3(6) Smaller species. Head-length to base of mandibles less than 4.0 mm and head-width less than 3.0 mm
- 4(5) Smaller in size. Head-length 2.75-3.10 and max. head-width 2.30-2.40 mm. Mandibles shorter but comparative to head-length longer (length 1.43-1.45 mm, index mandible-length/head-length 0.47-0.52).....*aleemi*
- 5(4) Larger in size. Head-length 3.5-3.9 and max. head-width 2.85-3.00 mm. Mandibles longer but comparative to head-length shorter (length 1.60-1.70 mm, index mandible-length/head-length 0.43-0.47).....*khajurjai*
- 6(3) Larger species. Head-length to base of mandibles more than 4.0 mm and head-width more than 3.0 mm
- 7(8) Head strongly converging in front and max. width situated somewhat medially (index width at base of mandibles/max. width 0.566-0.59). Head-length to base of mandibles 4.23-6.00, max. head-width 3.6-4.35, pronotum-width 2.6-2.9 mm.....*convulsionarius*
- 8(7) Head less so converging in front and max. width situated posteriorly (index width at base of mandibles/max. width 0.60-0.64). Head-length to base of mandibles 3.9-5.18, max. head-width 3.10-4.36, pronotum-width 2.30-2.86 mm
- 9(10) Mandibles longer in comparison to head, longer than 1/2 head-length (index mandible-length/head-length 0.60-0.617). Postmentum comparative to head shorter, nearly 2/3 head-length (index postmentum-length/head-length 0.643).....*annandalei*

- 10(9) Mandibles shorter in comparison to head, shorter than 1/2 head-length (index mandible-length/head-length 0.46-0.50). Postmentum comparative to head longer, nearly 3/4 head-length (index postmentum-length/head-length 0.74)
- 11(12) Meso-and metanota convex at postero-lateral margins.....
.....*serrulatus*
- 12(11) Meso-and metanota concave at postero-lateral margins.....
.....*hopini*

SOLDIERS MINOR

- 1(2) Pronotum a little narrower to almost as wide as head. Lateral margins of thoracical tergites rounded.....*gilvus*
- 2(1) Pronotum much narrower than head. Lateral margins of thoracical tergites angular
- 3(6) Smaller : Head-length less than 2.00, head-width less than 1.65 mm
- 4(5) Antennae with 16 segments.....*khajuriai*
- 5(4) Antennae with 17 segments.....*aleemi*
- 6(3) Larger : Head-length more than 2.0, head-width more than 1.8 mm
- 7(10) Mandibles longer (1.82-1.92 mm long)
- 8(9) Head strongly converging in front (Head-convergence index i.e. width at mandible-base/max. width 0.59).....*convulsionarius*
- 9(8) Head less so converging in front (head-convergence index 0.606-0.625)*annandalei*
- 10(7) Mandibles shorter (length 1.40-1.45 mm)
- 11(12) Smaller in size. Head-length to base of mandibles 2.20, max. head-width 1.80 mm. Antennae with segment 3 shorter than 2.....*serrulatus*
- 12(11) Larger in size. Head-length to base of mandibles 2.20-2.60, max. head-width 1.95-2.18 mm. Antennae with segment 3 little longer than 2.....*hopini*

218. *Macrotermes aleemi* Akhtar

(Figs. 191, 192)

1. *Macrotermes aleemi* Chaudhry, et al. (Nom. nud.) :1972. Chaudhry, et al., *Termites of Pakistan* (Final Tech. Rep. PL. 480 Proj. No. A17-FS-58) : 21 (nom. nud.).2. *Macrotermes aleemi* Akhtar :1975. Akhtar, *Bull. Dept. Zoology Univ. Panjab (N.S.)*, Art. 7 : 61-65. S maj. Holotype : S maj., in PU. Type-locality : Ukhia, Bangladesh.In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

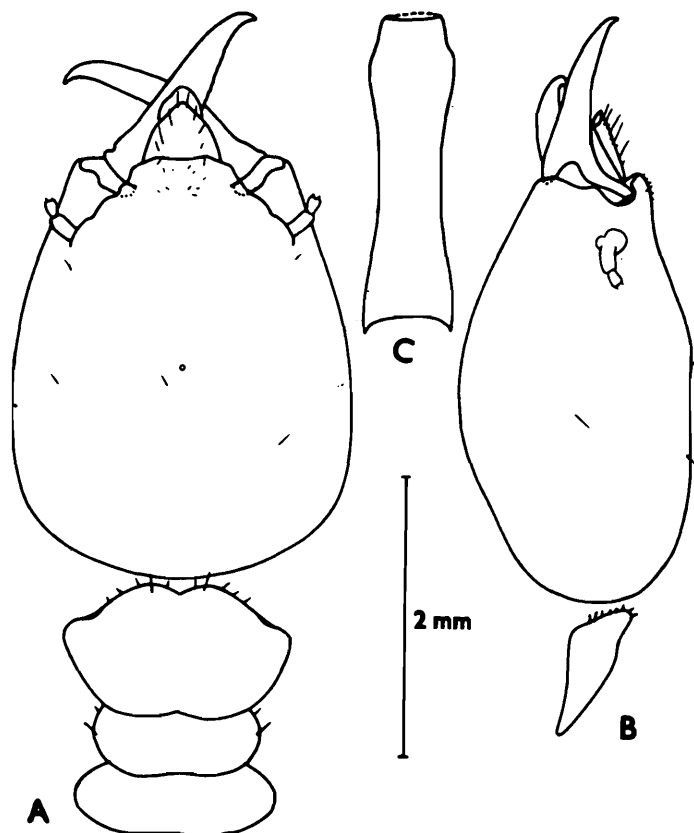
SOLDIER : Dimorphic. *Soldier major* (Fig. 191) : Head-capsule pale reddish brown; antennae yellowish brownish to pale brown; labrum pale

Fig. 191 : *Macrotermes aleemi*. Soldier major. (A) Head and thorax, in dorsal view. (B) Head and pronotum, side view. (C) Postmentum.

brown with a hyaline tip; mandibles dark reddish brown, paler basally; pronotum yellowish brown; mesonotum and metanotum paler than pronotum; legs and abdomen pale yellowish. Head with a few short hairs; thorax scantily hairy with a few hairs on margins and some on disc. Total body-length c 8.5-9.0 mm. Head-capsule broadly rectangular, narrowed in front (length to base of mandibles 2.75-3.10, max. width 2.30-2.40, width at base of mandibles 1.48-1.55 mm); max. width more than $\frac{3}{4}$ of length (index max. width/length to base of mandibles 0.77-0.83); sides strongly converging in front (index width at mandible-base/max. width 0.64). Fontanelle dot-like, circular; situated a little behind middle of head. Eyes small, whitish, rudimentary. Ocelli absent. Antennae incomplete in specimens available; segment 3 slightly longer than 2; 4 slightly shorter than 3. Labrum triangular; tip hyaline, broadly rounded. Mandibles short and stout, length about half of head-length (length 1.43-1.45 mm, index mandible-length/head-length 0.47-0.52). Left mandible with crenulations; right without crenulations. Postmentum subrectangular, sides slightly incurved (length 1.91-1.95, max. width 0.61-0.65, width at waist 0.43 mm). Pronotum weakly saddle-shaped (length 0.76-0.98, max. width 1.48-1.65 mm); anterior margin distinctly notched, posterior margin weakly emarginate; antero-lateral corners narrowly rounded; mesonotum narrower than pronotum and metanotum wider than mesonotum but narrower than pronotum, both faintly incurved at posterior margin and laterally angularly and broadly rounded (angularly rounded in Akhtar's description). *Soldier minor* (Fig. 192) : Head-capsule light reddish brown; labrum brownish with a hyaline tip; mandibles dark reddish brown, paler basally; pronotum yellowish brown. Head and body scantily hairy, but more so than soldier major. Total body-length 5.7-6.2 mm. Head-capsule oval, narrowed anteriorly (length to base of mandibles 1.84-2.05, max. width 1.43-1.65, width at base of mandibles 0.87-0.98 mm; index max. width/head-length 0.803-0.831 and index width at mandibles-base/max. width 0.50-0.59). Eyes rudimentary, whitish. Ocelli absent. Antennae with 17 segments; segment 2 about one-and-a-half times of 3. Labrum triangular, longer than wide; tip hyaline, narrowly rounded. Mandibles long, slender (length 1.21-1.25 mm); comparative to head-length longer than in soldier major (index mandible-length/head-length 0.608-0.610). Left mandible with a few crenulations basally. Postmentum subrectangular (length 1.17-1.22, max. width 0.46-0.51 mm); comparatively wider than in soldier major. Pronotum, mesonotum and metanotum as in soldier major but somewhat

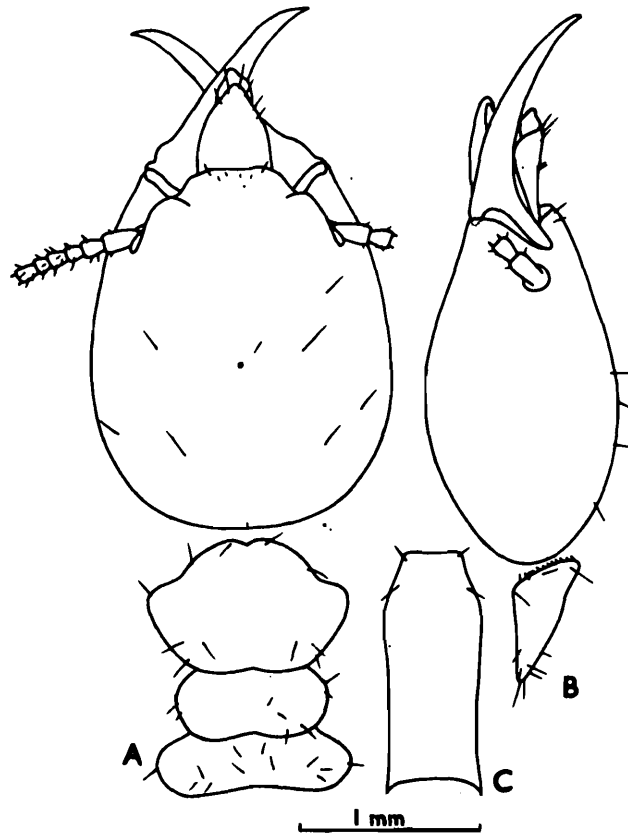


Fig. 192 : *Macrotermes aleemi*. Soldier minor. (A) Head and thorax, in dorsal view. (B) Head and pronotum, in side view. (C) Postmentum.

more rounded at lateral margins; pronotum-length 0.61-0.73, width 1.04-1.15 mm.

WORKER : Head-capsule yellowish brown; antennae creamish white to pale yellowish brown; postclypeus and labrum yellowish; thorax yellowish white; abdomen and legs whitish. Total body-length c 5.5-6.5 mm. Head-capsule subcircular, wider than long (length to base of mandibles 1.50-1.55, max. width 1.75-1.80 mm). Fontanelle round, hyaline spot (0.15 mm diameter). Eyes and ocelli indistinct. Antennae with 17 segments; segment 2 a little longer than 3; 4 slightly longer than 3 and 5 a little shorter than 3. Postclypeus swollen, short, length less than half of width (length 0.30-0.35, width 0.75-0.80 mm); divided by an incomplete dark line into two. Pronotum weakly saddle-shaped, faintly or indistinctly notched anteriorly and substraight posteriorly (length 0.55-0.60, width 0.93-1.0 mm). Mesonotum narrower than pronotum and metanotum wider than pronotum; laterally all three rounded.

Distribution : INDIA : Arunachal Pradesh. BANGLADESH.

219. *Macrotermes annandalei* (Silvestri)

(Figs. 193, 194)

1. *Termes annandalei* Silvestri :

1914. Silvestri, *Rec. Indian Mus.*, **8** : 427-428. S maj., S min., W maj. and W min. Lectotype (designated here) : S maj., in ZSI. Type-locality : Moulmein, Lower Burma.

2. *Macrotermes annandalei* (Silvestri) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 208.

1953. Rattan Lal and Menon, *Cat. Indian Insects. Pt. 27, Isoptera* : 64.

1955. Tu, *Formosan Sci.*, **9** : 3, 8.

1958. Ahmad, *Biologia, Lahore*, **4** : 95, 97.

1962. Weidner, *Anz. Schadl.*, **35**(9) : 129, 130, 131, 132.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 30, 31, 41-43.

1965. Krishna, *Am. Mus. Novit.*, No 2210 : 2.

1986. Gao and Lam, *Mem. Hongkong nat. Hist. Soc.*, **17** : 83.

IMAGO : Unknown.

SOLDIER : Dimorphic. *Soldier major* (Fig. 193, 194A, B) : Head-capsule reddish brown, darker anteriorly; mandibles dark, blackish brown; antennae brownish and labrum reddish brown, with hyaline tip; pronotum pale brown; mesonotum and metanotum a little paler than pronotum; abdomen brownish above, paler below. Head and body sparsely hairy; abdomen with 2-3 irregular rows of hairs. Total body-length c 12.0-13.0 mm. Head-capsule subrectangular, converging a little anteriorly (length to base of mandibles 4.0-5.18, max. width 3.10-4.36, width at base of mandibles 2.49-2.60 mm); length a little more than max. width (index max. width/length c 0.805-0.865); sides widest posteriorly and narrowest at base of mandibles (head-convergence index i.e. width at mandibles level/max. width c 0.60-0.64). Fontanelle minute, with a brownish tube leading anteriorly; situated a little in front of middle of head. Eyes not distinct (Lectotype) or dot-like. Antennae with 17 segments; segment 3 about 1/3 longer than 2; 4 slightly longer than 2 and 5. Labrum subtriangular, with a triangular hyaline tip/(length 1.20, width 0.90 mm).

Mandibles thick, stout and strong; a little incurved at tips and about half as long as head without mandibles (length 2.44-2.60 mm); left mandible with a few crenulations. Postmentum long, subrectangular; sides very slightly incurved at middle; waist elongate (length 2.65-3.27, max. width 0.98-1.09, width at waist 0.67-0.83 mm). Pronotum saddle-shaped; emarginate both anteriorly and posteriorly (length 1.35-1.40, width 2.30-2.86 mm); laterally narrowly rounded. Mesonotum a little narrower than pronotum, emarginate posteriorly; metanotum slightly wider than

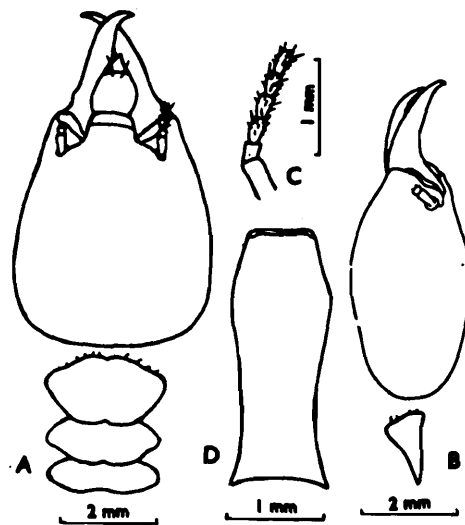


Fig. 193 : *Macrotermes annandalei*. Soldier major (Lectotype). (A) Head and thorax, in dorsal view. (B) Head and pronotum, in side view. (C) Basal segments of antenna. (D) Postmentum.

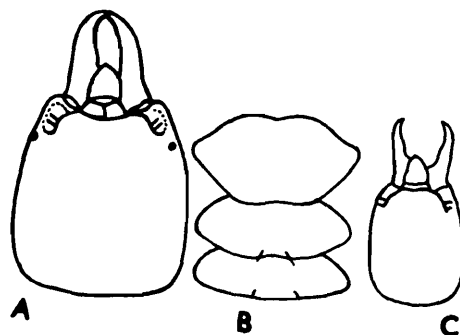


Fig. 194 : *Macrotermes annandalei*. Soldier major. (A) Head, in dorsal view. (B) Thorax in dorsal view. Soldier minor. (C) Head, in dorsal view. (After Silvestri, 1914).

mesonotum to almost as wide as pronotum, substraight posteriorly; both somewhat angular laterally. *Soldier minor* (Fig. 194c) : Head-capsule reddish brown; antennae and labrum pale brown; mandibles dark reddish brown; pronotum brown and rest of body paler than pronotum. Head and body sparsely hairy. Total body-length c 7.5-8.0 mm. Head-capsule subrectangular (length 2.25-3.12, max. width 1.9-2.60 mm, index max. width/length 0.78-0.80, head-convergence index 0.606-0.624). Fontanelle minute, round; situated a little in front of middle. Antennae with 17 segments, segment 3 a little longer than 2 and very slightly longer than 4; 5 slightly shorter than 4. Mandibles long, thin and slightly incurved apically (length 1.80-1.92 mm); a little longer than half of head-length (index mandible-length/head-length c 0.61); both mandibles without any crenulations. Postmentum subrectangular (length 1.95-2.02, max. width 0.75-0.78, width at waist 0.55-0.72 mm). Pronotum saddle-shaped; faintly notched anteriorly and distinctly notched posteriorly; laterally more angular than in soldier major and longer comparative to width (length 0.95-1.06, width 1.45-1.87 mm). Mesonotum and metanotum as in soldier major but more angular at lateral margins.

WORKER : Dimorphic. *Worker major* : Head yellowish brown, whitish medially; clypeus yellowish brown; rest of body yellowish brown above and paler below. Total body-length c 7.0 mm. Head subcircular (length to base of mandibles 1.75, max. width 2.10-2.30 mm). Fontanelle subcircular/oval, translucent. (0.20 mm). Postclypeus swollen (length 0.35, width 0.93 mm). Antennae with 17 segments; segment 3 slightly shorter than 2 and a little longer than 4, the latter somewhat longer than 5. Pronotum saddle-shaped, anterior margin notched medially; length 0.50-0.55, width 1.05-1.10 mm. Abdominal tergites with 2-3 rows of hairs. *Worker minor* : Like worker major. Head paler and antennal segment 3 shorter than 2 and slightly shorter than 4. Total body-length 4.6, head-length 1.20, head-width 1.5, pronotum-width 1.0 mm.

Lectotype : In the ZSI, there is a tube containing syntypes as follows :—One S maj., two S min., One W maj., One W min., and thorax and abdomen of one S major. The S maj. is designated as the Lectotype and the remaining specimens as paralectotypes. The Lectotype measures as follows :—Total body-length c 9.0, head-length to base of mandibles 4.05, max. width of head 2.60, length of mandibles 2.50, length of

postmentum 3.0, max. width of postmentum 1.0, width of postmentum at waist 0.68, length of pronotum 1.40, width of pronotum 2.50, width of mesonotum 2.30 and width of metanotum 2.40 mm; No. of antennal segments 17.

Distribution : BURMA (Lower and upper Burma), THAILAND and SOUTHERN CHINA (Yunnan).

220. *Macrotermes convulsionarius* (König)

(Synonym : *Termes estherae* Desneux)

(Figs. 195-197)

1. *Termes convulsionarii/convulsionarius* König :

1779. König, *Beschaft. Berlin Ges. Naturf. Freunde*, 4 : 24.

1917. Fletcher, in : Holmgren and Holmgren, 1917. *Mem. Dept. agric. Sci.*, 5 : 146.

1921. Fletcher, *Rep. Proc. 4th ent. Mtg.*, 1921 : 330-331.

2. *Hodotermes convulsionarius* (König) :

1858. Hagen, *Linn. Ent.*, 12 : 90-91.

3. *Macrotermes convulsionarius* (König) :

1925. John, *Treubia*, 6(3&4) : 385.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 160-162.

1987. Bose and Das, *Fauna of Orissa, Pt. 1. State Fauna Sr. 1* : 105, 109.

4. *Termes estherae* Desneux :

1908. Desneux, *Ann. Soc. Ent. Belg.*, 51(12) : 390.

1917. Holmgren and Holmgren, *Mem. Dept. agric Sci.*, 5 : 145-146. Treats *convulsionarius* as a synonym of *estherae*.

5. *Macrotermes estherae* (Desneux) :

1949. Snyder, *Smiths. misc. Colls.*, 112 : 211. Synonymy.

1958. Ahmad, *Biologia*, Lahore, 4 : 93, 95, 97.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 357.

1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 13, 39, 54, 65.

1978. Roonwal, *Z. ang. Ent.*, **85** : 19.

1980. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **46**(2) : 152-153.

1980. Chhotani, *Tech. Mongr. zool. Surv. India*, No. 4 : 4, 41, 43, 84, 85.

1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 200, 205, 211.

IMAGO (Fig. 195) : Head dark to blackish brown; antennae, labrum, legs rust yellow; postclypeus paler than head; wings hyaline, very pale yellowish. Abdomen dark brown above and brown below and paler medially. Head and body sparsely hairy; wings fairly densely hairy. Total body-length with wings 32.0-33.0, without wings 11.4-17.0 mm. Head subcircular, flat (length to base of mandibles 1.8-2.10, width with eyes 2.70-2.93 mm). Fontanelle small, very slightly raised. Eyes of medium size (max. diameter 0.83 mm); projecting out. Ocelli oval, large (long diameter 0.35, short diameter 0.20 mm); from eyes situated at about their short diameter (0.18 mm). Antennae with 19 segments; segment 3 longer than 2. Postclypeus swollen; length half of width. Pronotum almost as wide as head or slightly narrower (length 1.30-1.62, width 2.60-2.88 mm); anterior and posterior margins distinctly notched. Wings long,

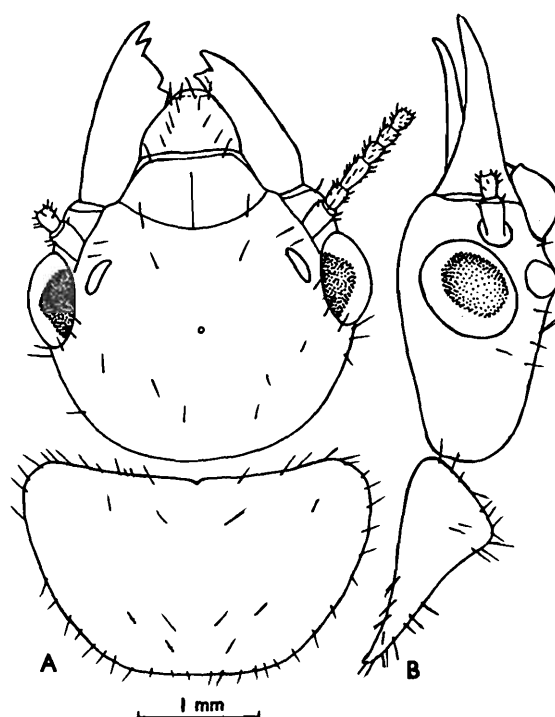


Fig. 195 : *Macrotermes convulsionarius*. Imago. (A) Head and pronotum, in dorsal view. (B) Same, in side view.

hyaline, fairly thickly hairy; microsculpture consists of 20-25 rows of papillae in between costa and radius and 6-7 rows on posterior margin (Roonwal et al. 1980); cuticular rods on membrane absent; forewing-length 27.0-28.0 mm.

SOLDIER : Dimorphic. *Soldier major* (Fig. 196) : Head-capsule pale reddish brown to brownish red; mandibles black; thorax rusty yellow; abdomen pale brown to brown; legs rusty yellow. Head and body very sparsely hairy. Total body-length 11.0-14.0 mm. Head-capsule large, broadly oval; widest near middle and strongly narrowed in front (length to base of mandibles 4.10-4.85, max. width 3.60-4.15 mm, index width/length 0.855-0.90, index width at mandible-base/max. width c 0.566-0.590). Fontanelle small, circular; situated at middle of head. Eyes pale spots, slightly raised. Ocelli indistinct. Antennae with 17 segments; segment 3 much longer than 2; 4 a little longer than 2. Labrum oval, tongue-shaped; with a triangular, hyaline tip. Mandibles short, stout; as long as 1/2 head-length (length 2.20-2.40 mm, index mandible-length/head-length 0.49-0.53). Postmentum subrectangular, shape as in figure; a little wider posteriorly (length 2.90-3.10, max. width 1.10-1.25 mm). Pronotum saddle-shaped (length 1.26-1.60, width 2.60-2.93 mm); anteriorly weakly and posteriorly distinctly notched. *Soldier minor* (Fig. 197) : Colour and hairiness as in soldier major. Total body-length 7.20-9.0 mm. Head oval (length to base of mandibles 2.20-2.96, max. width 1.88-2.51 mm); sides strongly converging anteriorly (index width at base of mandibles/max. width 0.584-0.625). Antennae with 17-segments; segment 3 a little longer than 2; 4 equal to 2; 5 shorter than 4. Labrum triangularly tongue-shaped; with a triangular, hyaline tip. Mandibles thin, long, weakly incurved apically (length 1.50-1.60 mm, index mandible-length/head-length 0.65-0.80). Pronotum saddle-shaped (length 0.88-1.05, max. width 1.48-1.86); anteriorly not notched, posteriorly clearly emarginate.

WORKER : Dimorphic. *Worker major* : Head pale brown, yellowish anteriorly; thorax yellowish brown; abdomen with pale yellowish brown tergites and paler sternites. Head and body sparsely hairy. Total body-length c 7.0 mm. Head round (length to tip of labrum 2.5-2.7, length to base of mandibles 1.80-1.90, max. width 2.15-2.20 mm). Fontanelle round, large. Eyes whitish spots, raised a little. Antennae with 18-19 segments; segment 3 longer than 2, the latter longer than 4 (18-segmented) and 3

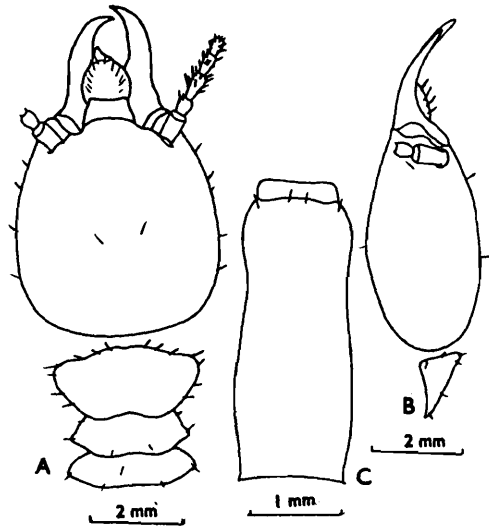


Fig. 196 : *Macrotermes convulsionarius*. Soldier major. (A) Head and thorax, in dorsal view. (B) Head and pronotum, side view. (C) Postmentum.

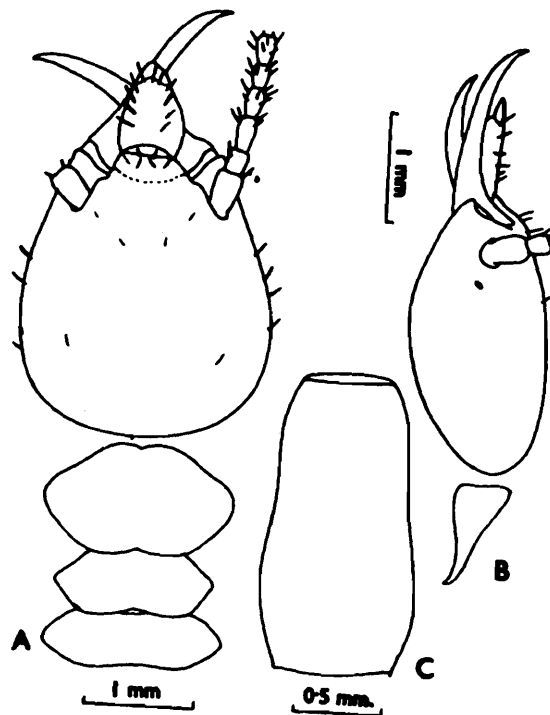


Fig. 197 : *Macrotermes convulsionarius*. Soldier minor. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (C) Postmentum.

shorter than 2 and latter as long as 4 (19-segmented). Postclypeus shorter than half of width. Pronotum not notched anteriorly and distinctly emarginate posteriorly (length 0.38-0.40, width 0.95-1.00 mm). *Worker minor* : Paler and smaller than worker major and with 17-segmented antennae; segment 3 shorter than 2, subequal to 4. Total body-length 5.5, max. width of head 1.41, max. pronotum-width 0.87 mm.

Distribution : INDIA : Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Maharashtra, Orissa and West Bengal states. SRI LANKA.

221. *Macrotermes gilvus* (Hagen)

(Synonyms : *Termes dives* Hagen, *Termes azarelli* Wasmann, *Termes malayanus* Haviland, *Termes (Macrotermes) philippinensis* Oshima, *Termes (Macrotermes) luzonensis* Oshima, *Termes (Macrotermes) manilaensis* Oshima, *Termes (Macrotermes) copelandi* Oshima, *M. gilvus* var. *borneensis* Kemner, *M. gilvus* f. *angusticeps* Kemner, *M. gilvus* f. *kalshoveni* Kemner, *M. gilvus* *madurensis* Kemner and *M. gilvus* f. *padangensis* Kemner-All vide Snyder 1949, and Krishna 1965b).

(Figs. 198-202)

1. *Termes gilvus* Hagen :

1858. Hagen, *Linn. Ent.*, **12** : 148-151, Pl. 3 (Fig. 14). Im, Q, S maj., S min. Syntypes : In Coll. Selys Longchamps, Brussels, Mus. Vienna, Mus. Berlin. Type-locality : Java, Indonesia.

2. *Macrotermes gilvus* (Hagen) :

1958. Ahmad, *Biologia*, Lahore, **4** : 93, 94-95, 96.

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 20-21. See for detailed synonymy.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 30, 31-33.

1968. Harris, *Opusc. Ent.*, **33** : 149.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 357-358, 359.

1973. Morimoto, *Bull. Govt. For. exp. Sta.*, No. 257 : 67, 78.

1980. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **46** (2) : 152, 153. (*M. g. borneensis* and *gilvus gilvus*)

1982. Thapa, Sabah For. Rec., No. 12 : 232, 237-245.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 19, 25, 91-92.

See Snyder (1949), Krishna (1965b) and Thapa (1982) for synonymy and all the synonyms.

IMAGO (Fig. 198) : Head-capsule dark reddish brown; antennae brownish; postclypeus and labrum yellowish brown; pronotum brown with a little paler T-mark and shoulder spots; abdomen and legs brownish; wings pale yellowish brown. Head and body sparsely hairy; wings densely hairy. Total body-length with wings 23.0-30.0, without wings 12.0-14.0 mm. Head-capsule subcircular (length to base of mandibles 1.72-2.39, max. width with eyes 2.45-2.80 mm). Fontanelle small, slightly raised and situated at middle of head-dorsum. Eyes large, strongly projecting out (max. diameter 0.79-0.93, min. diameter 0.64-0.80 mm). Ocelli broadly oval, large (long diameter 0.32-0.45, short diameter 0.25-0.36 mm); situated very close to eyes (eye-ocellus distance 0.02-0.10 mm). Antennae with 19 segments; segment 3 subequal to 2; 4 shorter. Postclypeus swollen, with one or two pairs of hairs; length a little less than 1/2 width. Pronotum subsemicircular; as wide as head with eyes (length 1.33-1.58, max. width 2.23-2.75; anterior margin straight or faintly incurved and indistinctly

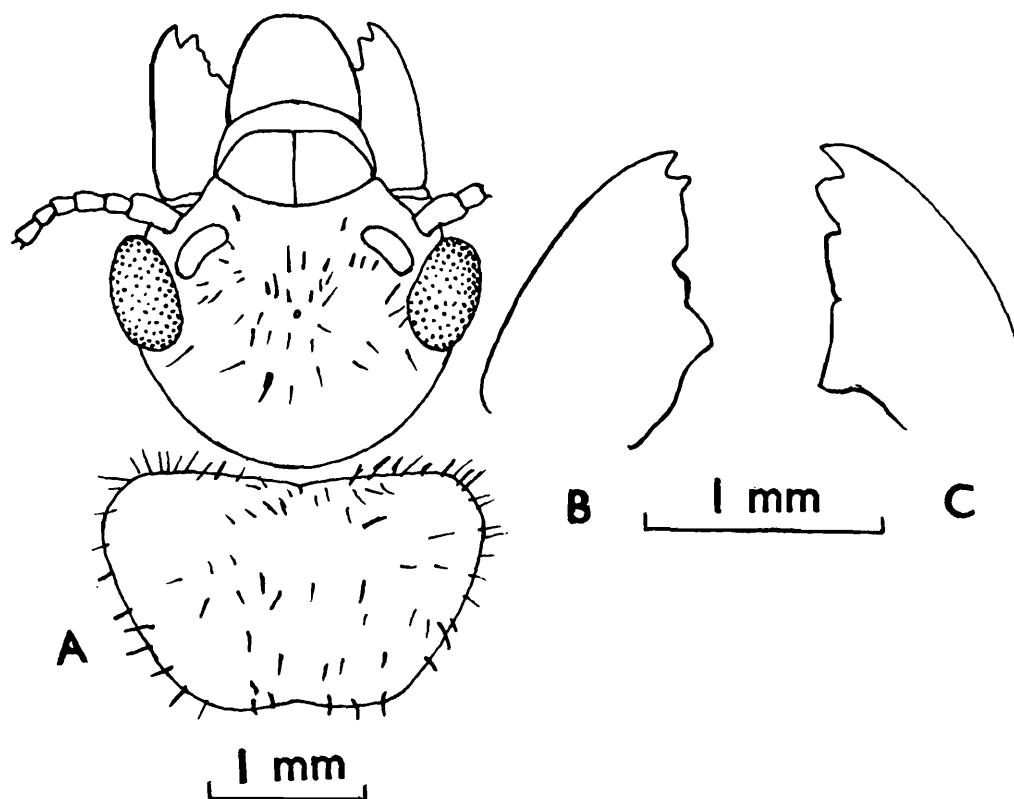


Fig. 198 : *Macrotermes gilvus*. (A) Imago. Head and pronotum, dorsal view. (B) and (C) Worker. Left and right mandibles.

emarginate; posterior margin weakly emarginate. Wings long, hairy; pale brown, forewing-length 20.0-25.0 mm; microsculpture consists of papillae on front vein (7-8 rows) and on posterior margin (2-3 rows) and pimpules on veins in proximal part.

SOLDIER : *Soldier major* (Figs. 199, 200) : Head-capsule golden brown to reddish brown; antennae brownish; mandibles dark reddish brown to black; thorax yellowish brown; abdomen a little paler than thorax. Head and thorax very sparsely hairy; labrum with long hairs on sides and a pair or two just below hyaline tip; pronotum with a few small hairs on anterior margin only; mesonotum and metanotum without hairs; abdomen with a few hairs. Total body-length 8.0-9.20 mm. Head-capsule subrectangular, sides converging in front (length to base of mandibles 3.24-4.0, max. width 2.36-3.42 mm, index max. width/length 0.76-0.88, head-convergence index i.e. width at base of mandibles/max. width 0.60-0.63). Fontanelle small, minute, circular; situated a little in front of middle of head. Eyes and ocelli absent (eyes minute and circular vide Ahmad, 1965). Antennae with 17-18 segments; segment 3 about 1.5 times of 2; 4 shorter than 3; 5 shorter than 4. Labrum triangular; with triangular, hyaline tip. Mandibles short, stout and strong (length 1.42-2.02 mm); less than 1/2 of head-length in length (mandible-length/head-length 0.45-0.49). Left mandible with crenulations in basal half; right without crenulations. Postmentum long, subrectangular with a long stalk or waist (length 2.04-2.86, max. width 0.62-0.95, width at waist 0.43-0.64 mm). Pronotum weakly saddle-shaped; distinctly notched both anteriorly and posteriorly; lateral margins rounded (length 1.05-1.35, width 1.93-2.60 mm). Mesonotum and metanotum as wide as pronotum or slightly narrower; both weakly incurved at posterior margin and rounded laterally. *Soldier minor* (Figs. 201, 202) : Head-capsule pale yellowish brown; labrum and antennae pale brown; mandibles dark reddish brown; body paler than head. Head very sparsely hairy, with a pair of hairs posteriorly and a pair or two just behind anteclypeus; pronotum with a few short hairs on anterior margin; mesonotum and metanotum without hairs. Total body-length 5.0-7.0 mm. Head-capsule subrectangularly oval (length to base of mandibles 1.82-2.43, max. width 1.43-2.0 mm, index max. width/length 0.76-0.83); sides converging in front (index width at mandible-base/max. width 0.59-0.62). Fontanelle minute, circular; situated medially on head.

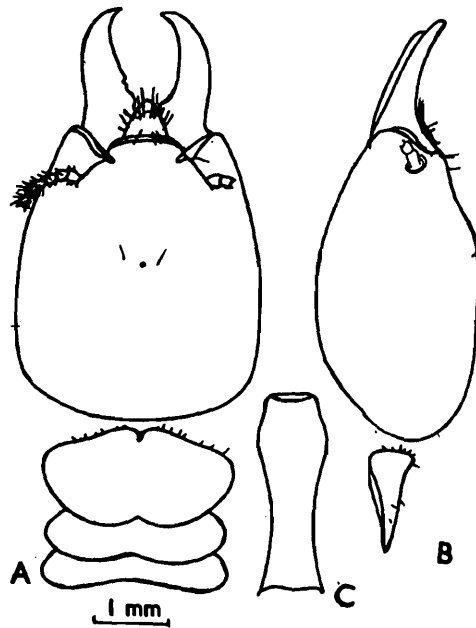


Fig. 199 : *Macrotermes gilvus*. Soldier major. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (C) Postmentum.

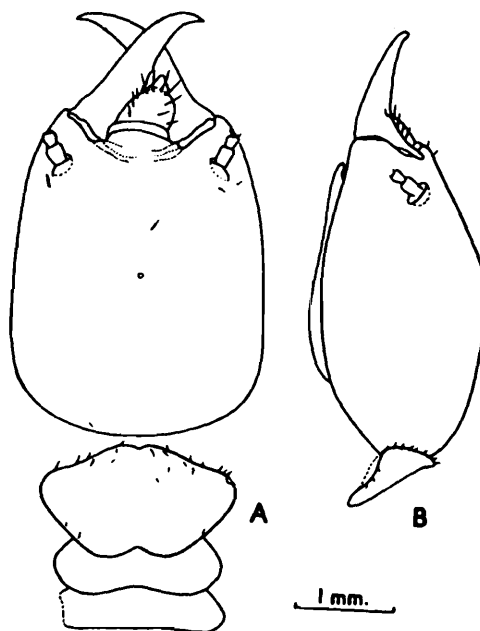


Fig. 200 : *Macrotermes gilvus*. Soldier major (Syntype of *Termes (Termes) azarelli*) (A) Head and thorax, dorsal view. (B) Head and pronotum, side view.

Antennae with 17 segments; segment 3 a little longer than 2 : 4 shorter than 3. Labrum triangular; with a hyaline, triangular, dome-shaped tip. Mandibles thin, long, slender and straighter (length 1.14-1.50 mm); slightly longer than half of head-length (index mandible-length/head-length 0.52-0.55); left mandible with a few crenulations in basal half, right without crenulations. Postmentum subrectangular (length 1.14-1.61, max. width 0.46-0.60, min. width 0.41-0.57 mm). Pronotum weakly saddle-shaped (length 0.60-0.88, width 0.95-1.13 mm); emarginate both at anterior and posterior margins; lateral margins rounded. Mesonotum narrower than pronotum and metanotum wider than mesonotum but narrower than pronotum; both rounded laterally.

WORKER : *Worker major* : Head-capsule yellowish brown; with a hyaline, circular, mid-dorsal fontanelle plate; body whitish to yellowish. Sparsely hairy. Head-capsule rounded (length to base of mandibles 1.11-1.73, max. width 1.79-2.03 mm). Eyes hyaline, rounded. Ocelli absent. Antennae with 17-18 segments; segment 3 clearly longer than 2; 4 very short. Postclypeus paler than head, swollen; shorter than 1/2 width (length 0.30-0.33, width 0.83-0.88 mm). Pronotum strongly saddle-shaped; emarginate both anteriorly and posteriorly (length 0.60-0.70, width 0.95-1.13 mm). *Worker minor* : As in worker major but smaller in size and with 17- (18 vide Holmgren 1913) segmented antennae. Total body-length 4.5-5.5, head-length to base of mandibles 1.07-1.10, max. width of head 1.35-1.43 and pronotum-width 0.80-0.93 mm.

Distribution : BURMA. Also widely distributed further east and is known from THAILAND, KAMPUCHEA, VIETNAM, MALAYSIA, SINGAPORE and INDONESIA (Java, Sumatra Borneo).

Biology : It is a common mound-building *Macrotermes* species. It builds dome-shaped, multi-locular type mounds. Roonwal and Chhotani (1961) have described the mound, fungus-combs, royal-chamber, etc. in detail and also various castes briefly from Burma. It is a pest of quite a serious nature and is reported damaging several plants and trees including sugar-cane, rubber and coconut. It is also found to damage papers, clothings, and woodwork in houses.

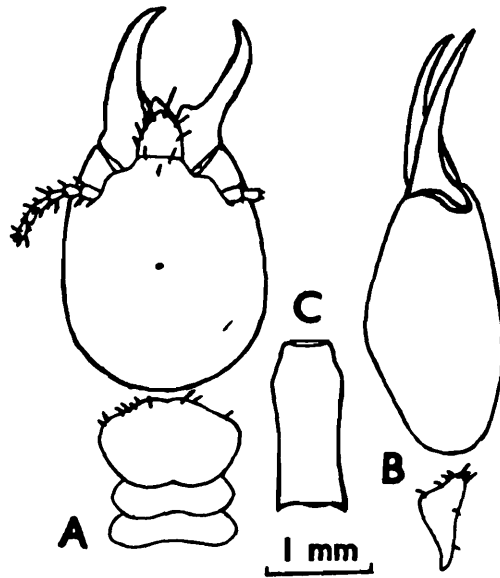


Fig. 201 : *Macrotermes gilvus*. Soldier minor. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view.(C) Postmentum.

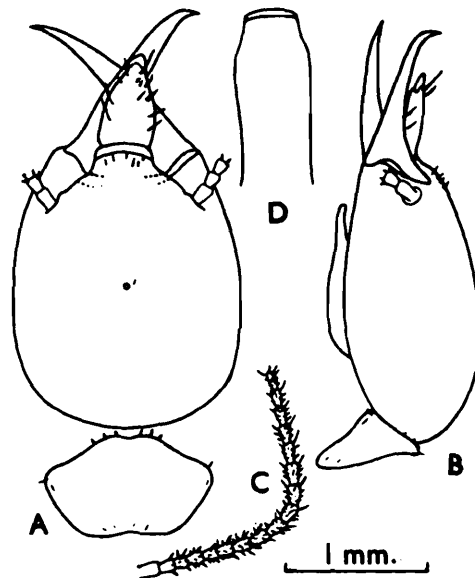


Fig. 202 : *Macrotermes gilvus*. Soldier minor (Syntypes of *Termes (Termes) azarelli*). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Antenna. (D) Postmentum.

222. *Macrotermes hopini* Roonwal and Sen-Sarma

(Figs. 203-205)

1. *Macrotermes serrulatus hopini* Roonwal and Sen-Sarma :

1956. Roonwal and Sen-Sarma, *Indian J. agric. Sci.*, **26** (1) : 15-21. S maj. only. Holotype : S maj., in ZSI. Type-locality : Hopin, Mytkyina Dist., Burma.

1962. Roonwal, In : *Termites Humid Tropics (UNESCO)* : 42.

1962. Weidner, *Anz. Schadl.*, **35**(9) : 129, 130, 131, 132, 133.

1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 23-24, 49 (tab. 22).

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER : Dimorphic. *Soldier major* (Figs. 203, 204) : Head-capsule reddish brown to brown; antennae pale brown; labrum reddish brown, with a hyaline tip; mandibles blackish; body pale brown to pale reddish brown. Head and thorax with very few hairs; abdomen and legs moderately hairy. Total body-length 10.80-12.70 mm. Head-capsule subrectangular (length to base of mandibles 4.30-4.86, max. width 3.53-3.98 mm); widest

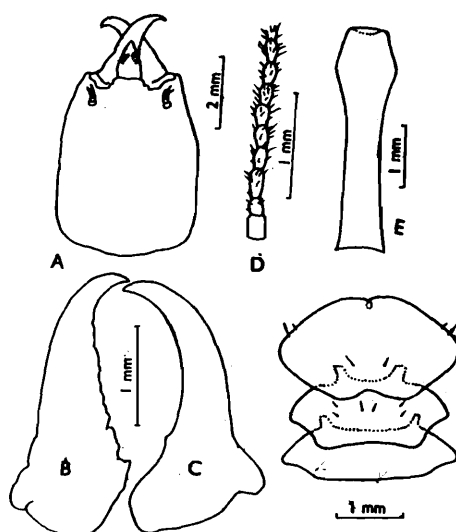


Fig. 203 : *Macrotermes hopini*. Soldier major. (A) Head, dorsal view. (B) and (C) Left and right mandibles. (D) antenna, basal part. (E) Postmentum. (F) Thorax. (Ex Roonwal and Sen-Sarma, 1956).

posteriorly and gradually narrowing anteriorly (index max. width/length 0.781-0.82, index width at mandible-base/max. width 0.626). Fontanelle minute, circular, situated a little in front of middle of head; leading to a small, anteriorly directed dark brown tube. Antennae with 17 segments; segment 3 much longer than 2 and others. Labrum subtriangular; with a triangular, hyaline tip (length 0.81-0.99, width 0.81-0.90 mm). Mandibles strong, stout, sabre-shaped; more incurved at tip than in *serrulatus* (length 2.16-2.34 mm); a little shorter than 1/2 head-length (index mandible-length/head-length 0.46-0.49). Postmentum long and subrectangular (length 3.06-3.42, max. width 0.90-0.99, min. width 0.63-0.72 mm). Pronotum saddle-shaped (length 1.20-1.45, max. width 2.30-2.70 mm); anterior margin weakly and posterior margin strongly emarginate. Mesonotum fairly narrower than pronotum; postero-lateral margins weakly to fairly incurved; posterior margin weakly incurved. Metanotum slightly narrower than pronotum; postero-lateral margins faintly incurved; posterior margin substraight. *Soldier minor* (Fig. 205) : Head-capsule reddish brown; antennae pale brown; thorax and abdomen paler than head. Head and thorax sparsely and abdomen somewhat moderately hairy.

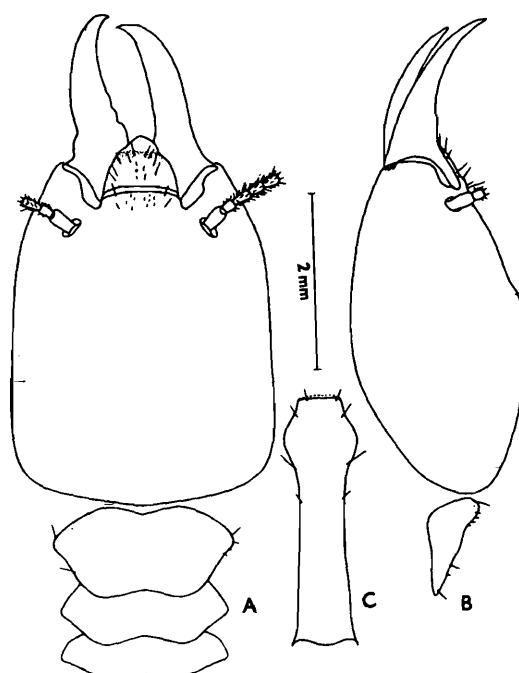


Fig. 204 : *Macrotermes hopini*. Soldier major. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (C) Postmentum. Specimen from Tripura, India showing variation.

Total body-length 6.8-8.0 mm. Head-capsule subrectangular; sides strongly converging anteriorly (length to base of mandibles 2.20-2.60, max. width 1.95-2.18, width at base of mandibles 1.10 mm; index max. width/length 0.810-0.817, index width at base of mandibles/max. width 0.60). Fontanelle minute, circular, situated at middle of head. Antennae with 17 segments; segment 3 a little longer than 2; 4 slightly shorter than 3. Labrum triangularly tongue-shaped; with a triangular, hyaline tip. Mandibles thin and long (length 1.45 mm); longer than half of head-length (index mandible-length/head-length 0.60). Postmentum subrectangular (length 1.6, max. width 0.55, min. width 0.45 mm). Pronotum saddle-shaped; weakly emarginate anteriorly and distinctly so posteriorly (length 0.80-1.08, width 1.35-1.60 mm).

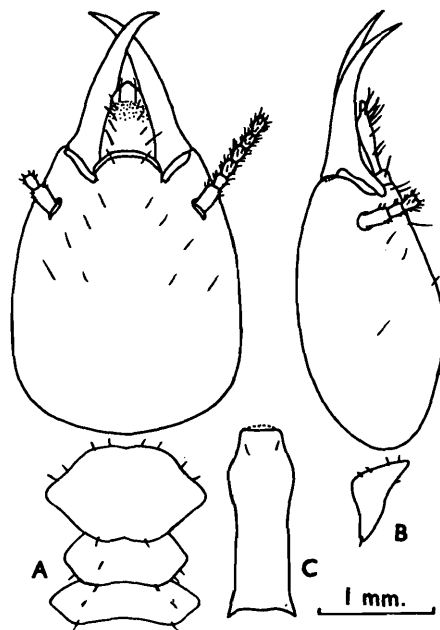


Fig. 205 : *Macrotermes hopini*. Soldier minor. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (C) Postmentum.

WORKER : Dimorphic. *Worker major* : Head reddish brown; antennae pale brown; postclypeus yellowish brown; body brownish above, paler than head; legs and abdomen below creamish. Head scantily and body somewhat more hairy. Total body-length 5.0-6.0 mm. Head-capsule subcircular, widest near antennae (length to base of mandibles 1.60-1.75, max. width 1.90-1.95 mm). Fontanelle plate small, somewhat horizontally oval, translucent, 0.13 mm long. Antennae with 17 segments;

segment 3 slightly shorter than 2; 4 longer than either 2 or 3; 5 shortest. Postclypeus swollen with one or two pairs of hairs anteriorly and one or two medially; length less than 1/2 width (length 0.35, width 0.90-0.95 mm). Pronotum saddle-shaped; anterior lobe semicircular, weakly notched anteriorly; posterior margin fairly emarginate; lateral margins angulated (length 0.60, width 1.0-1.05 mm). Mesonotum narrower than pronotum; laterally faintly angular; posteriorly weakly emarginate. Metanotum slightly wider than pronotum; posterior margin not emarginate, lateral margins faintly angular. *Worker minor* : Smaller and paler than worker major. Total body-length 4.0-5.8, head-length to base of mandibles 1.0, max. width of head 1.30, length of postclypeus 0.25, width of postclypeus 0.65, pronotum-length 0.55, pronotum-width 0.80 mm. No. of antennal segments 17, with segments 3 and 5 subequal and shorter than others.

Distribution : INDIA : Tripura and Manipur states. BURMA.

223. *Macrotermes khajuriai* Roonwal and Chhotani

(Figs. 206-208)

Macrotermes khajuriai Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 329-334, 395, Pls. 24-27. Holotype : S major, in ZSI. Type-locality. Umsa Nong-kharai, Khasi and Jaintia Hills, Meghalaya, India.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 39.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, Art. 7 : 65.
1977. Lahiri, et al., *Bull. Meghalaya Sci. Soc.*, **2** : 37.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 67, 68.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 34.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 25.
1985. Chhotani and Bose, *Rec. zool. Surv. India*, **82**(1-4) : 58.
- In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER : Dimorphic. *Soldier major* (Figs. 206, 207) : Head-capsule brownish yellow with two brownish longitudinal streaks, area around fontanelle paler, frons and postclypeus somewhat darker; labrum brownish with hyaline tip; mandibles black, brownish basally; antennae brown,

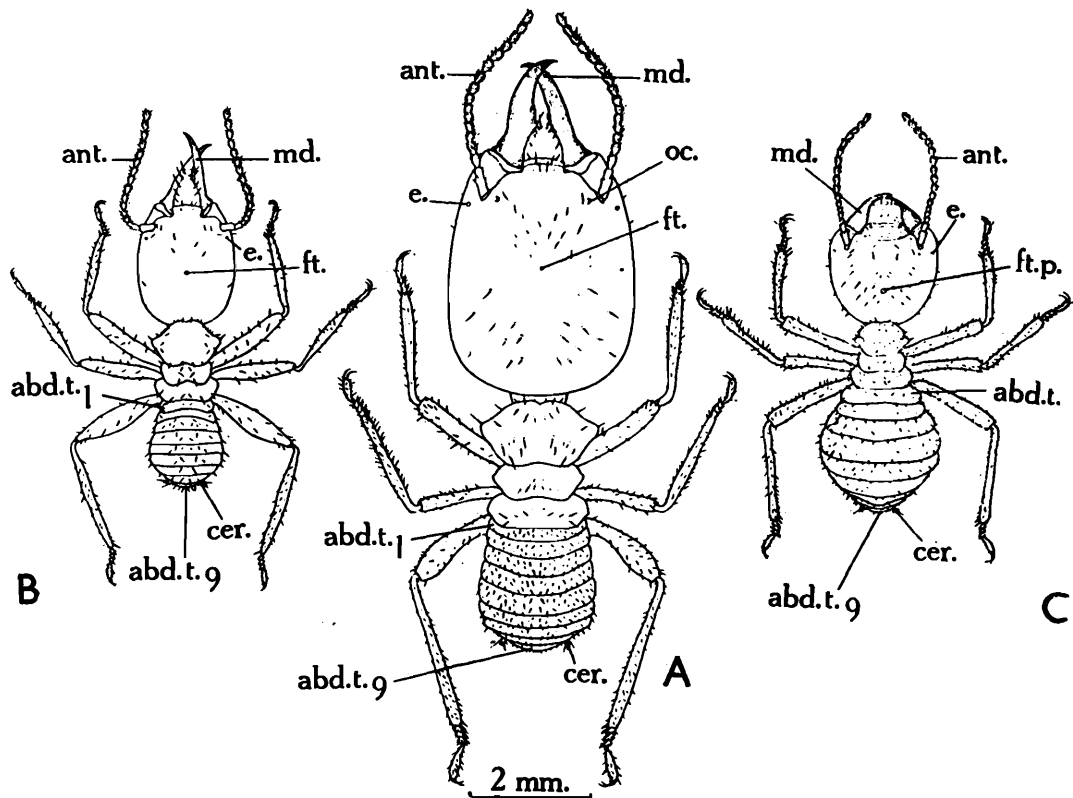


Fig. 206 : *Macrotermes khajuriae*. Full body of: (A) Soldier major. (B) Soldier minor and (C) Worker. (After Roonwal and Chhotani 1962c)

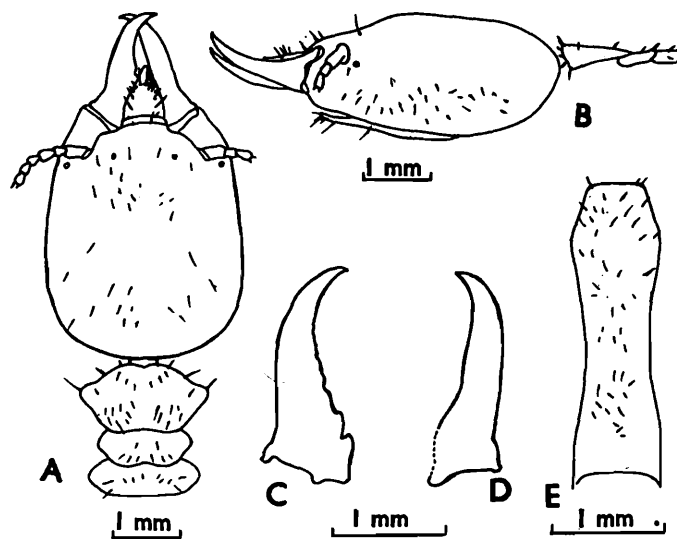


Fig. 207 : *Macrotermes khajuriae*. Soldier major. (A) Head and thorax, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles, respectively. (E) Postmentum.

paler basally; thorax pale brown to brown; legs yellow; abdomen brown above, paler below. Head and thorax sparsely and abdomen moderately hairy; each abdominal tergite with a row of hairs on posterior margin and few others irregularly placed. Total body-length 9.0-9.6 mm. Head-capsule large, subrectangular, weakly converging anteriorly (length to base of mandibles 3.50-3.90, max. width 2.85-3.0 mm); longer than wide (index max. width/length 0.76-0.80). Fontanelle minute, circular, with a brown chitinous rim; leading into a small tube; situated a little in front of middle of head (occipito-fontanelle distance 2.00-2.13, index occipito-fontanelle distance/head-length 0.54-0.59). Eyes whitish, rudimentary, round (0.05 mm diameter) and flat; located a little behind and outside of antennae. Ocelli dot-like, rudimentary; situated inner to antennae. Antennae with 17 segments; segment 3 longer than 2; 4 subequal to 2; 5 shortest, a little shorter than 4. Labrum subtriangular, with a sharp, hyaline tip; widest near base (length 0.65-0.75, width 0.63-0.65 mm). Mandibles thick, stout, sabre-shaped; shorter than 1/2 head-length (length 1.60-1.70 mm, index mandible-length/head-length 0.43-0.47). Left mandible crenulated in basal 2/3, crenulations coarser and larger proximally. Right mandible smooth, without any crenulations. Postmentum subrectangular, long and weakly narrowed behind at middle (length 2.5-2.63, max. width 0.80-0.83, width at waist 0.55-0.60 mm). Pronotum weakly saddle-shaped, anterior lobe slightly raised (length 1.0-1.13, max. width 1.78-2.03); antero-lateral angles prominently narrowed; anterior margin prominently notched; posterior margin convex and incurved medially. Mesonotum much narrower and metanotum a little narrower than pronotum, former weakly incurved and latter substraight at posterior margin; side margins of both angular and pointed weakly. *Soldier minor* (Figs. 206, 208) : Head-capsule, labrum and legs as in soldier major in colouration; mandibles reddish brown and paler proximally; body paler than head. Head and thorax sparsely and body moderately hairy. Total body-length 5.0-5.5 mm. Head-capsule subrectangular (length to base of mandibles 1.80-2.0, max. width 1.45-1.57 mm, index width/length 0.79-0.80); sides weakly convex, converging in front in anterior 1/4. Fontanelle as in soldier major but smaller and situated behind middle of head (occipito-fontanelle distance 0.85-0.90 mm, index fontanelle-distance/head-length 0.46-0.47). Eyes and ocelli as in soldier major; eyes somewhat smaller 0.025-0.037 mm. Antennae with

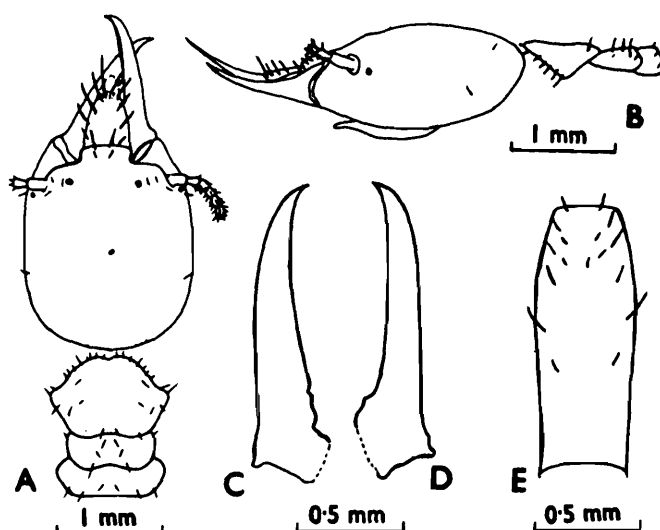


Fig. 208 : *Macrotermes khajuriae*. Soldier minor. (A) Head and thorax, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles. (E) Postmentum.

16 segments; segment 3 shorter than 2 : 4 subequal to 3. Labrum as in soldier major (length 0.45, width 0.38 mm). Mandibles thin, long, sabre-shaped, weakly incurved distally; longer than 1/2 of head-length (length 1.20-1.25 mm, index mandible-length/head-length 0.63-0.64). Postmentum subrectangular but without a waist, sides substraight. Pronotum, mesonotum, metanotum, legs and abdomen as in soldier major; pronotum-length 0.63-0.72 and width 1.0-1.10 mm.

WORKER : Head-capsule brownish yellow, frons somewhat paler; postclypeus paler than head; antennae pale brown; thorax and abdomen above paler than head, abdomen paler below; legs yellow. Head and body moderately hairy. Total body-length 4.5-5.0 mm. Head-capsule subcircular (length to base of mandibles 1.50-1.75, max. width 1.70-1.75 mm); sides weakly narrowed behind; dorsum raised a little in front of fontanelle and depressed behind. Fontanelle plate round (diameter 0.08 mm); situated a little behind middle. Eyes small, round, rudimentary (diameter 0.05 mm). Ocelli small, dot-like. Antennae with 17 segments; segment 3 shorter than 2 and subequal to 4; 5 shortest. Postclypeus swollen, hairy, incompletely divided by a median line; length less than 1/2 width. Pronotum strongly saddle-shaped, anterior lobe strongly upturned (length 0.48-0.53, max. width 0.88-0.93 mm); anterior margin weakly notched

and posterior margin weakly incurved. Mesonotum narrower and metanotum broader than pronotum; posterior margin of former weakly incurved and that of latter substraight; sides of both rounded.

Distribution : INDIA : Meghalaya, Assam, Arunachal Pradesh, and Mizoram states.

224. *Macrotermes serrulatus* Snyder

(Fig. 209)

1. *Macrotermes (Macrotermes) serrulatus* Snyder :

1934. Snyder, *Indian For. Rec.*, **20**(11) : 6-9. S maj. and min, also Im (?).
Syntypes : in FRI, BM and USNM. Type-locality : Magok, Burma.

2. *Macrotermes serrulatus* Snyder :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 217.

1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isopters* : 56.

1956. Roonwal and Sen-Sarma, *Indian J. agric. Sci.*, **26**(1) : 21.

1958. Ahmad, *Biologia*, Lahore, **4** : 95-96.

1962. Weidner, *Anz. Schadlingskunde*, **35**(9) : 129, 130, 131, 132, 133.

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 21-22.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 22-23. (Probably *hopini*).

1975. Ahmad, *Bull. Dept. Zool. Univ. Panjab. (N.S.)*, Art. 7 : 61, 65-70. (Probably *hopini*).

IMAGO : Snyder (1934) described winged adult (pp. 7-8) from an unassociated collection of winged forms collected at Hsipaw, Burma with remarks that they "may be the Burmese *serrulatus* Snyder" Krishna (1965b) had an associated collection of King, queen, soldiers (major, minor) and workers from Mandalay which differed from Snyders description for head and pronotum being smaller and less thickly hairy, the ocellus being closer to eye and 3rd segment of antenna being longer than or subequal to 2nd. According to Krishna 1965b, it is likely that the imagoes reported by Snyder (1934) were not those of *serrulatus*. As no imagoes of this species were available, I, therefore, give here Krishna's remarks and the measurements range of king and queen. Length of head to base of

mandibles 2.00-2.30, width of head 2.60-2.70, diameter of eye 0.87, long diameter of ocellus 0.34-0.36, eye-lower margin of head distance 0.05, eye-ocellus distance 0.15-0.16, length of pronotum 1.50 and width of pronotum 2.30-2.40 mm.

SOLDIER : *Soldier major* (Fig. 209) : Head pale castaneous brown; antennae brownish; labrum pale castaneous brown; mandibles dark brown, paler basally; pronotum brownish; rest of body paler than pronotum. Head and body scantily hairy; abdominal tergites each with a row of hairs on posterior margin. Total body-length 12.5-13.0 mm. Head-capsule subrectangular; wider posteriorly and narrowed anteriorly, less so than in *convulsionarius* (length to base of mandibles 3.90-4.60, max. width 3.20-3.65 mm, width/length index 0.782, min. width/max. width index 0.611). Fontanelle small, circular; situated at middle of head. Antennae with 17 segments; segment 3 much longer than 2 or 4 and 4 slightly longer than 2. Labrum subtriangular, tongue-shaped, extending upto middle of mandibles; tip hyaline, triangular, pointed. Mandibles strong, stout, sabre-shaped; length 2.2 mm, about 1/2 head-length; weakly incurved apically, less so than in *hopini*. Left mandible with crenulations in basal half, crenulations larger proximally and getting smaller anteriorly. Right

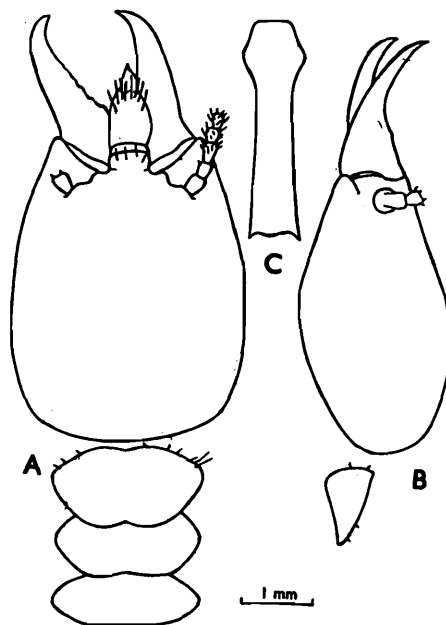


Fig. 209 : *Macrotermes serrulatus*. Soldier major (Syntype). (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (C) Postmentum.

mandible without any crenulations. Postmentum long, subrectangular; with a long waist (length 3.10, max. width 0.90, width at waist 0.65 mm). Pronotum saddle-shaped; weakly emarginate anteriorly and distinctly so posteriorly (length 1.30-1.40, width 2.30-2.50 mm). Mesonotum and metanotum convex on postero-lateral margins. *Soldier minor* : Head light castaneous brown; antennae and body yellowish brown; mandibles dark castaneous brown with reddish tinge. Head and body sparsely hairy. Total body-length c 7.0 mm. Head subrectangular (length to base of mandibles 2.20-2.60, max. width 1.80-2.10 mm). Antennae with 17 segments; segment 3 slightly longer than 2; 4 slightly shorter than 3, subequal to 2. Labrum narrow, tongue-shaped, light castaneous brown and with long hairs, extending upto 2/3 of mandibles; tip hyaline, triangular. Mandibles long, slender, sabre-shaped; incurved at distal tip (length 1.40-1.68 mm). Left mandible with crenulations extending upto half of mandible-length. Right mandible without crenulations. Postmentum subrectangular, narrow and elongate (length 1.60-1.75, max. width 0.63-0.65, width at waist 0.50 mm). Pronotum saddle-shaped; slightly emarginate at anterior and distinctly so at posterior margins (length 0.80, width 1.25 mm).

WORKER : *Worker major* : Head and postclypeus pale brown; antennae and thorax brownish yellow; abdominal tergites paler than thorax, sternites whitish. Sparsely hairy. Total body-length c 6.8-7.8 mm. Head-capsule subcircular (length to tip of labrum 2.4-2.8, length to base of mandibles 1.75-2.05, max. width 2.05-2.40 mm). Fontanelle small, circular, hyaline spot. Eyes whitish, oval spots. Antennae with 17-18 segments; segment 3 a little longer than 2; 4 equal to 2 (17-segmented) and shorter than 2 (18-segmented). Postclypeus swollen, length less than 1/2 width (length 0.35-0.38, width 1.00-1.05 mm). Pronotum saddle-shaped; anterior lobe large; without emargination anteriorly; posterior margin distinctly emarginate (length 0.73-0.88, width 1.10-1.30 mm). Mesonotum narrow and metanotum wider than pronotum. *Worker minor* : Not available.

Distribution : INDIA (Meghalaya), BANGLADESH, BURMA.

Genus 43. *Odontotermes* Holmgren

1. Subgenus *Odontotermes* (of *Termes*) Holmgren :
1910. Holmgren, *Zool. Anz.*, **35** : 286. (No description).

1911. Holmgren, K. *Svenska Vetensk-Akad. Handl.*, **46**(6) : 11. (No description).

2. Genus *Odontotermes* Holmgren :

1912. Holmgren, K. *Svenska Vetensk-Akad. Handl.*, **48**(4) : 35-40.

1949. Ahmad, *Am. Mus. Novit.*, No. 1392 : 1-11

1955. Emerson, *Fieldiana : Zool.*, **37** : 513.

1964. Roonwal and Bose, *Zoologica*, **40**(113) : 8.

1965. Bouillon and Mathot, *Zooleo*, No. 1 : 8.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 7, 8.

1967. Roonwal and Chhotani, *Zool. Anz.*, **178** : 236-256. Microsculpture of wings.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 146.

1970. Roonwal and Bose, *Rec. zool. Surv. India*, **62** (3&4) : 120.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 23.

1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235.

1974. Akhtar, *Pakistan J. Zool.*, **6**(1&2) : 92, 96, 97, 100.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 58, 60.

1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 43, 44.

1980. Lahiri and Ghosh, *Rec. zool. Surv. India*, **76** : 65.

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14**(2) : 7-10. See for Synonymy, description, etc.

1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 200.

1982. Thapa, *Sabah For. Rec.*, No. 12 : 6, 9.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 19, 25.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India.*, No. 49 : 97, 162.

1986. Chhotani, *Rec. zool. Surv. India*, **83**(3&4) : 21, 23, 24, 26.

1987. Bose and Das, *Fauna of Orissa Pt. 1, State Fauna Sr. 1* : 109.

1987. Chhotani, *Beitr. Ent.*, **37** : 411, 412.

Type of genus : *Termes vulgaris* Haviland.

See Snyder 1949, Rattan Lal and Menon 1953 and Thakur 1981 also for synonymy.

1. Characters of Genus *Odontotermes*

IMAGO : Yellowish brown to blackish brown, fairly densely pilose and large species. Head subcircular, broader than length to base of

mandibles. Fontanelle minute, circular, slightly raised. Eyes large, subcircular, strongly projecting out. Ocelli broadly oval, separated from eyes. Antennae with 18-20 segments; segment 3 generally smaller than 2. Postclypeus variably swollen, length less than to nearly half its width. Labrum broad, tongue-shaped; with a transverse chitinous band. Mandibles each with an apical and two marginals; apical finger-like. Left mandible : 1st marginal with a long posterior margin; 2nd marginal small, with anterior margin a little longer than posterior margin; separated from 1st by a deep cut; molar region small. Right mandible : 1st marginal with posterior margin a little longer than anterior margin; 2nd marginal small; with a long, straight posterior margin; molar plate as long as posterior margin of 2nd marginal. Pronotum subtrapezoidal or subsemicircular; with pale median T-shaped mark and an antero-lateral shoulder spot on either side; slightly raised medially at anterior margin; with a weak or without any notch at anterior margin and with a weakly emarginate posterior margin. Wings pale brown to dark greyish brown; membrane variably hairy and covered with cuticular rods; costa thick, chitinised, bordering anterior margin; subcosta (radius of some authors) small, fusing with costa just outside scale, basally separated from costa by a thin line; radius (radial sector of some authors) as thick as and running parallel with costa; radial streak generally present; media weak; in forewing separating from basal region of cubitus and coming out of radius in hindwing and with a few branches distally; cubitus also weak and with 8-16 branches to posterior margin. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Cerci short, 2-jointed; styli in male rudimentary or absent.

SOLDIER : Head pale yellow to yellowish brown. Head sparsely and body fairly densely hairy. Head-capsule oval or subrectangular, converging in front. Fontanelle indistinct. Antennae with 15-18 segments. Labrum tongue-shaped; anteriorly either rounded at anterior margin or narrowed to a sharp or bluntly rounded tip. Mandibles delicate to strong and stout. Left mandible with a small, rudimentary to a large and prominent tooth situated at variable position on inner margin. A small, rudimentary corresponding tooth present on right mandible. Postmentum subrectangular, weakly to strongly arched; sides substraight to strongly convex. Pronotum saddle-shaped. Legs with 3 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Cerci small, 2-jointed; styli single-jointed, rudimentary, sometimes absent.

WORKER : Monomorphic or Dimorphic. Head pale yellow to dark yellowish brown. Head and body fairly densely hairy. Head-capsule subsquarish, broader than long. Fontanelle plate round or oval, translucent spot. Antennae with 17-19 segments. Labrum, postclypeus and mandibles as in imago. Pronotum, legs and cerci and styli as in soldier.

2. *Distribution and Composition of Odontotermes*

(Fig. 190)

Distribution : The genus *Odontotermes* is known from the Ethiopian and Oriental zoogeographical regions. It is the most prolific and the most widely distributed genus of termites in these regions. Of about the 200 species so far known of this genus nearly half of them occur in the Ethiopian and the other half in the Oriental, regions.

Composition : Snyder (1949) has recognised 148 species and Emerson (1955) 155 (including 18 undescribed ones) from the world. According to Thakur 1981 as many as 195 species are known of which 107 occur in the Ethiopian and 88 in the Oriental, regions, while Chhotani 1987 has taken into account 176 species of which 91 are reported to occur in the Oriental and 85 in the Ethiopian, regions. In any case the species seem to be equally distributed in these two regions. Of these, the following 43 species, are now recognised to occur in the Indian Region and are taken into account here.

1. *Odontotermes adampurensis* Akhtar—India, Bangladesh
2. *O. anamallensis* Holmgren and Holmgren—India
3. *O. assmuthi* Holmgren—India, Pakistan, Bangladesh
4. *O. bellahunisensis* Holmgren and Holmgren—India
5. *O. bhagwatii* Chatterjee and Thakur—India
6. *O. boveni* Thakur—India, Nepal
7. *O. brunneus* (Hagen) (Syn. *O. mathadi* Roonwal and Chhotani)—
India
8. *O. ceylonicus* (Wasmann) (Syn. *O. meturensis* Roonwal &
Chhotani)—Sri Lanka, India
9. *O. distans* Holmgren and Holmgren—India
10. *O. escherichi* (Holmgrén)—Sri Lanka

11. *O. feae* (Wasmann) (Syn. *O. indicus* Thakur)—India, Nepal, Bhutan, Bangladesh, Sri Lanka, Burma, Thailand, Vietnam
12. *O. feaeoides* Holmgren and Holmgren—India
13. *O. ganpati* Bose—India
14. *O. giriensis* Roonwal and Chhotani—India, Bangladesh
15. *O. globicola* (Wasmann) (Synonyms : *Termes* (*Termes*) *dehraduni* Snyder and *O. roonwali* Bose)—India, Pakistan
16. *O. gravelyi* Silvestri—Burma
17. *O. guptai* Roonwal and Bose (Syn. *O. lokanandi* Chatterjee and Thakur)—India, Pakistan, Bangladesh
18. *O. gurdaspurensis* Holmgren and Holmgren—India, Pakistan
19. *O. hainanensis* (Light)—Burma, Thailand, Cambodia, Vietnam, South China
20. *O. horai* Roonwal and Chhotani—India, Pakistan, Nepal
21. *O. horni* (Wasmann)—India, Sri Lanka, Vietnam, Cambodia
22. *O. kapuri* Roonwal and Chhotani—India, Bhutan
23. *O. koenigi* (Desneux)—Sri Lanka
24. *O. kulkarnii* Roonwal and Chhotani—India
25. *O. latigula* (Snyder)—India
26. *O. latiguloides* Roonwal and Verma—India
27. *O. maliki* Akhtar—Bangladesh
28. *O. microdentatus* Roonwal and Sen-Sarma—India
29. *O. mirganjensis* Holmgren and Holmgren—India
30. *O. obesus* (Rambur) (Synonyms : *O. bangalorensis* Holmgren, *O. assamensis* Holmgren, *O. flavomaculatus* Holmgren and Holmgren, *O. obesus* var. *oculatus* Silvestri and *O. orissae* Snyder)—India, Pakistan, Bangladesh
31. *O. paralatigula* Chatterjee and Sen-Sarma—India, Burma

32. *O. parvidens* Holmgren and Holmgren—India, Pakistan, Bangladesh, Bhutan
33. *O. peshawarensis* Akhtar—Pakistan
34. *O. preliminaris* Holmgren—Sri Lanka
35. *O. profetae* Akhtar—Bangladesh
36. *O. proformosanus* Ahmad—India, Bangladesh
37. *O. prolatigula* Bose—India
38. *O. redemanni* (Wasmann)—India, Sri Lanka
39. *O. singsiti* Bose—India
40. *O. taprobanes* (Walker)—Sri Lanka
41. *O. vaishno* Bose—India
42. *O. wallonensis* (Wasmann) (Syn. *O. brunneus kushwahi* Roonwal and Bose)—India.
43. *O. yadevi* Thakur—India

3. Remarks on Status and Identity of Some Indian Species of *Odontotermes*

As many as 43 species of the genus *Odontotermes* have been recognised here from the Indian Region. Since Thakur's 1981 revision of the species of the genus from India there have been some further contributions and as such it is relevant to give a brief account on the status of different species on which there have been some controversial views, and on identification problems of the closely allied species.

The species *O. formosanus* Shiraki as reported from Arunachal Pradesh by Roonwal and Chhotani 1967 is based on wrong determination and, therefore, is not taken into account here.

Remarks on status of some species : Thakur 1981 treats *O. bellahunisensis guptai* Roonwal and Bose (1961) as a synonymy of *O. bellahunisensis* Holmgren and Holmgren but my studies show that *O. guptai* Roonwal and Bose is valid and that *O. lokanandi* Chatterjee and Thakur 1967 described later from Jammu and Kashmir is synonymous with *guptai* (vide also Chhotani, 1977a). Thakur (1981) has synonymised

O. parvidens Holmgren and Holmgren and *O. almorensis* Snyder with *O. distans* Holmgren and Holmgren but later studies (Bose, 1984) show that both *parvidens* and *distans* are valid, the former is distributed widely in northern and north-eastern parts of the subcontinent (including Pakistan, Nepal, Bhutan and Bangladesh) and *distans* is known only from southern India and that *almorensis* is synonymous with *parvidens*. Roonwal and Chhotani (1959b) described the species *O. meturensis* from southern India and Thakur 1981 (p. 92) has remarked that "I am keeping the separate entity of the species, even though I am of the firm opinion that both these species are conspecific and the name *O. meturensis* should sink as a junior synonym of *Odontotermes anamallensis*" I have examined the types of all the species in question and confirm Bose's (1984) view that *meturensis* is conspecific with *O. ceylonicus* and not with *anamallensis* as suggested by Thakur 1981. Roonwal and Verma (1981) take *O. indicus* Thakur as a synonym of *O. feae* (Wasmann) and I agree with their view. The present study also shows that *Termes (Termes) dehraduni* is synonymous with *globoicola* (Wasmann), the species *O. roonwali* Bose has already been treated as a synonym of *globoicola* (Chhotani and Bose, 1987) whereas Thakur (1981) treated *roonwali* as valid. I have come to this conclusion only after a study of the types of *globoicola* and *roonwali* and that *globoicola* which was described as a species of genus *Microtermes* actually belongs to the genus *Odontotermes* (Chhotani and Bose, 1987). The species *O. kulkarnii* treated as conspecific with *malabaricus* is resurrected since the latter species has been treated as species negligenda by Bose, 1984 (pp. 6-7); I have examined the collections from Shevaroy Hills and Bababudin Hills (two of the 3 collections, the third being not traceable) from which *malabaricus* was described by Holmgren and Holmgren (1917) and find that the former belongs to the species *assmuthi* and the latter to *ceylonicus* and, therefore, agree with Bose's (1984) contention.

Identification problems : Of the 43 species known from the Indian Region the species viz. *distans*, *koenigi*, *preliminaris* and *taprobanes* are known from the imago caste only, 17 by imagoes, soldiers and workers and 22 by soldiers and workers only. Many of the species are very close to each other and several are still known only through the type collection and the range of variations in these is not known. As such a number of species pose problems in the correct identifications and the following

remarks vis-a-vis the imago and soldier castes are, therefore, called for before dealing with the individual species.

Imago caste : The imagoes are known in case of 21 species, of these the imagoes of *koenigi* and *preliminaris* are the smallest (head-width 2.09 mm in both species) but soldier and worker castes of these species are so far not known and again they are known only by the type material which was not available to the author; their descriptions, etc. have been taken from termite literature. It is possible that their soldiers and workers have been described later as different species. Holmgren (1911b and 1913b) had also expressed some idea to that effect. The imagoes of the species *horni* and *feae* (forming one group of allied species) and of *obesus*, *redemanni* and *taprobanes* (forming another group of closely allied species) are not easily differentiated; they are separated on very minor characters, particularly the *taprobanes* imago which is separated only on the basis of eye-ocellus distance which is less than 1/2 of short diameter of ocellus vs 1/2 of short diameter in *obesus* and *redemanni*. The latter two species are separated on slight size differences, which to some extent fall in the range of variations. The author had the opportunity to study variation in case of *obesus* but not in *redemanni* since larger collection of imagoes of the species were not available. As such, detailed study of larger collections of the imago caste of *redemanni* from Sri Lanka is very much required to come to any conclusion with regard to the position of this species vis-a-vis *taprobanes* which is also known from Sri Lanka only and that too from the imago caste alone. The character of absence of radial streak in *redemanni* by which it is distinguished from *obesus* may also not hold good as the radial streak in some of the not fully mature imagoes of *obesus* has been found to be very feeble. The imagoes of *feae* and *horni* are separated only on the basis of wing-length, which character was also used by Holmgren, 1913b; the character of wing hairiness used by Maiti 1983, does not hold good in view of the wing hairiness given as "wings hairy all over" by Roonwal and Verma 1991 in case of *feae*. The imago of *wallonensis* is larger but the lower range of its size intermingles with the higher range of the size of different parts of *obesus* and *redemanni*; it, however, is separable for its longer wings (28-29 mm vs 21-25 mm).

Soldier caste : As many as 39 species of this genus are known by the soldier caste from the Indian Region. Ten of these species are larger

in size (head-length to base of mandibles over 2.0 mm). The species *parvidens* is easily separable for its left mandible having a very small, rudimentary tooth at basal third. All others have left mandibular tooth larger and medially placed and of these *gravelyi* is the largest (head-length 3.2 and head-width 2.5 mm) and has rounded anterior margin of labrum. Of the remaining 8 species, three viz. *yadevi*, *anamallensis* and *faeoides* are separated for having left mandibular tooth placed a little above the middle point of the mandible, otherwise they are very close to each other. All these are from southern India and are separated on some minor characters. Very likely they belong to one and the same species showing variations in the characters used for separation presently. Of the remaining 5 species *horni* and *faeae* are larger and separated on the characters of head, labrum and situation of left mandibular tooth whereas the other 3 viz. *mirganjensis*, *profaeae* and *singsiti* are almost of the same size and have pointed tip of labrum, these are separated from each other as per the key.

The remaining 29 species which have smaller sized soldier (head-length less than 2.0 mm) are grouped into two main groups : i) having subrectangular head-capsule and ii) having oval head-capsule. Of the group ii), the species *escherichi*, *proformosanus* and *hainanensis* are very close to each other under the uniformly coloured antennae category and *obesus* and *redemanni* under the darker distally and paler basally antennae category. These are separable only on minor characters.

4. Keys to the Indian Species of *Odontotermes*

IMAGOES

- 1(22) Postclypeus much shorter than 1/2 its width
- 2(5) Smaller species. Total length with wings 22.0-26.5, without wings 10.0-11.0, head-width with eyes less than 2.10 and pronotum-width less than 1.90 mm
- 3(4) Wings longer (22.0 mm). Ocelli separated from eyes by less than their short diameter.....*preliminaris*
- 4(3) Wings shorter (19.0 mm). Ocelli separated from eyes by their short diameter*koenigi*
- 5(2) Larger species. Total length with wings 26.5-30.0, without wings

- 11.0-16.0, head-width with eyes 2.15-2.80 and pronotum-width 1.95-2.60 mm
- 6(11) Head-width upto 2.4 mm
- 7(8) Eyes larger (max. diameter 0.65-0.70 mm) and strongly projecting out. Ocelli also larger (long diameter 0.30-0.38, short diameter 0.23-0.28 mm) and placed closer to eyes, eye-ocellus distance less than half of short diameter *globoicola*
- 8(7) Eyes smaller (max. diameter 0.53-0.58 mm) and less so projecting out. Ocelli smaller (long diameter 0.21-0.25, short diameter 0.20 mm) and placed farther from eyes, eye-ocellus distance equal to long diameter or more
- 9(10) Wings darker, dusky, smoky brown and shorter (forewing-length 20.0-22.5 mm). Microsculpture of wings consists of more wavy and thicker cuticular rods. Head a little narrower (width 2.20-2.35 mm) *assmuthi*
- 10(9) Wings paler, pale brown and longer (forewing-length 23.5-24.0 mm). Microsculpture of wings consists of less wavy and thinner cuticular rods. Head wider (width 2.30-2.40 mm)..... *giriensis*
- 11(6) Head-width more than 2.40 mm
- 12(17) Ocelli separated from eyes by about their long diameter or more (long diameter 0.20-0.27, short diameter 0.15-0.20, eye-ocellus distance 0.23-0.30 mm)
- 13(14) Head smaller (width with eyes 2.42-2.47 mm). Eyes smaller (max. diameter 0.54-0.55 mm)..... *proformosanus*
- 14(13) Head larger (width with eyes 2.50-2.80 mm). Eyes larger (max. diameter 0.58-0.65 mm)
- 15(16) Wings longer (forewing-length 25.5-27.5 mm)..... *parvidens*
- 16(15) Wings shorter (forewing-length 24.0 mm)..... *distans*
- 17(12) Ocelli separated from eyes by less than to about their short diameter (long diameter 0.23-0.35, short diameter 0.15-0.20, eye-ocellus distance 0.15-0.23 mm)
- 18(19) Eyes larger (max. diameter 0.68-0.80, min. diameter 0.58-0.70

- mm) and ocelli smaller (long diameter 0.23-0.30, short diameter 0.15-0.20 mm). Antennae 19-segmented..... *gurdaspurensis*
- 19(18) Eyes smaller (max. diameter 0.64-0.70, min. diameter 0.63-0.65 mm) and ocelli larger (long diameter 0.30-0.35, short diameter 0.18-0.20 mm). Antennae 19 to 20-segmented.
- 20(21) Head-width with eyes 2.50-2.80 and pronotum-width 1.96-2.60 mm. Antennae 20-segmented. Radial streak of wing separating from radius at proximal third of wing.....*brunneus*
- 21(20) Head-width with eyes 2.5-2.55 and pronotum-width 2.25-2.30 mm. Antennae 19-segmented. Radial streak of wing separating from radius at about middle of wing.....*latigula*
- 22(1) Postclypeus almost as long as 1/2 its width
- 23(26) Head-width with eyes upto 2.4 mm
- 24(25) Antennae with 18 segments. Ocelli subcircular (long diameter 0.23-0.25, short diameter 0.20-0.23 mm) and separated from eyes by less than their short diameter (eye-ocellus distance 0.13-0.15 mm).....*bellahunisensis*
- 25(24) Antennae with 19 segments. Ocelli broadly oval (long diameter 0.23-0.33, short diameter 0.15-0.23 mm) and separated from eyes by their short diameter (eye-ocellus distance 0.15-0.20 mm).....
.....*bhagwatii / horai*
- 26(23) Head-width with eyes more than 2.40 mm
- 27(34) Ocelli separated from eyes by less than their short diameter
- 28(29) Antennae with 20 segments. Ocelli closer to eyes, separated by less than 1/2 of short diameter (long diameter of ocellus 0.40, short diameter 0.275, eye-ocellus distance 0.08 mm, i.e 1/3 of short diameter).....*taprobanes*
- 29(28) Antennae with 19 segments. Ocelli farther from eyes, separated by 1/2 their short diameter (long diameter 0.25-0.40, short diameter 0.18-0.30, eye-ocellus distance 0.10-0.20 mm, i.e. about 1/2 short diameter)
- 30(31) Wings longer (forewing-length 28.0-29.0 mm). Eyes larger (max. diameter 0.73-0.95, min. diameter 0.65-0.90 mm).....*wallonensis*

- 31(30) Wings shorter (forewing-length 21.4-25.5 mm). Eyes smaller (max. diameter 0.65-0.80, min. diameter 0.53-0.75 mm)
- 32(33) Head-width with eyes 2.40-2.70, head-length to base of mandibles 1.85-2.55 mm. Min. diameter of eye less (0.53-0.58 mm). Pronotum larger (length 1.3-1.48, width 2.3-2.6 mm). Radial streak in wing present.....*obesus*
- 32(32) Head-width with eyes 2.3-2.6, head-length to base of mandibles 1.70-1.85 mm. Min. diameter of eye more (0.60-0.75 mm). Pronotum smaller (length 1.05-1.28, width 2.0-2.43 mm). Radial streak absent.....*redemanni*
- 34(27) Ocelli separated from eyes by about their short diameter
- 35(38) Larger forms. Head-width with eyes 2.6-2.90, pronotum-width 2.3-2.66 and pronotum-length 1.3-1.53 mm
- 36(37) Forewing-length 21.0-23.0 mm.....*feae*
- 37(36) Forewing-length 23.0-24.0 mm.....*horni*
- 38(35) Smaller forms. Head-width with eyes 2.50-2.70, pronotum-width 2.20-2.58 and pronotum-length 1.13-1.35 mm
- 39(40) Darker species. Head-capsule blackish brown. Eyes and ocelli larger (max. diameter of eye 0.75-0.80 and long diameter of ocellus 0.30-0.36 mm). Pronotum smaller (width 2.2-2.3, length 1.31-1.30 mm).....*microdentatus*
- 40(39) Paler species. Head-capsule reddish brown. Eyes and ocelli smaller (max. diameter of eye 0.60-0.70 and long diameter of ocellus 0.23-0.30 mm). Pronotum larger (width 2.32-2.58, length 1.27-1.35 mm).....*ceylonicus*

SOLDIERS

- 1(20) Larger species : Head-length to base of mandibles more than 2.0 mm
- 2(3) Tooth of left mandible *minute* and situated at basal third of mandible.....*parvidens*
- 3(2) Tooth of left mandible *prominent* and situated near about middle of mandible

- 4(5) Head-length to base of mandibles more than 3.0 mm, max. head-width more than 2.5 mm (head-length 3.2-3.25, head-width 2.6-2.8 mm). Labrum rounded at anterior margin.....*gravelyi*
- 5(4) Head-length to base of mandibles less than 3.0 mm, max. head-width less than 2.5 mm
- 6(11) Tooth of left mandible situated slightly above middle point of mandible (index tooth-distance from tip/mandible-length 0.41-0.50)
- 7(8) Head broad and oval and wider in comparison to length, index max. width/length to base of mandibles 0.82-0.92. Postmentum generally wider in comparison to length (length 1.25-1.55, max. width 0.70-0.90 mm, index width/length 0.54-0.61). Worker monomorphic.....*yadevi*
- 8(7) Head subrectangular and narrower, index max. width/length to base of mandibles 0.68-0.80. Postmentum narrower (length 1.15-1.60, width 0.45-0.70, index width/length 0.39-0.55). Worker dimorphic
- 9(10) Postmentum sides straighter. Antennae 16 to 17-(generally 17) segmented. Pronotum weakly notched at anterior and posterior margins.....*anamallensis*
- 10(9) Postmentum sides convexical. Antennae 16-segmented. Pronotum strongly notched.....*faeoides*
- 11(6) Tooth of left mandible situated at middle or below middle point of mandible (index tooth-distance from tip/mandible-length 0.50-0.65)
- 12(15) Generally larger species : Head-length to base of mandibles 2.25-3.10, max. width of head 1.80-2.50 mm
- 13(14) Labrum tongue-shaped, rounded at anterior margin and with a short point or tip sometimes. Head sides straighter, widest medially and less convergent anteriorly (Head-length 2.47-3.00, max. head-width 1.80-2.30 mm).....*horni*
- 14(13) Labrum triangular, with a sharp tip. Head sides widest near posterior margin and more convergent anteriorly (Head-length 2.25-3.10, max. width 1.80-2.50 mm).....*fae*

- 15(12) Generally smaller species : Head-length 1.96-2.40, max. head-width 1.53-1.90 mm
- 16(17) Head wider in comparison to length (index max. width/length to base of mandibles 0.837) and less converging in front, head-convergence index i.e. width at base of mandibles/max. width 0.681. Tooth of left mandible placed slightly below middle.....*profeae*
- 17(16) Head narrower in comparison to length (index max. width/length 0.75-0.783) and more converging in front, head-convergence index 0.64-0.665. Tooth of left mandible placed more backwardly
- 18(19) Larger : Head-length to base of mandibles 2.24-2.40, max. head-width 1.80-1.90 mm. Head wider in comparison to length (index max. width/length to base of mandibles 0.783). Mandibles shorter as compared to head and tooth of left mandible more backwardly placed (mandible-length 1.30-1.35 mm, index mandible-length/head-length 0.541, left mandibular tooth index i.e. tooth-distance from tip/mandible-length 0.651),.....*mirganjensis*
- 19(18) Smaller : Head-length to base of mandibles 2.0-2.15, max. width 1.53-1.70. Head narrower (index max. width/length 0.75-0.77). Mandibles longer and tooth of left mandible placed a little below middle point (mandible-length 1.15-1.30 mm, index mandible-length/head-length 0.560-0.590, left mandibular tooth index 0.566-0.580).....*singsiti*
- 20(1) Smaller species : Head-length less than to about 2.0 mm
- 21(32) Head subrectangular, sides of head subparallel
- 22(25) Tooth of left mandible minute and basally placed
- 23(24) Smaller in size. Head-length to base of mandibles 1.25-1.75, max. width of head 1.10-1.38 mm. Mandibles shorter (length 0.80-1.02 mm). Tooth of left mandible very small, rudimentary. Antennae longer.....*bhagwati*
- 24(23) Larger in size. Head-length 1.65-2.0, max. width of head 1.28-1.65 mm. Mandibles longer (length 1.05-1.23 mm). Tooth of left mandible more prominent). Antennae shorter.....*horai*
- 25(22) Tooth of left mandible larger and forwardly placed

- 26(29) Tooth of left mandible placed near middle or slightly below
- 27(28) Tooth of left mandible small and slightly below middle. Head-length to base of mandibles 1.99-2.09, max. head-width 1.07-1.12, mandible-length 1.15-1.22 and tooth-distance from tip in left mandible 0.64-0.65 mm.....*maliki*
- 28(27) Tooth of left mandible larger and placed at middle. Head-length 1.75-2.15, max. head-width 1.30-1.55, mandible-length 1.08-1.23 and tooth distance from tip in left mandible 0.50-0.60 mm*ceylonicus*
- 29(26) Tooth of left mandible placed in front of middle
- 30(31) Mandibles thicker and shorter, slightly longer than half of head-length to base of mandibles (index mandible-length/head-length 0.51-0.57). Tooth of left mandible placed at about distal third of mandible (tooth-index 0.33-0.37).....*assmuthi*
- 31(30) Mandibles thinner and longer (index mandible-length/head-length 0.62). Tooth of left mandible placed somewhat posteriorly (tooth index 0.37).....*kulkarnii*
- 32(21) Head subrectangularly oval to broadly oval, sides of head weakly to strongly convex
- 33(44) Antennae uniformly coloured, not darker distally
- 34(41) Smaller species : Head-length to base of mandibles 0.98-1.30, max. head-width 0.91-1.12 mm
- 35(36) Sides of head substraight or slightly convex (Head-length 1.05-1.30, max. head-width 0.91-1.10 mm, index width/length 0.87-0.894).....*adampurensis*
- 36(35) Sides of head strongly convex (Head-length 0.98-1.28, max. head-width 0.91-1.12 mm, index width/length 0.88-1.00)
- 37(38) Pronotum very slightly notched at anterior and posterior margins. Postmentum a little longer than wide [Head-length to base of mandibles 0.98-1.17, max. head-width 0.98-1.10 mm. Worker monomorphic].....*escherichi*
- 38(37) Pronotum weakly notched at anterior and distinctly at posterior margins. Postmentum as wide as or slightly longer than wide

- 39(40) Tooth of left mandible triangular and somewhat anteriorly directed. Postmentum a little longer than wide and arched.....
.....*proformosanus*
- 40(39) Tooth of left mandible acute and anteriorly directed. Postmentum nearly as long as wide.....*hainanensis*
- 41(34) Larger species : Head-length 1.30-1.87, max. head-width 1.15-1.65 mm
- 42(43) Head-length 1.30-1.55, max. head-width 1.15-1.33, mandible-length 0.73-0.80 mm. Antennae 15 to 16-segmented. Sides of postmentum convex.....*boveni*
- 43(42) Head-length 1.78-1.87, max. head-width 1.55-1.65, mandible-length 1.03-1.10 mm. Antennae 17-segmented. Sides of postmentum straighter.....*ganpati*
- 44(33) Antennae darker in colour distally and paler basally
- 45(52) Postmentum strongly arched with sides strongly convex
- 46(47) Smaller species : Head-length to base of mandibles 1.0-1.26, max. head-width 1.0-1.21 mm. Labrum tongue-shaped, broadly rounded anteriorly.....*latiguloides*
- 47(46) Larger species : Head-length to base of mandibles 1.20-1.75, max. head-width 1.13-1.60 mm. Labrum tongue-shaped, sharply rounded anteriorly
- 48(49) Head-length 1.50-1.75, max. head-width 1.40-1.60 mm. Labrum with roundly pointed tip.....*paralatigula*
- 49(48) Head-length 1.20-1.50, max. head-width 1.13-1.40 mm. Labrum with sharply rounded tip.
- 50(51) Head widest near posterior end, appearing more strongly convergent in front (head-convergence index i.e. width at base of mandibles/max. width 0.60-0.664). Tooth of left mandible forwardly placed, index tooth-distance from tip/mandible-length 0.25-0.287.....*prolatigula*
- 51(50) Head widest at middle, appearing less so convergent in front (head-convergence index 0.60-0.68). Tooth of left mandible backwardly

- placed (index tooth-distance from tip/mandible-length 0.30-0.34).....*latigula*
- 52(45) Postmentum weakly arched with sides substraight or weakly convex
- 53(54) Tooth of left mandible minute, rudimentary. Mandibles substraight and very slightly bent inwards near distal tip.....*microdentatus*
- 54(53) Tooth of left mandible prominent and large. Mandibles weakly to strongly incurved near distal end
- 55(60) Smaller species : Head-length to base of mandibles 0.90-1.14 and max. head-width 0.83-1.00 mm
- 56(57) Tooth of left mandible forwardly placed (mandible-length 0.60-0.69, tooth-distance from tip 0.13-0.15 mm, index tooth-distance/mandible-length 0.21-0.25). Labrum sharply pointed at tip.....
.....*globicola*
- 57(56) Tooth of left mandible near distal third (mandible-length 0.63-0.78, tooth-distance from tip 0.22-0.30 mm, index tooth-distance/mandible-length 0.32-0.37). Labrum sharply or broadly rounded at tip
- 58(59) Labrum broader than or as broad as long and rounded at anterior margin. Antennae with 16 segments. Mandibles more curved distally and tooth of left mandible at distal third (mandible length 0.63-0.78 and tooth-distance from tip 0.22-0.27 mm, index tooth-distance/mandible-length 0.32-0.34).....*vaishno*
- 59(58) Labrum longer than wide and sharply rounded at anterior end. Antennae with 15 segments. Mandibles less so curved distally and tooth of left mandible a little below distal third (mandible-length 0.74-0.78 and tooth-distance from tip 0.27-0.30 mm, index tooth-distance/mandible-length 0.36-0.37).....*peshawarensis*
- 60(55) Larger species : Head-length to base of mandibles 1.0-2.0 and max. head-width 0.95-1.50 mm
- 61(68) Tooth of left mandible situated in front of distal third of mandible (index tooth-distance from tip/mandible-length 0.21-0.33). Mandibles generally shorter and stouter

- 62(63) Larger species : Head-length to base of mandibles 1.38-1.60 and max. head-width 1.30-1.38 mm. Antennae with 17 segments.....
.....*kapuri*
- 63(62) Smaller species : Head-length to base of mandibles 1.0-1.35 and max. head-width 0.95-1.20 mm. Antennae with 15 to 16 (sometimes 17) segments
- 64(65) Mandibles thin, sabre-shaped and less so curved distally. Tooth of left mandible more forwardly placed (index tooth-distance from tip/mandible-length 0.21-0.27). Postmentum sides abruptly narrowed in front.....*giriensis*
- 65(64) Mandibles thicker and stouter and more so curved distally. Tooth of left mandible less so forwardly placed (index tooth-distance/mandible-length 0.26-0.33). Postmentum sides gradually narrowed in front
- 66(67) Head and body more hairy. Antennae with 15-16 segments. Mandibles shorter and stouter. Labrum broadly rounded at anterior margin. Postmentum sides convex.....*guptai*
- 67(66) Head and body less hairy. Antennae with 16-17 segments. Mandibles comparatively less stout and longer. Labrum narrowing anteriorly. Postmentum sides substraight.....*bellahunisensis*
- 68(61) Tooth of left mandible situated at distal third or a little behind distal third (index tooth-distance from tip/mandible-length 0.33-0.46). Mandibles generally longer
- 69(72) Larger in size. Head-length to base of mandibles 1.5-2.0 and max. head-width 1.28-1.50 mm
- 70(71) Mandibles shorter, stouter and more curved distally, index mandible-length/head-length to base of mandibles 0.56-0.62. Tooth of left mandible forwardly placed (tooth-distance from tip/mandible-length 0.34-0.42).....*brunneus*
- 71(70) Mandibles longer, thinner and less so curved distally, index mandible-length/head-length 0.62-0.71. Tooth of left mandible backwardly placed (tooth-distance from tip/mandible-length 0.41-0.46).....*wallonensis*

- 72(69) Smaller in size. Head-length to base of mandibles 1.10-1.67 and max. head-width 0.90-1.40 mm
- 73(74) Head-length to base of mandibles 1.42-1.63, max. head-width 1.20-1.40 mm. Head rectangularly oval, sides straighter. Mandibles longer (0.98-1.08 mm)...*gurdaspurensis*
- 74(73) Head-length to base of mandibles 1.0-1.67 (generally 1.2-1.5), max. width 0.90-1.37 mm (generally 1.10-1.25 mm). Head oval, sides somewhat convex. Mandibles shorter (0.75-1.03 mm)
- 75(76) Mandibles longer, index mandible-length/head-length to base of mandibles 0.69-0.79. Labrum longish*redemanni*
- 76(75) Mandibles shorter, index mandible-length/head-length 0.59-0.68. Labrum shorter and broadly rounded anteriorly.....*obesus*

225. *Odontotermes adampurensis* Akhtar

(Fig. 210)

1. *Odontotermes adampurensis* Chaudhry, et al. Nom. nud. :

1972. Chaudhry, et al. *Termites of Pakistan (Final Tech. Rep. PL 480 Proj. No. A17-FS-12)* : 23. Nom. nud.

2. *Odontotermes adampurensis* Akhtar : _____

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 70, 71-73. S only. Holotype : S, in PU. Type-locality : Adampur, Bangladesh.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER (Fig. 210) : Head yellowish to reddish brown; antennae uniformly coloured, paler than head; mandibles dark reddish brown, paler basally; body and legs yellowish to pale brown. Head sparsely and body fairly pilose. Total body-length 4.50-5.20 mm. Head rectangularly oval, sides weakly convex, converging anteriorly (length to base of mandibles 1.05-1.30, max. width 0.91-1.10, width at base of mandibles 0.65-0.76 mm (index max. width/length 0.870-0.894, index width at base of mandibles/ max. width 0.591-0.663). Antennae 15-16 segmented, segment 3 in 15-segmented and segment 4 in 16-segmented, shortest. Labrum tongue-shaped; sides weakly converging to a rounded tip; with a row of longer

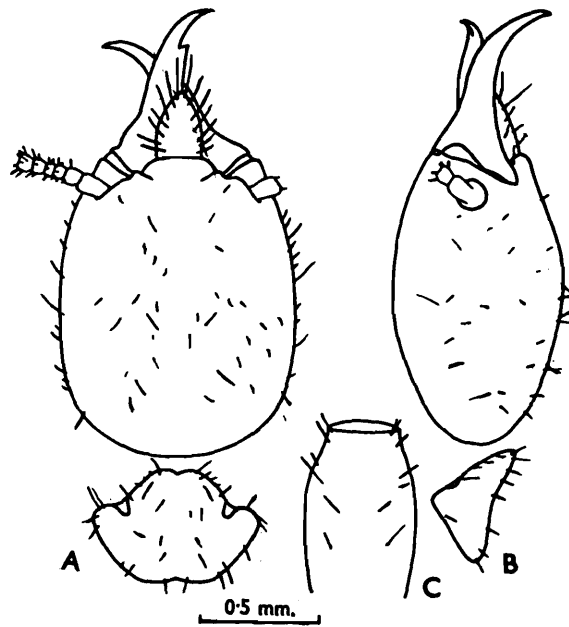


Fig. 210 : *Odontotermes adampurensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Same side view. (C) Postmentum.

bristles on sides and a few minute hairs on body. Mandibles sabre-shaped, weakly incurved distally (length 0.61-0.73 mm, index mandible-length / head-length 0.56-0.63). Left mandible with a well developed tooth at about apical third (tooth-distance from tip 0.18-0.23 mm, index tooth-distance/mandible-length 0.280-0.309). Right mandible with a small, rudimentary tooth a little lower than corresponding tooth on left mandible. Postmentum a little longer than wide, sides convex, concavely narrowed in anterior third (length 0.63-0.78, max. width 0.48-0.50 mm.). Pronotum saddle shaped, anterior margin weakly notched and posterior margin slightly emarginate; length 0.39-0.47, width 0.65-0.82 mm.

WORKER : Monomorphic. Head yellowish to pale brownish; antennae much paler than head, basal segments somewhat paler; postclypeus a little paler than head; body and legs yellowish white. Head and body fairly densely hairy. Head subcircular (length to base of mandibles 1.05-1.10, max. width 1.20-1.28 mm). Antennae 17-segmented; segment 3 shortest or subequal to 5, 4 a little longer. Postclypeus swollen, hairy, length less than half of width (length 0.25, width 0.60-0.65 mm). Pronotum saddle-shaped (length 0.36-0.38, width 0.63-0.68 mm); anterior and posterior margins faintly emarginate.

Distribution : INDIA : Assam, Meghalaya, Arunachal Pradesh and Tripura states. BANGLADESH.

226. *Odontotermes anamallensis* Holmgren and Holmgren

(Fig. 211)

1. *Odontotermes (Odontotermes) anamallensis* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. Agric. India (Ent.)*, **5**(3) : 157-158. S and W. Syntypes : In Riksmus. and AMNH (IS, IW). Syntypes of AMNH examined.

2. *Odontotermes anamallensis* Holmgren and Holmgren :

1981. Thakur, *Indian For. Rec. (N. S.) Ent.*, **14** (2) : 3, 4, 12, 13-16, Pls. 50, 51. Synonymy, description, etc.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 95, 167, 168-170.

IMAGO : Unknown.

SOLDIER (Fig. 211) : Syntype examined. Head-capsule pale yellow to brown; labrum a little paler than head; antennae and legs pale yellow to brownish yellow; mandibles dark brown, paler basally; body creamish to yellow. Head sparsely and body moderately hairy. Total body-length 4.9-7.4 mm. Head-capsule subrectangular, sides weakly convex and somewhat converging in front (length to base of mandibles 1.75-2.30, max. width 1.35-1.85, width at base of mandibles 0.95-1.18 mm); width $\frac{2}{3}$ to a little more than $\frac{3}{4}$ of head-length and width at mandible-base nearly $\frac{2}{3}$ to $\frac{3}{4}$ of max. width (index max. width/length 0.68-0.80 and index width at mandible-base/max. width 0.63-0.74). Antennae with 16-17 (generally 17) segments; in 16-segmented antennae segment 2 longer than 3, 4 shortest; in 17-segmented ones segment 2 twice as long as 3, the latter shortest. Postclypeus short, subrectangular, not clearly demarcated from frons. Labrum tongue-shaped, anteriorly triangularly pointed. Mandibles sabre-shaped, strong and stout; length (1.10-1.30 mm) a little more than half of head-length (index left mandible-length/head-length 0.54-0.63). Left mandible with a prominent tooth at about middle (index tooth-distance from tip/mandible-length 0.41-0.50, 0.41 in syntype). Right mandible with a minute corresponding tooth at middle. Postmentum subrectangular, widest in anterior third (length 1.15-1.60, max. width 0.45-0.70 mm).

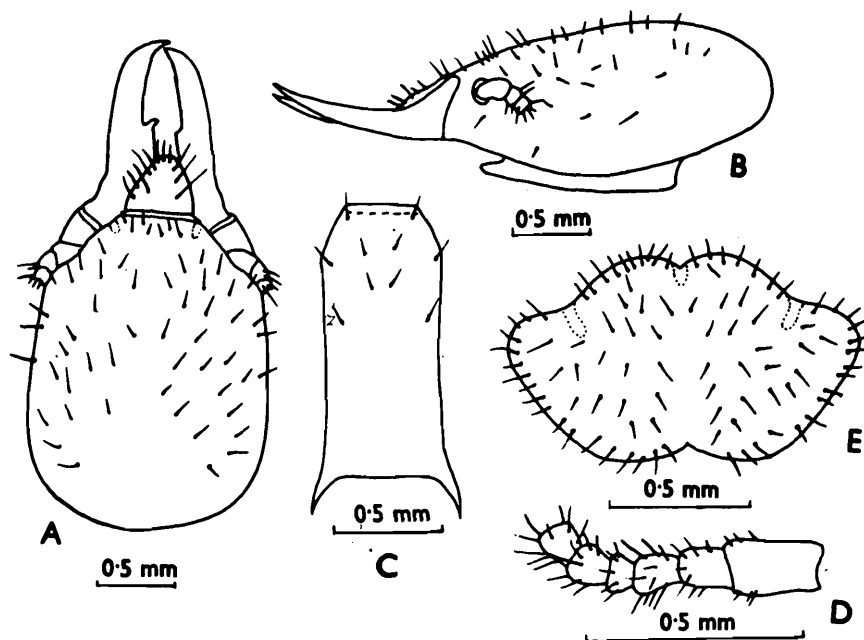


Fig. 211 : *Odontotermes anamallensis*. Soldier. (A) Head, dorsal view. (B) Head side view. (C) Postmentum. (D) Antenna. (E) Pronotum. (Ex Thakur, 1981).

Pronotum saddle-shaped (length 0.60-0.83, width 0.95-1.40 mm); anterior margin round, with a weak median notch; posterior margin weakly convex with a shallow, median depression. Mesonotum narrower than pronotum, distinctly emarginate posteriorly; metanotum as wide as or slightly wider than pronotum, posterior margin weakly convex.

Holmgren and Holmgren 1917 described "Smaller Solider" with 16-segmented antennae, but the measurements, etc given by them fall in the range of size given by Thakur 1981, as such it is not described here separately.

WORKER : The syntype worker in the AMNH is atypical and probably does not belong to *anamallensis*. The present description is based on other material and probably syntypes available in ZSI. Dimorphic. *Worker major* : Head-capsule pale yellow to brownish yellow; antennae and legs yellow; postclypeus as head-capsule in colour; body whitish to yellow. Head and body moderately hairy. Total body-length 4.0-5.5 mm. Head-capsule subcircular, broader than long (length to base of mandibles 1.2-1.65, max. width 1.35-1.78 mm). Fontanelle plate a small, whitish, translucent, round spot at middle of head. Antennae with 17-19 segments

(19-segments in syntypes); in 17-segmented antennae segment 3 shortest, in 18-segmented 4 shortest, and in 19-segmented one 3 either shortest or subequal to 4 or 5. Postclypeus weakly swollen; length less than half of width. Pronotum saddle-shaped (length 0.40-0.58, width 0.75-1.03 mm); anterior margin round with a median notch and posterior margin convex with median emargination. Mesonotum narrower and metanotum a little wider than pronotum; posterior margin of former weakly emarginate and that of latter substraight. *Worker minor* : Resembles worker major but is smaller and has 15 to 16-segmented antennae. Total body-length 3.0-4.0, length of head to base of mandibles 0.80-0.88, max. width of head 0.93-1.00, length of pronotum 0.30-0.35 and width of pronotum 0.60-0.68 mm.

Distribution : INDIA : Karnataka, Tamil Nadu and Kerala states.

Remarks : Thakur, 1981 (p. 92) states that he is of the firm opinion that both these species (*anamallensis* and *meturensis*) are conspecific and the name *O. meturensis* should sink as a junior synonym of *O. anamallensis* but kept them separate since he had not examined the types of *O. anamallensis*. I have examined the cotype soldier of *anamallensis* present in AMNH and find that they are not conspecific. I have also now examined the types of *O. ceylonicus* including as well as the lectotype designated by Thakur 1981 and confirm Bose's (1984) contention that *O. meturensis* is synonymous with *O. ceylonicus*, also vide infra under *ceylonicus*.

227. *Odontotermes assumuthi* Holmgren

(Figs. 212, 213)

1. *Odontotermes (Odontotermes) Assmuthi/assmuthi* Holmgren :

1913. Holmgren, *J. Bombay nat. Hist. Soc.*, **22**(1) : 112-113, S and W. Lectotype (selected A.E. Emerson) : S, in Riksmus., Stockholm. Type-locality : Borivilli Jungles, Bombay, India.

1917. Holmgren and Holmgren, *Mem. Dept. Agric. Sci.*, **5**(3) : 154-155.

2. *Odontotermes assmuthi* Holmgren :

1967. Roonwal and Chhotani, *Zool. Anz.*, **178** (3/4) : 252-253, tab.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner). Vol. 2 : 360.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab, (N.S.)*, Art. 7 : 70, 73-75.
1975. Sen-Sarma, et al., *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 15, 40, 55, 65.
1976. Thakur, *Indian Forester*, **102** (8) : 500, 502.
1977. Chhotani, *Rec. zool. Surv. India*, **72** : 372-373.
1981. Thakur, *Indian For. Rec. (N. S.) Ent.*, **14** (2) : 10, 12, 16-21. Synonymy, description, etc.
1982. Verma and Thakur (R.K.), *Rec. zool. Surv. India*, **79** : 313-314.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 19, 26, 94-97.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 95, 163, 170-172.
1984. Bose and Roy, *Bull. zool. Surv. India*, **5**(2 and 3) : 189.
1984. Verma, *Indian J. Forestry*, **7**(4) : 305.
1986. Verma, *J. Indian Acad. Wood Sci.*, **17**(1) : 46, 47, 48, 49, 50.
1989. Verma, *Indian J. Forestry*, **12** (4) : 298.
- In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO (Fig. 212) : Head-capsule, pronotum and abdomen dark greyish brown; antennae, postclypeus and legs brown; wings dusky, smoky

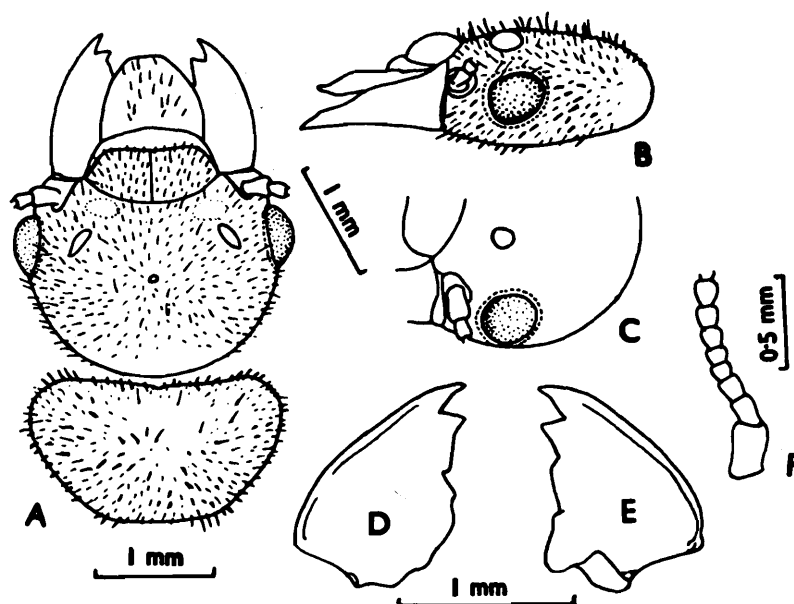


Fig. 212 : *Odontotermes assmuthi*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Part of head showing situation of eye, ocellus and antenna. (D) and (E) Left and right mandibles, respectively. (F) Antenna.

brown; sternites paler, medially whitish, pronotum with pale brown T-shaped mark and oval shoulder spots. Head and body densely hairy. Total body-length with wings 24.0-26.7, without wings 11.4-14.0 mm. Head-capsule subcircular (length to base of mandibles 1.6-1.9, width with eyes 2.2-2.35 mm). Fontanelle minute; area around fontanelle paler. Eyes of medium size, circular (max. diameter 0.53-0.58, min. diameter 0.48-0.53 mm); very close to antennae and from lower margin of head situated at about 1/3 of diameter. Ocelli broad, oval or round (long diameter 0.21-0.25, short diameter 0.20 mm); from eyes situated far away, at more than their long diameter. Antennae 19-segmented (rarely 20-segmented); segment 3 generally shorter than 4, sometimes longer; 5 shortest. Postclypeus swollen, densely hairy, length less than half its width. Pronotum trapezoidal (length 1.05-1.15, width 2.0-2.25 mm); anterior and posterior margins substraight, anteriorly with a faint median notch, posteriorly without any emargination. Wings long, hairy distally (length : forewing 20.0-22.5, hindwing 18.5-20.0 mm); radial streak separating from radius at about middle; membrane covered with thick and more wavy rods.

SOLDIER (Fig. 213) : Head-capsule, antennae and labrum pale yellow to pale brown; antennae uniformly coloured; mandibles brown to blackish brown; body straw yellow to pale yellowish brown. Head and pronotum sparsely and abdomen fairly densely hairy. Total body-length 4.5-6.5 mm. Head-capsule subrectangular, sides slightly convex (length to base of mandibles 1.44-1.70, max. width 1.07-1.35 mm); anteriorly very slightly converging at base of mandibles (width at base of mandibles 0.78-0.98 mm, head-convergence index 0.68-0.78). Antennae with 16 (rarely 17) segments; segment 4 shortest. Labrum tongue-shaped (length 0.35, width 0.30 mm); anteriorly narrowly rounded at tip. Mandibles stout and short; apically weakly incurved (length 0.77-0.95 mm); very slightly longer than half of head-length (index mandible-length/head-length 0.51-0.57). Left mandible with a prominent, anteriorly directed tooth a little behind apical third; tooth distance 0.28-0.35 mm, index tooth-distance/mandible-length 0.33-0.37. Right mandible with a weak denticle a little below level of tooth in left mandible. Postmentum subrectangular (length 0.94-1.25, max. width 0.45-0.60 mm). Pronotum saddle-shaped (length 0.48-0.58, width 0.75-0.95 mm); anterior margin distinctly and posterior margin weakly notched.

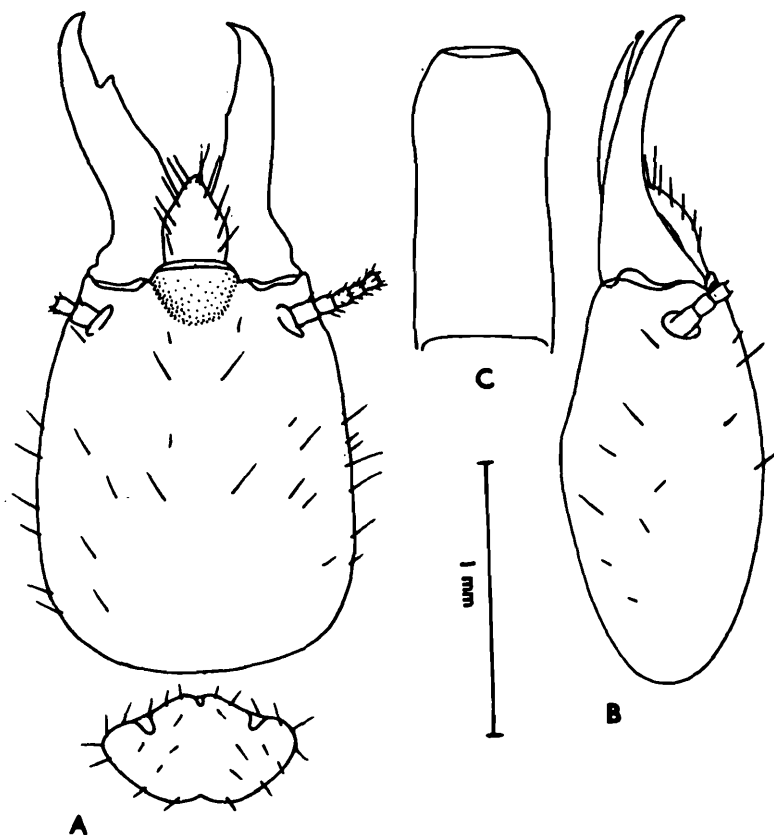


Fig. 213 : *Odontotermes assmuthi*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Postmentum.

WORKER : Dimorphic. *Worker major* : Head-capsule pale yellow to pale brownish yellow; antennae paler; body-length 3.5-4.0 mm. Head subsquarishly rounded (length to base of mandibles 1.05-1.20, max. width 1.25-1.33 mm). Antennae 17-segmented; segment 3 shortest; 4 longer than 5. Postclypeus swollen, hairy; length less than 1/2 of width. Pronotum saddle-shaped (length 0.25-0.35, width 0.52-0.58); anterior margin with a prominent median notch; posterior margin substraight or weakly emarginate. *Worker minor* : Resembles worker major except for its smaller size, 16-segmented (with 4th segment shortest) antennae and head slightly narrowing posteriorly. Total body-length 2.8-3.3, length of head to base of mandibles 0.80-0.90, max. width of head 0.85-0.95, pronotum-length 0.25-0.35 and pronotum-width 0.52-0.58 mm.

Distribution : INDIA : Widely distributed. Also PAKISTAN and BANGLADESH.

Biology : This species generally makes subterranean nests of diffused type. Basalingappa (1971), however, has reported it building mounds in Karnataka state. The swarming of alates has been observed in the afternoons in Dehradun and Calcutta (personal observation), while in Karnataka it has been recorded at any time of the day or night, first after the premonsoon showers in April and then continued throughout the wet months (Basalingappa, 1974).

228. *Odontotermes bellahunisensis* Holmgren and Holmgren

(Figs. 214, 215)

1. *Odontotermes (Cyclotermes) bellahunisensis* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. Agric. India*, **5**(3) : 150-151.
Im, S and W. Lectotype : S, in ZSI. Type-locality : Bellahunisi (Bellary Dist.), Karnataka, India. Types examined.

2. *Odontotermes bellahunisensis* Holmgren and Holmgren :

1961. Roonwal and Bose, *J. Bombay nat. Hist. Soc.*, **58**(3) : 580-588.
Redescription of species and lectotype designated.

1976. Thakur, *Indian Forester*, **102** (8) : 500, 502.

1981. Thakur, *Indian For. Rec. (N. S.) Ent.*, **14** (2) : 4, 11, 12, 21-25.
Synonymy, description, etc.

1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 206.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 95, 163, 165 172-174.

1984. Verma, *Rec. zool. Surv. India*, **81**(3 & 4) : 349.

1985. Verma, *Indian J. Forestry*, **8**(3) : 181.

1987. Bose and Das, In : *Fauna of Orissa*, Pt. 1 : 105.

1989. Verma, *Indian J. Forestry*, **12** (4) : 297.

IMAGO (Fig. 214) : Description from type material; the colour of specimens has run out due to long preservation. Head-capsule brownish yellow (dark brown vide Holmgren and Holmgren, 1917); antennae, labrum and postclypeus yellowish white (postclypeus tinged with brown vide Holmgren and Holmgren, 1917); pronotum brownish yellow with a paler T-marking and shoulder spots; wings grey brown; body brownish yellow. Head and body densely hairy. Total body-length without wings 11.6-12.3 mm. Head-capsule subcircular, with eyes broader than long (length to base of mandibles 1.75-1.80, width with eyes 2.20-2.25 mm). Fontanelle

small, minute, situated at middle of head. Eyes subcircular (max. diameter 0.60-0.63 mm); situated very close to lower margin of head. Ocelli broadly oval (long diameter 0.23-0.25, short diameter 0.20-0.23 mm); situated away from eyes by less than their short diameter or a little more than half of long diameter and from antennae by about long diameter. Antennae

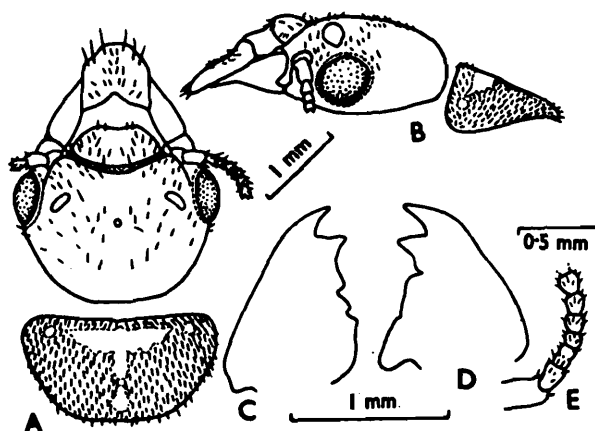


Fig. 214 : *Odontotermes bellahunisensis*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles, respectively. (E) Antenna. (Ex Roonwal and Bose, 1961).

18-segmented; segments 2 and 3 subequal, the latter subdivided; 4 shortest. Postclypeus strongly swollen, hairy (length 0.5, width 1.0 mm). Pronotum subtrapezoidal (length 1.15-1.23, width 2.10-2.15 mm); anterior margin slightly upturned with a faint median notch; posterior margin straight, without notch.

SOLDIER (Fig. 215) : Lectotype examined. Head-capsule pale yellowish brown to dark castaneous brown; antennae yellowish brownish, darker distally; mandibles reddish brown, paler basally. Head sparsely and body fairly densely hairy. Total body-length 3.60-5.60 mm. Head broadly oval, broadest posteriorly and narrowed in front (length to base of mandibles 1.10-1.35, max. width 0.95-1.15, width at base of mandibles 0.63-0.70 mm; index max. width/length 0.81-0.93, index width at base of mandibles/max. width 0.61-0.70). Antennae with 16-17 segments; segment 4 shortest in 16-segmented and 3 shortest in 17-segmented antennae. Labrum tongue-shaped; apically converging into some what pointed tip (length 0.30-0.35, width 0.28 mm). Mandibles short, stout, sickle-shaped and

strongly incurved distally (length 0.60-0.73 mm); shorter in comparison to head (index mandible length/head-length 0.548-0.583). Left mandible with a large pointed tooth at distal third (tooth distance from tip 0.18-0.25 mm, index tooth-distance/mandible-length 0.27-0.33). Right mandible with a minute tooth a little above middle. Postmentum subrectangular, with weakly convex sides; length a little more than width (length 0.60-0.75, max. width 0.45-0.55 mm). Pronotum saddle-shaped (length 0.40-0.55, width 0.70-0.90 mm); anteriorly weakly notched and posteriorly substraight. Mesonotum narrower and metanotum wider than pronotum; both without any emargination posteriorly.

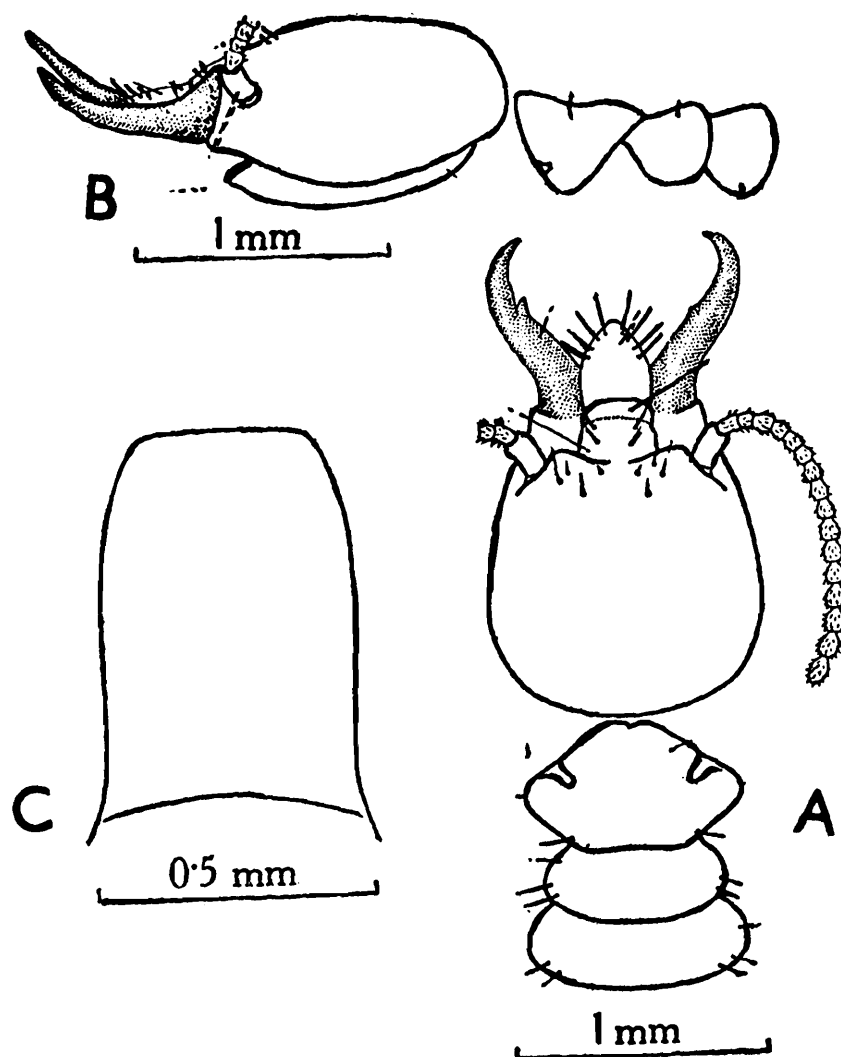


Fig. 215 : *Odontotermes bellahunisensis*. Soldier. (A) Head and thorax, dorsal view. (B) Same, side view. (C) Postmentum, (Ex Roonwal and Bose, 1961)

WORKER Dimorphic. *Worker major* : Head-capsule pale yellow to yellowish brown; antennae pale brownish, paler basally; body yellowish white. Head and body moderately hairy. Total body-length 3.5-4.50 mm. Head capsule subsquarish, (length to base of mandibles 1.0-1.10, max. width 1.05-1.15 mm). Antennae 17-segmented; segment 3 shortest. Postclypeus swollen, hairy; length almost half of width. Pronotum saddle-shaped (length 0.40, width 0.63 mm); anteriorly weakly notched, posteriorly straight. Meso- and metnotum as in soldier. *Worker minor* : Resembles worker major but for smaller size and 16 to 17-segmented antennae. Total body-length 3.0-3.60, length of head to base of mandibles 0.70-0.80, max. width of head 0.78-0.90, length of pronotum 0.30-0.40 and width of pronotum 0.50-0.60 mm.

Distribution : INDIA : Karnataka, Tamil Nadu, Kerala and Orissa states.

Remarks : Roonwal and Bose (1961) described a subspecies of *Odonototermes bellahunisensis*, *O. b. guptai*, from Rajasthan and at the same time redescribed *O. bellahunisensis* Holmgren and Holmgren from the syntypes available at the ZSI. Roonwal (1975), elevated *O. b. guptai* to the specific rank which was accepted by Roonwal and Verma (1977), Chhotani (1977a), etc. Chatterjee and Thakur (1967) had described the species *O. lokanandi* from Jammu and Kashmir, which species, was treated as a synonym of *O. guptai* by Chhotani (1977a). Thakur (1981), however, does not recognize *guptai* and considers it to be synonymous with *bellahunisensis*; he had probably missed Chhotani (1977a) reference as he does not mention anything about *lokanandi* being taken as a synonym of *guptai* by Chhotani (1977a). Verma and Thakur (R.K.) (1982) and Verma (1984, 1986) also take *lokanandi* as a synonym of *guptai* following Chhotani (1977a).

I have examined the types of all these species again and confirm the synonymy proposed earlier (Chhotani, 1977a).

The species *bellahunisensis* has been recorded from Uttar Pradesh, Maharashtra, Andhra and Karnataka states by Sen-Sarma, et al. (1975) and from Assam, Bihar, Orissa, West Bengal, Rajasthan, Karnataka and Tamil Nadu by Thakur (1981) but does not mention about its occurrence in Uttar Pradesh, Maharashtra and Andhra, even though he was a co-author in the publication of Sen-Sarma, et al. *Odonototermes lokanandi*

has been reported by Thakur (1981) from Himachal Pradesh, Uttar Pradesh and Jammu and Kashmir and is also reported from Pakistan and Bangladesh by Chaudhry, et al. (1972), Akhtar (1974a, 1975), etc.

Since these two species i.e. *bellahunisensis* and *guptai* (= *lokanandi*) are very close to each other there has been confusion in the distribution due to wrong determinations. In my opinion the species *bellahunisensis* occurs in Peninsular India whereas *guptai* in the northern and north-eastern parts of the subcontinent including Pakistan and Bangladesh.

These remarks apply to *O. guptai* infra, also.

229. *Odontotermes bhagwatii* Chatterjee and Thakur

(Figs. 216, 217)

Odontotermes bhagwatii Chatterjee and Thakur :

1967. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **11** (1) : 6, 33-35, Pls. 3 and 4. S and W. Holotype : S, in FRI. Type-locality : Pathankot, Panjab, India.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 1, 16, 40, 55, 65.
1976. Thakur, *Indian Forester*, **102** (8) : 500, 502, 503.
1977. Chhotani, *Rec. zool. Surv. India*, **72** : 373-376. Imago described.
1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 4, 11, 13, 25-30, Pls. 7, 50, 51. Synonymy, description, etc.

IMAGO (Fig. 216) : Head-capsule reddish brown to dark brown; antennae, labrum and postclypeus brownish, paler than head; pronotum and legs a little paler than head; abdominal tergites brownish, a little paler than postclypeus; sternites yellowish brown; wings pale brown. Head and body densely hairy. Total body-length with wings 22.5-26.75, without wings 10.0-13.5 mm. Head-capsule subcircular, wider than long (length to base of mandibles 1.67-1.83, width with eyes 2.15-2.40 mm); epicranial sutures indistinct. Fontanelle minute, point-like, slightly raised; small area around fontanelle and a little area in front of it paler. Eyes roundly suboval (max. diameter 0.55-0.60, min. diameter 0.48-0.53 mm); situated obliquely and slightly above the lower margin of head (distance between eye and lower margin of head 0.10-0.17 mm). Ocelli oval, moderately large (long diameter 0.23-0.33, short diameter 0.15-0.23 mm); separated from eyes by about short diameter (0.15-0.20 mm). Antennae

19-segmented; segments 3-5 short and subequal, shorter than 2. Postclypeus swollen, hairy; a little shorter than 1/2 of its width (length 0.43-0.53, width 0.93-1.03 mm). Pronotum subtrapezoidal, with a T shaped, paler marking in middle and shoulder spots (length 1.10-1.25, width 1.83-2.30 mm); anterior margin slightly incurved and with a prominent, median notch; posterior margin convex, weakly emarginate medially. Mesonotum and metanotum deeply notched posteriorly. Wings pale brownish; radial-streak separating from radius from proximal third to

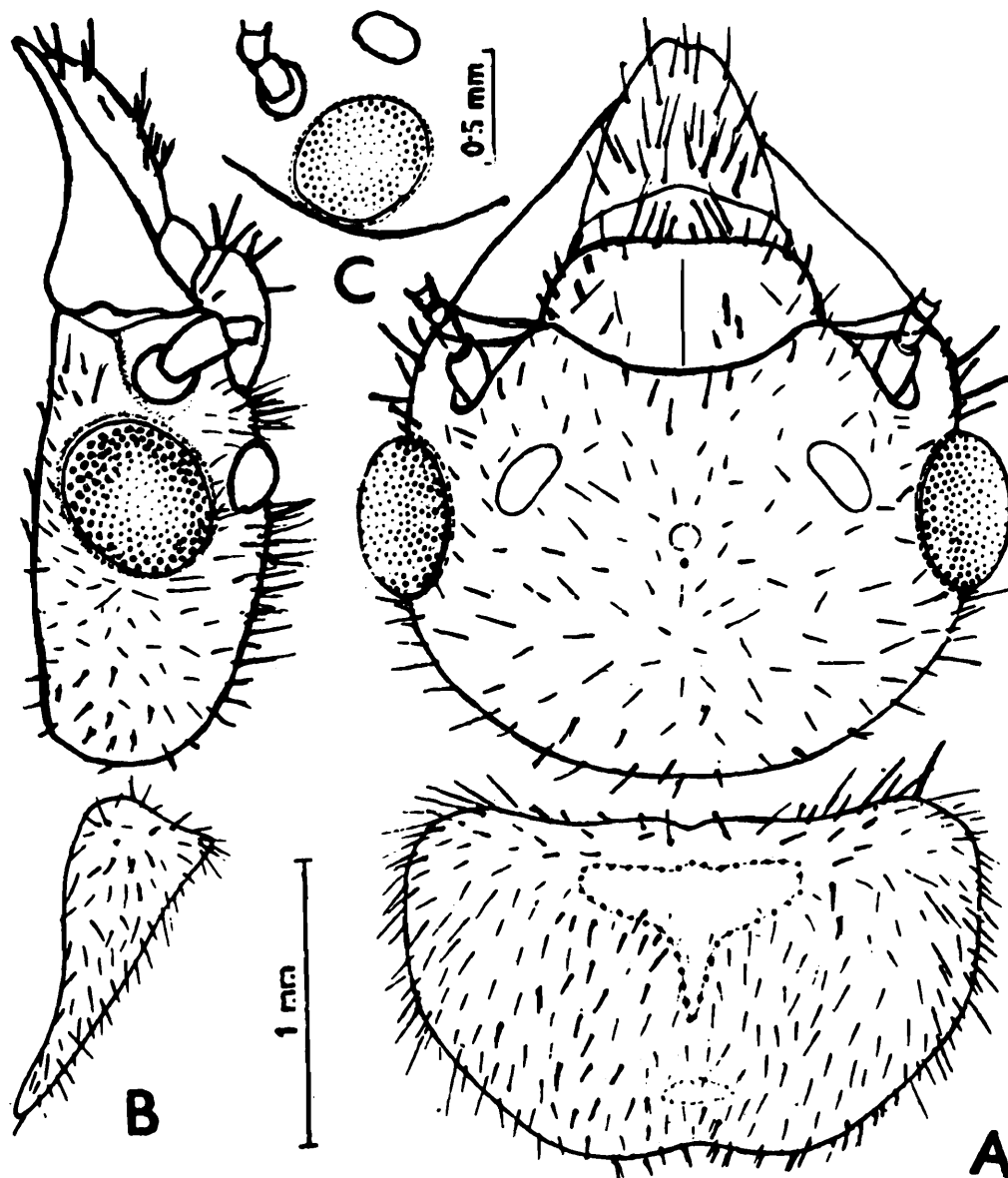


Fig. 216 : *Odontotermes bhagwati*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Part of head, showing situation of eye, ocellus and antenna. (After Chhotani, 1977a)

middle of membrane; forewing-length 21.2-23.10, hindwing-length 19.2-22.0 mm.

SOLDIER (Fig. 217) : Head-capsule pale yellow to yellowish brown; antennae uniformly coloured, paler than head; mandibles pale reddish brown to dark brown. Head sparsely and body fairly densely hairy. Total body-length 4.25-7.70 mm. Head-capsule subrectangular, wider posteriorly (length to base of mandibles 1.25-1.75, max. width 1.10-1.38 mm, index width/length 0.73-0.87). Antennae 15 to 17-segmented; segment 2 equal to 3 + 4 combined, 4 shortest. Labrum tongue-shaped; anteriorly narrowed to a pointed tip. Mandibles sabre-shaped, a little longer than half of head-length (length 0.80-1.02 mm, index left mandible-length/head-length 0.55-0.66); left mandible with a small tooth, situated a little above basal one third (tooth index i.e. tooth-distance from tip/mandible-length 0.51-

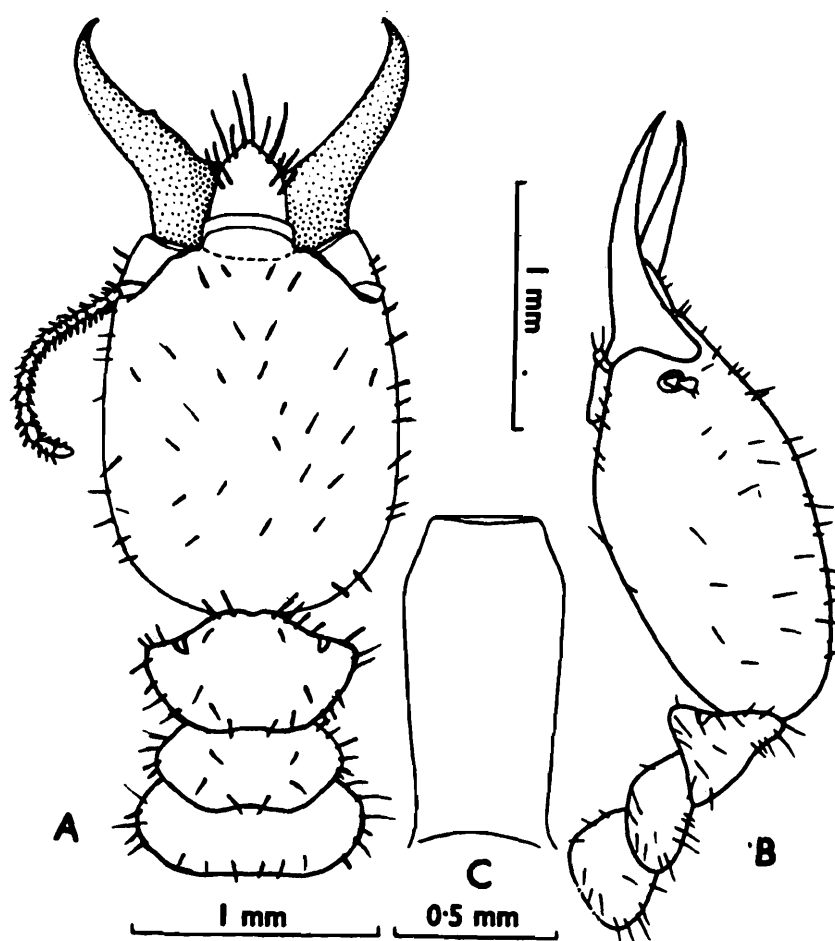


Fig. 217 : *Odontotermes bhagwati*. Soldier. (A) Head and thorax in dorsal view. (B) Same, side view. (C) Postmentum.

0.58); right mandible without any tooth. Postmentum subrectangular (length 0.80-1.15, width 0.50-0.60 mm); sides behind widest point (at distal 1/4) substraight. Pronotum saddle-shaped (length 0.45-0.60, width 0.83-0.98 mm); anterior margin distinctly notched; posterior margin weakly to distinctly emarginate. Mesonotum narrower and metanotum wider than pronotum; both substraight at posterior margin.

WORKER : Dimorphic. *Worker major* : Head-capsule yellow to yellowish brown; thorax and abdomen pale yellow. Head and body fairly densely hairy. Total body-length 3.9-5.0 mm. Head-capsule subcircular (length to base of mandibles 1.15-1.35, max. width 1.20-1.48 mm). Antennae with 17 segments; segment 2 equal to 3 and 4 combined together; 3 slightly shorter than 4. Postclypeus swollen, hairy; length less than 1/2 of its width. Pronotum strongly saddle-shaped; anterior margin round and deeply notched; posterior margin broadly depressed or emarginate. *Worker minor* : Resembles worker major except for its smaller size and 15 to 16-segmented antennae. Total body-length 2.9-3.6, length of head to base of mandibles 0.70-0.85, max. width of head 0.80-0.95, length of pronotum 0.30-0.35, width of pronotum 0.50-0.55 mm.

Distribution : INDIA : Jammu & Kashmir, Panjab, Uttar Pradesh, Madhya Pradesh and Karnataka states.

230. *Odontotermes boveni* Thakur

(Fig. 218)

Odontotermes boveni Thakur :

1976. Thakur, *Indian Forester*, **102** (8) : 500, 502. (Nom. nud.)

1981. Thakur, *Indian For. Rec (N.S.) Ent.*, **14** (2) : 4, 12, 30-33, Pls. 8, 9, 50, 51. S and W. Holotype : S, in FRI. Type-locality : Gwaldam, Garhwal, Uttar Pradesh, India.

1982. Verma and Thakur (R.K.), *Rec. zool. Surv. India*, **79** : 314.

IMAGO : Unknown.

SOLDIER (Fig. 218) : Head-capsule yellowish to dark rust brown; antennae uniformly pale yellow and labrum pale yellowish brown; mandibles reddish brown; thorax and abdomen creamy yellow. Head sparsely and body densely hairy. Total body-length 4.5-6.00 mm. Head-capsule oval, a little longer than wide (head-length to base of mandibles

1.30-1.53, max. width 1.15-1.33, width at base of mandibles 0.68-0.85 mm, index max. width/length 0.85-0.98, index width at base of mandibles/max. width 0.59-0.66). Antennae with 15-16 segments; in 15-segmented antennae, segment 3 shortest, 4 a little longer than 3; in 16-segmented ones, segment 2 equal to 3 + 4 and 4 shortest. Mandibles short, thick and stout; much shorter than head (length 0.73-0.80 mm, index left mandible-length/head-length 0.52-0.60); left mandible with a sharp, acute tooth at apical third (index tooth-distance/mandible-length 0.31-0.35); right mandible with a small, rudimentary tooth a little below level of tooth in left mandible. Postmentum swollen and arched at middle (length 0.75-0.88, max. width 0.53-0.63 mm, index width/length 0.68-0.78). Pronotum saddle-shaped; anterior lobe triangular and deeply notched medially; posterior margin weakly to markedly emarginate medially. Mesonotum a little narrow and metanotum a little wider than pronotum; both substraight at posterior margin.

WORKER : Monomorphic. Head yellowish brown to pale brownish; antennae uniformly coloured yellowish; labrum, postclypeus and body

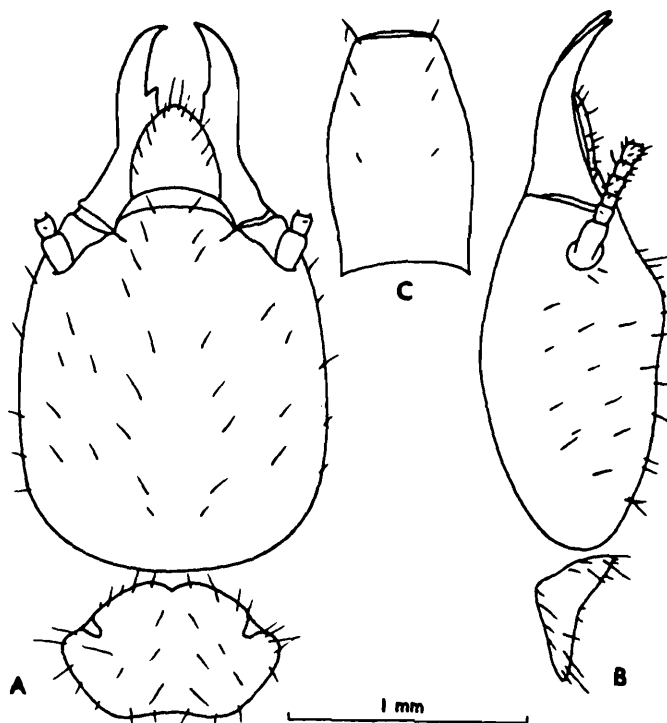


Fig. 218 : *Odontotermes boveni*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

yellowish. Head fairly and body fairly densely hairy. Total body-length 3.5-4.6 mm. Head-capsule subcircular (length to base of mandibles 1.0-1.20, max. width 1.13-1.35 mm). Antennae 15-17 segmented. Postclypeus swollen, hairy; length much less than half of width (length 0.20-0.23, width 0.60-0.65 mm). Pronotum saddle-shaped (length 0.35-0.40, width 0.58-0.65 mm); anterior margin weakly to deeply notched; posterior margin substraight, sometimes weakly emarginate medially.

Distribution : INDIA : Uttar Pradesh and Madhya Pradesh. NEPAL (Danda Pakhar, 1600-2500 m, present record).

231. *Odontotermes brunneus* (Hagen)

(Synonym : *Odontotermes mathadi* Roonwal and Chhotani)

(Figs. 219, 220)

1. *Termes brunneus* Hagen :

1858. Hagen, *Linn. Ent.*, **12** : 133-135. Im, S(?). Holotype : Im, in Museum Berlin. Type-locality : Bengal, India.

2. *Odontotermes brunneus* (Hagen) :

1981. Thakur, *Indian For. Rec. (N. S.) Ent.*, **14** (2) : 10, 12, 33-37. Synonymy, descriptions, etc.

1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 201, 206.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 95, 165, 174-176.

1987. Bose and Das, *Fauna of Orissa-State Fauna Sr. 1* : 105, 110

1989. Verma, *Indian J. Forestry*, **12** (4) : 298, 299.

3. *Odontotermes mathadi* Roonwal and Chhotani :

1964. Roonwal and Chhotani, *Beitr. Ent.*, **14** : 45-48.

IMAGO (Fig. 219) : Head-capsule dark reddish brown to blackish brown; antennae and postclypeus yellowish brown; pronotum of same colour as head and with a T-shaped mark centrally and two oval, shoulder spots; wings yellowish brown; abdominal tergites slightly paler than head and sternites yellowish brown. Head and body rather densely hairy. Total body-length with wings 27.0-29.0, without wings 13.0-14.6 mm. Head-capsule subcircular (length to base of mandibles 1.65-1.90, max. width with eyes 2.50-2.81 mm). Fontanelle minute, slightly raised. Eye moderately large, subcircular (max. diameter 0.65-0.70, min. diameter 0.63-0.65 mm). Ocelli oval (long diameter 0.30-0.35, short diameter 0.18-

0.20 mm); separated from eyes by almost half of long diameter or slightly less than short diameter. Antennae with 20 segments; segment 3 shorter than 2 or 4; 5 shortest. Postclypeus swollen, length a little less than half of width. Pronotum subtrapezoidal (length 1.25-1.35, max. width 1.95-2.60 mm); anterior margin slightly raised, with a weak median notch; posterior margin medially emarginate. Wings long and narrow; forewing 25.0 mm long; radial streak separating at about proximal third.

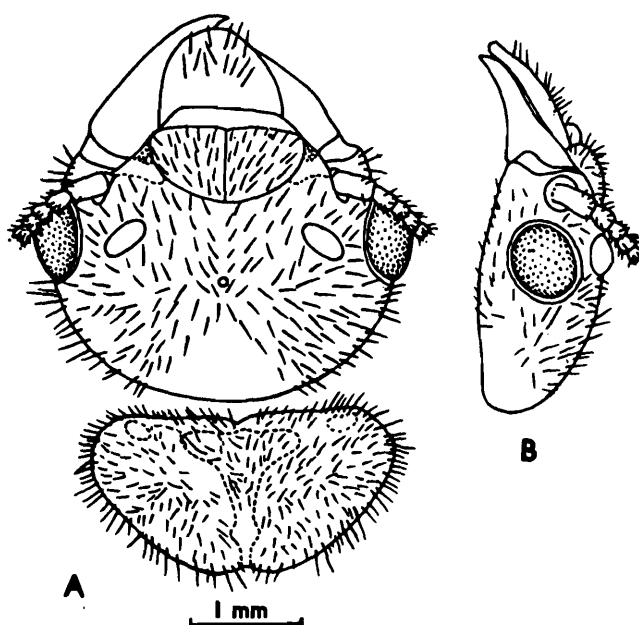


Fig. 219 : *Odontotermes brunneus*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view.

SOLDIER (Fig. 220) : Head-capsule pale brown to reddish brown; antennae brown, darker distally; labrum and body rusty yellow. Head-capsule fairly and body densely hairy. Total body-length 5.0-7.0 mm. Head-capsule subrectangularly oval, very slightly converged in front of antennae (length to base of mandibles 1.50-2.0, max. width 1.28-1.50 mm, index width/length 0.75-0.87). Antennae with 17 segments; segment 3 shortest; 4 shorter than 2; 5 shorter than 4. Labrum tongue-shaped, with rounded anterior margin. Mandibles thick, stout and short; strongly incurved anteriorly (length 0.90-1.10 mm); shorter than head (index mandible-length/head-length 0.56-0.62). Left mandible with a large, prominent tooth below distal third (tooth-distance 0.33-0.45, index tooth-distance/mandible-length 0.34-0.42). Right mandible with a small tooth

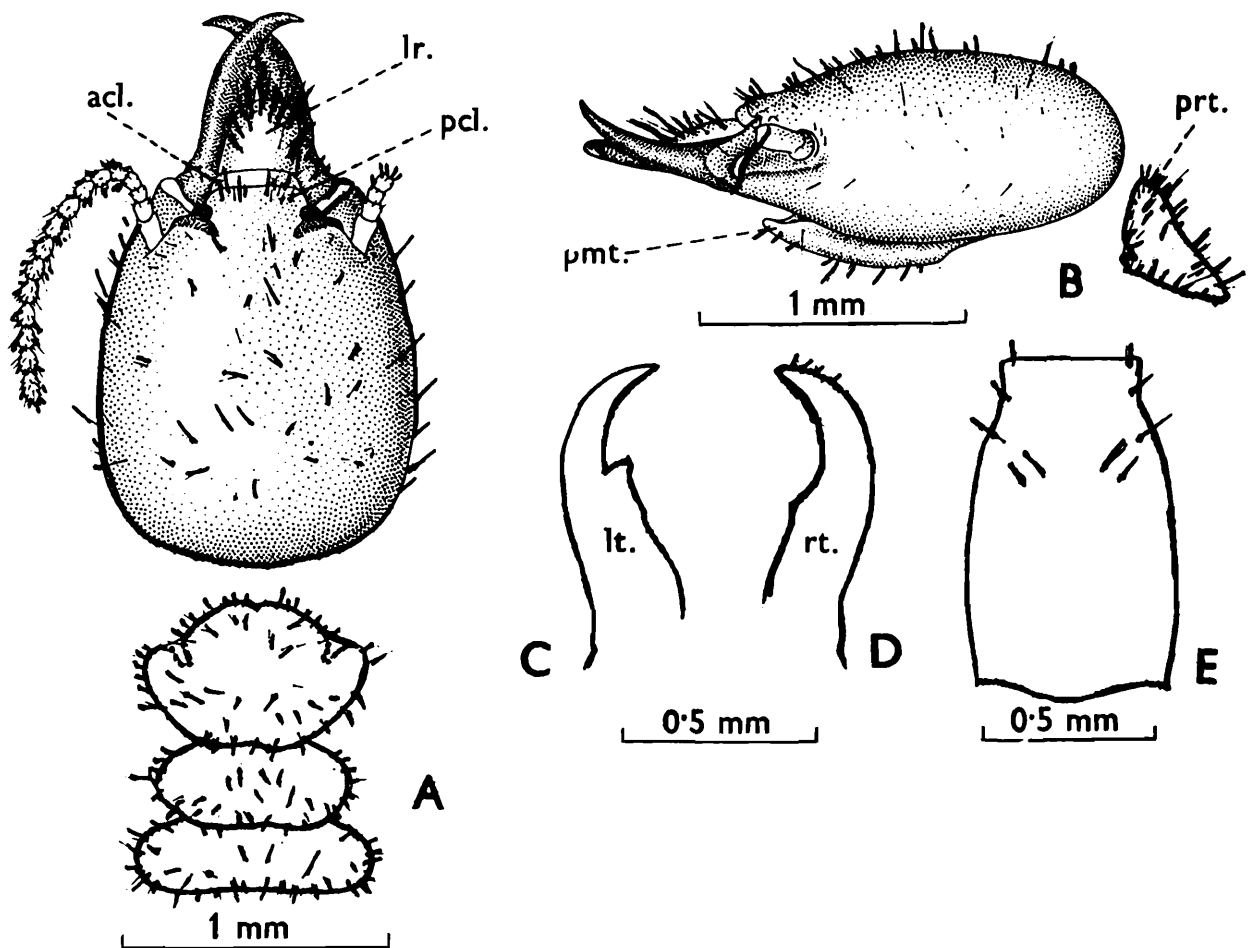


Fig. 220 : *Odontotermes brunneus*. Soldier. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (C) and (D) Left and right mandibles, respectively. (E) Postmentum.

situated almost at middle. Postmentum subrectangular (length 0.95-1.20, max. width 0.50-0.60 mm). Pronotum saddle shaped; anterior margin strongly notched and posterior margin weakly to deeply emarginate medially.

WORKER : Dimorphic. *Worker major* : Head-capsule pale brownish yellow; postclypeus and labrum yellowish; antennae yellowish brown, paler basally. Head and body fairly densely hairy. Total body-length 4.8-5.6 mm. Head-capsule subsquarish (length to base of mandibles 1.25-1.45, max. width 1.45-1.60 mm). Antennae with 17-19 segments; size of basal segments variable; 3 or 4 shortest. Postclypeus swollen, length a little less than half of width. Pronotum as in soldier (length 0.45-0.53, width 0.80-0.88 mm). *Worker minor* : Similar to worker major but for

smaller size and 16 to 17-segmented antennae. Total body-length 3.6-4.5, length of head to base of mandibles 0.75-0.88, max. width of head 0.93-1.00, length of pronotum 0.40-0.45, width of pronotum 0.65-0.70 mm.

Distribution : INDIA : Widely distributed in southern states; also Gujarat, Maharashtra, Orissa and Uttar Pradesh.

Biology : Roonwal (1973, 1978a) has described 5 types of mounds of this species and it has also been collected from soil under cowdung, from bark of trees and from under dead-leaves. It is reported to damage crops of groundnut and maize and also structural wood in Andhra Pradesh (Reddy and Sammaiah, 1991).

232. *Odontotermes ceylonicus* (Wasmann)

(Synonym : *Odontotermes meturensis* Roonwal and Chhotani)

(Figs. 221,222)

1. *Termes ceylonicus* Wasmann :

1902. Wasmann, *Zool. Jb. Syst.*, **17** (1) : 112-113. S and W. Lectotype : S, in NHM, Maastricht. Type-locality. Nalanda, Sri Lanka.

2. *Odontotermes (Odontotermes) ceylonicus* (Wasmann) :

1958. Ahmad, *Biologia*, Lahore, **4** : 113-114.

3. *Odontotermes ceylonicus* (Wasmann) :

1967. Roonwal and Chhotani, *Zool. Anz.*, **178** : 243-244. Table 1. Wing microsculpture.

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14**(2) : 4, 10, 13, 38-42. Synonymy, descriptions, etc. Lectotype designated.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 95, 164, 167, 176-179. Treats *O. meturensis* Roonwal & Chhotani as a synonym.

4. *Odontotermes meturensis* Roonwal and Chhotani :

1959. Roonwal and Chhotani, *Sci. & Cult.*, **25**(5) : 325-326.

1960. Roonwal and Chhotani, *Indian J. agric. Sci.*, **29** (4) : 62-68.

1964. Roonwal and Chhotani, *Beitr. z. Ent.*, **14** (1/2) : 48-50. Im described.

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 5, 90-92.

IMAGO (Fig. 221) : Head-capsule reddish brown to castaneous brown, paler around fontanelle; antennae, postclypeus and body yellowish brown,

paler than head; pronotum with a paler T-shaped marking in middle, shoulder spots and two spots posteriorly in middle; wings brownish. Head and body fairly densely hairy. Total body-length with wings 27.0-30.50, without wings 12.0-15.20 mm. Head-capsule subcircular (length to base of mandibles 1.75-2.0 mm, width with eyes 2.50-2.66 mm). Fontanelle minute, point-like, slightly raised. Eyes medium sized, subcircular (max. diameter 0.60-0.70, min. diameter 0.55-0.60 mm). Ocelli broad, oval (long diameter 0.23-0.30, short diameter 0.18-0.20 mm); separated from eyes by their short diameter to slightly less than their long diameter (eye-ocellus distance 0.20-0.28 mm). Antennae 19-segmented; segment 2 a little longer than half of 1; 3 shortest and 4 either subequal to or slightly larger than 5. Postclypeus swollen, hairy; length about half width (length 0.50, width 1.0-1.10 mm, index length/width 0.45-0.50). Pronotum subtrapezoidal, narrower than head (length 1.35-1.50, width 2.33-2.58 mm); anterior margin slightly concave and with a weak median notch;

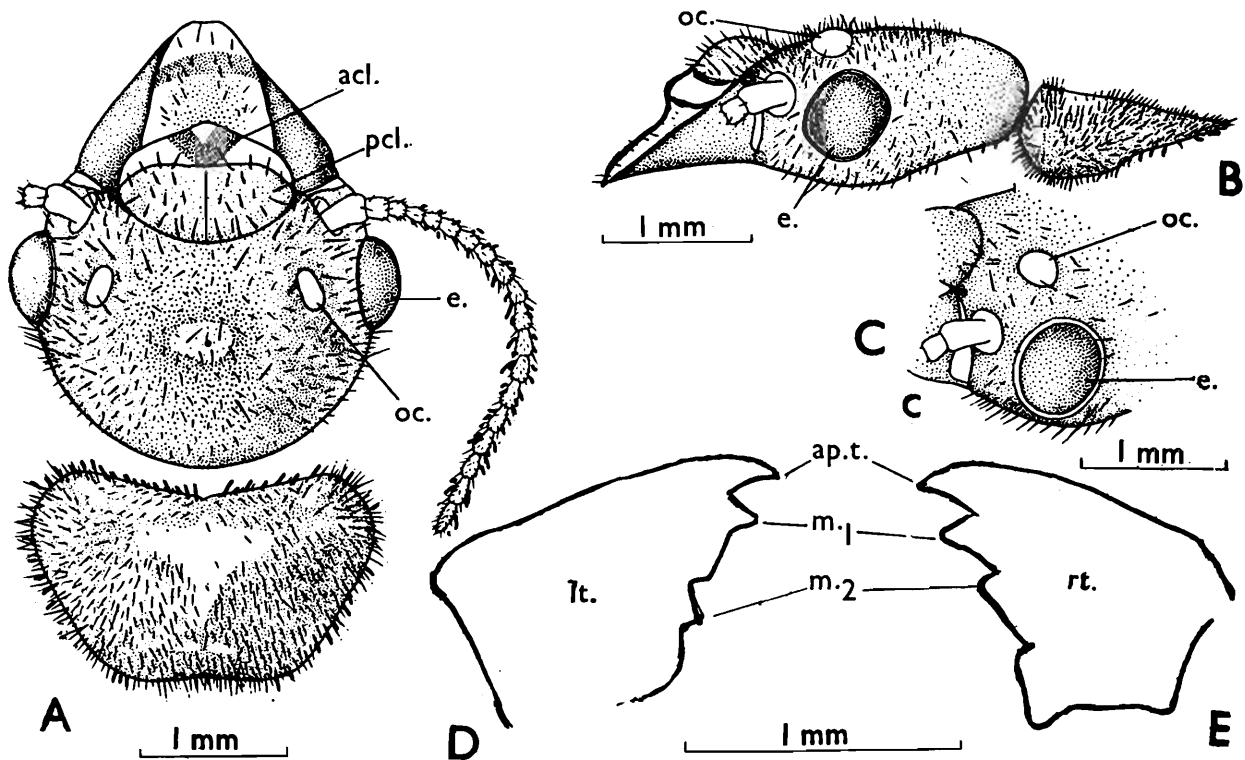


Fig. 221 : *Odontotermes ceylonicus*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Part of head, showing positions of eye, ocellus and antenna. (D) and (E) Left and right mandibles, respectively.

posterior margin weakly convex and medially faintly emarginate. Wings brownish (forewing-length 25.50, hindwing-length 24.0-24.6 mm). Wing microsculpture consists of thin, substraight to weakly curved *obesus*-type rods; radial streak separating from radius at about proximal third.

SOLDIER (Fig. 222) : Types examined. Head-capsule yellowish to brownish yellow; antennae uniformly yellow; mandibles blackish brown, basally dark brown; body whitish to pale yellow. Head sparsely and body densely hairy. Total body-length 5.0-7.4 mm. Head-capsule subrectangular, sides substraight or faintly convex and very slightly converged in front of antennae (length to base of mandibles 1.75-2.15, max. width 1.30-1.55, width at base of mandibles 1.20-1.45 mm, index max. width/length 0.68-0.77 and index width at base of mandibles/ max. width 0.71-0.79). Antennae with 16 (sometimes 17) segments; segment 4 shortest in 16-segmented antennae and 3 in 17-segmented ones. Labrum subtriangular, with tip somewhat pointed. Mandibles strong, stout, sabre-shaped,

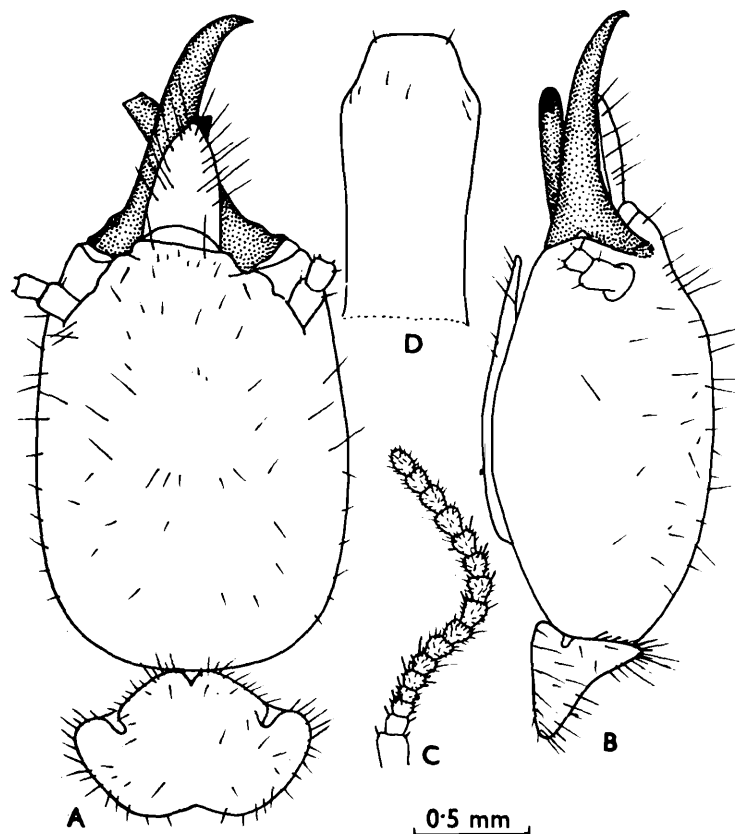


Fig. 222 : *Odontotermes ceylonicus*. Soldier (Lectotype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Antenna. (D) Postmentum.

incurved at tips (length 1.08-1.23 mm); less than 2/3 of head-length (index mandible-length/head-length 0.55-0.65). Left mandible with a large, sharp, pointed tooth at middle making an angle of about 90° (tooth-distance 0.50-0.60, index tooth-distance/mandible-length 0.44-0.50). Right mandible with a rudimentary tooth at middle. Postmentum long, subrectangular (length 1.15-1.43, max. width 0.45-0.55 mm). Pronotum saddle-shaped, anterior and posterior margins deeply emarginate in middle (length 0.50-0.70, width 0.95-1.20 mm).

WORKER : Dimorphic. *Worker major* : Head-capsule yellow; antennae and labrum paler; body and legs whitish to pale yellow. Head-capsule moderately and body thickly hairy. Total body-length 4.20-5.40 mm. Head-capsule subcircular, broadest at base of antennae (length to base of mandibles 1.20-1.38, max. width 1.45-1.60 mm). Antennae with 17 segments, segment 3 shortest. Postclypeus weakly swollen, hairy, length less than half width. Pronotum saddle-shaped, anterior margin much upturned and deeply notched; posterior margin substraight, weakly depressed medially (length 0.40-0.48, width 0.70-0.85 mm), Mesonotum narrower and metanotum wider than pronotum; posterior margin of former weakly emarginate and substraight in latter. *Worker minor* : Similar to worker major but smaller in size. Total body-length 3.0-4.0, length to base of mandibles 0.70-0.93, max. width 0.85-1.10, length of pronotum 0.33-0.40, max. width of pronotum 0.57-0.70 mm.

Distribution : INDIA : Karnataka, Tamil Nadu and Kerala states in southern India. SRILANKA.

233. *Odontotermes distans* Holmgren and Holmgren

(Fig. 223)

1. *Odontotermes (Cyclotermes) distans* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. agric. Sci.*, **5**(3) : 153. Im only.
Lectotype : Im, in IARI. Type-locality : Kedar Rocks, Shevaroy Hills, Tamil Nadu, India.
1975. Roonwal, *Zool. Jb. Syst.*, **103** : 490, 491. Is *parvidens*.
1976. Thakur, *Indian Forester*, **102** (8) : 500, 502, 503. See synonymy part dealing with *O. distans* only.
1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 446. Is *parvidens*.

1981. *Thakur, *Indian For. Rec. (N.S.) Ent.*, 14 (2) : 10,12,44-50. See synonymy part dealing with *O. distans* only.

1984. Verma. *Indian J. Forestry*, 7 (4) : 307, 309, 311, 313. Is *parvidens*

IMAGO (Fig. 223) : Head-capsule and pronotum dark chestnut brown; antennae and postclypeus brownish yellow; pronotum with a yellowish T-shaped mark and shoulder spots; meso- and metanotum paler than pronotum; abdomen above dark chestnut brown and much paler below; wings brownish. Head and body moderately pilose with long and short hairs. Head-capsule subcircular, with eyes broader than long (length to base of mandibles 1.80, max. width with eyes 2.52mm[†]). Fontanelle minute, slightly raised. Eyes subcircular (max. diameter 0.60, min. diameter 0.53 mm[†]). Ocelli oval (long diameter 0.19 mm[†]); separated from eyes by a distance more than its long diameter (0.28 mm[†]). Antennae with 19 segments; segment 2 longer than 3; 4 as long as 3; 5 shortest. Postclypeus

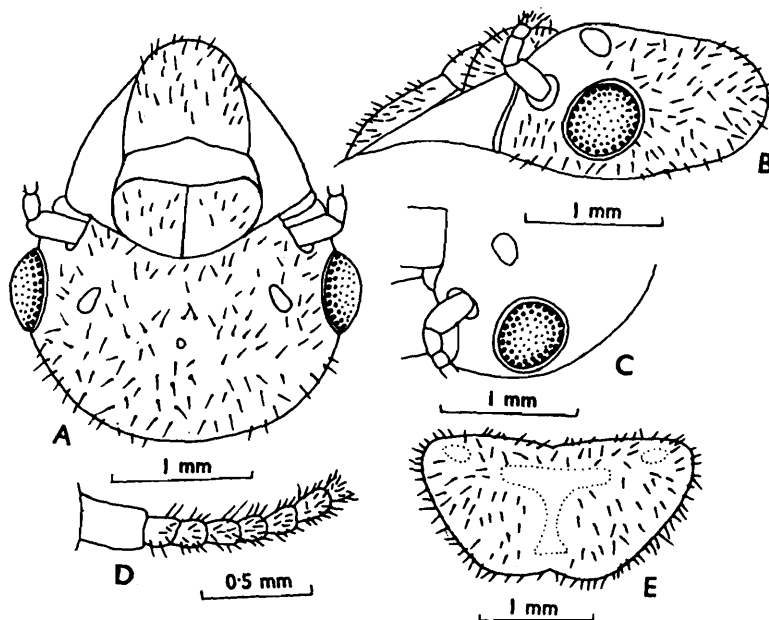


Fig. 223 : *Odontotermes distans*. Imago.(A) Head, dorsal view. (B) Head, side view. (C) Part of head showing position of eye, ocellus and antenna. (D) Basal part of antenna. (E) Pronotum. (Ex Thakur, 1981)

* Treats *almorensis* and *parvidens* as synonyms but *parvidens* and *distans* are treated separately here.

† Calculated from drawings of cotype given by Thakur 1981; head-width 2.02 mm as given by Holmgren and Holmgren 1917 appears to be wrong.

length less than 1/2 width; anteriorly straight and posteriorly subrounded. Pronotum subtrapezoidal (length 1.28, width 2.44 mm[†]; anterior margin weakly indented in middle; posterior margin broadly indented. Wings long, narrow; forewing-length 24.0 mm.

Distribution : INDIA : Tamil Nadu (Kediar rocks, Shevaroy Hills, about 4000 ft., type-locality). Known only from the type-locality.

Remarks : Bose, 1984 (pp. 167-168) has treated the species *O. distans* and *O. parvidens* separately as two distinct valid species, whereas Thakur (1981), treats *O. parvidens* as a synonym of *distans*. On review of the present position, I agree with the contention of Bose (1984) that the species *distans* is restricted to southern India and *parvidens* to the northern and north-eastern parts of the Indian subcontinent. The imago of *distans*, however, is very close to that of *parvidens* except that the forewing is a little shorter.

234. *Odontotermes escherichi* (Holmgren)

(Fig. 224)

1. *Termes Escherichi* Holmgren :

1911. Holmgren, In Escherich's *Termitenleben auf Ceylon* : 195-196. S and W. Syntypes probably in Riksmus., Stockholm. Type-locality : Hantana near Peradeniya, Sri Lanka.

2. *Odontotermes (Odontotermes) escherichi* Holmgren :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 226. Synonymy.

1958. Ahmad, *Biologia*, Lahore, **4** : 109.

IMAGO : Unknown.

SOLDIER (Fig. 224) : Description and measurements taken from Holmgren 1911, 1913 and Ahmad, 1958. Head yellow; mandibles brown, basally yellow; antennae uniformly coloured, not darker distally. Head very sparsely hairy, with thin hairs; thorax and abdomen moderately thickly hairy with somewhat longer hairs at distal end of abdomen. Total body-length 3.0-3.5 mm. Head oval, slightly narrowed anteriorly and moderately strongly arched (length with mandibles 1.7-1.82, length without mandibles 0.98-1.17, width 0.98-1.10 mm). Antennae with 16 segments; segment 2 equal to 3 + 4; 3 longer than 4 and subequal to 5. Labrum oval. Mandibles sabre-shaped, incurved; left mandible (length 0.67 mm)

with a sharp tooth at beginning of distal third (tooth distance 0.15 mm). Right mandible with a minute tooth, slightly more posteriorly located than that of left. Postmentum moderately strongly arched, hardly longer than wide; widest in middle (length 0.70, width 0.49 mm.). Pronotum slightly saddle-shaped, with large anterior lobe; narrower than head (length 0.39, width 0.72-0.80 mm); anterior and posterior margins weakly emarginate.

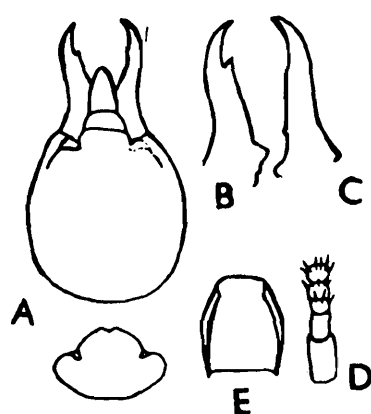


Fig. 224 : *Odontotermes escherichi*. Soldier. (A) Head and pronotum, dorsal view. (B) and (C) Left and right mandibles, respectively. (D) Antenna. (E) Postmentum.

WORKER : Head pale yellowish; body whitish. Head somewhat more hairy otherwise hairiness as in soldier. Total body-length 3.0 mm. Head rounded posteriorly, with sides slightly diverging anteriorly; longer than broad, flatly arched (length 1.48, width 1.24 mm.). Antennae long, 17-segmented; segment 2 longer than 3. Postclypeus slightly swollen; shorter than half of width. Pronotum saddle-shaped, with a large anterior lobe; anteriorly and posteriorly very weakly emarginate (width 0.65 mm).

Distribution : SRI LANKA

235. *Odontotermes feae* (Wasmann)

(Synonym : *Odontotermes indicus* Thakur)

(Figs. 225, 226)

1. *Termes feae* Wasmann :

1896. Wasmann, *Ann. Mus. Stor. Nat. Genova*, (2) 16 (36) : 625, 626. S

and W. Holotype : S, in Natural History Museum, Maastricht. Type-locality : Carin Cheba, Burma. Type examined.

2. *Odontotermes feae* (Wasmann) :

1912. Holmgren, *J. Bombay nat. Hist. Soc.*, **21**(3) : 786, 787.

1991. Roonwal and Verma, *Occ. Pap. Rec. zool. Surv. India*, No. 129 : See for detailed synonymy, description, etc. Treat *O. indicus* as a synonym.

3. *Odontotermes indicus* Thakur :

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 70-75.

IMAGO (Fig. 225) : Head castaneous brown to deep reddish brown; postclypeus and legs rusty yellow, paler than head; antennae pale reddish brown; pronotum brownish, paler than head; with yellowish T-shaped mark and shoulder spots; mesonotum paler than pronotum; abdominal tergites brown, sternites pale yellow. Head and pronotum moderately and abdomen densely hairy. Total body-length with wings 24.0-25.5, without wings 13.75-15.20 mm. Head-capsule subcircular, much wider

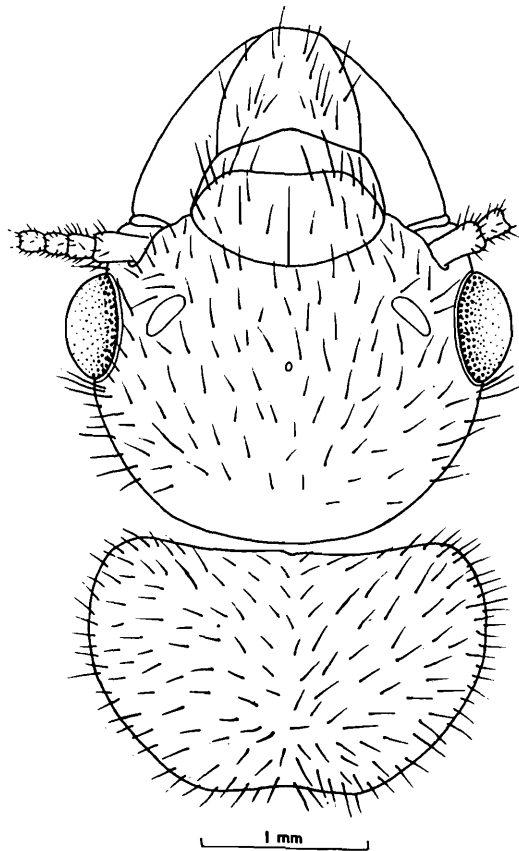


Fig. 225 : *Odontotermes feae*. Imago. Head and pronotum, in dorsal view.

than long (length to tip of labrum 2.95-3.40, length to base of mandibles 1.65-2.20, width with eyes 2.65-2.90 mm). Fontanelle small, minute, slightly raised from head-surface and situated at mid-dorsum. Eyes subcircular, moderately large (max. diameter 0.65-0.78, min. diameter 0.58-0.78 mm). Ocelli oval, moderately large (max. diameter 0.30-0.38, min. diameter 0.18-0.26 mm); from eyes situated at about their short diameter (0.18-0.26 mm). Antennae with 19 segments; segment 3 shorter than 2 or 4, subequal to 5. Postclypeus hairy, greatly swollen; length about half of its width. Anteclypeus subtrapezoidal with anterior margin projected in front medially. Labrum subsquarish, hairy; hairs longer near anterior margin. Pronotum trapezoidal, narrower than head; anterior margin slightly raised and with a weak, median notch; posterior margin also weakly incurved medially (length 1.30-1.48, width 2.30-2.60 mm). Wings hairy all over especially on margins and pale brown. Venation generally as in genus; media in wings with 6-7 main branches, some of which branching further and cubitus with 8-10 main branches. Length of forewing 21.0-23.0, of hindwing 19.5-21.0 mm. Microsculpture consists of papillae and rods; papillae pointed, in 8-10 rows on anterior margin (size $4-12 \mu\text{m} \times 4-8 \mu\text{m}$, density 7605-9126/mm²) and in 6-7 rows on posterior margin ($4-10 \mu\text{m} \times 4-6 \mu\text{m}$, density 7098-8112/mm²); rods thick, length 8-15 μm , density 5070-6084/mm².

SOLDIER (Fig. 226) : Type examined. Head-capsule yellow to reddish brown; antennae, labrum and legs paler; mandibles blackish, basally reddish brown; thorax and abdomen creamy yellow to pale rusty yellow. Head and body moderately hairy. Total body-length 6.5-9.0 mm. Head-capsule subrectangular, longer than wide (length to base of mandibles 2.25-3.10, max. width 1.80-2.50 mm); widest in posterior region, width more than 3/4 of length; sides gradually narrowed in front, sometimes almost subparallel. Antennae with 17 segments; segment 3 shortest; 4 longer than 5. Postclypeus indistinctly marked from frons; anteclypeus whitish, narrow, apilose, strip-like. Labrum tongue-shaped, narrowed in front to a pointed tip. Mandibles stout, strong, sabre-shaped; a little longer than half of head-length (length 1.20-1.65 mm, mandible/head index 0.51-0.59). Left mandible with a medium sized tooth near middle (tooth-index 0.50-0.55, angle of tooth variable from either right angle to a little less. Right mandible with a minute tooth at basal third.

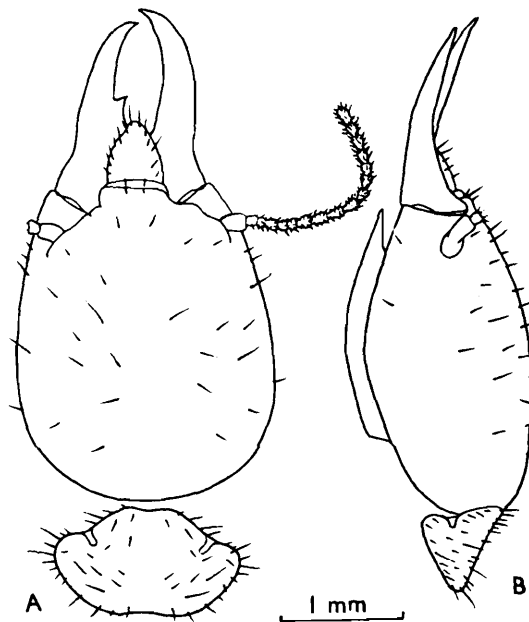


Fig. 226 : *Odontotermes feae*. Soldier (Type). (A) Head and pronotum, dorsal view. (B) Same, side view.

Postmentum subrectangular, somewhat swollen near basal third (length 1.30-2.0, max. width 0.73-0.93 mm). Pronotum saddle-shaped (length 0.75-1.00, width 1.40-1.83 mm); anterior margin with a weak median notch; posterior margin weakly to deeply notched. Mesonotum and metanotum with substraight posterior margin.

WORKER : Dimorphic. *Worker major* : Head-capsule pale yellow to rusty yellow; antennae paler; thorax, abdomen and legs creamish yellow. Head moderately and body fairly hairy. Total body-length 5.0-6.5 mm. Head-capsule subsquarish, a little wider than long; sides subparallel, widest at base of antennae (length to tip of labrum 2.05-2.50, length to base of mandibles 1.50-1.85, max. width 1.68-2.10 mm). Fontanelle plate small, rounded. Antennae with 19 segments, 3 and 4 subequal, 5 shortest. Postclypeus weakly swollen, length less than half of width, hairy; anteclypeus subtrapezoidal, hyaline, with anterior margin projected medially. Labrum dome-shaped. Pronotum as in soldier (length 0.48-0.65, width 0.85-1.20 mm). Legs and abdomen as in soldier. *Worker minor*. As worker major but smaller in size (total body-length 3.5-4.70, head-length to tip of labrum 1.70-2.0, head-length to base of mandibles 1.10-1.48, max. width of head 1.15-1.50, pronotum-length 0.35-0.53, pronotum-width 0.58-0.90 mm).

Distribution : INDIA : Recorded from almost all over the country. Also NEPAL, BHUTAN, BANGLADESH, SRI LANKA, BURMA, THAILAND and VIETNAM. For detailed distribution vide Roonwal and Verma, 1991.

Biology : The species *O. feae* is of great economic importance and causes destruction to wood-work in houses and buildings and has been reported as pest of a number of crops, orchard and forest trees and plantation crops such as tea and eucalyptus. The nests of this species are generally underground but it has been reported to construct mounds sometimes (Roonwal and Chhotani 1962a, 1966a from India; Chaudhry, et al. 1972 from Bangladesh; Ahmad, 1965 from Thailand). Recently Bose (1992b) has reported a curious behaviour of mound construction by this termite from inside huts under cover of roof in Manipur, India. The swarming is reported from June to November and seems to vary with geographical location. Roonwal and Verma (1991) give a detailed account of its habits and habitat, swarming, nesting-behaviour, predators, inquiline, etc.

236. *Odontotermes feaeoides* Holmgren and Holmgren

(Fig. 227)

1. *Odontotermes (Odontotermes) feaeoides* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. agric. Sci. India (Ent.)*, 5(3) : 156-157. S and W. Lectotype : S, in Riksmus., Stockholm. Type-locality : Margalli Estate, Coorg, Karnataka. Paralectotypes in AMNH and ZSI examined.

2. *Odontotermes feaeoides* Holmgren and Holmgren :

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, 14 (2) : 3, 4, 13, 53-55. Synonymy, description, etc.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 95, 167, 181-183.

IMAGO : Unknown.

SOLDIER (Fig. 227) : Paralectotype examined. Head-capsule yellowish brown; antennae and labrum paler than head; mandibles dark brown, paler basally; thorax and abdomen deep straw yellow. Head scantily and pronotum and body moderately hairy. Total body-length 6.0-6.5 mm. Head-capsule subrectangular (length to base of mandibles 2.0-2.10, max. width 1.53-1.63 mm); width about 3/4 of length, index width/length 0.75-0.78;

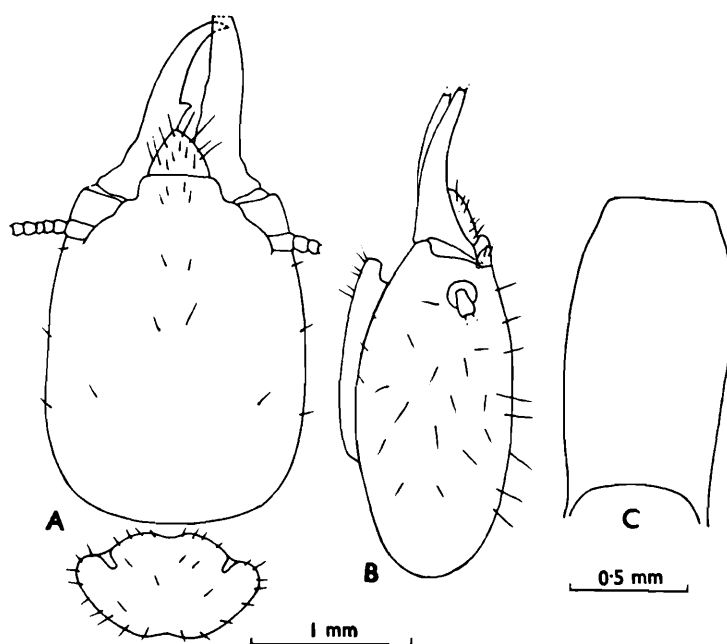


Fig. 227 : *Odontotermes feaeoides*. Soldier (Paralectotype). (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Postmentum.

sides subparallel, slightly converging in anterior one-third (width at base of mandibles 1.15 mm, index width at mandible-base/max. width 0.73); frons weakly sloping in front. Antennae 16-segmented; segment 3 shorter than 2; 4 shortest. Labrum subtriangular, with a sharp tip (length 0.30, width 0.40 mm). Mandibles sabre-shaped and strong (length 1.15-1.22 mm); a little longer than half of head-length, index mandible-length/head-length 0.585). Left mandible with a laterally directed tooth in middle third a little above middle, not at upper edge of basal third as mentioned by Holmgren and Holmgren, 1917 and Thakur, 1981 (index tooth-distance from tip/mandible-length 0.43). Right mandible with a rudimentary tooth in middle-third. Postmentum subrectangular, sides faintly convex (length 1.20, max. width 0.66 mm). Pronotum saddle-shaped (length 0.60-0.68, width 1.10-1.22 mm); anterior margin convex and markedly notched medially; posterior margin convex and prominently emarginate medially. Mesonotum narrower than pronotum and posteriorly with a median depression; metanotum as wide as or slightly narrower than pronotum, posteriorly straight.

WORKER : Head-capsule pale yellow to yellowish brown; antennae and postclypeus paler than head; thorax and abdomen creamish yellow.

Head and body moderately hairy. Total body-length 3.5-4.4 mm. Head-capsule subcircular, broader than long (length to base of mandibles 1.25-1.40, width 1.35-1.53 mm). Antennae 17-segmented; segment 3 subequal to or shorter than 4; 5 shortest or subequal to 3. Postclypeus swollen hairy; length less than 1/2 of width. Pronotum saddle-shaped; anterior margin convex, with a distinct notch (faintly incised according to Holmgren and Holmgren 1917); posterior margin weakly convex, with a weak depression medially (length 0.40-0.55, width 0.75-0.84 mm). Mesonotum narrower than pronotum (0.70 mm wide), medially notched at posterior margin; metanotum wider than pronotum (0.88-0.90 mm wide) and straight at posterior margin.

Distribution : INDIA : Karnataka (Margalli Estate, Coorg, type-locality), known only from the type-locality.

237. *Odontotermes ganpati* Bose

(Fig. 228)

Odontotermes ganpati Bose :

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER (Fig. 228) : Head yellowish brown to brown; antennae uniformly pale brown; mandibles dark brown, basally yellowish brown; pronotum, mesonotum and metanotum yellowish with brown patches; body and legs creamish yellow. Head moderately and body and legs fairly densely hairy. Total body-length c 6.10-6.40 mm. Head-capsule broadly oval, a little longer than wide (length to base of mandibles 1.78-1.87, max. width 1.55-1.65 mm, index width/length 0.829-0.90); sides converging in front, width at base of mandibles (1.00-1.03 mm) a little less than 2/3 of max. width (index 0.624-0.645). Antennae with 17 segments, segment 3 shortest, 4 longer than 5. Postclypeus faintly demarcated from frons, with one long hair on either side; anteclypeus hyaline, apilose, trapezoidal. Labrum broad tongue-shaped, anterior margin round; with 2 pairs of hairs on anterior margin and 3 or 4 pairs of somewhat shorter hairs on body. Mandibles thick, stout and short; a little longer than half of head-length (length 1.03-1.10 mm, index left mandible-length/head-length 0.546-0.59). Left mandible with a prominent, acute angled tooth at distal third

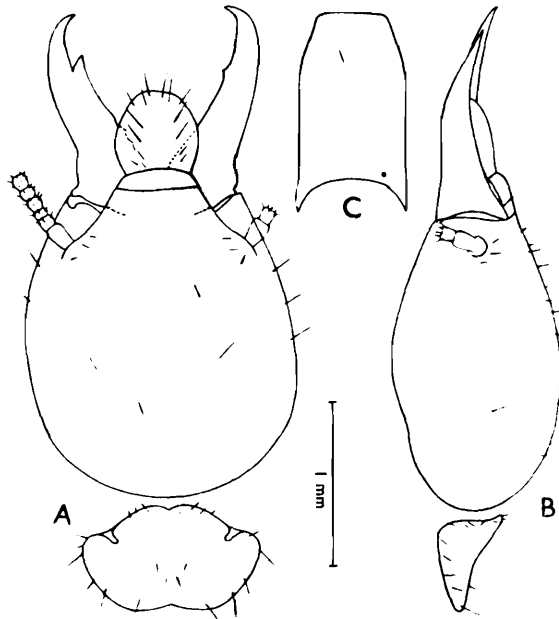


Fig. 228 : *Odontotermes ganpati*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

(tooth-distance from tip 0.30-0.35 mm, index tooth-distance/mandible-length 0.28-0.32). Right mandible with a minute tooth a little below distal third of mandible. Postmentum subrectangular, sides weakly convex; anterior margin straight (length 1.00-1.08, max. width 0.58-0.60, width at anterior margin 0.35-0.38 mm). Pronotum saddle-shaped (length 0.55-0.65, width 1.00-1.08 mm); anterior margin deeply notched medially; posterior margin weakly incurved. Mesonotum narrower and metanotum wider than pronotum; both weakly incurved at posterior margin. Legs and abdomen as in genus.

WORKER : Unknown.

Distribution : INDIA : Assam : Mesamari Tea Estate, type-locality; known only from the type-locality.

238. *Odontotermes giriensis* Roonwal and Chhotani

(Figs. 229, 230)

Odontotermes giriensis Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 289, 296, 341-345, pls. 28, 29. S, W. Holotype : S, in ZSI. Type-locality : Rongrengiri, Garo Hills, Meghalaya, India.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 47.
 1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 70, 79-81.
 1975. Sen-Sarma, et al. *Wood destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A 7-FS-58) : 14, 41, 56.
 1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 6, 25-26, 32, 50.
 1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 4, 11, 55-59, 154.
 1984. Verma, *Indian J. For.*, **7**(4), 307.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. (Im described).

IMAGO (Fig. 229) : Head dark reddish brown; antennae, postclypeus and legs brownish yellow; pronotum slightly paler than head, with a pale T-shaped mark and shoulder spots; abdominal tergites pale reddish brown, sternites paler; wings pale brown. Head and body densely hairy; wings hairy along margins and weakly so in distal half. Total body-length with wings c 27.0-28.0, without wings 10.30-10.60 mm. Head-capsule

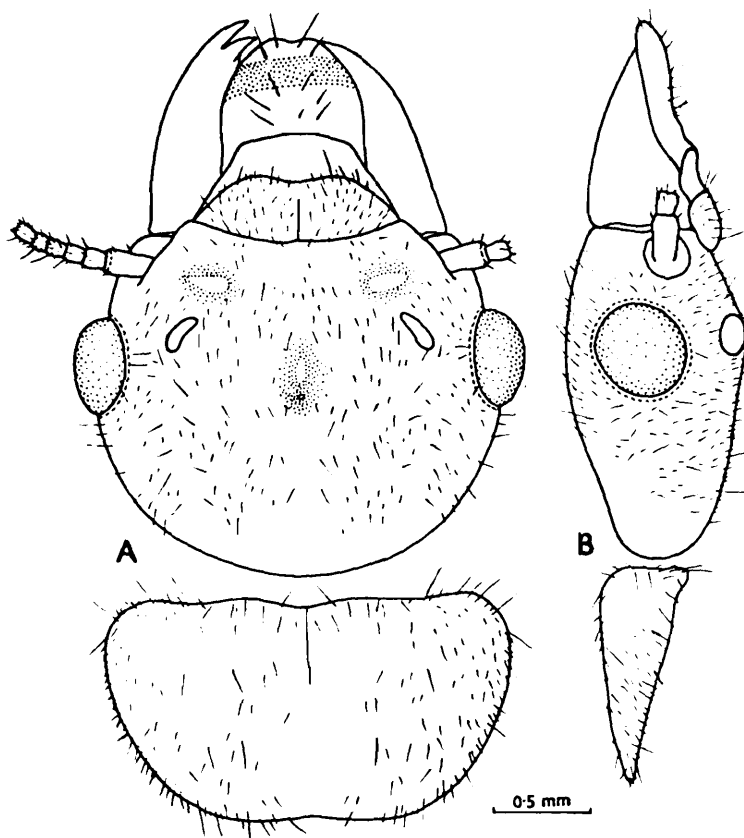


Fig. 229 : *Odontotermes giriensis*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (After Bose, In press)

subcircular, depressed in region of fontanelle (length to base of mandibles 1.80-1.90, max. width 2.30-2.40 mm). Fontanelle minute, situated medially. Eyes subcircular, slightly longer than wide (max. diameter 0.53-0.55, min. diameter 0.45-0.50 mm). Ocelli broadly oval (max. diameter 0.23-0.25, min. diameter 0.20 mm); separated from eyes by about their long diameter (eye-ocellus distance 0.25-0.32 mm) and also by same distance from antennae (ocellus-antennal distance 0.26-0.33 mm). Antennae with 19-20 segments; segment 3 slightly smaller than 2; 4 slightly smaller than 3 and 5 slightly shorter than 4 and shortest. Postclypeus weakly swollen, hairy; length much less than width (length 0.30-0.35, width 0.90-0.95 mm). Labrum and mandibles as in genus. Pronotum narrower than head (length 1.20-1.25, width 2.13-2.15 mm); anterior margin weakly incurved medially; posterior margin weakly invaginated. Mesonotum and metanotum broadly and angularly invaginated posteriorly. Wings long (forewing-length 23.5-24.0 and hindwing-length 22.5-23.5 mm.). Venation as in genus; media and cubitus coming out of scale jointly in forewing and media from radius in hindwing; radial streak separating from radius at about middle of wing membrane.

SOLDIER (Fig. 230) : Head-capsule yellow to dark brown; antennae yellowish brown to brown and getting darker distally; mandibles dark

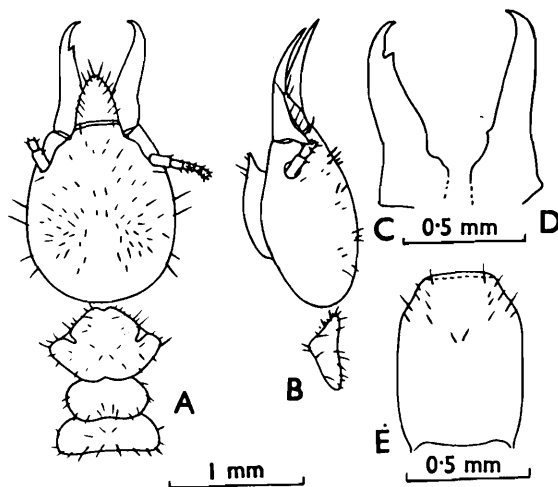


Fig. 230 : *Odontotermes giriensis*. Soldier. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (C) and (D) Left and right mandibles, respectively. (E) Postmentum.

brown, paler proximally; thorax, legs and abdomen pale yellow to pale brownish, pronotum slightly darker. Head and thorax moderately and body fairly densely hairy. Total body-length c 3.75-5.5 mm. Head-capsule oval, longer than broad; sides convex, narrowed anteriorly (head-length to base of mandibles 1.13-1.30, max. width of head 1.00-1.20, width of head at base of mandibles 0.85-1.03 mm, index width at mandible base/max. width 0.56-0.61). Antennae with 15-16 segments; segment 3 equal to 2; 4 large, subdivided in 15-segmented one and shortest in 16-segmented antennae. Labrum tongue-shaped, narrowed in front into a pointed tip. Mandibles long, sabre-shaped, weakly incurved at tip; shorter than head-capsule (length 0.63-0.76 mm, index mandible-length/head-length 0.50-0.60). Left mandible with a sharp tooth at about distal fourth (tooth distance from tip 0.15-0.20 mm, index tooth-distance/mandible-length 0.21-0.27). Right mandible with a minute tooth at about same level as the tooth in left mandible. Postmentum subrectangular (length 0.70-0.85, width 0.50-0.60 mm); sides abruptly converging in distal fourth (width at anterior margin 0.30-0.35 mm). Pronotum saddle-shaped (length 0.45-0.60, width 0.73-0.93 mm); anterior lobe fairly narrowed in front and with a prominent median notch anteriorly; posterior margin convex, with a weak median notch. Mesonotum narrower and metanotum as wide as or slightly wider than pronotum; posterior margin of former weakly notched or depressed and that of latter substraight or weakly concave. Legs and abdomen as in genus.

WORKER : Dimorphic. *Worker major* : Head-capsule pale yellow to yellow; antennae yellowish, darker distally; pronotum, legs and abdomen paler than head. Head and body densely hairy. Total body-length 4.0-5.0 mm. Head-capsule subcircular (length to base of mandibles 1.18-1.35, width 1.30-1.50 mm). Antennae with 17-18 segments; segment 3 shorter than 2; in 17-segmented antennae 4 subequal to 3 and 5 shortest, in 18-segmented ones 4 shortest. Postclypeus swollen, hairy, length a little less than half of width. Pronotum saddle-shaped; deeply notched medially at anterior margin and posterior margin weakly incurved; length 0.35-0.50, width 0.65-0.75 mm. Mesonotum weakly incurved and metanotum substraight at posterior margin, otherwise as in soldier. Labrum, mandibles, legs and abdomen as in genus. *Worker minor* : Similar to worker major only that it is smaller and has 16-segmented antennae with segment 4 shortest. Total body-length 3.10-3.40, length of head to

base of mandibles 0.70-0.80, max. width of head 0.83-0.95, pronotum-length 0.35-0.45 and max. width of pronotum 0.58-0.65 mm.

Distribution : INDIA : Assam, Meghalaya, Arunachal Pradesh, Tripura, Manipur, Orissa and Uttar Pradesh. BANGLADESH.

239. *Odontotermes globicola* (Wasmann)

(*Synonyms* : *Odontotermes roonwali* Bose and *Termes (Termes) dehraduni* Snyder)

(Figs. 231, 232)

1. *Microtermes globicola* Wasmann :

1902. Wasmann, *Zool. Jb. Syst.*, **17**(1) : 116-117. S and W. Holotype : S, in NHM, Maastricht. Type-locality : Anuradhpura, Sri Lanka. Type examined.

1964. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (11) : 220, 221, 222, 223-225, 250. See for Synonymy, description, etc.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 203.

2. *Odontotermes globicola* (Wasmann) :

1987. Chhotani and Bose, *Bull. zool. Surv. India*, **8**(1-3) : 61, 62, 63, 64, figs. 1 and 2 [fig. 1. is that of type soldier of *O. globicola* (= *M. globicola* Wasmann) wrongly mentioned as that of *O. mycophagus* (Wasmann)]. Transfer the species to *Odontotermes* and treat *O. roonwali* as synonym of *globicola*.

3. *Odontotermes roonwali* Bose :

1975. Bose, *Orient. Insects*, **9**(2) : 157-161.

1984. Bose. *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 97, 164, 195-197.

1987. Chhotani and Bose, *Bull. zool. Surv. India*, **8**(1-3) : 63, 64. Treat as a synonym of *O. globicola* (Wasmann)

4. *Termes (Termes) dehraduni* Snyder (New synonymy) :

1933. Snyder, *Proc. U.S. natn. Mus.*, **82** (6) : 6-7.

5. *Odontotermes dehraduni* Snyder :

1989. Verma, *Indian J. Forestry*, **11** (4) : 310-315. See for detailed synonymy, description, etc.

IMAGO (Fig. 231) : Syntypes of *O. dehraduni* examined. Head-capsule yellowish brown to castaneous brown; antennae, labrum, postclypeus and

pronotum yellowish brown, paler than head; pronotum with a T-shaped mark medially and an ocellus-like spot on antero-lateral corners; wings pale brown. Head and body densely hairy with short and long hairs. Total body-length with wings 24.0-26.5, without wings 12.5-14.0 mm. Head-capsule subcircular (length to base of mandibles 1.50-1.80, max. width with eyes 2.14-2.40 mm). Fontanelle small, slightly raised; a small, suboval, raised spot in front of it present. Eyes large subcircular (max. diameter 0.65-0.70, min. diameter 0.55-0.65 mm); well projecting out and larger comparative to head than in other species. Ocelli large, oval (long diameter 0.30-0.38, short diameter 0.23-0.28 mm); lying very close to eyes, eye-ocellus distance (0.08-0.10 mm) about 1/3 short diameter.

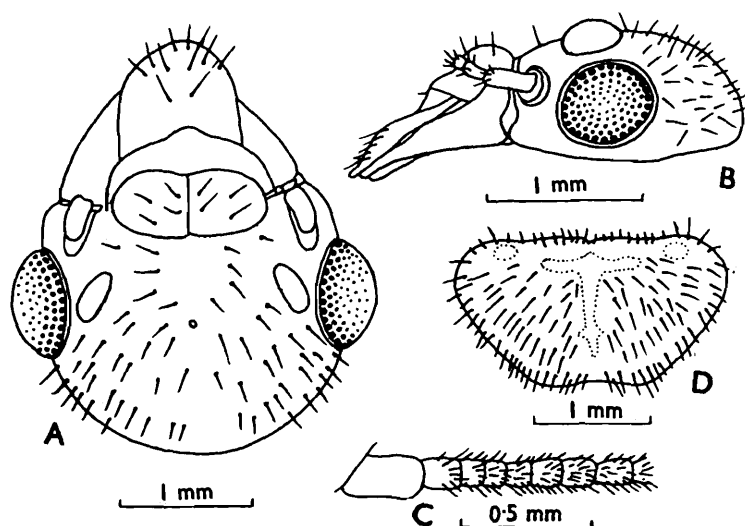


Fig. 231 : *Odontotermes globicola*. Imago. Syntype of *Termes (Termes) dehraduni*. (A) Head, dorsal view. (B) Same, side view. (C) Antenna, basal part. (D) Pronotum. (Ex Thakur, 1981).

Antennae with 19 segments; segments 3, 4 and 5 subequal. Postclypeus weakly swollen; length less than half of its width (length 0.39-0.40, width 0.86-0.90 mm). Pronotum subtrapezoidal (length 1.03-1.20, max. width 1.95-2.13 mm); anterior margin with a weak median notch; posterior margin with a weak median depression. Wings long, narrow, shorter than in other species (length : forewing 20.0-21.3 mm); radial streak separating from radius at proximal third.

SOLDIER (Fig. 232) : Type examined. Head-capsule yellowish to dark golden brown; antennae yellowish to brownish, paler than head and paler

apically; mandibles dark brown, paler basally; body whitish to pale yellow. Head sparsely and body moderately hairy. Total body-length 3.0-4.0 mm. Head-capsule roundly oval, converging anteriorly; widest behind middle (length to base of mandibles 0.90-1.03, max. width 0.83-0.95, width at mandible-base 0.53-0.58 mm, index max. width/length 0.86-0.94, index width at mandible-base/max. width 0.61-0.618). Antennae 15 to 16-segmented; segment 2 equal to 3 + 4, the latter shortest; in type soldier (antennae broken) segment 3 shortest, 4 longer than 5. Postclypeus not well differentiated from frons; with a pair of hairs near distal end. Labrum triangular, pointed in front; longer than wide (length 0.25-0.34, width 0.25-0.34 mm). Mandibles thin, long and slender; straight and weakly incurved near distal end (length 0.60-0.69 mm); shorter than head (index mandible-length/head-length 0.60-0.73). Left mandible with a prominent tooth near tip, tooth distance from tip 0.13-0.15 mm (index tooth-distance/mandible-length 0.21-0.25). Right mandible with a small tooth at about distal third. Postmentum short, broad and arched, sides convex, anteriorly converging (length 0.43-0.60, max. width 0.38-0.40 mm). Pronotum saddle-shaped; weakly to markedly notched at anterior margin; posterior margin slightly emarginate; length 0.38-0.48, width 0.58-0.76 mm. Mesonotum

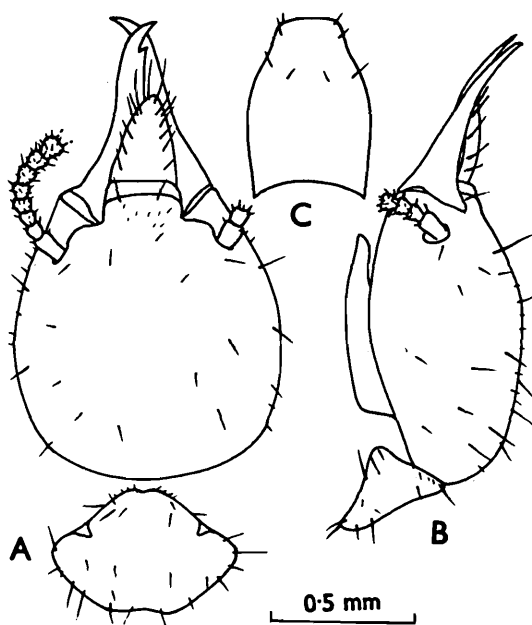


Fig. 232 : *Odontotermes globicola*. Soldier (Type). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

narrower and metanotum as wide as pronotum; the former straight or faintly incurved at posterior margin and latter substraight.

WORKER : Dimorphic. *Worker major* : Head yellow to dark reddish brown; antennae pale brownish yellow, paler basally; body creamish yellow. Head and body fairly densely hairy. Total body-length 3.4-4.1 mm. Head-capsule subcircular (length to base of mandibles 0.95-1.18, max. width 1.0-1.18 mm). Antennae 17-segmented; segment 3 shortest. Postclypeus swollen, hairy; length a little less than to about 1/2 of width. Pronotum saddle-shaped (length 0.30-0.40, width 0.50-0.63 mm.); anterior margin distinctly notched; posterior margin weakly emarginate. *Worker minor* : Similar to worker major except for smaller size. Total body-length 2.7-3.2, length of head to base of mandibles 0.60-0.88, max. width of head 0.68-0.88, length of pronotum 0.25-0.33, width of pronotum 0.48-0.53 mm.

Distribution : INDIA : Karnataka, Tamil Nadu, Kerala, Uttar Pradesh, Jammu and Kashmir, and Rajasthan states. Also SRI LANKA and PAKISTAN.

240. *Odontotermes gravelyi* Silvestri

(Fig. 233)

Odontotermes gravelyi Silvestri :

1914. Silvestri, *Rec. Indian Mus.*, **8** : 428-430. S and W. Lectotype (designated here) : S, in ZSI. Type-locality : Sukli, East side of Dawna Hills, Lower Burma.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 229.

1958. Ahmad, *Biologia*, Lahore, **4** : 112.

IMAGO : Unknown.

SOLDIER (Fig. 233) : Head-capsule and labrum rust coloured; antennae yellowish brown; mandibles blackish, dark brown basally; body creamish yellow. Total body-length 7.5-8.0 mm. Head-capsule large, broad and rectangularly oval; a little longer than wide (length with mandibles 4.8, length without mandibles 3.2-3.25 and max. width 2.6-2.80 mm, width/length index 0.846-0.861); narrowed anteriorly (width at base of mandibles 1.70 mm; convergence index 0.607-0.618) and convex in profile. Fontanelle indistinct. Antennae with 17 segments; segment 2 1/4 longer than 3; and 4 slightly longer than 3 (i.e. 3 shortest); 5 slightly shorter than 4. Labrum tongue-shaped, broadly rounded at anterior margin.

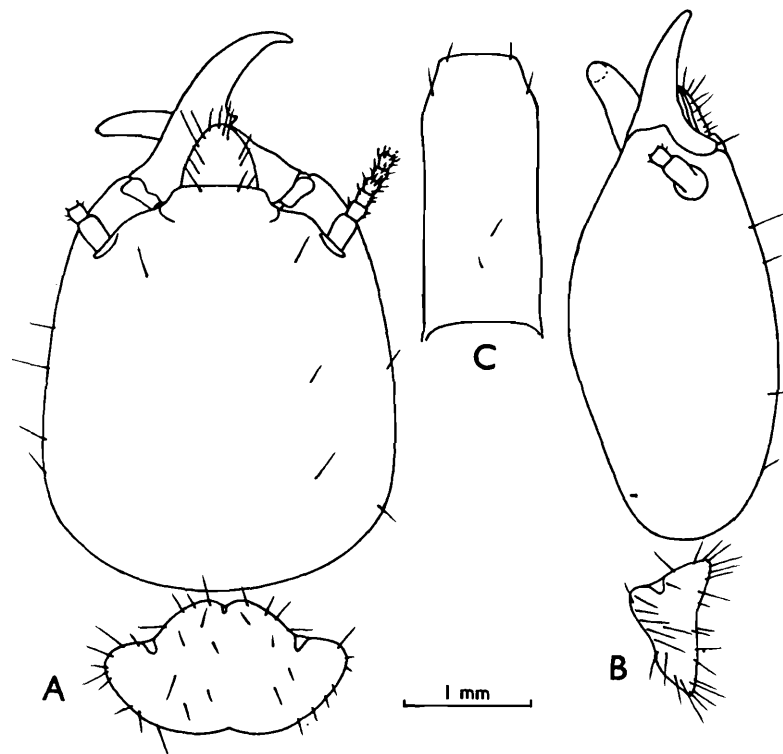


Fig. 233 : *Odontotermes graveleyi*. Soldier (Lectotype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

Mandibles strong, stout and strongly curved anteriorly (length 1.6-1.70 mm). Left mandible with a prominent tooth at mid-point (mandible-length/head-length 0.507-0.523; tooth-distance/mandible-length 0.470-0.473). Postmentum subrectangular (length 2.10-2.13, max. width 0.98-1.0 mm). Pronotum saddle-shaped (length 1.0-1.08, width 1.90-2.0 mm); anterior margin weakly notched medially and posterior margin weakly sinuate. Mesonotum slightly narrower than pronotum and weakly sinuate; metanotum slightly wider than mesonotum.

WORKER MAJOR : Head-capsule reddish yellow; body creamish. Total body-length c 6.0 mm. Head subcircular (width 2.0 mm). Antennae with 19 segments; segment 2 twice as long as 3, 4 a little longer than 3 and thicker. Pronotum saddle-shaped, weakly sinuate at anterior margin.

Lectotype (designated here) : In ZSI there are two soldiers and a worker labelled as "cotype" (syntypes). One of the soldiers is designated as the Lectotype and the remaining syntypes as paralectotypes. The paralectotype soldier has lateral expansions on mesonotum and metanotum. The measurements of the Lectotype are as follows : Total

body-length 7.40, head-length to base of mandibles 3.25, max. head-width 2.75, width of head at mandible base 1.70, length of mandibles 1.70, left mandibular tooth distance from tip 0.80, length of labrum 0.53, width of labrum 0.58, length of postmentum 2.13, max. width of postmentum 1.0, length of pronotum 1.08 and width of pronotum 1.90 mm.

Distribution : BURMA : Sukli, E. side of Dawna Hills, Lower Burma, type-locality). Known only from the type-locality.

241. *Odontotermes guptai* Roonwal and Bose

(Synonym : *O. lokanandi* Chatterjee and Thakur)

(Figs. 234, 235)

1. *Odontotermes bellahunisensis guptai* Roonwal and Bose :

1961. Roonwal and Bose, *J. Bombay nat. Hist. Soc.*, **58**(3) : 588-593. S and W. Holotype : S, in ZSI. Type-locality : Near Gudha Village (Nagaur Dist.), Rajasthan, India.

2. *Odontotermes guptai* Roonwal and Bose :

1975. Roonwal, In : *Environment Analysis of Thar Desert* (Eds Gupta and Prakash) : 409.

1976. Roonwal, *Zool. Jb. Syst.*, **103** : 464, 465, 470, 471, 490, 492.

1976. Verma and Bhargava, *J. Bombay nat. Hist. Soc.*, **73** : 229-230.

1977. Chhotani, *Rec. zool. Surv. India*, **72** : 377.

1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 449.

1982. Verma and Thakur (R.K.), *Rec. zool. Surv. India*, **79** : 314-315.

1984. Verma, *Rec. zool. Surv. India*, **81**(3 & 4) : 349. Is probably wrong determination for *bellahunisensis*.

1985. Verma, *Indian J. Forestry*, **7**(4) : 307.

1989. Verma, *Indian J. Forestry*, **12** (1) : 1, 2, 3, 4.

1989. Verma, *Indian J. Forestry*, **12** (4) : 299.

1990. Akhtar and Shahid, *Proc. Pakistan Congr. Zool.*, **10** : 43-53.

1992. Akhtar, et al. *Pakistan J. Zool.*, **24** : 91, 92, 93.

1992. Shahid and Akhtar, *Pakistan J. Zool.*, **24** : 161-164.

1992. Akhtar, *Proc. 19th int. Congr. Ent.*, (Beijing 1992) : 245.

3. *Odontotermes lokanandi* Chatterjee and Thakur :

1967. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (1) : 38-41.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480) Proj. No. A 17-FS-12) : 28-29, Fig. 32.

1974. Akhtar, *Pakistan J. Zool*, **6** (1 & 2) : 102.
 1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 70, 81-83, 192.
 1976. Thakur, *Indian Forester*, **102** (8) : 501, 502.
 1977. Verma and Thakur (R.K.). *Newsl. zool. Surv. India*, **3**(5) : 262.
 1977. Akhtar, *Biologia*, Lahore, **23** : 173-177.
 1981. Thakur, *Indian For. Rec. (N.S) Ent.*, **14** (2); 5, 11, 84-86, Pl. 30.

IMAGO (Fig. 234) : Description ex Akhtar, 1977 for *O. lokanandi*. Head dark reddish brown, brownish above ocelli; antennae dark brown, brownish yellow basally; postclypeus and labrum brown; pronotum reddish brown with pale (brownish yellow), T-shaped marking medially and ocellus-like shoulder spots; abdominal tergites darker than pronotum, brownish with reddish tinge, sternites brownish yellow; legs light brown. Head and pronotum fairly densely and abdomen densely hairy. Head subcircular (length to tip of labrum 2.73-2.93, length to base of mandibles 1.77-1.92, max. width with eyes 2.31-2.57 mm). Fontanelle small, circular, Eyes large, elongately oval (max. diameter 0.70-0.80, min. diameter 0.61-0.70 mm). Ocelli broadly oval (long diameter 0.38, short diameter 0.25-0.26

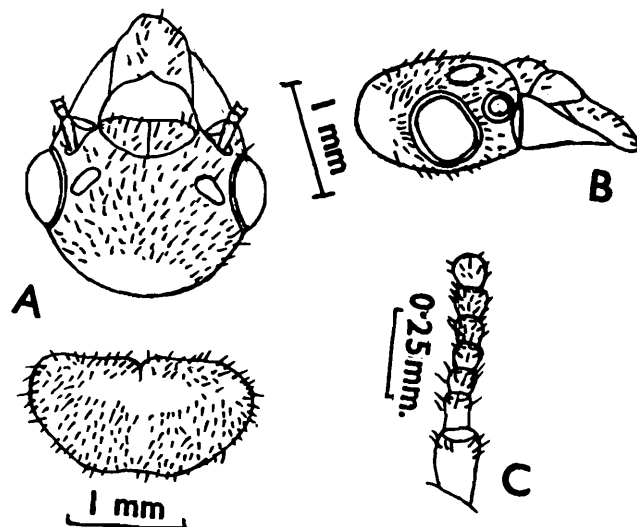


Fig. 234 : *Odontotermes guptai*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Basal part of antenna (Ex Akhtar, 1977, *Biologia* 23).

mm); separated from eyes by $\frac{1}{3}$ short diameter. Antennae incomplete; segment 2 twice as long as 3; 3 and 4 subequal. Postclypeus swollen, hairy; nearly $\frac{1}{2}$ as long as wide (length 0.45-0.49, width 0.93-0.96 mm). Pronotum narrower than head, trapezoidal (length 1.12-1.22, width 2.25-2.31 mm); weakly emarginate both anteriorly and posteriorly.

SOLDIER (Fig. 235) : Head-capsule yellowish brown to dark brown; antennae brownish yellow, paler basally; mandibles reddish brown, paler basally; body yellowish white. Head-capsule broad, oval; little longer than wide (length to base of mandibles 1.0-1.2, max. width 0.95-1.08 mm, index width/length 0.87-0.98); appreciably converging in front (width at base of mandibles 0.58-0.70, index width at mandible base/max. width 0.58-0.64). Antennae 15 to 16-segmented; segment 3 shortest generally,

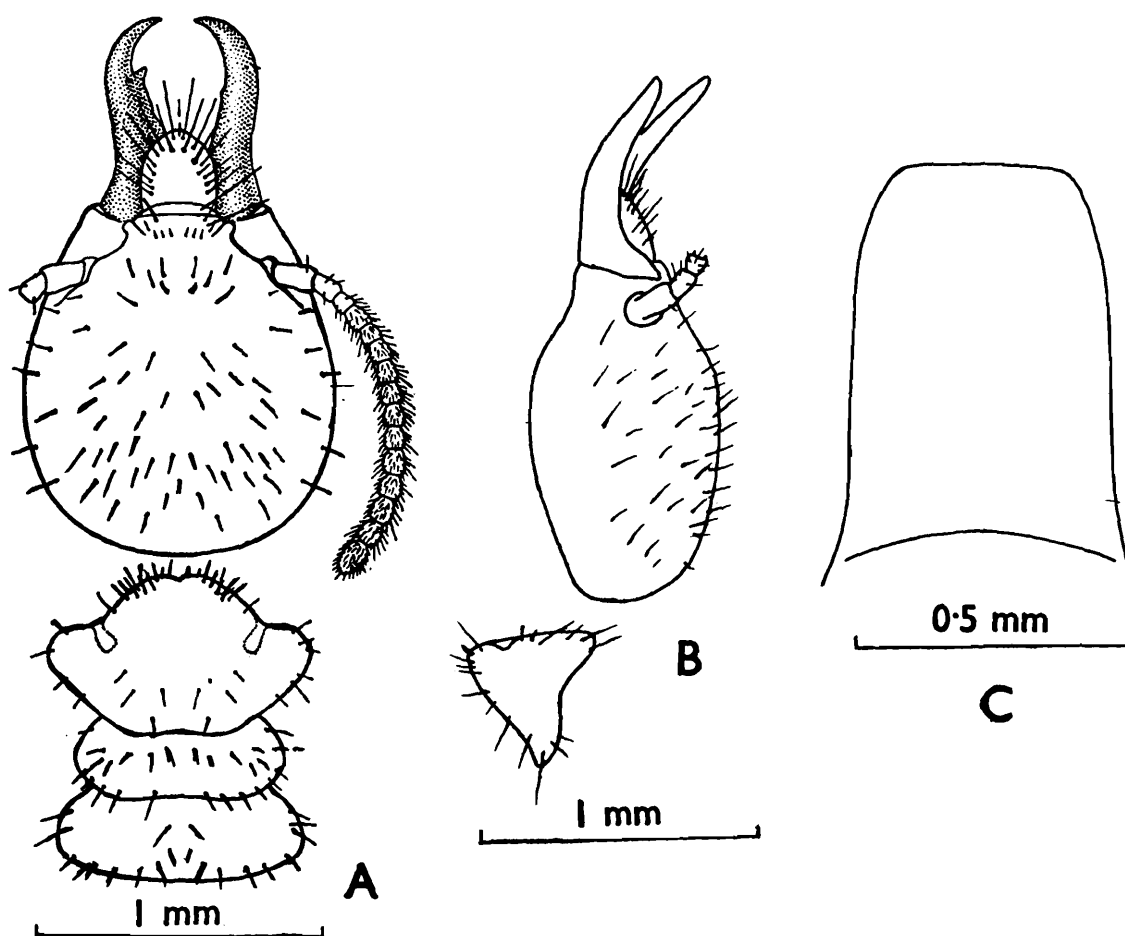


Fig. 235 : *Odontotermes guptai*. Soldier. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (c) Postmentum.

sometimes 4 shortest. Labrum tongue-shaped, apically broadly rounded (length 0.25-0.28, width 0.23-0.28 mm). Mandibles short, stout, strongly incurved apically; length a little more than 1/2 of head-length (length 0.55-0.68 mm, index mandible-length/head-length 0.54-0.63). Left mandible with a prominent tooth a little in front of distal 1/3 of mandible (tooth-distance 0.15-0.20 mm, index tooth-distance/mandible-length 0.26-0.33). Right mandible with a minute tooth a little below distal 1/3. Postmentum a little longer than wide, sides strongly convex (length 0.45-0.65, width 0.38-0.50 mm, index width/length 0.84-0.96). Pronotum saddle-shaped (length 0.45-0.55, width 0.70-0.90 mm); anteriorly weakly notched, posteriorly weakly to appreciably emarginate. Mesonotum a little narrower than pronotum; posteriorly weakly incurving. Metanotum almost as wide as or slightly wider than pronotum; posteriorly substraight.

WORKER : Monomorphic. Head-capsule pale yellowish brown to brown; antennae brownish, paler basally; body yellowish white. Head and body moderately hairy. Total body-length 2.5-4.25 mm. Head-capsule subsquarish (length to base of mandibles 0.98-1.40, max. width 1.08-1.50 mm). Antennae with 16-18 (generally 17) segments. Postclypeus swollen; length a little less than half of width. Pronotum saddle-shaped; anterior margin notched medially and posterior margin weakly incurved (length 0.33-0.53, width 0.53-0.80 mm).

Distribution : INDIA : Northern and North-eastern parts (Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh, Bihar, Assam, Madhya Pradesh). PAKISTAN, BANGLADESH.

Remarks : For status and distribution see under *O. bellahunisensis*, supra.

242. *Odontotermes gurdaspurensis* Holmgren and Holmgren

(Figs. 236, 237)

1. *Odontotermes (Cyclotermes) obesus* f. *gurdaspurensis* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. agric. Sci.*, **5** : 149-150.

Lectotype : S, in IARI. Type-locality : Gurdaspur, Panjab, India.

1955. Ahmad, *Biologia*, Lahore, **1** : 222-224.

1967. Roonwal and Chhotani, *Zool. Anz.*, **178** : 245, 246, Tab. 1

1974. Akhtar, *Pakistan J. Zool.*, **6** (1 & 2) : 101.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A 7-FS-58) : 1, 15, 41, 56, 65.
1976. Verma and Thakur (R.K.), *Indian Acad. Wood Sci.*, **7** : 36-37.
1976. Thakur, *Indian Forester*, **102** (8) : 500, 502, 503.
1976. Roonwal, *Zool. Jb. Syst.*, **103** : 464, 490, 492
1977. Verma and Thakur (R.K.) *Newsl. zool. Surv. India*, **3**(1) : 16 and **3**(5) : 260-261.
1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 449-450.
1980. Roonwal, *Indian J. Ent.*, **42** (4) : 541-546.
1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 10,11, 59-63, pl. 21. Synonymy, descriptions, etc.
1982. Verma and Thakur (R.K.), *Rec. zool. Surv. India*, **79** : 315.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 19, 25, 101-102.
1984. Verma, *Indian J. Forestry*, **7**(4) : 307-308, 310, 311.
1986. Verma, *J. Indian Acad. Wood Sci.*, **17**(1) : 50.
1988. Verma, *Ann. Ent.*, **6**(2) : 71-75.
1989. Verma, *Indian J. Forestry*, **12** (1), 1, 2, 3, 4, 5.
1989. Verma, *Indian J. Forestry*, **12** (4) : 297, 299.

IMAGO (Fig. 236) : Head-capsule and body fuscous; antennae

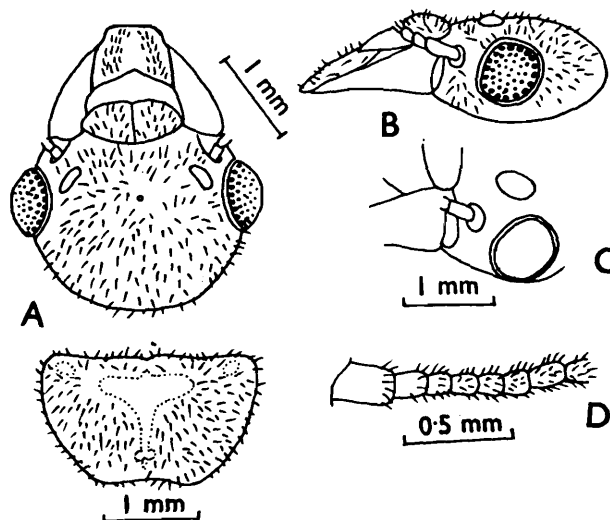


Fig. 236 : *Odontotermes gurdaspurensis*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Portion of head showing positions of eye, ocellus and antenna. (D) Basal part of antenna. (Ex Thakur, 1981).

brownish; postclypeus labrum and legs yellowish brown. Head and body densely hairy. Total body-length with wings 27.0-30.0, without wings 14.0-15.75 mm. Head-capsule subcircular (length to base of mandibles 1.65-2.00, width with eyes 2.45-2.80 mm). Fontanelle minute, round, raised. Eyes subcircular, large (max. diameter 0.68-0.80, min. diameter 0.58-0.70 mm); situated close to lower margin of head. Ocelli large, oval (long diameter 0.23-0.30, short diameter 0.15-0.20 mm); separated by about their short diameter from eyes (eye-ocellus distance 0.15-0.18 mm). Antennae 19-segmented; segment 3 shortest. Postclypeus swollen, hairy; length slightly less than 1/2 of width. Pronotum subtrapezoidal (length 1.20-1.40, width 2.25-2.60 mm); with paler, T-shaped, median and 2 oval shoulder spots; anterior margin slightly raised, sinuate and slightly notched medially; posterior margin weakly to deeply notched. Wings, long, hairy distally (length : forewing 23.0-26.0, hindwing 20.6-23.50 mm); radial streak separating at about proximal third; wing microsculpture consists of papillae and *obesus*-type rods.

SOLDIER (Fig. 237) : Head-capsule golden yellow to dark brown; antennae yellowish brown, paler proximally; mandibles reddish brown to dark brown; body yellowish to pale brownish. Head sparsely and body fairly densely hairy. Total body-length 5.0-6.50 mm. Head-capsule subrectangularly oval; sides subparallel and weakly converging in front of antennae (length to base of mandibles 1.42-1.63, max. width 1.20-1.40, width at base of mandibles 0.73-0.95 mm, index max. width/length 0.80-0.89 and index width at base of mandibles/max. width 0.58-0.68). Antennae 16 segmented; segment 4 shortest. Labrum broad, tongue-shaped; slightly longer than wide; anterior margin rounded. Mandibles long, slender, weakly incurved (length 0.95-1.08 mm); longer than half of head-length (index mandible-length/head-length 0.63-0.72). Left mandible with a prominent, sharp tooth a little behind distal third (tooth distance 0.33-0.45, index tooth distance/mandible-length 0.33-0.40). Right mandible with a small, minute tooth in middle third of mandible. Postmentum subrectangular, sides weakly convex (length 0.80-1.0, max. width 0.40-0.55 mm). Pronotum saddle-shaped (length 0.50-0.70, width 0.85-1.0 mm).

WORKER : Dimorphic. *Worker major* : Head-capsule pale yellow to golden yellow; antennae pale yellow basally, darker distally; legs and

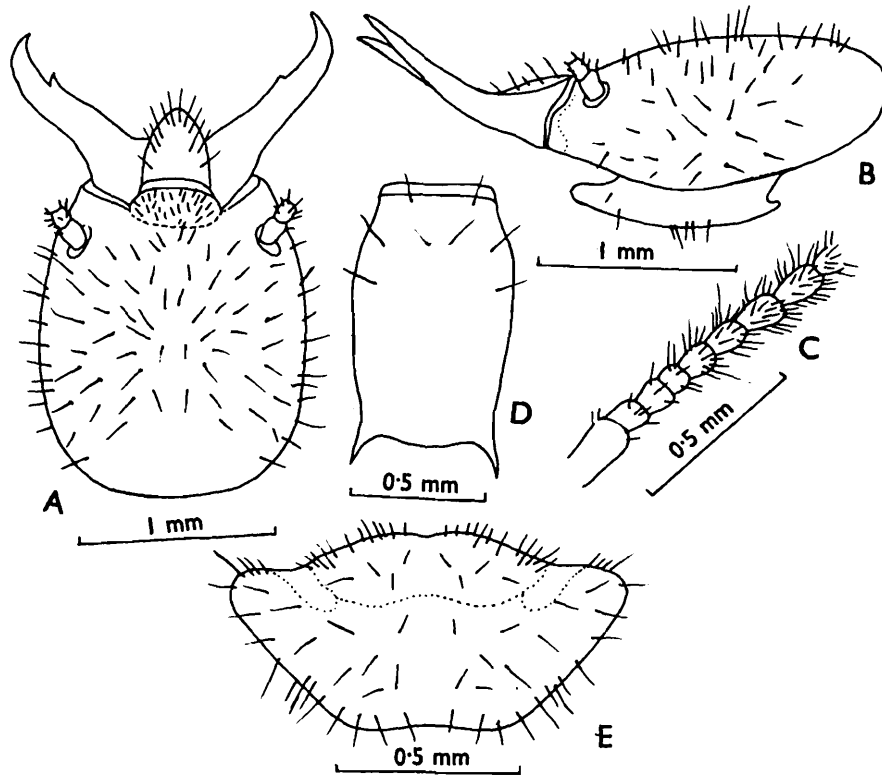


Fig. 237 : *Odontotermes gurdaspurensis*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal part of antenna. (D) Postmentum. (E) Pronotum, dorsal view. (Ex Thakur, 1981).

body whitish. Head and body fairly pilose. Total body-length 4.5-5.2 mm. Head-capsule subsquarish (length to base of mandibles 1.25-1.40, max. width 1.45-1.65 mm). Antennae 17-segmented; segments 3 and 5 shortest and subequal. Postclypeus swollen, hairy; length less than half of width. Pronotum saddle-shaped (length 0.40-0.58, width 0.74-0.90 mm); deeply notched at anterior margin and broadly emarginate at posterior margin. *Worker minor* : As worker major except for its smaller size and head subrectangularly oval. Total body-length 3.5-4.0, length of head to base of mandibles 0.65-0.80, max. width of head 0.95-1.10, length of pronotum 0.35-0.48 and width of pronotum 0.55-0.70 mm.

Distribution : INDIA : Widely distributed in India and is reported from Jammu and Kashmir, Panjab, Himachal Pradesh, Haryana, Uttar Pradesh, Madhya Pradesh, West Bengal, Rajasthan and Maharashtra. PAKISTAN : Also widely distributed.

243. *Odontotermes hainanensis* (Light)

(Fig. 238)

1. *Termes hainanensis* Light :

1924. Light, *China J. Sci. Arts*, **2**(1-4) : 54 (Key); 251-254 (Description of sp.) Holotype : Repository not known. Type-locality : Kachek, Hainan, China.

2. *Odontotermes (Odontotermes) hainanensis* (Light) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 229. Synonymy.

1958. Ahmad, *Biologia*, Lahore, **4** : 106.

3. *Odontotermes hainanensis* (Light) :

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 23-24.

1968. Harris, *Opusc. Ent.*, **33** : 150.

1973. Morimoto, *Bull. Govt. For. exp. Sta.*, No. 257 : 69, 78.

1986. Gao and Lam, *Mem. Hongkong nat. Hist. Soc.*, **17** : 83.

1987. Shi, Zhang and Chen, *Ins. Knowl.*, **24** : 337-343.

IMAGO : Unknown.

SOLDIER (Fig. 238) : Head yellowish with brownish tinge; antennae uniformly pale yellow, not darker distally; mandibles dark reddish black, basally yellowish red; body pale yellowish white. Head-capsule broad, oval (length to base of mandibles 1.04-1.28, max. width 0.94-1.12 mm); sides rounded and strongly converging in front, widest posteriorly. Antennae with 15 to 16 segments; segment 3 in 15-segmented antennae and 4 in 16-segmented ones smallest; 4 sometimes shows signs of division. Labrum tongue-shaped, converging in front into a narrow tip. Mandibles thin, sabre-shaped; only a little longer than half of head-length (length 0.61-0.73 mm, index mandible-length/head-length 0.57). Left mandible with a prominent tooth at about distal third (tooth-distance from tip 0.17-0.22 mm, index tooth-distance/mandible-length about 0.27-0.30). Right mandible with a small, rudimentary tooth. Postmentum strongly arched; sides convex (length 0.59-0.79, max. width 0.46-0.52 mm). Pronotum saddle-shaped (length 0.41-0.49, width 0.64-0.77 mm); anterior and posterior margins distinctly emarginate.

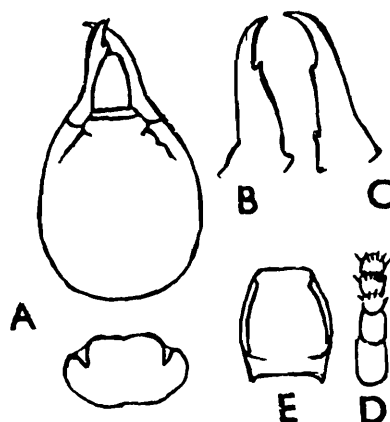


Fig. 238 : *Odontotermes hainanensis*. Soldier. (A) Head and pronotum, dorsal view. (B) and (C) Left and right mandibles, respectively. (D) Basal segments of antenna. (E) Postmentum.

WORKER : Dimorphic. *Worker major* : Head pale yellow; body whitish. Head-capsule subsquarish (length to tip of labrum 1.62, width 1.45 mm); sides substraight, widest below antennae. Antennae with 17 segments, segment 3 shortest. Postclypeus somewhat swollen, length less than 1/2 of width (length 0.20, width 0.50 mm). Pronotum saddle-shaped (length 0.36, width 0.60 mm). *Worker minor* : As in worker major but for smaller size and 16-segmented antennae, with segment 4 shortest. Head-length to tip of labrum 0.96, max. head-width 0.82 mm.

Distribution : BURMA in the Indian Region. Also THAILAND, CAMBODIA, VIETNAM and SOUTH CHINA.

244. *Odontotermes horai* Roonwal & Chhotani

(Figs. 239,240)

1. *Odontotermes horai* Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 289, 296, 346-349, pls. 30, 31. S, W. Holotype : S, in ZSl. Type-locality : Bank of Nongpriang Stream, Khasi Hills, Meghalaya, India. Type examined.
1970. Weidner, *Khumbu Himmal.*, **3**(3) : 459-460.
1974. Akhtar, *Pakistan J. Zool.*, **6** : 101.
1975. Sen-Sarma, et al., *Wood Destroying Termites of India (Final Tech. Rep. PL 480 Proj. A7-FS-58)* : 16, 41, 56, 65.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab* (N.S), Art. 7 : 85.

1976. Akhtar, *Pakistan J. Zool.*, 8(2) : 159-161. Im described.

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, 14(2) : 3, 5, 13, 63-66, 156, 180 181.

1984. Verma, *Indian J. For.*, 7(1) : 82.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO (Fig. 239) : Head-capsule reddish brown, paler anteriorly; postclypeus much paler than head, yellowish brown with reddish tinge; pronotum slightly paler than head, with a yellow T-shaped marking in middle and a shoulder spot each on antero-lateral corners. Head and body densely hairy. Head-capsule subcircular; with eyes wider than its length to base of mandibles (length to tip of labrum 2.39-2.81, length to base of mandibles 1.67-1.80, width with eyes 2.22-2.39 mm). Fontanelle minute, situated medially. Eyes roundly oval and of medium size (long diameter 0.55-0.61, short diameter 0.48-0.54 mm) and situated from lower margin of head by 0.13-0.16 mm. Ocelli oval; separated from eyes by almost their short diameter (long diameter 0.25-0.29, short diameter 0.16-0.20, eye-ocellus distance 0.16-0.22 mm). Postclypeus swollen, length about half of width (length 0.48-0.52, width 0.94-0.99 mm). Antennae with 19 segments; segments 3 and 4 subequal, 5 shortest. Pronotum slightly

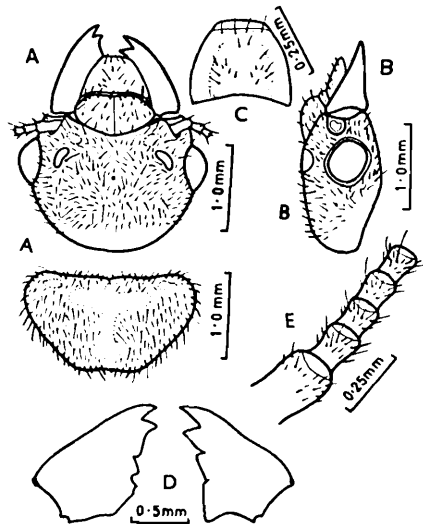


Fig. 239 : *Odontotermes horai*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Labrum. (D) Left and right mandibles. (E) Antenna. (After Akhtar, 1976).

narrower than head, indistinctly notched at anterior and posterior margins (length 1.12-1.16, width 2.13-2.31 mm).

SOLDIER (Fig. 240) : Head-capsule brownish yellow; antennae uniformly yellow; mandibles dark brown, yellowish brown basally; pronotum, legs and body yellowish white. Head-capsule sparsely, pronotum moderately and abdomen densely hairy. Total body-length 4.85-6.80 mm. Head-capsule subrectangular; sides slightly narrowed in front; longer than wide (length to base of mandibles 1.65-2.00, max. width 1.28-1.65 mm; index width/length 0.74-0.89). Antennae with 15-16 segments, short; segment 3 shorter than 2; 4 shortest. Labrum subtriangular, with a sharp tip; length subequal to width, 0.26-0.33 mm. Mandibles sabre-shaped, slightly incurved near tips; about 2/3 of head-length (mandible-length 1.05-1.23 mm, index mandible-length/head-length to base of mandibles 0.55-0.65). Left mandible with a small tooth in proximal part of middle-third, index tooth-distance/mandible-length 0.60-0.66). Right mandible without any tooth or basal projection. Postmentum subrectangular (length 1.13-1.38, max. width 0.53-0.70 mm); shape as in figure. Pronotum saddle-shaped; much broader than long (length 0.55-0.75, max. width 0.90-1.25

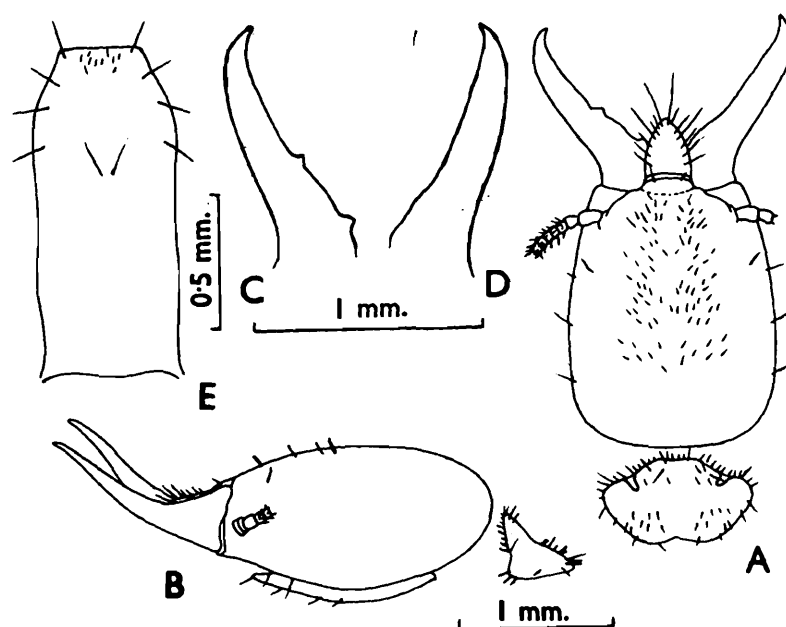


Fig. 240 : *Odontotermes horai*. Soldier. (A) head and pronotum, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles, respectively. (E) Postmentum.

mm); anterior margin weakly notched medially; posterior margin markedly notched. Mesonotum narrower than pronotum, posterior margin weakly notched. Metanotum as wide as pronotum; posterior margin substraight. Legs and abdomen as in genus.

WORKER : Monomorphic. Head-capsule and antennae pale yellow; postclypeus somewhat darker; legs and body yellowish white. Head and body densely hairy. Total body-length 3.90-5.50 mm. Head-capsule subcircular (length to tip of labrum 1.60-2.20, length to base of mandibles 1.10-1.45, max. width 1.25-2.50 mm). Antennae with 17-segments; segment 3 shorter than 2, subequal or shorter than 4; 5 subequal to 3. Postclypeus swollen, pilose; length a little less than half of width. Labrum, mandibles, pronotum, legs and abdomen as in genus. Pronotum-length 0.40-0.53, max. width 0.63-0.85 mm.

Distribution : INDIA : Meghalaya, Nagaland, West Bengal, Uttar Pradesh and Madhya Pradesh. Thakur (1981) had a collection from Madhya Pradesh but has not given under "Geographical Distribution" and his record from Arunachal Pradesh is not correct as Khasi Hills on which it is based are in Meghalaya. Also NEPAL (Jirikhala Tal, Sikri and Kabre) and PAKISTAN (Thall).

245. *Odontotermes horni* (Wasmann)

(Synonyms : *Termes paradeniyae* Holmgren, *Odontotermes horni* var. *hutsoni* Kemner, *O. horni* var. *minor* Kemner)

(Figs. 241, 242)

1. *Termes Horni* Wasmann :

1902. Wasmann, *Zool. Jb. Syst.*, 17(1) : 111. S and W. Lectotype : S, in NHM, Maastricht. Type-locality : Nalanda, Sri Lanka.

2. *Termes (Termes) horni* Wasmann :

1953. Rattan Lal and Menon, *Cat. Indian Insects, Isoptera-Pt. 27* : 79-80. Synonymy.

3. *Odontotermes (Odontotermes) horni* (Wasmann) :

1913. Bugnion, *Rev. Suiss. Zool.*, 21(10) : 299-330, 3 pls.

1949. Snyder, *Smiths. misc. Coll.*, 112 : 229.

1958. Ahmad, *Biologia*, Lahore, **4** : 105, 114.

1969. van Boven, *Publ. Nat.-hist. Genoot. Limburg* **19** : 48.

4. *Odontotermes horni* (Wasmann) :

1962. Roonwal and Chhotani, *Proc. nat. Inst. Sci. India*, (B) **28**(4) : 296, 349-352.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner), Vol. 2 : 363.

1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 15, 41, 56.

1977. Chhotani, *Rec. zool. Surv. India*, **72** : 372-378.

1982. Bose and Das, *Rec. zool Surv. India*, **80** : 201, 207, 211.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 2, 19, 26, 102-106.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 164, 166, 183-187.

1985. Verma, *Indian J. Forestry*, **8**(3) : 176-183.

1987. Bose and Das, *Fauna of Orissa Pt. 1, State Fauna Sr. 1* : 106, 110.

5. *Odontotermes horni* var. *hutsoni* Kemner :

1926. Kemner, *Bull. ent. Res.*, **16** (4) : 384-385.

6. *Odontotermes horni* var. *minor* Kemner :

1926. Kemner, *Bull. ent. Res.*, **16** (4) : 385-386.

7. *Termes peradeniyae* Holmgren :

1911. Holmgren, In Escherich's *Termitenleben auf Ceylon* : 197.

See Snyder 1949, Rattan Lal and Menon 1953 and Thakur 1981 also for synonymy.

According to Thakur 1981, the imago of *O. horni* is not known and that the imago description of *Termes peradeniyae* Holmgren 1911, the species which was treated by Holmgren 1913 and Snyder 1949 as a synonym of *O. horni* (Wasmann), does not become available for *horni* since there is no published record of soldier and worker castes of *peradeniyae* having been collected and described. Holmgren, 1913 treats *peradeniyae* a synonym of *horni* and his description of imago of *horni* is not based wholly on the original description of *peradeniyae* as there are a few differences in measurements and description. Very probably Holmgren had some other associated collections of imagoes, soldiers and workers which he had determined as *horni* and had, therefore,

synonymised his own species *peradeniyae* with that of Wasmann's *horni*. It may be mentioned here that Bugnion 1913 had also described the imago of *horni* and that in the Wasmann Collection at NHM, Maastricht there are associated collections of imagoes, soldiers and workers of *horni* which may have been available to Holmgren 1913 for comparison to have enabled him to synonymise his own species *peradeniyae* with *horni* to substantiate his earlier view 1911 (p. 187) of the possibility of *peradeniyae* imago to be of that of *horni*. The species *peradeniyae*, therefore, is taken as a synonym of *horni* here.

IMAGO (Fig. 241) : Head dark brown, anteriorly reddish yellow; pronotum slightly paler than head and with a pale, T-shaped mark and shoulder spots; abdomen brownish above and sternites reddish yellow at middle; wings dark rusty yellow. Head and body moderately thickly hairy; wings hairy in distal part. Total body-length 27.0-30.0, without wings 13.0-14.2 mm. Head-capsule subcircular, broad and flat (length to tip of labrum 3.0, length to base of mandibles 1.90-2.10, max. width with eyes 2.61-2.85 mm). Fontanelle distinct, small, ring-like; area around fontanelle

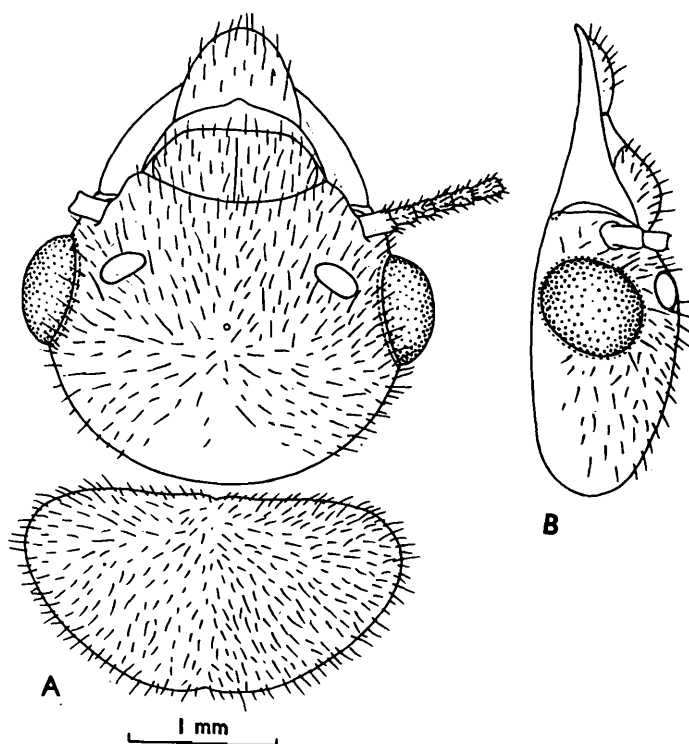


Fig. 241 : *Odontotermes horni*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view.

slightly depressed. Eyes medium-sized, subcircular (max. diameter 0.70-0.75 mm). Ocelli moderately large, broadly oval (long diameter 0.29-0.32, short diameter 0.25 mm); from eyes separated by about their short diameter (eye-ocellus distance 0.20-0.25 mm). Antennae with 19 segments; segment 3 slightly shorter than 2; 3, 4 and 5 almost equal. Postclypeus large, swollen, length half of width (length 0.52-0.54, width 1.05-1.14 mm). Pronotum narrower than head with eyes (length 1.40-1.53, width 2.52-2.66 mm); with a weak median notch at anterior and posterior margins. Wings long, narrow (length : forewing 23.0-24.0, hindwing 22.0-22.50 mm); microsculpture consists of cuticular rods much smaller than in *obesus*.

SOLDIER (Fig. 242) : Head-capsule yellow to reddish brown; antennae, labrum, pronotum and legs pale yellowish brown; abdomen creamish white to pale yellow. Head sparsely and body fairly hairy. Total body-length 6.7-10.4 mm. Head-capsule subrectangular; sides substraight very slightly converged in front of antennae (length to base of mandibles 2.47-3.00, max. width 1.82-2.30. Antennae with 17 segments; segment 3 much shorter

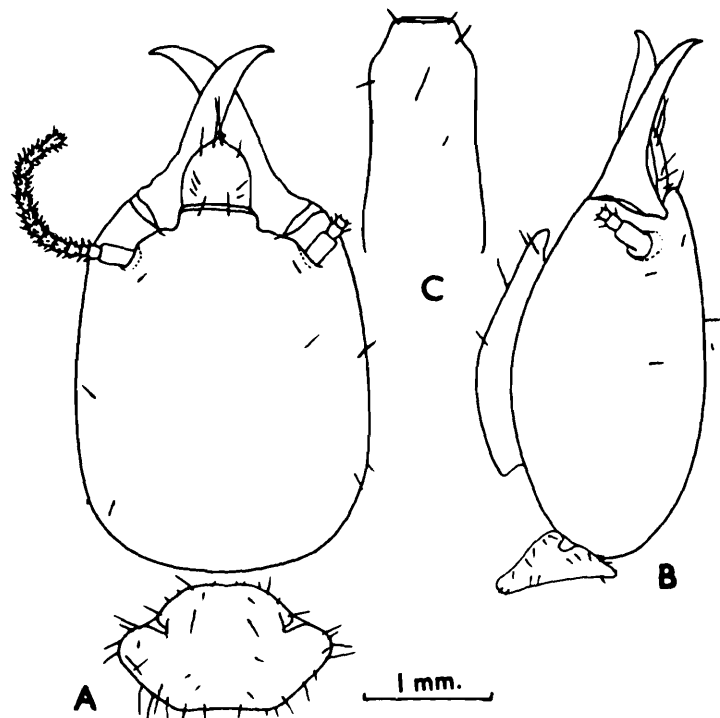


Fig. 242 : *Odontotermes horni*. Soldier (Type). (A) Head and pronotum, dorsal view. (B) Same , side view. (C) Postmentum.

than 2; 4 almost as long as 2 ; 5 shorter than 4. Labrum tongue-shaped; anteriorly with bluntly rounded tip. Mandibles strong, stout, sabre-shaped (length 1.27-1.60 mm, index mandible-length/head-length 0.53-0.66); left mandible with a large, prominent tooth near base of middle third (tooth-distance 0.70-1.00 mm, index tooth-distance/mandible-length 0.55-0.63); right mandible with a minute tooth a little below level of tooth on left mandible. Postmentum subrectangular; sides bulging out in proximal third (length 1.50-2.00, max. width 0.75-0.93 mm). Pronotum saddle-shaped (length 0.80-1.03, width 1.40-1.80 mm); anterior margin with weak to fairly marked median notch; posterior margin fairly distinctly notched.

WORKER : Dimorphic. *Worker major* : Head-capsule paler yellow to rusty yellow; antennae pale yellow; body yellowish white. Head fairly and body fairly densely hairy. Total body-length 5.0-7.8 mm. Head-capsule subsquarish, wider than length to base of mandibles (length 1.50-1.80, max. width 1.75-2.10 mm). Fontanelle plate small, circular. Antennae with 19 segments; segment 3 a little shorter than 2 ; 4 longer than 3 ; 5 shortest. Postclypeus weakly swollen, length less than 1/2 of width. Pronotum strongly saddle-shaped otherwise as in soldier (length 0.55-0.65, width 1.03-1.20 mm). *Worker minor* : Like worker major but for its smaller size and 17 to 18-segmented antennae. Total body-length 3.5-4.7, head-length to base of mandibles 1.20-1.38, max. width of head 1.35-1.58, pronotum-length 0.40-0.58, pronotum-width 0.73-0.93 mm.

Distribution : INDIA : Southern India also Madhya Pradesh, Orissa, West Bengal and Manipur. BHUTAN, SRI LANKA, VIETNAM and CAMBODIA.

According to Thakur (1981), this species is found only in SRI LANKA and some localities in southern India and that its records from N.E. India are incorrect. I have examined large collections from Southern India, Madhya Pradesh and Orissa which were determined as *O. horni* (Wasmann). They are definitely not *O. feae* which is its closest ally. There appears to be a great range of variation in this species also as has been found in case of *O. feae* by Roonwal and Verma 1991. A study of all these collections on the same lines is desirable to bring out proper range of variation and distribution. Bathellier 1927 has recorded this species from Vietnam and Cambodia but ever since this species has not been reported again from these countries or from Thailand or Burma, the termites of which countries are fairly well worked out. As such the records from Cambodia and Vietnam need confirmation.

246. *Odontotermes kapuri* Roonwal and Chhotani

(Fig. 243)

1. *Odontotermes kapuri* Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 296, 352-356. S and W. Holotype : S, in ZSI. Type-locality : Cherrapunji, Meghalaya, India. Type examined.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 47.
1965. Roonwal and Chhotani, *J. Bombay nat. Hist. Soc.*, **62** : 21.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 70, 71, 81.
1977. Lahiri, Ghosh and Biswas, *Bull. Meghalaya Sci. Soc.*, **2** : 38.
1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13**(1) : 6, 26, 32, 50.
1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14**(2) : 11, 75-78, 161.
- In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER (Fig. 243) : Head-capsule yellowish brown or dark brown; antennae brownish, getting darker distally; mandibles dark brown, brownish yellow proximally; pronotum a little paler than head; legs yellowish to rust yellow; abdomen yellowish to pale brownish yellow. Head and thorax moderately and abdomen fairly densely hairy, with a row of hairs at posterior margin of each of tergites and few irregularly placed hairs in front. Total body-length c 3.70-4.90 mm. Head-capsule broadly oval, longer than broad (length to base of mandibles 1.38-1.60, max. width 1.30-1.38 mm, index max. width/length to base of mandibles 0.873); sides strongly converging in front (index width at base of mandibles/max. width 0.625). Antennae with 17 segments; segment 3 shorter than 2 or 4; 4 shorter than 2; 5 subequal to 3. Labrum broadly tongue-shaped, longer than broad (length 0.35-0.38, width 0.30-0.33 mm); anteriorly rounded or with a faint point. Mandibles short, stout, sabre-shaped, fairly well incurved near distal tip; about half of head-length (length 0.80-0.84 mm, index mandible-length/head-length 0.51-0.52). Left mandible with a prominent, sharp tooth at distal fourth (tooth-distance from tip 0.20, index tooth-distance/mandible-length 0.24-0.25). Right mandible with a minute, rudimentary tooth; situated a little posterior to the corresponding tooth on left mandible. Postmentum subrectangular, sides in anterior

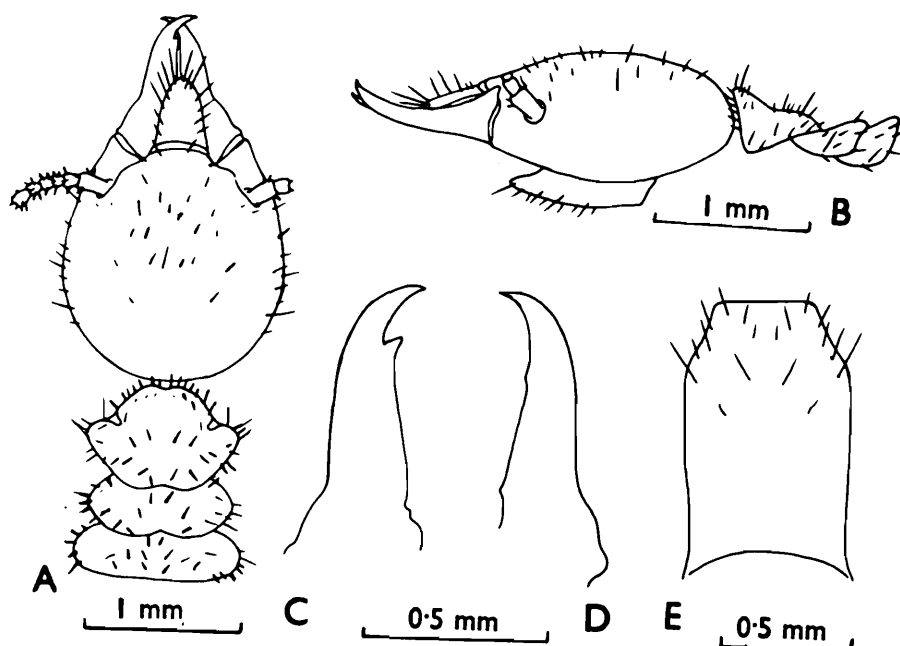


Fig. 243 : *Odontotermes kapuri*. Soldier. (A) Head and thorax, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles, respectively. (E) Postmentum.

fourth narrowed, posteriorly subparallel (length 0.90-0.93, max. width 0.60-0.63 mm). Pronotum saddle-shaped, with a prominent notch; posterior margin concave. Mesonotum slightly narrower than pronotum; posterior margin with a median notch. Metanotum a little wider than pronotum; posterior margin substraight. Legs and abdomen as in genus.

WORKER : Monomorphic. Roonwal and Chhotani described only one type of workers from a collection from a single source. Now on examination of some more collections from different places it is confirmed that only one type of workers occur in this species. Head-capsule and postclypeus yellow; antennae yellow, gradually becoming darker distally to pale brownish. Head and body fairly densely hairy. Total body-length 4.5-5.20 mm. Head-capsule subcircular; broader than its length to base of mandibles (length to base of mandibles 1.45-1.60, max. width 1.58-1.75 mm). Fontanelle indistinct. Antennae with 18-19 segments. Postclypeus swollen, hairy; shorter than half its width. Labrum, mandibles, legs and abdomen as in genus. Pronotum saddle-shaped (length 0.50-0.55, max. width 0.75-0.90 mm); anterior lobe strongly upturned and semicircular, with anterior

margin strongly notched; posterior margin convex and strongly notched. Mesonotum slightly narrower than pronotum and medially notched at posterior margin. Metanotum broader than pronotum and with convex posterior margin. Legs and abdomen as in genus.

Distribution : INDIA : Meghalaya and Tripura states. BHUTAN.

247. *Odontotermes koenigi* (Desneux)

1. *Termes koenigi* Desneux :

1906. Desneux, *Ann. Soc. Ent. Belg.*, **49**(12) : 359-360. Im only. Repository of type not known. Type-locality : Sri Lanka.

2. *Odontotermes (Odontotermes) koenigi* (Desneux) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 231. Synonymy.

1958. Ahmad, *Biologia*, Lahore, **4** : 99.

IMAGO : Reddish brown; antennae, mouth-parts, tarsi, underside, pronotal margins and median spot pale brown; wings greyish brown. Total body-length with wings 22.0 and without wings 10.0 mm. Head small, flat, round, so long as wide (head-width 2.09 mm). Fontanelle slightly raised, surrounded by paler area. Antennae with 19 segments, segment 2 longer than 3. Postclypeus flatly swollen, much shorter than 1/2 of width. Pronotum narrower than head with eyes (length 1.03, width 1.82 mm); anteriorly distinctly incised at middle; posteriorly substraight. Inner half of wing membrane in part very thinly hairy; media in distal third branched; radial streak present. Forewing-length 19.0 mm.

Distribution : SRI LANKA.

Remarks : No specimens of this species were examined and the above description is drawn from Hagen 1858 and Holmgren 1913 descriptions under the name *fatalis* since according to Snyder 1949 these pertain to *koenigi*.

248. *Odontotermes kulkarnii* Roonwal & Chhotani

(Fig. 244)

Odontotermes kulkarnii Roonwal and Chhotani :

1959. Roonwal and Chhotani, *Sci. & Cult.*, **25**(5) : 325. S and W. Holotype : S, in ZSI. Type-locality : Bijapur, Karnataka, India. Type examined.

1960. Roonwal and Chhotani, *Indian J. agric. Sci.*, **29** (4) : 57-62.
 1962. Roonwal, In : *Termites Humid Tropics* : 42.
 1975. Akhtar, *Bull. Dept Zool. Univ. Panjab. (N.S.)*, Art. 7 : 85, 92.
 1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14**(2) : 2, 87. Treats as synonym
 of *O. malabaricus* Holmgren and Holmgren.
 1984. Bose, *Occ. Pap. zool. Surv. India*, No. 49 : 6-7, 167, 187.

IMAGO : Unknown.

SOLDIER (Fig. 244) : Head-capsule yellowish; antennae pale yellow; labrum rust-yellow; mandibles blackish brown, pale basally; body pale yellow. Head and pronotum fairly and body densely hairy. Total body-length 5.0-5.3 mm. Head-capsule subrectangular, sides substraight, slightly converging in front of antennae (head-length to base of mandibles 1.50,

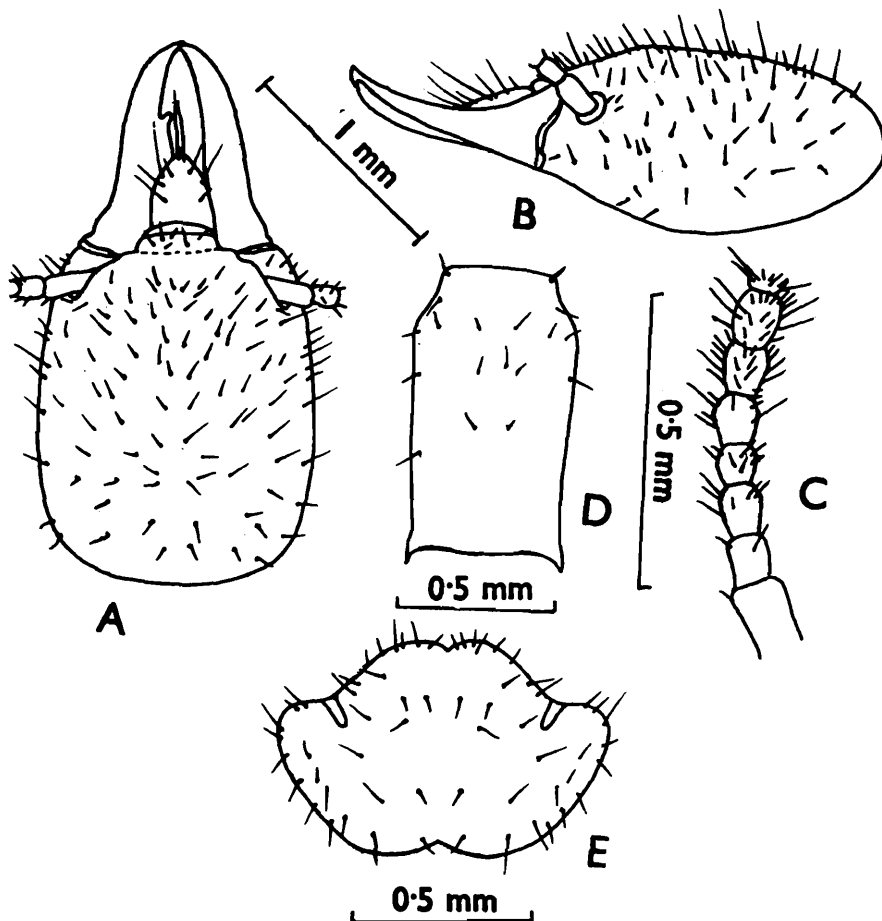


Fig. 244 *Odontotermes kulkarnii*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal part of antenna. (D) Postmentum, (E) Pronotum, (Ex Roonwal and Chhotani, 1960a).

max. width 1.2 mm); width $\frac{4}{5}$ of length (index width/length 0.80). Antennae with 16 segments; segment 3 either subequal to or a little shorter than 2; 4 shortest. Labrum tongue-shaped; with sides substraight in posterior region and anteriorly convergent into a blunt tip. Mandibles sabre-shaped, relatively thin and incurved distally; a little longer than half of head-length (length 0.93 mm, index mandible-length/head-length 0.62). Left mandible with a prominent tooth in middle third a little above middle, tooth distance 0.35 (index tooth-distance/mandible-length 0.37). Postmentum subrectangular, sides almost straight, slightly converging basally; length 0.9, max. width 0.53, width near posterior end 0.45 mm. Pronotum saddle-shaped; anterior and posterior margins deeply notched (length 0.58, width 0.88-0.93 mm). Mesonotum narrower and metanotum broader than pronotum, posterior margins of both substraight.

WORKER : Dimorphic. *Worker major* : Head-capsule, labrum and postclypeus yellow; antennae yellow, slightly paler proximally; legs and body whitish. Head moderately and body thickly hairy. Total body-length 3.8-5.05 mm. Head-capsule subcircular, sides slightly narrowed behind (length to base of mandibles 1.28-1.40, max. width 1.33-1.50 mm). Antennae with 17 segments, segment 3 either shortest or subequal to 5, 4 longer than either 3 or 5. Postclypeus weakly swollen, length less than half of width. Pronotum saddle-shaped, anterior margin deeply notched and posterior margin weakly incurved medially (length 0.35-0.40, width 0.70-0.80 mm). *Worker minor* : Resembles worker major except for smaller size. Total body-length 3.0-3.5 mm, length of head to base of mandibles 0.75, max. width of head 0.95-1.00, length of pronotum 0.30-0.33, max. width of pronotum 0.63 mm.

Distribution : INDIA : Karnatak (Bijapur, type-locality); known only from type-locality.

108. *Odontotermes latigula* (Snyder)

(Figs. 245, 246)

1. *Termes (Cyclotermes) latigula* Snyder :

1934. Snyder, *Indian For. Rec. (Ent.)* **20**(11) : 9-10. S only. Syntypes in BM, FRI and USNM. Type-locality : Andamans.

2. *Odontotermes latigula* (Snyder) :

1980. Bose, *Rec. zool. Surv. India*, **77** : 102-104, Im described.

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 5, 11, 78-81. Synonymy, description, etc.

IMAGO (Fig. 245) : Head-capsule dark reddish brown, paler anteriorly; fontanelle plate light yellowish brown; antennae brownish; postclypeus pale yellowish brown; pronotum dark brown with paler T-marking; wings pale brown; abdominal tergites brown, paler than head and pronotum. Head and body densely hairy. Total body-length with wings 25.1-25.5, without wings 11.4-12.6 mm. Head-capsule subcircular, broader than long (length to base of mandibles 1.8-1.82, width with eyes 2.5-2.55 mm). Fontanelle plate small, suboval. Eyes subcircular, strongly projecting (max. diameter 0.64-0.68, min. diameter 0.60-0.61 mm); situated very close to lower margin of head. Ocelli large, oval, convexical (long diameter 0.33-0.38, short diameter 0.28-0.32 mm); from eyes situated at a distance of less than their short diameter (eye-ocellus distance 0.15-0.23 mm). Antennae 19-segmented; segments 3,4,5 subequal, shorter than

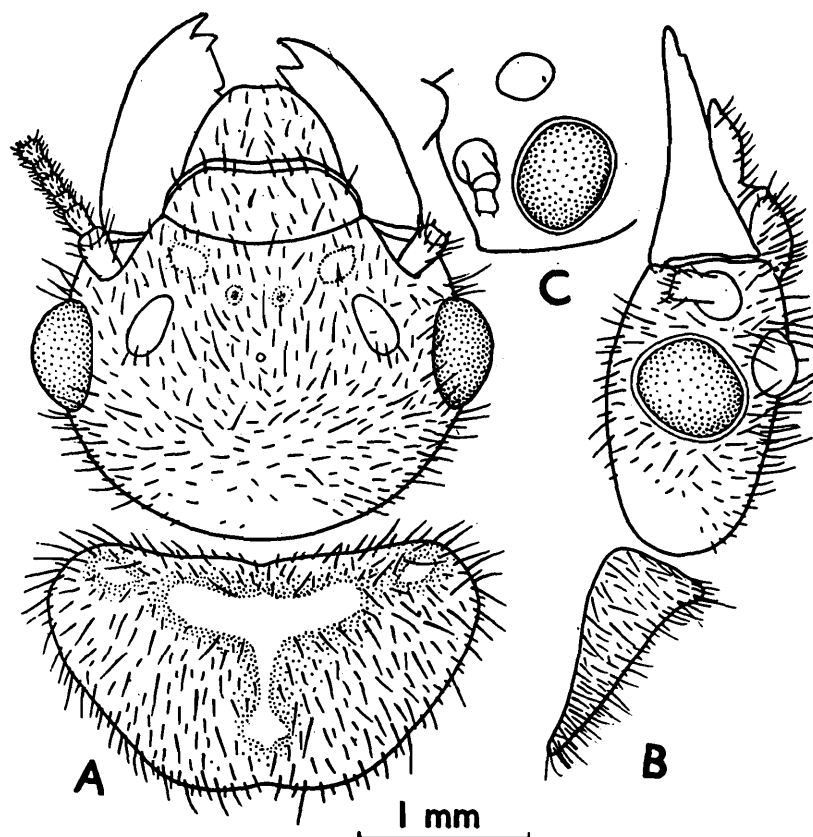


Fig. 245 : *Odontotermes latigula*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side, view. (C) Part of head showing positions of eye, ocellus and antenna. (After Bose, 1980).

2. Postclypeus swollen, hairy; length less than half its width (length 0.40-0.45, width 1.05-1.15 mm). Pronotum subtrapezoidal, slightly narrower than head-width with eyes (length 1.23-1.30, width 2.25-2.30 mm). Wings pale brown, long and narrow (length: forewing 22.0-22.5, hindwing 20.00-20.65 mm). Radial streak separating from radius at about middle of wing membrane in both wings.

SOLDIER (Fig. 246) : Head pale brown to castaneous brown; antennae light yellowish brown, distal part darker than basal part; mandibles reddish brown to dark brown; body and legs yellowish white, pronotum sometimes slightly darker. Head sparsely and body moderately densely hairy. Total body-length 4.50-6.50 mm. Head-capsule oval, longer than wide (length to base of mandibles 1.20-1.50 and max. width 1.15-1.40 mm, index width/length 0.88-0.96); max. width at about middle, sides converging anteriorly (width at base of mandibles 0.75-0.88 mm, index width at base of mandibles/max. width 0.60-0.68). Antennae 16-17 segmented; in 16 segmented antennae, segment 3 slightly shorter than 2, 4 shortest; in 17-segmented ones, 2 twice length of 3, the latter shortest, 4 slightly longer than 5. Labrum subtriangular, with a pointed tip; little longer than wide. Mandibles sabre-shaped, weakly hooked anteriorly

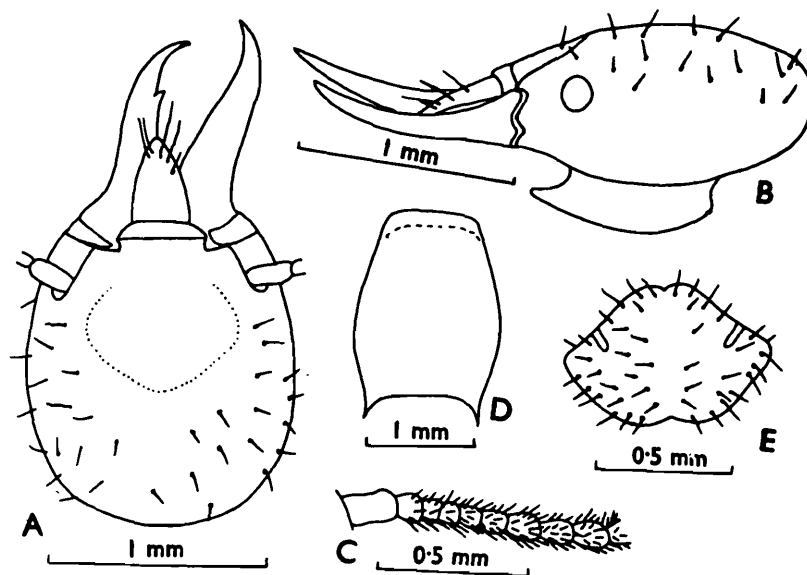


Fig. 246 : *Odontotermes latigula*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal part of antenna. (D) Postmentum. (E) Pronotum. (Ex Thakur, 1981)

(length 0.80-0.93 mm, index mandible length/head-length 0.60-0.69). Left mandible with a sharply pointed tooth at distal third (tooth distance from tip 0.25-0.30 mm, index tooth-distance/ mandible-length 0.30-0.34). Right mandible with a rudimentary tooth near middle. Postmentum very wide with sides strongly arched; length a little more than width (length 0.75-0.93, max. width 0.55-0.70 mm, width/length index 0.68-0.80); in profile strongly swollen. Pronotum saddle-shaped; weakly notched anteriorly and markedly emarginate posteriorly (length 0.50-0.65, width 0.80-1.00 mm).

WORKER : Monomorphic. Head-capsule pale yellowish brown to rusty brown; antennae brownish distally and yellowish brown basally; postclypeus, pronotum and legs paler than head. Head and body fairly pilose. Total body-length 3.40-4.50. Head-capsule subsquarish, wider than long and widest at level of antennae (length to base of mandibles 1.15-1.50, max. width 1.30-1.60 mm). Antennae 17-segmented; segment 3 shorter than 4; 5 shortest. Postclypeus swollen, hairy; length less than half width. Pronotum saddle-shaped, anterior margin weakly and posterior margin deeply emarginate (length 0.40-0.53, width 0.68-0.80 mm). Mesonotum narrower than pronotum; weakly emarginate posteriorly. Metanotum broader than pronotum with substraight posterior margin.

Distribution : INDIA : Andaman and Nicobar Isls. Thakur (1981) does not report this species from Burma as was recorded by Roonwal and Pant (1953) and Roonwal and Verma (1973). These records were probably based on *O. paralatigula* Chatterjee and Sen-Sarma which occurs in Burma and has lately been reported from Andamans (Bose, 1980) and Manipur (Bose, in press)

250. *Odontotermes latiguloides* Roonwal and Verma

(Fig. 247)

Odontotermes latiguloides Roonwal and Verma :

1973. Roonwal and Verma, *J. Indian Acad. Wood. Sci.*, 4(2) : 83-86. S and W. Holotype : S, in ZSI. Type-locality : Mandalgarh, Bhilwara Dist., Rajasthan, India.
1976. Roonwal, *Zool. Jb. Syst.*, 103 : 25, 494.
1977. Roonwal and Verma, *Rec. zool. Surv. India*, 72 : 451-452, 469, 474.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 34.

1981. Thakur, *Indian For. Rec. (N.S.). Ent.*, 14 (2) : 81-83.

IMAGO : Unknown.

SOLDIER (Fig. 247) : Head-capsule yellowish brown; antennae brownish, basal segments paler; mandibles dark brown, yellowish brown basally; legs straw yellow; body yellowish with a few brownish patches. Head and thorax moderately and body fairly densely pilose. Total body-length 3.8-5.2 mm. Head-capsule broadly oval, narrowed anteriorly; width almost equal to length (length to base of mandibles 1.0-1.26, max. width 1.0-1.21 mm, index width/length c 0.96-1.0). Antennae with 16-17 segments; segment 3 shortest. Labrum tongue-shaped, with several long hairs; longer than broad; tip broadly round and narrowed (length 0.26-0.37, width 0.26-0.32 mm). Mandibles sabre-shaped, strongly incurved apically; about $\frac{3}{4}$ of head-length (length 0.79-0.89 mm, index mandible-length/head-length 0.75-0.79). Left mandible with an acute, forwardly pointed, well marked tooth at about distal $\frac{1}{3}$ (tooth-distance from tip

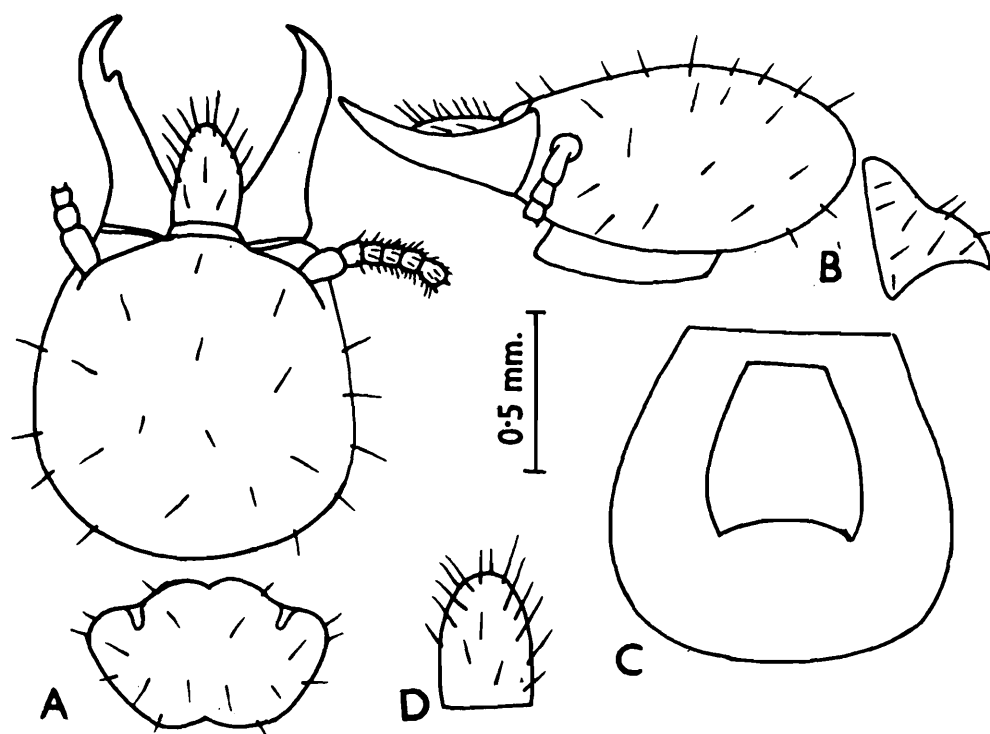


Fig. 247 : *Odontotermes latiguloides*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum, in situ. (D) Labrum. (Ex Roonwal and Verma, 1973)

0.26-0.34 mm, index tooth-distance/mandible-length 0.33-0.38). Right mandible with a minute tooth a little lower than tooth on left mandible. Postmentum strongly arched and swollen; width slightly shorter than length (length 0.53, max. width 0.47 mm, index width/length 0.92). Pronotum saddle-shaped; strongly notched both at anterior and posterior margins (length 0.47-0.58, width 0.79-0.95 mm). Meso- and metanotum as wide as pronotum, both substraight posteriorly. Legs with 3 : 2 : 2 apical tibial spurs (not 2 : 2 : 2 as given by Roonwal and Verma 1973).

WORKER : Head-capsule yellowish brown; body straw-coloured. Head sparsely and body fairly pilose. Total body-length 3.70-5.0 mm. Head-capsule subsquarishly rounded (length to base of mandibles 1.16-1.53, width 1.32-1.42 mm). Antennae with 17 segments; segment 2 subequal to 3 + 4, the latter two subequal. Postclypeus swollen, with a few hairs; length less than half width. Pronotum saddle-shaped, anterior margin markedly notched medially and posterior margin weakly incurved (length 0.30-0.38, width 0.68-0.75 mm). Legs with 3 : 2 : 2 apical tibial spurs (not 2 : 2 : 2).

Distribution : INDIA : Rajasthan.

251. *Odontotermes maliki* Akhtar

(Fig. 248)

1. *Odontotermes maliki* Chaudhry, et al. Nom. nud :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 29. Nom. nud.

2. *Odontotermes maliki* Akhtar :

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab. (N.S)*, Art. 7 : 70, 83,85. S only. Holotype : S, in PU. Type-locality : Adampur, Bangladesh.

IMAGO : Unknown.

SOLDIER (Fig. 248) : Head brownish yellow, slightly darker anteriorly; antennae uniformly yellowish brown; mandibles dark reddish brown, slightly paler basally; labrum pale reddish brown; legs and abdomen white. Head very sparsely hairy. Pronotum fairly hairy on margins and body. Head subrectangularly oval, sides slightly convex and very weakly converging anteriorly (length to base of mandibles 1.99-2.09, width 1.55-

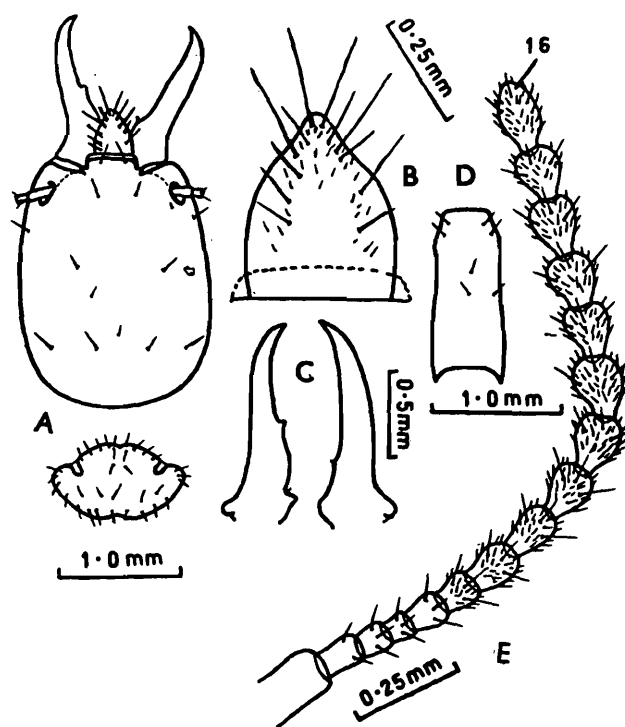


Fig. 248 : *Odontotermes maliki*. Soldier. (A) Head and pronotum, dorsal view. (B) Labrum. (C) Left and right mandibles. (D) Postmentum. (E) Antenna. (After Akhtar, 1975)

1.65, width at base of mandibles 1.07-1.12 mm, index max. width/length to base of mandibles 0.775 and index width at base of mandibles/max. width 0.679). Antennae 16 to 17-segmented, segment 4 shortest. Labrum triangular, with sharply rounded tip and a row of long bristles on either side and a few small hairs. Mandibles long, slender and weakly incurved apically (length of left mandible 1.15-1.22 mm, index mandible-length/head-length 0.565). Left mandible with a small, laterally directed tooth a little below middle (tooth from tip 0.64-0.65 mm, index tooth-distance/mandible-length 0.542). Right mandible with a minute, rudimentary denticle near base. Postmentum subrectangular; with subparallel sides, slightly wider below middle (length 1.20-1.38, max. width 0.64-0.65 mm). Pronotum saddle-shaped; anterior margin weakly notched and posterior margin distinctly emarginate (length 0.64-0.65, width 1.12-1.16 mm).

Distribution : BANGLADESH : Adampur, type locality; known only from type-locality.

252. *Odontotermes microdentatus* Roonwal and Sen-Sarma

(Figs. 249-251)

Odontotermes microdentatus Roonwal and Sen-Sarma :

1960. Roonwal and Sen-Sarma, *Contrib. Syst. Orient. Termites* (ICAR Ent. Monogr. 1) : 33-39, 2 pls. Im, S and W. Holotype : S, in FRI. Type-locality : Dehra Dun, U.P. India. Types examined.
1962. Mathur and Thapa, *J. Soc. Indian Foresters*, 3 (3 & 4) : 107.
1967. Roonwal and Chhotani, *Zool. Anz.*, 178 (3/4) : 249-250, tab, 1.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 2, 14, 42, 57, 65.
1976. Thakur, *Indian Forester*, 102 (8) : 501, 502.
1977. Chhotani, *Rec. zool. Surv. India*, 72 : 378-379.
1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, 14 (2) : 5, 11, 12, 92-97, 166 (Pls. 34, 35). Synonymy, description, etc.
1982. Verma and Thakur (R.K.), *Rec. zool. Surv. India*, 79 : 315.
1982. Bose and Das, *Rec. zool. Surv. India*, 80 : 200, 207, 211, tab.

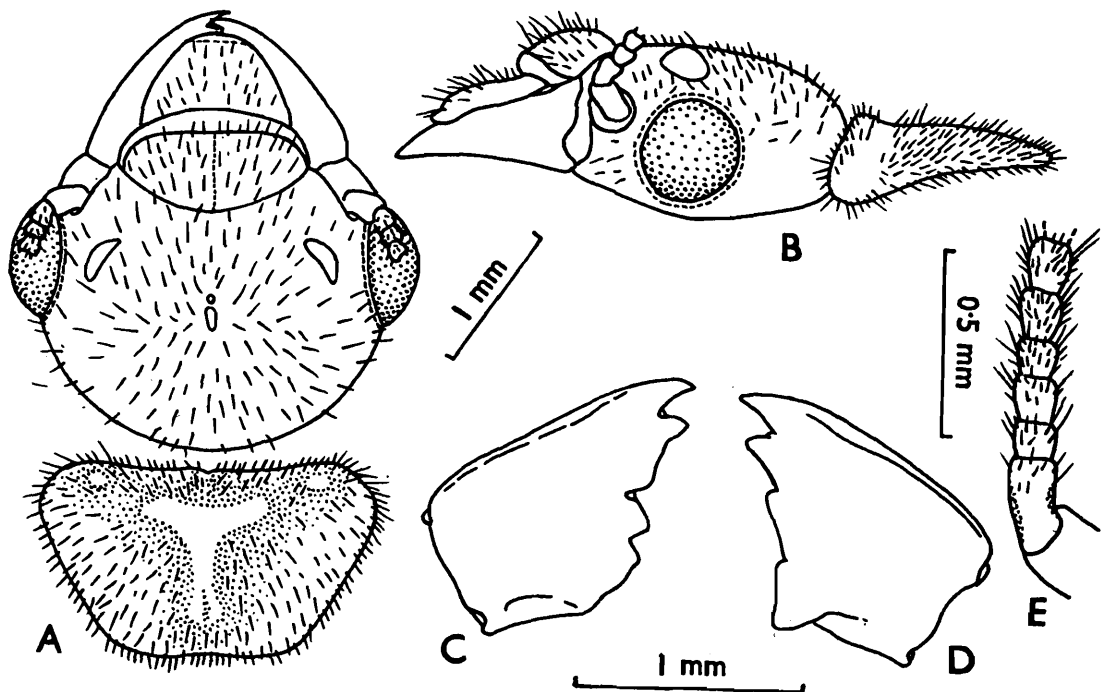


Fig. 249 : *Odontotermes microdentatus*. Imago (Paratype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles, respectively. (E) Basal segments of antenna.

1984. Verma, *Indian J. Forestry*, 7(4) : 308, 310.

1984. Verma, *Ann. Entom.*, 2(2) : 46.

1986. Verma, *J. Indian Acad. Wood Sci.*, 17 (1) : 47, 48, 49.

1989. Verma, *Indian J. Forestry*, 12 (4) : 297, 299, 300, 301.

IMAGO (Figs. 249, 250) : Head-capsule blackish brown; antennae brownish; labrum and legs pale brown; thorax and abdomen above a little paler than head and sternites pale brown. Head and body densely hairy. Total body-length with wings 27.8-30.0, without wings 12.0-14.8 mm. Head-capsule subcircular (length to base of mandibles 1.70-2.0, width with eyes 2.55-2.70 mm); Y-suture absent. Fontanelle minute, point-like, raised; surrounded by paler area. Eyes large, subcircular (max. diameter 0.75-0.80, min. diameter 0.65-0.70 mm). Ocelli suboval, moderately large

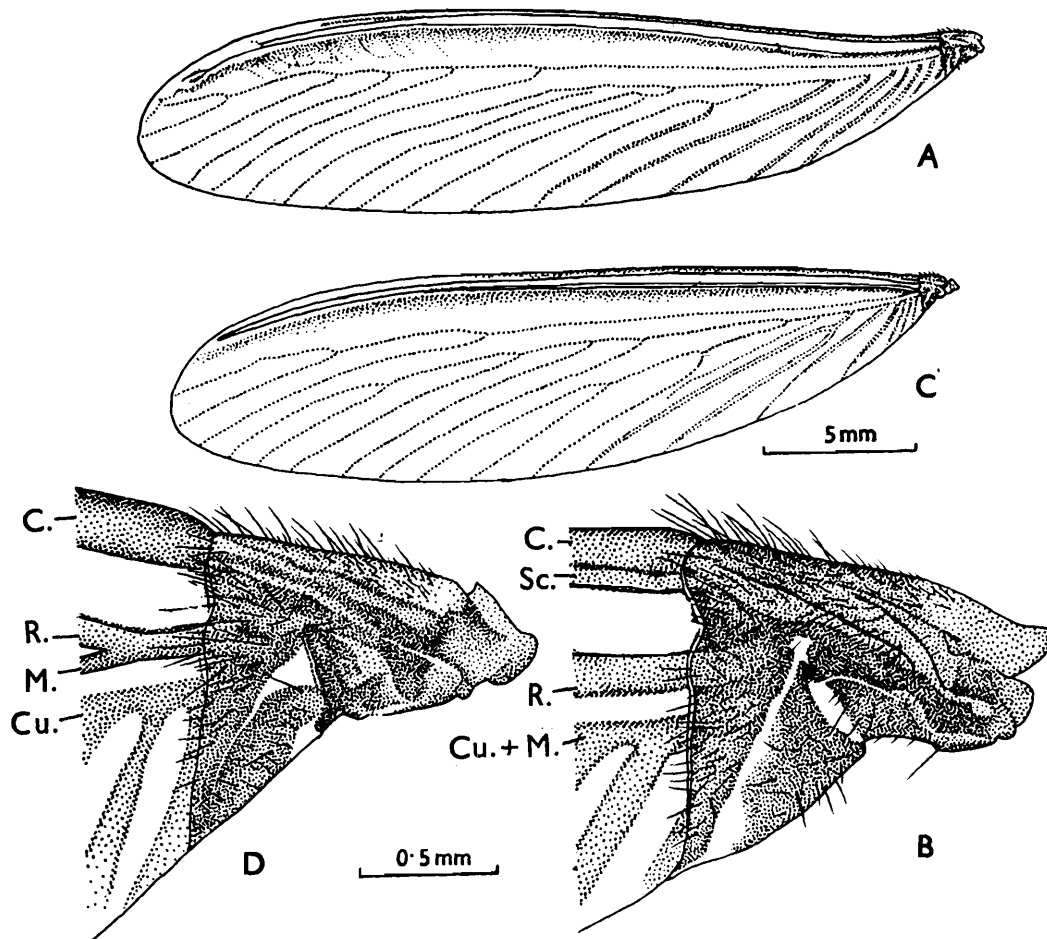


Fig. 250 : *Odontotermes microdentatus*. Imago wings (Paratype). (A) Forewing. (B) Part of forewing with scale. (C) Hindwing. (D) Part of hindwing with scale.

(long diameter 0.30-0.36, short diameter 0.16-0.20 mm); separated from eyes by about their short diameter (0.18-0.20 mm). Antennae 19-segmented; segments 3 and 5 subequal and shortest. Postclypeus greatly swollen; length half of its width. Pronotum subtrapezoidal (length 1.13-1.30, width 2.2-2.3 mm); with a T-shaped pale mark at middle and one shoulder spot on either side; anterior margin sinuate, with a weak median notch; posterior margin substraight, medially faintly incurved. Wings long, brown (length : forewing 25-27 and hindwing 22.5-25.5 mm); radial streak separating from radius at proximal 1/3.

SOLDIER (Fig. 251) : Head pale brown to dark brown; antennae brownish, darker distally; pronotum pale straw coloured; legs and abdomen creamish white. Head sparsely and body fairly densely hairy. Total body-length 3.9-5.3 mm. Head-capsule oval, converging anteriorly (length to base of mandibles 1.0-1.45, max. width 0.90-1.15, width at base of

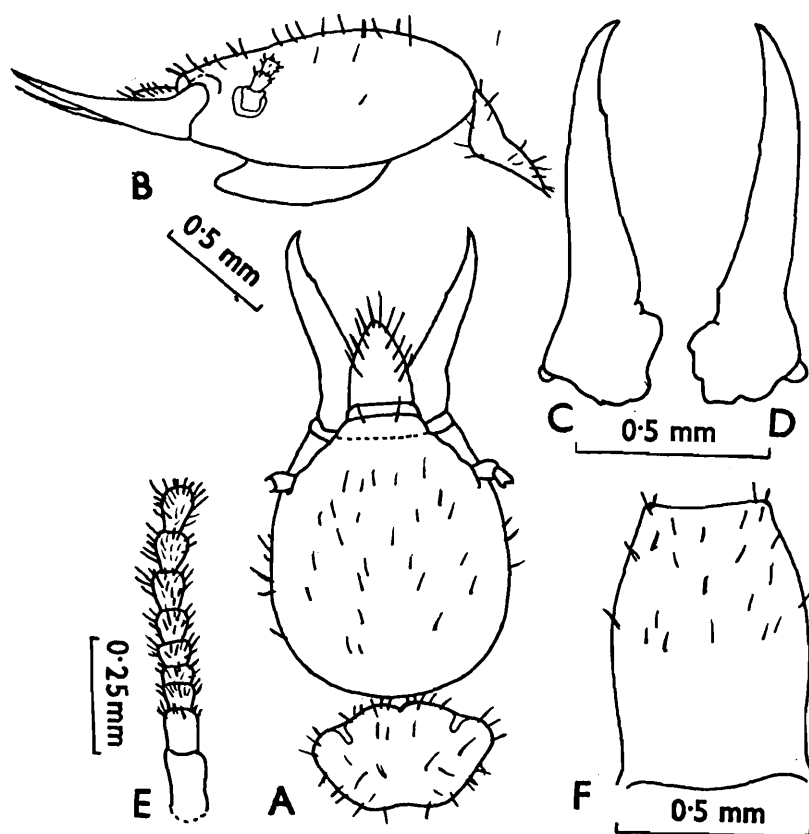


Fig. 251 : *Odontotermes microdentatus*. Soldier (Paratype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles, respectively. (E) Basal part of antenna. (F) Postmentum.

mandibles 0.55-0.68 mm, index width/length 0.73-0.95 and index width at mandible base/max. width 0.55-0.64). Antennae 16 to 17-segmented; segment 4 shortest in 16- and 3 and 5 shortest and subequal in 17-segmented antennae. Labrum tongue-shaped, converging anteriorly into a narrow rounded tip (length 0.35, width 0.30 mm). Mandibles long, slender and almost straight, very slightly bent inwards at distal tip; length 2/3 to 3/4 of head-length (length 0.78-0.90 mm, index mandible-length/ head-length 0.62-0.78). Left mandible with a minute tooth above distal 1/3 (tooth-distance from tip 0.20-0.25 mm, index tooth-distance/ mandible-length 0.28 -0.31). Right mandible with a rudimentary tooth at distal 1/3. Postmentum subrectangular with convex sides (length 0.65-0.80, max. width 0.40-0.50 mm). Pronotum saddle-shaped (length 0.45-0.55, width 0.70-0.85 mm); anteriorly deeply notched and posteriorly weakly to fairly prominently incurved medially.

WORKER : Monomorphic, Head-capsule deep straw-coloured; antennae, postclypeus and pronotum a little paler; abdomen whitish. Head and body densely hairy. Total body-length 3.5-4.8 mm. Head-capsule subsquarish (length to base of mandibles 1.2-1.55, max. width 1.40-1.74 mm). Antennae 17-segmented; segments 3 and 4 subequal. Postclypeus swollen, hairy; length about 1/2 of width. Pronotum saddle-shaped (length 0.33-0.50, width 0.63-0.90 mm); anteriorly deeply notched; posterior margin straight with shallow median notch.

Distribution : INDIA : So far recorded from Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh, Madhya Pradesh and Bihar States. Karnataka record by Sen-Serma, et al. (1975) seems to be doubtful as it is not given by Thakur (1981) in his revision of the genus.

253. *Odontotermes mirganjensis* Holmgren and Holmgren

(Fig. 252)

1. *Odontotermes (Odontotermes) mirganjensis* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. agric. Sci.*, **5** : 158. S and W (maj.) Lectotype (selected A.E. Emerson) : S, in Riksmus., Stockholm. Type-locality : Mirganj, Bihar, India. Paralectotype examined.

2. *Odontotermes mirganjensis* Holmgren and Holmgren :

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, 14 (2) : 13, 97-99. Synonymy, description, etc.

IMAGO : Unknown.

SOLDIER (Fig. 252) : Head brownish; antennae paler than head; mandibles blackish, dark brown basally; body and legs paler brown. Head sparsely and body fairly densely hairy. Total body-length c 7.0 mm. Head-capsule subrectangularly, broadly oval; side slightly convex and converging in front (length to base of mandibles 2.24-2.4, max. width 1.8-1.90, width at base of mandibles 1.35 mm, head index max. width/length 0.783, head-convergence index 0.665). Antennae broken in paralectotype, only 14 segments present (no. of segments not given in original description); segments 3 and 5 shortest, subequal. Labrum subtriangular; with a

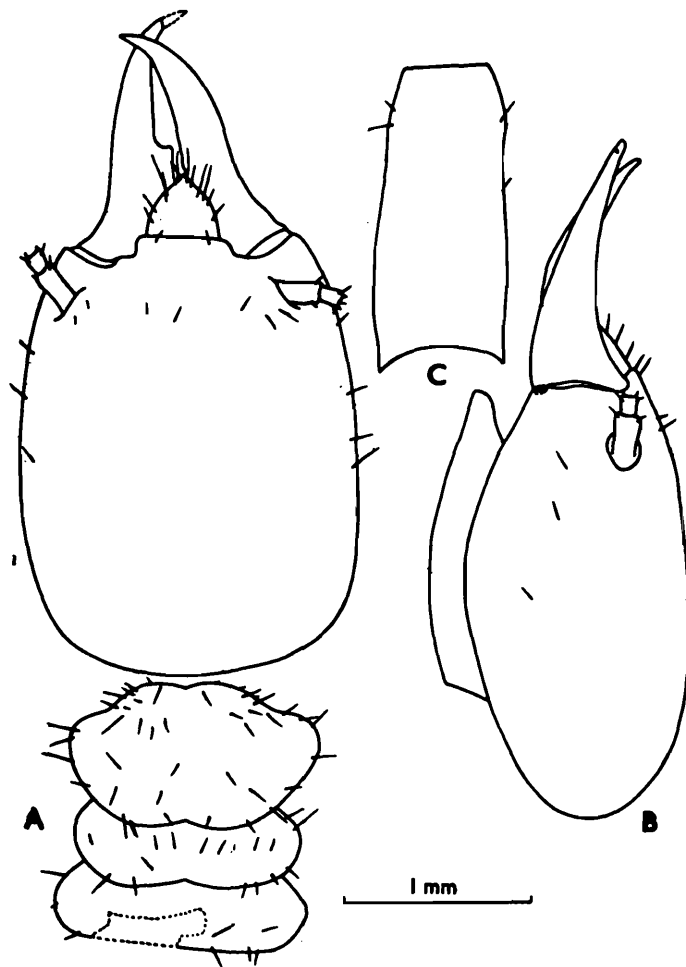


Fig. 252 : *Odontotermes mirganjensis*. Soldier (Syntype). (A) Head and thorax, dorsal view. (B) Head, side view. (C) Postmentum.

narrow, pointed tip (length 0.33, width 0.40 mm). Mandibles thick, short, incurved apically (length : left 1.30, tip broken, right 1.35 mm); a little longer than half of head-length (index mandible-length/head-length 0.541). Left mandible with a rather large tooth a little below middle, tooth-distance 0.73 mm, index tooth-distance/mandible-length 0.651). Right mandible with a minute tooth a little below that on left mandible (tooth-distance 0.78 mm). Postmentum subrectangular, broad posteriorly (length 1.58, max. width 0.75 mm). Pronotum saddle-shaped (length 0.80, width 1.43-1.48 mm), distinctly notched both anteriorly and posteriorly.

WORKER : Not available. According to Holmgren and Holmgren (1917) the larger worker is 5.0 mm long, having 1.82 mm wide head and 0.95 mm wide pronotum.

Distribution : INDIA : Bihar (Mirganj, type-locality), known only from the type-locality.

254. *Odontotermes obesus* (Rambur)

(Synonyms : *Odontotermes assamensis* Holmgren, *O. bangalorensis* Holmgren, *O. flavomaculatus* Holmgren and Holmgren, *O. obesus* var. *oculatus* Silvestri and *Termes* (*Cyclotermes*) *orissae* Snyder)

(Figs. 253-256)

1. *Termes obesus* Rambur :

1842. Rambur, *Histoire nat. Insectes, Ne'vropte'res* : 304. Im only. Syntypes : one Im, in Hope Mus., Oxford (U.K.).

2. *Odontotermes obesus* (Rambur) :

1965. Krishna, *Am. Mus. Novit*, No. 2210 : 24-25.

1967. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, 11 (1) : 5, 43-45.

1967. Roonwal and Chhotani, *Zool. Anz.*, 178 (3/4) : 240-242. Wing microsculpture.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 364-365.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 29-32, figs. 33, 34.

1974. Akhtar, *Pakistan J. Zool.*, 6(1 & 2) : 201.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, Art. 7 : 70, 86-87.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 1, 2, 15, 20, 31, 32, 33, 42, 48, 74, 75.
1977. Chhotani, *Rec. zool. Surv. India*, **72** : 379-385.
1979. Chhotani and Bose, *Zoologiana*, No. 2 : 22-23.
1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 8, 46, 47-48.
1981. Thakur, *Indian For. Rec. (N.S.). Ent.*, **14**(2) : 10, 12, 108-109. Synonymy, description, etc.
1982. Verma and Thakur (R.K.) *Rec. zool. Surv. India*, **79** : 315-316.
1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 201, 207-208, 211, 212, tab. 2.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.. 49 : 7, 96-165, 189-192.

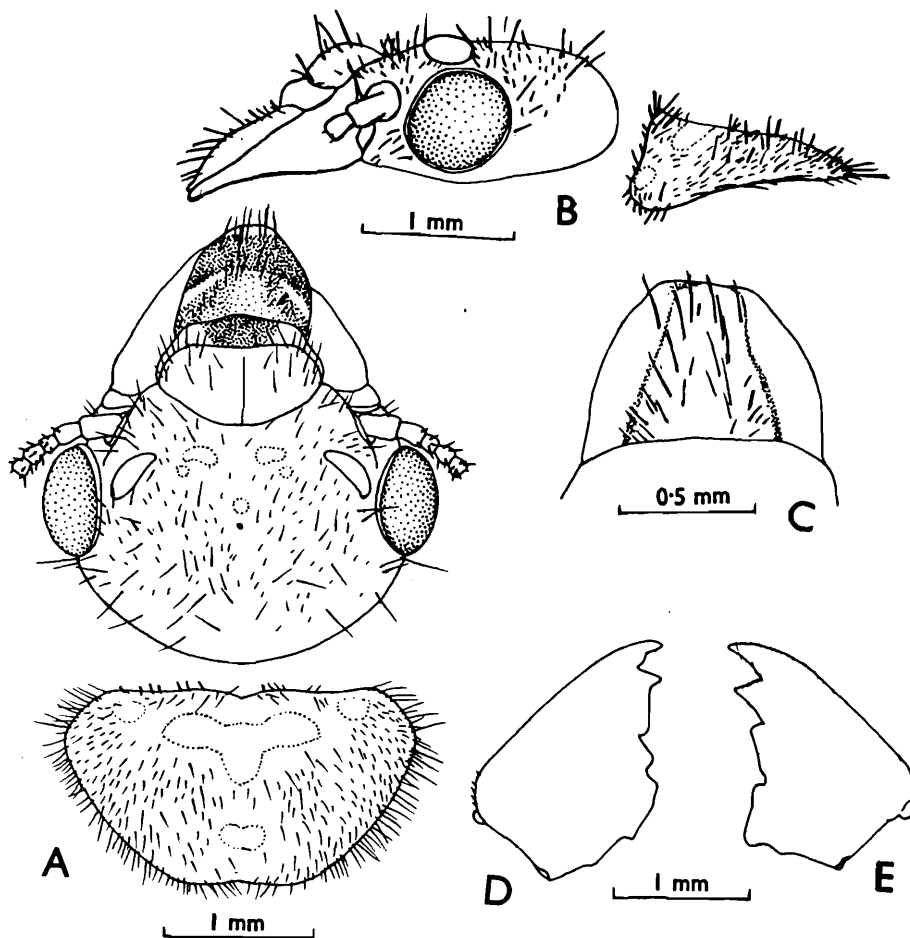


Fig. 253 : *Odontotermes obesus*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Labrum. (D) and (E) Left and right mandibles, respectively.

1984. Bose and Roy, *Bull. zool. Surv. India*, 5 (2-3) : 189.

1984. Verma, *Indian J. Forestry*, 7(4) : 308-309, 310, 313.

1987. Bose and Das, *Fauna of Orissa., Pt. 1, State Fauna Sr.*, 1 : 106, 110.

1989. Verma, *Indian J. Forestry*, 12.(4) : 297-298, 300.

3. *Termes obesus (Cyclotermes) orissae Snyder* :

1934. Snyder, *Indian For. Rec.*, 20(11) : 10-11.

See Snyder (1949), Rattan Lal and Menon (1953), Krishna (1965b) and Thakur (1981) also for synonymy.

IMAGO (Figs. 253, 254, 255) : Head-capsule and pronotum reddish brown to castaneous brown; postclypeus reddish brown; wings yellowish brown to somewhat rusty brown. Head and body rather densely hairy. Total body-length with wings 26.0-31.0, without wings 11.0-15.0 mm. Head-capsule subcircular, broader than long (length to base of mandibles 1.85-2.55, max. width with eyes 2.40-2.70 mm). Fontanelle small, ring-like, slightly raised. Eyes moderately large and projecting (max. diameter 0.65-0.78, min. diameter 0.53-0.58 mm). Ocelli broad, oval (long diameter 0.30-0.38, short diameter 0.23-0.30 mm); separated from eyes by 1/2 their long diameter (0.15-0.20mm). Antennae with 19 segments; segment 2 as long as or longer than 3; 3, 4 and 5 variable in size, either 3 or 4 shortest, sometimes 3 and 5 subequal and shortest. Postclypeus greatly swollen,

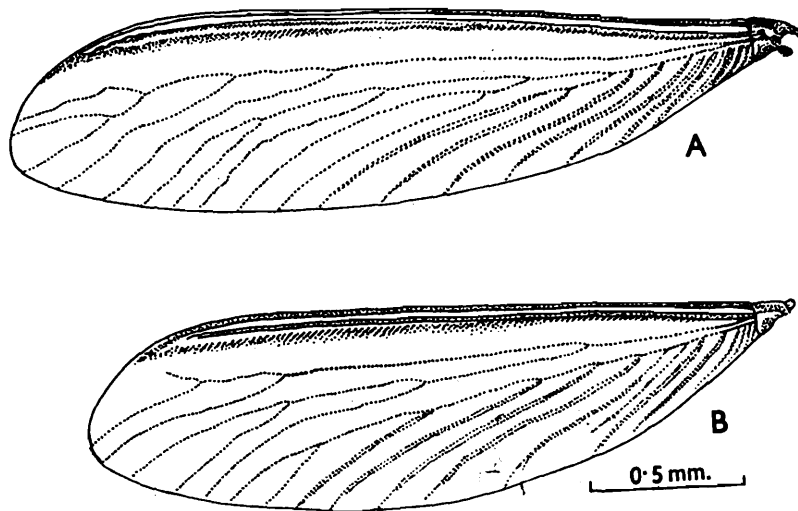


Fig. 254 : *Odontotermes obesus*. Imago wings. (A) Forewing, with scale. (B) Hindwing with scale.

hairy; length half or slightly more than half its width. Labrum broad, tongue-shaped with broadly rounded anterior margin. Pronotum subtrapezoidal, with a central, pale, T-shaped mark and two shoulder spots; a little narrower than head (length 1.14-1.48, width 2.28-2.60 mm); anterior margin sinuate, with a weak median notch; posterior margin substraight with a weak depression medially. Wings long and narrow; forewing-length 21.4-25.5 mm, hindwing-length 20.5-23.0 mm; radial streak separating from middle of wing membrane; membrane with slightly wavy, thin, cuticular rods.

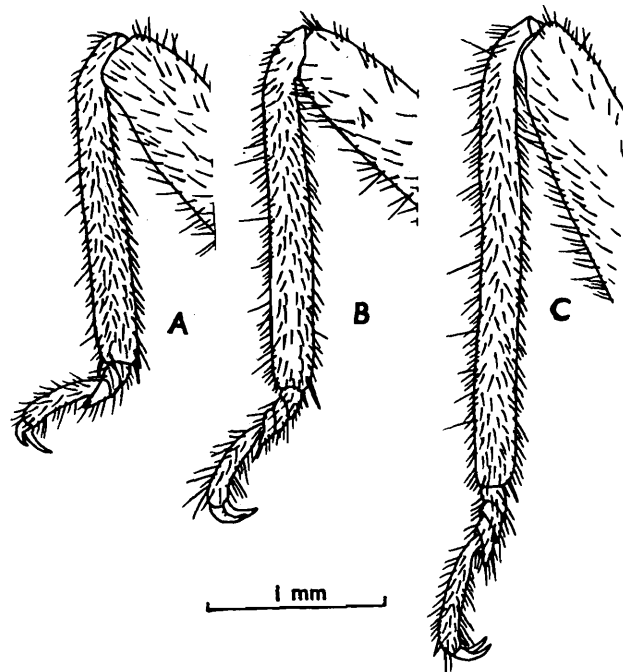


Fig. 255 : *Odontotermes obesus*. Imago legs. (A) Foreleg. (B) Middle-leg. (C) Hindleg.

SOLDIER (Fig. 256) : Head-capsule pale yellow to castaneous brown; antennae pale yellow to yellowish brown, darker distally; mandibles light brown to deep reddish brown; body pale yellow to pale brownish. Head sparsely and body moderately hairy. Total body-length 4.0-6.0 mm. Head-capsule oval, weakly converging anteriorly (length to base of mandibles 1.03-1.67, max. width 0.95-1.37 mm, index width/length 0.82-0.95 and convergence index i.e. width at mandible base/max. width 0.62-0.70). Antennae with 16-17 segments; segment 2 subequal to 3 + 4 in 16-segmented antennae and 3 in 17-segmented ones, shortest. Labrum

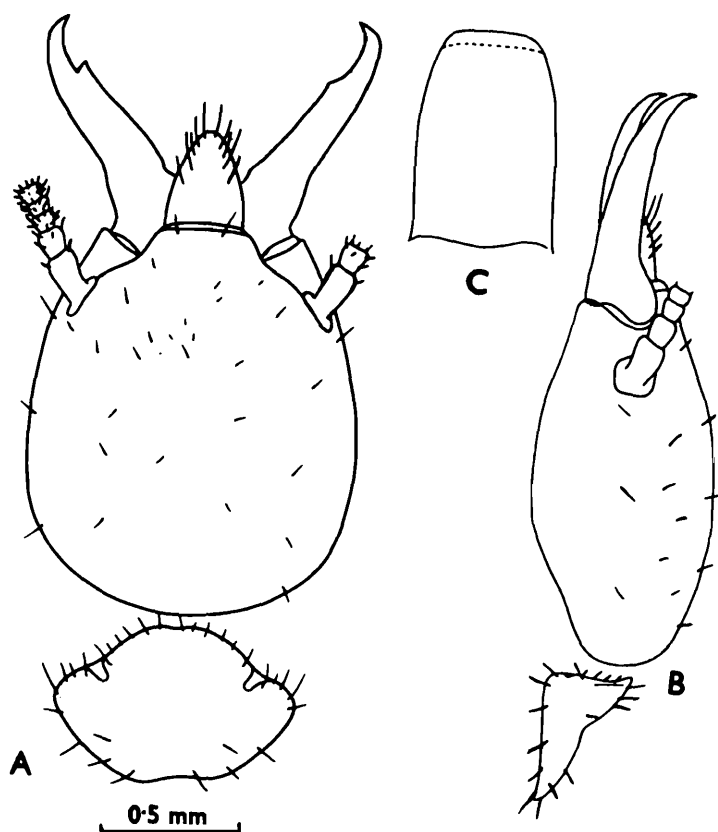


Fig. 256 : *Odontotermes obesus*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

tongue-shaped, with broadly rounded anterior margin. Mandibles long, slender, sabre-shaped (length 0.75-1.03 mm, index mandible-length/head-length 0.59-0.68). Left mandible with a sharp, prominent tooth at distal 1/3 (tooth-distance from tip 0.25-0.38, index tooth-distance/mandible-length 0.31-0.40). Right mandible with a minute tooth a little below level of tooth on left mandible. Postmentum subrectangular (length 0.70-0.93, width 0.50-0.58 mm). Pronotum saddle-shaped, anterior lobe semicircular; anterior margin weakly to deeply notched; posterior margin also weakly emarginate to distinctly notched (length 0.50-0.65, width 0.80-1.07 mm).

WORKER : Dimorphic. *Worker major* : Head-capsule pale yellow to yellowish brown; antennae pale yellow to yellowish brown, darker distally; body creamish to straw yellow. Head moderately and body somewhat thickly hairy. Total body-length 3.80-4.50 mm. Head-capsule subsquarish, widest near antennae (length to base of mandibles 1.15-1.40; max. width 1.37-1.58 mm). Antennae with 17-18 segments; in 17-segmented one,

segment 3 shortest and in 18-segmented one, 4 shortest. Postclypeus weakly swollen, length less than half its width. Pronotum strongly saddle-shaped; anterior margin weakly to distinctly notched; posterior margin broadly emarginated (length 0.43-0.58; width 0.70-0.85 mm). *Worker minor* : Smaller than worker major and with 16-17 segmented antennae. Total body-length 2.70-4.70, length of head to base of mandibles 0.65-1.00, max. width of head 0.75-1.15, pronotum-length 0.30-0.40, pronotum-width 0.50-0.63 mm.

Distribution : Widely distributed in the Indian subcontinent.

Biology (Plates 1, 2) : This is the most common species of termites found in the Indian subcontinent. It has been reported to build mounds of five different types. Holmgren (1912b), Chhotani (1977a) and Roonwal (1978b) have described these different mounds in some details. It is also reported as a serious pest of several crops, plantations and forestry and also damages woodwork in buildings and houses. The swarming occurs during the monsoons and is generally at dusk. Chhotani (1980) has given a list of its hosts and pest status.

255. *Odontotermes paralatigula* Chatterjee and Sen-Sarma

(Fig. 257)

1. *Odontotermes paralatigula* Chatterjee and Sen-Sarma :

1962. Chatterjee and Sen-Sarma, *J. Bombay nat. Hist. Soc.*, **59**(3) : 822-826. S only. Holotype : S, in FRI. Type-locality : Hlegu Range, Insein Forest Division, Burma.

1973. Roonwal and Verma, *J. Indian Acad. Wood Sci.*, **4**(2) : 84, 89-90.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 34.

1980. Bose, *Rec. zool. Surv. India*, **77** : 104-105.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER (Fig. 257) : Head-capsule brown to chocolate brown; antennae paler than head, distal part darker than proximal part; mandibles dark reddish brown, paler basally; labrum as dark as head; body and legs pale yellow to light brown. Head sparsely to moderately and body densely hairy. Total body-length 5.4-7.0 mm. Head-capsule broad,

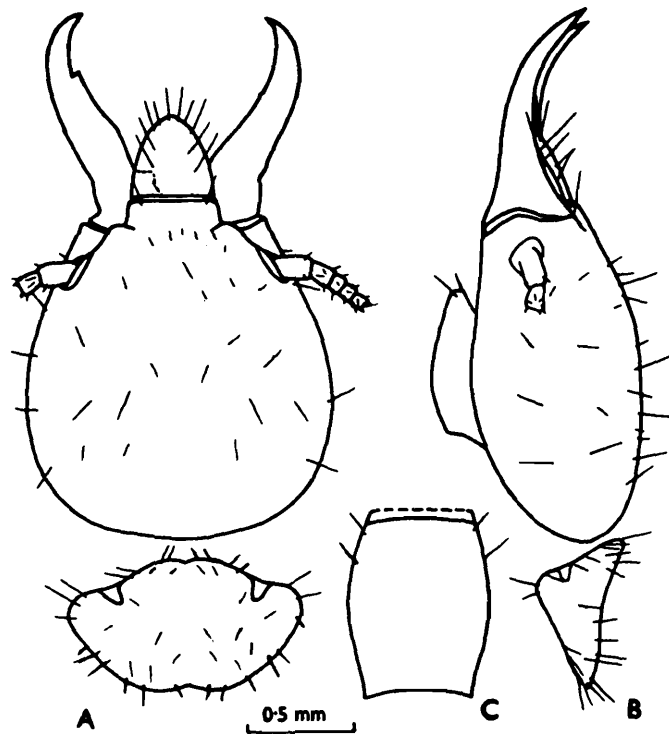


Fig. 257 : *Odontotermes paralatigula*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

oval, widest posteriorly (length to base of mandibles 1.45-1.79, max. width 1.40-1.74, width at base of mandibles 0.85-1.00 mm, index width/length 0.75-0.90, index width at base of mandibles/max. width 0.57-0.69). Antennae 17-segmented; segments 3 and 4 subequal; 5 shortest. Labrum tongue-shaped; longer than wide (length 0.35-0.50, width 0.30-0.45 mm); with a row of long bristles on either side. Mandibles sabre-shaped, sharply incurved distally; length more than half head-length (length 0.85-1.0 mm, index mandible-length/head-length 0.53-0.62). Left mandible with a prominent tooth at about distal third (tooth-distance from tip 0.25-0.35 mm, index tooth-distance/mandible-length 0.30-0.35). Right mandible with a minute tooth a little anterior to middle. Postmentum swollen, with greatly arched sides; widest at middle; a little longer than wide (length 0.80-1.0, max. width 0.70-0.80 mm). Pronotum saddle-shaped; both anteriorly and posteriorly prominently notched (length 0.62-0.79, width 0.98-1.42 mm).

WORKER : Monomorphic. Head pale yellowish brown; antennae pale brown, paler basally; postclypeus paler than head; body and legs yellowish

white. Total body-length 4.4-5.0 mm. Head-capsule subcircular, widest at base of mandibles (length to base of mandibles 1.35-1.40, max. width 1.55-1.68 mm). Fontanelle plate translucent, oval to round spot. Antennae with 18-19 segments; in 18-segmented antennae, segment 3 slightly shorter than 2 and sometimes in process of division, 4 shortest; in 19-segmented ones 3 shortest or 3,4 and 5 subequal. Postclypeus swollen; length less than 1/2 width (length 0.28-0.30, width 0.73-0.78 mm). Pronotum saddle-shaped (length 0.45-0.50, width 0.83-0.90 mm); distinctly notched anteriorly and fairly incurved posteriorly.

Distribution : INDIA : Manipur state and South Andamans. BURMA.

Remarks : Roonwal and Verma (1973) reported this species from South Andamans, Thakur (1981), however, felt that this species *paralatigula* reported by Roonwal and Verma was actually based on specimens belonging to *latigula*. Bose (1980) had somehow not seen the publication of Roonwal and Verma (1973) and had independently reported the presence of this species from South Andamans. The author has examined the specimens from Andamans and Manipur, as well as the paratypes present in ZSI and finds that *O. paralatigula* does occur in the Andamans. The differences of both these species are enumerated in the key.

256. *Odontotermes parvidens* Holmgren and Holmgren

(Synonyms : *Termes (Termes) almorensis* Snyder and *O. microdens* Holmgren Nom. nud.

(Figs. 258,259)

1. *Odontotermes/O. (Odontotermes) parvidens* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. agric. Sci.*, 5(3) : 154. S and W. Syntypes : S and W, in IARI, ZSI, and Riksmus., Stockholm. Type-localities : Mysore to Mercara Road, Karnataka, India*; Dhar, Gurdaspur Dist., Panjab, India; Gauhati, Assam, India; Khamakhya Hill, Gauhati, Assam, and Chaumahani, Noakhali Dist., Bangladesh.
1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 296, 356-359.

* See "Remarks" below and Bose, 1984 (pp. 167-168).

1965. Mathur and Thapa, *Bull. Ent.*, No. 6 : 9.
1967. Roonwal and Chhotani, *Zool. Anz.*, **178** :250, 251 (Wing microsculpture).
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 32-33, fig. 35.
1974. Akhtar, *Pakistan J. Zool.*, **6**(1 &2) : 102.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 70, 87-90.
1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 452-454.
1980. Lahiri and Ghosh, *Rec. zool. Surv. India*, **76** : 68.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 19, 26, 106-109, map 1.
1984. Bose and Roy, *Bull. zool. Surv. India*. **5**(2-3) : 189-190.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 167-168.
1989. Verma, *Indian J. Forestry*, **12** (4) : 298, 300.
1992. Akhtar, et al. *Pakistan J. Zool.*, **24**(2) : 92, 93.
- In press. Bose, *Occ. Pap. Rec. zool. Surv. India*. No.

2. *Termes (Cyclotermes)/Odontotermes almorensis* Snyder :

1933. Snyder, *Proc. U. S. natn. Mus.*, **84** : 8-9.
1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 45. Synonymy.

3. *Odontotermes distans* Holmgren and Holmgren (Part) :

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 44-50. See for synonymy part of *parvidens*.

4. *Odontotermes microdens* Holmgren (In Silvestri) Nom. nud. :

1914. Silvestri, *Rec. Indian Mus.*, **8**(5) : 428.

IMAGO (Fig. 258) : Head-capsule brown with reddish tinge to castaneous brown; antennae and postclypeus pale brown; pronotum of same colour as head and with a T-shaped, pale marking in middle and one shoulder spot on either side; wings pale brownish yellow; abdominal tergites castaneous, sternites pale brown. Head and body densely hairy. Total body-length with wings 26.5-30.5, without wings 10.50-14.00 mm. Head-capsule subcircular, broader than long (length to base of mandibles 2.0-2.40, width with eyes 2.50-2.80 mm). Fontanelle small, point-like, slightly raised; area around fontanelle slightly depressed and paler. Eyes subcircular (max. diameter 0.58-0.65, min. diameter 0.55-0.60 mm). Ocelli

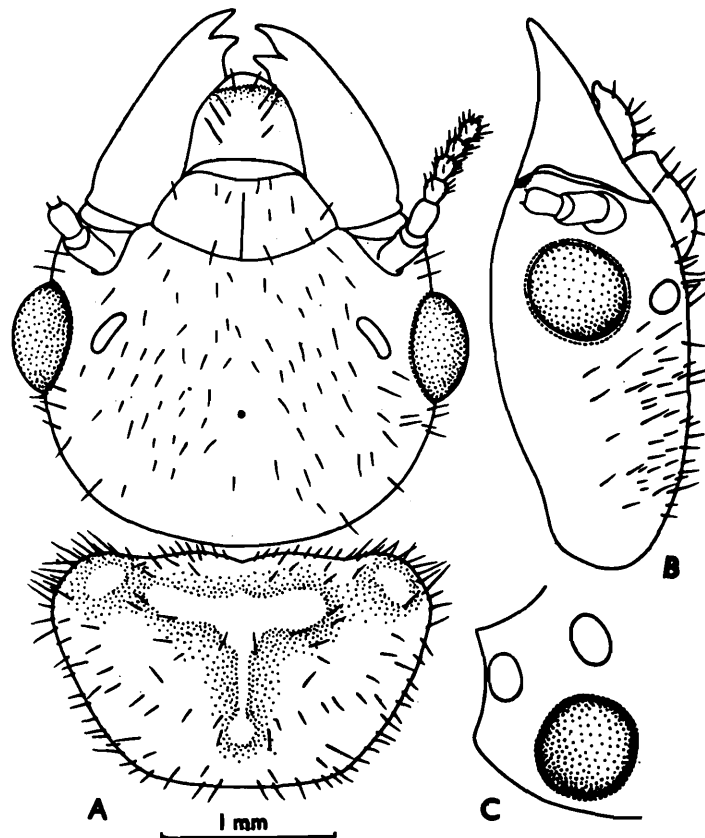


Fig. 258 : *Odontotermes parvidens*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Part of head showing positions of eye, ocellus and antenna.

roundish to suboval; separated from eyes by their long diameter to a little more (long diameter 0.20-0.27, short diameter 0.15-0.20, eye-ocellus distance 0.23-0.30 mm). Antennae with 18-19 segments, segments 3,4,5 either subequal or slightly variable in size (4 slightly longer than 3 and 5 shortest). Postclypeus swollen, hairy; length less than half width; anterior margin straight, posterior margin rounded. Pronotum trapezoidal, narrower than head with eyes (length 1.0-1.3, width 2.0-2.50 mm); anterior margin with a shallow, median invagination, posterior margin with deep invagination. Wings smoky pale brown (length : forewing 25.0-27.50, hindwing 24.0-25.0 mm); microsculpture consists of thin, wavy, *obesus*-type cuticular rods on membrane; radial streak separating from radius at proximal third.

SOLDIER (Fig. 259) : Head-capsule yellowish to deep reddish brown; antennae and body creamy white to straw yellow; mandibles blackish

brown, yellowish brown basally. Head sparsely and body rather densely hairy. Total body-length 5.30-7.45 mm. Head-capsule large, subrectangularly oval, converging anteriorly (length to base of mandibles 1.89-2.70, max. width 1.45-2.15 mm). Antennae 16 to 17-segmented; in 16-segmented ones, segment 3 either subequal to 2 or slightly longer and subdivided; in 17-segmented ones, segment 3 shorter than 2 and subequal to 4 and 5, or shortest. Labrum triangularly tongue-shaped, with pointed tip. Mandibles strong; half as long as or a little longer than half head-length (length 1.19-1.38 mm, index mandible-length/head-length 0.50-0.60); slightly incurved at tips. Left mandible with a minute, laterally directed tooth at base of middle-third (tooth-distance from tip 0.70-0.90 mm, index tooth-distance/mandible-length 0.58-0.65). Right mandible without or with a minute denticle near base. Postmentum subrectangular (length 1.15-1.70 mm, max. width 0.62-0.90 mm). Pronotum saddle-shaped; anterior margin weakly notched; posterior margin strongly emarginate (length 0.60-0.93, width 1.05-1.65 mm).

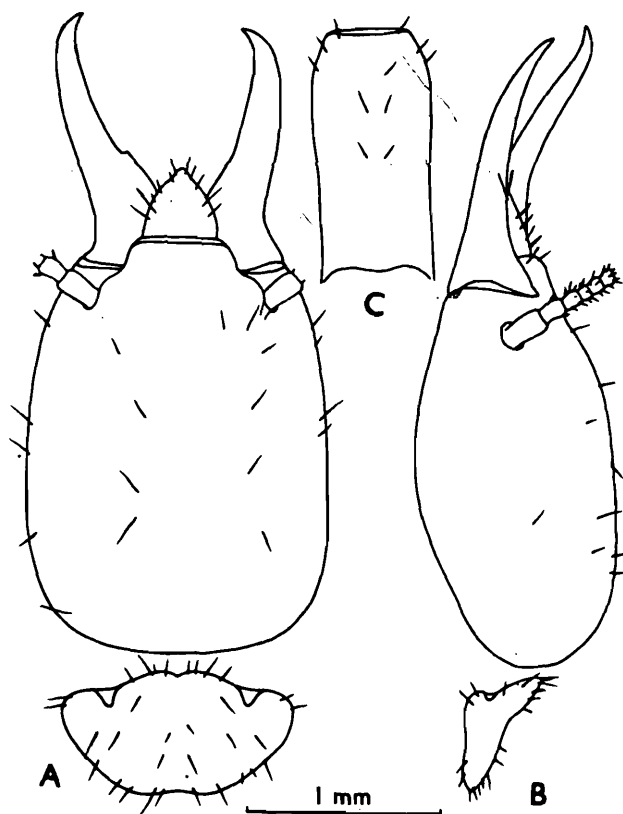


Fig. 259 : *Odontotermes parvidens*. Soldier. (A) Head and pronotum, dorsal view. (B) same, side view. (C) Postmentum.

WORKER : Dimorphic : *Worker major* : Head-capsule yellowish brown; antennae, thorax and legs pale yellowish; body whitish to pale yellow. Head and body moderately hairy. Total body-length 4.70-5.80 mm. Head-capsule subsquarish (length to base of mandibles 1.50-1.75, max. width 1.60-1.80 mm). Antennae with 17-19 segments ; segment 3 subequal to 4 and 5 shortest in 17-segmented one and 3 shortest in 18 or 19 segmented ones. Postclypeus weakly swollen; length less than half width. Pronotum saddle-shaped; weakly notched at anterior and posterior margins (length 0.50-0.60, width 0.85-1.20 mm). *Worker minor* : Very rare. As worker major except for smaller size and 17-segmented antennae with segments 3 and 4 subequal and 5 shortest. Total body-length 3.0-3.6, length of head to base of mandibles 0.90-0.95, max. width of head 1.08-1.15, length of pronotum 0.48-0.50, width of pronotum 0.75-0.78 mm.

Distribution : INDIA : Northern, eastern and north-eastern India. BANGLADESH, BHUTAN, PAKISTAN.

Remarks : Thakur 1981 treats *parvidens* as synonymy of *distans* but here these two species are kept separate in view of the remarks of Bose (1984) on the species *Odontotermes parvidens* (pp. 167-168) to which I also agree.

257. *Odontotermes peshawarensis* Akhtar

(Fig. 260)

1. *Odontotermes peshawarensis* Chaudhry, et al. Nom. nud. :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 33. Nom. nud.

2. *Odontotermes peshawarensis* Akhtar :

1974. Akhtar, *Biologia*, Lahore, **20** (1) : 44-46. S only. Holotype : S, in PU. Type-locality : Peshawar, N.W.F.P., Pakistan.

1974. Akhtar, *Pakistan J. Zoology*, **6** (1 & 2) : 102.

IMAGO : Unknown.

SOLDIER (Fig. 260) : Head brownish yellow to yellowish brown, slightly paler anteriorly; antennae smoky brown, brownish yellow basally; mandibles light reddish brown, paler basally; pronotum yellowish; abdomen and legs whitish yellow. Head sparsely hairy; pronotum with a few bristles at margins and on disc; postmentum with a few hairs on

anterior half. Head subrectangularly oval, a little longer than wide (length to base of mandibles 1.07-1.14, maximum width 0.95-1.00, width at base of mandibles 0.65-0.72 mm, index max. width/length c 0.9 and index width at base of mandibles/maximum width c 0.65). Antennae 15-segmented; segment 2 twice as long as 3, latter shortest. Labrum tongue-shaped, roundly pointed anteriorly; with a row of hairs on either side. Mandibles long, slender, weakly incurved apically (length of left mandible 0.74-0.78 mm, index mandible-length/head-length 0.691). Left mandible with a small, anteriorly directed tooth at distal third (tooth-distance from tip 0.27-0.30 mm, index tooth-distance/mandible-length 0.365). Right mandible with a minute tooth a little below level of left mandibular tooth. Postmentum arched, with slightly convex sides; a little longer than wide, with maximum width at middle (length of postmentum 0.63-0.70, maximum width 0.39-0.44 mm). Pronotum saddle-shaped; anterior margin indistinctly notched, posterior margin weakly emarginate (length 0.37-0.41, width 0.65-0.68 mm).

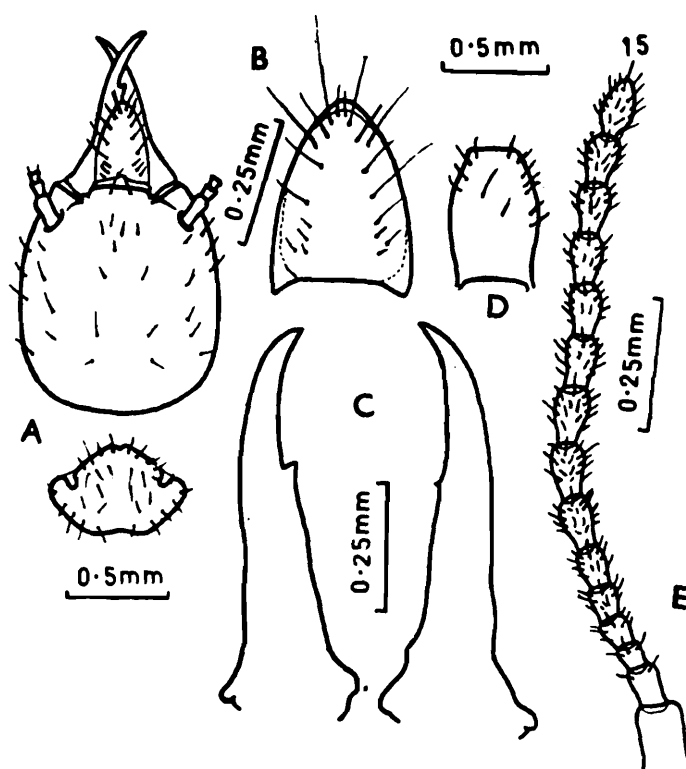


Fig. 260 : *Odontotermes peshawarensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Labrum. (C) Left and right mandibles, respectively. (D) Postmentum. (E) Antenna. (After Akhtar, 1974a).

Distribution : PAKISTAN : N.W.F.P. : Peshawar (Bara type-locality and Jamrud) (near Peshawar vide Chaudhry et al. 1972).

258. *Odontotermes preliminaris* (Holmgren)

1. *Termes preliminaris* Holmgren :

1911. Holmgren, In Escherich's *Termitenleben auf Ceylon* : 196. Im only. Syntypes probably in Riksmus., Stockholm. Type-locality : Peradeniya, Sri Lanka.

2. *Odontotermes (Odontotermes) preliminaris* (Holmgren) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 237. Synonymy.

1958. Ahmad, *Biologia*, Lahore, **4** : 99.

IMAGO : Description drawn from Holmgren (1911b, 1913b). Head brown; antennae, postclypeus, area around fontanelle and legs rust yellow; pronotum brown, with yellow shoulder spots one on either side and T-shaped mark medially and a small, triangular one placed in front; wings brownish with reddish brown streak; abdomen greyish brown to rust brown; anterior abdominal sternites whitish medially. Head and body moderately hairy with rust-yellow hairs. Total body-length 26.5, without wings 11.00. Head broad, oval (length 2.28, width 2.09 mm). Fontanelle not raised, round, open, whitish. Eyes medium-sized, projecting normally. Ocelli moderately large; from eyes situated at half their diameter. Antennae with 19 segments; segment 2 equal to 3 + 4, 4 longer than 3 and as long as 5. Postclypeus weakly swollen; much shorter than 1/2 of width. Pronotum as wide as head without eyes, semicircular (length 1.10, width 1.90 mm); with strongly rounded anterior corners; anterior margin incised at middle; hind margin weakly depressed. Mesonotum sharply and metanotum broadly angularly incised. Forewing-length 22.0 mm.

Distribution : SRI LANKA.

259. *Odontotermes profae* Akhtar

(Fig. 261)

1. *Odontotermes profae* Chaudhry, et al. Nom. nud. :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 33. Nom. nud.

2. *Odontotermes profecae* Akhtar :

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 90-93. S only.

Holotype : S, in PU. Type-locality : Singara, Bangladesh.

IMAGO : Unknown.

SOLDIER (Fig. 261) : Head brownish yellow to yellowish brown with reddish tinge; antennae uniformly coloured, very slightly darker apically; labrum yellowish brown with hyaline tip; mandibles dark brown, basally reddish brown; pronotum brownish yellow; legs and abdomen whitish yellow. Head sparsely hairy, pronotum more hairy than head. Head subrectangular; sides weakly convex (length to base of mandibles 1.96-2.39, max. width 1.73-2.00, width at base of mandibles 1.06-1.26 mm, index max. width/head-length 0.837 and index width at mandible-base/max. width 0.681). Antennae 17-segmented, segment 3 shortest. Labrum triangular; with pointed, hyaline tip and a row of bristles on either side and a few minute hairs. Mandibles long, stout and slightly incurved near tip. Left mandible with a large, anteriorly directed tooth a little below

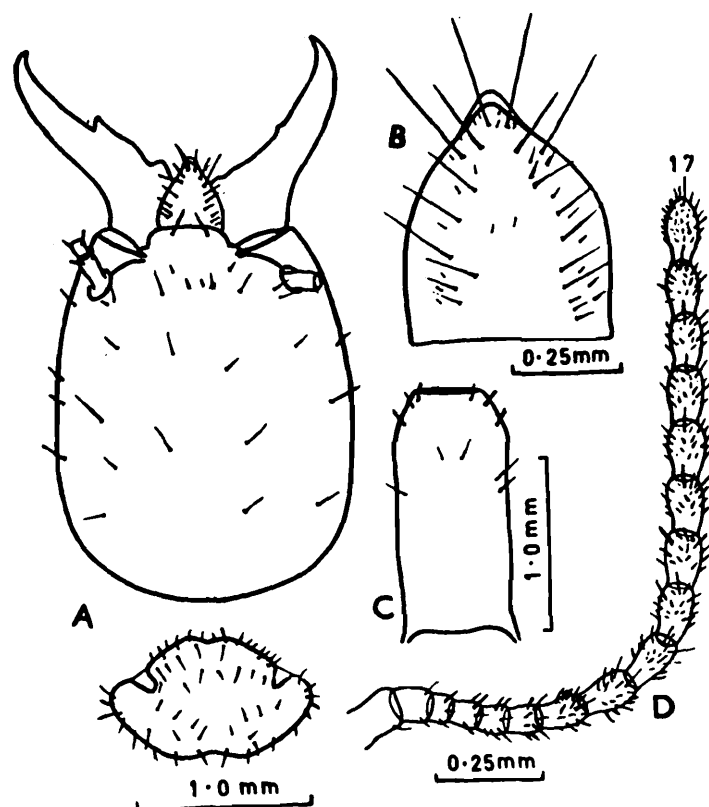


Fig. 261 : *Odontotermes profecae*. Soldier. (A) Head and pronotum, dorsal view. (B) Labrum. (C) Postmentum. (D) Antenna. (After Akhtar, 1975).

middle (length of left mandible 1.19-1.35 mm, index mandible-length head-length 0.57). Right mandible with a small denticle almost at level of tooth on left mandible. Postmentum subrectangular, sides almost parallel (length 1.28-1.58, max. width 0.64-0.80 mm). Pronotum saddle-shaped; anterior margin weakly emarginate medially; posterior margin distinctly emarginate (length 0.60-0.77, width 1.25-1.33 mm).

Distribution : BANGLADESH.

260. *Odontotermes proformosanus* Ahmad

(Figs. 262, 263)

1. *Odontotermes proformosanus* Ahmad :

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131**(Art. 1) : 43, 46-48, Im and S. Holotype : S, in PU. Type-locality : Kachong, Thailand.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. A17-FS-12) : 34, figs. 36 and 37.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)* Art. 7 : 70, 93-97.

In press. Bosè, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO (Fig. 262) : Head-capsule dark reddish brown, paler near postclypeus; postclypeus a little paler than head; antennae dark reddish brown; pronotum dark reddish brown; with a yellowish brown T-marking and small, ocellus-like shoulder spots. Head densely hairy with short and long hairs; postclypeus and pronotum as hairy as head-capsule. Head subcircular (length to base of mandibles 1.61-1.76, max. width with eyes 2.21-2.47 mm). Fontanelle small, circular, situated a little posterior to level of ocelli. Eyes subcircular (max. diameter 0.49-0.55, min. diameter 0.46-0.49 mm); separated from lower margin of head by much less than min. diameter (eye-lower margin distance 0.18-0.19 mm). Ocelli broadly oval (long diameter 0.19-0.22, short diameter 0.14-0.17 mm); separated from eyes by more than their long diameter (0.29-0.33 mm). Antennae 19-segmented, segment 3 slightly shorter or subequal to 4. Postclypeus swollen, length less than half width (length 0.41-0.42, width 0.90-0.93 mm)* Pronotum narrower than head; indistinctly emarginate at anterior and posterior margins (length 1.06-1.12, width 1.95-2.13 mm).

* According to Ahmad 1965, postclypeus is "less" than half as long as broad, but the measurement given by him show otherwise. I have, therefore, taken the measurements as given by Akhtar, 1975.

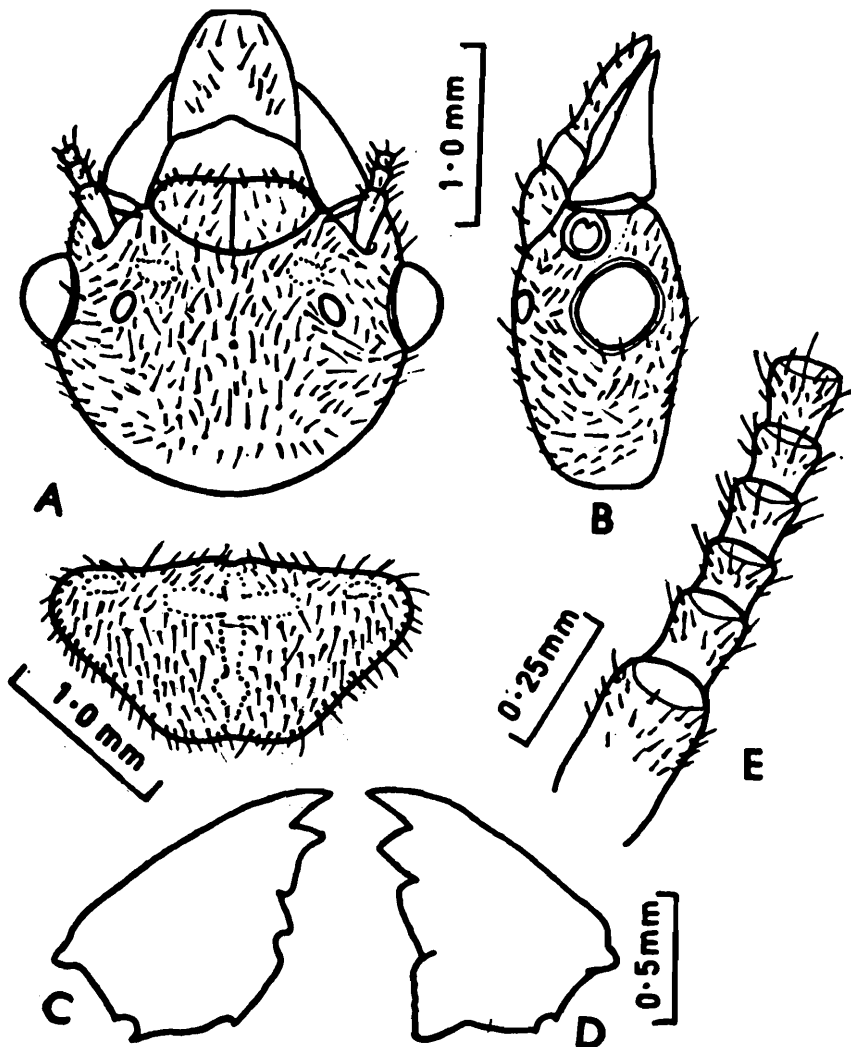


Fig. 262 : *Odontotermes proformosanus*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) and (D) Left and right mandibles, respectively. (E) Basal segments of antenna.

SOLDIER (Fig. 263) : Head-capsule yellowish brown to reddish brown; antennae uniformly yellowish to pale yellowish brown; labrum yellowish brown to pale brown; mandibles dark reddish brown, basally paler; pronotum yellowish; legs and abdomen creamy white. Head sparsely and body fairly densely hairy. Total body length 3.75-4.40 mm. Head-capsule oval, narrowed anteriorly (length to base of mandibles 1.00-1.31, max. width 0.90-1.22, width at base of mandibles 0.55-0.82 mm, index max. width/head-length 0.894-0.930, index width at base of mandibles/max. width 0.60-0.630). Antennae 15 to 16-segmented, segment 3 or 4 shortest.

Labrum tongue-shaped, anteriorly broadly rounded. Mandibles sabre-shaped, weakly incurved at tips, a little longer than half of head-length (length 0.62-0.74 mm, index mandible-length/head-length 0.533). Left mandible with a sharply pointed, anteriorly directed tooth in apical third (tooth-distance from tip 0.16-0.25 mm, index tooth-distance/mandible-length 0.292). Right mandible with a small denticle, a little below level of tooth on left mandible. Postmentum arched, and with convex sides; a little longer than broad and widest at middle (length 0.49-0.72, max. width 0.39-0.59 mm). Pronotum saddle-shaped, weakly to distinctly notched anteriorly and weakly emarginate at posterior margin (length 0.33-0.49, width 0.65-0.88 mm).

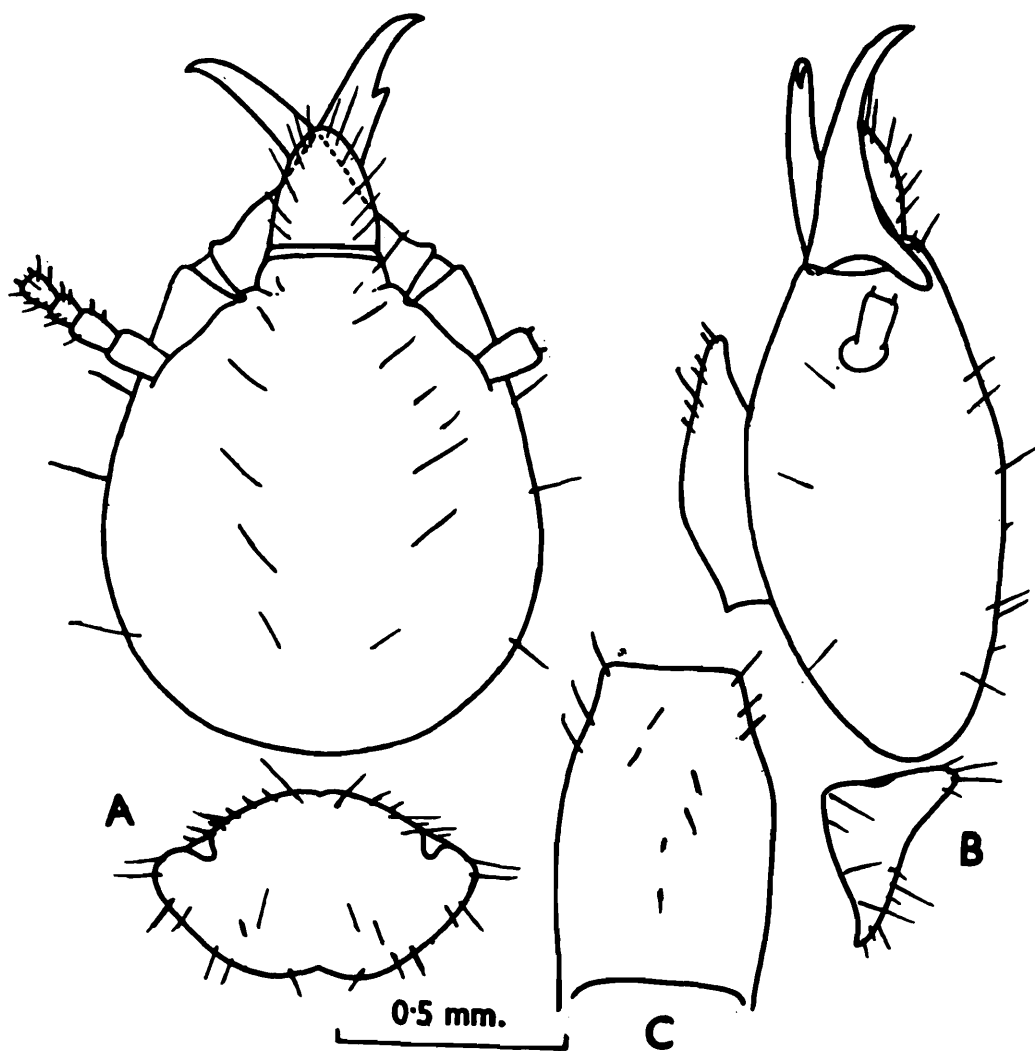


Fig. 263 : *Odontotermes proformosanus* Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum.

WORKER : Monomorphic : Head-capsule and postclypeus pale yellowish brown; antennae uniformly yellowish; legs and body creamish. Head and body fairly densely hairy. Total body-length 3.0-3.30 mm. Head-capsule subcircular (length to base of mandibles 0.95-0.98, max. width 1.13-1.15 mm). Antennae with 17 segments; segments 3 and 4 subequal, segment 5 shortest. Postclypeus swollen, hairy; length less than half width (length 0.18-0.19, width 0.55 mm). Pronotum saddle-shaped (length 0.35, width 0.58-0.63 mm); anterior and posterior margins weakly emarginate.

Distribution : INDIA : Arunachal Pradesh. BANGLADESH and THAILAND.

261. *Odontotermes prolatigula* Bose

(Fig. 264)

Odontotermes prolatigula Bose :

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. Holotype : S, in ZSI.
Type-locality: Nambung, East Siang District, Arunachal Pradesh.

IMAGO : Unknown.

SOLDIER (Fig. 264) : Head-capsule yellow to dark brown; antennae brownish, getting darker distally; mandibles dark brown, pale brown basally; pronotum and legs pale yellow to pale brownish; abdomen creamish yellow. Head and body fairly densely hairy. Total body-length 4.60-5.0 mm. Head oval, longer than wide (length to base of mandibles 1.28-1.40, max. width 1.13-1.15 mm) ; appreciably narrowed in front to base of mandibles (width at base of mandibles 0.68-0.75 mm, index head-convergence 0.602-0.644). Antennae with 16 segments; segment 3 a little shorter than 2; 4th shortest. Postclypeus trapezoidal, not clearly differentiated from frons; with a long hair on either side anteriorly. Anteclypeus thin, line-like. Labrum triangularly tongue-shaped (length 0.33-0.35, width 0.28-0.30 mm); with 4 pairs of long hairs. Mandibles sabre-shaped, moderately robust (length 0.78-0.83 mm); about 0.59-0.60 times that of head-length. Left mandible with a prominent tooth situated a little in front of distal 1/3 (index tooth distance/ mandible-length 0.253-0.287). Right mandible with a minute tooth a little below distal third (index tooth-distance/mandible-length 0.337-0.361). Postmentum broad cask-like; max. width about 4/5 of length (length 0.75-0.87, max. width

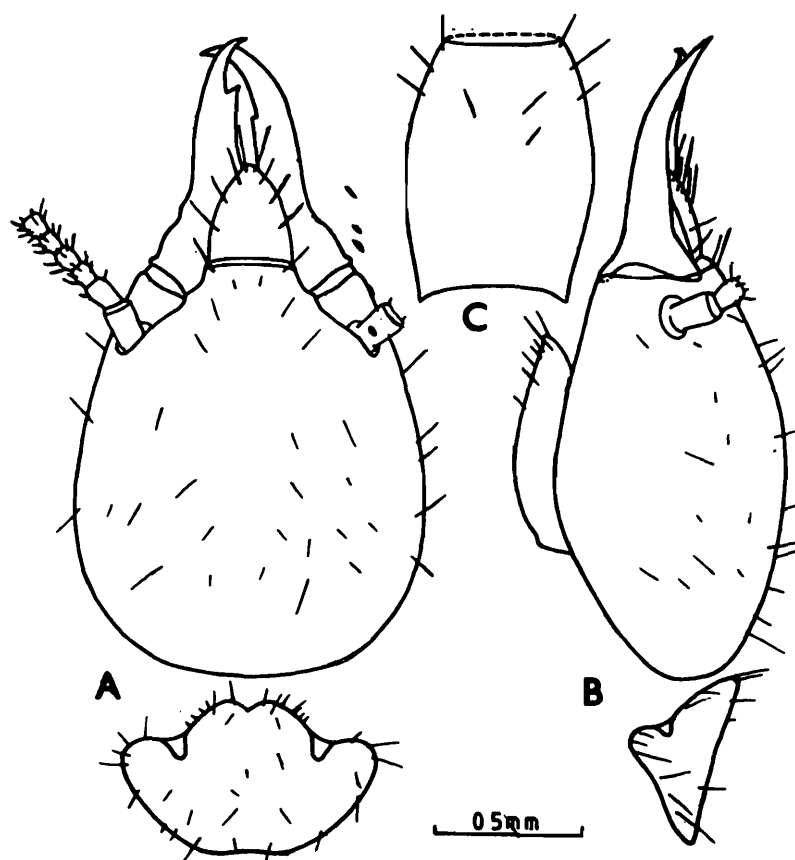


Fig. 264 : *Odontotermes prolatigula*. Soldier (Paratype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum. (After Bose, In press).

0.58-0.63, width at anterior margin 0.35-0.38 mm). Pronotum saddle-shaped; anteriorly fairly to prominently notched medially; posterior margin weakly incurved (length 0.50-0.53, width 0.80-0.87mm). Mesonotum narrower and metanotum almost as wide as pronotum.

WORKER : Head-capsule pale yellow; postclypeus paler; antennae pale brown, getting darker distally; pronotum and legs creamish; abdomen whitish. Total body-length 4.30-4.80 mm. Head-capsule subcircular, wider than long (head-length to tip of labrum 1.70-1.75, length to base of mandibles 1.23-1.25, max. width 1.40-1.45 mm). Antennae with 19-segments; segment 3 shortest; 4 and 5 subequal. Postclypeus swollen, pilose; divided in 2 halves; length less than half of width (length 0.25; width 0.70 mm). Anteclypeus trapezoidal, apilose. Labrum broad, tongue-shaped (length 0.45-0.50, width 0.50 mm); hairy along anterior margin and on body. Pronotum as in soldier (pronotum-length 0.40-0.45, width 0.75 mm); anterior and posterior margins of pronotum distinctly notched.

Distribution : INDIA : Arunachal Pradesh: Nambung, East Siang Dist., type-locality. Known only from the type-locality.

262. *Odontotermes redemanni* (Wasmann)

(Figs. 265, 266)

1. *Termes redemanni* Wasmann :

1893. Wasmann, *Wein. Ent. Zeig.*, **12** (7) : 239. Im, S and W. Lectotype : S. in NHM, Maastricht. Type-locality : Sri Lanka. Paralectotypes examined.

2. *Odontotermes redemanni* (Wasmann) :

1967. Roonwal and Chhotani, *Zool. Anz.*, **178** (3/4) : 251-252.

1969. van Boven, *Publ. natuurh. Genoot. Limburg*, **19** : 48.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner). Vol. 2 : 368-369.

1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rept. PL 480 Proj. No. A7-FS-58) : 1,2,15,42, 57,65.

1976. Thakur, *Indian Forester*, **102** (8) : 498, 501, 502.

1979. Chhotani and Bose, *Zoologiana*, No. 2 : 23.

1981. Thakur, *Indian For. Rec. (N.S.). Ent.*, **14** (2) : 11, 12, 110-114.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42, : 19, 25, 110-114.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 163, 165, 192-195.

1984. Verma, *Rec. zool. Surv. India*, **81** (3 & 4) : 251.

1984. Verma, *Indian J. Forestry*, **7** (4) : 308, 309, 310, 311.

1985. Verma, *Indian J. Forestry*, **8** (3) : 182.

See Synder (1949), Rattan Lal and Menon (1953) and Thakur (1981) also for synonymy.

IMAGO (Fig. 265) : Head-capsule pale reddish brown to dark castaneous brown; antennae and postclypeus brownish, paler than head; pronotum either paler than or as dark as head, with paler T-shaped mark and shoulder spots; abdominal tergites little paler than head, sternites brownish yellow. Head and body densely hairy. Total body-length with wings 25.0-29.0, without wings 9.2-15.0 mm. Head-capsule subcircular, wider than long (length to base of mandibles 1.70-1.85, width with eyes 2.30-2.66 mm (2.30-2.35 mm in paralectotypes). Fontanelle minute, round, faintly raised; area around fontanelle flat or faintly

depressed, not paler. Eyes subcircular or broad and oval (max. diameter 0.70-0.75, min. diameter 0.60-0.75 mm, 0.73×0.61 - 0.63 mm in paralectotypes); situated very close to lower margin. Ocelli broadly oval (long diameter 0.25-0.36, short diameter 0.18-0.25 mm, 0.30×0.25 mm in paralectotypes); from eyes situated at about $1/2$ of short diameter, 0.12-0.18mm (0.12-0.15 mm in paralectotypes). Antennae with 18-19

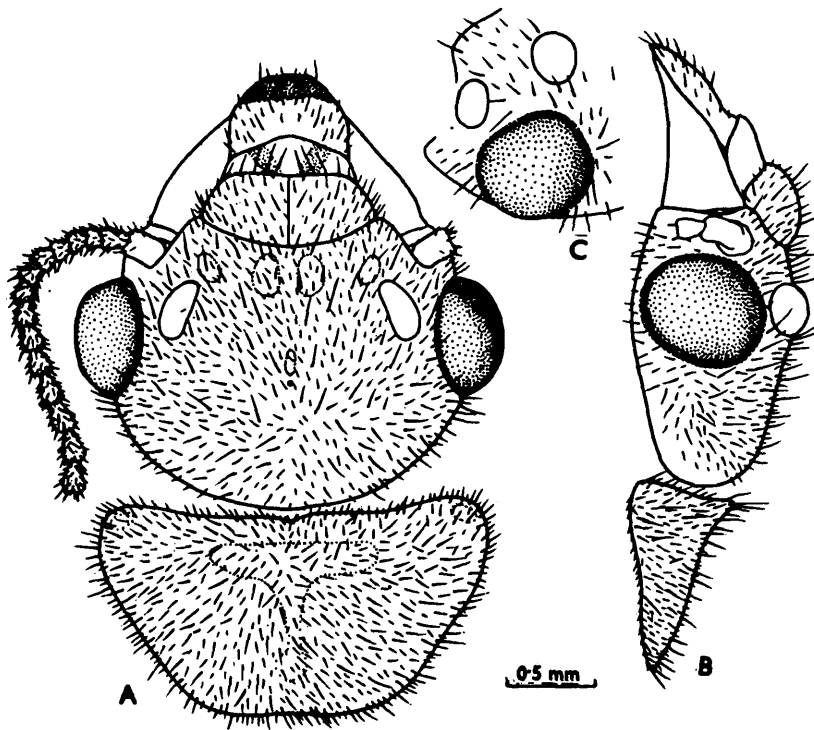


Fig. 265 : *Odontotermes redemanni*. Imago (Paralectotype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Part of head, showing position of eye, ocellus and antenna.

segments; segment 2 longer than 3, the latter shortest or subequal to 5. Postclypeus swollen, hairy; length $1/2$ of width. Pronotum trapezoidal; weakly raised at anterior margin and with a weak, median notch, posterior margin weakly invaginated medially (length 1.05-1.28, width 2.02-2.43 mm). Wings yellowish brown; microsculpture as in *obesus*; radial streak absent (length : forewing 24.0-25.0, hindwing 23.0-24.0 mm).

SOLDIER (Fig. 266) : Head-capsule pale yellowish to dark yellowish brown; antennae brown, paler basally; labrum brownish; mandibles dark reddish black, paler basally. Head sparsely and body fairly densely hairy. Total body-length 3.5-5.10 mm. Head-capsule oval (length to base of

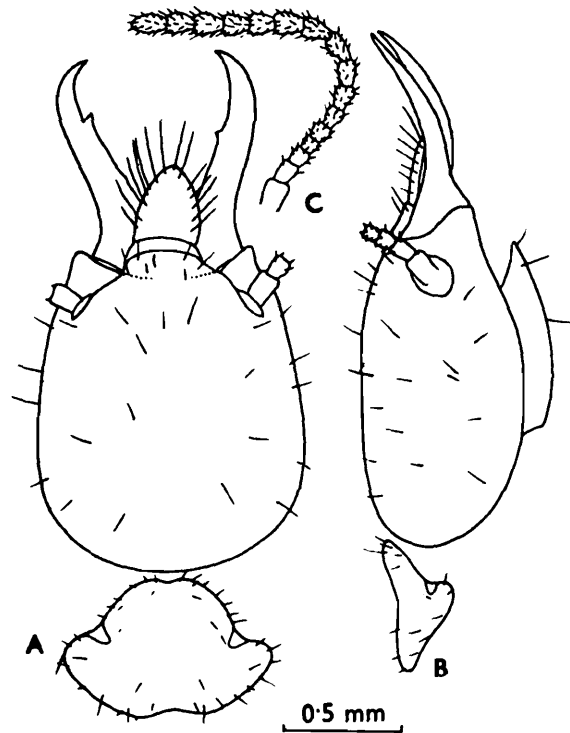


Fig. 266 : *Odontotermes redemanni*. Soldier (Paralectotype) (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Antenna.

mandibles 1.15-1.35, max. width 1.0-1.20 mm), resembles *O. obesus* very much. Antennae 16 to 17-segmented (16-segmented in types); segment 4 shortest in 16-segmented antennae and 3 in 17-segmented ones. Labrum tongue-shaped; anterior margin broadly rounded. Mandibles long, slender, sabre-shaped, incurved distally; length 0.75-0.95 mm (0.85-0.88 mm in paralectotype); longer than 1/2 of head-length (index mandible-length/head-length 0.60-0.63). Postmentum moderately swollen, subrectangular (length 0.65-0.85, width 0.45-0.58 mm). Pronotum saddle-shaped, weakly to deeply notched medially at anterior margin; posterior margin faintly notched (length 0.45-0.60, max. width 0.70-1.0 mm).

WORKER : Dimorphic. *Worker major* : Head-capsule pale yellowish brown; antennae brownish, paler basally; body and legs creamish white. Head and body fairly densely hairy. Total body-length 3.0-5.20 mm. Head-capsule subsquarish (length to base of mandibles 1.20-1.35, max. width 1.30-1.40 mm). Antennae with 17-18 segments; segment 5 in 17-segmented antennae and 4 in 18-segmented ones, shortest. Postclypeus weakly swollen; length nearly 1/2 of width. Pronotum saddle-shaped, prominently

notched at anterior and posterior margins (length 0.35-0.38, width 0.70-0.80 mm). *Worker minor* : Resembles worker major but for its smaller size and 16 to 17-segmented antennae. Total body-length 3.0-3.8, length of head to base of mandibles 0.70-0.78, max. width of head 0.85-0.90, length of pronotum 0.30-0.35 and width of pronotum 0.57-0.60 mm.

Distribution : SRI LANKA : Very widely distributed. INDIA : Quite widely distributed in southern and eastern India and is reported from Tamil Nadu, Kerala, Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh, eastern Bihar and West Bengal states. Record from Jammu and Kashmir by Verma (1984) is doubtful.

Biology : it is a common species in Sri Lanka and southern India and is reported to damage woodwork in buildings and also several crops and trees. It builds massive, multilocular-type, subconical mounds. Swarming is reported in September in eastern India and in November-December in Sri Lanka (Roonwal, 1970a).

263. *Odontotermes singsiti* Bose

(Fig. 267)

Odontotermes singsiti Bose :

In press. Bose, *Occ. Pap. Rec. zool. Surv India*, No. Holotype : S, in ZSI.
Type-locality : Langor, c 3 km. from Imphal, Manipur, India.

IMAGO : Unknown.

SOLDIER (Fig. 267) : Head-capsule yellowish brown, brownish near base of mandibles; antennae a little paler than head; uniformly coloured; labrum brownish; thorax, legs and abdomen creamish yellow. Head and thorax sparsely and abdomen fairly densely hairy; each abdominal tergite with a row of hairs at posterior margin and some on body. Total body-length 5.70-6.70 mm. Head subrectangular, sides weakly convex and converging in front; longer than wide (length with mandibles 3.10-3.40, length to base of mandibles 2.00-2.15, max. width 1.53-1.70 and width at base of mandibles 1.03-1.10 mm); width at base of mandibles about 2/3 of max. width (index 0.64-0.66). Antennae with 17 segments and segments 3 and 5 subequal and shortest. Postclypeus not clearly demarcated from frons, with one or two hairs on either side anteriorly; anteclypeus line-like, transparent. Labrum triangular with a pointed tip (length 0.37-0.43,

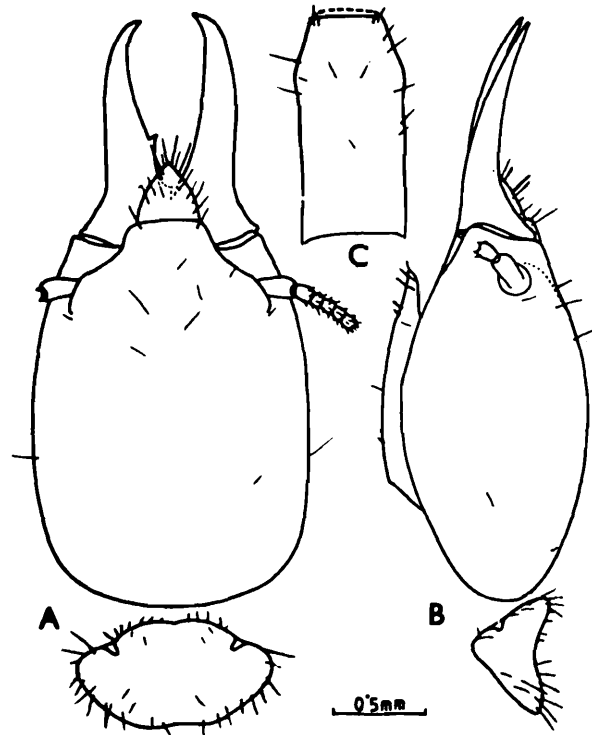


Fig. 267 : *Odontotermes singsiti*. Soldier (Paratype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum. (After Bose, In press)

width 0.33-0.38 mm); with 4 pairs of long hairs and one or 2 pairs of smaller hairs near base. Mandibles sabre-shaped, finely tapering in front; about half of head-length (length 1.15-1.27 mm, index left mandible-length/ head-length 0.56-0.59). Left mandible with a prominent tooth a little below middle point (tooth distance from tip 0.66-0.73 mm, index tooth-distance/mandible-length 0.566-0.580). Right mandible with a minute, point-like tooth (sometimes not discernible) at a corresponding position as in left mandible. Postmentum subrectangular; widest at about distal third; whence very slightly narrowed behind; anterior margin straight, posterior margin incurved (length 1.15-1.30, max. width 0.60-0.63, width at anterior margin 0.38-0.40 mm). Pronotum saddle shaped; anteriorly faintly notched medially; posterior margin weakly emarginate (length 0.63-0.70, width 1.07-1.20 mm).

WORKER : Dimorphic. *Worker major* : Head-capsule yellow; antennae pale brown; postclypeus of same colour as head; thorax, legs and abdomen creamish. Head and body fairly densely hairy. Total body-length 4.70-

5.03 mm. Head-capsule subsquarish; a little wider than length to base of mandibles (length to tip of labrum 1.90-2.03, length to base of mandibles 1.35-1.40, max. width 1.60-1.78 mm). Fontanelle plate round, situated on mid-dorsum. Antennae with 17-19 segments. Postclypeus swollen, length less than half of width (length 0.31, width 0.75-0.85 mm). Pronotum saddle-shaped (length 0.45-0.50, width 0.80-1.10 mm). *Worker minor* : Only smaller in size, otherwise as in worker major. Head subcircular and antennae are 17-segmented with segments 3 and 4 subequal. Total body-length 3.70-3.90, head-length to tip of labrum 1.33-1.40, length of head to base of mandibles 0.85, max. width of head 1.05-1.10, pronotum-length 0.38-0.40, pronotum-width 0.65-0.70 mm.

Distribution : INDIA : Manipur: Langor (Near Imphal), type-locality. Known only from the type-locality.

264. *Odontotermes taprobanes* (Walker)

(Fig. 268)

1. *Termes Taprobanes* Walker :

1853. Walker, *List Neuropterous Insects in Brit. Mus.*, Part 3 : 522. Im only. Lectotype : Im, in BM (Selected by A.E. Emerson). Type-locality : Sri Lanka. Paralectotype examined.

2. *Odontotermes (Odontotermes) taprobanes* (Walker) :

1949. Snyder, *Smiths. misc. Colls.*, 112 : 242. Synonymy.

1958. Ahmad, *Biologia*, Lahore, 4 : 104.

3. *Odontotermes taprobanes* (Walker) :

1976. Thakur, *Indian Forester*, 102 : 501, 503.

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, 14 (2) : 3.

IMAGO (Fig. 268) : Description and figures from a single paralectotype imago in AMNH. Head-capsule reddish brown, area around fontanelle paler; postclypeus, antennae and legs brownish; pronotum paler than head but darker than postclypeus; abdominal tergites slightly paler than head, sternites paler than tergites; wings pale brown. Head and body densely hairy. Head-capsule subcircular, much wider than length to base of mandibles (length to tip of labrum 2.70, length to base of mandibles 1.88, width with eyes 2.68 mm); frons fairly inclined in front. Fontanelle minute, raised. Eyes large, broad, oval (max. diameter 0.80, min. diameter

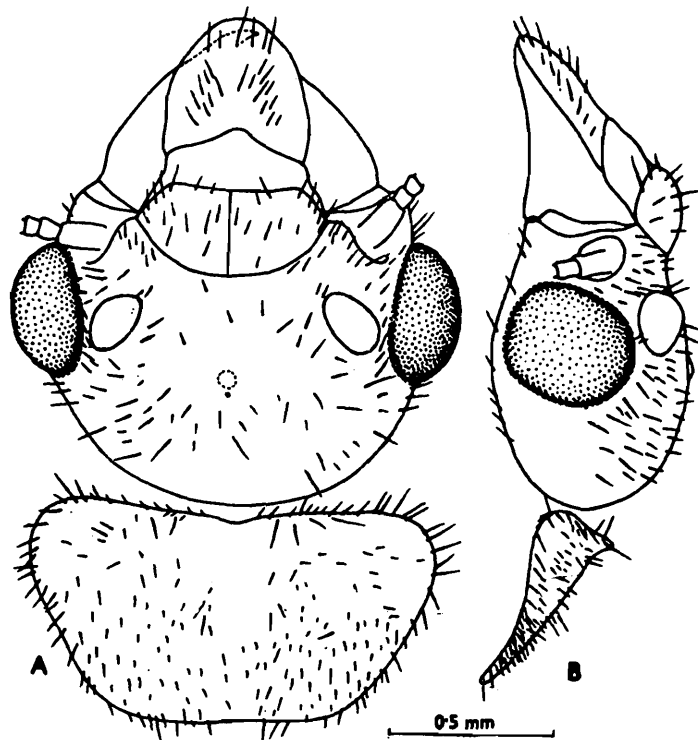


Fig. 268 : *Odontotermes taprobanes*. Imago (Paralectotype). (A) Head and pronotum, dorsal view. (B) Same, side view.

0.70mm); situated very close to lower margin (eye-lower margin distance 0.08 mm) Ocelli large, broadly oval (long diameter 0.40, short diameter 0.275 mm); close to eyes, separated from eyes by much less than their short diameter (eye-ocellus distance 0.080, ocellus-antennal distance 0.20 mm). Antennae broken; with 17 + segments (with not more than 20 according to Walker, 1853); segments 3 and 5 subequal, 4 longer slightly. Postclypeus greatly swollen, length 1/2 of width (length 0.50, width 1.05 mm). Labrum broad, tongue-shaped (length 0.80, width 0.88 mm). Pronotum subtrapezoidal, narrower than head with eyes (length 1.30, width 2.40 mm); anterior margin slightly raised, wavy and distinctly notched medially; sides converging a little and faintly incurved; posterior margin weakly convex, medially faintly incurved. Meso- and metanota broadly incurved at posterior margin. Wings long, membrane without hairs; radial streak separating from radius a little before middle (length of forewing with scale 27.93 mm and scale 1.43 mm long).

Distribution : SRI LANKA Records of the species from further east i.e. Sumatra, Borneo, Malacca and India and Burma are doubtful. According to Thakur (1976), it is restricted to Sri Lanka.

265. *Odontotermes vaishno* Bose

(Fig. 269)

1. *Odontotermes vaishno* Bose :

1975. Bose, *Orient. Insects*, 9 (2) : 161-164. S and W. Holotype: S, in ZSI. Type-locality: Kannoth Forest Range, Wynaad Div., Kerala, India.

1981. Thakur, *Indian For. Rec. (N.S.) Ent.* 14 (2) : 100, 101. Treated as a synonym of *O. obesus* (Rambur).

1984. Bose, *Occ. Pap Rec. zool. Surv. India*, No. 49 : 97, 164, 196, 197.

1984. Verma, *Rec. zool. Surv. India*, 81 (3 & 4) : 252.

IMAGO : Unknown.

SOLDIER (Fig. 269) : Head-capsule and labrum brownish yellow; antennae pale yellow, darker apically; mandibles dark reddish brown; body light brownish yellow. Head and body sparsely hairy. Total body-length 3.8-4.10 mm. Head-capsule oval, converging anteriorly; a little longer than wide (length to base of mandibles 1.0-1.15, max. width 0.89-0.98). Antennae with 16 segments; segment 4 shortest, 3 and 5 subequal. Labrum tongue-shaped, anterior margin broad and rounded. Mandibles

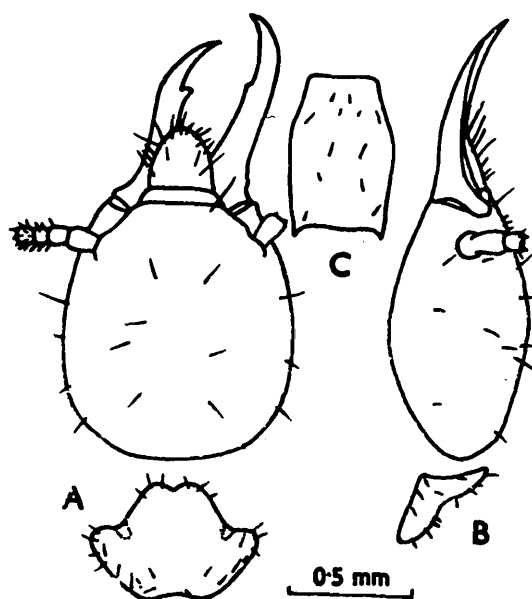


Fig. 269 : *Odontotermes vaishno*. Soldier (Paratype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum. (After Bose, 1975)

thin, long, slender, sabre-shaped; very weakly incurved distally (length 0.63-0.78 mm); a little longer than half of head-length; index mandible-length/ head-length 0.58-0.70. Left mandible with a sharp, laterally directed tooth at distal one-third (tooth-distance 0.22-0.27 mm, index tooth-distance/ mandible-length 0.32-0.34). Right mandible with a minute tooth a little above middle. Postmentum subrectangular (length 0.58-0.68, max. width 0.40-0.45 mm). Pronotum saddle-shaped, anterior margin deeply notched and posterior margin fairly incurved medially (length 0.39-0.45, width 0.65-0.69mm).

WORKER : Dimorphic : *Worker major* : Head-capsule, labrum and thorax pale yellowish brown; antennae pale brown; body and legs pale creamy yellow. Head sparsely and body moderately pilose. Total body-length 3.20-3.35 mm. Head-capsule subsquarish (length to base of mandibles 0.90-1.10, max. width 0.98-1.21 mm). Antennae with 17 segments; segments 3 and 4 subequal, shortest. Postclypeus swollen, with a few short hairs; length less than half of width. Pronotum saddle-shaped; anterior margin weakly notched, posterior margin substraight (length 0.30-0.38 width 0.60-0.65 mm). *Worker minor* : Generally resembles worker major, but smaller. Total body-length 2.5, length of head to base of mandibles 0.63, max. width of head 0.71, width of pronotum 0.43 mm.

Distribution : INDIA : Kerala and Karnataka states.

266. *Odontotermes wallonensis* (Wasmann)

(Synonym : *O. brunneus kushwahai* Roonwal and Bose)

(Figs. 270, 271)

1. *Termes obesus* subsp. *wallonensis* Wasmann:

1902. Wasmann, *Zool. Jb. Syst.*, **17** (1) : 106. Im, S and W. Holotype : Im, in NHM, Maastricht. Type-locality : Wallon, Sangamner (Dist. Ahmadnagar), Maharashtra. Type-examined.

1904. Desneux, *Genera Insect.*, **25** : 38.

2. *Termes wallonensis* Wasmann :

1914. Bugnion, *Bull. Mus. Hist. nat. Paris*, **20** (4) : 189.

3. *Cyclotermes wallonensis* (Wasmann) :

1941. Beeson, *Ecology & Control Forest Insects of India, etc* : 547.

4. *Cyclotermes brunneus* subsp. *wallonensis* (Wasmann) :

1914. Holmgren, *J. Bombay nat. Hist. Soc.*, **22** : 109-110.

5. *Termes (Termes) brunneus var. wallonensis* Wasmann :

1953. Rattan Lal and Menon, *Catal. Indian Insects, Pt. 27-Isoptera* : 75. Synonymy.

6. *Odontotermes (Odontotermes) wallonensis* (Wasmann) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 243. Synonymy.
1969. van Boven, *Publ. natuurh. Genoots. Limburg*, **19** : 49.

7. *Odontotermes wallonensis* (Wasmann) :

1960. Mathur and Chhotani, *Indian Forester*, **86** (10) : 623-624.
1963. Mathur and Thapa, *J. Soc. Indian Foresters*, **3** (3 & 4) : 110.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 369.
1976. Thakur, *Indian Forester*, **102** (8) : 502, 503.
1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 454-455.
1977. Verma and Thakur, *Newsl. zool. Surv. India*, **3** (5) : 263-264.
1978. Roonwal, *Zeit. ang. Ent.*, **85** : 23-25.
1979. Chhotani and Bose, *Zoologiana*, No. 2 : 24.
1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 5, 10, 12, 117-122, pls. 44,45,48,49,53. See for synonymy, descriptions, etc.
1982. Verma and Thakur, *Rec. zool. Surv. India*, **79** : 316.
1982. Bose and Das, *Rec. zool. surv. India*, **80** : 201, 208, 211, 212.
1989. Rajagopal, *Mysore J. agric. Sci.*, **23** : 480-486.

8. *Odontotermes brunneus kushwahai* Roonwal and Bose :

1964. Roonwal and Bose, *Zoologica*, **40** (13) : 33-36, pl. 5.
1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 117-118.

IMAGO (Fig. 270) : Types examined: Head-capsule brown to dark reddish brown, area around fontanelle paler; a small, round spot in front of fontanelle, 2 in between ocelli and 2 above ocelli one on either side, paler; postclypeus and labrum brownish yellow; antennae brownish; pronotum brownish with paler T-shaped median and shoulder spots; abdominal tergites brown to dark brown; sternites and legs brownish yellow. Head and body densely hairy. Total body-length with wings 32.0-34.0, without wings 14.0-15.5 mm. Head-capsule subcircular, much broader than long (length to base of mandibles 1.80-2.13, width with eyes 2.5-3.08 mm). Fontanelle minute, round, slightly raised. Eyes large, broadly oval (max. diameter 0.73-0.95, min. diameter 0.65-0.90 mm); situated

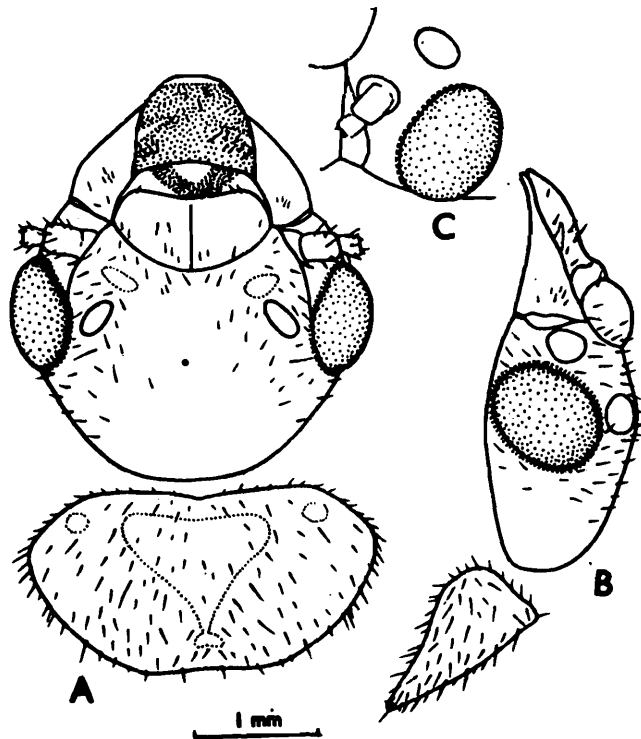


Fig 270 : *Odontotermes wallonensis*. Imago (Paratype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Part of head showing positions of eye, ocellus and antenna.

equidistant from lower margin of head and antennae. Ocelli broadly oval (long diameter 0.33-0.40, short diameter 0.20-0.30 mm); separated from eyes by about 1/2 short diameter (0.10-0.15 mm). Antennae with 19 segments; segment 3 shortest, 4 and 5 subequal or former slightly longer. Postclypeus greatly swollen; length slightly less than 1/2 of width (length 0.55-0.58, width 1.20-1.25 mm). Pronotum subtrapezoidal (length 1.20-1.40, width 2.10-2.75 mm); anterior margin faintly wavy, slightly raised medially and weakly notched medially; posterior margin faintly to appreciably incurved medially. Mesonotum and metanotum strongly incurved medially at posterior margin. Wings long and membrane covered with thin, slightly wavy, 8-13 μ m long cuticular rods; length of forewing 28.0-29.3 and of hindwing 26.5-27.5 mm.

SOLDIER (Fig. 271) : Head-capsule pale yellow to brownish yellow; antennae yellow to pale brown distally and paler proximally; mandibles dark brown; body and legs whitish to yellowish. Head sparsely and body

densely hairy. Total body-length 4.6-6.70 mm. Head-capsule subrectangularly oval, sides faintly convex (length to base of mandibles 1.50-1.90, max. width 1.30-1.50, width at base of mandibles 0.88-1.03 mm, index max. width/length 0.70-0.87 and index width at base of mandibles/ max. width 0.65-0.73). Antennae with 16-17 segments; in 16-segmented antennae, segment 2 subequal to 3, and 4 shortest; in 17-segmented ones, 2 longer than 3 and latter shortest and 4 longer than 5. Postclypeus not clearly demarcated from frons, faintly marked on sides; with a few hairs. Labrum broadly tongue-shaped; anteriorly broadly rounded (length 0.35-0.48, width 0.40-0.43 mm). Mandibles long and fairly strongly incurved anteriorly; length about 2/3 of head-length (length 1.03-1.20, index left mandible-length/head-length 0.62-0.71); left mandible with a prominent tooth a little above middle point (tooth-distance from tip 0.43-0.53, index tooth-distance/mandible-length 0.41-0.46); right mandible with a small tooth at middle (tooth-distance 0.50-0.58 mm). Postmentum subrectangular, flat; widest at anterior 1/4; behind sides slightly incurved (length 0.95-1.18, max. width 0.53-0.65 mm). Pronotum saddle-shaped (length 0.53-0.75, width 0.95-1.20 mm); deeply notched

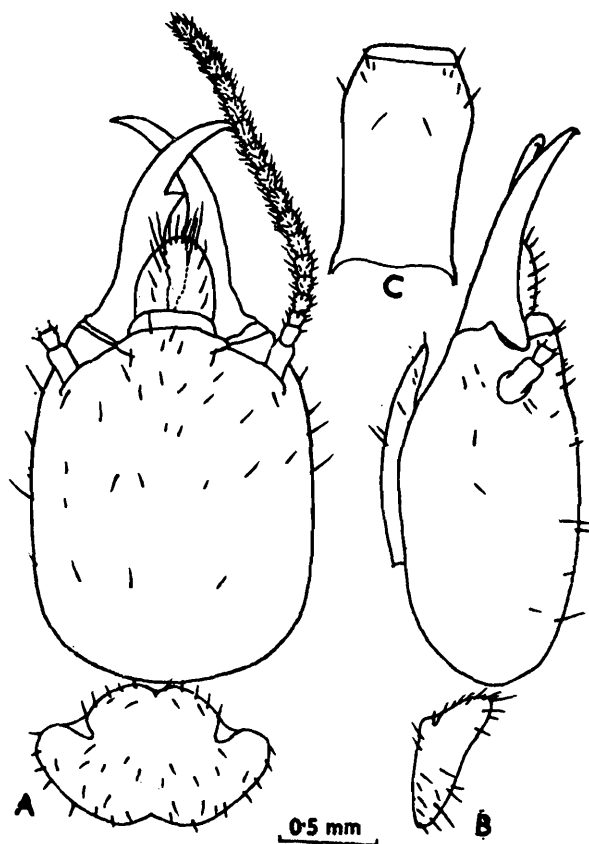


Fig. 271 : *Odontotermes wallonensis*. Soldier (Paratype). (A) Head and pronotum, dorsal view. (B) Same, side view (C) Postmentum.

both anteriorly and posteriorly. Mesonotum narrower than pronotum, posterior margin weakly to fairly incurved. Metanotum as wide as or broader than pronotum, posterior margin substraight or weakly incurved.

WORKER : Dimorphic. *Worker major* : Head-capsule pale brownish, yellow; antennae pale brownish, paler proximally; body and legs pale yellow. Head and body fairly densely hairy. Total body-length 4.0-5.5 mm. Head-capsule subcircular, wider than long (length to base of mandibles 1.20-1.38, max. width 1.40-1.63 mm). Antennae with 17-18 segments, segment 4 shortest. Postclypeus swollen, pilose; length less than half of width (length 0.33, width 0.80 mm). Pronotum saddle-shaped; anterior margin deeply notched, posterior margin weakly to deeply emarginate (length 0.45-0.55, width 0.80-0.90 mm). Mesonotum as wide as and metanotum wider than pronotum. *Worker minor* : As worker major except that it is smaller in size and has comparatively more swollen postclypeus and 17-segmented antennae. Total body-length 3.2-3.8, length of head to base of mandibles 0.73-0.88, max. width of head 0.90-1.05, length of postclypeus 0.25, width of postclypeus 0.50, length of pronotum 0.33-0.45, width of pronotum 0.55-0.68 mm.

Distribution : INDIA : It is a very wide spread species in peninsular India and is reported from Maharashtra, Gujarat, Karnataka, Andhra Pradesh, Tamil Nadu, Madhya Pradesh, Bihar and Orissa states. According to Thakur (1976) the records from Uttar Pradesh are based on wrong identifications.

Remarks on type specimens : In Wasmann Collection at the NHM, Maastricht (Holland), in case no. 3 of dry collection, there is a pin holding one dealate imago with the following 4 labels; 1. F; 2. Heim ! no. 62=57; 3. Wallon (Ahmednagar) Heim! ; and 4. T. obesus Ramb subsp. Wallonensis Wasm. Typen. The first and second labels are in black ink, the third printed and fourth is in red ink. This specimen is the same as mentioned by van Boven 1969 as "Type queen, labelled E. Wasmann" (in fact a dealate imago). There is another pin holding 3 soldiers having the following 2 labels; 1. Heim! no 57= 62. 1899; and 2. Wallon/Ahmednagar, both in black ink. I had examined these specimens in 1977 when I visited NHM. Also there are a number of vials from Wallon labelled as *Termes obesus wallonensis* but two of these have same data as in the dry specimens one has several imagos and the other several soldiers and workers. It is evident that these are from the type colony. But since one dealate imago on pin is labelled as 'typen' and also so mentioned by van Boven, it should be taken as the holotype. In that case, the lectotype designated by

Thakur (1981) does not have that status; it along with other specimens as mentioned above be taken as paratypes.

Biology (Plates 3, 4) : It is a common mound-building termite of Peninsular India. The mounds are characteristic of having chimney-like openings which lead to the main mound which is below the ground-level. This species is also a pest of consequence and has been reported to damage a number of crops such as groundnut, sugarcane, maize, soyabean, sunflower, etc., and is recorded damaging live trees and structural timbers.

267. *Odontotermes yadevi* Thakur

(Fig. 272)

Odontotermes yadevi Thakur :

1976. Thakur, *Indian Forester*, **102** (8) : 501, 502. (Nom. nud.)

1981. Thakur, *Indian For. Rec. (N.S.) Ent.*, **14** (2) : 5, 13, 122-125, pls. 46, 47, 50, 51. S and W. Holotype : S, in FRI, Type-locality : Siddapur, Karnataka, India.

IMAGO : Unknown.

SOLDIER (Fig. 272) : Head-capsule yellowish brown to brown; labrum and postclypeus dark brown; antennae uniformly coloured, yellowish brown to brown; mandibles blackish brown, deep reddish brown basally. Head sparsely and body fairly densely hairy. Total body-length 5.75-7.30 mm. Head-capsule broadly oval, longer than wide and widest posteriorly (length to base of mandibles 1.88-2.35, max. width 1.70-2.00 and width at base of mandibles 1.15-1.35 mm; index max. width/length 0.82-0.92 and index width at base of mandibles/max. width 0.64-0.68). Antennae 17-segmented; segment 2 longer than 3, 4 longer than 3 and 5 shortest. Labrum tongue-shaped, longer than broad and pointed anteriorly into a hyaline tip. Mandibles short, thick, sabre-shaped (length 1.0-1.37 mm, index left mandible-length/head-length 0.55-0.60); left mandible with a large, acute tooth near mid-point making angle of about 90° with inner margin (tooth-distance from tip 0.50-0.66 mm, index tooth-distance/mandible-length 0.46-0.49); right mandible with a small, rudimentary tooth at middle. Postmentum subrectangular, sides weakly convex; in profile weakly swollen (length 1.25-1.55, max. width 0.70-0.90 mm). Pronotum saddle-shaped (length 0.63-0.90, width 1.25-1.60 mm); anterior margin distinctly

notched and posterior margin deeply emarginate. Mesonotum narrower than pronotum and notched at posterior margin; metanotum broader than pronotum and substraight posteriorly.

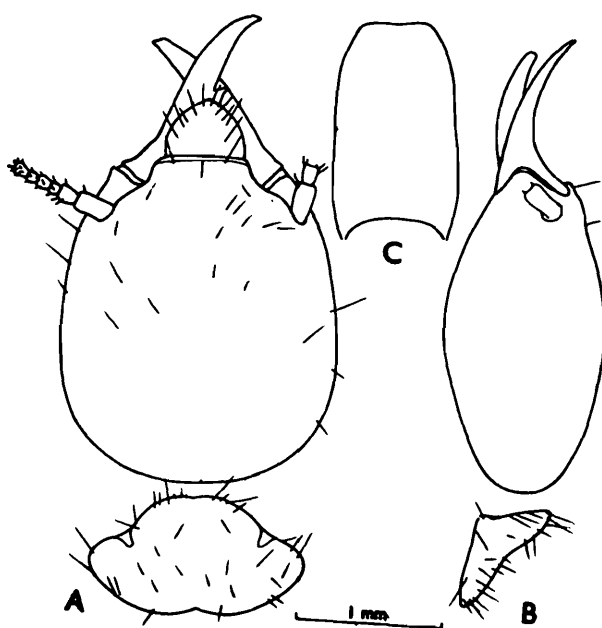


Fig. 272 : *Odontotermes yadevi*. Soldier (Paratype). (A) Head and pronotum, dorsal view. (B) Same side view. (C) Postmentum.

WORKER : Head-capsule pale yellow to yellow; antennae slightly darker than head and uniformly coloured; body paler than head. Head-capsule fairly and body densely hairy. Total body-length 5.15-6.00 mm. Head-capsule subcircular (length to base of mandibles 1.50-1.80, max. width 1.80-2.00 mm). Antennae with 19 segments; segments 3, 4 and 5 variable in size. Postclypeus weakly swollen, hairy; length nearly 1/3 of width. Pronotum saddle-shaped (length 0.55-0.70, width 1.08-1.20 mm); anterior margin distinctly notched medially and posterior margin deeply emarginate medially. Mesonotum narrower and metanotum broader than pronotum; former clearly emarginate at posterior margin and latter weakly convex without any emargination.

Distribution : INDIA : Karnataka (Siddapur, type-locality). Known only from the type-locality.

Genus 44. **Hypotermes** Holmgren(Synonym : Subgenus *Xenotermes* (of *Odontotermes*) Holmgren)1. Subgenus *Xenotermes* (of *Odontotermes*) Holmgren (*Xenotermes* Preoccupied) :1912. Holmgren, *K. Svenska Vetensk.- Akad. Handl.*, **48**(4) : 36, 39-40.2. Subgenus *Hypotermes* (of *Termes*) Holmgren :1934. Snyder, *Indian For. Rec.*, **20** (11) : 25, 28.1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : 70.3. Subgenus *Hypotermes* (of *Odontotermes*) Holmgren :1913. Holmgren, *K. Svenska Vetensk. Akad. Handl.*, **50**(2) : 141.1949. Snyder, *Smiths. misc. Coll.*, **112** : 244.1955. Emerson, *Fieldiana : Zool.*, **37** : 513.1958. Ahmad, *Biologia*, Lahore, **4** : 97,98.4. Genus *Hypotermes* Holmgren :1956. Roonwal and Sen-Sarma, *Indian J. agric. Sci.*, **26**(1) : 21.1963. Chatterjee and Thakur, *Indian For. Rec (N.S.). Ent.*, **10** (9) : 172-173.1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art 1) : 8.1967. Roonwal and Chhotani, *Zool. Anz.*, **178** (3/4) : 256.1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 146.1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 370.1972. Chaudhry, et. al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 34-35.1973. Chhotani and Bose, *Zool. Anz.*, **190** (3/4) : 235.1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No A7-FS-58) : 4, 8,43.1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 58,60.1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 39,43,44.1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 4.1980. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **46** (2) : 157.1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*. No. 42 : 19, 25.1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 100, 102.

1986. Chhotani, *Rec. zool. Surv. India*, **83** (3 & 4) : 21, 23, 26, 27.

1987. Chhotani, *Beitr. Ent.*, **37** : 412.

Type of genus : *Termes xenotermitis* Wasmann.

1. Characters of Genus *Hypotermes*

Imago : Moderately large, castaneous brown and moderately densely hairy. Head-capsule broad, subcircular; epicranial suture indistinct. Eyes large, subcircular, projecting out. Ocelli large, suboval. Fontanelle small, circular; situated at mid-dorsum and not raised. Antennae 19-20 segmented. Postclypeus swollen, length a little less than 1/2 width. Mandibles as in *Odontotermes*; each with an apical and two marginal teeth. Pronotum trapezoidal; anterior margin slightly elevated. Wings yellowish brown; membrane covered with thin, cuticular rods; costa thick running along anterior margin, subcosta short, meeting costa just outside scale; radius as thick as costa and running parallel with costa-subcosta; media coming out of scale jointly with cubitus in forewing and from radius in hindwing, and bifurcating at about middle; cubitus with 9-10 branches. Legs with 3: 2: 2 apical tibial spurs; tarsi 4-jointed. Cerci 2-jointed; styli in male not present in specimens examined.

Soldier : Head oval. Fontanelle indistinct. Eyes and ocelli absent. Antennae 16 to 17-segmented, darker distally. Mandibles sabre-shaped, thick and strong; left with crenulations in basal half; right without any crenulations or teeth. Labrum tongue-shaped or oval. Postmentum subrectangular; sides subparallel to strongly convex and arched. Pronotum saddle-shaped. Legs with 3:2:2 apical tibial spurs; tarsi 4-jointed. Cerci 2 jointed; styli single jointed.

WORKER : Head-capsule subcircular or subsquarishly rounded; broader than long. Fontanelle plate round, translucent. Antennae with 16-18 segments. Postclypeus swollen, in length less than 1/2 width. Mandibles as in imago. Pronotum, legs, cerci and styli as in soldier.

The *Hypotermes* worker is generally monomorphic but sometimes two types may be seen in some collections. It is almost identical with that of *Odontotermes* and is difficult to differentiate in the absence of soldier caste.

2. *Distribution and Composition of Hypotermes*

(Fig. 190)

Distribution : The genus *Hypotermes* is endemic to the Oriental Region and is quite widely distributed. It is reported from India, Bhutan, Bangladesh, Burma, Thailand, Vietnam and Malaysia. *H. xenotermitis* (Wasmann) is the most wide spread species over the Region.

Composition : Snyder (1949) has recognised three species, Emerson (1955) four species and Chatterjee and Thakur (1963) five species. More recently, while discussing the distribution and zoogeography of Oriental Termitidae, Chhotani (1987) has recognised 6 species. Of these, the following three are known from the Indian Region:—

1. *Hypotermes obscuriceps* (Wasmann)—India, Sri Lanka, Indochina
2. *H. winifredi* Ahmed —Sri Lanka
3. *H. xenotermitis* (Wasmann) —India, Bhutan, Bangladesh, Burma, Thailand, Malaysia

3. *Keys to Indian Hypotermes*

IMAGOES

- 1(2) Smaller. Head-width with eyes 1.89-2.10, pronotum-width 1.71-2.00 mm. Eyes smaller (max. diameter 0.52-0.63, min. diameter 0.45-0.58 mm). Ocelli smaller (long diameter 0.19-0.20, short diameter 0.13-0.16 mm); separated from eyes by about short diameter or slightly more (0.15-0.19 mm).....*xenotermitis*
- 2(1) Larger. Head-width with eyes 2.23-2.37, pronotum-width 2.02-2.26 mm. Eyes larger (max. diameter 0.62-0.72, min. diameter 0.54-0.59 mm). Ocelli larger (long diameter 0.31-0.33, short diameter 0.23-0.28 mm); separated from eyes by less than or about their short diameter 0.20-0.26 mm)
- 3(4) Ocelli separated from eyes by about their short diameter (long diameter 0.32-0.33, short diameter 0.23-0.28, eye-ocellus distance 0.20-0.25 mm).....*obscuriceps*
- 4(3) Ocelli separated from eyes by less than their short diameter (long diameter 0.31, short diameter 0.26, eye-ocellus distance 0.17 mm).....*winifredi*

SOLDIERS

The soldiers of all the three species are very close to each other and difficult to separate.

- 1(2) Head sides rounded, narrowing in front and appear more strongly converging; max. width somewhat posteriorly.....*xenotermitis*
 2(1) Head sides convex, gradually narrowing in front; max. width at middle
 3(4) Antennae with 16-17 segments, segment 3 shortest in 16-segmented one and 4 shortest in 17-segmented one.....*obscuriceps*
 4(3) Antennae with 16-17 segments, segment 3 slightly longer than 2.....*winifredi*

268. *Hypotermes obscuriceps* (Wasmann)

(Synonym : *Odontotermes (Hypotermes) marshalli* Kemner)

(Figs. 273,274)

1. *Termes obscuriceps* Wasmann :

1902. Wasmann, *Zool. Jb. Syst.*, **17** : 113-114. S and W. Lectotype (Designated here) : S, in NHM. Type-locality: Trincomalee, Sri Lanka.

2. *Odontotermes (Hypotermes) obscuriceps* (Wasmann) :

1969. van Boven, *Publ. natuurh. Genoot. Limburg*, **19** : 49.

3. *Hypotermes obscuriceps* (Wasmann) :

1956. Roonwal and Sen-Sarma, *Indian J. agric. Sci.*, **26** (1) : 25.

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 360-362.

1963. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (9) : 174, 175-186. Synonymy, description, etc.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 56.

1967. Roonwal and Chhotani, *Zool. Anz.*, **178** (3/4): 256-257, tab.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. **2** : 370-371.

1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 16,43,58.

1978. Ghosh, et al. *Sci. & Cult.*, **14** : 502-504. (Wrongly spelt as *desciuriceps*)

1977. Lahiri, et al. *Bull. Meghalaya Sci. Soc.*, **2** : 37.
 1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.* , **13** (1) : 6,27,51.
 1980. Lahiri and Ghosh, *Rec. zool. Surv. India*, **76** : 68-69.
 1980. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **46** (2) : 156, 157.
 1983. Maiti, *Occ. Pap. Rec. zool. Surv. India.*, No. 42 : 19, 114-115.
 1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 200-202.

See Snyder (1949) and Chatterjee and Thakur (1963) also for synonymy.

IMAGO (Fig. 273) : Head-capsule dark castaneous brown; postclypeus yellow; antennae brown; pronotum brown with yellow T-mark at middle and shoulder spots; abdomen brown above and below much paler medially; wings yellowish brown with cuticular rods on membrane; radial streak present. Densely hairy. Total body-length with wings 26.0-27.0, without wings 10.0-12.0 mm. Head-capsule subcircular (length to base of mandibles 1.56-1.88, max. width with eyes 2.23-2.35 mm). Fontanelle small, circular, whitish; not raised. Eyes large, subcircular (max. diameter 0.62-0.70; min. diameter 0.54-0.59 mm). Ocelli large, oval, translucent; from eyes situated at a distance of about their short diameter (long diameter 0.32-0.33, short diameter 0.23-0.28, eye-ocellus distance 0.20-0.25 mm). Antennae with 19 segments; segment 3 shorter than 2; 4 longer than 3 but shorter than 2; 5 as long as 3. Postclypeus large, swollen; length less than half width (length 0.40-0.43, width 0.90-0.95 mm). Pronotum subtrapezoidal (length 1.05-1.14, width 2.10-2.26 mm); anterior margin slightly raised and weakly emarginate at middle; posterior margin substraight, faintly incurved medially. Wings yellowish brown; membrane with thin, *obesus*- type cuticular rods; hairy near distal end (length of forewing 22.0-24.0 mm). Media bifurcating near about middle; cubitus with 12-16 branches.

SOLDIER (Fig. 274) : Head-capsule pale brown to dark brown; labrum pale brown; antennae brownish, paler basally; mandibles dark brown, paler basally; body and legs whitish yellow to dirty yellow. Head sparsely and body fairly densely hairy. Total body-length 3.5-5.75 mm. Head-capsule oval; sides weakly convex and slightly narrowing in front, widest at middle (length to base of mandibles 1.13-1.60, max. width 0.90-1.25, width at base of mandibles 0.65-0.70 mm; index max. width/ length 0.76-

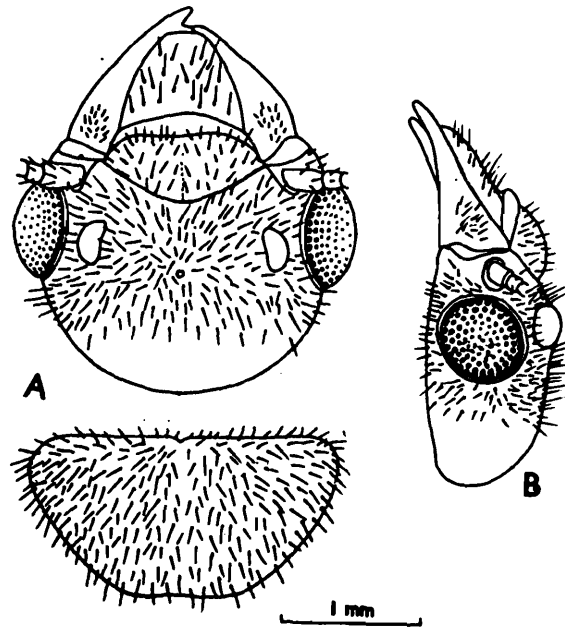


Fig. 273 : *Hypotermes obscuriceps*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view.

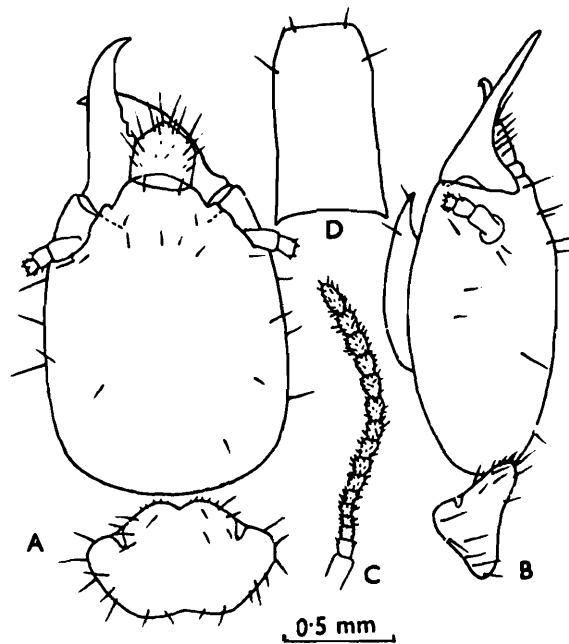


Fig. 274 : *Hypotermes obscuriceps*. Soldier (Lectotype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Antenna. (D) Postmentum.

0.89, head-convergence index i.e. width at mandible base/ max. width 0.644-0.679). Antennae with 16-17 segments; segment 3 shortest in 16 segmented and 4 shortest in 17-segmented; 4 sometimes in process of division. Labrum broadly tongue-shaped; with a row of hairs on either side (7 hairs on either side in Lectotype); sides subparallel; anterior margin rounded with a small tip (length 0.18-0.30, width 0.25-0.35 mm). Mandibles short, stout, sabre-shaped, incurved distally; shorter to a little longer than half of head-length (length 0.60-0.75 mm, index mandible-length/head-length 0.47-0.58). Left mandible with three crenulations and a basal projection in proximal half. Right mandible either without or with only a small crenulation a little below middle. Postmentum subrectangular, sides subparallel or very faintly incurved (length 0.60-0.90, max. width 0.35-0.50 mm). Pronotum saddle-shaped; anterior margin deeply notched in middle (not notched vide Holmgren 1913); posterior margin also deeply notched (length 0.40-0.58, width 0.70-0.90 mm). Mesonotum narrower than pronotum and metanotum almost as wide as to slightly wider than pronotum; both substraight at posterior margin (mesonotum in lectotype faintly incurved).

WORKER : Dimorphic. *Worker major* : Head-capsule brown; antennae deep straw coloured to brownish, paler basally; postclypeus straw-coloured to brownish yellow; abdomen and legs pale yellow. Head and body fairly densely hairy. Total body-length 3.0-5.65 mm. Head-capsule subcircular (length to base of mandibles 1.35-1.40, max. width 1.4-1.53 mm). Antennae 16-18 segmented; basal segments variable in size (18-segmented with segment 4 shortest in paralectotypes). Postclypeus swollen, pilose; length less than half of width (length 0.30-0.33, width 0.70-0.73 mm in paralectotypes). Pronotum saddle-shaped; deeply emarginate at anterior margin and fairly prominently incurved at posterior margin (length 0.40-0.45, width 0.73-0.85 mm; 0.40-0.45 and 0.73-0.78 mm respectively in paralectotypes). *Worker minor* : As in worker major except for smaller size. Total body-length 3.6-4.3, head-length to base of mandibles 0.75-1.20, max. width of head 0.83-1.25, length of pronotum 0.30-0.40, width of pronotum 0.55-0.65 mm.

Lectotype (designated here) : In the NHM, Maastricht, there are 2 pins holding the Syntypes—one pin with 3 soldiers and the other with 3 workers. The pin holding the card with the soldier specimens are labelled

as type by Wasmann; of these the 2nd specimen from top is figured and designated as the lectotype. All the other specimens thus, become the paralectotypes. The lectotype soldier measures as follows:— Total body-length 3.80, head-length to base of mandibles 1.33, max. width of head 1.10, width of head at base of mandibles 0.75, length of labrum 0.25, width of labrum 0.33, length of left mandible 0.70 and right mandible 0.73, length of postmentum 0.85, max. width of postmentum 0.43, length of pronotum 0.53 and width of pronotum 0.83 mm; No. of antennal segments 16, segment 4 shortest.

Distribution : It is very widely distributed species and is known from INDIA (southern and North-eastern India), SRI LANKA and INDO-CHINA.

269. *Hypotermes winifredi* Ahmad

(Figs. 275, 276)

1. *Odontotermes (Hypotermes) winifredi* Ahmad :

1953. Ahmad, *Spolia Zeylanica* , **27** (1) : 38-40. Im and S. Holotype : S, in Colombo Mus., Colombo. Type-locality : Colombo, Sri Lanka.

1958. Ahmad, *Biologia* Lahore, **4** : 121, 122.

2. *Hypotermes winifredi* Ahmad :

1956. Roonwal and Sen-Sarma, *Indian J. agric. Sci.*, **26** (1) : 25.

1963. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (9) : 174, 192-197. Synonymy, description, etc.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.* , **131** (Art. 1) : 56.

IMAGO (Fig. 275) : Head-capsule dark brown; labrum brownish ; antennae pale brown; abdomen pale brown above. Head and body fairly densely hairy. Head subcircular (length to base of mandibles 1.58, width of head with eyes 2.37 mm). Fontanelle small, circular, whitish spot, (diameter 0.08 mm, vide Thakur 1963). Eyes large, broadly oval (max. diameter 0.72, min. diameter 0.58 mm); strongly bulging out. Ocelli oval, translucent (long diameter 0.31, short diameter 0.26 mm); separated from eyes by a little more than half of long diameter (eye-ocellus distance 0.17 mm). Antennae incomplete with segment 2 equal to 3+4; 3 shortest. Postclypeus swollen, hairy; length less than half its width (length 0.37, width 0.88 mm). Pronotum trapezoidal (length 1.05, width 2.02 mm);

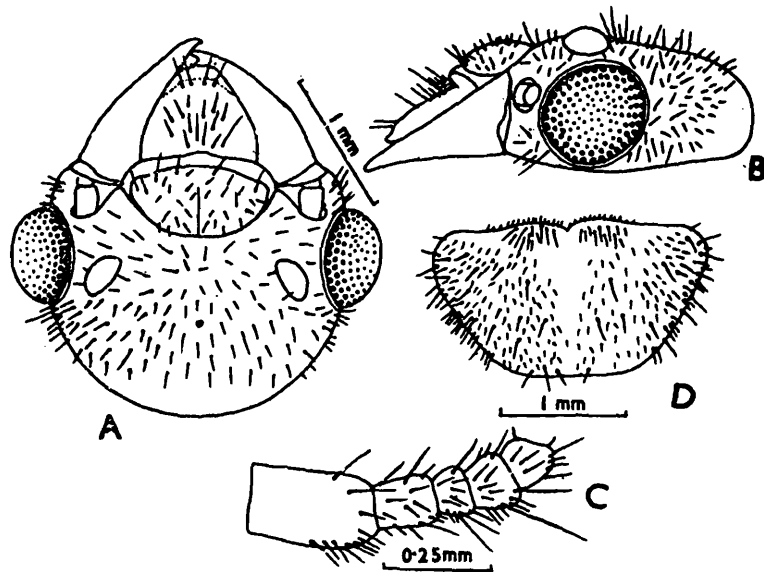


Fig. 275 : *Hypotermes winifredi*. Imago. (A) Head, dorsal view. (B) Same, side view. (C) Basal few segments of antenna. (D) Pronotum. (Ex Chatterjee and Thakur, 1963).

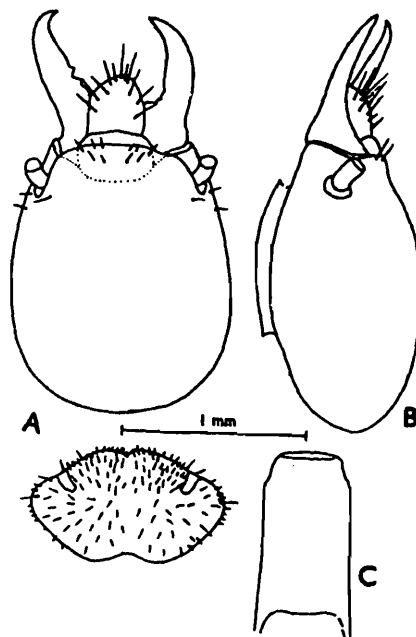


Fig. 276 : *Hypotermes winifredi*. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Postmentum. (Ex Chatterjee and Thakur, 1963).

anterior margin slightly raised and distinctly notched in middle, posterior margin substraight. The measurements given by Chatterjee and Thakur 1963 are slightly different from those given by Ahmad 1953, but here I have taken the measurements as given by Ahmad, since the specimens were not available to me.

SOLDIER (Fig. 276) : Head-capsule reddish brown; labrum paler than head; rest of body straw yellow. Head and pronotum with a few scattered hairs, abdomen somewhat more hairy. Total body-length 5.0-5.40 mm. Head-capsule broadly oval, sides weakly converging in front, broadest near middle (length to base of mandibles 1.36-1.60, max. width 1.14-1.27 mm). Antennae with 16-17 segments; segment 3 slightly longer than 2. Labrum broad, tongue-shaped; anterior margin broadly rounded; with longish hairs on either side. Mandibles strong, stout; about half of head-length (0.70-0.79 mm). Left mandible with 3 crenulations in basal half; right without crenulations. Postmentum subrectangular (length 0.79-0.90, max. width 0.39-0.48 mm). Pronotum saddle-shaped; anterior margin weakly to distinctly notched, posterior margin distinctly emarginate (length 0.48-0.60, width 0.90-1.01 mm). Mesonotum narrower and metanotum broader than pronotum; both substraight at posterior margin.

Distribution : SRI LANKA.

270. *Hypotermes xenotermis* (Wasmann)

(Synonym : *Hypotermes nongpriangi* (Roonwal & Sen-Sarma)

(Figs. 277, 278)

1. *Termes xenotermis* Wasmann :

1896. Wasmann, *Ann. Mus. Civ. Stor. Nat.*, (2) **16** (36) : 628. S and W Lectotype (designated here) : S, in NHM. Type-locality : Palon (Pegu), Burma.

2. *Hypotermes xenotermis* (Wasmann) :

1956. Roonwal and Sen-Sarma, *Indian J. agric. Sci.*, **26** (1) : 25.

1963. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (9) : 174, 197-203. Synonymy, description etc.

1963. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 362.

1965. Krishna, *Am. Mus. Novit.*, No. 2210: 2, 3, 25.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 53, 54-55.

1969. van Boven, *Publ. natuurh. Genoot. Limburg* **19** : 49.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12): 35-36, fig. 39.
1973. Morimoto, *Bull. Govt. For. exp. Sta.*, No. 257 : 70.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 97-101.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 16, 58.
1977. Lahiri, et al. *Bull. Meghalaya Sci. Soc.*, 2 : 37.
1977. Roonwal and Chhotani, *Ent. Basil.* 2 : 74-76.
1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.)*, 13 (1) : 6, 28, 52.
1982. Thapa, *Sabah For. Rec.*, No. 12: 287-290.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 19, 25, 115-117.
1985. Chhotani and Bose, *Rec. zool. Surv. India*, 82 (1-4) : 59.
- In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

3. *Hypotermes nongpriangi* Roonwal & Sen-Sarma :

1956. Roonwal and Sen-Sarma, *Indian J. agric. Sci.*, 26 : 21-26.
1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 25. Treats it as a synonym of *xenotermis*.

IMAGO (Fig. 277): Head-capsule dark reddish brown to castaneous brown, paler anteriorly; postclypeus yellowish to yellowish brown; antennae brownish; pronotum as dark as head, with yellowish T-shaped marking and shoulder spots; abdominal tergites brown as pronotum and sternites paler. Head and body fairly densely hairy. Total body-length with wings 23.0-25.0, without wings 11.0-12.0 mm. Head-capsule subcircular (head-length to base of mandibles 1.44-1.80, max. width with eyes 1.89-2.20 mm). Fontanelle minute, circular, not raised. Eyes of medium size, moderately bulging out (max. diameter 0.52-0.63, min. diameter 0.45-0.58 mm); situated close to lower margin of head (eye-lower margin of head distance 0.12-0.13 mm). Ocelli oval (long diameter 0.19-0.20, short diameter 0.13-0.16 mm); from eyes separated by about short diameter or a little more (eye-ocellus distance 0.15-0.19 mm). Antennae with 19 segments, segments 3 and 4 subequal, 5 shortest. Postclypeus swollen, hairy; slightly less than half as long as wide (length 0.39-0.45, width 0.83-0.90 mm). Pronotum subsemicircular (length 0.87-1.05, width 1.71-2.00 mm); anterior margin almost straight and indistinctly notched; posterior margin slightly emarginate. Wings long, forewing-length 20.5-22.0, hindwing-length 19.1-20.0 mm.

SOLDIER (Fig. 278) : Head-capsule and labrum yellowish to yellowish brown, head somewhat paler anteriorly; antennae brownish, paler basally;

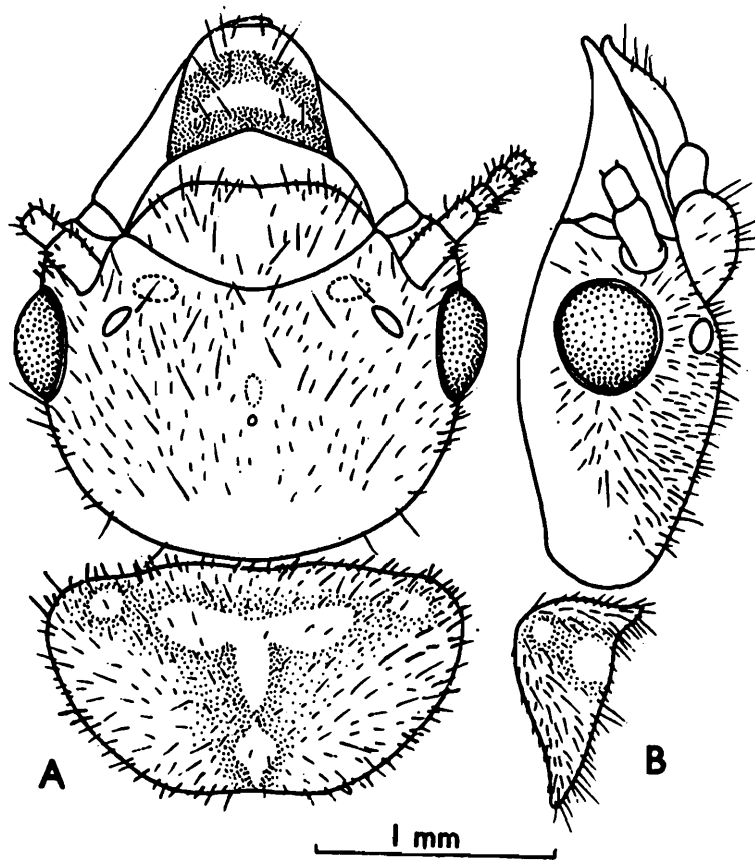


Fig. 277 : *Hypotermes xenotermitis*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view.

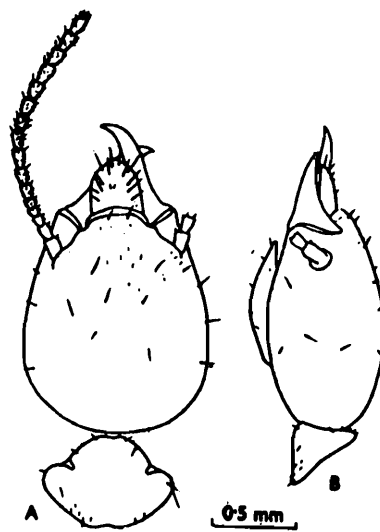


Fig. 278 : *Hypotermes xenotermitis*. Soldier (Lectotype). (A) Head and pronotum, dorsal view. (B) Same, side view.

mandibles dark brown, basally yellowish brown; body pale yellow, pronotum sometimes a little darker. Head sparsely and body fairly hairy. Total body-length 3.50-5.25 mm. Head-capsule oval, broadest posteriorly (head-length to base of mandibles 0.98-1.50, max. width 0.85-1.32 mm; width /length 0.83-0.90, 0.86-0.88 in Syntypes); sides appreciably converging in front (head-convergence index i.e. width at base of mandibles/ max. width 0.64-0.68 in Syntypes). Antennae with 15-16 segments, segment 3 shorter than 2, 4 shortest. Labrum broad, tongue-shaped, with 6-7 longer bristles on either side; tip slightly pointed (length 0.20-0.30, width 0.28-0.38 mm). Mandibles short and thick, almost half as long as head-length (mandible-length 0.54-0.72 mm, 0.68 mm in Syntypes); index mandible-length/head-length 0.45-0.60, 0.52-0.54 in Syntypes). Left mandible with 3 prominent crenulations in basal half; right without crenulations but sometimes with a few serrations near base. Postmentum subrectangular, broadest in anterior third (length 0.64-0.88, max. width 0.41-0.53 mm). Pronotum saddle-shaped; sparsely hairy; anterior margin weakly to fairly distinctly notched, posterior margin weakly to fairly emarginate (weakly in Syntypes); length 0.38-0.55, width 0.62-0.90 mm (0.50 and 0.73-0.75 mm respectively in Syntypes). Mesonotum little narrower than pronotum; posterior margin weakly invaginated. Metanotum as wide as or slightly wider than pronotum, posteriorly substraight.

WORKER : Head-capsule pale brown, paler anteriorly; antennae straw yellow, darker distally; postclypeus a little paler than head; body yellowish white. Head and body fairly hairy. Total body-length 4.0-5.0 mm. Head-capsule subcircular, widest near base of antennae (length to base of mandibles 1.20-1.35, max. width 1.35-1.45 mm). Fontanelle plate small, circular, translucent spot, visible under strong light only. Antennae with 17 segments; segment 3 shorter than 2, and subequal to 5: 4 slightly bigger than 3. Postclypeus swollen and with a few hairs; length less than half of width. Pronotum saddle-shaped; anterior margin distinctly notched and posterior margin shallowly concave (length 0.40-0.48, width 0.70-0.75 mm).

Lectotype (designated here) : In the NHM, Maastricht there is a pin holding 2 syntype soldiers labelled by Wasmann as *Type*. Of these, the top specimen is designated as the *Lectotype* and the other as *Paralectotype*. The *Lectotype* measures as follows : Total body-length 3.60 mm, length

of head to base of mandibles 1.28, max. width of head 1.10, width of head at base of mandibles 0.70, length of labrum 0.30, width of labrum 0.30, length of left and right mandibles 0.68, length of pronotum 0.50, width of pronotum 0.75 mm; number of antennal segments 16, segment 4 shortest.

Distribution : This is a very widely distributed species in the Orient and is reported from INDIA (Bengal and North-eastern states), BANGLADESH, BHUTAN, BURMA, THAILAND and MALAYSIA (Sabah).

Genus 45. *Euscaiotermes* Silvestri

1. Subgenus *Euscaiotermes* (of *Odontotermes*) Silvestri :

1923. Silvestri, *Rec. Indian Mus.*, **25** (2) : 221.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 224.

1955. Emerson, *Fieldiana : Zool.*, **37** : 513.

1958. Ahmad, *Biologia*, Lahore, **4** : 97.

1. Subgenus *Euscaiotermes* (of *Termes*) Silvestri :

1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : 36,69.

3. Genus *Euscaiotermes* Silvestri :

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 146.

1973. Chhotani and Bose, *Zool. Anz.* , **190** (3/4) : 235.

1987. Chhotani, *Beitr. Ent.*, **37** : 412.

Type of genus : *Odontotermes* (*Euscaiotermes*) *primus* Silvestri

1. *Characters of Genus Euscaiotermes*

As no specimens of the genus were available, the following descriptions of the genus and the species are drawn up from original description and notes of late Prof. Emerson who very kindly permitted the author to use his notes during his assignment at the AMNH, New York, in 1973-74.

Imago : Unknown.

Soldier : Head subrectangular, slightly converging anteriorly. Antennae with 17 segments; segment 3 shorter than 2. Labrum triangular; tip pointed. Mandibles strong, incurved apically; left with concave notch posterior to apical third; right without any tooth. Postmentum subrectangular. Pronotum saddle-shaped; anterior margin notched,

posterior margin emarginate. Apical tibial spurs 3 : 2: 2; tarsi 4-jointed. Cerci 2 jointed; styli present.

Worker : Head subcircular, broader than long. Fontanelle whitish, circular, large. Antennae 19-segmented. Postclypeus swollen, length 1/3 of width. Mandibles as in *Odontotermes*, each with an apical and two marginal teeth. Pronotum saddle-shaped. Legs as in soldier.

2. *Distribution and Composition of Euscaiotermes*

(Fig. 190)

The genus *Euscaiotermes* is endemic to India and is known by a single species. *E. primus* Silvestri. Ever since it is described it has not been found again even though the author himself collected quite extensively in Orissa and particularly at Barkuda Island, the locality from where it was first reported.

271. *Euscaiotermes primus* Silvestri

(Figs. 279-281)

1. *Odontotermes* (*Euscaiotermes*) *primus* Silvestri :

1923. Silvestri, *Rec. Indian Mus.*, **25** (2) : 221-223. Holotype : S, in Silvestri Coll., Portici (Italy). Type-locality: Barkuda Isl., Chilka Lake, Orissa, India

1949. Snyder, *Smiths. misc. Colls.*, **112** : 224.

1958. Ahmad, *Biologia*, Lahore, **4** : 121.

2. *Termes* (*Euscaiotermes*) *primus* Silvestri :

1953. Rattan Lal and Menon, *Cat. Indian Insects*, Pt. 27-*Isoptera* : 69.

IMAGO : Unknown.

SOLDIER (Figs. 279, 280) : Head fairly dark reddish brown; labrum a little paler than head; mandibles dark reddish brown; pronotum, meso- and metanotum paler than head; abdominal tergites and sternites yellowish. Head with a few scattered bristles; abdomen with numerous bristles and somewhat shorter hairs. Total body-length 8.0 mm. Head-capsule subrectangular with slightly convex sides; weakly narrowed in front (length to base of mandibles 2.85, max. width 2.4, height 1.65 mm; index width/length 0.742, convergence index i.e. width at base of

mandibles/max. width 0.533*); Y-suture absent. Fontanelle indistinct. Eyes absent. Antennae with 17 segments; segment 3 shorter than 2; 4 shorter than 2. Labrum triangular with convex sides and pointed tip (length 0.65, width 0.58 mm). Mandibles thick, stout, incurved apically (length 1.6 mm, according to Emerson's notes length of left mandible 1.71 mm); a little longer than 1/2 head-length (index mandible-length/head-length c 0.561 to 0.60*) Postmentum subrectangular (length 1.87, max. width 0.90 mm). Pronotum saddle-shaped (length 0.97, width 1.69 mm); front lobe distinct; anterior margin notched; posterior margin widely emarginate. Mesonotum and metanotum with rounded sides and widely emarginate posterior margin; latter wider than former. Legs long; with 3:2:2 apical tibial spurs. Cerci 2-jointed; styli present, single jointed.

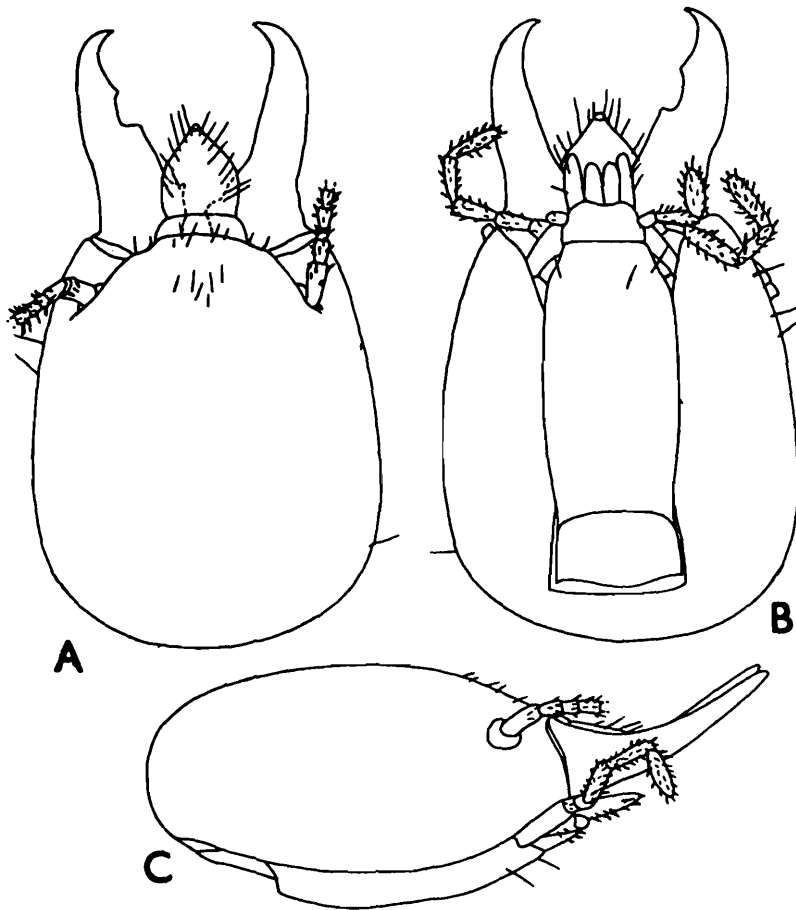


Fig. 279 : *Euscaiotermes primus*. Soldier (Type). (A) Head, dorsal view. (B) Same, side view. (C) Same, ventral view, showing, postmentum in situ. (Drawing courtesy late Prof. Emerson).

* Calculated from figure and notes of Prof. Emerson.

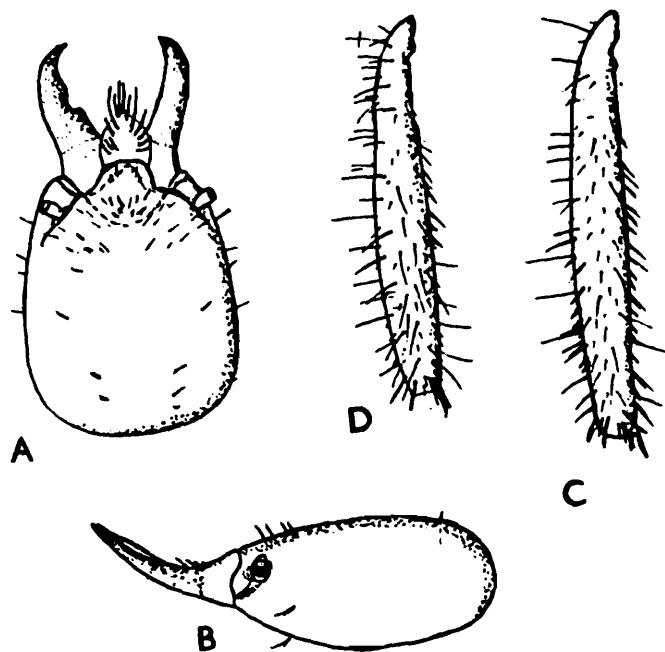


Fig. 280. *Euscaiotermes primus*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) and (D) first and second legs. (Ex Silvestri, 1923).

WORKER (Fig. 281) : Monomorphic (?) : Head yellowish white; body rusty yellow; abdomen greyish due to intestinal contents. Head moderately hairy (as seen in figure). Total body-length 5.5 mm. Head-capsule a little wider than long, subcircular (length 1.62, width 1.78 mm). Fontanelle whitish, circular, large. Antennae with 19 segments; segment 2 a little less than double the length of 3; 4 a little shorter than 3 and little longer than 5. Postclypeus swollen a little; about 1/3 as long as wide. Mandibles each with an apical and two marginal teeth; posterior margin of 1st marginal of left mandible much longer than anterior margin and posterior margin of 1st marginal of right a little longer than anterior margin; 2nd marginal of left small and that of right with a long, straight posterior margin (the mandibles are very much like those in *Odontotermes*). Pronotum saddle-shaped with anterior margin of lobe weakly sinuate, its posterior margin and that of mesonotum weakly sinuate medially; metanotum with posterior margin faintly sinuate; legs and abdomen as in soldier.

Distribution : INDIA : Orissa : Barkuda Island (Chilka Lake), type-locality.

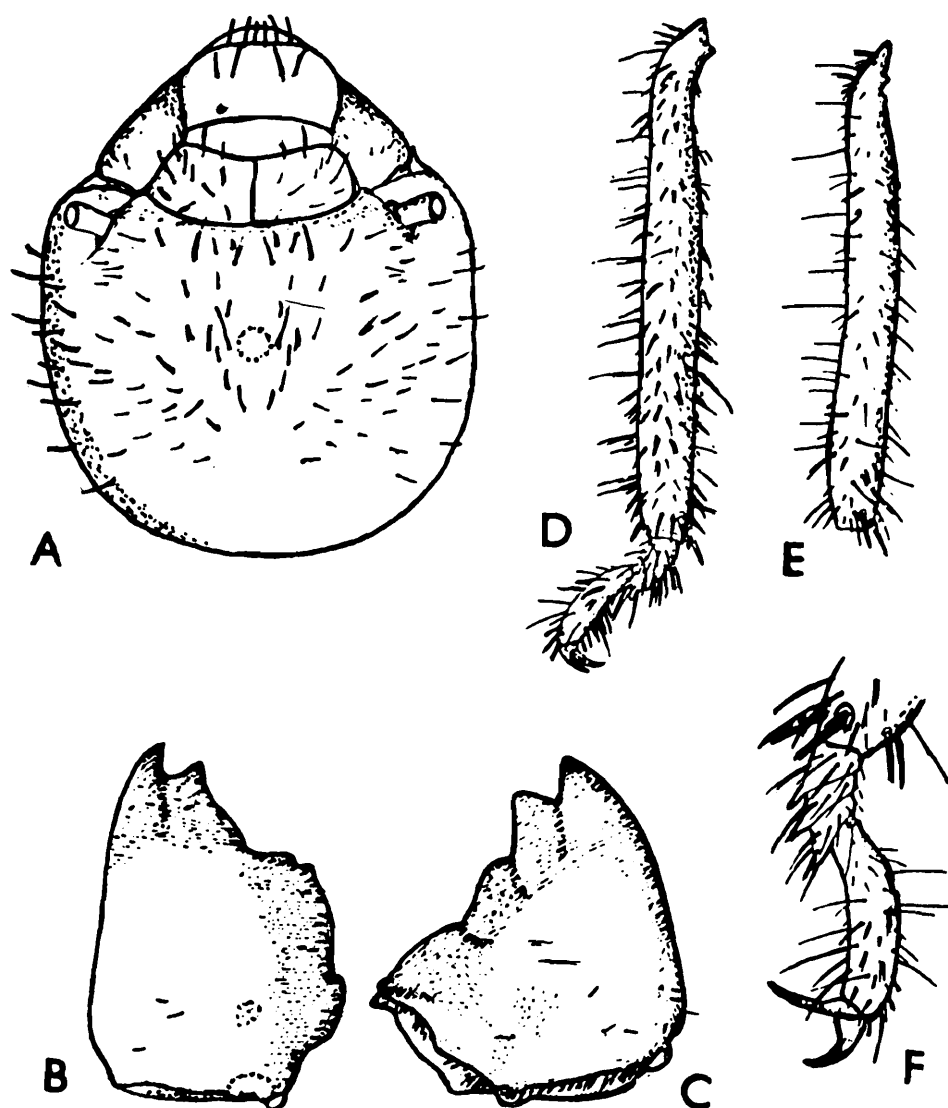


Fig. 281 : *Euscaiotermes primus*. Worker. (A) Head, dorsal view. (B) and (C) Left and right mandibles, respectively. (D)-(E) First and second tibiae. (F) part of tibia and tarsus of the same. (Ex Silvestri, 1923).

Remarks : A number of surveys have been conducted by the Zoological Survey of India in the State of Orissa and the author has also surveyed Barkuda Island and some other parts of Orissa (Tikader and Chhotani, 1987). Bose and Das (1982) have worked out the collections of termites from these surveys but the species *E. primus* has not been reported by them, the only record being Silvestri's original description. The unique type soldier and 4 workers are in Silvestri Collection but were not available for study. However, Late Prof. Emerson had examined these specimens and the descriptions and figures given above are based

on the original description as well as the notes of Prof. Emerson at the American Museum of Natural History to which the author was permitted access, while on an assignment there in 1973-74. Prof. Emerson did not give any comments on the validity of the genus in his notes and kept it as a distinct subgenus of *Odontotermes* (Emerson, 1955). Krishna (1970) treats it as full genus and the author has kept it as such in this publication.

On perusal of the description it is seen that the genus can be separated from *Odontotermes* only on the basis of a wide notch on the left mandible of the soldier (vs tooth in *Odontotermes*). The soldier otherwise appears to be close to *O. feae* and *O. horni*, the species which have been reported from the areas nearby, the former having also been found making earthen mounds at Barkuda Island (Roonwal and Chhotani, 1966 a).

Genus 46. *Microtermes* Wasmann

Genus *Microtermes* Wasmann :

- 1902. Wasmann, *Zool. Jb. Syst.*, **17** (1) : 115-116.
- 1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** (Art. 2) : 57, 58, 59.
- 1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : 65. Synonymy.
- 1955. Emerson, *Fieldiana : Zool.*, **37** : 473, 486, 489, 501, 513.
- 1962. Roonwal and Chhotani, *Proc. nat. Inst. Sci. India*, (B) **28** (4) : 295.
- 1964. Roonwal and Bose, *Zoologica*, **40** (113) : 8.
- 1965. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (11): 220-222. See for synonymy, description, etc.
- 1967. Roonwal and Chhotani, *Zool. Anz.*, **178** (3/4) : 256-257.
- 1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 146.
- 1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. 17-FS-12) : 36.
- 1972. Coaton and Sheasby, *Cimbebasia*, Mem. 2 : 89, 91, 101.
- 1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235.
- 1974. Akhtar, *Pakistan J. Zool.*, **6**(1-2) : 92, 93.
- 1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 1,4,8,39, 43.
- 1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, Art. 7 : 58.
- 1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 44.

1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.). Ent.*, **13** (1) : 4.
1980. Lahiri and Ghosh, *Rec. zool. Surv. India*, **76** : 65.
1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 200.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 94, 98.
1986. Chhotani, *Rec. zool. Surv. India*, **83** : 21, 23, 24, 26.
1987. Chhotani and Bose, *Bull. zool. Surv. India*, **8** (1-3) : 61-64.
1987. Chhotani, *Beitr. Ent.*, **37** : 412-413.

Type of genus : *Termes incertus* Hagen.

1. Characters of Genus *Microtermes*

Imago : Light brown to castaneous brown, medium sized, fairly densely hairy. Head broad, oval, widest across eyes; epicranial suture faint or indistinct. Fontanelle small, whitish, spot-like. Eyes medium sized, projecting out, close to lower margin. Ocelli broadly oval, either touching or separated from eyes by about their diameter. Antennae with 15-18 segments. Postclypeus greatly swollen, length a little less than half to a little more than half width. Labrum with a transverse, chitinous band. Mandibles each with an apical and two marginal teeth and resemble those of *Odontotermes*. Pronotum subsemicircular; anterior margin faintly raised medially and with faint notch or without notch; posterior margin faintly to markedly emarginate. Legs with 3:2:2 apical tibial spurs; tarsi 4-jointed. Wings long, narrow; membrane hairy and covered with small, rod-like, chitinous structures; costa thick, bordering anterior margin, subcosta small, rudimentary or absent, when present meeting costa just outside scale; radius as thick as costa-subcosta and running parallel to it; media weak, arising independently from scale in forewing and from radius just outside scale in hindwing and with 2-5 branches; cubitus also weak and with 9-15 branches. Abdomen elongate; cerci 2 jointed; styli very minute, rudimentary.

Soldier : Small, pale, delicate, fairly hairy and smaller than worker. Head-capsule oval. Fontanelle indistinct. Eyes and ocelli absent. Antennae 12-15 segmented. Labrum elongate, lanceolate or triangular and pointed at tip. Mandibles thin and delicate; concave at base on outer margin and apically weakly incurved. Left mandible either without or with a rudimentary tooth; right mandible without any denticle. Postmentum arched, with convex sides. Pronotum saddle-shaped;

anteriorly fairly to deeply notched. Legs with 3: 2: 2 apical tibial spurs; tarsi 4-jointed; foreleg tibiae swollen, fossorial. Abdomen elongate; cerci 2-jointed; styli minute, rudimentary.

Worker : Dimorphic. *Worker major* : Pale, fairly densely hairy. Head-capsule subsquarish. Fontanelle indistinct. Eyes and ocelli absent. Antennae with 13-16 segments. Labrum, postclypeus and mandibles as in imago. Pronotum, legs and abdomen as in soldier. *Worker minor* : Smaller, otherwise as worker major; head somewhat rounded.

2. *Distribution and Composition of Microtermes*

(Fig. 190)

Distribution : The genus *Microtermes* is known to occur in the Ethiopian, Malagasy and the Oriental zoogeographical regions. It is quite well represented in the Ethiopian Region (36 species) and in the oriental and Malagasy regions it is known by 8 and 6 species, respectively (Chhotani 1987). In the Oriental Region the species *M. obesi* Wasmann is most widely distributed.

Composition : According to Snyder 1949, the genus comprises 51 species (37 Ethiopian ; 5 Malagasy with 2 common to Ethiopian and 11 Oriental). Emerson (1955) recognises 56 species including 11 new ones to be described. Chatterjee and Thakur record 57 species, of which according to them 43 occur in the Ethiopian, 4 in Malagasy (2 common with Ethiopian) and 14 in Oriental regions. Of the species occurring in the Oriental Region, Chhotani (1987) has transferred 4 to the genus *Ancistrotermes* and recognised only 8 species, and of which 7 occur in the Indian subcontinent. Following is the list of species from the Indian Region.

1. *Microtermes imphalensis* Roonwal and Chhotani—India
2. *M. incertoides* Holmgren—India, Pakistan
3. *M. macronotus* Holmgren—Sri Lanka
4. *M. mycophagus* Desneux—India, Pakistan
5. *M. obesi* Holmgren—India, Pakistan, Bangladesh, Thailand, Vietnam
6. *M. sindensis* (Desneux)—Pakistan
7. *M. unicolor* Snyder—India, Pakistan

3. Keys to Indian Species of *Microtermes*

IMAGOES

- 1(2) Larger species : Head-width with eyes 1.70-1.93, pronotum width 1.48-1.70, forewing-length 15.0-17.0 mm. Antennae 17 to 18-segmented.....*mycophagus*
- 2(1) Smaller species : Head-width with eyes 1.31-1.60, pronotum-width 1.19-1.45, forewing-length 11.0-14.0 mm. Antennae 15 to 16-segmented
- 3(4) Eyes and ocelli smaller (max. eye-diameter 0.29-0.34, ocellus diameter 0.13-0.18 × 0.09-0.13 mm); ocellus separated from eye by about long diameter (0.13-0.16 mm).....*sindensis*
- 4(3) Eyes and ocelli larger (max. eye-diameter 0.35-0.50, ocellus diameter 0.15-0.28 × 0.10-0.20 mm); ocellus separated from eye by about half short diameter or less
- 5(6) Ocellus generally touching the eye or separated very slightly (0.01-0.02 mm).....*imphalesis*
- 6(5) Ocellus separated from eye, eye-ocellus distance 1/3 to 1/2 of short diameter
- 7(8) Anterior margin of pronotum strongly convex.....*macronotus*
- 8(7) Anterior margin of pronotum substraight
- 9(10) Ocellus separated from eye by 1/3 of short diameter. Postclypeus about 1/2 as long as its width.....*unicolor*
- 10(9) Ocellus separated from eye by 1/2 of short diameter. Postclypeus 1/2 or slightly more than 1/2 of its width.....*obesi*

SOLDIERS

- 1(2) Labrum tongue-shaped, tip broadly pointed.....*mycophagus*
- 2(1) Labrum lancet-shaped
- 3(4) Tip of labrum narrow.....*incertoides*
- 3(4) Tip of labrum comparatively wider
- 5(6) Max. width of head near posterior end and sides strongly converging in front. Labrum tip faintly lanceolate.....*imphalensis*

- 6(5) Max. width of head near middle and sides somewhat less so converging in front. Labrum clearly lanceolate
- 7(8) Head and body densely hairy. Second segment of antenna shorter than third and fourth combined together.....*unicolor*
- 8(7) Head and body less so hairy. Second segment of antenna equal to third and fourth combined together.....*obesi*

272. *Microtermes imphalensis* Roonwal and Chhotani

(Figs. 282, 283)

Microtermes imphalensis Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 364-374, 391, 396, pl. 34. Holotype : Im, in ZSI. Type-locality : Imphal Valley, Manipur, India. Types examined.
1964. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (11) : 222, 225-226, 251.
1967. Roonwal and Chhotani, *Zool. Anz.*, **178** : 258-259.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 34.
- In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO (Fig. 282) : Types examined. Head-capsule chestnut brown; antennae, postclypeus and legs yellow; pronotum brownish yellow anteriorly and paler posteriorly, with pale yellow T-shaped marking in middle and round shoulder spots; mesonotum and metanotum paler than pronotum, each with a pair of yellow spots posteriorly; abdomen brownish yellow above and pale yellow below. Head and pronotum moderately and abdomen densely hairy Total body-length with wings 15.0-18.0 and without wings 8.5-11.10 mm. Head-capsule subcircular (length to base of mandibles 1.05-1.13, width with eyes 1.43-1.65 mm); somewhat depressed around fontanelle and raised between eyes; Y-suture weakly marked. Fontanelle minute, circular, white, dot-like. Eyes subcircular (max. diameter 0.43-0.50 mm); strongly projecting out. Ocelli moderately large (long diameter 0.23-0.27, short diameter 0.16-0.18 mm); either touching the eyes or very slightly separated by 0.01-0.02 mm. Antennae with 15 (rarely 16) segments; segment 3 shortest (longer than 4 in 16-segmented antennae). Postclypeus strongly swollen; length a little more than 1/2 width; anterior margin straight, posterior margin strongly convex and somewhat projecting

medially. Pronotum subsemicircular (length 0.85-0.93, width 1.25-1.45 mm); anterior margin slightly concave, with a weak median notch; posterior margin slightly convex and weakly incurved medially. Mesonotum and metanotum deeply notched posteriorly. Wings long, hairy; microsculpture consists of small rod-like, cuticular structures; rods longer than in *obesi* or *unicolor*. Forewing-length 12.75-13.6, hindwing-length 12.0-13.2 mm, for variation in venation vide Roonwal and Chhotani, 1962c.

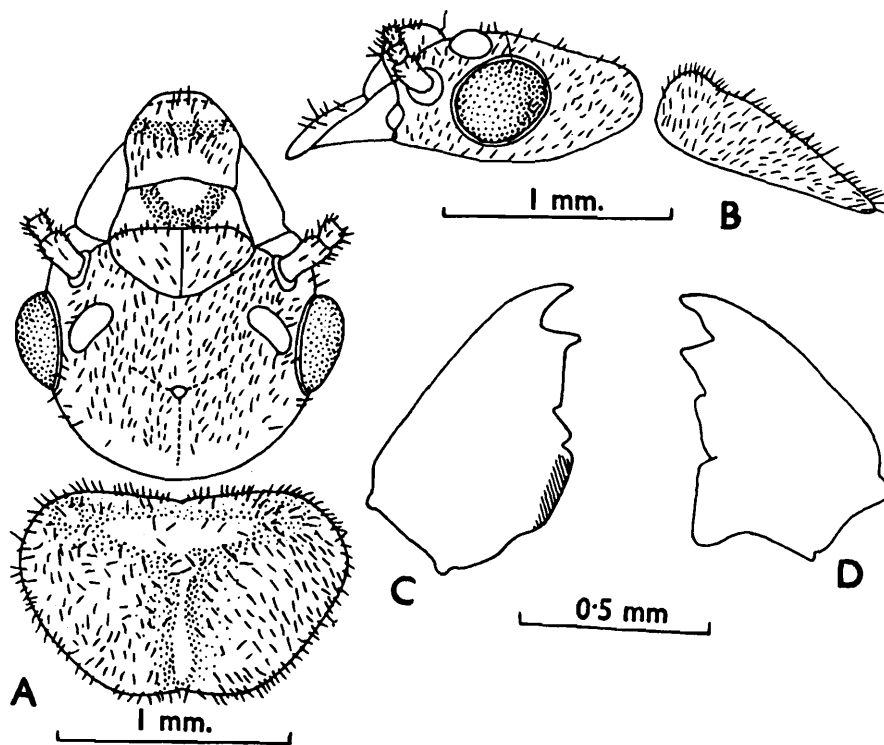


Fig. 282 : *Microtermes imphalensis*. Imago. (A) Head and pronotum, in dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles, respectively.

SOLDIER (Fig. 283) : Head pale brownish yellow, paler medially, labrum also pale brownish yellow; antennae, legs and abdomen creamy white. Head and body fairly hairy. Total body-length 3.70-3.90 mm. Head-capsule oval (length to base of mandibles 0.88-0.93, max. width 0.80-0.85 mm, index max. width/length 0.892-0.909); sides strongly converging in front (width at base of mandibles 0.50-0.58 mm, head-convergence index i.e. width at base of mandibles/max. width 0.625-0.682). Antennae with 14 segments; segment 3 shortest. Labrum elongately tongue-shaped; with

a weak, lanceolately pointed tip, reaching upto a little less than two thirds of mandibles (length 0.25-0.28, width 0.18-0.23mm). Mandibles delicate, slightly concave in outer margin in basal half; tips weakly incurved (length 0.50-0.53 mm, index mandible-length/head-length 0.569). Postmentum somewhat rectangular, a little longer than broad. Pronotum saddle-shaped; anterior margin distinctly notched, posterior margin not sinuate (length 0.33-0.35, width 0.54-0.55 mm).

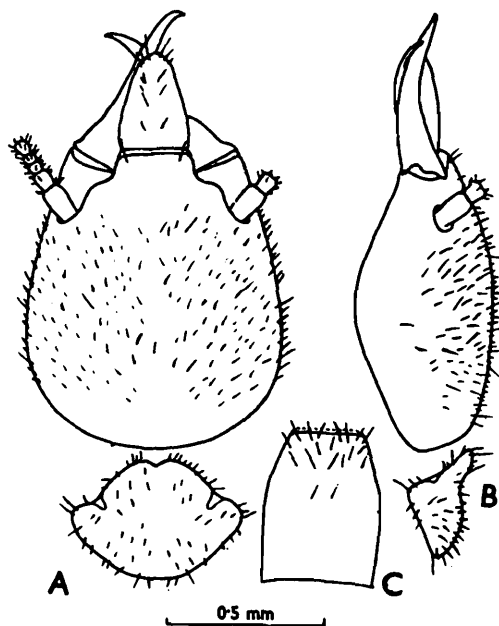


Fig. 283 : *Microtermes imphalensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Postmentum. (After Bose, In press).

WORKER : Dimorphic. *Worker major* : Head-capsule pale creamy yellow; postclypeus and labrum of same colour as head; antennae, legs and abdomen pale creamy white. Head and body fairly densely hairy. Total body-length 4.0-4.3 mm. Head subsquarish (length to base of mandibles 0.93-0.95, width 0.90 mm). Antennae with 14 segments. Postclypeus swollen, length about half of width (length 0.15-0.20, width 0.40-0.43 mm). Pronotum strongly saddle-shaped (length 0.26-0.28, width 0.46-0.58 mm). *Worker minor* : Generally smaller and head-capsule subrounded, otherwise as in worker major. Total body-length 3.5, length of head to base of mandibles 0.60-0.63, max. width of head 0.73-0.75 mm.

Distribution : INDIA : Manipur and Arunachal Pradesh states.

273. *Microtermes incertoides* Holmgren

(Fig. 284)

1. *Microtermes incertoides* Holmgren :

1913. Holmgren, *J. Bombay nat. Hist. Soc.*, **22**(1) : 113-114. S and W. Holotype : Probably in Riksmus., Stockholm. Type-locality : Wallon, Ahmednager Dist., Maharashtra, India.

1964. Chatterjee and Thakur, *Indian For. Rec. Ent.*, **10**(11) 223, 227-229, 252. Synonymy, description, etc.

1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 2, 16, 43, 58, 65.

2. *Microtermes incertus* (Hagen) (Part) :

1902. Wasmann, *Zool. Jb. Syst.*, **17**(1) : 117.

1952. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : 66.

IMAGO : Unknown.

SOLDIER (Fig. 284) : Head-capsule straw yellow; labrum yellowish; antennae and body whitish; mandibles reddish brown, paler basally. Head and body fairly densely hairy. Total body-length 3.30-4.0 mm. Head-

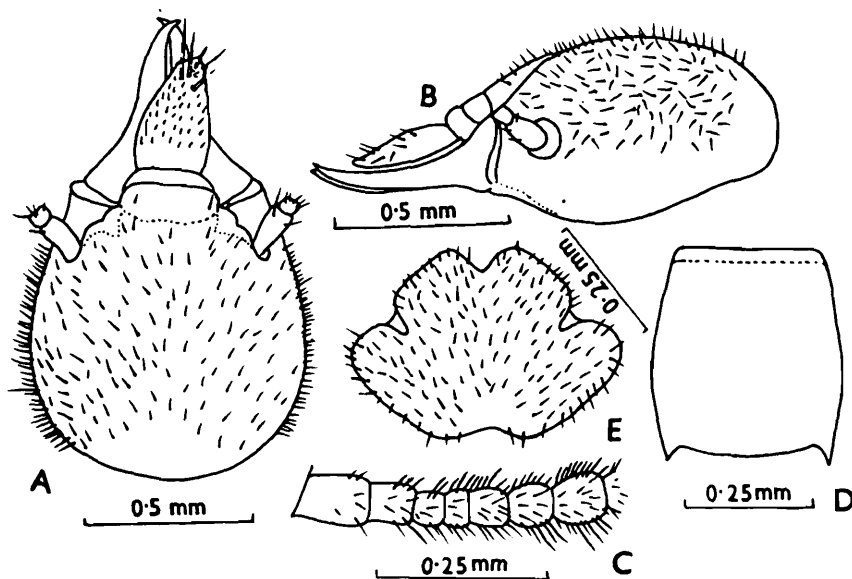


Fig. 284 : *Microtermes incertoides*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal segments of antenna. (D) Postmentum. (E) Pronotum, dorsal view. (Ex Chatterjee and Thakur, 1964b).

capsule oval; a little longer than wide (length to base of mandibles 0.80-0.88, max. width 0.75-0.78 mm); sides converging in front. Antennae with 14 segments; segment 2 subequal to 3 + 4. Labrum lancet-shaped, extending upto 2/3 of mandibles; tip narrow and pointed (length 0.30-0.33, width 0.20-0.23 mm). Mandibles thin, delicate, weakly incurved anteriorly (length 0.50-0.53 mm), index mandible-length/head-length 0.60-0.63). Postmentum a little longer than wide; sides weakly convex (length 0.45, width 0.35-0.38 mm). Pronotum saddle-shaped; notched anteriorly and broadly incurved medially at posterior margin (length 0.35, width 0.48-0.53 mm).

WORKER : Dimorphic. *Worker major* : Head-capsule pale yellowish brown; labrum and postclypeus yellowish; antennae and body creamish white. Head and body moderately hairy. Total body-length 3.5-4.30 mm. Head-capsule subsquarish, sides faintly narrowed behind (length to base of mandibles 0.80, width 0.87 mm). Antennae with 14 segments. Postclypeus swollen, length 1/2 of width. Pronotum saddle-shaped (max. width 0.46 mm); anteriorly deeply notched and posteriorly substraight. *Worker minor* : As in worker major. Head-capsule subcircular. Total body-length c 3.0, head-width 0.68, pronotum-width 0.42 mm.

Distribution : INDIA : Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh and Uttar Pradesh states. PAKISTAN.

274. *Microtermes macronotus* Holmgren

Microtermes macronotus Holmgren :

1913. Holmgren, K. *Svenska Vetensk.-Akad. Handl.*, **50**(2) : 144, 145-146.
Im only. Holotype : Im, in Mus. Vienna. Type-locality : Sri Lanka.
1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : 67.
1964. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10**(11) : 222, 229-230. Synonymy, description, etc.

IMAGO : Description from literature. Head pale brown, anteriorly somewhat paler; postclypeus antennae, pronotum, anterior parts of meso- and metanotum, legs and underside of body yellow; rest of body pale brown; wings somewhat yellowish. Moderately densely hairy; wings with a few hairs near tip. Total body-length with wings 17.0, without wings 10.0 mm. Head elongately oval, narrowed in front (length 1.6 upto labrum, width 1.48 mm). Fontanelle indistinct, pale spot. Eyes moderately large;

projecting out. Ocelli moderately large; separated from eyes by 1/2 diameter. Postclypeus large, strongly swollen; about 1/2 as long as wide; anterior margin weakly convex. Antennae? segmented; segments 2, 3 and 4 subequal, 5 shorter than 4. Pronotum very large, strongly convex anteriorly and in middle clearly notched; antero-lateral corners angular (length 0.95, width 1.44 mm). Mesonotum more strongly notched posteriorly than metanotum. Media free, arising from scale in forewing, with 2-3 branches in distal third (length of forewing 14.0 mm).

Distribution : SRI LANKA.

275. *Microtermes mycophagus* (Desneux)

(Fig. 285)

1. *Termes mycophagus* (Desneux) :

1905. Desneux, *Ann. Soc. Ent. Belg.*, **49**(12) : 348-352. Im, S and W.
Holotype : Repository not known. Type-locality : Karachi, Sind, Pakistan.

2. *Microtermes mycophagus* (Desneux) :

1964. Roonwal and Bose, *Zoologica*, **40**(113) : 6, 39, 41-44.

1964. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (11) : 222, 234. Synonymy, description, etc.

1969. Roonwal and Bose, *Rec. zool. Surv. India*, **61**(3 & 4) : 443, 445, pl. 23 (fig. 6).

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 372-373.

1974. Akhtar, *Biologia*, Lahore, **6**(1 & 2) : 102.

1976. Roonwal, *Zool. Jb. Syst.*, **103** : 465, 466, 475, 476, 477, 497, 498.

1977. Roonwal, In : *Natural Resources of Rajasthan* (Ed Roonwal) Vol. 1 : 376, pl. 3 (fig. p.)

1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 456, 462, 469.

1980. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **46**(2) : 157, 158, pl. 2 (figs 5, 6).

IMAGO (Fig. 285 A, B) : Head-capsule castaneous brown; antennae, labrum and postclypeus pale brownish yellow; abdomen paler than head. Head and body moderately densely hairy. Total body-length with wings 22.0-23.75, without wings 10.0-11.5 mm. Head-capsule subcircular, broader than long (length to base of mandibles 1.25-1.45, max. width with eyes

1.70-1.93 mm). Fontanelle hyaline, subcircular, small spot (0.08 mm diameter). Eyes large, subcircular, bulging out (max. diameter 0.40-0.50, min. diameter 0.35-0.45 mm). Ocelli large, oval (long diameter 0.20-0.26, short diameter 0.17-0.20 mm); separated from eye by $\frac{1}{2}$ their short diameter (eye-ocellus distance 0.07-0.10 mm). Antennae with 17-18 segments; segment 2 equal to 3 in 17-segmented antennae and equal to $3 + 4$ in 18-segmented antennae; 4 shortest. Postclypeus swollen; length a little less than $\frac{1}{2}$ width. Pronotum subsemicircular (length 0.90-1.05, width 1.48-1.70 mm); anterior margin slightly incurved and medially slightly raised and with a faint notch; posterior margin with a shallow emargination. Wings transparent yellow, with a few hairs on membrane in distal third; forewings 15.0-17.0 and hindwings 14.0-16.0 mm long

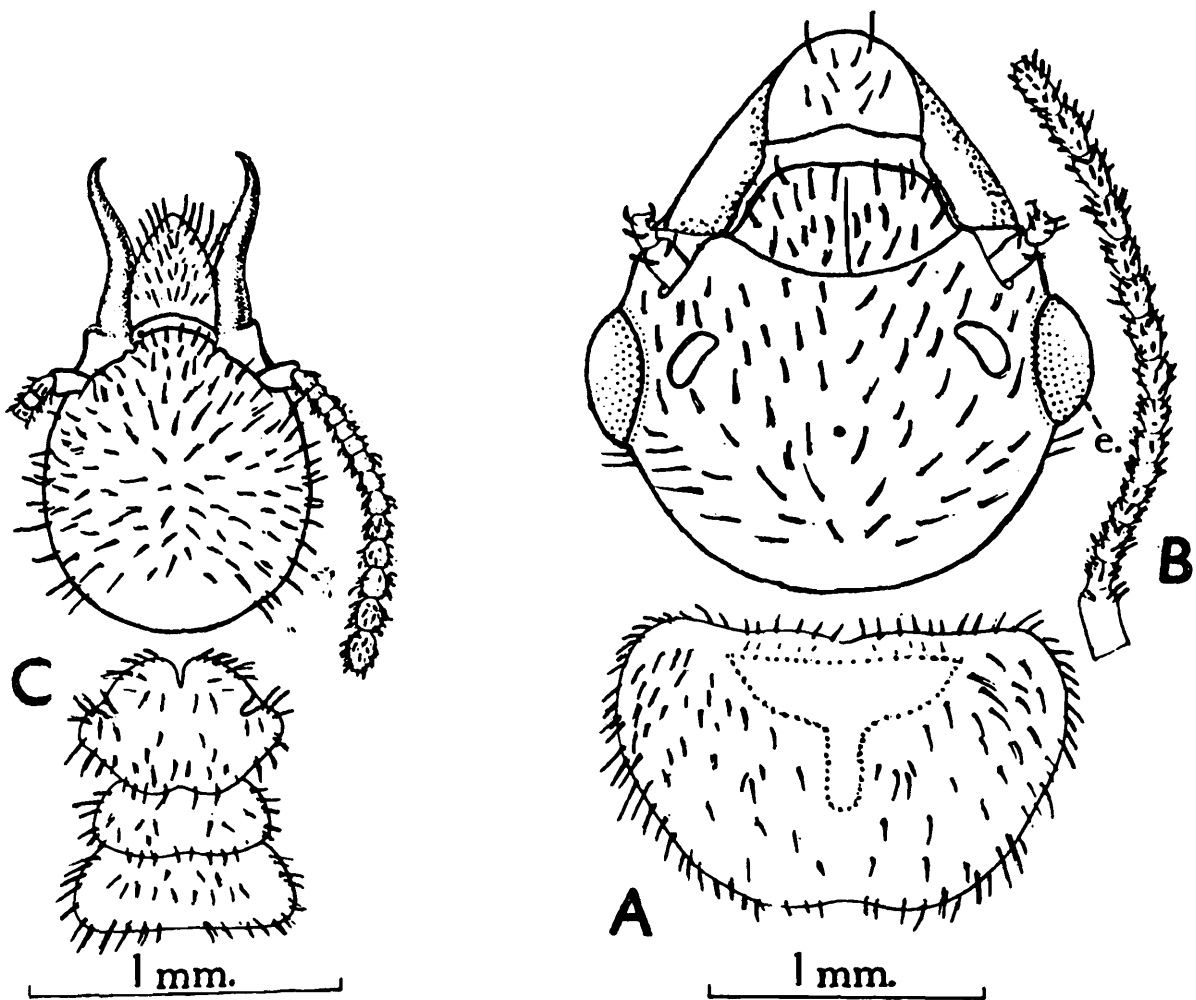


Fig. 285 : *Microtermes mycophagus*. Imago. (A) Head and pronotum, dorsal view. (B) Antenna. Soldier. (C) Head and thorax, dorsal view.

approximately; microsculpture consists of papillae on anterior and posterior margins and small, thin, substraight to slightly curved cuticular rods on membrane.

SOLDIER (Fig. 285C) : Head-capsule yellowish to pale reddish brown; antennae and labrum whitish to pale brownish yellow; body creamish to pale brownish yellow. Head and body rather densely hairy. Total body-length 3.20-5.0 mm. Head-capsule oval, slightly longer than wide (length to base of mandibles 0.85-1.03, max. width 0.78-0.95 mm); sides weakly convex, widest at middle. Antennae with 15-segments; segments 2-5 variable in size. Labrum tongue-shaped, extending upto distal third of mandibles; tip broadly pointed, not lanceolate; longer than wide (length 0.28-0.35, width 0.25-0.30 mm). Mandibles thin and feeble, weakly incurved apically (length 0.58-0.65 mm); a little longer than 1/2 head-length (index mandible-length/head-length 0.62-0.67). Left mandible with a minute, rudimentary tooth on apical third. Right mandible without any tooth. Postmentum swollen, arched; sides convex (length 0.43-0.53, width 0.33-0.45 mm). Pronotum saddle-shaped; anterior margin distinctly notched and posterior margin weakly emarginate (length 0.35-0.48, width 0.55-0.70 mm).

WORKER : Dimorphic. *Worker major* : Head pale brownish yellow; body whitish. Head and body fairly densely hairy. Total body-length 4.0-5.0 mm. Head-capsule subsquarish (length to base of mandibles 0.98-1.20, max. width 1.08-1.15 mm). Antennae 15-16 segmented. Postclypeus swollen; length less than 1/2 width. Pronotum saddle-shaped (length 0.20-0.28, width 0.45-0.55 mm); anteriorly distinctly notched, posteriorly substraight.

Distribution : INDIA : Rajasthan, Delhi, Haryana, Panjab. PAKISTAN : Panjab, Sind.

276. *Microtermes obesi* Holmgren

(Synonyms : *M. anandi* Holmgren, *M. anandi f. curvignathus* Holmgren)

(Figs. 286, 287)

1. *Microtermes obesi* Holmgren :

1911. Holmgren, *J. Bombay nat. Hist. Soc.*, **21**(1) : 787-788. Im only.
Holotype : Probably in Riksmus., Stockholm. Syntypes (vide

- Chatterjee and Thakur 1964) present in FRI and IARI. Type-locality : Khandala, Maharashtra, India.
1964. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (11) : 222, 223, 234-239, 265, 266. Synonymy, descriptions, etc.
1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 25-26.
1967. Roonwal and Chhotani, *Zool. Anz.*, **178** (3/4) : 257-258, tab.
1968. Harris, *Opusc. Ent.*, **33** : 151.
1972. Chaudhry, et al., *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 37-38, figs. 41, 42.
1974. Akhtar, *Pakistan J. Zool.*, **6**(1 & 2) : 102.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 101-105.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 1, 16, 44, 45, 59, 65, 68.
1976. Chhotani, *Newsl., zool. Surv. India*, **2**(1) : 13.
1976. Roonwal, *Zool. Jb. Syst.*, **103** : 465, 466, 470-471, 472, 480, 497, 498.
1977. Roonwal, In : *Natural Resources of Rajasthan* (Ed Roonwal) Vol. 1 : 375, pl. 3.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 75, 76.
1977. Chhotani, *Rec. zool. Surv. India*, **72** : 385.
1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 456, 457, 462.
1980. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **46**(2) : 158, pl. 2 (Fig. 7).
1982. Verma and Thakur (R. K.) *Rec. zool. Surv. India*, **79** : 317.
1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 198, 200, 208, 211.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 26, 117-121.
1984. Verma, *Rec. zool. Surv. India*, **81**(3 & 4) : 251-253.
1985. Verma, *Indian J. Forestry*, **7**(4) : 309, 310, 313.

2. *Microtermes anandi* Holmgren :

1913. Holmgren, *J. Bombay nat. Hist. Soc.*, **22**(1) : 114.
1963. Mathur and Thapa, *J. Soc. Indian Foresters*, **3**(3 & 4) : 110.
1964. Roonwal and Bose, *Zoologica*, **40**(113) : 39-41.
1969. Roonwal and Bose, *Rec. zool. Surv. India*, **61**(3 & 4) : 443, 445, pl. 23 (fig. 5).

3. *Microtermes anandi* f. *curvignathus* Holmgren :

1913. Holmgren, *J. Bombay nat. Hist. Soc.*, **22** (1) : 114.

See Snyder 1949, Chatterjee and Thakur 1964b and Krishna 1965 also for synonymy.

IMAGO (Fig. 286) : Head-capsule yellowish brown to castaneous brown; antennae, labrum and postclypeus yellowish, pronotum and abdominal tergites little paler than head; wings brownish. Head and body fairly densely hairy. Total body-length with wings 14.0-16.0, without wings 8.0-12.00 mm. Head-capsule subcircular (length to base of mandibles 0.92-1.15, max. width with eyes 1.31-1.60 mm); epicranial suture faint. Fontanelle small, circular, white spot. Eyes round, projecting out (max. diameter 0.35-0.48, min. diameter 0.30-0.36 mm); situated very close to lower margin of head (eye-lower margin of head distance less than $\frac{1}{4}$ of short diameter). Ocelli oval, large (long diameter 0.15-0.28, short diameter 0.10-0.16 mm); from eyes separated by about $\frac{1}{2}$ of short diameter (eye-ocellus distance 0.05-0.08 mm). Antennae with 15-16 segments; segments 2, 3 and 4 subequal, 2 sometimes slightly longer. Postclypeus strongly swollen; length $\frac{1}{2}$ of width or slightly more. Pronotum subsemicircular, a little narrower than head (length 0.68-0.98, max. width 1.19-1.45 mm); anterior margin substraight, slightly raised and faintly or indistinctly

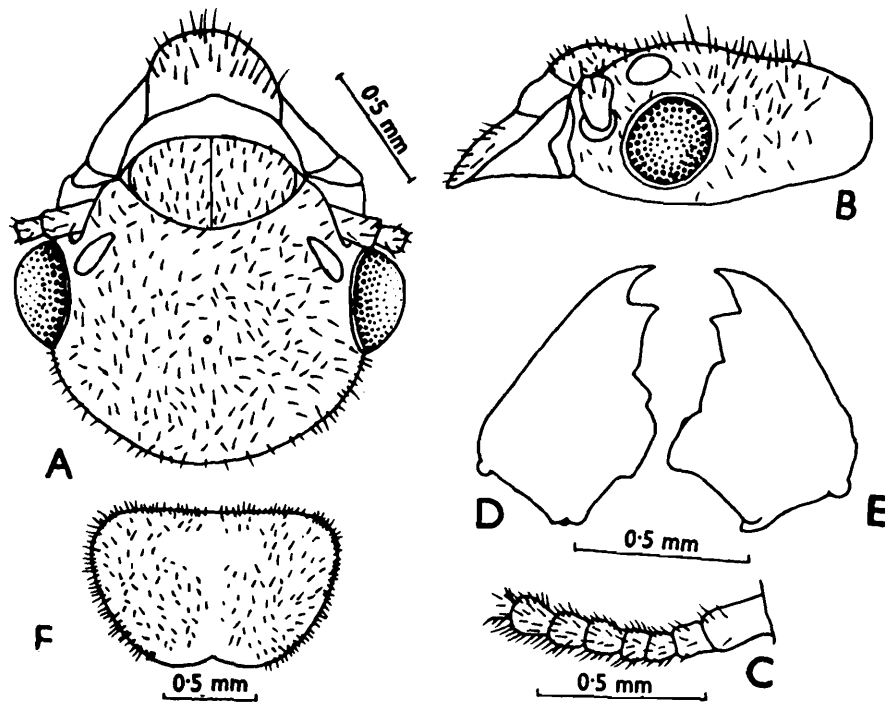


Fig. 286 : *Microtermes obesi*. Imago. (A) Head, dorsal view. (B) Same, side view. (C) Basal part of antenna- (D) and (E) Left and right mandibles, respectively. (F) Pronotum, dorsal view. (Ex Chatterjee and Thakur, 1964b).

notched medially; posterior margin distinctly notched. Wings long, sparsely hairy; forewing-length 12.0-12.5, hindwing-length 10.7-11.0 mm; microsculpture consists of papillae on margins and cuticular rods on membrane.

SOLDIER (Fig. 287) : Head-capsule yellowish to brownish yellow; antennae creamish white; labrum pale yellowish brown; body creamish white. Head and body fairly densely hairy. Total body-length 3.2-5.0 mm. Head-capsule oval, a little longer than wide (length to base of mandibles 0.80-1.0, max. width 0.74-0.90 mm); widest at middle of head. Antennae with 14 segments; segment 2 subequal to 3 + 4; 4 shortest. Labrum long, lanceolate, reaching upto about 2/3 of mandibles; tip comparatively wider than in other species. Mandibles thin, delicate and weakly incurved apically (length 0.49-0.55 mm); a little longer than 1/2 of head-length (index mandible-length/head-length 0.55-0.62). Postmentum a little longer than wide and slightly arched; sides weakly convex (length 0.40-0.59,

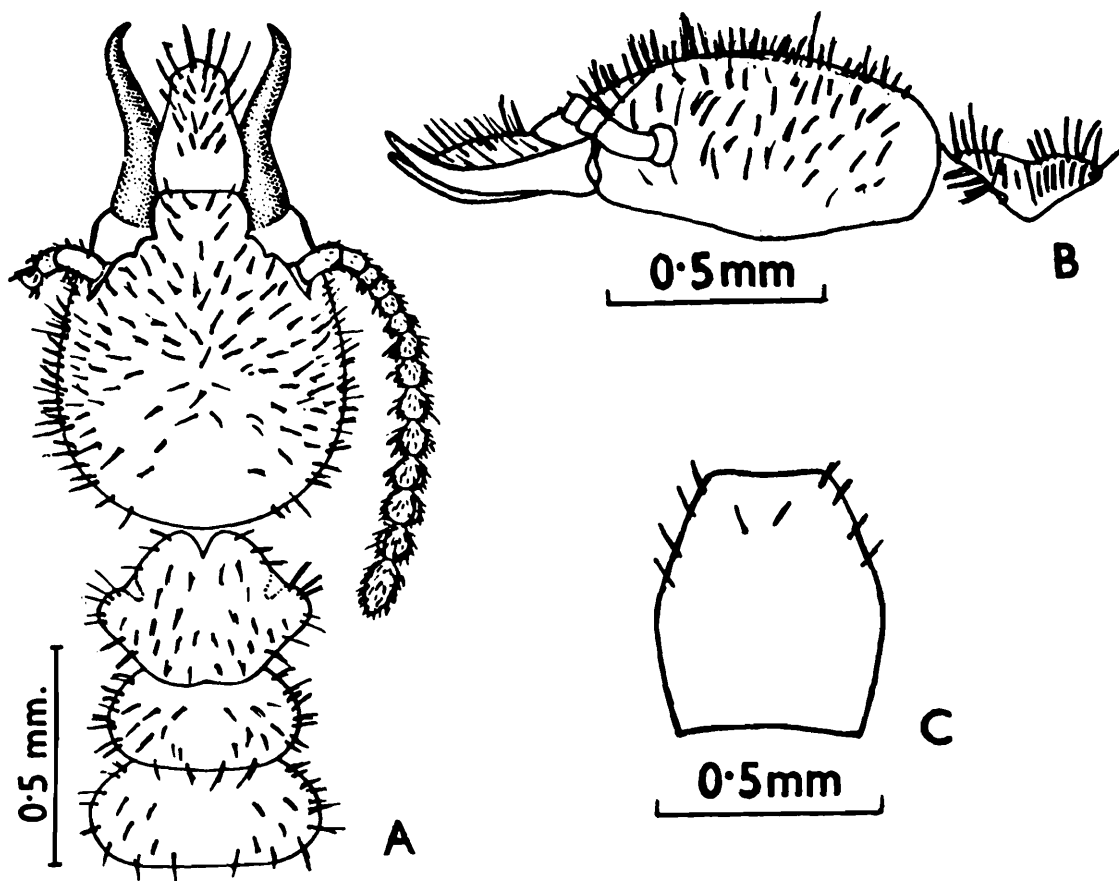


Fig. 287 : *Microtermes obesi*. Soldier. (A) Head and thorax, dorsal view. (B) Head and pronotum, side view. (C) Postmentum.

width 0.35-0.52 mm). Pronotum strongly saddle-shaped (length 0.33-0.50, width 0.50-0.76 mm); anterior margin deeply notched; posterior margin weakly emarginate.

WORKER : Dimorphic. *Worker major* : Head-capsule yellow to brownish yellow; postclypeus a little paler; antennae and body whitish. Head and body fairly densely hairy. Total body-length 3.0-5.0 mm. Head-capsule subsquarish (length to base of mandibles 0.80-0.90, max. width 0.90-1.03 mm. Antennae with 13-14 segments; segment 2 equal to 3 + 4. Postclypeus swollen; length almost half of width. Pronotum saddle-shaped (length 0.25-0.33, width 0.45-0.50 mm). *Worker minor* : As in worker major except for smaller size. Total body-length 3.0-3.5, length of head to base of mandibles 0.60-0.65, max. width of head 0.65-0.73, width of pronotum 0.35-0.43 mm.

Distribution : INDIA : Very widely distributed. PAKISTAN, SRI LANKA, BANGLADESH, BHUTAN, THAILAND, VIETNAM, KAMPUCHEA.

Biology : It is a very common termite species of India, Pakistan and Bangladesh. It lives in small underground communities making thin, narrow galleries and small chambers or in walls of mounds of *Odontotermes* species. The chambers contain fungus combs cultivated by the termite and also serve as nurseries. This termite is also a pest of importance and has been reported damaging wheat seedlings, sugarcane, maize and germinating seeds of some flowering plants and vegetables. Swarming of the species is during the months of April to August in northern India.

277. *Microtermes sindensis* (Desneux)

(Fig. 288)

1. *Termes sindensis* Desneux :

1905. Desneux, *Ann. Soc. Ent. Belg.*, **49**(12) : 354-355. Im only. Holotype : Repository not known. Type-locality : Karachi, Sind, Pakistan.

2. *Microtermes sindensis* (Desneux) :

1964. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (11) : 222, 242-244. Synonymy, description, etc.

1974. Akhtar, *Pakistan J. Zool.*, **6**(1 & 2) : 102.

IMAGO (Fig. 288) : Head dark brown; antennae, pronotum and posterior parts of meso-and metanotum brown; T-shaped marking and shoulder spots on pronotum and postclypeus brownish yellow; abdominal tergites brown. Head and body rather densely pilose. Total body-length with wings 14.0-15.0, without wings 9.0-10.0 mm. Head-capsule round (length to base of mandibles 1.18-1.29, width with eyes 1.38-1.49 mm). Fontanelle indistinct. Eyes round, of medium size and bulging out (max. diameter 0.29-0.34 mm); from lower margin of head placed at $1/2$ of diameter (eye-lower margin of head distance 0.15-0.18 mm). Ocelli small, oval (long diameter 0.13-0.18, short diameter 0.09-0.13 mm); separated from eyes by their long diameter or so (eye-ocellus distance 0.13-0.16 mm). Antennae with 15 segments; segment 3 about half of 2, shortest. Postclypeus strongly swollen; length nearly $1/2$ of width. Pronotum subsemicircular, slightly wider than head with eyes (length 0.92-0.99, max. width 1.40-1.50 mm); anterior margin straight, slightly elevated and weakly notched; posterior margin indistinctly emarginate. Wings hyaline, colourless; forewing-length c 11.0-11.9 mm.

Distribution : PAKISTAN : Sind.

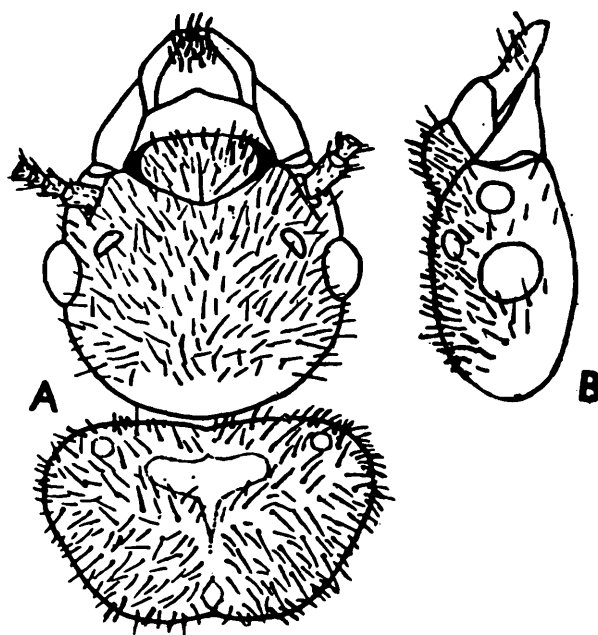


Fig. 288 : *Microtermes sindensis*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (After Ahmad, 1955b).

278. *Microtermes unicolor* Snyder(Synonym : *M. pubescens* Snyder)

(Figs. 289, 290)

1. *Microtermes unicolor* Snyder :

1933. Snyder, *Proc. biol. Soc. Washington*, **46** : 92-93. Im only. Syntypes in BM and USNM.
1964. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (11) : 222, 223, 244-247, 259, 260. Synonymy, description, etc.
1967. Roonwal and Chhotani, *Zool. Anz.*, **178** (3/4) : 259-260, tab.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480, Proj. No. A17-FS-12) : 40-41, figs. 45, 46.
1974. Akhtar, *Pakistan J. Zool.*, **6**(1 & 2) : 102.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 104, 109-112.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480. Proj. No. A7-FS-58) : 45, 65.
1976. Roonwal, *Zool. Jb. Syst.*, **103** : 466, 470-471, 475, 476, 477, 478, 479, 497, 498.
1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 457-458, 462, 469, 474.
1980. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **46**(2) : 156, 158-159, pl. 2(fig. 8).
1985. Verma, *Indian J. Forestry*, **7**(4) : 310, 313.

2. *Microtermes pubescens* Snyder :

1933. Snyder, *Proc. U.S. natn. Mus.*, **82**(Art. 16) : 9-10.

See Chatterjee and Thakur 1964b also for synonymy.

IMAGO (Fig. 289) : Head pale castaneous brown to brown with smoky tinge; antennae, postclypeus, labrum and pronotum yellowish brown; pronotum with yellowish T-marking and shoulder spots; abdomen brownish above and yellowish below. Head and body fairly densely hairy; wings with minute hairs on membrane. Total body-length without wings 8.75-9.70 mm. Head-capsule subcircular (length to base of mandibles 1.0-1.15, width with eyes 1.35-1.48 mm); epicranial suture weakly marked or indistinct. Fontanelle small, circular, whitish spot. Eyes moderately large, circular (max. diameter 0.35-0.43, min. diameter 0.30-0.39 mm); situated very close to lower margin of head. Ocelli large, oval (long diameter 0.16-

0.25, short diameter 0.12-0.17 mm); separated from eyes by one-third their diameter (eye-ocellus distance 0.04-0.06 mm). Antennae with 15 segments; segment 2 slightly longer than 3; the latter shortest or subequal to 5; 4 a little longer than 3 or 5. Postclypeus swollen, strongly arched; length a little more than 1/2 its width. Pronotum trapezoidal (length 0.75-0.85, max. width 1.20-1.38 mm); anterior margin slightly elevated and indistinctly emarginate medially; posterior margin also indistinctly emarginate. Wings long, hairy; membrane covered with small, thin, cuticular rods; forewing-length 13.5 mm.

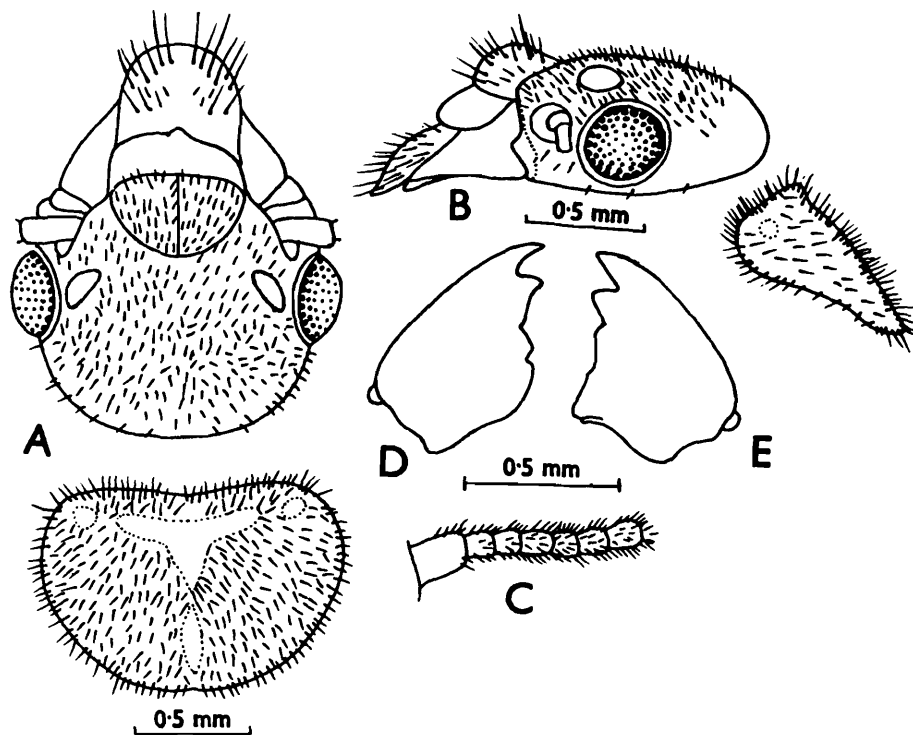


Fig. 289 : *Microtermes unicolor*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Basal part of antenna. (D) and (E). Left and right mandibles, respectively. (Ex Chatterjee and Thakur, 1964b).

SOLDIER (Fig. 290) : Head-capsule yellowish white to brownish yellow; antennae, legs and body paler than head. Head and body fairly densely hairy. Total body length 3.8-4.9 mm. Head-capsule oval, widest posteriorly and converging anteriorly (length to base of mandibles 0.82-0.96, max. width 0.75-0.86 mm). Antennae with 14 segments; segment 2 slightly smaller than 3 + 4, the latter two subequal. Labrum long, lanceolate,

reaching upto $\frac{3}{4}$ of mandibles (length 0.30-0.37, max. width 0.23-0.25 mm), sides convex; tip comparatively broad. Mandibles thin, delicate, weakly incurved apically and without any tooth (length 0.49-0.55 mm); a little longer than $\frac{1}{2}$ head-length (index mandible-length/head-length 0.58-0.61). Postmentum well arched; a little longer than wide (length 0.38-0.45, max. width 0.35-0.43 mm). Pronotum saddle-shaped (length 0.27-0.37, width 0.48-0.58 mm); anterior margin deeply notched, posterior margin weakly incurved.

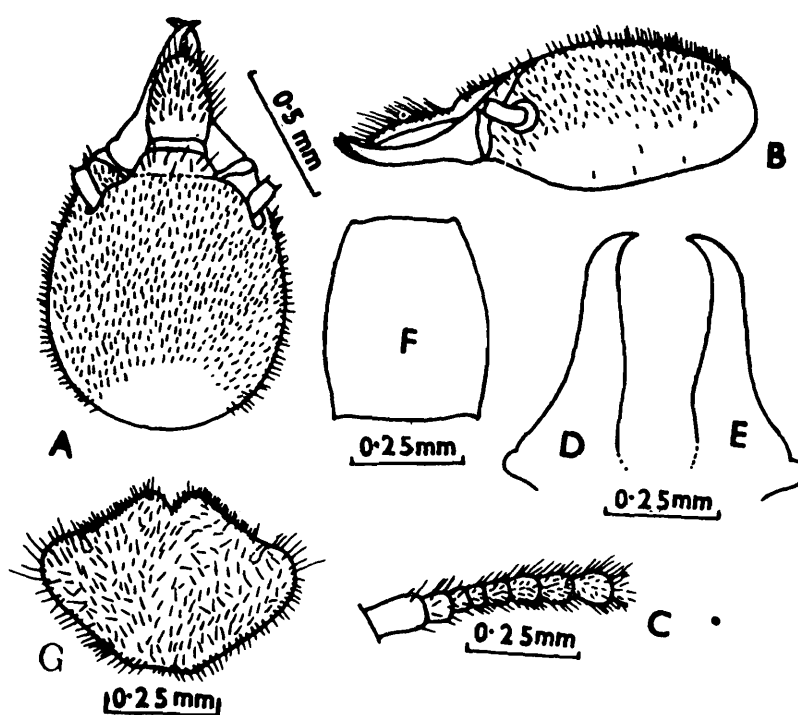


Fig. 290 : *Microtermes unicolor*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal part of antenna. (D) and (E) Left and right mandibles, respectively. (F) Postmentum. (G) Pronotum. (Ex Chatterjee and Thakur, 1964b).

WORKER : Head-capsule pale yellow to straw yellow; body whitish. Head and body moderately hairy. Total body length 3.6-4.5 mm. Head-capsule subsquarish (length to base of mandibles 0.78-0.85, max. width 0.85-0.95 mm). Antennae with 14-15 segments; segment 2 equal to 3 + 4. Postclypeus swollen; length almost half of width. Pronotum saddle-shaped (length 0.20-0.25, width 0.45-0.50 mm); anterior margin distinctly notched, posterior margin substraight.

Distribution : INDIA : Uttar Pradesh, Himachal Pradesh, Panjab, and Jammu and Kashmir states. PAKISTAN, BANGLADESH.

Genus 47 **Ancistrotermes** Silvestri

1. Subgenus *Ancistrotermes* (of *Termes*) Silvestri

1912. Silvestri, *Ann. Mus. Zool. Napoli (N.S.)*, 3(22) : 4.

2. Genus *Ancistrotermes* Silvestri :

1949. Snyder, *Smiths. misc. Colls.*, 112 : 245. Synonymy.

1965. Bouillon and Mathot, *Zooleo*, No. 1 : 33.

1966. Harris, *Bull. Br. Mus. nat. Hist. (Ent.)*, 18 : 3-6.

1972. Coaton and Sheasby, *Cimbebasia*, Mem. No. 2 : 89, 90.

1975. Coaton and Sheasby, *Cimbebasia*, (A) 3(9) : 96, 102.

1980. Akhtar and Hussain, *Sociobiology*, 5 : 261-271.

1986. Chhotani, *Rec. zool. Surv. India*, 83(3 & 4) : 21; 23, 26, 27.

1987. Chhotani, *Beitr. Ent.*, 37 : 412, 417, 418.

Type of genus : *Termes crucifer* Sjöstedt

1. *Characters of Genus Ancistrotermes*

Imago : Small, fairly densely hairy and close to *Microtermes*. Head-capsule subcircular, width with eyes 1.5-1.86 mm. Antennae with 17 segments. Postclypeus swollen, paler than head; with a dark median line; longer than half width. Eyes large, circular, projecting out. Ocelli large, oval; lying close to eyes or touching. Mandibles very much like those in *Microtermes*; each with an apical and two marginal teeth; without any subsidiary tooth on 1st marginal of right mandible. Pronotum semicircular; weakly sinuate at anterior and posterior margins. Wings generally as in *Microtermes*; cubitus and media coming out of scale separately (not united) in forewing and media emanating from radius outside scale.

Soldier : Dimorphic or monomorphic. *Soldier major* : Head sparsely and body fairly densely hairy. Head almost circular. Antennae with 15 segments. Labrum tongue-shaped, converging anteriorly to round or pointed tip (not lanceolate). Mandibles sickle-shaped, very strongly incurved distally; left mandible generally with a minute tooth (absent sometimes); right mandible with or without a tooth. Postmentum strongly arched; sides convex; slightly constricted near hind margin. Pronotum

strongly saddle-shaped. Legs long, slender; foretibia somewhat swollen; apical tibial spurs 3 : 2 : 2; tarsi 4-jointed. Cerci 2-jointed; styli single-jointed. *Soldier minor* : Very much like soldier major but smaller and having 14-15 segmented antennae.

Worker : Dimorphic. *Worker major* : Head yellow, body whitish; densely hairy. Head subsquarish. Antennae with 15-16 segments. Postclypeus paler than head and swollen, length more than 1/2 width. Mandibles as in imago. Pronotum and legs as in soldier. *Worker minor* : Similar to worker major but smaller in size. Antennae 14-segmented in *pakistanicus*, number not known in other species.

2. *Distribution and Composition of Ancistrotermes*

(Fig. 190)

Distribution : The genus *Ancistrotermes* is mainly Ethiopian. It is also known from the Oriental zoogeographical region and is quite widely distributed. It is reported from Thailand, Malaysia, Singapore, Java, Sumatra and southern China (Kwangsi, Yunnan) and in the Indian subcontinent it is restricted to north-eastern part including Bangladesh and Burma.

Composition : Chhotani 1987 has recognised 12 species, 8 from the Ethiopian and 4 from the Oriental zoogeographical regions; of the Oriental species only *A. pakistanicus* (Ahmad) occurs in the Indian Region which is taken up here.

279. *Ancistrotermes pakistanicus* (Ahmad)

(Synonyms : *Termes pallidus* Haviland and *Microtermes umsae* Roonwal and Chhotani)

(Figs. 291, 292)

1. *Microtermes pakistanicus* Ahmad :

1955. Ahmad, *Biologia*, Lahore, **1** : 25-27. Holotype : S, in PU. Type-locality : Mainimukh, Chittangong Hills, Bangladesh.

1958. Ahmad, *Biologia*, Lahore, **4** : 124-125.

1964. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (11) : 222, 239-242.

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 26-27. See for synonymy; treats *T. pallidus* and *M. umsaе* as its synonyms.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 57, 58-59.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 101, 105-109.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 35.
1979. Sen-Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 6, 29-30.

2. *Termes pallidus* Haviland :

1898. Haviland, *J. Linn. Soc. Lond.*, **26** : 389.

3. *Microtermes umsaе* Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 297, 370-374, 396, pls. 35, 36.
1964. Chatterjee and Thakur, *Indian For. Rec. (N.S.) Ent.*, **10** (11) : 222-224.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 35.
1977. Lahiri, et al., *Meghalaya Sci. Soc.*, **2** : 37.

4. *Ancistrotermes pakistanicus* (Ahmad) :

1980. Akhtar and Hussain, *Sociobiology*, **5** : 261-271.
1985. Chhotani and Bose, *Rec. zool. Surv. India*, **82**(1-4) : 59.

See Krishna (1965) and Ahmad (1965) also for synonymy.

IMAGO (Fig. 291) : Head pale brown to brown, slightly paler anteriorly; postclypeus yellowish; antennae yellowish brown; pronotum much paler than head, with yellow T-shaped mark and shoulder spots. Head and body densely hairy with short and long hairs. Total body-length with wings c 18.5, without wings 9.0-10.0 mm. Head-capsule subcircular (length to base of mandibles 1.26-1.31, width with eyes 1.53-1.78 mm). Fontanelle minute, faintly marked. Eyes large, bulging out (max. diameter 0.51-0.59, min. diameter 0.45-0.51 mm). Ocelli broadly oval (long diameter 0.25-0.28, short diameter 0.19-0.21 mm); from eyes separated by 1/3 short diameter (eye-ocellus distance 0.06-0.07 mm). Antennae with 17-18 segments. Postclypeus swollen, slightly longer than 1/2 width. Pronotum subsemicircular; narrower to as wide as head (length 0.90-1.03, width 1.44-1.68 mm); anterior margin slightly raised medially and with a weak notch; posterior margin convex with a weak depression or substraight.

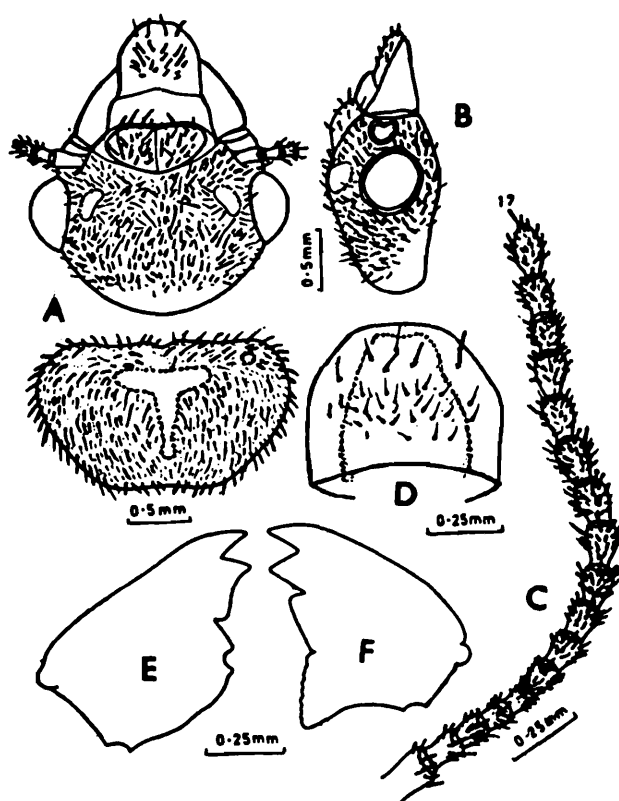


Fig. 291 : *Ancistrotermes pakistanicus*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Antenna. (D) Labrum. (E) and (F) Left and right mandibles. (After Akhtar, 1975).

SOLDIER (Fig. 292) : Head-capsule pale yellow to yellowish brown; antennae, pronotum and body whitish; mandibles brownish, pale brown basally. Head sparsely and body moderately densely hairy. Total body-length 3.75-4.50 mm. Head-capsule subcircular, almost as wide as long (length to base of mandibles 0.80-1.03, max. width 0.79-1.00 mm). Antennae with 15 segments, segment 3 shortest. Labrum subtriangular, tongue-shaped; tip pointed (length 0.23-0.29, max. width 0.23-0.28 mm). Mandibles thin, sickle-shaped, strongly incurved from middle onwards; a little longer than $\frac{1}{2}$ head-length (length 0.55-0.65 mm, index mandible-length/head-length 0.60-0.61). Left mandible with a minute tooth above middle of mandible, sometimes absent. Right with a similar denticle a little below level of tooth in left mandible. Postmentum strongly arched, subhexagonal (length 0.47-0.60, max. width 0.41-0.52 mm). Pronotum saddle-shaped (length 0.37-0.49, max. width 0.55-0.76 mm); anterior margin with weak median notch, posterior margin substraight or slightly incurved.

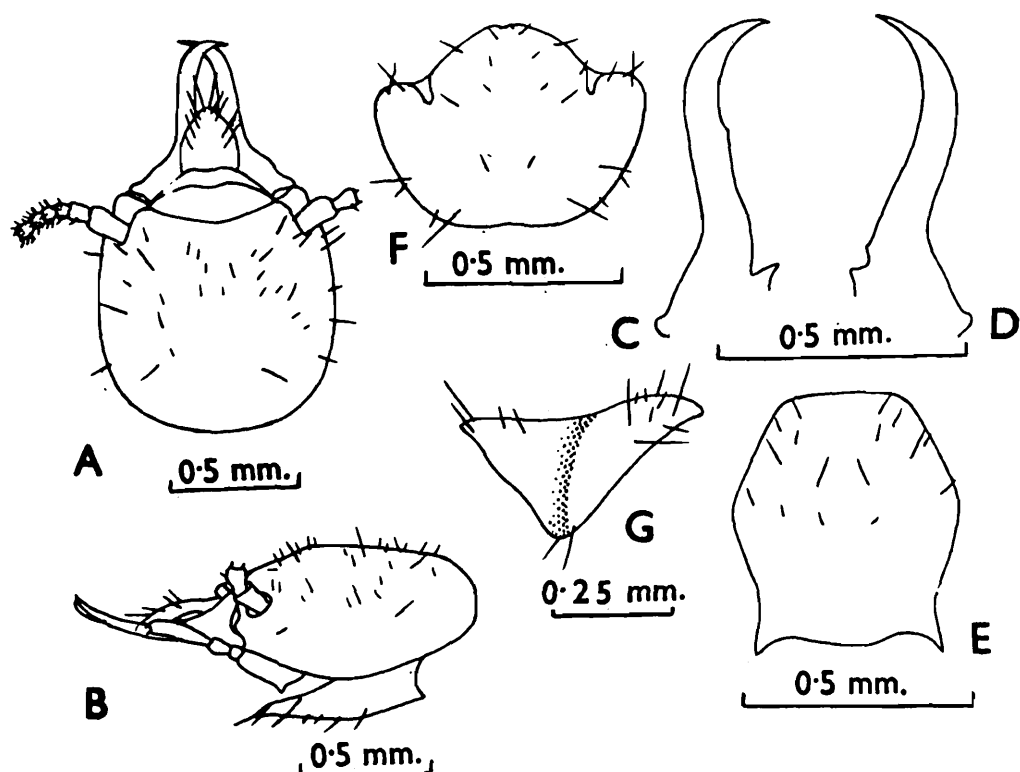


Fig. 292 : *Ancistrotermes pakistanicus*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles, respectively. (E) Postmentum. (F) Pronotum, dorsal view. (G) Same, side view.

WORKER : Dimorphic. *Worker major* : Head-capsule, postclypeus and labrum yellow; antennae, thorax and body pale yellow. Head and body moderately densely hairy. Total body-length 4.0-5.0 mm. Head-capsule subsquarish (length to base of mandibles 1.13-1.23, max. width 1.17-1.27 mm). Antennae with 15 segments; segments 3-5 short and broad, 3 shortest. Postclypeus swollen, hairy; length 1/2 width. Pronotum strongly saddle-shaped, anterior lobe greatly upturned and with a prominent median notch; posterior margin weakly emarginate medially. Mesonotum narrower and metanotum broader than pronotum; both substraight at posterior margin. *Worker minor* : Smaller than worker major; has 14-segmented antennae and more strongly notched anterior margin of pronotum. Total body-length 3.0-3.6, length of head to base of mandibles 0.93-1.0, max. width of head 0.85-0.98, length of pronotum 0.25 and max. width of pronotum 0.50-0.52 mm.

Distribution : INDIA : Assam, Meghalaya, Tripura, Arunachal Pradesh, Nagaland and Mizoram states in North-eastern India. BANGLADESH, BURMA, MALAYSIA and INDONESIA.

Subfamily (iv) NASUTITERMITINAE

1. Subfamily Nasutitermitinae Hare :

1937. Hare, *Ann. ent. Soc. Am.*, **30**(3) : 462, 464, 475.
1949. Snyder, *Smiths. misc. Coll.*, **112** : 255. Synonymy and genera included.
1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95**(Art. 2) : 58-64.
1955. Emerson, *Fieldiana : Zool.*, **37** : 480-481, 486-487, 495-497, 505, 506, 514-515, 516, 517.
1957. Sands, *Insectes Soc.*, **4** : 13-24.
1965. Sands, *Bull. Br. Mus. (nat. Hist.) Ent.*, Suppl. 4 : 1-172.
1965. Bouillon and Mathot, *Zooleo*, No. 1 : 7, 13, 33-34, 49-51, 54.
1966. Bouillon and Mathot, *Zooleo*, No. 1, Suppl. 1 : 2-4, 9-13, 14.
1967. Sands., *Actes V Congr. U.I.E.I.S* (Toulouse, 1965) : 159-171.
1968. Sen-Sarma, *Orient. Insects*, **2**(1) : 1-23.
1966. Weidner, *Deutsch. Ent. Zeitsch.*, **13** (4-5) : 334, 335-336, 339, 346-348.
1970. Weidner, *Handb. d. Zool.*, **4**(Arthropoda) Sec. 2 (Insecta), Pt. 2 (Special), Lief. 13, No. 14 : 11, 12, 25-28.
1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 146-150.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol 2 : 374.
1971. Bouillon and Mathot, *Zooleo*, No. 1, Suppl. 2 : 6, 15-16.
1973. Chhotani and Bose, *Zool. Anz.* **190** (3/4) : 235-236.
1981. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **47**(3) : 341-369. Wing microsculpture.
1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 79-108.
1987. Chhotani, *Beitr. Ent.*, **37** : 413-416, 417, 418, 419.
1989. Roonwal and Chhotani, *Fauna of India-Isoptera (Termites)* Vol. 1 : 11, 17, 25, 38, 83, 86, 109, 110, 114, 118, 120, 121, 601.

Type genus : *Nasutitermes* Dudley.

1. *Characters of Subfamily Nasutitermitinae*

The Nasutitermitinae is the most highly evolved subfamily of the family Termitidae. Its soldier is characterised by the presence of nasute or rostrum with the gland opening at its tip through which it squirts out sticky fluid for defence.

Imago : Medium sized, fairly hairy. Head generally subcircular. Fontanelle plate variously shaped, generally slit-like or oval. Antennae with 13-21 segments. Labrum broader than long, without transverse sclerotised band. Mandibles with apical tooth slightly shorter to distinctly longer than 1st marginal; with or without notch or cut between 1st and 2nd marginals of left mandible and posterior margin of 2nd marginal of right mandible straight or incurved. Legs generally with 2 : 2 : 2 apical tibial spurs except in the primitive genus *Syntermes* where they are 3 : 2 : 2. Styli absent.

Soldier : Monomorphic or dimorphic. Head-capsule modified to form a nasute which got progressively evolved correlated with degeneration of mandibles. Antennae with 11-21 segments. Mandibles fully developed or vestigial (with or without spine-like process). Pronotum saddle-shaped. Legs generally with 2 : 2 : 2 apical tibial spurs, 3 : 2 : 2 in primitive genus *Syntermes*. Styli absent.

Worker : Monomorphic or dimorphic. Head-capsule subsquarish or subcircular. Fontanelle plate generally prominent. Antennae with 13-20 segments. Postclypeus swollen. Mandibles as in imago. Pronotum and legs as in soldier.

2. *Distribution and Composition of Nasutitermitinae*

(Figs. 293, 294)

Distribution : The subfamily Nasutitermitinae is cosmopolitan in distribution. It originated in the Neotropical Region and later got spread to all over the world (Emerson, 1955). It is postulated that the subfamily is closely related to Macrotermitinae (Emerson, 1945; Ahmad, 1950 and Sen-Sarma, 1968) and evolved in two phyletic lines independently (Emerson, 1949; Ahmad 1950; Sands, 1965; Sen-Sarma, 1968), i.e. *Procornitermes-Nasutitermes* Line (imago-worker left mandible with straight or concave posterior margin of 1st marginal) and *Paracornitermes-Subulitermes* Line (imago-worker left mandible with sinuate posterior

margin of 1st marginal and notch or cut between 1st and 2nd marginals). Genera belonging to both these phyletic lines are known from the Oriental Region. Emerson (1955) has discussed the distribution, zoogeography and evolution of the world genera and Chhotani (1987) has discussed the distribution and zoogeography of the Oriental genera.

Composition : According to Chhotani (1987), 23 genera with 201 species are known from the Oriental zoogeographical region. Of these, 12 genera (including 58 species) are known from the Indian subregion, as follows, and of which 5 are endemic to the subregion.

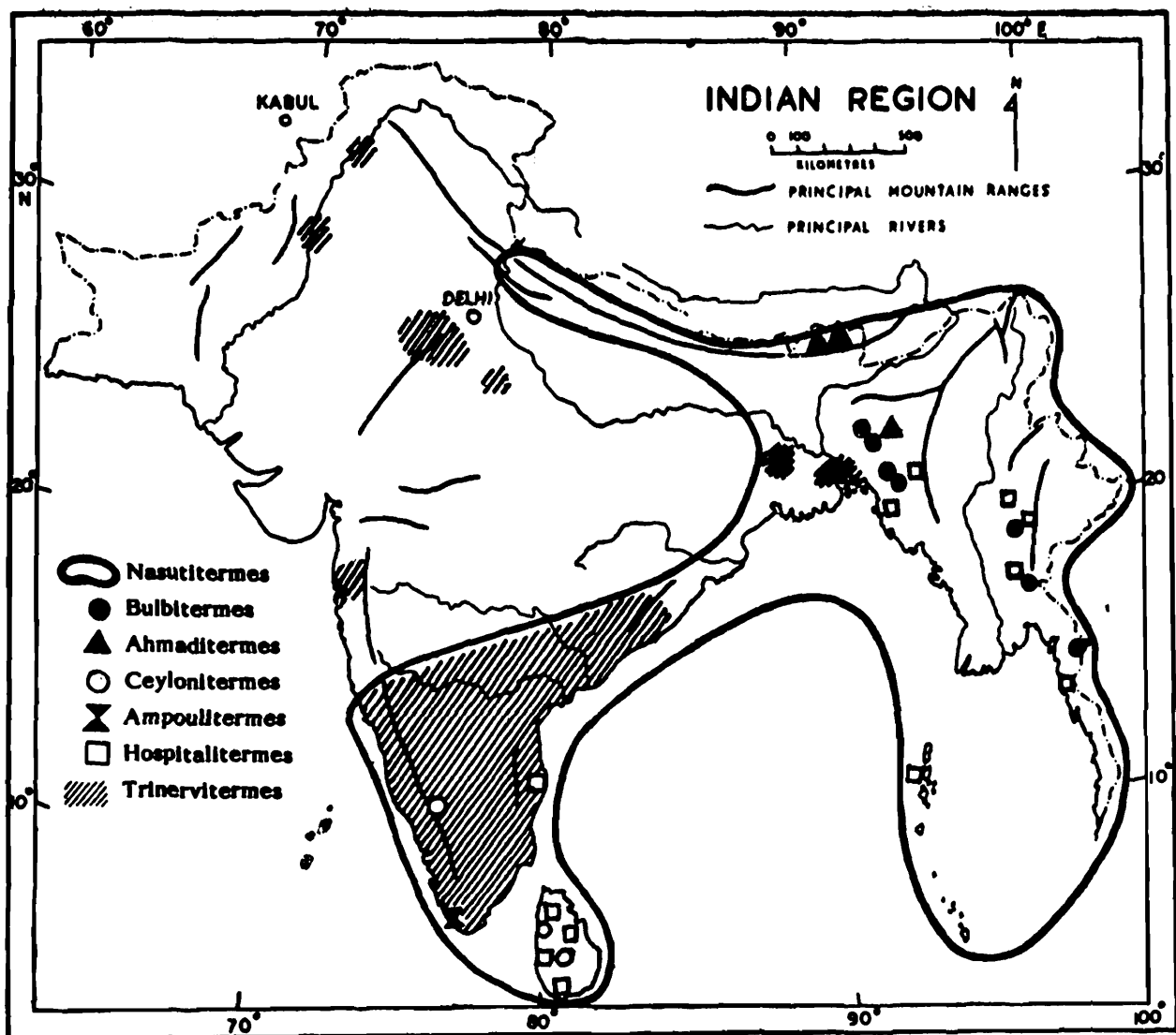


Fig. 293 : Map of Indian Region showing distribution of Nasutitermitinae genera *Nasutitermes*, *Bulbitermes*, *Ahaditermes*, *Ceylonitermes*, *Ampoulitermes*, *Hospitalitermes* and *Trinervitermes*.

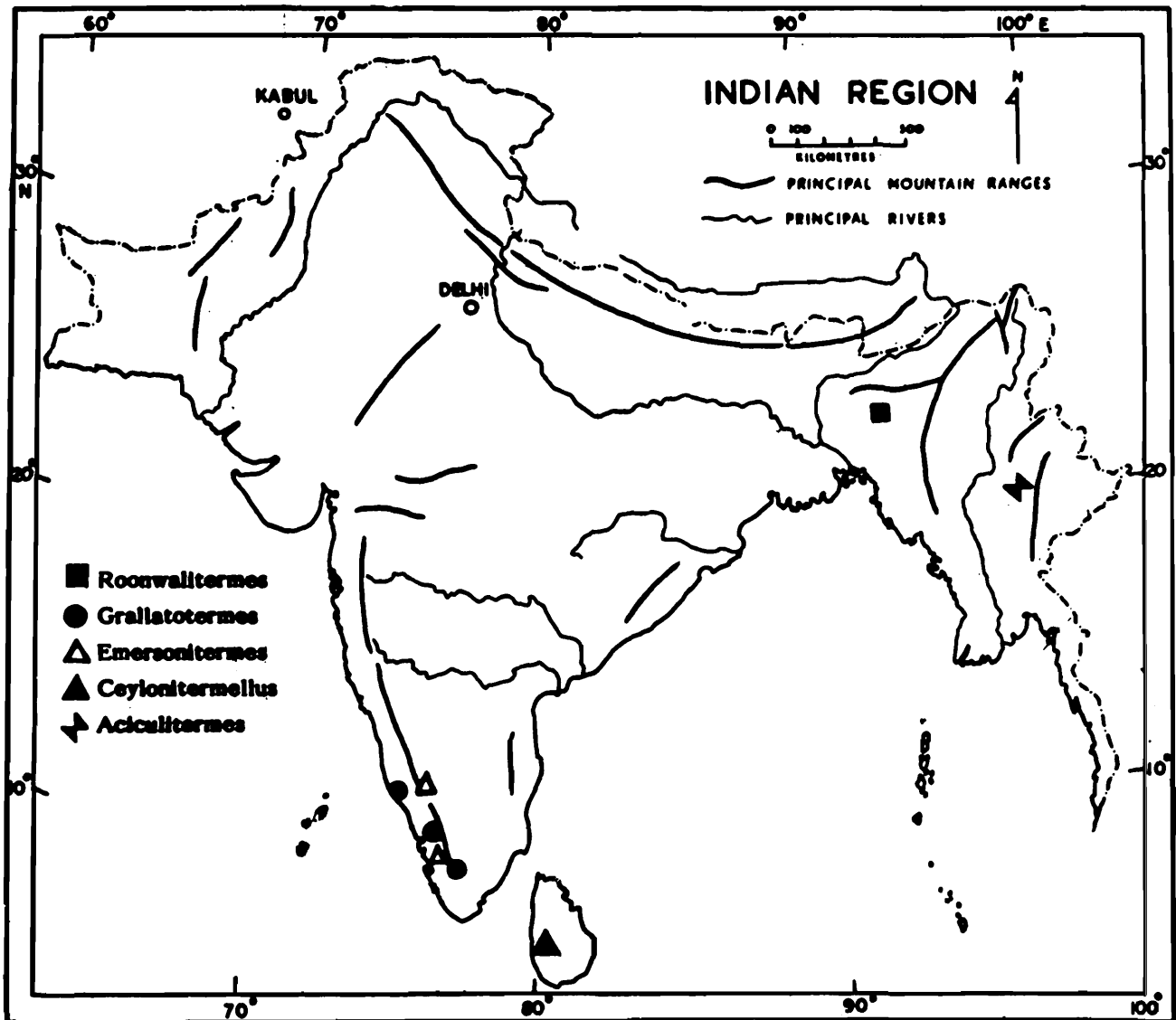


Fig. 294 : Map of Indian Region showing distribution of Nasutitermitinae genera *Roonwalitermes*, *Grallatotermes*, *Emersonitermes*, *Ceylonitermellus* and *Aciculitermes*.

1. *Nasutitermes* Dudley—Cosmotropical
2. *Bulbitermes* Emerson—Oriental
3. *Ahmaditermes* Akhtar—Oriental
4. *Ceylonitermes* Holmgren—Oriental (Indian)
5. *Ampoulitermes* Mathur and Thapa—Oriental (Indian)
6. *Hospitalitermes* Holmgren—Oriental, Papuan
7. *Trinervitermes* Holmgren—Ethiopian, Oriental
8. *Roonwalitermes* Bose—Oriental (Indian)

9. *Grallatotermes* Holmgren—Oriental, Papuan, Ethiopian
10. *Emersonitermes* Mathur and Sen-Sarma—Oriental (Indian)
11. *Ceylonitermellus* Emerson—Oriental (Indian)
12. *Aciculitermes* Emerson—Oriental

3. Keys to Indian Genera of Nasutitermitinae

IMAGOES

Of the 12 genera of the subfamily, the imago caste of *Ceylonitermes*, *Ampoulitermes*, *Roonwalitermes*, *Emersonitermes* and *Aciculitermes* is not known and the imago of *Ahmaditermes* is known by an immature specimen. The remaining 6 are keyed as follows :-

- 1(8) Posterior margin of 1st marginal of left mandible straight or evenly concave, without notch
- 2(3) Apical tooth of mandibles much shorter than 1st marginal; apical of right very much shorter and that of left generally shorter. Postclypeus nearly half as long as its width.....*Hospitalitermes*
- 3(2) Apical tooth of mandibles slightly shorter to almost as long as 1st marginal and well developed. Postclypeus shorter than half as long as wide
- 4(5) Postclypeus slightly shorter than half its width and strongly swollen (arched). Left mandible with apical tooth subequal to 1st marginal and both closely placed. Fontanelle triangular or Y-shaped.....*Trinervitermes*
- 5(4) Postclypeus much shorter than half its width and less so swollen. Left mandible with apical tooth slightly shorter than 1st marginal. Fontanelle large and oval or narrow and elongate.
- 6(7) Fontanelle plate large, oval and prominent. Postclypeus slightly paler than head.....*Bulbitermes*
- 7(6) Fontanelle plate elongate and narrow. Postclypeus much paler than head.....*Nasutitermes*
- 8(1) Posterior margin of 1st marginal tooth of left mandible sinuate or with a distinct notch before 2nd marginal
- 9(10) Postclypeus nearly 2.5 times as wide as long. Fontanelle oval.....*Ceylonitermellus*

- 10(9) Postclypeus nearly 4 times as wide as long. Fontanelle plate slit-like and narrow or indistinct.....*Grallatotermes*

SOLDIERS

- 1(4) Soldier dimorphic
- 2(3) Soldier major : Mandibles without any spine-like process. Rostrum much shorter than head and antennal segments longer.....
.....*Trinervitermes*
- 3(2) Soldier major : Mandibles with a small, spine-like process. Rostrum slightly shorter than head and antennal segments shorter.....
.....*Roonwalitermes*
- 4(1) Soldier monomorphic, rarely of two sizes
- 5(14) Head constricted behind antennae
- 6(7) Mandibles without any spine-like process.....
.....*Ahmaditermes*
- 7(6) Mandibles with spine-like process
- 8(11) Antennae with 12 segments
- 9(10) Head in profile incurved behind rostrum. Segment 3 of antennae much longer (nearly 1.5 times) than 2.....*Ceylonitermes*
- 10(9) Head in profile almost straight and with a weak hump. Segment 3 of antennae only slightly longer than 2.....*Ampoulitermes*
- 11(8) Antennae generally with more than 12 segments
- 12(13) Head strongly produced behind and strongly incurved in profile. Mandibles with very long spine-like process. Antennae and legs very long; hindlegs extending beyond abdomen.....
.....*Hospitalitermes*
- 13(12) Head not strongly produced behind and less so incurved in profile. Mandibles with short spine-like process. Antennae and legs shorter; hindlegs not extending beyond abdomen.....*Bulbitermes*
- 14(5) Head not constricted behind antennae
- 16(17) Head greatly produced behind and strongly depressed at base of rostrum in profile. Rostrum short, thick and conical. Mandibles with well developed, long, spine-like process.....*Grallatotermes*

- 17(16) Head not greatly produced behind and weakly or not depressed at base of rostrum in profile. Rostrum long, cylindrical or conical. Mandibles without or with a small, spine-like process
- 18(23) Head pyriform. Rostrum long, narrow, cylindrical. Mandibles without spine-like process. Posterior margin of left 1st marginal tooth of worker mandibles with a distinct notch before 2nd marginal
- 19(20) Antennae with 14 segments. Rostrum long, a little shorter than head-length without rostrum.....*Emersonitermes*
- 20(19) Antennae with 12 segments. Rostrum shorter
- 21(22) Head with many short and few long hairs. Segment 3 of antennae shorter than 2. Angle between apical and 1st marginal tooth of worker mandibles narrower.....*Aciculitermes*
- 22(21) Head nearly without hairs or thinly hairy. Segment 3 of antennae longer than 2. Angle between apical and 1st marginal tooth of worker mandibles wider.....*Ceylonitermellus*
- 23(18) Head pyriform or round. Rostrum long, narrow, cylindrical to conical. Mandibles with short or without spine-like process. Posterior margin of left 1st marginal of worker mandibles incurved and without a notch before 2nd marginal.....*Nasutitermes*

Genus 48. *Nasutitermes* Dudley

(Synonyms : *Fletcheritermes* Sen-Sarma and *Alstonitermes* Thakur)

1890. Dudley, in Dudley and Beaumont, *Trans. N.Y. Acad. Sci.*, **9** : 158.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 265. Synonymy.

1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** : 58, 61.

1955. Emerson, *Fieldiana : Zool.*, **37** : 468, 472, 478, 481, 486, 496, 574.

1958. Ahmad, *Biologia*, Lahore, **4**(1-2) : 85, 89.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 7, 9, 76.

1965. Sands, *Bull. Br. Mus. (nat. Hist.) Ent.* Suppl. No. 4 : 13-15, 20.

1966. Bouillon and Mathot, *Zooleo*, No. 1 (Suppl. 1) : 3, Table.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 147, 148, 149.

1971. Bouillon and Mathot, *Zooleo*, No. 1 (Suppl. 2) : 15, Table.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 56.

1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 59, 60, 331.
1977. Mathews, *Studies Termites Mato Grasso State, Brazil* : 159. Description.
1977. Araujo, *Cat. Isoptera Novo Mundo* : 40.
1977. Roonwal and Chhotani, *Ent. Basil*, **2** : 44, 76.
1982. Thapa, *Sabah. For. Rec.*, No. 12 : 7, 8, 293.
1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 199.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 26, 121.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 103, 206-207.
1987. Chhotani, *Beitr. Ent.*, **37** : 413, 414, 418, 419.
1987. Bose and Das, In : *Fauna of Orissa*, Pt. 1 : 108.

2. Genus *Nasutitermes* Banks :

1919. Banks, *Bull. Mus. Comp. Zool. Harv.*, **62**(10) : 479.
1959. Prashad and Sen-Sarma, *Rev. Termite Gen. Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 2-5. Description, distribution, key Indian species, etc.
1968. Sen-Sarma, *Orient. Insects*, **2** : 6, 11, 12, 19, 23, 34.
1970. Roonwal and Bose, *Rec. zool. Surv. India*, **62**(3 & 4) : 120, 157.
1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 81, 82, 91, 96-97. Description.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 9, 16, 45.
1981. Roonwal, Chhotani and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **47**(3) : 351-356. Wing microsculpture.

3. Subgenus *Eutermes* (of *Termes*) Heer (Part) :

1904. Desneux, *Gen. Insect.*, Fasc. 25 : 39.

4. Genus *Eutermes* Heer.(Part) :

1942. Hill, *Termites (Isoptera) Australian Region* : 202-205. Synonymy, characters.
1953. Rattan Lal and Menon, *Cat. Indian Insects, Part 27-Isoptera* : 36, 52-54. Synonymy, characters.

5. Genus *Fletcheritermes* Sen-Sarma :

1965. Sen-Sarma, *Proc. zool. Soc.*, Calcutta, **18**(2) : 143-144.
1969. Ahmad, *Pakistan J. Zool.*, **1**(2) : 181-182.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 149.

6. Genus *Alstonitermes* Thakur (New synonymy) :

1975. Thakur, In : Sen-Sarma et al. *Wood Destroying Termites of India* (Final Tech Rep. PL 480 Proj. No. A7-FS-58) : 9.

1976. Thakur, *J. Bombay nat. Hist. Soc.*, **72**(3) : 781-782.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 12.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 99, 103, 229.

1983. Sen-Sarma and Verma, *Oriental Insects*, **17** : 91, 102.

Type of genus : *Eutermes sanchezi* Holmgren

1. *Characters of Genus Nasutitermes*

Imago : Pale brown to blackish brown, fairly hairy species. Head-capsule subcircular, sides somewhat straighter without eyes; epicranial suture sometimes distinct. Fontanelle plate elongate, narrow or somewhat Y-shaped. Eyes large, subcircular. Ocelli oval to subrounded; very slightly (almost touching) to fairly well separated from eyes. Postclypeus weakly swollen; length generally nearly $\frac{1}{3}$ of its width, sometimes a little more but always less than $\frac{1}{2}$ width. Mandibles each with an apical and two marginal teeth; apical slightly shorter to almost as long as 1st marginal. Left mandible : 1st marginal with a long, weakly incurved posterior margin; 2nd marginal short, triangular and not separated by any cut; basal projection short, blunt. Right mandible : 1st marginal triangular, having a slightly longer posterior margin; 2nd marginal small with a long, straight posterior margin; molar plate longer than posterior margin of 2nd marginal. Pronotum subtrapezoidal, anterior margin sometimes raised medially. Legs short, pilose; apical tibial spurs 2 : 2 : 2; tarsi 4-jointed. Wings transparent, pale brown to grayish brown; membrane with short hairs; wing microsculpture consists of papillae on margins and both asteroid and nonasteroid micrasters on membrane; costa and radius thick, running parallel to each other on anterior margin; media thin, running medially and with 2-3 branches distally, arising independently in forewing and from radius in hindwing; cubitus with 10-13 branches to posterior margin. Abdomen elongate, hairy; cerci 2 jointed; styli absent.

Soldier : Generally monomorphic, only sometimes dimorphic. Pale yellow to almost blackish species. Head without rostrum pyriform to

rounded, with or without minute hairs and a few long hairs. Rostrum cylindrical to conical. Antennae with 12-14 segments. Mandibles vestigial; with or without spine-like process, when present not dentate. Pronotum small, saddle-shaped. Legs short, pilose; apical tibial spurs 2 : 2 : 2; tarsi 4-jointed. Abdomen elongate; tergites and sternites hairy or without hairs; cerci 2-jointed; styli absent.

Worker Generally monomorphic sometimes dimorphic. Pale to brownish species. Head subsquarish to broad and oval; epicranial suture sometimes distinct. Fontanelle plate elongate, narrow, translucent. Antennae with 13-15 segments. Postclypeus weakly swollen, length less than 1/2 width. Mandibles as in imago. Pronotum and legs as in soldier. Abdomen elongate, hairy; cerci 2-jointed; styli absent.

2. *Distribution and Composition of Nasutitermes*

(Fig. 293)

Distribution : *Nasutitermes* is a cosmopolitan genus and is known from all the zoogeographical regions except the Palaearctic. From the Nearctic, however, it is reported by a single species which is common with that from the Neotropical Region. In the Oriental Region, it is very widely distributed all over and from the Indian subregion it is reported from India (except north-western parts), Bhutan, Bangladesh, Sri Lanka and Burma. It is not so far reported from Nepal but is likely to be found in lower altitudes.

The species *N. matangensis matangensis* and *N. matangensisformis* are widely distributed in South-eastern Asia and *N. indicola* is fairly well distributed in western ghats area of India; otherwise most of the species are endemic to particular parts of the region.

Composition : According to Chhotani 1987, as many as 89 species are known from the Oriental Region. Of these 30 species listed below are known from the Indian Region and are taken into account here.

1. *Nasutitermes anamalaiensis* Snyder—India
2. *N. anoniensis* Akhtar—Bangladesh
3. *N. brunneus* Snyder—India
4. *N. ceylonicus* (Holmgren)—Sri Lanka

5. *N. cherraensis* Roonwal and Chhotani—India
6. *N. chhotanii* Bose—India
7. *N. crassicornis* (Holmgren and Holmgren)—India
8. *N. dunensis* Chatterjee and Thakur—India
9. *N. emersoni* Snyder—India, Bangladesh
10. *N. fabricii* Krishna—India (Little Nicobar)
11. *N. fletcheri* (Holmgren and Holmgren)—India
12. *N. gardneri* Snyder—India, Bhutan
13. *N. garoensis* Roonwal and Chhotani—India, Bhutan
14. *N. horni* (Wasmann)—Sri Lanka
15. *N. indicola* (Holmgren and Holmgren)—India
16. *N. jalpaigurensis* Prashad and Sen-Sarma—India, Bangladesh
17. *N. kali* Roonwal and Chhotani—India
18. *N. krishna* Roonwal and Bose—India (Andamans)
19. *N. lacustris* (Bugnion)—Sri Lanka
20. *N. matangensiformis* (Holmgren)—India, Bangladesh, Thailand, Malaysia, Indonesia
21. *N. matangensis matangensis* (Haviland)—Burma, Thailand, Malaysia, Indonesia, Vietnam
22. *N. moratus* (Silvestri)—India
23. *N. oculatus* (Holmgren)—Sri Lanka
24. *N. profuscipennis* Akhtar—Bangladesh
25. *N. roboratus* (Silvestri)—Burma
26. *N. sukzensis* Prashad and Sen Sarma—India
27. *N. tandoni* Bose—India
28. *N. thanensis* Prashad and Sen-Sarma—India
29. *N. triloki* Bose—India (Andamans)

30. *N. vishnu* Bose—India3. *Keys to Indian Species of Nasutitermes*

IMAGOES

- 1(12) Generally smaller species : Head-width generally less than 1.30 and pronotum-width generally less than 1.00 mm
- 2(5) Ocelli situated very close to eyes, very slightly separated
- 3(4) Epicranial suture faintly marked. Segment 3 of antenna shortest. Pronotum deeply notched at posterior margin and pronotum-length 0.53-0.57 mm.....*emersoni*
- 4(3) Epicranial suture well marked. Segment 3 of antenna subequal to or slightly shorter than 2. Pronotum weakly notched at posterior margin and pronotum-length 0.60-0.68 mm.....*garoensis*
- 5(2) Ocelli situated farther from eyes, separated by half of their short diameter to nearly short diameter
- 6(7) Pronotum comparative to width longer (length 0.60-0.68, width 0.88-0.98 mm). Ocelli separated from eyes by 1/2 of short diameter.....*chhotanii*
- 7(6) Pronotum comparative to width shorter (length 0.40-0.57, width 0.79-1.00 mm). Ocelli separated from eyes by about their short diameter or slightly less
- 8(9) Pronotum faintly notched at anterior and posterior margins. Fontanelle plate bluntly Y-shaped. Segment 3 of antenna longer than 2.....*fletcheri*
- 9(8) Pronotum distinctly notched at anterior margin and deeply at posterior margin. Fontanelle plate long and narrow. Segment 3 of antenna shorter or equal to 2
- 10(11) Pronotum pale brown and weakly notched at anterior margin. Antennae with 14-15 segments; segment 3 equal to 2 and 4 shortest in 14 segmented condition and segment 3 half of 2 and shortest in 15 segmented condition.....*ceylonicus*

- 11(10) Pronotum deep straw coloured and deeply notched both at anterior and posterior margins. Antennae with 15 segments; segment 3 equal to 2 and 4; 5 shortest*brunneus*
- 12(1) Generally larger species : Head-width generally more than 1.30 and pronotum-width generally more than 1.00 mm
- 13(14) Ocelli separated from eyes by their long diameter.....*oculatus*
- 14(13) Ocelli separated from eyes by less than their long diameter
- 15(16) Ocelli separated from eyes by little less their short diameter. [Head-width 1.50-1.60, pronotum-width 1.35-1.43, pronotum-length 0.83-0.84, forewing-length 15.50-15-70 mm].....*gardneri*
- 16(15) Ocelli separated from eyes by less than 1/2 of their short diameter or lying very close to eyes
- 17(18) Ocelli separated from eyes by 1/3 of their short diameter. Wings shorter, forewing-length 12.25-12.60 mm.....*dunensis*
- 18(17) Ocelli almost touching the eyes or very slightly separated. Wings longer 14.0-15.80 mm
- 19(20) Larger species : Total body-length 16.50-17.00, head-width with eyes 1.70-1.79, pronotum-width 1.30-1.40, pronotum-length 0.80-0.84 mm*matangensis matangensis*
- 20(19) Smaller species : Total body-length 13.2-14.4, head-width with eyes 1.30-1.58, pronotum-width 1.10-1.32, pronotum-length 0.60-0.75 mm
- 21(22) Darker species (head blackish brown). Pronotum deeply notched at posterior margin.....*lacustris*
- 22(21) Paler species (head castaneous brown). Pronotum weakly notched at posterior margin or not notched
- 23(24) Larger (head-width 1.40-1.58 mm). Eyes larger (max. diameter 0.50-0.62 mm). Fontanelle plate, narrow.....
.....*matangensisformis*
- 24(23) Smaller (head-width 1.30-1.47 mm). Eyes smaller (max. diameter 0.43-0.50 mm). Fontanelle plate elongate, Y-shaped.....
.....*indicola*

SOLDIERS

- 1(18) Head-capsule without rostrum almost circular
- 2(7) Mandibles without any spine-like process or with a very minute sometimes imperceptible process
- 3(4) Larger species : Head-length with rostrum 1.75-1.98, head-length without rostrum 1.10-1.20, head-width 1.20-1.38 mm. Mandibles without or with very minute process.....*anamalaiensis*
- 4(3) Smaller species : Head-length with rostrum 1.55-1.70, head-length without rostrum 0.89-1.30, head-width 0.95-1.05 mm
- 5(6) Head in profile depressed behind rostrum; without rostral hump. Rostrum longer in comparison to head-length without rostrum and narrow at base; head-length without rostrum 0.90-1.30 and rostrum-length 0.60-0.75, index rostrum-length/head-length 0.709-0.806.....*chhotanii*
- 6(5) Head in profile straight behind rostrum; without rostral hump. Rostrum shorter and wider at base; head-length without rostrum 0.89-0.95 and rostrum-length 0.62-0.68 mm, index rostrum-length/head-length 0.67-0.76.....*vishnu*
- 7(2) Mandibles with a prominent spine-like process
- 8(9) Antennae with 12 segments. Smaller in size (head-length with rostrum 1.43-1.45, head-length without rostrum 0.83-0.88, head-width 0.83-0.95 and rostrum-length 0.55-0.62 mm. Rostrum longer in comparison to head-length, rostrum-length/head-length index 0.83-0.88). Mandibles with minute spines.....*triloki*
- 9(8) Antennae with 13-14 segments. Larger in size (head-length with rostrum 1.40-2.20, head-length without rostrum 0.84-1.50, head-width 0.84-1.50, and rostrum-length 0.55-0.85 mm; rostrum shorter in comparison to head-length, rostrum-length/head-length index 0.55-0.85.
- 10(15) Larger species : Head-width 1.20-1.50 mm

- 11(14) Mandibles with spine-like process very prominent and large (Figs. 304, 330). Rostrum conical but thinner. Indian Region species
- 12(13) Larger in size (head-length with rostrum 2.0-2.20, head-length without rostrum 1.25-1.35, head-width 1.35-1.47 mm). Head in profile straight behind rostrum, dorsally; somewhat straighter at posterior margin. Anterior abdominal tergites with long hairs. Indian species.....*crassicornis*
- 13(12) Smaller in size (head-length with rostrum 1.85-2.0, head-length without rostrum 1.20-1.25, head-width 1.20-1.28 mm). Head in profile incurved behind rostrum dorsally; rounded at posterior margin. Anterior abdominal tergites without long hairs. Burmese species.....*roboratus*
- 14(11) Mandibles with smaller spine-like process (Fig. 326) Rostrum conical and thicker at base. South-east Asian (Burma and further east) species.....*matangensis matangensis*
- 15(10) Smaller species : Head-width 0.84-1.26 mm
- 16(17) Head dark brown to almost black; rostrum black. Head almost circular (length without rostrum 0.95-1.15, width 0.95-1.10 mm). Antennae with 13 segments ; segment 3 subequal to 2. Sri Lanka species.....*lacustris*
- 17(16) Head reddish brown to castaneous brown; rostrum brown. Head circular but wider in comparison to length (length without rostrum 0.83-1.20, width 0.84-1.26 mm). Antennae with 13-14 segments; segment 3 (in 13 segmented condition) much longer than 2. South-east Asian species.....*matangensiformis*
- 18(1). Head-capsule without rostrum pear-shaped
- 19(24) Mandibles without any spine-like process
- 20(21) Head-capsule smaller (length with rostrum 1.26, width 0.69 mm) and profusely hairy with short curved hairs and few longer hairs.....*fabricii*
- 21(20) Head-capsule larger (length with rostrum more than 1.5, width more than 0.80 mm) and less hairy

- 22(23) Rostrum subcylindrical. Antennae with 13 segments; segment 3 longer than 2. Anterior margin of pronotum faintly notched. Head-width less than length without rostrum (length 0.95-1.15, width 0.88-1.10 mm).....*gardneri*
- 23(22) Rostrum conical. Antennae with 13 segments; segment 3 slightly shorter than 2. Anterior margin of pronotum clearly notched. Head-width equal to or more than length without rostrum (length 0.98-1.05, width 0.98-1.08 mm).....*tandoni*
- 24(19) Mandibles with spine-like process
- 25(28) Spine-like process of mandibles short and blunt (Figs. 301, 331)
- 26(27) Head with rostrum 1.70-1.87 mm long. Head in profile incurved behind rostrum; rostral hump absent. Rostrum longer (length 0.67-0.77 mm). Soldier dimorphic, minor form rare.....*cherraensis*
- 27(26) Head with rostrum 1.55-1.60 mm long. Head in profile straight; rostral hump present. Rostrum shorter (length 0.60-0.65 mm). Soldier monomorphic.....*suknensis*
- 28(25) Spine-like process of mandibles long and prominent (Fig. 319)
- 29(30) Smaller species (head-length with rostrum 1.30-1.36, head-length without rostrum 0.80-0.83, head-width 0.73-0.77, rostrum-length 0.50-0.53 mm). Antennae 11 to 12 segmented, segment 3 in 12-segmented condition equal to 2.....*kali*
- 30(29) Larger species (head-length with rostrum generally more than 1.4, head-length without rostrum more than 0.83, head-width more than 0.80 and rostrum-length more than 0.53 mm). Antennae 12 to 13-segmented, size of segments 2 and 3 variable
- 31(32) Rostrum thin, narrow and cylindrical (Fig. 317).....*indicola*
- 32(31) Rostrum thicker, cylindrical to subcylindrical or conical (Figs. 306, 308, etc.)
- 33(46) Antennae with 12 segments
- 34(35) Abdominal tergites and sternites with only short hairs, long hairs completely wanting. Larger form (head-length with rostrum 1.70-1.80, head-length without rostrum 1.10-1.12, head-width 1.00-1.07 mm).....*thanensis*

- 35(34) Abdominal tergites and sternites with short and long hairs. Smaller forms (head-length with rostrum generally less than 1.7, head-length without rostrum less than 1.10 and head-width less than 1.00 mm)
- 36(39) Head substraight or slightly incurved at posterior margin
- 37(38) Smaller in size (head-length with rostrum 1.50-1.57, length without rostrum 0.87-0.93 and head-width 0.87-0.93 mm). Head thinner (height 0.53-0.57 mm). Head with short hairs all over. Rostrum longer in comparison to head-length (length 0.60-0.67 mm, rostrum-length/head-length index 0.65-0.77). Mandible spines more prominent.....*garoensis*
- 38(37) Larger in size (head-length with rostrum 1.55-1.70, head-length without rostrum 0.95-1.05, head-width 0.95-1.05 mm). Head-thicker (height 0.60-0.73 mm). Head without any short hairs. Rostrum shorter in comparison to head-length (length 0.60-0.65 mm, rostrum-length/head-length index 0.60-0.63). Mandible spines less prominent.....*emersoni*
- 39(36) Head rounded at posterior margin
- 40(45) Third antennal segment shorter than or subequal to second
- 41(42) Head sharply pyriform, widest near posterior margin. Abdominal tergites more hairy, longer hairs present on all tergites.....*jalpaigurensis*
- 42(41) Head roundly pyriform; widest at middle. Abdominal tergites with fewer or no longer hairs on anterior tergites
- 43(44) Head pale yellow to pale reddish brown; rostrum pale brown to deep brown basally, darker distally; abdomen above pale yellow. Third segment of antennae subequal to 2nd. Head narrower and rostrum thicker comparatively.....*dunensis*
- 44(43) Head darker, brownish; rostrum darker; abdomen pale brownish above. Third segment of antennae shorter than 2nd. Head wider and rostrum thinner comparatively.....*krishna*
- 45(40) Third antennal segment longer than second (a little longer to nearly one-and-a-half times).....*fletcheri*
- 46(33) Antennae with 12-13, or 13 or 13-14 or 14 segments

- 51(52) Antennae with 14 segments. Larger species (head-length with rostrum 1.73-1.85, head-length without rostrum 1.09-1.19, head-width 1.11-1.24 mm). Rostrum conical, raised anteriorly*profuscipennis*
- 52(51) Antennae with 12-13 or 13-14 (generally 13) segments. Smaller species (head-length with rostrum 1.55-1.73, head-length without rostrum 0.87-1.06, head-width 0.90-1.05 mm). Rostrum subcylindrical
- 53(54) Head more hairy and sides straighter. Antennae 12 to 13 (generally 13)-segmented; segment 3 a little longer than 2. Rostrum longer (length 0.63-0.78 mm, index rostrum-length/head length 0.663).....*moratus*
- 54(53) Head less hairy and sides rounded. Antennae 13 to 14-segmented; segment 3 much longer than 2 (in 13-segmented condition). Rostrum shorter (length 0.58-0.60 mm, index rostrum-length/head-length 0.547-0.57)
- 55(56) Antennae with 13 to 14-segments. Head in profile slightly incurved behind rostrum; rostral hump present but weak. Mandibles with short spines.....*annoniensis*
- 56(55) Antennae with 13 segments. Head in profile incurved appreciably behind rostrum; rostral hump absent. Mandibles with long spines
- 57(58) Head without any long or short hairs; abdominal tergites without any long hairs.....*oculatus*
- 58(57) Head with long and short hairs; abdominal tergites all with long and short hairs.....*horni*

280. *Nasutitermes anamalaiensis* Snyder

(Synonym : *Alstonitermes flavescens* Thakur)

(Fig. 295)

1. *Nasutitermes (Rotunditermes) anamalaiensis* Snyder :

1933. Snyder, *Proc. U. S. natn. Mus.*, **82** (Art. 16) : 11, 12, Fig. 6 a-c.
Lectotype : S, in FRI. Type-locality. Anamalai Hills, Tamil Nadu.

2. *Nasutitermes anamalaiensis* Snyder :

1958. Ahmad, *Biologia*, Lahore, **4** : 155.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 4, 5-8, Synonymy, description, etc. and lectotype designated.

1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 97.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 208, 209-210.

3. *Alstonitermes flavescens* Thakur : New synonymy.

1975. Thakur, In : Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 61 (Wrongly spelt as *flavescent*). Nom. nud.

1976. Thakur, *J. Bombay nat. Hist. Soc.*, 72(3) : 783-785, 2 pls. New Synonymy.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 36.

1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 103.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 229-230.

IMAGO : Unknown.

SOLDIER (Fig. 295) : Head-capsule straw coloured; rostrum pale brown basally, darker distally; antennae slightly pale brown, darker than head; pronotum yellowish, darker anteriorly; abdomen yellowish white. Head with numerous minute hairs all over and a pair of longer bristles each on vertex and at base of rostrum; abdominal tergites each with a long

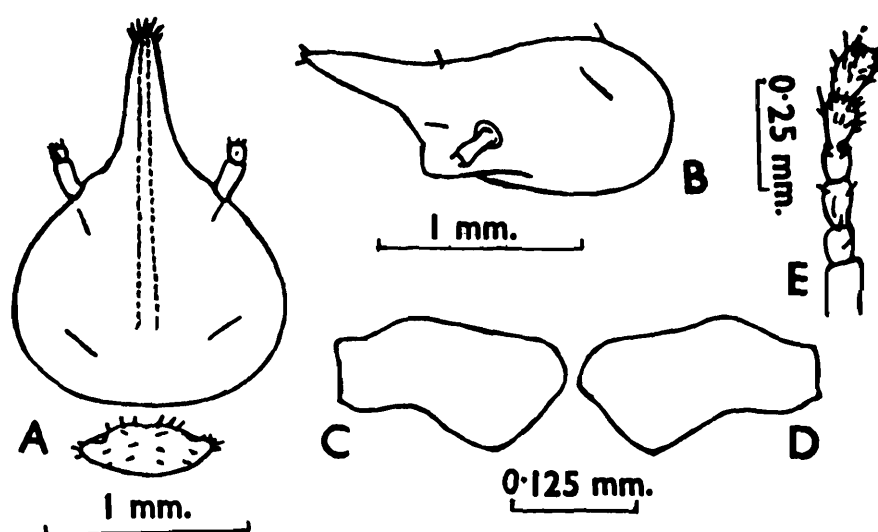


Fig. 295 : *Nasutitermes anamalaiensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C), (D) Left and right mandibles. (E) Basal part of antenna.

bristle on either side, last few tergites with more long hairs and sternites densely hairy with long and short hairs. Total body-length 4.0-5.2 mm. Head-capsule subcircular, broader than long (length with rostrum 1.75-1.98, length without rostrum 1.10-1.20, max. width 1.20-1.38 mm); in profile incurved appreciably behind rostrum, rostral hump absent; posterior margin round, slightly invaginated medially sometimes; sides rounded strongly. Rostrum conical, very thick at base (length 0.60-0.80 mm, rostrum/head-length index 0.52-0.65). Antennae with 12-13 segments; segment 3 one-and-a-half times of 2. Mandibles vestigial, without or with a very minute spine-like process. Pronotum saddle-shaped, with several minute hairs and a few long ones (length 0.20-0.31, width 0.48-0.60 mm); anterior margin not emarginate.

WORKER Head-capsule smoky brown; frons and postclypeus yellowish white; antennae and labrum stramineous; pronotum pale brown. Total body-length 3.5-5.0 mm. Head-capsule subsquarishly round (length to base of mandibles 0.80-1.20, max. width 1.05-1.30 mm); epicranial suture faint to prominent. Fontanelle plate long, whitish. Antennae with 14 segments; segment 3 shorter than 2 and as long as 4. Postclypeus swollen, hairy; length less than 1/2 width. Pronotum saddle-shaped (length 0.18-0.35, width 0.48-0.65 mm); anterior margin distinctly notched.

Distribution : INDIA : Andhra Pradesh, Tamil Nadu and Karnataka states.

Remarks : Large series of the species *N. anamalaiensis* Snyder from different localities, present in the ZSI, were examined and it was found that the mandibles in soldier have a very minute spine-like process which falls off or breaks. The paratype soldier of *Alstonitermes flavescens* Thakur (taken here as a synonym), present in ZSI, also has a very minute spine-like process in the left mandible. Thakur (1976a) mentions "no spinous process on outer margin" It seems that in the specimens examined or dissected by him, the spine had fallen off. Prashad and Sen-Sarma (1959) also in case of *N. anamalaiensis* mention. "We have not found any spine-like process on the outer margin though according to Snyder (1933, original description) there is a short spine near base"

The species *Alstonitermes flavescens* Thakur could not be separated from *N. anamalaiensis* Snyder and, therefore, has been taken here as a synonym of the latter.

281. *Nasutitermes anoniensis* Akhtar

(Fig. 296)

1. *Nasutitermes pakistamicus* Chaudhry, et al. (Nom. nud.) :1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 58. Nom. nud.2. *Nasutitermes anoniensis* Akhtar :1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, Art. 7 : 132, 140-141. S Only. Holotype : S, in PU. Type-locality : Anoni, Bangladesh.

IMAGO : Unknown.

SOLDIER (Fig. 296) : Head-capsule brownish red; rostrum slightly darker than head; antennae pale brown; pronotum yellowish brown, anterior lobe slightly darker; legs brownish yellow; abdominal tergites light brown with smoky tinge, darker than head. Head with a pair of bristles in posterior half, rostrum with 4 long bristles and some short hairs; pronotum with a few hairs on margins; abdominal tergites with a few hairs; last 3 tergites with long bristles; sternites with short and few

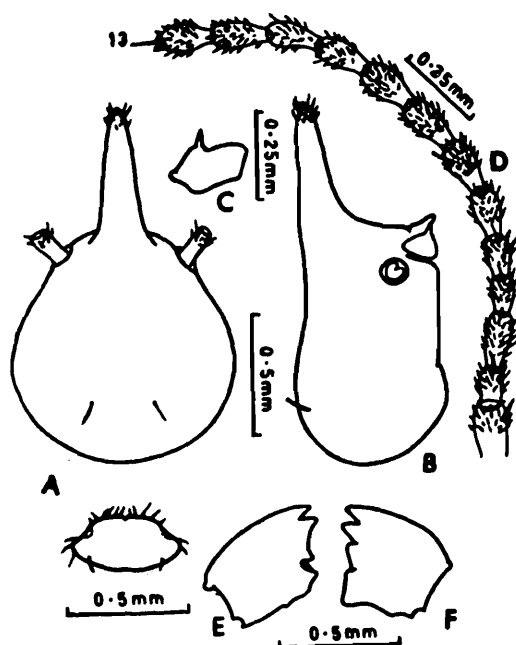


Fig. 296 : *Nasutitermes anoniensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Mandible. (D) Antenna. Worker. (E)-(F) Left and right mandibles. (After Akhtar, 1975).

long bristles. Head-capsule pear-shaped (length with nasute 1.58-1.64, length without nasute 1.0-1.06, max. width 0.96-1.05 mm); in profile slightly depressed behind base of rostrum; rostral hump slightly indicated. Rostrum short and subcylindrical. Antennae with 13-14 segments; segment 3 in 13-segmented one almost twice as long as second, and in 14-segmented one, slightly shorter than 2. Mandibles vestigial, each with a short apical process. Pronotum saddle-shaped, without emargination on both anterior and posterior margins but faint emargination shown in figure by author (length 0.20-0.24, width 0.47-0.50 mm).

Distribution : BANGLADESH. Known only from Anoni (type-locality).

282. *Nasutitermes brunneus* Snyder

(Fig. 297, 298)

1. *Nasutitermes (Nasutitermes) fletcheri* Snyder (nec. Holmgren and Holmgren) :

1933. Snyder, *Proc. U.S. natn. Mus.*, **82** (Art. 16) : 10.

2. *Nasutitermes (Nasutitermes) brunneus* Snyder :

1934. Snyder, *Indian For. Rec.*, **20**(11) : 11. Lectotype : S, in FRI. Type-locality : Anamalai Hills, Tamil Nadu, India.

1958. Ahmad, *Biologia*, Lahore, **4** : 147.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 4, 5, 13-18. Synonymy, description and lectotype designation.

1981. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **47**(3) : 353.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 207, 208.

IMAGO (Fig. 297) : Head-capsule brown; antennae pale brown; labrum and postclypeus straw coloured; pronotum deeper straw coloured; legs pale brown; abdominal tergites slightly paler than head and sternites whitish. Head and body densely hairy with long and short hairs. Total body-length with wings 10.90-11.60 mm; without wings 5.60-6.90 mm. Head-capsule subsquarish (length to base of mandibles 0.75-1.00, width with eyes 1.15-1.20 mm); epicranial suture faintly visible, median arm quite distinct in the specimens examined. Fontanelle plate elongate,

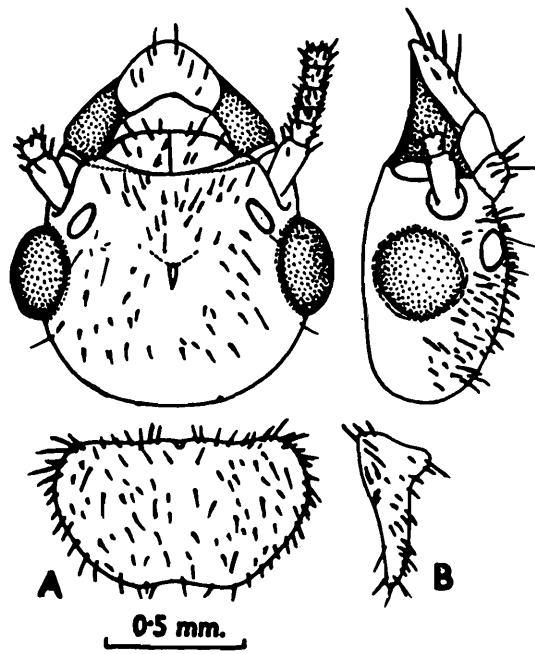


Fig. 297 : *Nasutitermes brunneus*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view.

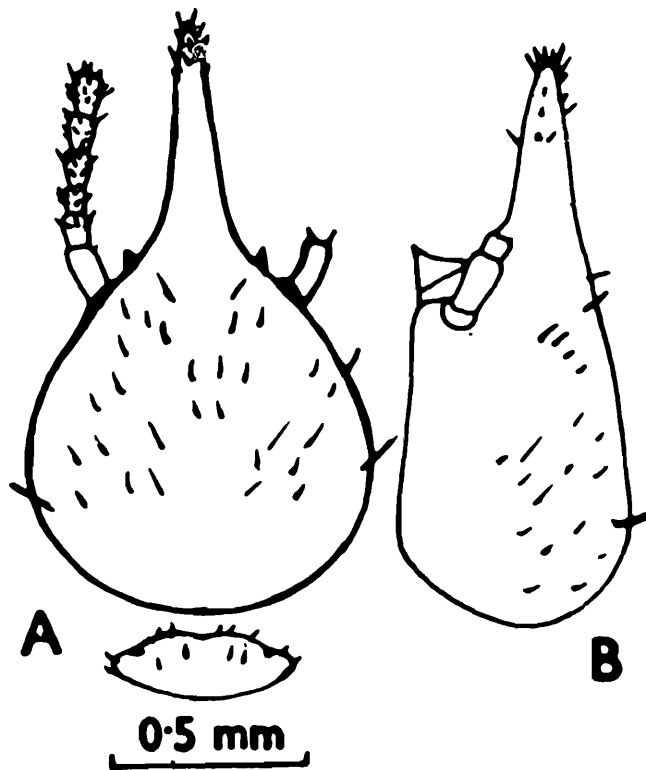


Fig. 298 : *Nasutitermes brunneus*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view.

narrow, translucent. Eyes large, projecting out, broadly subcircular (max. diameter 0.35-0.40 mm). Ocelli oval, translucent; separated from eyes by slightly less than their short diameter (long diameter 0.13-0.18, short diameter 0.085 mm, eye-ocellus distance 0.06-0.08 mm). Antennae with 15 segments; segment 3 as long as 2 and 4, but narrower than both; segment 5 shorter than 4. Postclypeus swollen, hairy; length less than $1/2$ width. Pronotum subtrapezoidal, anteriorly slightly upturned (length 0.40-0.53, width 0.90-0.95 mm); anterior margin sinuate with distinct median notch; posterior margin also with a distinct emargination. Wings greyish, densely hairy; with small, thin papillae on anterior margin (4-5 rows) and slightly stouter ones on posterior margin (6 rows); membrane with thin, nonasteroid micrasters; forewing-length 9.2-10.8, hindwing-length 9.0-9.30 mm.

SOLDIER (Fig. 298) : Head-capsule pale brown to brown; rostrum brown to dark brown; antennae deep straw coloured to brownish; pronotum brown; legs deep straw coloured; abdominal tergites pale brown to brown, sternites paler. Head with numerous minute hairs and a pair of long bristles at vertex and a pair near base of rostrum; pronotum with numerous short hairs; each abdominal tergite with a long hair on either side otherwise with numerous minute hairs; sternites densely hairy. Total body-length 3.30-4.10. Head-capsule pear-shaped (length with rostrum 1.36-1.50, length without rostrum 0.83-0.95, max. width 0.89-0.95 mm). Rostrum short, conical (length 0.53-0.57 mm, rostrum/head-length index 0.58-0.61). Antennae with 12-13 segments; segment 3 shorter or longer and wider than 2. Mandibles vestigial, each with a short, spinose process. Pronotum saddle-shaped (length 0.18-0.22, width 0.40-0.45 mm); anterior margin rounded, not emarginate; posterior margin substraight.

WORKER : Head-capsule pale yellow to yellow; antennae, labrum and legs a little paler; abdominal tergites pale brown, sternites yellowish. Head and body moderately hairy. Total body-length 3.50-4.50 mm. Head-capsule subcircular (length to base of mandibles 0.85-0.90, max. width 1.00-1.08 mm); Y-suture faintly marked. Fontanelle plate longish, translucent. Antennae with 14 segments; segments 2 and 3 subequal. Postclypeus pale brownish, hairy, swollen; length much less than $1/2$ width. Pronotum saddle-shaped (length 0.25, width 0.50-0.55 mm); anterior margin weakly emarginate.

Distribution : INDIA : Karnataka, Tamil Nadu and Kerala states.

283. *Nasutitermes ceylonicus* (Holmgren)

(Figs. 299, 300)

1. *Eutermes ceylonicus* Holmgren :

1911. Holmgren, In Escherich's *Termitenleben auf Ceylon* : 197, 198. S and W. Lectotype : S, in FRI. Type-locality : Peradeniya, Sri Lanka. Paralectotype examined.

2. *Nasutitermes ceylonicus* (Holmgren) :

1958. Ahmad, *Biologia*, Lahore, 4 : 146, 158.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 4, 5, 18-21. Synonymy, description, lectotype designation.

1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 56-57.

1981. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) 47(3) : 354.

IMAGO (Fig. 299) : Head-capsule castaneous brown; antennae, labrum and postclypeus brown; abdominal tergites castaneous brown and sternites pale brown. Head and body moderately densely hairy. Total body-length 7.4 mm. Head-capsule subsquarish (length to base of mandibles 0.80-1.01, width with eyes 1.20 mm); epicranial suture indistinct. Fontanelle plate long (0.11-0.14 mm), narrow, translucent. Eyes small, subcircular (max. diameter 0.31-0.36, min. diameter 0.29-0.34 mm). Ocelli oval, translucent (long diameter 0.13-0.17, short diameter 0.08-0.11 mm); from

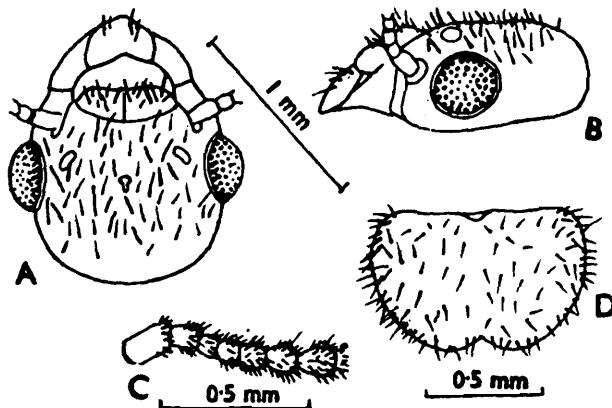


Fig. 299 : *Nasutitermes ceylonicus*. Imago. (A) Head, dorsal view. (B) Head, side view. (C) Basal portion of antenna. (D) Pronotum, dorsal view. (Ex Prashad and Sen-Sarma, 1959).

eyes situated at about their short diameter (0.07-0.12 mm). Antennae with 14-15 segments; in 14-segmented one segment 3 subequal to 2, 4 shortest; in 15-segmented one 3 half of 2 and shortest. Postclypeus swollen, hairy; length less than 1/2 width (length 0.14-0.17, width 0.43-0.53 mm); anterior margin incurved, posterior margin convex. Pronotum subtrapezoidal (length 0.43-0.53, width 0.79-0.95 mm); anterior margin straight, weakly emarginate medially; posterior margin with a deep emargination. Wings pale brown with smoky tinge, densely hairy; forewing-length 8.80-10.6 mm; wing microsculpture consists of papillae on anterior and posterior margins and thick, nonasteroid (3-6 arms) micrasters on membrane.

SOLDIER (Fig. 300) : Paralectotype examined. Head-capsule pale brown; rostrum a little darker than head; antennae straw coloured; pronotum pale brown, darker anteriorly. Head with a pair of long hairs on vertex and 2-4 hairs at base of rostrum, not densely covered with minute hairs as in other species; pronotum with minute hairs; abdominal tergites with numerous short hairs and a pair of long bristles at middle and one on either side of tergites, sternites densely hairy with short and long hairs. Total body-length 3.2-4.0 mm. Head-capsule pear-shaped (length with rostrum 1.30-1.50, length without rostrum 0.79-0.95, max. width 0.75-0.92 mm); in profile substraight with an indistinct rostral hump. Rostrum short, conical (length 0.50-0.55 mm, rostrum/head-length

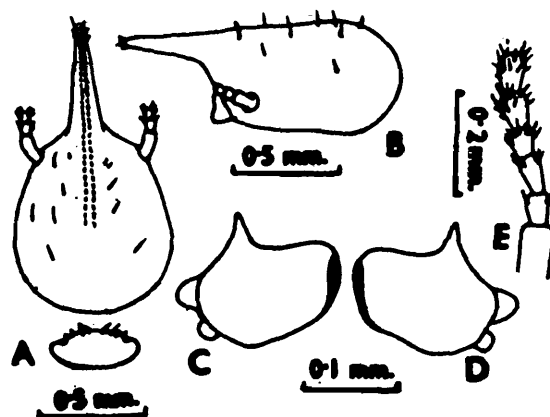


Fig. 300 : *Nasutitermes ceylonicus*. Soldier (paralectotype). (A) Head and pronotum, dorsal view. (B) Head, side view. (C), (D) Left and right mandibles. (E) Basal part of antenna.

index 0.56-0.59); with a tuft of short and long hairs at tip. Antennae with 12-13 segments; segment 3 (in 12-segmented one) slightly longer than 2. Mandibles vestigial, each with a prominent, spine-like process. Pronotum saddle-shaped (length 0.18-0.20, width 0.40-0.46 mm); anterior margin faintly emarginate, posterior margin straight.

WORKER : Head-capsule pale yellow; antennae, labrum and postclypeus a little paler than head; abdomen yellowish white. Head and body densely hairy. Total body-length 2.8-3.5 mm. Head-capsule subcircular (length to base of mandibles 0.85, max. width 1.00 mm). Fontanelle plate white, translucent, longish, 0.13 mm long. Antennae with 13 segments; segment 3 slightly longer than 2; 4 shortest. Postclypeus swollen, hairy; length 1/2 width (length 0.20, width 0.45 mm). Pronotum saddle-shaped (length 0.25, width 0.45-0.53 mm); anterior margin faintly emarginate or not emarginate.

Distribution : SRILANKA : Quite widely distributed in the Island.

284. *Nasutitermes cherraensis* Roonwal and Chhotani

(Fig. 301)

Nasutitermes cherraensis Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 297, 374, 379, pls. 37, 38. S(maj. and min.) and W. Holotype, S(major), in ZSI. Type-locality : Cherrapunji, Meghalaya, India. Types examined.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 80.

1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 98.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

SOLDIER : Dimorphic. *Soldier major* (Fig. 301 A-E.) : Types examined. Head-capsule yellowish to brownish yellow, pale yellowish in posterior region; rostrum a little darker; antennae pale yellowish to pale brown; legs pale yellow; thorax and abdomen above yellow to pale brown. Head with a single pair of long bristles on vertex and a few minute ones elsewhere; rostrum very hairy at tip. Total body-length 3.50-4.60 mm. Head pyriform, without rostrum a little longer than wide (length with rostrum 1.50-1.80, length without rostrum 0.90-1.13, width 0.80-1.07 mm,

index width/length without rostrum 0.89-0.97); in profile weakly depressed behind rostrum. Rostrum cylindrical and slender, length 0.60-0.77 mm; rostrum-length/head-length without rostrum 0.65-0.78. Antennae with 12-14 (generally 12 or 13) segments; 3rd segment longer than 2nd (shorter in 14-segmented antennae); 4th variable. Mandibles rudimentary; lateral spine-like process very minutely formed, or absent. Postmentum subhexagonal, widest medially; posteriorly sides incurved. Pronotum saddle-shaped, weakly hairy with short hairs, anterior margin with a few long hairs sometimes; length 0.20-0.24, width 0.46-0.57 mm; anterior margin weakly notched, posterior margin convex without notch. Mesonotum a little narrower and metanotum as wide as or a little wider than pronotum. *Soldier minor* (Fig. 301F, G) : Rare. Generally smaller. Head generally constricted behind antennae and narrower. Antennae with 11-12 segments, segment 3 longer and more slender. Total body-length 2.90-3.40, head-length with rostrum 1.25-1.40, head-length without rostrum 0.68-0.80, and head-width 0.60-0.67 mm; head-index width/length without rostrum 0.84-88.

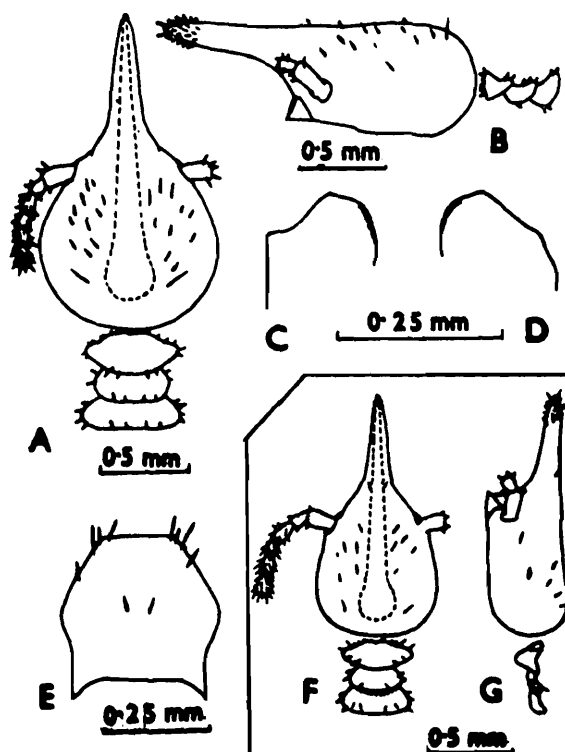


Fig. 301 : *Nasutitermes cherraensis*. Soldier major. (A) Head and thorax, dorsal view. (B) Same, side view. (C), (D) Left and right mandibles. (E) Postmentum. Soldier minor. (F) Head and thorax, dorsal view. (G) Same, side view. (Ex Roonwal and Chhotani, 1962c).

WORKER : Monomorphic, but very variable in size and colour. Head-capsule pale yellow to yellowish brown; thorax and abdomen pale yellow to pale brown. Head and body fairly densely hairy. Total body-length 4.5-5.90 mm. Head-capsule suboval, broader than long (length to base of mandibles 0.97-1.20, width 1.00-1.33 mm) : Y-suture prominent in larger workers. Fontanelle plate suboval. Antennae with 14 (sometimes 15) segments in general, segment 4. shortest. Postclypeus swollen, pilose, length less than half of width. Pronotum saddle-shaped; with short and long hairs; length less than half of width (length 0.25-0.40, width 0.50-0.80 mm); anterior margin with a prominent median notch. Mesonotum narrower and metanotum broader than pronotum; posterior margin of both without emargination or notch.

Distribution : INDIA : Meghalaya and Arunachal Pradesh.

285. *Nasutitermes chhotanii* Bose

(Figs. 302, 303)

Nasutitermes chhotanii Bose :

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 1m, S and W. Holotype : S, In ZSI. Type-locality : Lake Ganga, Itanagar, Arunachal Pradesh. Types examined.

IMAGO (Fig. 302) : Types examined. Head-capsule dark brown, with a pair of line-like spots between fontanelle plate and postclypeus; antennae and legs pale brown; pronotum a little paler than head-capsule, a paler T-mark with a short stump and a pair of paler medial spots little above posterior margin present; abdominal tergites as dark as pronotum, sternites paler and medially more pale; wings pale brown. Head and body densely hairy. Total body-length with wings c 10.00-12.50 and without wings 6.00-7.20 mm. Head-capsule subcircular, width with eyes more than length to base of mandibles (length to tip of labrum 1.23-1.25, length to base of mandibles 0.85-0.95 and width of head with eyes 1.10-1.18 mm). Fontanelle plate elongate, elliptical (length 0.10-0.13, width 0.05-0.06 mm). Eyes subcircular (max. diameter 0.30-0.35, min. diameter 0.28-0.30 mm). Ocelli broad, oval (length 0.13, width 0.10 mm); from eyes separated by about 1/2 their width. Antennae with 15 segments; segment 3 shortest. Postclypeus weakly swollen, length less than half of width

(length 0.18, width 0.45-0.50 mm); anteclypeus trapezoidal, hyaline, narrow and projected in front medially. Labrum dome-shaped, broader than long (length 0.28-0.30, width 0.35-0.43 mm). Pronotum trapezoidal, a little narrower than head with eyes and wider than long (length 0.60-0.68, width 0.88-0.98 mm); anterior margin substraight, slightly raised, with a faint, median notch; posterior margin convex with a deep, median invagination. Mesonotum and metanotum deeply and angularly invaginated at posterior margin. Wings pale brown, hairy along margins and in distal part (length with scale : forewing 9.5-11.00, hindwing 9.0-10.0 mm).

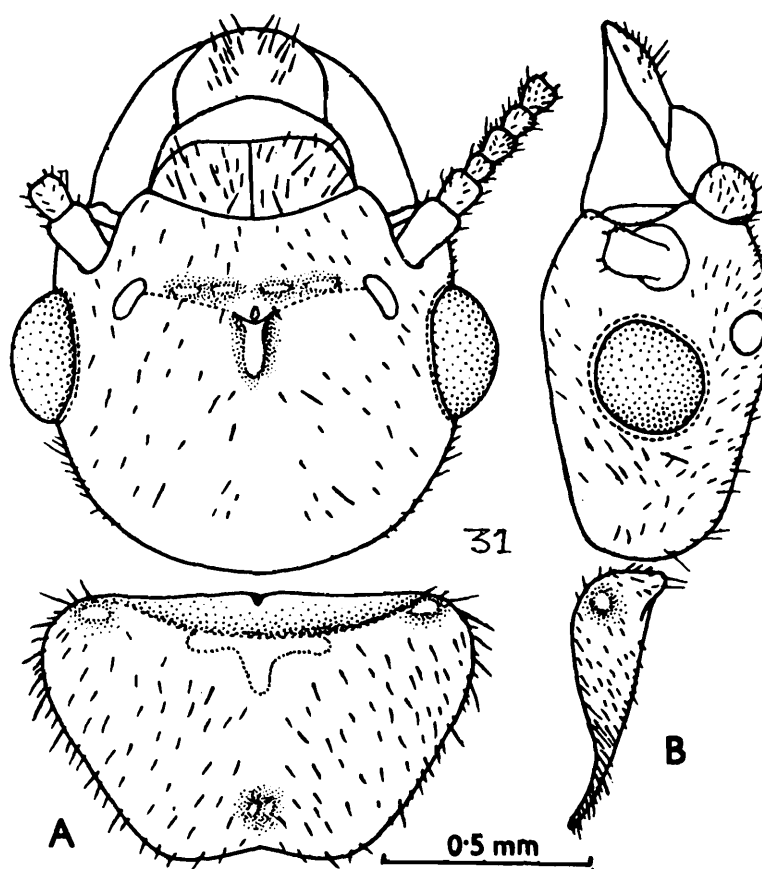


Fig. 302 : *Nasutitermes chhotanii*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (After Bose, in press).

SOLDIER (Fig. 303) : Type examined. Head-capsule yellowish brown to pale brown; rostrum dark reddish brown, basally paler as head; antennae pale brown, paler than head; thorax creamish, pronotum brownish along anterior margin; abdomen with contents showing through. Head with a pair of hairs at base of rostrum and a pair of long hairs a

little below middle and several short, minute hairs all over; rostrum with a pair of long hairs near tip and several shorter ones, sometimes 1 or 2 extra long hairs present; pronotum with a few short hairs on margins and body; abdominal tergites with several short hairs and two pairs of longer hairs on each tergite at posterior margin; last tergites and sternites with several long and short hairs. Total body-length c 4.2-4.5 mm. Head subcircular, broader than length without nasute (length with nasute 1.58-1.70, length without nasute 0.90-1.03, max. width 0.95-1.05 mm); in profile depressed behind nasute, without rostral hump. Rostrum thick, conical, gradually narrowing in front, shorter than head without nasute (length 0.60-0.75 mm, index nasute-length/head-length without nasute 0.709-0.806). Fontanelle tube prominent and clear in part of head and nasute. Antennae with 13 segments; segment 4 shortest. Mandibles vestigial, without any apical spine. Postmentum subsquarish, weakly narrowed posteriorly (length 0.28-0.30, max. width 0.25-0.28, min. width 0.23-0.25 mm). Pronotum saddle-shaped, broader than long (length 0.26-0.28, width 0.48-0.50 mm); anterior margin faintly notched medially; posterior margin substraight.

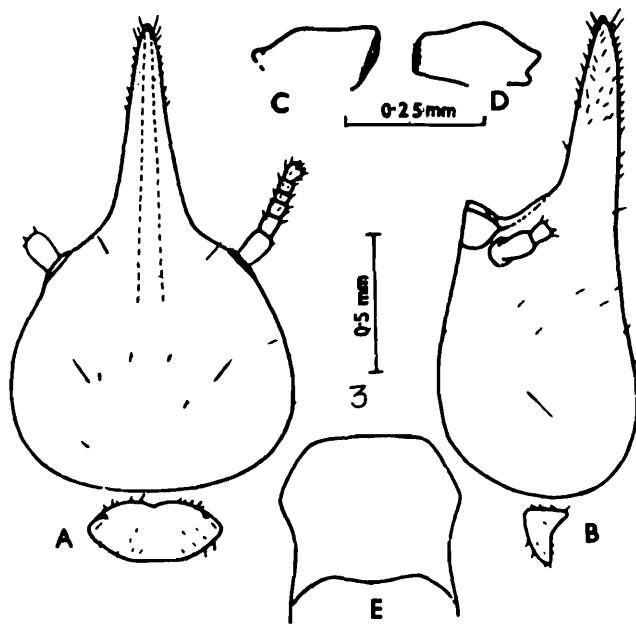


Fig. 303 : *Nasutitermes chhotanii*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C), (D) Left and right mandibles. (E) Postmentum. (After Bose, in press).

WORKER : Dimorphic. *Worker major* : Head-capsule creamish to pale yellow; antennae, postclypeus and legs paler than head; thorax creamish; abdomen transparent with intestinal contents showing through. Head and body densely hairy. Total body-length c 4.0-4.6 mm. Head-capsule subcircular, broader than length to base of mandibles (length to tip of labrum 1.15-1.20, length to base of mandibles 0.77-0.83, max. width 0.90-1.03 mm); Y-suture indistinct. Fontanelle plate elliptical, translucent. Antennae with 13-14 segments; segment 3 and 4 subequal in 13 segmented antennae and 4 sometimes longer and subdivided; in 14-segmented antennae 4 shortest. Postclypeus weakly swollen (length 0.15-0.17, width 0.45 mm). Pronotum saddle-shaped. *Worker minor* : Like worker major but smaller in size.

Distribution : INDIA : Arunachal Pradesh : Itanagar (Lake Ganga), type-locality. Known only from type-locality.

286. *Nasutitermes crassicornis* (Holmgren and Holmgren)

(Fig. 304)

1. *Eutermes (Eutermes) crassicornis* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. Agric. India.*, 5 : 162. S and W. Lectotype : S, in FRI. Type-locality : Bababudin Hills, Karnataka. Paralectotypes examined.

2. *Nasutitermes crassicornis* (Holmgren and Holmgren) :

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10. 23) : 5, 23-25. Synonymy, description and lectotype designation.

1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 98.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 98, 208, 214-216.

IMAGO : Unknown.

SOLDIER (Fig. 304) : Paralectotypes examined. Head-capsule brown with smoky tinge, fontanelle area paler; rostrum brown, darker distally; antennae brown; pronotum slightly paler than head; legs and abdominal tergites pale brown. Head with a pair of long hairs on vertex and a pair behind rostrum and several minute hairs; rostrum with a tuft of small hairs on tip; pronotum with numerous minute hairs, each tergite with a

long hair on either side and a pair in the middle and numerous short hairs; sternites with many long and short hairs. Total body-length 4.40-5.10 mm. Head-capsule subcircular, width appreciably more than length without rostrum (length with rostrum 2.00-2.20, length without rostrum 1.25-1.35, max. width 1.35-1.47 mm); sides sharply converging anteriorly; in profile almost straight, rostral hump absent. Rostrum short, conical, thick at base; length a little more than half head-length (length 0.70-0.85 mm, rostrum-length/head-length index 0.54-0.63). Antennae with 13 segments, segment 3 almost twice as long as 2. Mandibles vestigial, each with a prominent, spine-like process. Pronotum saddle-shaped (length 0.30-0.34, width 0.60-0.68 mm); anterior margin rounded, not emarginate; posterior margin straight.

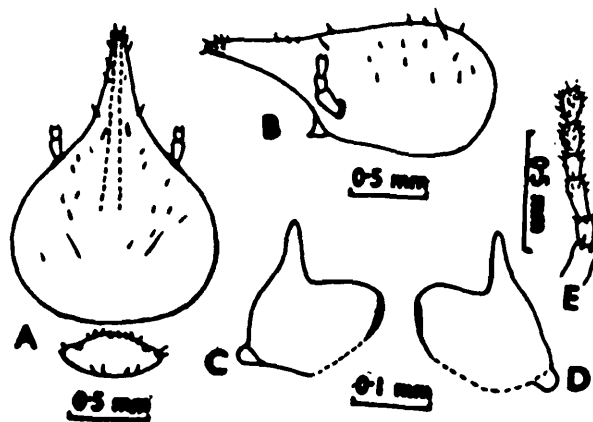


Fig. 304 : *Nasutitermes crassicornis*. Soldier, paralectotype. (A) Head and pronotum, dorsal view. (B) Head, side view. (C), (D) Left and right mandibles. (E) Basal part of antenna.

WORKER : Head-capsule smoky brown on occiput, pale brown elsewhere; antennae and labrum brownish; pronotum deep straw coloured; abdomen paler than pronotum. Head sparsely hairy; pronotum with a few hairs; abdominal tergites each with a long hair on lateral margins and a pair in middle and several minute hairs; sternites rather densely hairy. Total body-length 5.0-5.9 mm. Head-subsquarish; length a little less than width (length to base of mandibles 1.05-1.20, width 1.17-1.37 mm); epicranial suture faint. Fontanelle plate translucent, longish. Antennae with 15 segments, segment 3 slightly longer than 2, 4 shortest. Postclypeus swollen, hairy, length 1/2 of width. Pronotum saddle shaped,

(length 0.30-0.40, width 0.78-0.85 mm); anterior margin very faintly emarginate, posterior margin straight.

Distribution : INDIA (Karnataka and Tamil Nadu states).

287 *Nasutitermes dunensis* Chatterjee and Thakur

(Synonyms : *N. lambai* Verma and Thakur and *N. guptai* Sen-Sarma and Thakur)

(Figs. 305, 306)

Nasutitermes dunensis Chatterjee and Thakur :

1969. Chatterjee and Thakur, *Bull. syst. Zool.*, 1(2) : 57-65. Im, S and W.
Holotype : S, in FRI. Type-locality : Mohamedpur Block, Asarori Range, Dehradun Forest Div., Dehradun, Uttar Pradesh, India.

1978. Verma and Thakur (R.K.), *J. Indian Acad. Wood Sci.*, 9(1) : 53.

1981. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) 47(3) : 353.

1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 98.

2. *Nasutitermes lambai* Verma and Thakur (New synonymy) :

1978. Verma and Thakur (R.K.) *J. Indian Acad. Wood Sci.*, 9(1) : 50-55.
Im, S and W. New synonymy.

1981. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) 47(3) : 354.

1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 100.

3. *Nasutitermes guptai* Sen-Sarma and Thakur (New synonymy) :

1980. Sen-Sarma and Thakur, *Indian For. Rec.*, (N.S.) Ent., 14(1) : 25-29.
S and W. New synonymy.

1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 99.

IMAGO (Fig. 305) : Head-capsule pale castaneous brown; antennae, labrum postclypeus, pronotum and legs brownish yellow; abdominal tergites smoky brown, sternites yellowish brown with smoky brown spots laterally. Head and body densely hairy with short hairs and some long hairs. Total body-length with wings 14.50-15.00, without wings 8.50-8.70 mm. Head-capsule subsquarish (length to base of mandibles 1.05-1.20, width with eyes 1.30-1.38 mm); median arm of epicranial suture faint, lateral arms not distinct. Fontanelle plate elongate, Y-shaped, white, narrow. Eyes subcircular (max. diameter 0.43-0.45, min. diameter 0.35-

0.38 mm); from lower margin of head placed at about 1/4 of short diameter. Ocelli oval (long diameter 0.15-0.18, short diameter 0.13-0.15 mm); situated at about 1/3 of short diameter from eyes (eye-ocellus distance 0.04-0.05 mm). Antennae with 15 segments; segment 3 subequal to or slightly longer than 2. Postclypeus moderately swollen, length much less than 1/2 width; anterior margin straight, posterior margin convex. Pronotum trapezoidal (length 0.65-0.70, width 1.10-1.13 mm); anterior margin weakly concave, slightly elevated medially in profile and without any emargination or notch at middle; posterior margin convex, with a distinct median invagination. Wings smoky grey; membrane covered with minute hairs and thin non-asteroid (3-7 arms) micrasters; forewing-length 12.25-12.60, hindwing-length 11.20-11.60 mm.

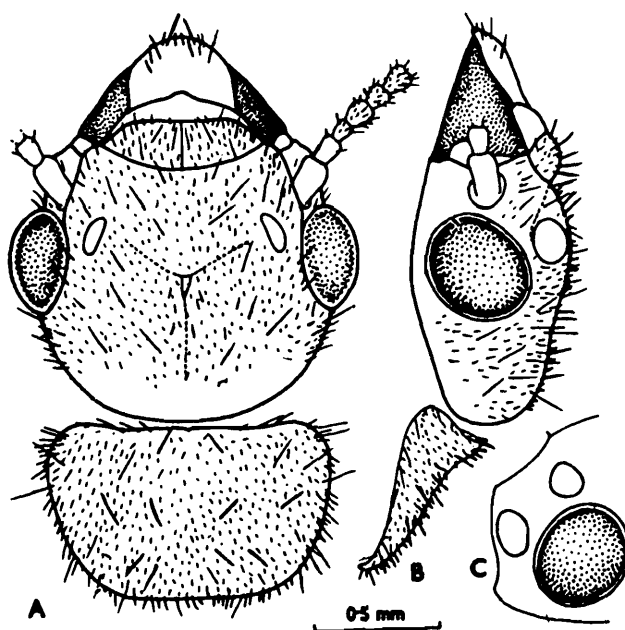


Fig. 305 : *Nasutitermes dunensis*. Imago (paratype). (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Portion of head showing position of eye, ocellus and antenna.

SOLDIER (Fig. 306) : Head-capsule pale reddish brown, fontanelle gland area paler; rostrum deep brown, darker near tip; antennae brown; body pale yellow. Head and abdominal tergites with numerous minute hairs; head with 2 or 3 longer hairs at vertex on either side and a pair at base of rostrum; pronotum with short hairs on margin and body; anterior abdominal tergites without any longer hairs and posterior ones

with a few long hairs; sternites with short and long hairs. Total body-length 3.40-4.25 mm. Head-capsule broadly pear-shaped (length with rostrum 1.45-1.60, length without rostrum 0.95-1.03, width 0.90-0.98 mm); in profile weakly incurved behind rostrum, hump weak. Rostrum short, conical (length 0.50-0.60 mm, index rostrum/head-length 0.50-0.60); tip with a tuft of hairs. Antennae with 12 segments; segment 3 slightly longer than 2; 4 almost as long as 3. Mandibles vestigial; each with a spine-like process. Pronotum saddle-shaped, anterior lobe darker (length 0.18-0.20, width 0.43-0.48 mm); anterior margin convex, with a faint emargination at middle; posterior margin convex.

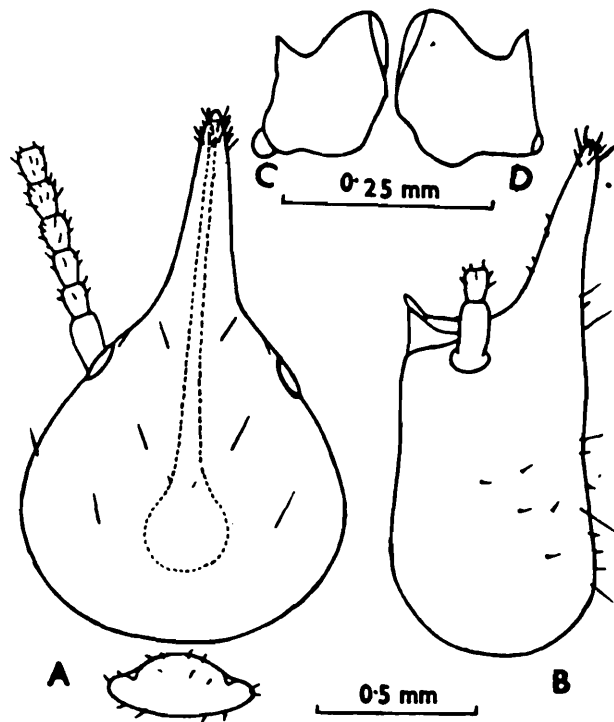


Fig. 306 : *Nasutitermes dunensis*. Soldier (paratype). (A) Head and pronotum, dorsal view. (B) Head, side view, (C) and (D) Left and right mandibles.

WORKER : Head-capsule pale yellow to pale brown; antennae, labrum, postclypeus and legs creamish; abdomen translucent. Head and body moderately hairy. Total body-length 4.40-5.25 mm. Head-capsule subsquarish (length to base of mandibles 0.90-1.10, max. width 1.00-1.15 mm); epicranial suture distinct. Fontanelle plate white, elongate. Antennae with 13 segments; segment 3 slightly shorter or subequal to 2. Postclypeus swollen, hairy; length slightly less than 1/2 width. Pronotum saddle-

shaped; 0.25-0.30 mm long and 0.50-0.60 mm wide; anterior lobe greatly uplifted and anterior margin with a distinct but weak emargination; posterior margin weakly emarginate medially.

Distribution : INDIA : Uttar Pradesh.

288. *Nasutitermes emersoni* Snyder

(Figs. 307, 308)

Nasutitermes/Nasutitermes (Nasutitermes) emersoni Snyder :

1934. Snyder, *Indian For. Rec.*, 20(11) : 11-12. S only. Lectotype : S, in FRI. Type-locality : Sunderbans, Bangladesh.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10. 23) : 5, 26-28. Synonymy, description, lectotype designation.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab. (N.S.)*, Art. 7 : 131, 132-135.

1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 98.

IMAGO (Fig. 307) : Head-capsule brownish with reddish tinge; postclypeus and labrum brownish yellow; antennae yellowish brown; pronotum yellowish brown, much paler than head; legs brownish yellow; abdomen light brown above. Head and body densely hairy. Head-capsule subcircular (length to base of mandibles 0.92-0.98; width with eyes 1.21-1.27 mm); Y-suture faintly marked, lateral arms indistinct. Fontanelle plate elongate. Eyes subcircular, large, bulging out (max. diameter 0.42-0.45, min. diameter 0.38-0.40 mm); close to lower margin of head, 0.06-0.08 mm away. Ocelli oval; situated very close to eyes (long diameter 0.17-0.18, short diameter 0.13-0.14 mm, eye-ocellus distance 0.03 mm). Antennae with 15 segments, segment 3 shortest. Postclypeus weakly swollen, narrow, much shorter than 1/2 width. Pronotum subtrapezoidal (length 0.53-0.57, width 0.91-1.00 mm); anterior margin substraight, slightly convex medially, not emarginate; posterior margin clearly emarginate at middle.

SOLDIER (Fig. 308) : Head-capsule reddish yellow to castaneous brown; rostrum reddish basally and darker near tip; antennae pale brown; pronotum much paler than head, anterior lobe darker; legs straw yellow to brownish yellow; abdomen straw yellow to yellowish brown above. Head scantily hairy, with few minute hairs; nasute with a few long and

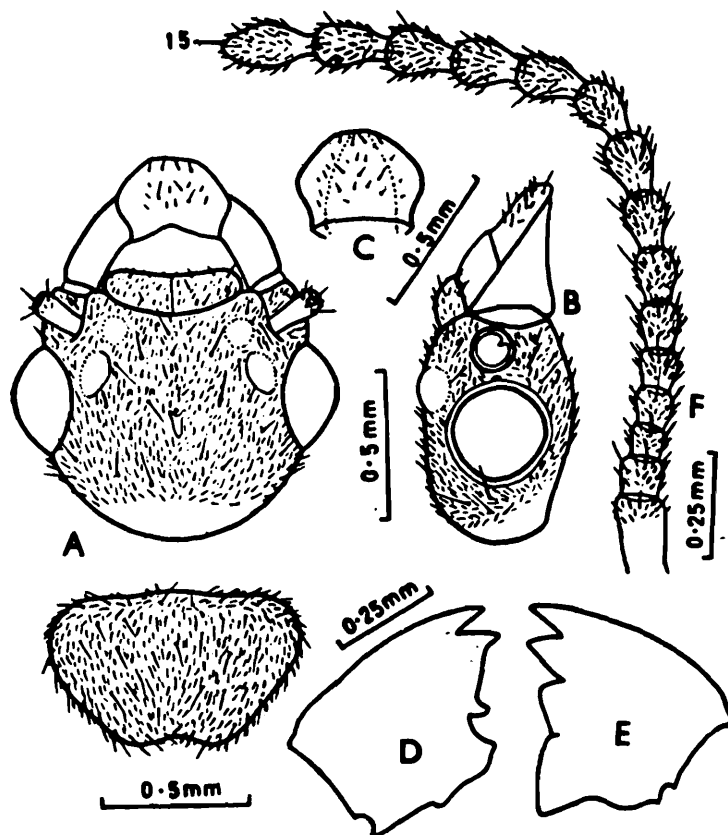


Fig. 307 : *Nasutitermes emersoni*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Labrum. (D)-(E) Left and right mandibles. (F) Antenna. (After Akhtar, 1975).

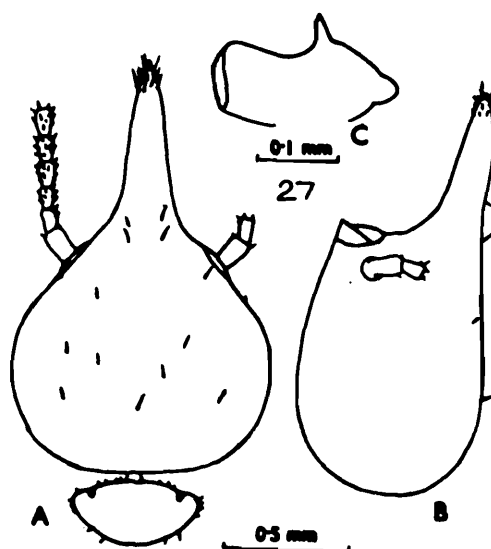


Fig. 308 : *Nasutitermes emersoni*. Soldier (paralectotype). (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Right mandible.

several short hairs; pronotum with a few short hairs on anterior margin and one or two longer ones on lateral margins; tergites and sternites with a few long bristles and many shorter hairs. Total body-length 3.3-4.0 mm. Head pear-shaped, slightly longer than wide; posterior margin straight (length with nasute 1.43-1.70, length without nasute 0.87-1.05, max. width 0.83-1.05 mm); in profile almost straight, rostral hump faint. Rostrum slightly conical; a little longer than half head-length without nasute (0.60-0.65 mm). Antennae with 12 segments, segment 3 subequal to or a little longer and thinner than 2. Mandibles vestigial, each with a small, apical process. Pronotum saddle-shaped (length 0.13-0.25, width 0.41-0.53 mm); anteriorly indistinctly emarginate, posteriorly substraight.

WORKER : Head-capsule pale brown; rest of body straw coloured. Head sparsely hairy; abdominal tergites with several short hairs and sternites with long and short hairs. Total body-length 3.5-4.5 mm. Head subcircular (length to base of mandibles 0.80-0.85, max. width 0.90-1.00 mm). Fontanelle plate longish. Antennae with 13 segments; segment 3 subequal to 2. Postclypeus swollen, length less than 1/2 width. Pronotum saddle-shaped (length 0.25, width 0.50-0.65 mm); anterior margin distinctly notched, posterior margin straight.

Distribution : BANGLADESH.

289. *Nasutitermes fabricii* Krishna

(Fig. 309)

Nasutitermes fabricii Krishna :

1965. Krishna. *Ent. Medd.*, **34** : 107-109. S only. Holotype : S, in Zoologisk. Mus., Copenhagen. Type-locality : Little Nicobar, Andaman and Nicobar Isl., India.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 35.

1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 98.

IMAGO : Unknown.

SOLDIER (Fig. 309) : Head-capsule pale brownish yellow; rostrum light brown; antennae, pronotum and legs pale yellowish. Head densely hairy with coat of short, curved hairs and a few longer bristles; rostrum hairy near tip only; pronotum with a few hairs. Head-capsule pear-shaped

(length with rostrum 1.28, max. width 0.69 mm); in profile depressed at base of rostrum and convex behind. Rostrum weakly conical, thick at base (length 0.49 mm) and more depressed than head. Antennae with 11 segments; segment 3 longer than 2. Mandibles small rudimentary; without points or apical processes. Pronotum saddle-shaped; anterior margin faintly indented; posterior margin rounded; length 0.15, max. width 0.38 mm.

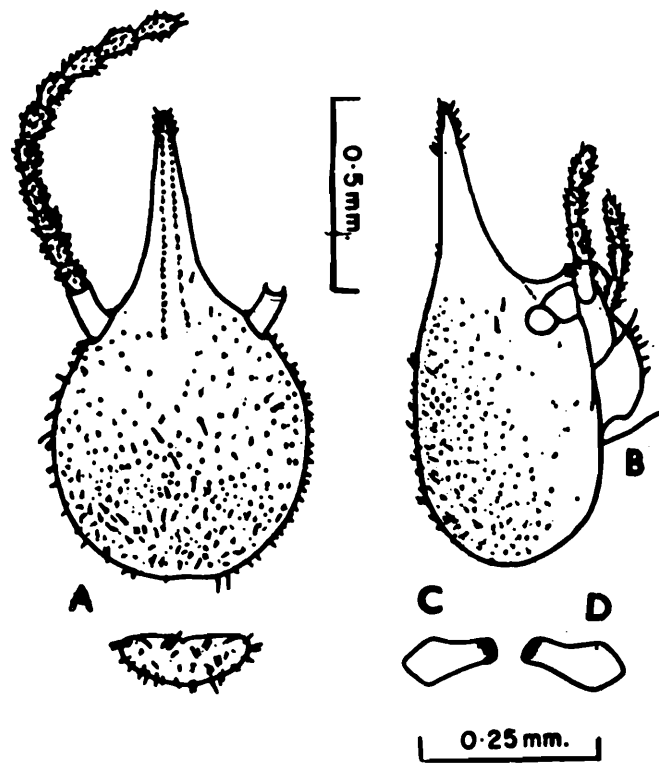


Fig. 309 : *Nasutitermes fabricii*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) and (D) Left and right mandibles (After Krishna, 1965a).

Distribution : INDIA : Andaman and Nicobar Islands : Little Nicobar (type-locality).

Remarks : Krishna (1965a) described this species under the genus *Nasutitermes* but the description and figures give the impression of it belonging to the *Subulitermes*-group of genera. Ahmad (1968) has described a number of new genera related to the *Subulitermes* including *Eleanoritermes* which has been separated from others on the basis of 11 segmented antennae, densely hairy head and lateral sides of head bulging, in soldier. The soldier of *N. fabricii* also has densely hairy head, 11-segmented antennae and somewhat rounded sides and Krishna (1965a)

compared the species with *N. mollis* Light and Wilson from the Philippines as it comes closest to it for its minute size, its small number of antennal segments and densely pilose head. Possibly both these species belong to the genus *Eleanoritermes*, but they are kept as such since the types could not be examined. All other *Nasutitermes* have 12 to 14-segmented antennae and sparsely hairy head.

290. ***Nasutitermes fletcheri*** (Holmgren and Holmgren)

(Synonym : *Fletcheritermes salemensis* Sen-Sarma)

(Fig. 310)

1. *Eutermes (Eutermes) fletcheri* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. Agric. India*, **5** : 161-162. S and W. Lectotype : S, in FRI. Type-locality : Shevaroy Hills, Tamil Nadu, India.

2. *Nasutitermes fletcheri* (Holmgren and Holmgren) :

1958. Ahmad, *Biologia*, Lahore, **4** : 158.

1958. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 5, 28-31. Synonymy, description and lectotype designation.

1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 208, 211, 212.

1983. Sen-Sarma and Verma, *Orient, Insects*, **17** : 98.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 207, 208, 216-219. Imago described.

3. *Fletcheritermes salemensis* Sen-Sarma (New synonymy) :

1965. Sen-Sarma, *Proc. zool. Soc., Calcutta*, **18** (2) : 143-148.

4. *Nasutitermes salemensis* (Sen-Sarma) :

1969. Ahmad, *Pakistan J. Zool.*, **1** (2) : 181-182.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 35.

1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 100.

IMAGO Q (Fig. 310A) : Head-capsule light reddish brown; postclypeus, labrum and antennae light golden yellow; pronotum pale yellowish brown; abdominal tergites light brown; legs yellowish. Head and body moderately hairy. Total body-length 11.8 mm. Head-capsule subcircular (length to

base of mandibles 1.05, width with eyes 1.20 mm). Fontanelle plate elongate, bluntly Y-shaped (length 0.15 mm). Eyes moderately large, circular, and moderately bulging out (max. diameter 0.32 mm). Ocelli oval (long diameter 0.15, short diameter 0.08 mm); from eyes placed at a distance of short diameter (0.08 mm). Antennae broken, only 11 segments present; segment 3 slightly longer than 2, 4 shortest. Postclypeus swollen, semicircular (length 0.20, width 0.50 mm), hairy. Pronotum subtrapezoidal (length 0.55, width 0.98 mm); weakly notched at anterior margin and faintly incurved at posterior margin.

SOLDIER (Fig. 310 B, C) : Head-capsule castaneous brown, fontanelle gland area paler; rostrum darker than head; antennae brownish; pronotum slightly paler than head; abdominal tergites straw coloured, sternites whitish. Head with a pair of long hairs at vertex, a pair at base of rostrum and one or two extra hairs near base of rostrum; otherwise with numerous, minute hairs all over; rostrum with a tuft of short hairs at tip; pronotum with numerous minute hairs; each abdominal tergite with a long hair on lateral margin and a pair at middle, otherwise covered with numerous minute hairs; sternites with many long and short hairs. Total body-length

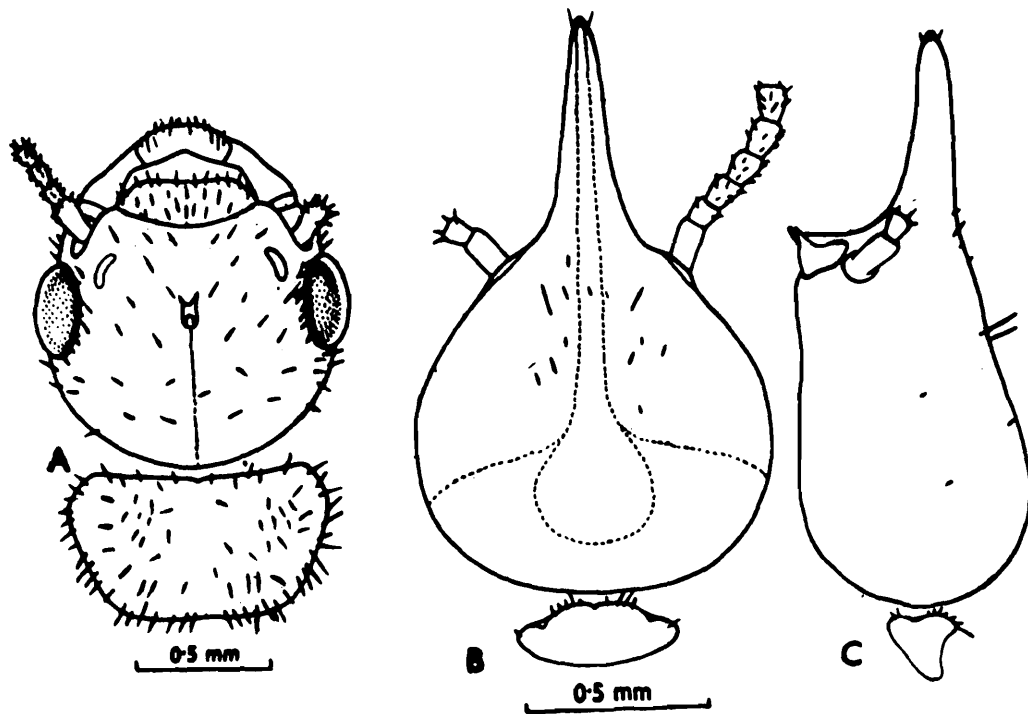


Fig. 310 : *Nasutitermes fletcheri*. Imago. (A) Head and pronotum, dorsal view. Soldier. (B) Head and pronotum, dorsal view. (C) Same, side view.

3.2-4.0 mm. Head-capsule pear-shaped; with a minute projection on either side of rostrum base (length with rostrum 1.40-1.52, length without rostrum 0.84-0.95, max. width 0.83-0.91 mm); in profile straight, with a weak rostral hump. Rostrum short, almost cylindrical (length 0.50-0.58 mm, rostrum/head-length index 0.56-0.58). Antennae with 12 segments; segment 3 about one-and-a-half times longer than 2. Mandibles vestigial, each with a short, brown, spine-like process. Pronotum saddle-shaped (length 0.17-0.22, width 0.40-0.53 mm); anterior margin very faintly emarginate, posterior margin straight.

Worker : Head-capsule brown; antennae and labrum stramineous; pronotum a little paler than head; abdomen yellowish white. Head and body moderately hairy with short and long hairs. Total body-length 3.8-5.0 mm. Head-capsule subsquarish (length to base of mandibles 0.85-0.98, max. width 0.95-1.10 mm). Fontanelle plate longish, translucent. Antennae with 13 segments; segment 3 subequal to 2. Postclypeus swollen, hairy; length nearly 1/2 width (length 0.20-0.23, width 0.45-0.50 mm). Pronotum saddle-shaped (length 0.20-0.30, width 0.50-0.65 mm).

Distribution : India : Tamil Nadu, Orissa.

291. *Nasutitermes gardneri* Snyder

(Figs. 311, 312)

1. *Nasutitermes (Subulitermes) gardneri* Snyder :

1933. Snyder, *Proc. U.S. natn. Mus.*, **82** (Art. 16) : 12. S and W. Lectotype : S, in FRI. Type-locality : Rangirum, Darjeeling Dist., West Bengal, India.

2. *Nasutitermes gardneri* Snyder :

1958. Ahmad, *Biologia*, Lahore, **4** : 155.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 5, 31-34. Synonymy, description and lectotype designation.

1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 76-77.

1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 98.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 27, 121-122, map. 3.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO (Fig. 311) : Head-capsule reddish brown; antennae, labrum, postclypeus and legs brownish yellow; pronotum brownish with a faint T-shaped marking in middle; wings pale brown; abdomen brownish above, paler than pronotum and yellowish brown below. Head and body densely hairy with a thick coat of fine hairs and several longer hairs. Wing margins and membrane fairly hairy. Total body-length with wings 16.20-17.8 mm, without wings 8.80-9.00 mm. Head-capsule subcircular, depressed in the region of fontanelle plate (length to base of mandibles 1.20-1.30, width with eyes 1.55-1.60 mm); epicranial suture faintly marked. Fontanelle plate pale brown, elongately oval; a white spot present just anterior to it. Eyes subcircular; situated equidistant from antennae and lower margin of head (max. diameter 0.40-0.43, min. diameter 0.35-0.38 mm). Ocelli broadly oval (long diameter 0.16-0.18, short diameter 0.13-0.15 mm); from eyes placed at a distance of little less than their short diameter (eye-ocellus distance 0.10-0.11 mm). Antennae with 15 segments; segment 3 little shorter and narrower than 2; 4 rounded, shorter than 3; 5 shortest. Postclypeus swollen, hairy (length 0.18-0.20, width 0.50-0.55 mm). Pronotum subtrapezoidal, slightly raised at anterior margin (length 0.83-0.84, width 1.35-1.43 mm); anterior margin faintly incurved, without any notch; posterior margin rounded with a well-marked invagination. Wings fairly hairy in distal half and sparsely so in proximal half; membrane also covered with micrasters; forewing-length 15.50-15.70; hindwing-length 14.5-15.0 mm.

SOLDIER (Fig. 312) : Head-capsule pale brown, fontanelle gland area paler; rostrum reddish brown, brownish at base; antennae straw coloured; pronotum darker than antennae; abdomen creamy white. Head with a pair of long hairs at vertex and a pair at base of rostrum and some minute hairs all over; pronotum with several short and a few long hairs; abdominal tergites each with a long hair laterally and a pair at middle, otherwise densely covered with short hairs; sternites densely hairy with short and long hairs. Total body-length 3.90-5.00 mm. Head-capsule pear-shaped, sides sharply converging in front (length with rostrum 1.53-1.85, length without rostrum 0.95-1.15, max. width 0.88-1.10 mm); in profile faintly incurved and with very weak rostral hump. Rostrum cylindrical to slightly conical (length 0.57-0.70 mm, index rostrum/head-length 0.57-0.70); with a tuft of hairs at tip. Antennae with 13 segments; segment 3 much longer than 2, 4 shortest. Mandibles vestigial, without any spine-

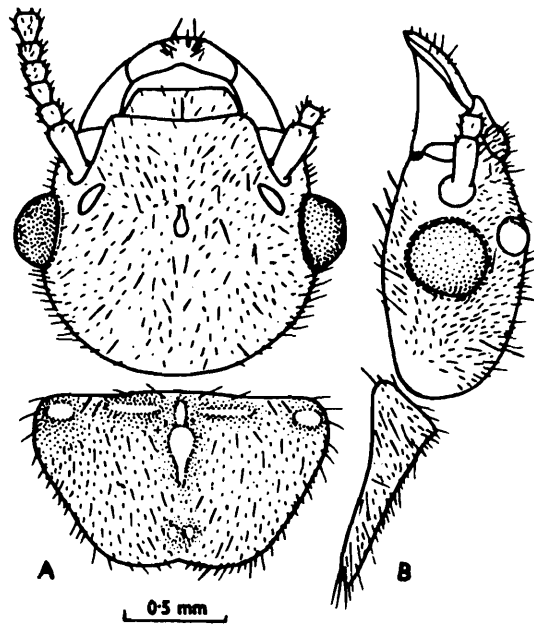


Fig. 311 : *Nasutitermes gardneri*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (After Bose, in press).

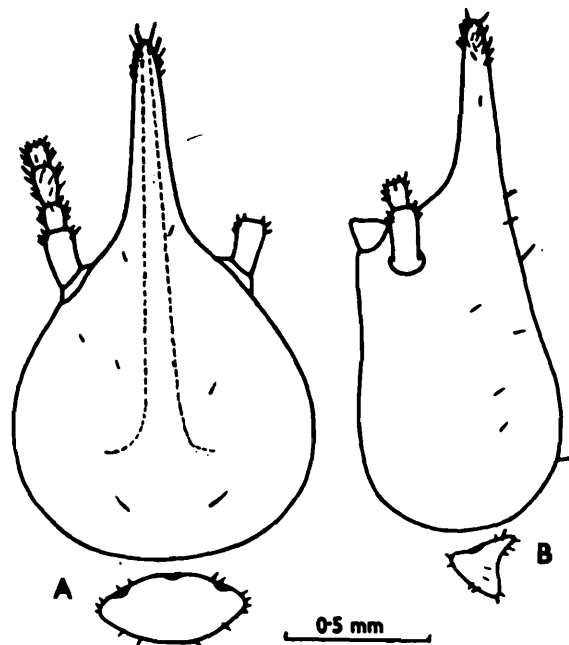


Fig. 312 : *Nasutitermes gardneri*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view.

like process. Pronotum saddle-shaped (length 0.20-0.25, width 0.50-0.58 mm); anterior margin round with a faint emargination medially; posterior margin straight.

WORKER : Head-capsule pale brown to brown; antennae pale yellow; postclypeus paler than head; body creamish white. Head and body moderately hairy. Total body-length 4.5-5.5 mm. Head-capsule subsquarish (length to base of mandibles 1.05-1.15, max. width 1.28-1.38 mm). Fontanelle plate longish (0.20 mm), translucent. Antennae with 14 segments; segment 3 as long as or slightly shorter than 2. Postclypeus weakly swollen; length slightly less than 1/2 width (length 0.18-0.20, width 0.58-0.60 mm). Pronotum saddle-shaped (length 0.35-0.38, width 0.65-0.78 mm); anterior margin roundish, not emarginate; posterior margin straight.

Distribution : INDIA : West Bengal and North-eastern states of Assam, Arunachal Pradesh and Manipur. BHUTAN.

292. *Nasutitermes garoensis* Roonwal and Chhotani

(Figs. 313, 314)

Nasutitermes garoensis Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(4) : 297, 397-384, S and W. Holotype : S, In ZSI. Type-locality : Rongrengiri (Garo Hills), Meghalaya, India. Type examined.
1965. Mathur and Thapa, *Bull. Ent.*, No. 6 : 9-10.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 79.
1975. Akhtar, *Bull. Dept. zool. Univ. Panjab (N.S.)*, Art. 7 : 140.
1975. Chhotani, *Orient. Insects*, **9**(2) : 152, 153-154. Im described.
1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 77, 78, 81.
1977. Lahiri, Ghosh and Biswas, *Bull. Meghalaya Sci. Soc.*, **2** : 39.
1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 99.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 27, 123-124.
1984. Verma, *Indian J. For.*, **7**(1) : 82.
1985. Chhotani and Bose, *Rec. zool. Surv. India*, **82** : 89.
- In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO (Fig. 313) : Head-capsule dark brown; postclypeus, labrum, antennae and legs yellowish brown; abdomen above brown, paler than

head, below pale yellowish brown. Head and body fairly densely hairy with short and long hairs. Total body-length with wings c 13.50-15.50, without wings c 6.80-8.90 mm. Head-capsule subcircular, with eyes wider than its length to base of mandibles (length to tip of labrum 1.40-1.67, length to base of mandibles 0.90-1.10, width with eyes 1.20-1.37 mm); epicranial suture distinct; dorsum flat. Fontanelle plate elongate, Y-shaped (length 0.09-0.10, width 0.04-0.05 mm). Eyes moderately large (max. diameter 0.38-0.50 mm), subcircular. Ocelli suboval (length 0.17-0.19, width 0.13-0.15 mm); situated very close to eyes (eye-ocellus distance about 1/4 of their width, 0.02-0.04 mm). Postclypeus weakly swollen, length about 1/3 of width (length 0.17, width 0.57-0.60 mm); anterior margin weakly incurved. Antennae with 15 segments; segment 3 subequal to or slightly shorter than 2 : 4 subequal to or slightly shorter than 3 ; 5 shortest. Pronotum flat, weakly raised anteriorly at middle and with a faint median notch; posterior margin convex, faintly to appreciably

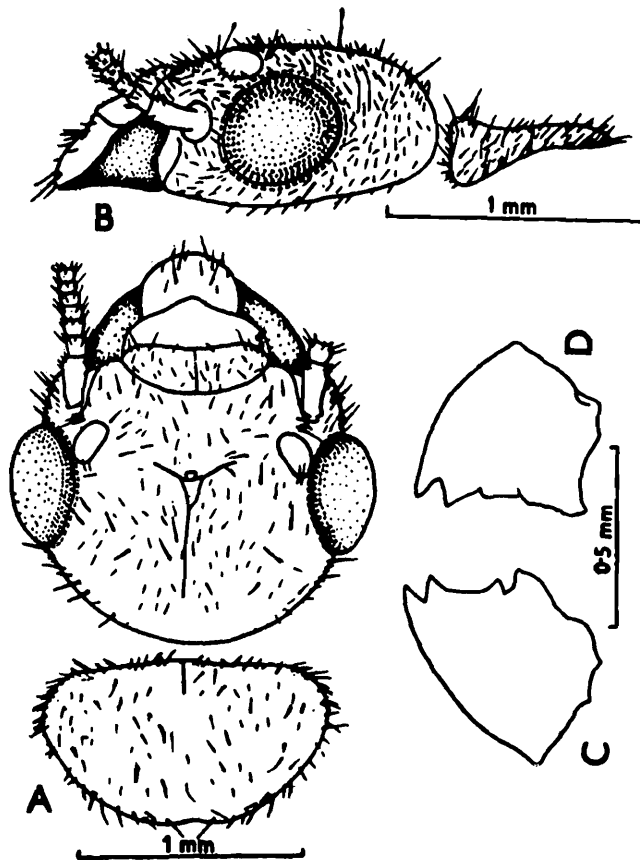


Fig. 313 : *Nasutitermes garoensis*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) and (D) Left and right mandibles. (After Chhotani, 1975).

incurved medially (length 0.60-0.68, width 0.97-1.13 mm). Wings hairy, punctate, wing venation as in genus. Forewing-length 10.5-13.00, hindwing-length 9.50-12.20 mm. Microsculpturing consists of 1-2 rows of thin, long, pointed papillae ($6-9 \mu\text{m} \times 2-3 \mu\text{m}$) on anterior margin and a row of smaller ones on posterior margin and thin asteroid micrasters ($5-6 \mu\text{m} \times 3-6 \mu\text{m}$; density 6000-8000/ mm^2).

SOLDIER (Fig. 314) : Head-capsule brownish yellow; rostrum dark brown; antennae pale brown; thorax and abdominal tergites brownish; legs pale brownish yellow. Head with several short and 3 pairs of long hairs; thorax with several short and abdomen with several short and a few long hairs. Total body-length c 3.30-4.50 mm. Head pyriform; width subequal to length without rostrum or slightly more (length with rostrum 1.40-1.57, length without rostrum 0.85-0.93, max. width 0.85-0.93 mm, index width/length without rostrum 0.94-1.03). Rostrum subcylindrical and slender (length 0.57-0.67 mm); tip with several short and 2 or 3 longer hairs. Antennae with 12 segments; segment 3 longer than 2 and club-shaped; 4 subequal to 3. Mandibles small, rudimentary; each with a spine-like, lateral process. Postmentum brown, subhexagonal, max. width subequal to length (0.30 mm). Pronotum saddle-shaped; anterior margin

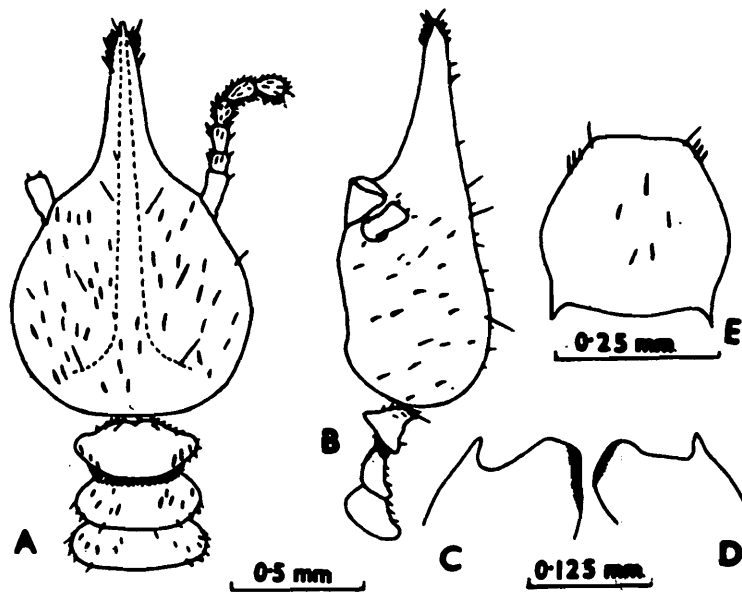


Fig. 314 : *Nasutitermes garoensis*. Soldier. (A) Head and thorax, dorsal view. (B) Same, side view. (C), (D) Left and right mandibles. (E) Postmentum. (Ex Roonwal and Chhotani, 1962c).

with a weak, median invagination (length 0.13-0.18, width 0.40-0.48 mm). Mesonotum slightly narrower and metanotum slightly wider than pronotum.

WORKER : Dimorphic. *Worker major* : Head-capsule yellowish to brownish yellow; antennae, legs, labrum and thorax pale yellow; abdomen translucent but appears greyish due to intestinal contents. Head and body moderately densely hairy. Total body-length 3.5-4.8 mm. Head-capsule subsquarish; a little broader than long (length to base of mandibles 0.93-1.03, max. width 1.03-1.10 mm) ; Y-suture hyaline. Fontanelle plate, suboval, translucent. Antennae with 13 segments; segment 3 subequal to or shorter than 2; 4 longer than 3. Postclypeus swollen, length less than half of width. Pronotum saddle-shaped; anterior margin rounded and with a medial notch (length 0.23-0.27, width 0.50-0.57 mm). Mesonotum narrower than pronotum and metanotum wider; posterior margin of former convex and of latter substraight or weakly convex, without notch. *Worker minor*. Resembles worker major but is a little smaller (Total body-length 3.2-3.5, length of head to base of mandibles 0.80-0.83, max. width of head 0.85-0.88, length of pronotum 0.13 and max. width of pronotum 0.40 mm).

Distribution : INDIA : Assam, Meghalaya, Arunachal Pradesh, West Bengal. BHUTAN.

293. *Nasutitermes horni* (Wasmann)

(Figs. 315)

1. *Eutermes inanis* subsp. *Horni/horni* Wasmann :

1902. Wasmann, *Deutsch. Ent. Zeitschr.*, **46**(1) : 80 (locality only).

1902. Wasmann, *Zool. Jb. Syst.*, **17** : 137. S and W. Lectotype : S. in NHM (designated by Emerson, 1957 but not published). Type-locality : Bandarawella, Sri Lanka.

2. *Nasutitermes horni* (Wasmann) :

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 5, 36. See for synonymy.

1969. van Boven, *Publ. nat.-hist. Genootschap Limburg*, **19** : 51.

IMAGO : Unknown.

SOLDIER (Fig. 315) : Head-capsule brownish yellow; rostrum pale reddish; antennae pale brown; thorax, legs and abdomen yellowish. Head with minute hairs all over and a pair of longer hairs at vertex and a pair a little below base of rostrum ; rostrum with minute hairs all over and a few longer ones at tip; pronotum with short and long hairs on anterior margin and 1 or 2 long hairs on lateral margins; abdomen with long and short hairs all over tergites and sternites. Total body-length 3.20-3.60 mm. Head-capsule broadly pear-shaped; width only little less than length without rostrum (length with rostrum 1.53, length without rostrum 0.95-1.00, width 0.88-0.90 mm); in profile a little depressed at base of rostrum; rostral hump absent. Rostrum subcylindrical, not raised at tip (length 0.53-0.58 mm; rostrum/head-length index 0.53-0.60). Antennae with 13 segments ; segment 3 little longer than 2; 4 subequal to 3. Mandibles vestigial, each with fairly long, spine-like process. Pronotum saddle-shaped; weakly emarginate medially at anterior margin ; posterior margin straight (length 0.15-0.20, width 0.40-0.43 mm).

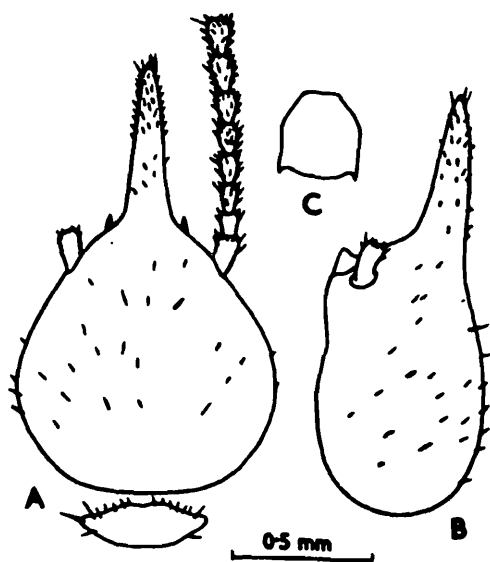


Fig. 315 : *Nasutitermes horni*. Lectotype. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Postmentum.

WORKER : (Not seen). According to Wasmann 1902, it is somewhat larger than soldier (3.5-4.0 mm); white with reddish yellow head on which there is a white I-shaped line in middle (probably epicranial suture) dividing it. Antennae with 13 segments; segments rounded, last segments hardly longer than wide. Postclypeus transverse, swollen, with a middle line. Anterior lobe of pronotum with a distinct notch in middle.

Lectotype : In NHM, Maastricht, there is a pin holding 3 soldier specimens with the following labels. 1. Rb. Horn; 2. Bandarawella, Ceylon; 3. *Eutermes horni* Wasm Type. The first two labels are in black ink and the third in red ink. Emerson designated the top specimen as the Lectotype and the remaining as Paralectotypes in 1957 and there is a label to that effect on the same pin. Since Prof. Emerson did not publish any report on this designation, its figure and measurements are given here.

In the Lectotype, antennae are broken, the right has 8 and left only 7 segments; it measures as follows : Total body length 3.60, head-length with rostrum 1.53, head-length without rostrum 1.0, head-width 0.90, length of rostrum 0.53, length of pronotum 0.20 and width of pronotum 0.43 mm.

Distribution : SRILANKA.

294. *Nasutitermes indicola* (Holmgren and Holmgren)

(Synonyms *Nasutitermes beckeri* Prashad and Sen-Sarma and *Eutermes (Eutermes) processionarius* Schmitz)

(Figs. 316,317)

1. *Eutermes indicola* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem Dept. Agric. India*, **5** (3) : 161. S and W. Lectotype : S, in FRI. Type-locality : Anamalai Hills, Tamil Nadu, India.

2. *Nasutitermes indicola* (Holmgren and Holmgren) :

1958. Ahmad, *Biologia*, Lahore, **4** : 157.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 5, 35, 36-39. Synonymy, description and lectotype designation.

1971. Chhotani, *Rec. zool. Surv. India*, **63** : 223-229, 3 pls. Im described.

1979. Chhotani and Bose, *Zoologiana*, No. 2 : 25, fig. 6.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 207, 208, 219-222.

3. *Nasutitermes beckeri* Prashad and Sen-Sarma : New synonymy.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. (10.23) : 4, 5, 8-13.

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 35.

1981. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **47** (3) : 352, 353.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 207, 208, 210-212.

4. *Eutermes (Eutermes) processionarius* Schmitz : :

1924. Schmitz, *Zool. Anz*, **59** (11-12) : 302-304, fig 3, II A and II B (p. 301).
(Spelt as *processionarins*, but actually is *processionarius*).

5. *Nasutitermes processionarius* (Schmitz) :

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 4, 57-58, 60.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 207, 223-244.

IMAGO (Fig. 316) : Head-capsule dark castaneous brown ; antennae, labrum, postclypeus and thorax yellowish brown ; abdominal tergites dark brown ; sternites pale brown medially, somewhat darker laterally, rest of abdomen whitish in Q. Head-capsule, pronotum, wing scales, abdominal tergites and sternites densely hairy. Total body-length with wings 16.00-17.50, without wings 6.70-8.80 mm and 22.0-28.2 mm (Q), 8.50 mm (K). Head-capsule subcircular (length to base of mandibles 1.08-1.18, width with eyes 1.30-1.47 mm). Fontanelle plate whitish, elongate and narrow, 0.10-0.13 mm long. Eyes large, broadly oval (max. diameter 0.43-0.50, min. diameter 0.40 mm). Ocelli oval, translucent, situated very close to eyes (long diameter 0.15-0.19, short diameter 0.13-0.15, eye-ocellus distance 0.03-0.05 mm). Antennae with 15 segments; segment 3 subequal to or slightly longer than 2, 4 subequal to 5. Postclypeus swollen, hairy ; length about 1/3 of width (length 0.20-0.21, width 0.57-0.58 mm). Pronotum subtrapezoidal (length 0.65-0.80, width 1.18-1.40 mm); anterior margin straight, without notch; posterior margin weakly notched.

SOLDIER (Fig. 317) : Head-capsule brown, fontanelle gland area slightly paler; rostrum dark brown with reddish tinge; antennae, legs and body pale brown. Head with a few long hairs, microscopic hairs rather sparse; pronotum with several minute hairs ; abdominal tergites with a long hair on either side and a pair of hairs at middle, otherwise densely covered with minute hairs; sternites with a few long and numerous short hairs. Total body-length 3.00-4.50 mm. Head-capsule pear-shaped (length with rostrum 1.45-1.70, length without rostrum 0.83-1.00, max. width 0.73-0.90 mm); in profile incurved, with a prominent rostral hump. Rostrum long, slender, cylindrical and narrow (length 0.55-0.80 mm, rostrum/head index 0.58-0.74); with a tuft of hairs at tip. Antennae with

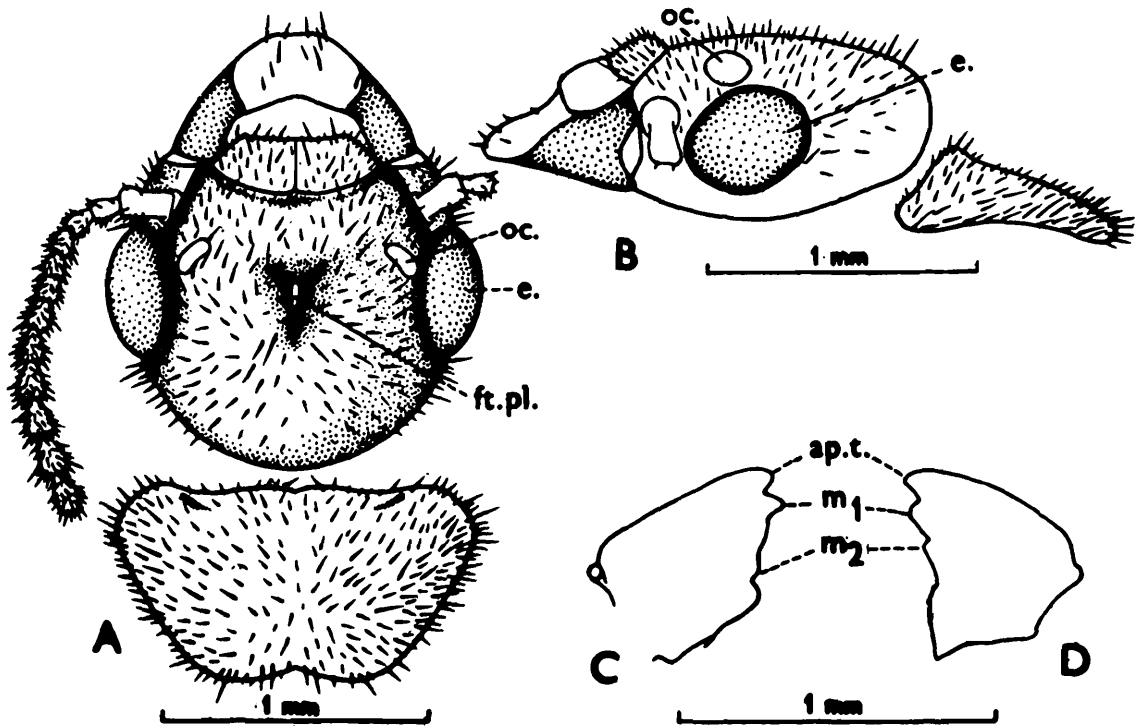


Fig: 316 : *Nasutitermes indicola*. Imago, Q. (A) Head and pronotum, dorsal view. (B) Same, side view. Worker. (C) and (D) Left and right mandibles. (After Chhotani, 1971).

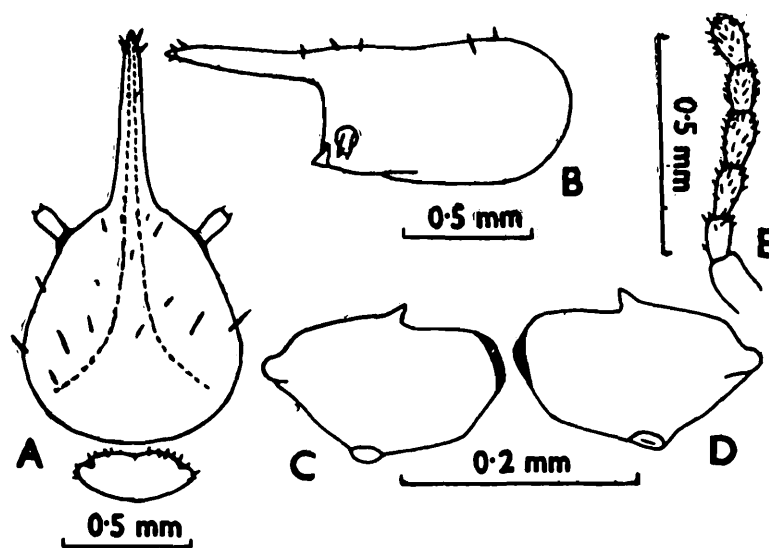


Fig. 317 : *Nasutitermes indicola*. Paralectotype soldier. (A) Head and pronotum, dorsal view. (B) Head, side view (C), (D) Left and right mandibles. (E) Basal part of antenna.

12 segments, segment 3 slightly longer than 2. Mandibles vestigial; each with a short spine-like process. Pronotum saddle-shaped (length 0.15-0.20, width 0.45-0.50 mm); anterior margin rounded with a faint, median emargination ; posterior margin convex.

WORKER : Dimorphic. *Worker major* : Head-capsule brown; antennae, labrum and legs pale yellow; postclypeus pale brown; abdomen creamish. Head and body densely hairy. Total body-length 3.00-4.90 mm. Head-capsule subcircular (length to base of mandibles 0.97-1.00, max. width 1.07-1.10 mm); epicranial suture distinct. Fontanelle plate longish, translucent. Antennae with 13 segments, segment 3 very small, shortest. Postclypeus swollen, hairy; length less than 1/2 width. Pronotum strongly saddle-shaped; anterior margin distinctly notched, posteriorly convex (width 0.50-0.60 mm). *Worker minor* : Similar to worker major but for its smaller size. Total body-length 3.00-3.90, head-length to base of mandibles 0.80-0.83, max. head-width 0.83-0.90, pronotum width 0.45-0.58 mm.

Distribution : INDIA : Karnataka, Kerala and Tamil Nadu states.

295. *Nasutitermes jalpaigurensis* Prashad and Sen-Sarma

(Fig. 318)

Nasutitermes jalpaigurensis Prashad and Sen-Sarma :

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 5, 38, 39-41, 43. Holotype : S, in FRI. Type-locality : Jalpaiguri (Teesta For. Div.), West Bengal, India.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 132, 136-137.

1977. Sen-Sarma and Thakur, *Indian For. Rec (N.S.) Ent.*, 13 (1) : 6, 31, 54.

1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 99.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 27, 124-126.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER (Fig. 318) : Head-capsule pale brown, fontanelle gland area paler; rostrum brown, darker distally; antennae pale brown; pronotum light brownish; abdomen above with brownish tinge; legs and sternites yellowish white. Head with numerous minute hairs and a pair of long

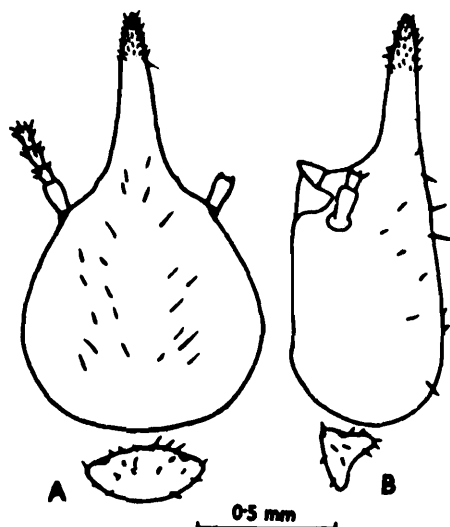


Fig. 318 : *Nasutitermes jalpaigurensis*. Paratype soldier. (A) Head and pronotum, dorsal view. (B) Same, side view.

hairs at vertex, a pair at base of rostrum and few more nearby; rostrum with a few long and short hairs at tip; pronotum with numerous short hairs; abdominal tergites with a pair of long hairs at middle and one on either side laterally, otherwise with numerous short hairs; sternites with many short and long hairs. Total body-length 3.2-4.1 mm. Head-capsule pear-shaped (length with rostrum 1.28-1.62, length without rostrum 0.82-1.00, max. width 0.70-1.03 mm); in profile not depressed, rostral hump weakly indicated. Rostrum conical (length 0.55-0.60, index rostrum-length/head-length 0.61-0.67). Antennae with 12 segments, segment 3 subequal to or slightly longer than 2. Mandibles vestigial; each with a short, brown, spine-like process. Pronotum saddle-shaped (length 0.13-0.20, width 0.39-0.51 mm); anterior margin slightly emarginate, posterior margin straight.

WORKER : Head-capsule deep straw-coloured; antennae and labrum a little paler than head; pronotum stramineous; abdomen with brownish tinge above and yellowish white below. Head moderately hairy; abdomen fairly densely hairy. Total body-length 3.5-4.5 mm. Head subsquarish (length to base of mandibles 1.10, max. width 1.15 mm). Fontanelle plate elongate, translucent. Antennae with 13 segments; segment 3 shortest. Postclypeus swollen, hairy; length almost half width. Pronotum saddle-shaped (length 0.15, width 0.50-0.60 mm); anterior margin notched medially, posterior margin almost straight.

Distribution : INDIA : West Bengal, Tripura and Arunachal Pradesh.
BANGLADESH.

296. **Nasutitermes kali** Roonwal and Chhotani

(Fig. 319)

Nasutitermes kali Roonwal and Chhotani :

1962. Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 297, 384-388. S and W (maj. & min.). Holotype : S, in ZSI. Type-locality: Umsa Nongkharai, Khasi and Jaintia Hills, Meghalaya, India. Type examined.

1965. Mathur and Thapa, *Bull. Ent.*, No. 6 : 10.

1965. Roonwal and Chhotani, *J. Bombay nat. Hist. Soc.*, **62** : 21.

1977. Lahiri, Ghosh and Biswas, *Bull. Meghalaya Sci. Soc.*, **2** : 38.

1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 99.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER (Fig. 319) : Head-capsule brownish yellow, rostrum darker; antennae pale brown; thorax and abdomen pale brownish yellow. Head

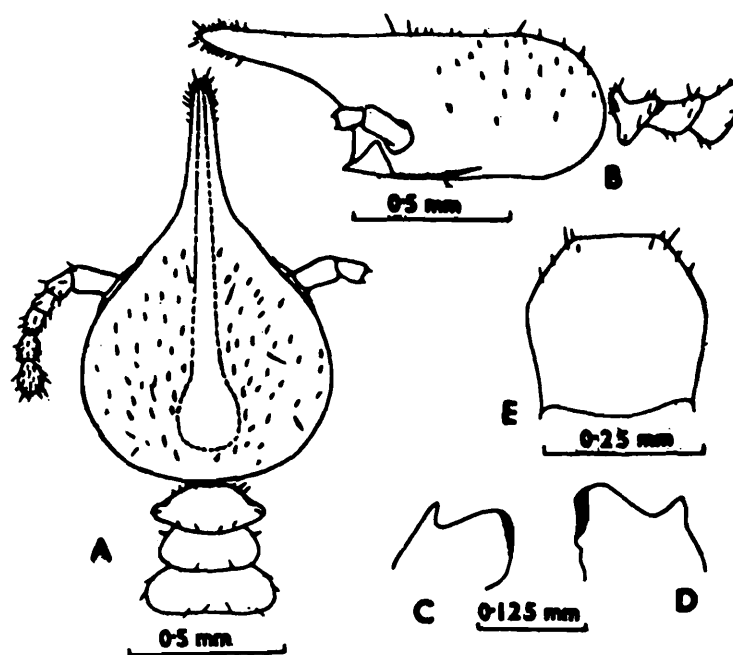


Fig. 319 : *Nasutitermes kali*. Soldier. (A) Head and thorax, dorsal view., (B) Same, side view, (C) and (D) Left and right mandibles. (E) Postmentum. (Ex Roonwal and Chhotani, 1962c).

with several short and 3 pairs of long hairs; thorax and abdomen also with several short and a few long hairs. Total body-length c 3.0-3.8 mm. Head-capsule pyriform, slightly longer than wide (length with rostrum 1.30-1.58, length without rostrum 0.78-0.83, max. width 0.73-0.90 mm). Rostrum subcylindrical and slender; tip hairy with short and 2 long hairs. Antennae with 11-12 segments; segment 3 in 11-segmented antennae subdivided, in 12-segmented one subequal to 2. Mandibles small, rudimentary; each with a lateral, spine-like process. Postmentum subhexagonal; as long as wide. Pronotum saddle-shaped; length 0.10-0.18, max. width 0.35-0.48 mm; anterior margin convex with a weak, median notch; posterior margin convex. Mesonotum narrower than pronotum; posterior margin straight. Metanotum as wide as or a little wider than pronotum; posterior margin substraight or faintly incurved.

WORKER : Dimorphic. *Worker major* : Head-capsule yellowish to brownish yellow; antennae, labrum and legs pale yellow to yellow; thorax a little paler than head; abdomen translucent with greyish intestinal contents showing through. Head and body fairly densely hairy. Total body-length c 3.4-3.7 mm. Head-capsule subsquarish; a little broader than long (length to base of mandibles 0.83-0.90, max. width 0.90-0.97 mm). Fontanelle plate long, suboval, prominent. Antennae with 13 segments; segment 3 shortest. Postclypeus swollen, pilose; length less than half of width. Pronotum as in soldier but a little larger (length 0.20, max. width 0.40-0.47 mm). *Worker minor* : Resembles worker major but is generally smaller. Total body-length 2.8-3.00, head-length to base of mandibles 0.70, max. head-width 0.80, length of pronotum 0.13-0.16, max. width of pronotum 0.37 mm.

Distribution : INDIA : Meghalaya.

297. *Nasutitermes krishna* Roonwal and Bose

(Fig. 320)

Nasutitermes krishna Roonwal and Bose :

1970. Roonwal and Bose, *Rec. zool. Surv. India*, **62** (3& 4) : 120, 157-161. S, W (maj. & min.) Holotype : S, in ZSI. Type-locality : Kwate-tukwage, Little Andamans, India. Types examined.
1980. Bose, *Rec. zool. Surv. India*, **77** : 105.
1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 99.

IMAGO : Unknown.

SOLDIER (Fig. 320) : Head-capsule brownish yellow; rostrum reddish brown ; antennae and body of same colour as head. Head with several minute and two pairs of long hairs, one pair on vertex and one pair at base of rostrum; thorax and abdomen with many short and a few long hairs. Total body-length 3.4-4.0 mm. Head broad, pear-shaped, width slightly more than length without rostrum (length with rostrum 1.5-1.60, length without rostrum 0.93-1.00, width 0.98-1.10 mm, index width/length 1.03-1.14); in profile faintly incurved, without hump. Rostrum subcylindrical and slender; tip with several short and a pair of long hairs; length (0.55-0.68 mm) much less than head-length without rostrum (index rostrum-length/head-length 0.60-0.76). Antennae with 12 segments; segment 3 shortest. Mandibles vestigial, each with a short spine-like process in middle of outer margin. Postmentum hexagonal, short (length 0.25-0.30, max. width 0.30-0.33, min. width 0.25-0.28 mm). Pronotum saddle-shaped; with a few short hairs on margins; length 0.16-0.18, width 0.40-0.48 mm. Mesonotum (width 0.33-0.38 mm) narrower and metanotum (width 0.48-0.50 mm) wider than pronotum. Abdomen elongate, posterior tergites with 2 pairs of long hairs and several short hairs, sternites with many long and short hairs.

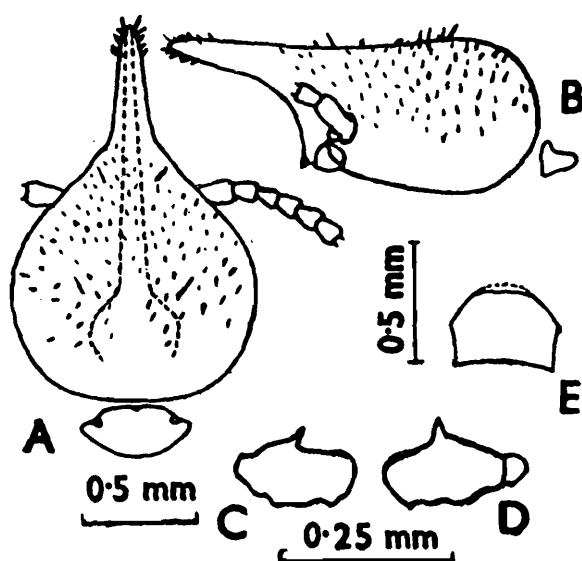


Fig. 320 : *Nasutitermes krishna*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C), (D) Left and right mandibles. (E) Postmentum. (Ex Roonwal and Bose, 1970)

WORKER : Dimorphic. *Worker major* : Head-capsule yellow to reddish yellow; antennae, postclypeus and thorax yellowish; anteclypeus, legs and abdomen pale creamish yellow. Head and body moderately hairy. Total body-length 3.8-4.9 mm. Head-capsule subsquarish, length to base of mandibles 0.90-0.93, max. width 1.00-1.10 mm. Fontanelle plate triangularly elongate, translucent. Antennae with 13 segments; segment 3 shortest. Postclypeus swollen, sparsely hairy; length a little less than half of width. Pronotum saddle-shaped; length 0.23-0.25, width 0.53-0.58 mm. *Worker minor* : Similar to worker major but smaller. Total body-length 3.0-4.10, head-length to base of mandibles 0.70-0.83, max. width of head 0.80-0.93, pronotum-length 0.15-0.23, pronotum-width 0.40-0.48 mm.

Distribution : INDIA : Andaman and Nicobar Islands : North, South and Little Andaman Islands.

298. *Nasutitermes lacustris* (Bugnion)

(Figs. 321,322)

1. *Eutermes lacustris* Bugnion :

1912. Bugnion, *Rev. Suisse. Zool.*, **20** : 487-505, 2 pls. S and W. Repository of types not known. Type-locality : Ambalangoda, Sri Lanka.

1958. Ahmad, *Biologia*, Lahore, **4** : 147, 153.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 4, 5, 43-46. See for Synonymy, descriptions, etc.

IMAGO (Fig. 321) : Head-capsule blackish brown; postclypeus a little paler than head; antennae and labrum brown; abdominal tergites dark brown, paler than head; legs and sternites pale brown. Head and body densely hairy with short and long hairs. Total body-length without wings 7.5-8.0 mm. Head-capsule subsquarishly round (length to base of mandibles 1.15-1.20, width with eyes 1.35-1.40 mm); slightly depressed at middle; epicranial suture indistinct. Fontanelle plate long, narrow, translucent. Eyes broad, oval; strongly projecting out (max. diameter 0.50, min. diameter 0.42 mm). Ocelli oval to roundish (long diameter 0.18-0.20); situated very close to eyes, almost touching ocular sclerite (eye-ocellus distance 0.023-0.025 mm). Antennae with 15 segments; segments 2 and 3 subequal. Postclypeus very weakly swollen; length much less than 1/2

width. Pronotum subtrapezoidal (length 0.60-0.65, width 1.10-1.15 mm); slightly raised anteriorly; anterior margin substraight not incised, posterior margin deeply invaginated medially. Wings grayish; membrane covered with short hairs and thin, non-asteroid (4-7 arms) micrasters; forewing-length 14.25-14.75 mm, hindwing-length 13.10-13.60 mm.

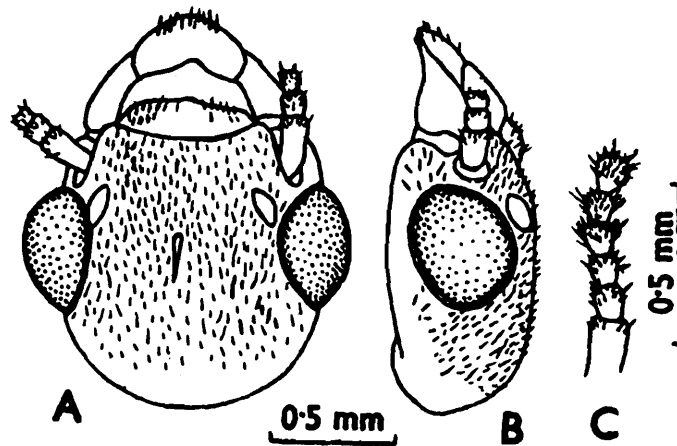


Fig. 321 : *Nasutitermes lacustris*. Imago. (A) Head, dorsal view. (B) Same, side view. (C) Basal part of antenna. (Ex Prashad and Sen-Sarma, 1959).

SOLDIER (Fig. 322) : Head-capsule dark brown to almost black, fontanelle gland area a little paler; rostrum almost black; antennae and pronotum brown; abdominal tergites pale brown; legs and abdominal sternites straw coloured. Total body-length 3.50-4.50 mm. Head with a

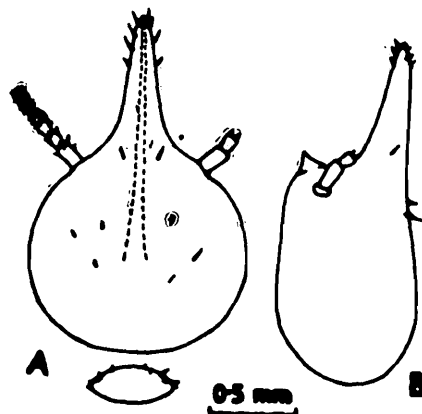


Fig. 322 : *Nasutitermes lacustris*. Soldier (A) Head and pronotum, dorsal view. (B) Head, side view.

pair of long hairs on vertex and a pair at base of rostrum and covered with minute hairs; pronotum with minute hairs all over; abdominal tergites each with a long bristle on either side and a pair in middle otherwise densely covered with minute hairs. Head-capsule subcircular (length with rostrum 1.55-1.80, length without rostrum 0.95-1.15, max. width 0.95-1.10 mm); in profile substraight dorsally or very slightly incurved at base of rostrum; rostral hump absent; posterior margin rounded, sometimes shallowly invaginated. Rostrum conical, short (length 0.55-0.75 mm, with a few hairs on tip; a little longer than 1/2 to 3/4 of head-length (index rostrum-length/head-length 0.55-0.79). Antennae with 13 segments; segment 3 subequal to 2, 4 shortest. Mandibles vestigial, each with a short, black, spine-like process. Pronotum saddle-shaped; anterior margin round, not incised; posterior margin straight (length 0.20, width 0.45-0.50 mm).

WORKER : Head-capsule reddish brown to dark brown; antennae, postclypeus, labrum and legs straw coloured; abdomen pale brown above, creamish below. Head sparsely hairy with short hairs and abdomen densely hairy. Total body-length 4.0-4.5 mm. Head-capsule subsquarish (length 1.00, width 1.03-1.08 mm); epicranial suture prominent. Fontanelle plate longish, translucent. Antennae with 14 segments; segment 3 shorter than 2 and 4 shorter than 3. Postclypeus relatively short; length much less than 1/2 width. Pronotum saddle-shaped; weakly notched at anterior margin; posterior margin almost straight; length 0.20, width 0.53 mm.

Distribution : SRI LANKA.

299. *Nasutitermes matangensiformis* (Holmgren)

(Figs. 323,324)

1. *Eutermes* (*Eutermes*) *matangensiformis* Holmgren :

1913. Holmgren, *K. Svenska Vetensk-Akad. Handl.*, **50** (2) : 159, 162, 185, Im, S, W maj., W min. Lectotype : S, in FRI. Type-locality : Sarawak, Borneo, Malaysia.

2. *Nasutitermes matangensiformis* / *matangensis matangensiformis* (Holmgren) :

1956. Roonwal and Sen-Sarma, *Indian J. Agric. Sci.*, **26** (1) : 27-28.

1958. Ahmad, *Biologia*, Lahore, **4** : 147, 150.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 5, 51, 53. Synonymy, description, lectotype designation.
1965. Ahmad, *Bull. Am. Mus. Nat. Hist.*, **131** (Art. 1) : 76-77. Synonymy, description.
1970. Roonwal and Bose, *Rec. zool. Surv. India*, **62** (3 & 4) : 120, 162-163.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 58.
1973. Morimoto, *Bull. Govt. For. exp. Stn.*, No. 257 : 78.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)* Art. 7 : 131-139. Synonymy, description, etc.
1981. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **47** (3) : 354.

IMAGO (Fig. 323) : Head-capsule castaneous brown; antennae, labrum and postclypeus pale brown, paler than head; pronotum yellowish brown; wings hyaline; abdominal tergites brownish, sternites paler. Head and body rather densely hairy. Total body-length with wings 13.20-14.20 mm, without wings 7.50-8.20 mm. Head subcircular (length to base of mandibles 1.10-1.22; width with eyes 1.40-1.58 mm); epicranial suture absent. Fontanelle plate narrow, elongate, translucent. Eyes large, subcircular, projecting out (max. diameter 0.50-0.62, min. diameter 0.49-0.54 mm). Ocelli broadly oval (long diameter 0.15-0.20, short diameter 0.13-0.16 mm); situated very close to eyes (eye-ocellus distance 0.02-0.05 mm). Antennae with 15 segments; segment 3 subequal to or a little longer than 2, 4 shorter than 2. Postclypeus weakly swollen, hairy; length less than half width. Pronotum subtrapezoidal (length 0.68-0.75, width 1.14-1.32 mm); anterior margin straight, slightly raised at middle and without emargination; posterior margin convex, weakly emarginate medially.

SOLDIER (Fig. 324) : Head-capsule brownish yellow to castaneous brown, fontanelle gland area paler; rostrum brown, darker near tip; antennae pale brown; pronotum brownish; abdomen above as dark as head, sternites paler. Head with 4 long hairs near base of nasus and a pair at vertex and several short hairs; nasus with 2-4 hairs at tip; pronotum with short hairs and a few longer ones along margins; abdominal tergites with many short hairs and a pair of longer hairs at middle and one on either side; sternites with many long and short hairs. Total body-length 3.30-4.80 mm. Head-capsule almost circular, slightly wider than long (length with rostrum 1.40-1.92, length without rostrum 0.83-1.20,

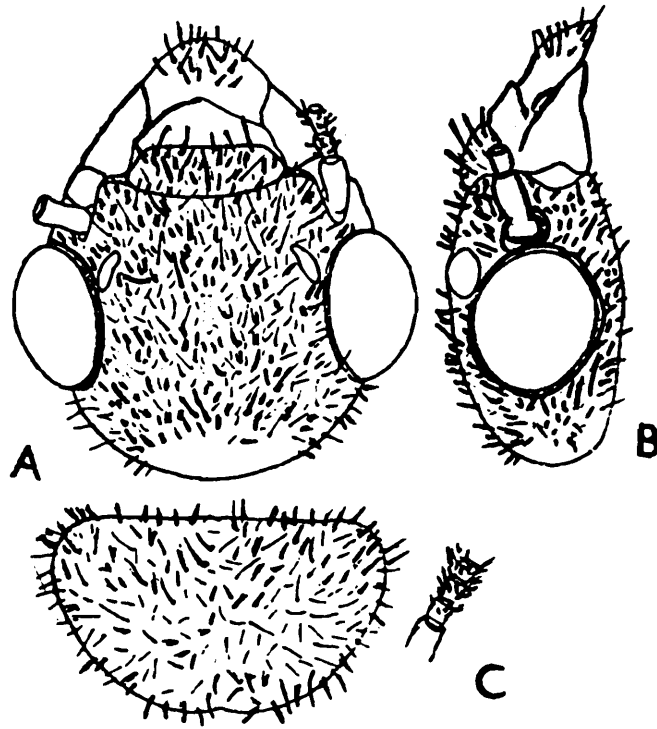


Fig. 323 : *Nasutitermes matangensiformis*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Basal part of antenna. (After Ahmad, 1965).

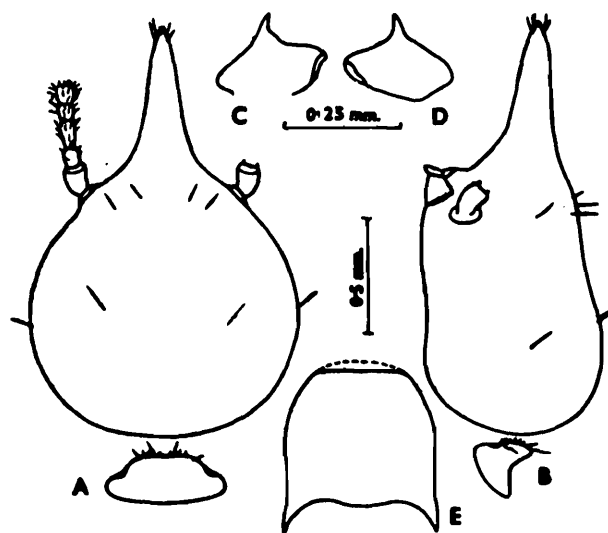


Fig. 324 : *Nasutitermes matangensiformis*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C), (D) Left and right mandibles. (E) Postmentum.

width 0.84-1.26 mm); in profile not depressed, basal hump distinct. Rostrum conical, length 0.55-0.70 mm. Antennae with 13-14 segments; in 13segmented antennae, segment 3 almost twice as long as 2; in 14-segmented ones, 3 as long as 2. Mandibles vestigial; with short, spine-like processes. Pronotum saddle-shaped; without any emargination on anterior or posterior margins (length 0.14-0.30, width 0.39-0.66 mm).

WORKER Dimorphic. *Worker major* : Head brown; antennae and postclypeus paler; body whitish to reddish yellow. Head and body thinly hairy. Head-capsule squarish (head-width 1.25 mm); head sutures and fontanelle distinct. Antennae with 14 segments; segment 3 a little longer than 2, 4 shorter than 2. Postclypeus short, moderately swollen. Pronotum saddle shaped, hardly emarginate in front (width 0.65 mm).

Holmgren 1913 has described a smaller worker having head-width 1.14 and pronotum-width 0.53 mm.

Distribution : INDIA : North-eastern India (Arunachal Pradesh), Little Andamans, and Nicobars. BANGLADESH, MALAYSIA, INDONESIA (Java, Sumatra, Borneo) and THAILAND.

300. *Nasutitermes matangensis matangensis* (Haviland)

(Figs. 325,326)

1. *Termes matangensis* Haviland :

1898. Haviland, *J. Linn. Soc. London*, **26** (169) : 427-428. Im, S and W. Syntypes : In Mus. Zoology, Cambridge (U. K.). Type-locality : Matang, Sarawak, Malaysia.

2. *Nasutitermes matangensis / matangensis matangensis* (Haviland) :

1956. Roonwal and Sen-Sarma, *Indian J. agric. Sci.*, **26** (1) : 28.

1958. Ahmad, *Biologia*, Lahore, **4** : 146, 149.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 4, 46-51. Synonymy, description, etc.

1966. Harris, *Proc. Linn. Soc. London*, **177** (1) : 15.

1973. Morimoto, *Bull. Govt. For. exp. Stn.*, No. 257 : 72, 78.

1981. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **47** (3) : 354

IMAGO (Fig. 325) : Head-capsule castaneous brown; antennae and postclypeus brownish; pronotum deep straw coloured to pale brown;

abdominal sternites pale brown. Head and body densely hairy; wings in distal half with short hairs. Total body-length with wings 16.50-17.00, without wings 7.50-8.50 mm. Head subcircular (length to base of mandibles 1.30, width with eyes 1.70-1.79 mm); epicranial suture absent. Fontanelle plate longish, translucent, narrow. Eyes large, subcircular, bulging out (max. diameter 0.60 mm). Ocellus large, oval (long diameter 0.20 mm). **situated** very close to eyes, almost touching (eye-ocellus distance 0.025 mm). Antennae with 15 segments; segment 3 slightly longer than 2, 4 shorter than 2. Postclypeus weakly swollen, hairy; length less than 1/2 width. Pronotum trapezoidal (length 0.80-0.84, width 1.30-1.40 mm); anterior margin slightly raised, not emarginate; posterior margin somewhat emarginate. Wings straw coloured, membrane hairy; microsculpture consists of papillae on anterior and posterior margins and thin micrasters both asteroid and non-asteroid (5-7 arms); forewing-length 14.0-14.50 mm, hindwing-length 14.0 mm.

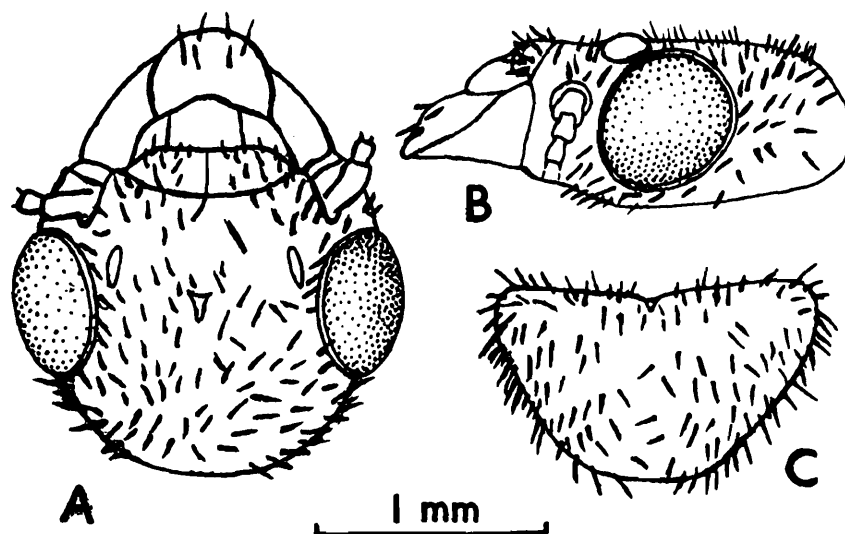


Fig. 325 : *Nasutitermes matangensis matangensis*. Imago. (A) Head, dorsal view. (B) Head, side view. (C) Pronotum (Ex Prashad and Sen-Sarma, 1959).

SOLDIER (Fig. 326) : Head-capsule brownish yellow with reddish tinge to castaneous brown; fontanelle gland area paler; rostrum brown, darker near tip; antennae brownish yellow; abdominal tergites brown to rust brown; legs and sternites creamish. Head with a pair of long hairs on vertex and a pair at base of rostrum and a few more hairs sometimes, minute hairs absent; abdominal tergites without hairs, sternites however

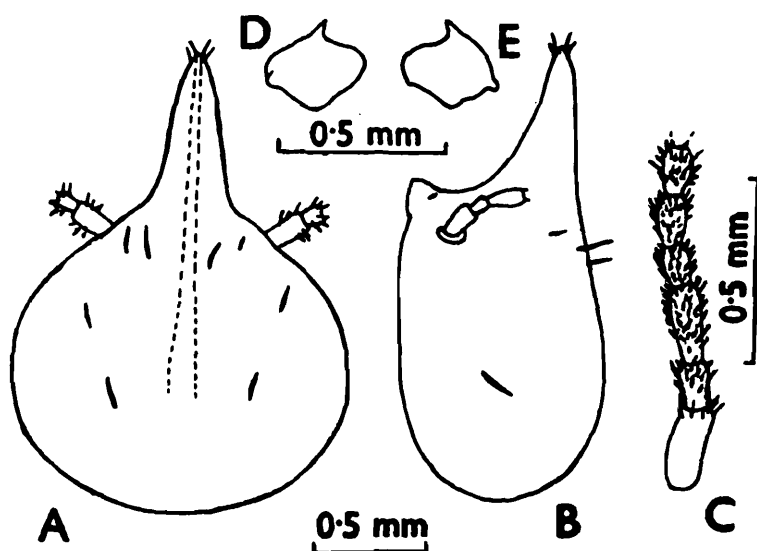


Fig. 326 : *Nasutitermes matangensis matangensis*. Soldier. (A) Head, dorsal view. (B) Head, side view. (C) Basal portion of antenna. (D), (E) Left and right mandibles.

with short hairs. Total body-length 4.00-5.30 mm. Head thick, broad, transversely oval, wider than length without rostrum (length with rostrum 1.90-2.10, length without rostrum 1.10-1.30, width 1.30-1.50 mm); in profile almost straight, rostral hump absent. Rostrum short, conical, stout, hairy at tip (length 0.70-0.85 mm, rostrum/head-length index 0.58-0.68). Antennae with 13-14 (generally 13) segments; segment 3 almost twice length of 2, 4 shorter than 2 (13 segmented antenna) and 3 subequal to 2 (14 segmented one). Mandibles vestigial, each with a short, brown, spine-like process. Pronotum saddle-shaped (length 0.30-0.35, width 0.60-0.65 mm); anterior margin rounded without or with faint emargination; posterior margin straight.

WORKER : Head-capsule yellowish brown to smoky brown; pronotum paler than head; antennae and postclypeus straw coloured; abdominal tergites pale brown, sternites yellowish white. Head sparingly and body moderately hairy. Total body-length 4.00-5.50 mm. Head squarishly rounded (length to base of mandibles 1.20, width 1.44 mm); epicranial suture faintly distinct. Fontanelle elongately oval. Antennae with 14 segments; segment 3 much longer than 2 and segment 4 subequal to 2. Postclypeus short, swollen, hairy; length less than half width. Pronotum saddle-shaped (length 0.30, width 0.95 mm); anterior margin distinctly notched, posterior margin straight.

Distribution : BURMA (Monhnit, Pyinmana). THAILAND, MALAYSIA, INDONESIA (Java, Sumatra) and VIETNAM.

301. **Nasutitermes moratus** (Silvestri)

(Fig. 327)

1. *Eutermes moratus* Silvestri :

1914. Silvestri, *Rec. Indian Mus.*, 8 : 431. Ny and S. Lectotype : S, in ZSI (designated here). Type-locality : Yabung, Siang District, Arunachal Pradesh, India.

2. *Nasutitermes moratus* (Silvestri) :

1958. Ahmad, *Biologia*, Lahore, 4 : 157.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 5, 52, 53. Synonymy, description, etc.

1962. Roonwal and Chhotani, *Proc. nat. Inst. Sci. India*, (B) 28(4) : 297, 389-390.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER (Fig. 327) : Head-capsule pale straw coloured to yellowish; rostrum pale brown, basally brownish yellow; antennae very pale brownish yellow; legs and body creamish white. Head with several minute hairs and a pair of long hairs on vertex (one or two extra hairs present sometimes) and a pair of shorter hairs at base of rostrum; rostrum with several shorter hairs and a pair of longer hairs at tip; abdominal tergites with several minute hairs and a longer hair on either side and a pair at middle; sternites more hairy. Total body-length 3.65-4.10 mm. Head-capsule pear-shaped, sides somewhat straight to round (length with rostrum 1.55-1.73, length without rostrum 0.95-1.05, width 0.93-1.00 mm); in profile slightly incurved, rostral hump absent. Rostrum subcylindrical, a little wider at base (length 0.63-0.78 mm, index rostrum-length/head-length 0.663). Antennae 12 to 13 (generally 13)-segmented; segment 3 a little longer than 2; in the Lectotype (designated here) left antenna with 13 and right with 12 segments and segment 4 of right larger than 3, appearing to be dividing. Mandibles vestigial, each with a short spine-like process. Pronotum saddle-shaped (length 0.20-0.25, width 0.45-0.50

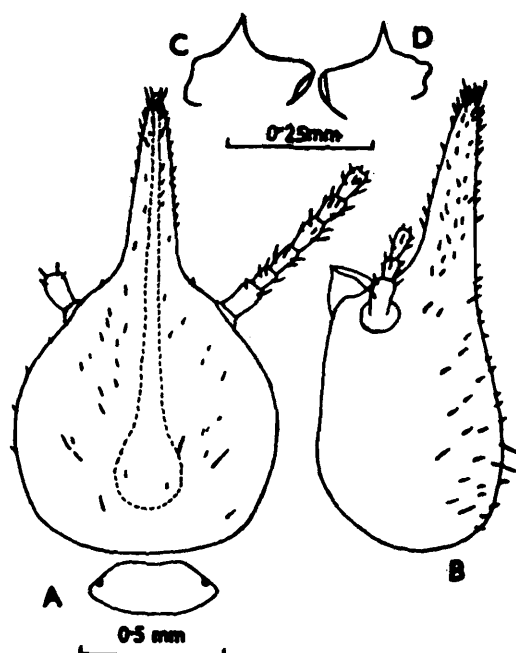


Fig. 327 : *Nasutitermes moratus*. Lectotype soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) and (D) Left and right mandibles from another soldier.

mm); anterior margin faintly emarginate, posterior margin substraight.

WORKER : Head-capsule pale yellow; antennae, legs, postclypeus and thorax creamy white; abdomen transparent with gut contents showing through. Head and body fairly hairy. Total body-length 4.00-4.50 mm. Head-capsule subcircular; sides slightly converging behind and substraight (length to base of mandibles 0.95-1.05, max. width 1.05-1.13 mm); median arm of epicranial suture present as a transparent line, lateral arms not clear. Fontanelle plate elongate, oval, 0.10-0.13 mm long; head around fontanelle plate somewhat transparent. Antennae 14-segmented; segment 3 as long as 2, 4 shortest. Postclypeus very weakly swollen, hairy (length 0.16-0.18, width 0.50-0.55 mm); median dividing line faint. Pronotum saddle-shaped (length 0.25-0.28, width 0.60-0.70 mm); anterior margin faintly notched, posterior margin straight.

Lectotype : In ZSI, there are 2 soldiers (one without head) in a vial, labelled "Eutermes moratus Silv., Cotype, India, S.W.Kemp, Yambung, Abor Exped. 14-21-1-1912" The complete soldier from this collection is designated here as the Lectotype. It measures as follows : Total body

length 4.10, length of head with rostrum 1.55, length of head without rostrum 0.95, length of rostrum 0.75, width of head 0.93, height of head 0.65, length of pronotum 0.18, width of pronotum 0.45 mm.

Distribution : INDIA : Arunachal Pradesh.

302. *Nasutitermes oculatus* (Holmgren)

[Synonym : *Eutermes (Eutermes) longicornis* Holmgren]

(Fig. 328)

1. *Eutermes oculatus* Holmgren :

1911. Holmgren, In Echerich's *Termitenleben auf Ceylon* : 200, 208.

Syntypes : In Mus. Vienna. Type-locality : Peradeniya, Sri Lanka.

2 *Nasutitermes oculatus* (Holmgren) :

1958. Ahmad, *Biologia*, Lahore, 4 : 157.

1959. Prashad and Sen-Serma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monog. 10.23) : 4, 54-57 Synonymy, description, etc.

3. *Eutermes (Eutermes) longicornis* Holmgren :

1913. Holmgren, *K. Svenska Vetensk-Akad. Handl.*, 50(2) : 160, 172.

IMAGO : Head brown, reddish yellow around fontanelle plate and anteriorly; fontanelle plate whitish; postclypeus bright; pronotum paler than head; wings brownish; abdominal tergites brown, sternites and legs reddish yellow. Head and thorax densely hairy; wings thickly and finely hairy. Total body-length with wings 14.50 mm, without wings 5.50 mm. Head wider than long (length to tip of labrum 1.35, head-width with eyes 1.44 mm). Fontanelle plate large, oval, whitish. Eyes large, strongly projecting out. Ocelli oval; situated at a distance of its long diameter from eyes. Antennae 7-segmented; segment 3 a little longer than 2, 4 somewhat shorter than 2. Postclypeus not strongly swollen, length less than 1/2 width; anterior margin straight, posterior margin convex. Pronotum trapezoidal, with straight front and hind margins (length 0.65, width 1.10 mm). Wings brownish, hairy; forewing length 11.5 mm.

SOLDIER (Fig. 328) : Head capsule brown with smoky tinge, fontanelle gland area paler; rostrum slightly darker than head; antennae pale brown; thorax pale brown; abdominal tergites darker than thorax; legs and

abdominal sternites pale yellow. Head without hairs; rostrum with a few hairs at tip; pronotum with many minute hairs at anterior margin and a few on body; abdominal tergites without long hairs, posterior tergites with a few minute hairs; sternites densely hairy with long and short hairs. Total body-length 3.0-4.50 mm. Head-capsule without rostrum pear-shaped; sides sharply converging anteriorly (length with rostrum 1.60-1.65, length without rostrum 0.87-1.05, width 0.90-1.0 mm); in profile distinctly incurved, without rostral hump. Rostrum long, cylindrical (length 0.60 mm, rostrum/head-length index 0.57-0.60). Antennae with 13 segments; segment 3 almost twice as long as 2 (vide Holmgren, 1913, for *longicornis*), one-and a half times 2 vide Ahmad, 1958 and almost equal to 2 vide Prashad and Sen-Sarma 1959). Pronotum saddle-shaped (length 0.25, width 0.50 mm); anterior margin not notched, posterior margin straight.

WORKER : Head-capsule deep straw coloured; antennae, labrum and postclypeus yellowish; pronotum paler than head; legs and abdominal sternites creamish, abdominal tergites brown. Head and body sparsely pilose. Total body-length 4.25-5.0 mm. Head-capsule broadly oval, length to base of mandibles equal to max. width (head-width 1.33). Head sutures distinct and broad. Fontanelle plate large, suboval, whitish, not elongate as in other Indian species. Antennae with 15 segments, segment 2 slightly

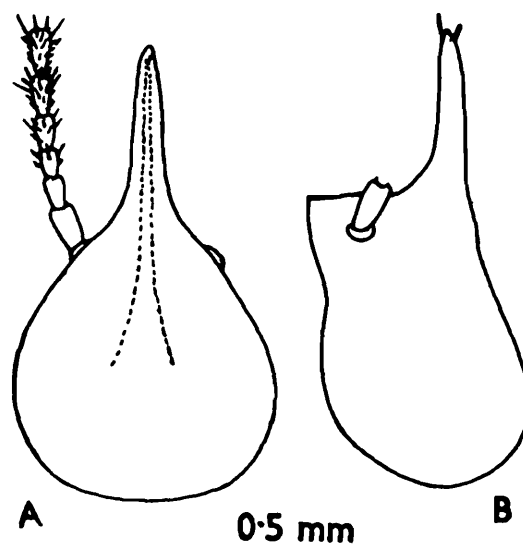


Fig. 328 : *Nasutitermes oculatus*. Soldier. (A) Head dorsal view. (B) Head, side view. (Ex Prashad and Sen-Sarma, 1959).

longer than 3, 3 as long as 4 or slightly longer. Postclypeus swollen, hairy; length less than 1/2 width. Pronotum saddle-shaped (width 0.72 mm); not notched at anterior margin.

Distribution : SRI LANKA.

303. *Nasutitermes profuscipennis* Akhtar

(Fig. 329)

1. *Nasutitermes profuscipennis* Chaudhry, et al. Nom nud. :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : 58-59. Nom nud.

2. *Nasutitermes profuscipennis* Akhtar :

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 :132, 141-143. S only. Holotype : S, in PU. Type-locality : Adampur, Bangladesh.

IMAGO : Unknown.

SOLDIER (Fig. 329) : Head-capsule brownish red, fontanelle area paler; rostrum as dark as head, slightly darker at tip; antennae light

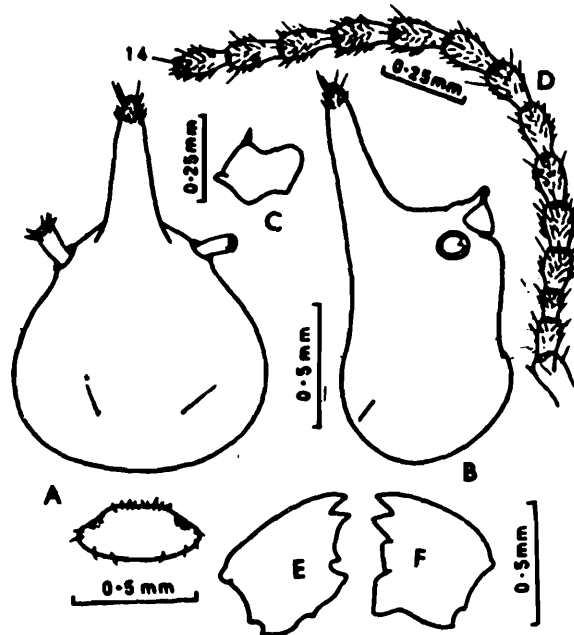


Fig. 329 : *Nasutitermes profuscipennis*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Left mandible. (D) Antenna. Worker. (E), (F) Left and right mandibles.

brown; pronotum much lighter than head, anterior lobe slightly darker; abdominal tergites light brown with smoky tinge. Head with a pair of bristles in posterior half, rostrum tip with a few long and short hairs; pronotum with a few hairs on margins; abdominal tergites with microscopic hairs and last 6 with long bristles, sternites with short hairs and long bristles. Head-capsule broadly pear-shaped, wider than long (length with rostrum 1.73-1.85, length without rostrum 1.09-1.19, max. width 1.11-1.24 mm); in profile depressed behind base of rostrum; rostral hump absent. Rostrum somewhat conical and raised anteriorly. Antennae with 14 segments, segment 3 shortest. Mandibles each with a small, spine-like process. Pronotum saddle-shaped, not emarginate at both anterior and posterior margins (faint emargination shown in fig. by author); length 0.24-0.25, width 0.50-0.56 mm.

Distribution : BANGLADESH : Known only from Adampur, type-locality.

304. *Nasutitermes roboratus* (Silvestri)

(Fig. 330)

1. *Eutermes roboratus* Silvestri :

1914. Silvestri, *Rec. Indian. Mus.*, **8** : 430-431. S and W. Lectotype : S, in ZSI (designated here). Type-locality : Moulmein, Burma.

2. *Nasutitermes roboratus* (Silvestri) :

1958. Ahmad, *Biologia*, Lahore, **4** : 156.

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 4, 59, 60. Synonymy, description, etc.

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 2.

1969. van Boven, *Publ. nat-hist. Genootschap Limburg*, **19** : 52.

IMAGO : Unknown.

SOLDIER (Fig. 330) : Head-capsule yellowish red; rostrum reddish, basally mixing up with colour of head; antennae pale creamish; legs and abdomen creamish; pronotum yellowish, reddish yellow anteriorly. Head generally without minute hairs; with a pair of longer hairs at vertex (sometimes absent), a pair at base of rostrum and a pair of hairs at rostral tip; pronotum with only short hairs at anterior margin; abdominal

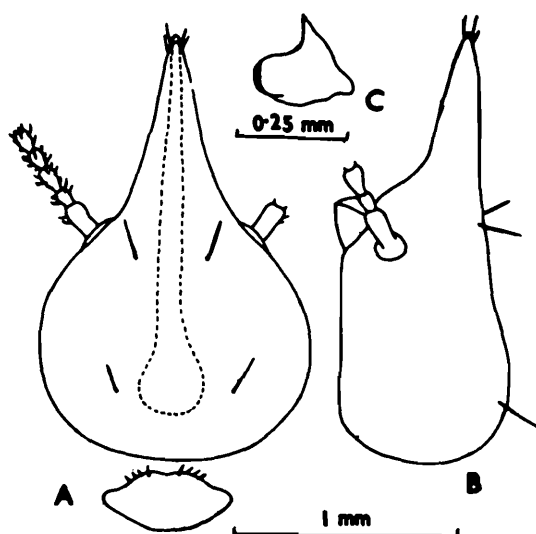


Fig. 330 : *Nasutitermes roboratus*. Lectotype soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Right mandible of paralectotype.

tergites with a few minute hairs all over, posteriorly with longer hairs on 5th onwards, one long hair present on 1st tergite in one specimen; sternites fairly hairy with long and short hairs. Total body-length 4.00-4.30 mm. Head-capsule almost round; almost as wide as length without rostrum (length with rostrum 1.85-2.00, length without rostrum 1.20-1.25, width 1.20-1.28 mm); in profile incurved, without rostral hump. Rostrum conical, very wide at base; rostrum-length 0.65-0.75 mm; index rostrum-length/head-length 0.542-0.625; tip hyaline with a pair or two of short hairs. Antennae with 13 segments, segment 3 about 1 and 1/2 times as long as 2, sometimes appears to be subdividing; 4 a little shorter than 2. Mandibles vestigial, each with a prominent, spine-like process. Pronotum saddle-shaped (length 0.25-0.30, width 0.58-0.60 mm); with a weak emargination at anterior margin and faintly convex at posterior margin.

WORKER : Not seen by me, but according to Silvestri, head reddish brown (badio); body straw yellow; epicranial suture distinct; anterior part of median suture much wider than lateral sutures; antennae and legs avellanious. Total body-length 4.40 mm. Head a little broader than long (head-width 1.45 mm). Antennae with 14 segments; segment 3 equal to 2 and twice 4; 5 longer than 4. Postclypeus a little swollen. Pronotum saddle-shaped, anterior lobe with a weak emargination in middle.

Lectotype : In ZSI there is a vial containing 6 soldiers and 2 soldier heads, labelled as cotype (Syntypes), Moulmein (Lr. Burma), F.H.Gravely, 10. XI. 1911. One soldier out of these is designated here as Lectotype, the remaining soldiers and the soldier present at NHM, Maastricht are designated as the paralectotypes. The Lectotype soldier measures as follows : Total body-length 4.0, length of head with rostrum 1.90, length of head without rostrum 1.20, width of head 1.23, length of rostrum 0.70, height of head 0.83, length of pronotum 0.28, width of pronotum 0.60 mm.

Distribution : BURMA (Moulmein, Lower Burma, type-locality), known only from the type-locality.

305. *Nasutitermes suknensis* Prashad and Sen-Sarma

(Fig. 331)

Nasutitermes suknensis Prashad and Sen-Sarma :

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 64-66. S only. Holotype : S, in FRI. Type-locality : Sukna, West Bengal India.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 35.
1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 101.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 27, 126,-127, map 4.

IMAGO : Unknown.

SOLDIER (Fig. 331) : Head-capsule pale brown, fontanelle gland area yellowish; rostrum reddish brown; antennae brownish; pronotum deep straw coloured; abdominal tergites brownish, sternites yellowish white. Head with numerous minute hairs and a pair of longer hairs at base of rostrum and a pair at vertex; rostrum with a few long and several minute hairs at tip; pronotum hairy; abdominal tergites densely hairy with short hairs; first five tergites without any long hairs, remaining tergites with a pair of longer hairs on lateral margin and a pair at middle; abdominal sternites with short and long hairs. Total body-length 3.0-3.4 mm. Head-capsule pear-shaped (length with rostrum 1.55-1.60, length without rostrum 0.90-1.0, max. width 0.90-0.95 mm); in profile straight with a weak rostral hump; faint constriction behind antennae; posterior margin round. Rostrum weakly conical (length 0.60-0.65 mm, rostrum/head-length

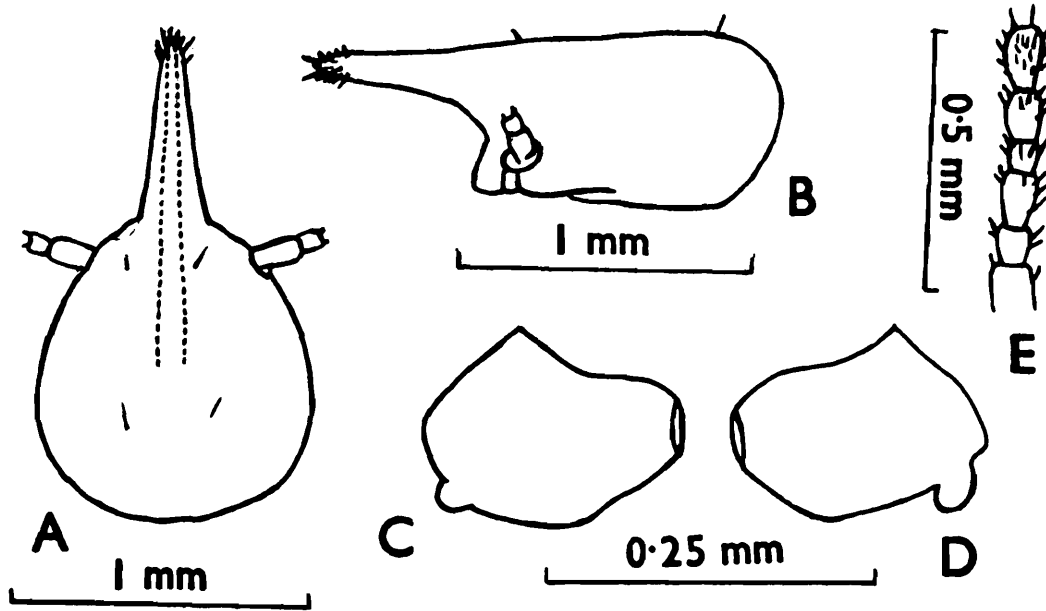


Fig. 331 : *Nasutitermes suknensis*. Soldier. (A) Head, dorsal view. (B) Head, side view. (C), (D) Left and right mandibles. (E) Basal portion of antenna. (Ex Prashad and Sen-Sarma, 1959).

index 0.65-0.72). Antennae with 13 segments; segment 3 longer than 2, 4 shortest. Mandibles vestigial; each with short, conical process. Pronotum saddle-shaped (length 0.15, width 0.40 mm); anterior margin with a slight median emargination; posterior margin straight.

Distribution : INDIA : West Bengal (Sukna, type-locality), known only from the type-locality.

306. *Nasutitermes tandoni* Bose

(Fig. 322)

Nasutitermes tandoni Bose :

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*. No.

Holotype : S, in ZSI. Type-locality : Tappi, Siang Dist., Arunachal Pradesh, India. Type examined.

IMAGO : Unknown.

SOLDIER (Fig. 332) : Head pale yellowish brown; rostrum pale brown; antennae, legs and pronotum creamish; abdominal tergites and sternites translucent with greyish intestinal contents showing through. Head with several minutes hairs; a pair of longer hairs at vertex, a pair at level of antennae and a pair or two on rostrum; tip of rostrum with numerous

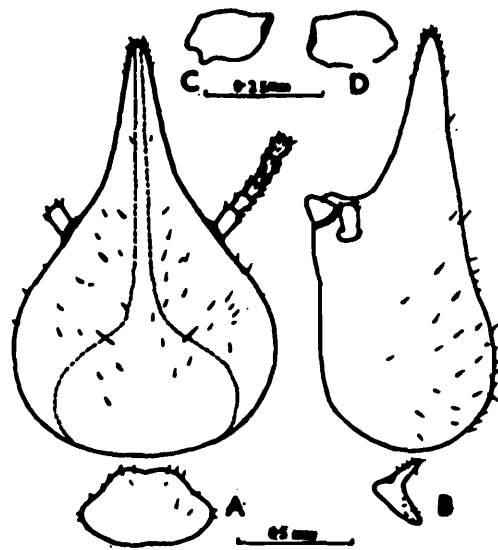


Fig. 332 : *Nasutitermes tandoni*. Soldier. (A) Head and pronotum, dorsal view. (B) Same. side view. (C), (D) Left and right mandibles (After Bose, in press).

minute and a pair or two of longer hairs; abdominal tergites each with several short and a few, long hairs near distal margin, sternites more hairy. Total body-length 4.0-4.5 mm. Head broadly pyriform, wider than length without rostrum (length with rostrum 1.70-1.80, length without rostrum 0.98-1.05, max. width 0.98-1.08 mm, index width/length without rostrum 1.00-1.05); depressed behind rostrum when viewed laterally; rostrum thick and conical. Antennae with 13 segments; segment 3 slightly shorter than 2 and subequal to 5; 4 shortest. Mandibles rudimentary, knob-like; without lateral spine-like processes. Pronotum saddle-shaped; margins with minute hairs and one or two longer hairs; anterior margin clearly notched; posterior margin straight. Mesonotum narrower and metanotum a little wider than pronotum; both substraight at posterior margin.

WORKER : Dimorphic. *Worker Major* : Head pale-yellow; thorax a little paler than head; antennae and legs creamish; abdominal tergites and sternites translucent. Head and body fairly densely hairy. Total body-length 4.3-4.4 mm. Head-capsule subsquarish (length to base of mandibles 0.90-0.92, max. width 1.0-1.05 mm). Fontanelle plate oval (length 0.20-0.25, width 0.07-0.075 mm). Antennae with 14 segments, segment 4 shortest. Postclypeus weakly swollen, hairy (length 0.18-0.19, width 0.50-

0.53 mm); posterior margin indented medially, anterior margin faintly incurved. *Worker Minor* : As in worker major but a little smaller. Total body-length 3.5-4.0, length of head to base of mandibles 0.78-0.80, max. width of head 0.88-0.95 mm.

Distribution : INDIA : Arunachal Pradesh : Tappi, Siang District, type-locality. Known only from type-locality.

307. *Nasutitermes thanensis* Prashad and Sen-Sarma

(Fig. 333)

Nasutitermes thanensis Prashad and Sen-Sarma :

1959. Prashad and Sen-Sarma, *Rev. Termite Genus Nasutitermes Indian Region* (ICAR Ent. Monogr. 10.23) : 4, 61-63. S and W. Holotype : S, in FRI. Type-locality : Thano (Dehradun, Uttar Pradesh, India).

1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 35.

1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 101.

IMAGO : Unknown.

SOLDIER (Fig. 333) : Head-capsule brown, fontanelle gland paler;

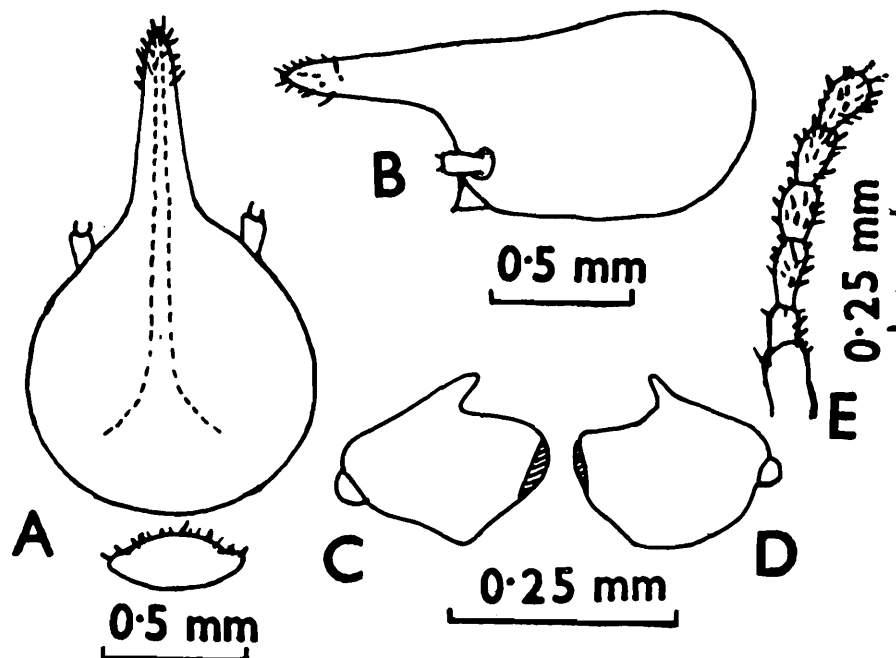


Fig. 333 : *Nasutitermes thanensis*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C), (D) Left and right mandibles. (E) Basal portion of antenna.

rostrum brown, darker at tip; antennae deep straw coloured; pronotum pale brown; legs and abdomen above stramineous, sternites whitish yellow. Head with several minute hairs but no longer hairs; rostrum with a tuft of hairs at distal tip; pronotum with several minute hairs; abdominal tergites and sternites with only short hairs, without any long hairs. Total body-length 3.8-4.30 mm. Head-capsule pear-shaped, sides convex; length to base of mandibles subequal to max. width (length with rostrum 1.70-1.80, length without rostrum 1.10-1.12, max. width 1.0-1.07 mm); in profile weakly concave behind rostrum; rostral hump weak. Rostrum short, conical; length a little more than 1/2 head-length (length 0.60-0.70 mm, rostrum-length/head-length index 0.54-0.64). Antennae with 12 segments; segment 3 about one-and-a-half times that of 2; 4 shorter than 3. Mandibles vestigial, each with a lateral spine-like process. Pronotum saddle-shaped, with numerous short hairs; anterior margin without any notch; posterior margin substraight (length 0.20-0.25, width 0.45-0.55 mm).

WORKER : Head-capsule pale brown; antennae and postclypeus straw coloured; legs and abdomen whitish yellow. Head and body fairly pilose. Total body-length 3.50-4.50 mm. Head-capsule subsquarish (length to base of mandibles 0.85, max. width 0.98 mm). Fontanelle plate suboval, large, whitish. Antennae with 13 segments; segment 3 shortest. Postclypeus swollen, hairy; length 1/2 width. Pronotum saddle-shaped (length 0.20, width 0.45-0.55 mm); anterior margin distinctly emarginate medially; posterior margin almost straight.

Distribution : INDIA : Uttar Pradesh, known only from type-locality.

308. *Nasutitermes triloki* Bose

(Fig. 334)

Nasutitermes triloki Bose :

1980. Bose, *Rec. zool. Surv. India*, **77** : 105-108. S and W. Holotype : S, in ZSI. Type-locality : Havelock Island, South Andamans, India. Types examined.

1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 101.

IMAGO : Unknown.

SOLDIER (Fig. 334) : Types examined. Head-capsule, antennae, and body creamy yellow; rostrum yellowish brown. Head-capsule with many short and 1 or 2 pairs of long hairs; rostrum tip with several short hairs; abdominal tergites also with short and few long hairs. Total body-length 3.30-3.75 mm. Head-capsule subcircular; length with rostrum 1.43-1.45, length without rostrum 0.83-0.88, max. width 0.83-0.93 mm; in profile shallowly incurved at base of rostrum. Rostrum slender, conical, 0.55-0.62 mm long; a little shorter than head without rostrum, index rostrum-length/head-length 0.83-0.88. Antennae with 12 segments; segment 3 shortest. Mandibles vestigial, each with a minute, spine-like process at middle. Postmentum, length 0.33-0.40, max. width 0.25-0.30 mm. Pronotum saddle-shaped; anterior margin with a weak median notch; length 0.24-0.28, max. width 0.42-0.48 mm. Mesonotum narrower and metanotum wider than pronotum, both sub-semicircular.

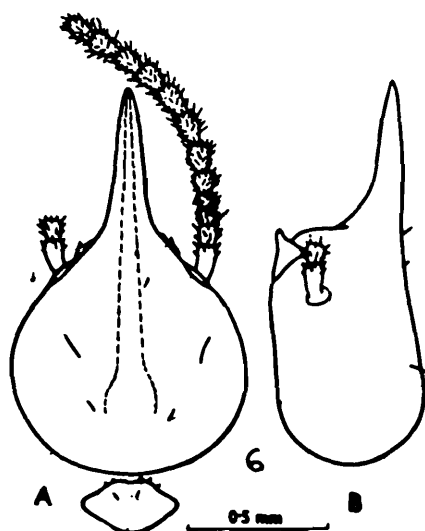


Fig. 334 : *Nasutitermes triloki*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (After Bose, 1980)

WORKER : Monomorphic. Head pale creamy yellow; antennae and body creamy white. Total body-length 3.5 mm. Head-capsule subsquarish; length to base of mandibles 0.83-0.85, max. width 0.95-0.98 mm. Antennae with 13 segments; segment 3 shortest. Fontanelle elongate translucent. Postclypeus swollen, hairy, length less than half width. Pronotum saddle-shaped; length 0.25-0.28, width 0.53 mm.

Distribution INDIA : Andaman and Nicobar Islands : South Andamans : Havelock Island, type-locality; known only from the type-locality.

309. *Nasutitermes vishnu* Bose

(Fig. 335)

Nasutitermes vishnu Bose :

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 98, 208, 225-229, 266, S and W. Holotype : S, in ZSI. Type-locality : Makut (Coorg), Karnataka, India. Types examined.

IMAGO : Unknown.

SOLDIER (Fig. 335) : Types examined. Head-capsule golden yellow; rostrum pale reddish brown, darker apically and hyaline at tip; antennae and thorax pale golden brown; abdomen pale yellow. Head sparsely and body moderately hairy; anterior abdominal tergites and sternites hairy with several long hairs. Total body-length 3.3-3.5 mm. Head-capsule subcircular, a little broader than long; length with rostrum 1.55-1.63, length without rostrum 0.89-0.95, max. width 0.95-1.05 mm; in profile substraight, without any hump. Rostrum long, conical, 0.62-0.68 mm long; index rostrum-length/head-length 0.67-0.76. Antennae with 13

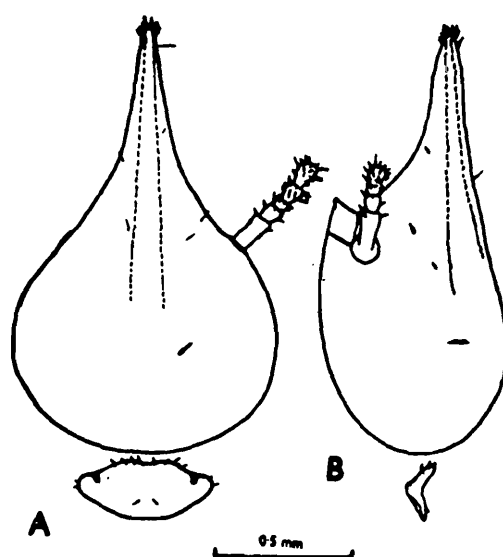


Fig. 335 : *Nasutitermes vishnu*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view (After Bose, 1984).

segments; segment 3 subequal to 2 : 4 shortest. Mandibles vestigial, without spine-like processes. Postmentum subrectangular; length subequal to max. width (length 0.30-0.33, max. width 0.30-0.35 mm). Pronotum small, saddle-shaped (length 0.20-0.25, width 0.48-0.50 mm). Mesonotum as wide as and metanotum wider than pronotum.

WORKER : Dimorphic. *Worker major* : Head-capsule, antennae and labrum yellowish brown; thorax and legs pale yellowish; abdomen pale creamy white. Head and body fairly pilose. Total body-length 3.4-4.1 mm. Head subcircular, broader than long (length to base of mandibles 0.95-1.05, max. width 1.08-1.15 mm). Antennae with 14 segments; segments 3 and 5 subequal; 4 shortest. Postclypeus weakly swollen, length less than half of width. Pronotum saddle-shaped; length 0.27-0.30, width 0.52-0.55 mm. *Worker minor* : As in worker major but generally smaller. Total body-length 2.8-3.0, head-length to base of mandibles 0.80-0.81, max. width of head 0.92-0.93, pronotum-length 0.13-0.15 and pronotum-width 0.33-0.35 mm.

Distribution : INDIA : Makut (Coorg.), Karnataka, type-locality and Kolar Forest Range, Karnataka.

Genus 49. *Bulbitermes* Emerson

1. Genus *Bulbitermes* Emerson :

- 1949. Emerson, In : Snyder 1949, *Smiths. misc. Colls.*, **112** : 307, 377.
- 1949. Snyder, *Smiths. misc. Colls.*, **112** : 307. (Synonymy).
- 1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95**(Art. 2) : 58, 61.
- 1955. Emerson, *Fieldiana : Zool.*, **37** : 481, 514.
- 1958. Ahmad, *Biologia*, Lahore, **4**(1-2) : 86, 89.
- 1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (1) : 7, 9, 82-83.
- 1968. Sen-Sarma, *Orient. Insects*, **2**(1) : 9, 21, 23, 29, 34.
- 1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 148, 149.
- 1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 378.
- 1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 59.
- 1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235.
- 1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, Art. 7 : 61, 143.

1977. Roonwal and Chhotani, *Ent. Basil.*, **2** : 43, 44.
 1979. Maiti, *Proc. zool. Soc., Calcutta*, **30** : 25.
 1982. Thapa, *Sabah For. Rec.*, No. 12 : 7, 8, 326-327.
 1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 92-93, Characters.
 1987. Chhotani, *Beitr. Ent.*, **37** : 413, 414.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

2. Genus *Termes* Linn. (Part) :

1898. Haviland, *J. Linn. Soc. (Zool.) London*, **26** : 279, 426.

3. Subgenus *Eutermes* (of *Eutermes*) (Part) :

1912. Holmgren, *K. Svensk. Vetensk.-Akad. Handl.*, **48**(4) : 59, 63.

4. Genus *Eutermes* Heer Part) :

1934. Kemner, *K. Svensk. Vetensk.-Akad. Handl.*, (3) **13** (4) : 122.

1953. Rattan Lal and Menon, *Cat. Indian Insects., Pt. 27-Isoptera* : 52-64.

Type of genus : *Termes constrictus* Haviland.

1. *Characters of Genus Bulbitermes*

Imago : Small, brownish, fairly hairy species. Head-capsule subcircular. Fontanelle plate broadly oval, anteriorly forked with sharp antero-lateral corners or sometimes indistinct. Eyes subcircular, projecting out. Ocelli broadly oval, separated from eyes. Antennae with 14-15 segments; segment 3 longer than 2. Mandibles very much like those of *Nasutitermes*, each with an apical and two marginal teeth; apical tooth subequal to or slightly shorter than 1st marginal and angle between the two smaller, about 45°; left mandible without cut between 1st and 2nd marginals; right mandible with posterior margin of 2nd marginal substraight and shorter than molar plate. Pronotum subtrapezoidal. Legs with 2 : 2 : 2 apical tibial spurs; tarsi 4 jointed. Wings elongate, hairy; microsculpture consists of short, pointed, thorny papillae on anterior and posterior margins and thick, asteroid and non-asteroid micrasters; venation as in *Nasutitermes*.

Soldier : Monomorphic. Head-capsule pyriform, constricted behind antennae. Rostrum cylindrical, length a little more than 1/2 head-length without rostrum. Antennae not markedly elongate, with 12-14 segments. Mandibles vestigial, with a spine-like process. Pronotum saddle-shaped;

without or with a faint notch at anterior margin. Legs with 2 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Abdomen without any short or long hairs on anterior tergites.

Worker : Head subsquarishly rounded; Y-suture and fontanelle plate present. Antennae with 14 segments. Mandibles as in imago. Pronotum and legs as in soldier.

2. *Distribution and Composition of Bulbitermes*

(Fig. 293)

Distribution : *Bulbitermes* is endemic to the Oriental zoogeographical region and is known from eastern India and Bangladesh through to the remaining parts of the Region except the Philippines and Taiwan. From the Indian subregion it is known from Meghalaya in India and Bangladesh.

Composition : Snyder (1949) has catalogued 17 species from the Oriental Region and Emerson (1955) has recognised 24 (including 2 undescribed ones) species. According to Chhotani (1987), 25 species are known from the Region with the following 3 from the Indian Region. The species *emersoni* Maiti is transferred to the genus *Ahmaditermes*.

1. *B. parapusillus* Ahmad—India, Bangladesh, Thailand
2. *B. prabhae* Krishna—Burma, Thailand
3. *B. pyriformis* Akhtar—Bangladesh

3. *Keys to Indian Species of Bulbitermes*

IMAGOES

- 1(2) Smaller : Head-width with eyes 1.06-1.09, pronotum-width 0.85-1.05 mm. Eyes smaller (max. diameter 0.33-0.39 mm). Antennae with segment 3 as long as 2.....*parapusillus*
- 2(1) Larger : Head-width with eyes 1.30-1.40, pronotum-width 1.04-1.14 mm. Eyes larger (max. diameter 0.46-0.49 mm). Antennae with segment 3 twice as long as 2.....*prabhae*

SOLDIERS

- 1(2) Generally larger (head-length with rostrum 1.37-1.94 mm). Antennae with 14 segments. Head appreciably depressed behind rostrum in profile and without hump.....*prabhae*

- 2(1) Generally smaller (head-length with rostrum 1.17-1.59 mm).
Antennae with 12-13 or 13 segments. Head weakly depressed or
straight behind rostrum and with a hump
- 3(4) Head straight behind rostrum and with a faint hump in profile.
Mandibles with a short, spine-like process.....*parapusillus*
- 4(3) Head weakly depressed behind rostrum and with a weak hump in
profile. Mandibles with a long, spine-like process.....*pyriformis*

310. *Bulbitermes parapusillus* Ahmad

(Figs. 336. 337)

Bulbitermes parapusillus Ahmad :

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 82, 85-87. Im and
S. Holotype : S, in PU. Type-locality : Prew, Thailand.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480
Proj. No. A17-FS-12) : 59.

1973. Morimoto, *Bull. Gov. For. exp. Sta.*, No. 257 : 74, 79.

1975. Akhtar, *Bull. Dept Zool. Univ. Panjab (N.S.)*, Art. 7 : 143-146.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

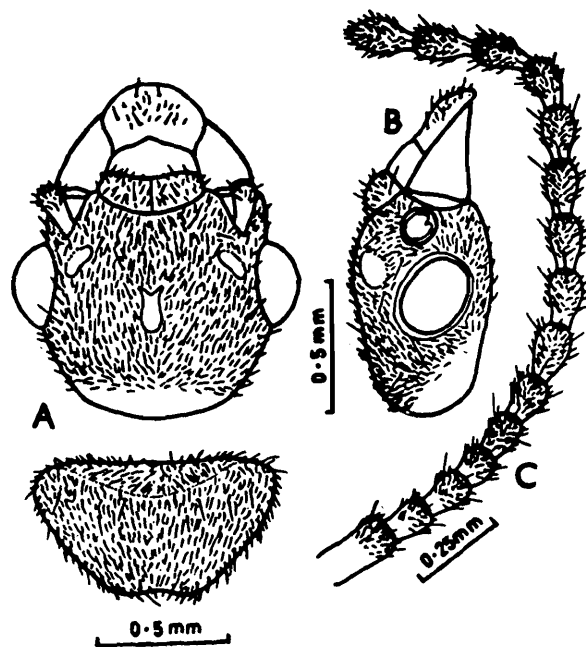


Fig. 336 : *Bulbitermes parapusillus*. Imago. (A) Head and pronotum, dorsal view
(B) Head, side view. (C) Antenna. (After Akhtar, 1975).

IMAGO (Fig. 336) : Head-capsule reddish brown to brown; postclypeus paler than head, brownish yellow; antennae yellowish brown; abdominal tergites pale brown. Head fairly hairy with many short and some scattered long hairs; pronotum as hairy as head. Head-capsule subcircular (length to base of mandibles 0.83-0.96, width with eyes 1.06-1.19 mm). Fontanelle plate prominent, large, broadly oval; anterior margin incurved and anterolateral corners pointed. Eyes large, bulging out, subcircular, slightly longer than wide (max. diameter 0.33-0.39; min. diameter 0.31-0.33 mm). Ocelli broadly oval, separated from eyes by half of their short diameter (long diameter 0.15-0.18; short diameter 0.09-0.10 mm, eye-ocellus distance 0.03-0.06 mm). Antennae with 15 segments; segment 3 as long as 2; 4 shorter than or subequal to 3. Postclypeus slightly swollen, as hairy as head; length less than half of width (length 0.13-0.16, width 0.36-0.41 mm). Pronotum subtrapezoidal, (length 0.52-0.57, width 0.85-1.05 mm);

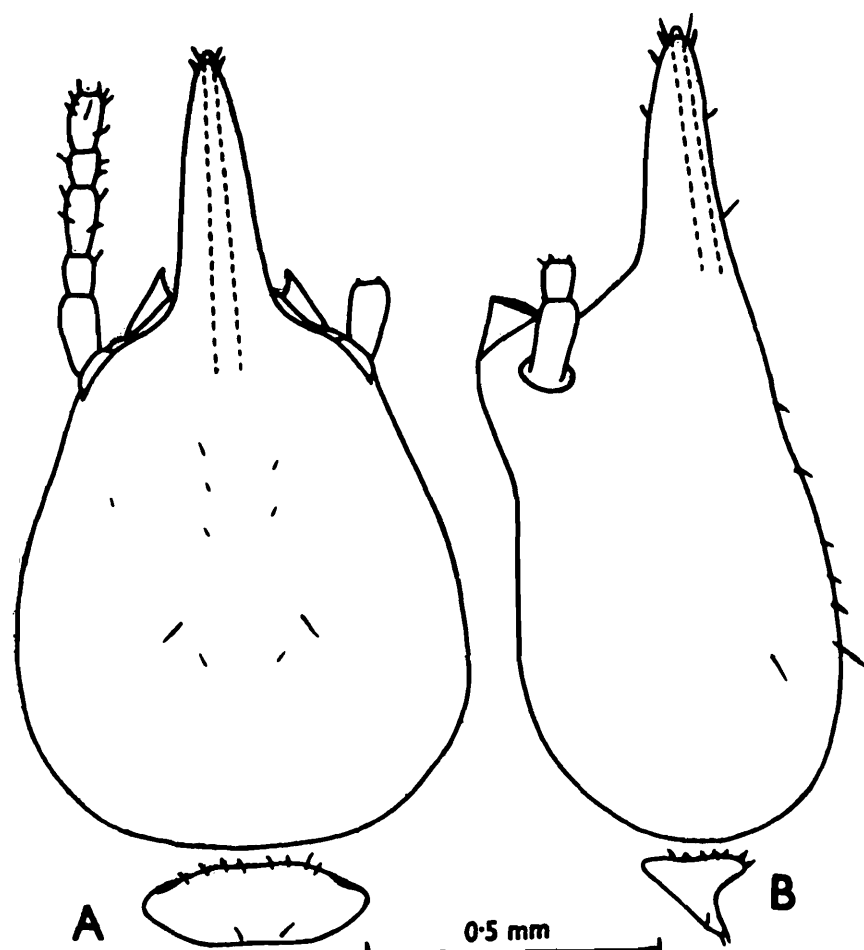


Fig. 337 : *Bulbitermes parapusillus*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view.

anterior margin straight, without any notch; posterior margin convex, incurved.

SOLDIER (Fig. 337) Head-capsule pale reddish brown or orange with brownish tinge; rostrum slightly darker than head; antennae light brown; pronotum pale brownish yellow and rest of body paler. Head with 2 bristles posteriorly and a few minute hairs; rostrum with a few bristles at tip; pronotum with minute hairs anteriorly; abdominal tergites with minute hairs, last few with slightly longer hairs; sternites with long and short hairs. Total body-length 3.20-3.65 mm. Head-capsule pyriform, slightly constricted behind antennae (length with rostrum 1.17-1.52, length without rostrum 0.78-1.08, max. width 0.67-0.88 mm); in profile almost straight and with a faint hump. Rostrum cylindrical; a little longer than half of head-length without rostrum (length 0.53-0.60 mm). Antennae with 13 segments; segment 3 longer than 2; 4 shortest. Mandibles vestigial, each with a short, spine-like process. Pronotum saddle-shaped (length 0.13-0.25, width 0.39-0.51 mm).

WORKER : Head dirty yellowish brown; postclypeus paler than head; antennae pale yellow; legs and thorax pale yellowish brown; abdomen dirty white. Head and body fairly hairy. Total body-length 3.80-4.50 mm. Head-capsule subsquarishly rounded (length to base of mandibles 0.85, max. width 1.00-1.03 mm); epicranial suture distinct. Fontanelle plate oval, prominent. Antennae with 14 segments; segment 3 subequal to 2 ; 4 shortest. Postclypeus weakly swollen, hairy; length less than 1/2 width (length 0.16-0.17, width 0.45 mm). Pronotum saddle-shaped; not notched at anterior margin; length 0.20, width 0.50-0.55 mm.

Distribution : INDIA (Meghalaya). BANGLADESH and THAILAND.

311. *Bulbitermes prabhae* Krishna

(Figs. 338, 339)

Bulbitermes prabhae Krishna :

1965. Krishna, *Am. Mus. Novit*, No. 2210 : 3, 27-29. S only. Holotype : S, in AMNH. Type-locality : Maymyo, Burma.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 82, 83-84.

1968. Harris, *Opusc. Ent.*, **33** : 152, 153.

1973. Morimoto, *Bull. Govt. For. exp. Sta.*, No. 257 : 79.

1975. Akhtar, *Bull. Dep. Zool. Univ. Panjab (N.S.)*, Art. 7 : 147.

IMAGO (Fig. 338) : Head-capsule brown; antennae yellow with reddish tinge; postclypeus and labrum yellow; pronotum pale brown, with a yellow, T-shaped marking in middle and ocellus-like shoulder spots. Head sparsely hairy; postclypeus with a pair of hairs on either side of median line; pronotum fairly hairy, more densely than head. Head oval; head-capsule subcircular (length to base of mandibles 0.97-1.01, width with eyes 1.30-1.40 mm). Fontanelle plate prominent, larger than ocellus; with 4 small, dot-like spots in front of it. Eyes large, circular, bulging out; situated very close to lateral margin of head (max. diameter 0.46-0.49, min. diameter 0.39-0.44, eye-lower margin of head distance 0.05 mm). Ocelli large, oval, separated from eyes by 1/3 of their short diameter (long diameter 0.18-0.19, short diameter 0.10-0.13, eye-ocellus distance 0.03 mm). Antennae with 15 segments; segment 3 twice as long as 2. Postclypeus moderately swollen; length less than 1/2 of width (length 0.20, width 0.49-0.54 mm). Pronotum subtrapezoidal, length more than

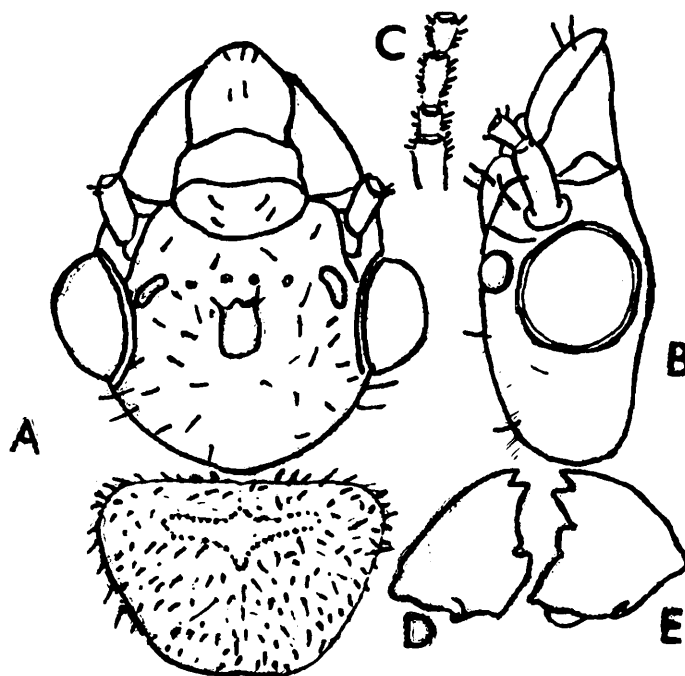


Fig. 338 : *Bulbitermes prabhae*. Imago. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Basal part of antenna. (D), (E) Left and right mandibles. (After Krishna, 1965b).

1/2 width (length 0.67-0.72, width 1.04-1.14 mm); anterior margin straight, without emargination; posterior margin indistinctly depressed in middle.

SOLDIER (Fig. 339) : Head-capsule rusty brown to dark smoky brown; rostrum paler anteriorly; antennae pale yellowish brown; pronotum paler than head, anterior lobe darker; abdominal tergites brown, sternites brownish yellow; legs pale yellow. Head without hairs or bristles; rostrum with 4 hairs at tip; pronotum with minute hairs at anterior margin; anterior abdominal tergites without any hairs, last few tergites with a few bristles, sternites with long bristles. Head-capsule pyriform, constricted behind antennae (length with rostrum 1.37-1.94, length without rostrum 0.80-1.17, width 0.59-1.17 mm); in profile appreciably depressed behind rostrum and without any hump. Rostrum long and cylindrical (length 0.64-0.77 mm); longer than half of head-length without rostrum. Antennae with 14 segments; segment 3 about twice as long as 2; 4 slightly shorter than or subequal to 3. Mandibles vestigial; each with a prominent, long,

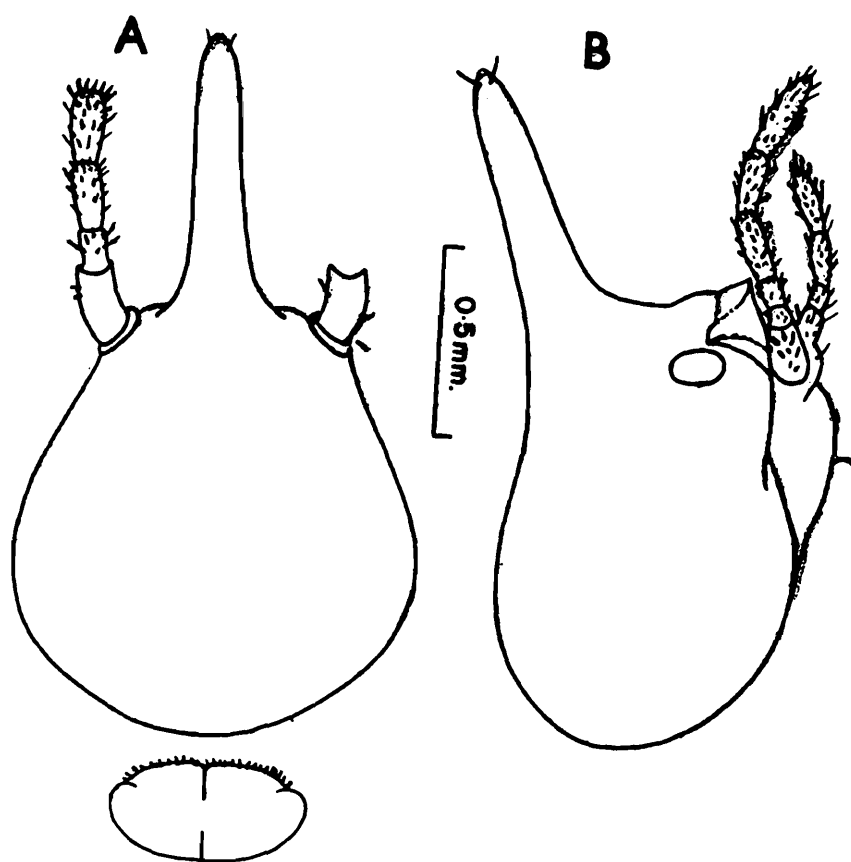


Fig. 339 : *Bulbitermes prabhae*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (After Krishna, 1965b).

spine-like process. Right mandible with a minute inconspicuous tooth below tip of apical process (Ahmad, 1965). Pronotum strongly saddle-shaped, faintly notched at anterior and posterior margins (length 0.15-0.28, width 0.33-0.56 mm).

Distribution : BURMA, THAILAND

312. *Bulbitermes pyriformis* Akhtar

(Fig. 340)

1. *Bulbitermes pyriformis* Chaudhry, et al. (Nom. nud) :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 60. Nom. nud.

2. *Bulbitermes pyriformis* Akhtar :

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab, (N.S.)*, Art. 7 : 143, 147. S only. Holotype : S, in PU. Type-locality : Adampur, Bangladesh.

IMAGO : Unknown.

SOLDIER (Fig. 340) : Head-capsule yellowish red to brownish red; rostrum slightly darker than head; antennae pale brown; pronotum and abdominal tergites yellowish brown. Head-capsule with a pair of bristles

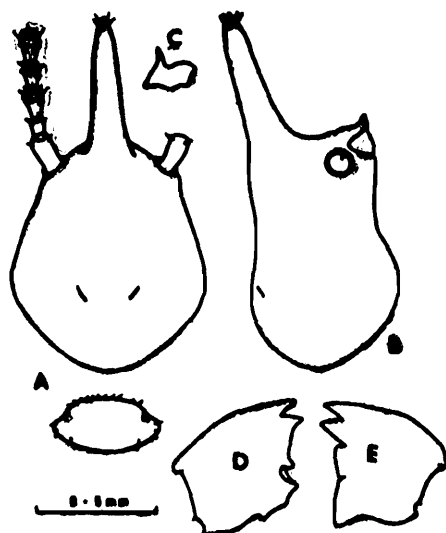


Fig. 340 : *Bulbitermes pyriformis*. Soldier. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Left mandible. Worker (D), (E) Left and right mandibles.

posteriorly; rostrum with a few hairs at tip; pronotum and abdominal tergites with scattered hairs, last few tergites with long hairs and sternites with short and long hairs. Head-capsule pyriform. constricted behind antennae (length with rostrum 1.28-1.59, length without rostrum 0.78-0.98, max. width 0.64-0.85 mm); in profile a little depressed behind rostrum and with a weak hump. Rostrum long, cylindrical (length c 0.70*). Antennae with 12-13 segments; segment 3 twice as long as 2. Mandibles vestigial ; each with a long, spine-like process. Pronotum saddle-shaped; not notched or emarginate at anterior and posterior margins; length 0.16-0.20, width 0.37-0.46 mm.

Distribution : BANGALDESH.

Genus 50. *Ahmaditermes* Akhtar

Genus *Ahmaditermes* Akhtar :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A 17-FS-12) : vii. Nom. nud.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, Art. 7 : 60, 127-128. S and W.
1987. Chhotani, *Beitr. Ent.*, **37** : 413.
1987. Gao and Deng, *Sichuan J. Zool.*, **6**(3) : 1.
1989. Gao and Deng, *Entomotaxonomia*, **11** : 249-252.

Type of genus : *Ahmaditermes pyricephalus* Akhtar.

1. *Characters of Genus Ahmaditermes*

Imago : Head-capsule broad, subcircular; Y-suture indisinct. Fontanelle Y-shaped, pale or indistinct. Antennae with 15 segments. Eyes large, rounded. Ocelli large, oval, eye-ocellus distance less than half of short diameter. Postclypeus narrow, weakly swollen; length less than 1/2 of width. Mandibles each with an apical and 2 marginals. Pronotum a little narrower than head, anterior margin substraight or weakly incurved, without any notch medially; posterior margin convex, emarginate medially. Wings long, membrane hairy; costa thick, running along anterior margin; radius running close to costa; media in forewing arising independently from scale and in hindwing from radius in wing-membrane, cubitus with 10-11 branches to posterior margin.

* Calculated from figure given by Akhtar, 1975.

Soldier : Generally monomorphic, rarely dimorphic (*A. pyricephalus*). Head-capsule pear-shaped without rostrum, laterally constricted below antennae and fairly well produced behind; with short, microscopic hairs all over and 2 pairs of long hairs; in profile substraight or incurved; with or without hump at base of rostrum. Rostrum short, cylindrical; with several short hairs and generally a pair of longer hairs on tip. Antennae with 12-13 segments. Mandibles vestigial, without spine-like process, sometimes with short points (*A. choui*). Pronotum saddle-shaped. Legs with 2 : 2 : 2 apical tibial spurs; tarsi 4-jointed.

Worker : Head subsquarish, Y-suture distinct. Antennae with 14 segments. Mandibles each with an apical and two marginals, dentition very much like *Bulbitermes*; cutting edge between the marginals sinuate in left mandible. Pronotum and legs as in soldier.

2. Distribution and Composition of *Ahmaditermes*

(Fig. 293)

Distribution : The genus *Ahmaditermes* is known to occur in India, Bhutan, Bangladesh, Thailand, Hongkong and southern China.

Composition : As many as 12 species of the genus are known, of which one occurs in Hongkong, one in Thailand, one (same species) in Bangladesh and southern China and the remaining species in southern Chinese provinces. Two species, *A. pyricephalus* Akhtar and *A. emersoni* (Maiti), transferred from *Bulbitermes*, are known from the Indian Region and taken into account here.

3. Key to Indian Species of *Ahmaditermes*

SOLDIERS

Of the two species of genus known from the Indian Region, the soldier of *A. emersoni* (Maiti) is monomorphic whereas that of *A. pyricephalus* Akhtar is dimorphic. In size, the soldier of *emersoni* is close to that of soldier major of *pyricephalus* and are separated as follows :

- 1(2) Head-capsule narrower (max. width 0.83-0.93 mm) and less so depressed at posterior margin.....*emersoni*
- 2(1) Head-capsule wider (max. width 0.95-1.07 mm) and more so depressed at posterior margin.....*pyricephalus*

313. **Ahmaditermes emersoni** (Maiti n. comb.)

(Figs. 341, 342)

1. *Bulbitermes emersoni* Maiti :

1977. Maiti, In : Roonwal and Chhotani, *Ent. Basil.*, **2** : 78-79, 81 (fig. 21 and soldier measurements from Bhutan)

1979. Maiti, *Proc. zool. Soc.*, Calcutta, **30** : 25-29. S and W. Holotype : S, in ZSI. Type-locality : Tashiding Forest, 5 km N-E of Teesta Bridge, Darjeeling Dist., West Bengal, India.

1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 26, 127-129.

IMAGO : Unknown.

SOLDIER (Fig. 341) : Head-capsule straw yellow; rostrum dark brown, paler basally; antennae yellowish, somewhat darker distally; pronotum and abdomen paler than head; legs yellowish white. Head sparsely and body fairly densely hairy. Total body-length 3.50-4.20 mm. Head-capsule pyriform; fairly strongly constricted behind antennae and widest posteriorly (length with rostrum 1.37-1.58, length without rostrum 0.90-1.00, max. width 0.83-0.93, width at point of constriction 0.57-0.61 mm); in profile weakly depressed behind rostrum and with a weak hump. Rostrum cylindrical; a little longer than 1/2 head-length (length 0.46-0.60 mm, index rostrum-length/head-length 0.51-0.53). Fontanelle gland and tube prominent. Antennae with 13 segments; segment 3 subequal to 2 : 4 shortest. Mandibles vestigial; without lateral, spine-like process. Pronotum saddle-shaped; anterior lobe weakly raised and anterior margin without notch; posterior margin convex (length 0.14-0.20, width 0.37-0.53 mm).

WORKER (Fig. 342) : Head-capsule fuscous brown, paler anteriorly; antennae paler than head; legs and body whitish. Head and body fairly pilose. Total body-length 3.75-4.50 mm. Head-capsule subsquarish (length to base of mandibles 0.76-0.88, max. width 0.92-1.00 mm); epicranial suture well marked. Fontanelle plate distinct. Antennae with 14 segments; segment 3 subequal to or slightly shorter than 2; 4 shortest. Postclypeus swollen, hairy; length less than 1/2 width (length 0.14-0.18, width 0.35-0.42 mm). Pronotum saddle-shaped, weakly emarginate at anterior and posterior margins (length 0.21-0.23, width 0.50-0.57 mm).

Distribution : INDIA : West Bengal, Arunachal Pradesh. BHUTAN.

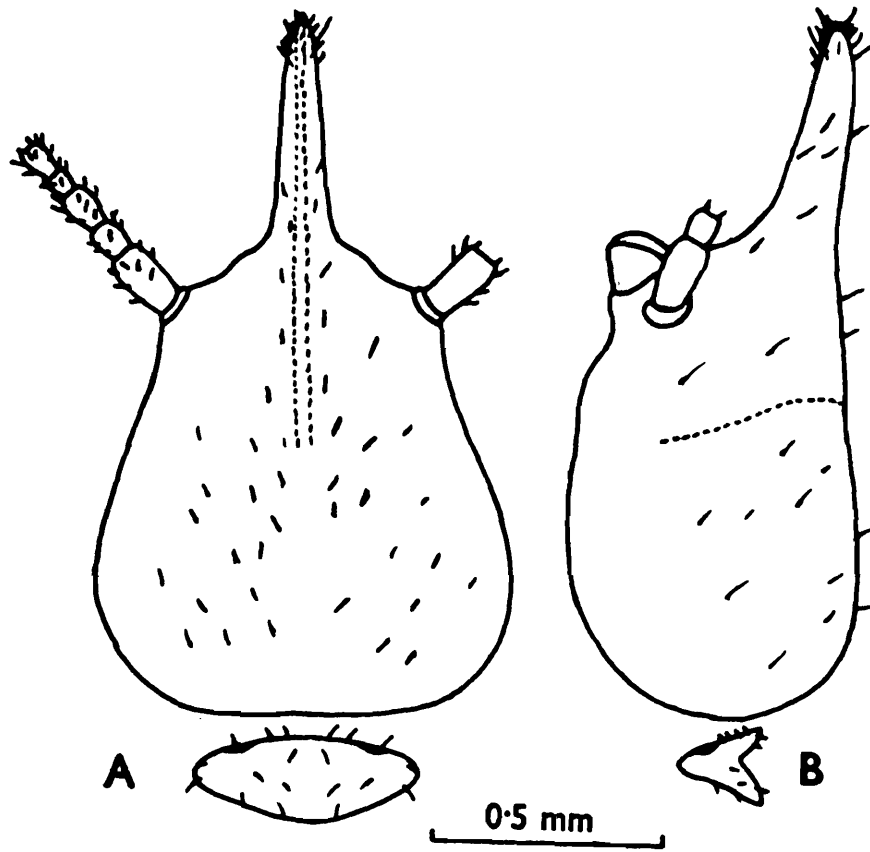


Fig. 341 : *Ahmaditermes emersoni*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view.

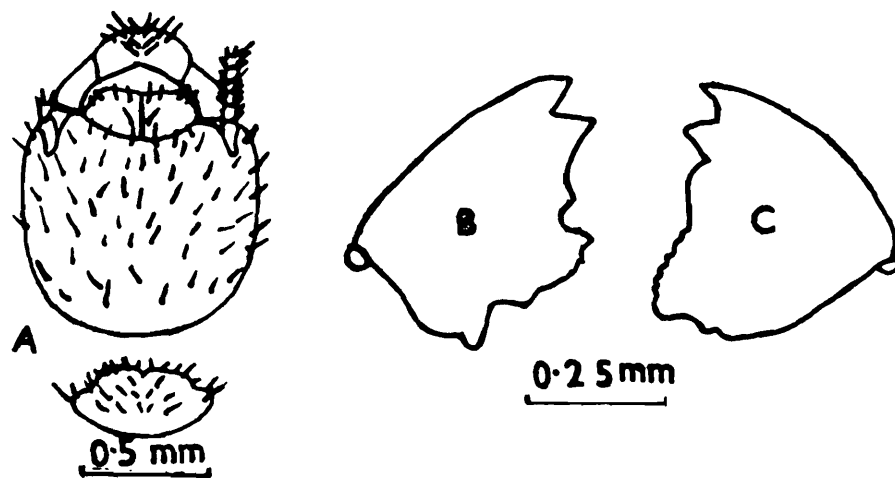


Fig. 342 : *Ahmaditermes emersoni*. Worker. (A) Head and pronotum, dorsal view. (B), (C) Left and right mandibles. (After Maiti, 1979a)

314. *Ahmaditermes pyricephalus* Akhtar

(Figs. 343, 344)

1. *Ahmaditermes pakistanicus* Chaudhry, et al. (Nom. nud.) :

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL. 480 Proj. No. A 17-FS-12) : vii, 56. Nom. nud.

2. *Ahmaditermes pyricephalus* Akhtar :

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, Art. 7 : 128-131, 193. S¹⁻², W. Holotype : S, in PU. Type-locality : Adampur, Bangladesh.

1987 Gao and Deng, *Sichuan J. Zool.*, 6(3) : 1.

1989. Gao and Deng, *Entomotaxonomia*, 11 : 249-252.

IMAGO : Unknown.

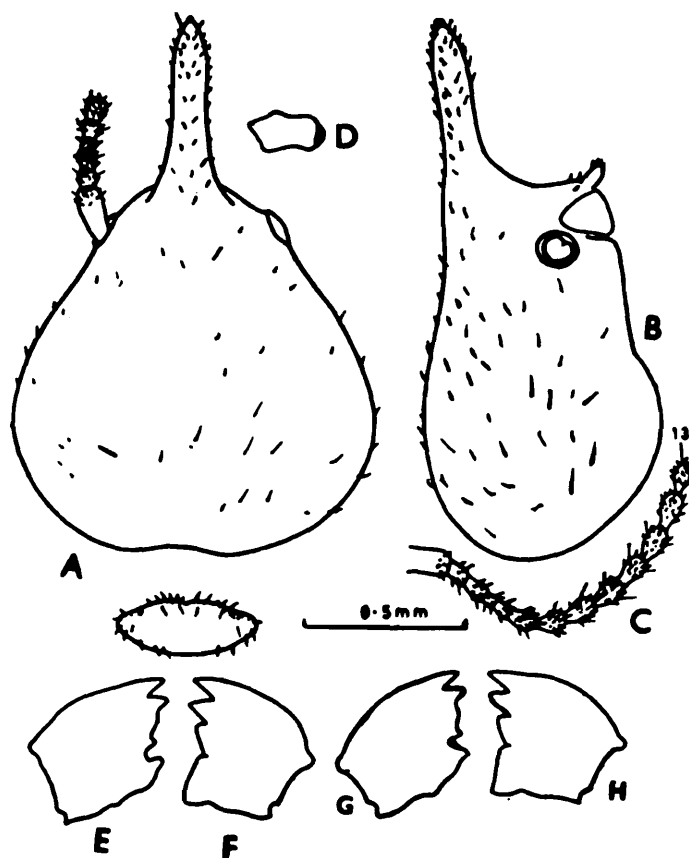


Fig. 343 : *Ahmaditermes pyricephalus*. Soldier major. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Antenna. (D) Left mandible. Worker. (E)-(F) Left and right mandibles. Nymph. (G), (H) Left and right mandibles. (After Akhtar, 1975).

SOLDIER Dimorphic. *Soldier major* (Fig. 343) : Head yellowish brown; rostrum darker, light brown with reddish tinge; antennae pale brown; pronotum yellow; anterior lobe with brownish tinge; legs and abdomen whitish yellow. Head with several short, minute hairs and two-pairs of longer hairs, a pair at vertex and a pair a little behind base of rostrum; rostrum with several minute hairs and a few longer hairs at tip; abdominal tergites moderately hairy, longer hairs present only on last 4 tergites. Head broad, pear-shaped, constricted slightly behind antennae; sides rounded, max. width about length of head without rostrum; posterior margin depressed medially; length with rostrum 1.45-1.54, length without rostrum 1.00-1.08, max. width 0.95-1.07 mm; in profile a weak hump present at base of rostrum. Rostrum short, cylindrical and narrow; length less than half of head-length without rostrum. Antennae with 13 segments; segment 3 slightly longer than 2. Mandibles vestigial, without spine-like process at lateral margin. Pronotum saddle-shaped; anterior margin weakly notched. *Soldier minor* (Fig. 344) : Head brownish yellow; rostrum darker, light brown with reddish tinge; antennae yellowish brown; legs and abdomen yellowish white. Head with several minute hairs and a pair of long hairs at vertex, sometimes a pair of long hairs at base of rostrum;

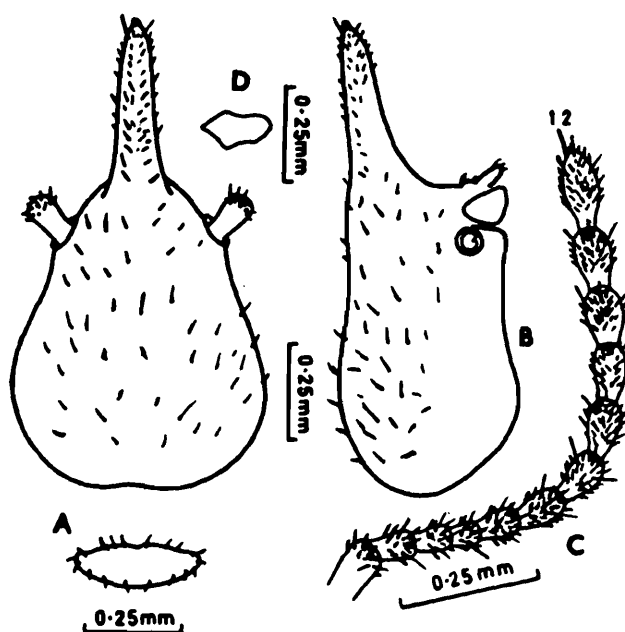


Fig. 344 : *Ahmaditermes pyricephalus*. Soldier minor. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Antenna. (D) Left mandible. (After Akhtar, 1975).

rostrum with several minute and a few long hairs near tip; abdominal tergites with many short and scattered long hairs. Head without rostrum pear-shaped, constricted behind antennae; sides less rounded than in soldier major and less wide; posterior margin slightly depressed medially; length with rostrum 1.08-1.23, length without rostrum 0.70-0.78, max. width 0.60-0.68 mm; in profile a weak hump present at base of rostrum. Rostrum cylindrical, slightly longer than half of head-length without rostrum. Antennae with 12 segments, segment 2 equal to 3. Mandibles vestigial, without lateral processes. Pronotum saddle-shaped; anterior margin with a weak notch medially; length 0.10-0.12, max. width 0.29-0.32 mm; posterior margin without notch.

Distribution : BANGLADESH: Adampur, type-locality. CHINA : Southern China.

Genus 51. *Ceylonitermes* Holmgren

1. Subgenus *Ceylonitermes* (of *Eutermes*) Holmgren :

1912. Holmgren, K. *Svensk. vetensk.-Akad. Handl.*, **48**(4) : 59-61, 64, 70, 71, 72.
 1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : 36.

2. Genus *Ceylonitermes* Holmgren :

1930. Light, *Philippines J. Sci.*, **42**(1) : 16.
 1949. Snyder, *Smiths. misc. Colls.*, **112** : 313.
 1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** (Art. 2) : 60, 62.
 1955. Emerson, *Fieldiana: Zool.*, **37** : 481, 514.
 1958. Ahmad, *Biologia; Lahore*, **4** (1-2) : 89.
 1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 248 : 2, 3-4.
 1968. Sen-Sarma, *Orient. Insects*, **2** (1) : 9, 21, 23, 24, 29, 34.
 1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 148, 149.
 1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235.
 1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 2.
 1976. Thakur, *J. Timb. Dev. Assoc. India*, **22** (2) : 15.
 1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 91, 101.
 1984. Bose, *Occ. Pap. Rec. zool. Surv. India.* , No. 49 : 104, 238.
 1987. Chhotani, *Beitr. Ent.*, **37** : 413, 414.

3. Genus *Eutermes* Heer (Part) :

1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : 52-54, 56-57. Synonymy.

Type of genus : *Eutermes Escherichi* Holmgren.

1. Characters of Genus *Ceylonitermes*

Imago : Unknown.

Soldier : Monomorphic, small species. Head without rostrum pyriform, with a well marked constriction behind antennae; in profile depressed behind base of rostrum. Rostrum cylindrical, raised apically in profile. Antennae with 12 segments, not much elongate. Mandibles vestigial, each with a prominent, long, spine-like process. Pronotum saddle-shaped; not notched at anterior margin. Legs with 2 : 2 : 2 apical tibial spurs; tarsi 4-jointed.

Worker : Head-capsule subsquarish; epicranial suture indistinct (*escherichi*) or well marked (*indicola*). Fontanelle plate small, translucent. Antennae with 14-15 segments. Mandibles each with an apical and two marginals; apical shorter than 1st marginal. Left mandible : 1st marginal with long, incurved posterior margin; 2nd marginal short, widely separated from 1st and without any cut or notch in between. Right mandible : 1st marginal triangular, with posterior margin a little longer than anterior margin; 2nd marginal shorter, with straight posterior margin equal to molar plate. Pronotum and legs as in soldier.

2. Distribution and Composition of *Ceylonitermes*

(Fig. 293)

Genus *Ceylonitermes* is endemic to the Indian Region and is reported from Sri Lanka and southern India by two species viz. *C. escherichi* (Holmgren) from Sri Lanka and *C. indicola* Thakur from Kerala state, India.

3. Key to Indian Species of *Ceylonitermes*

SOLDIERS

- 1(2). Head-length with rostrum 1.15-1.23 mm. Rostrum shorter in comparison to head-length (rostrum-length 0.37-0.43 and head-length without rostrum 0.75-0.80 mm, index rostrum-length/head-length 0.47-0.57).....*indicola*

- 2(1). Head-length with rostrum 1.26-1.41 mm. Rostrum longer in comparison to head-length (rostrum-length 0.47 and head-length 0.67mm, index rostrum-length/head-length 0.67)
*escherichi*

315. *Ceylonitermes escherichi* (Holmgren)

(Figs. 345, 346)

1. *Eutermes Escherichi* Holmgren :

1911. Holmgren, In : *Escherich's Termitenleben auf Ceylon* : 199; Pl. III fig. L₁ and L₂. Syntypes : Probably in Riksmus., Stockholm. : Type-locality : Peradeniya, Sri Lanka.

2. *Eutermes (Ceylonitermes) Escherichi* Holmgren :

1912. Holmgren, K. *Svensk. vetensk.-Akad. Handl.*, **48**(4) : 64, Pl. 3. fig. 4.
 1913. Holmgren, K. *Svensk. vetensk.-Akad. Handl.*, **50**(2) : 164, 189-190.

3. *Eutermes (Eutermes) escherichi* Holmgren :

1925. John, *Treubia*, **6**(3-4) : 399.

4. *Eutermes escherichi* Holmgren :

1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptora* : 56-57.
 Synonymy.

5. *Ceylonitermes escherichi* Holmgren :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 314.
 1958. Ahmad, *Biologia*, Lahore, **4**(1-2) : 158.
 1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 248 : 4-6.
 1962. Mathur and Thapa, *Indian For. Leaflet*, No. 167 : 76.
 1976. Thakur, *J. Timb. Dev. Assoc. India*, **22**(2) : 15, 17.

IMAGO : Unknown.

SOLDIER (Fig. 345) : Head-capsule brownish yellow; rostrum somewhat brownish; abdominal tergites brown, anteriorly somewhat yellowish; sternites paler, Head naked, only with few pairs of hairs; abdominal tergites very thinly hairy with microscopic hairs; sternites generally hairy with a distinct row of hairs. Total body-length 2.5-3.0

mm. Head moderately, elongately oval, distinctly constricted behind antennae (head-length with rostrum 1.26-1.41, head-length without rostrum 0.67, head-width 0.53-0.60 mm); in profile depressed and in between flatly raised. Rostrum narrow, cylindrical, nearly $\frac{2}{3}$ of head-length (length 0.47 mm); in profile straight and raised in front. Antennae with 12 segments; segment 3 one-and-half times as long as 2, 4 shorter than 2. Mandibles vestigial, with a prominent, long, spine-like process. Pronotum weakly saddle-shaped, with a small anterior lobe; anterior margin hardly notched; pronotum-width 0.34 mm.

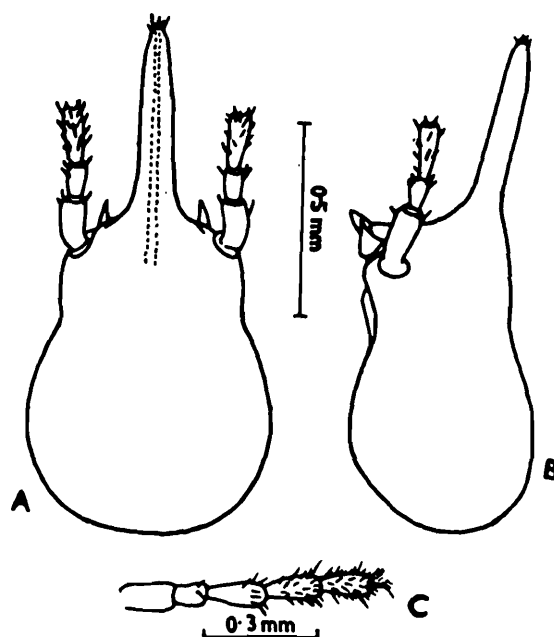


Fig. 345 : *Ceylonitermes escherichi*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal segments of antenna. (Ex Prashad and Sen-Sarma, 1966b).

WORKER (Fig. 346) : Head yellow, colour of remaining parts as in soldier; clypeus brown at margins. Head thinly hairy; abdominal tergites moderately hairy with weakly marked posterior hairs; sternites as hairy as in soldier. Total body-length 4.0 mm. Head broad, oval, broadest in region of antennae, frons flatly raised (head length to tip of labrum 1.29, head-width 0.99-1.01 mm); epicranial suture hardly distinct. Fontanelle plate weak, triangular. Antennae with 15 segments; segment 3 half as long as 2, 4 longer than 3, 5 subequal to 4. Postclypeus large, swollen; Pronotum strongly saddle-shaped, anterior lobe very large, anterior margin not notched; width 0.46 mm.

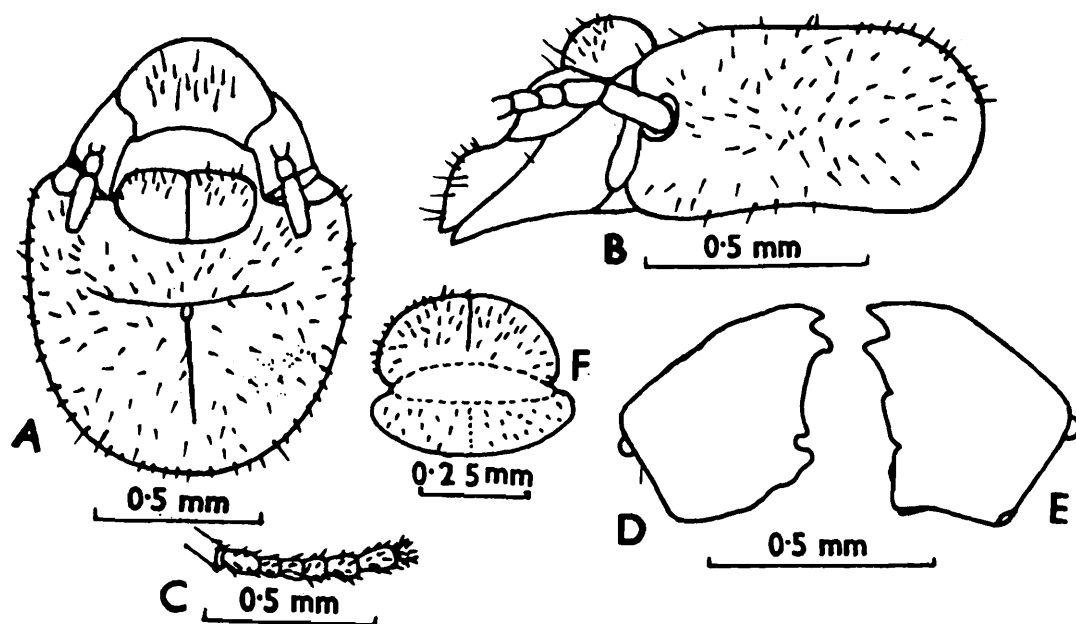


Fig. 346 : *Ceylonitermes escherichi*. Worker. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna. (D), (E) Left and right mandibles. (F) Pronotum. (Ex Prashad and Sen-Sarma, 1966b).

Distribution : SRI LANKA.

316. *Ceylonitermes indicola* Thakur

(Figs. 347, 348)

1. *Ceylonitermes indicola* Thakur :

1976. Thakur, *J. Timb. Dev. Assoc. India*, **22**(2) : 15-17, 2 pls. S and W.
Holotype : S, in FRI. Type-locality : Nilambur, Kerala, India.

IMAGO : Unknown.

SOLDIER (Fig. 347) : Head-capsule golden yellow, paler posteriorly; rostrum dark brown somewhat paler apically; antennae rusty yellow, paler distally; abdominal tergites smoky brown; legs and abdominal sternites dirty yellow. Head-capsule with 2 pairs of long hairs on vertex and a few hairs near tip of rostrum; abdominal tergites without hairs; sternites densely hairy with long and short hairs. Total body-length 2.40-2.65 mm. Head-capsule without rostrum pyriform, with sides markedly constricted behind antennae; widest posteriorly (length with rostrum 1.15-1.23, length without rostrum 0.75-0.80, width 0.53-0.60 mm); in profile

depressed at base of rostrum and in the region of constriction, in between faintly raised. Rostrum short and cylindrical; about half of head-length without rostrum (length 0.37-0.43 mm, index rostrum-length/head-length 0.47-0.57); in profile raised anteriorly. Antennae with 12 segments, segment 2 shortest, 3 twice that of 2, 4 shorter than 3, 4-8 subequal and shorter than 3; remaining segments little shorter than preceding ones. Mandibles vestigial, each with a long, narrow, pointed, spine-like process. Pronotum saddle-shaped, without any long hairs; anterior margin semicircular, without notch; posterior margin weakly convex, without notch (length 0.13-0.15, width 0.30-0.35 mm).

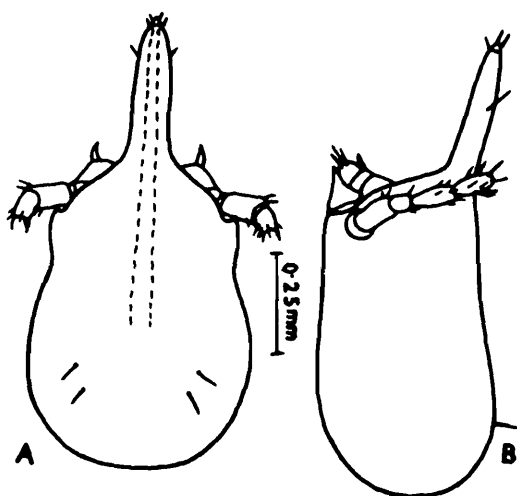


Fig. 347 : *Ceylonitermes indicola*. Soldier. (A) Head, dorsal view. (B) Head, side view. (Ex Thakur, 1976c).

WORKER (Fig. 348) : Head-capsule brown; antennae, postclypeus and thorax pale yellowish brown; abdomen smoky brown. Head moderately and body densely hairy. Total body-length 3.0-3.4 mm. Head-capsule subsquarish, widest near base of mandibles (length to base of mandibles 0.88-0.90, max. width 0.93-0.98 mm); epicranial suture distinct. Fontanelle plate small, whitish. Antennae with 14 segments; segment 3 as long as 2, 4 shortest. Postclypeus swollen, length almost half of width. Pronotum as in soldier (length 0.25-0.33, width 0.43-0.45 mm).

Distribution : INDIA : Kerala (Neelambur, type-locality).

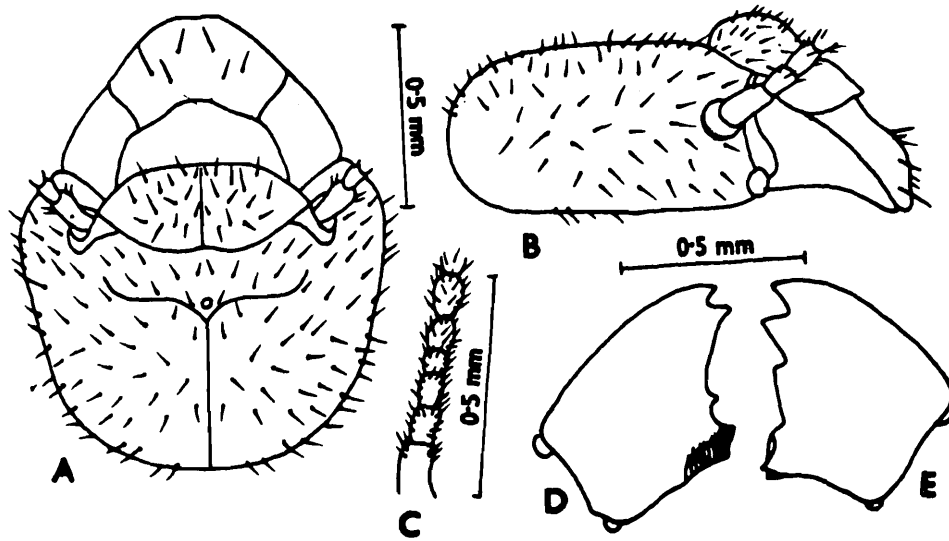


Fig. 348 : *Ceylonitermes indicola*. Worker. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna. (D), (E) Left and right mandibles (Ex Thakur, 1976c).

Genus 52. *Ampoulitermes* Mathur and Thapa

Genus *Ampoulitermes* Mathur and Thapa :

1962. Mathur and Thapa, *Indian Forester*, **88** (1) : 49-50.
 1970. Chhotani and Bose, *Zool. Anz.*, **190** : 235.
 1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 9, 28.
 1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 83, 87, 90, 91, 94-95.
 1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 103, 230.
 1987. Chhotani, *Beit. Ent.*, **37** : 415, 416.

Type of genus : *Ampoulitermes wynaadensis* Mathur and Thapa.

1. Characters of Genus *Ampoulitermes*

Imago : Unknown.

Soldier Head-capsule dark brown to chocolate in colour, pear-shaped, strongly constricted behind antennae and medially depressed at posterior margin. Rostrum long, cylindrical. Antennae 12 segmented; segments short, 3rd longer and narrower than 2nd. Mandibles vestigial, bluntly pointed laterally. Pronotum small, saddle-shaped; anteriorly notched medially. Legs with 2 : 2 : 2 apical tibial spurs; tarsi 4-jointed, Abdomen hairy, with short and long hairs; cerci 2-jointed.

Worker : Head-capsule yellowish brown to brown, subcircular; epicranial suture present. Fontanelle plate elongate, whitish. Antennae 13 to 14-segmented. Postclypeus swollen moderately; length less than 1/2 of width. Left mandible with an apical and two marginals; apical and 1st marginal, pointed, subequal, angle between the two acute; 2nd marginal short, separated from 1st by long posterior margin of 1st; basal projection (molar plate) less so projected and at level with 2nd marginal. Right mandible with apical and 1st marginal as in left; 2nd marginal short with a substraight posterior margin; molar plate longer than posterior margin of 2nd marginal. Pronotum saddle-shaped. Legs and abdomen as in soldier.

2. *Distribution and Composition of Ampoulitermes*

(Fig. 293)

The genus is represented by a single species, *Ampoulitermes wynaadensis* Mathur and Thapa, reported from Periyar Reserve Forest, Kerala, India.

317 *Ampoulitermes wynaadensis* Mathur and Thapa

(Figs. 349, 350)

Ampoulitermes wynaadensis Mathur and Thapa :

1962. Mathur and Thapa, *Indian Forester*, **88** : 50-52. S and W. Holotype : S, in FRI. Type-locality : Wynaad, Periyar For. Range, Kerala, India. Types examined.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 36.
1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 87, 95.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 230-232.

IMAGO : Unknown.

SOLDIER (Fig. 349) : Head-capsule and rostrum dark brown to chocolate in colour; antennae brown; body yellowish brown; legs pale yellow. Head and body sparsely covered with minute hairs and a few scattered longer hairs. Total body-length 3.30-3.90 mm: Head pear-shaped, strongly constricted behind antennae; posteriorly sides weakly convex; posterior margin depressed medially; in side view rostrum slightly upturned, dorsum weakly concave and with a faint hump at base of

rostrum; length with rostrum 1.675-1.725, length without rostrum 0.95-0.975, max. width 0.812-0.862 mm. Fontanelle gland small; with a tube running up to tip of rostrum. Rostrum thin, narrow, cylindrical; a little smaller than head-length without rostrum (0.70-0.75 mm long, index rostrum/head-length 0.702-0.769). Antennae with 12 segments; segment 2 shortest, 3 thin and much longer than 2. Mandibles vestigial, with blunt points on outer margin, sometimes points sharp. Pronotum strongly saddle-shaped; anterior lobe strongly upturned and notched medially on anterior margin; posterior margin straight (length 0.187-0.20, max. width 0.48-0.525 mm). Mesonotum wider than pronotum and metanotum wider than mesonotum; both substraight at posterior margin.

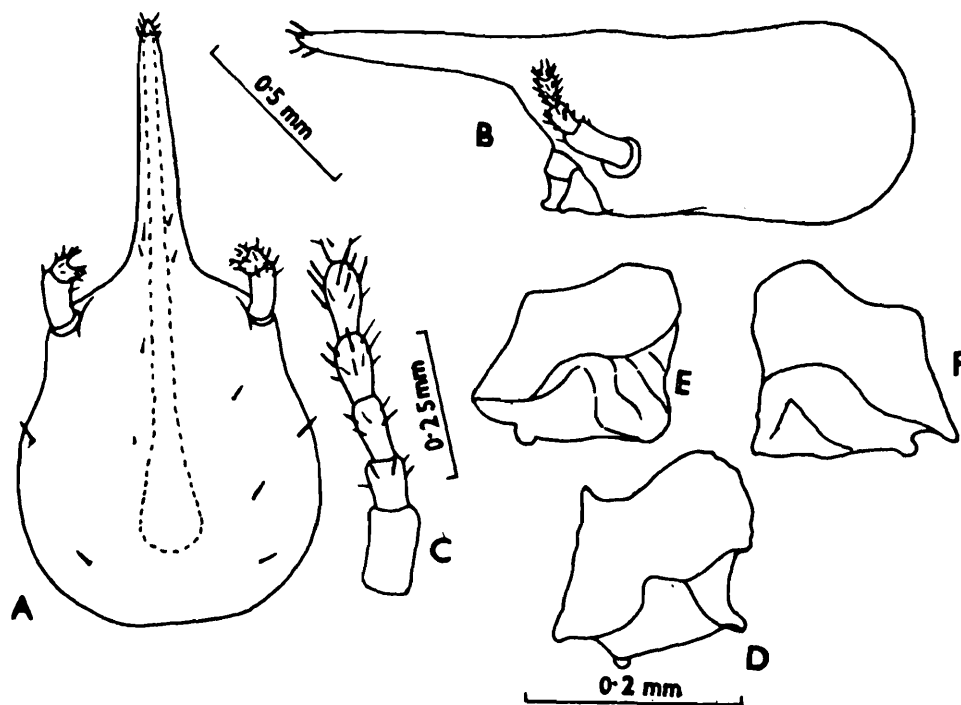


Fig. 349 : *Ampoulitermes wynaadensis*. Soldier. (A) Head, dorsal view. (B) Head, side view. (C) Basal part of antenna. (D) Left mandible showing distinct apical spine. (E), (F) Left and right mandibles; apical spine not prominent, probably broken. (Ex Mathur and Thapa 1962c).

WORKER (Fig. 350) : Head-capsule yellowish brown to brown; antennae, labrum and body yellowish. Head moderately and body densely hairy. Total body-length 3.52-3.85 mm. Head-capsule subcircular, sides weakly convex; median arm of epicranial suture present; length to base of mandibles 0.888-0.925, max. width 0.95-1.05 mm. Fontanelle plate

elongate, translucent white. Antennae with 13-14 segments, segment 3 shortest in 13-segmented antennae and 4 shortest in 14-segmented ones. Postclypeus swollen, length less than half of width. Pronotum strongly saddle-shaped; length 0.237-0.275 and max. width 0.525-0.575 mm.

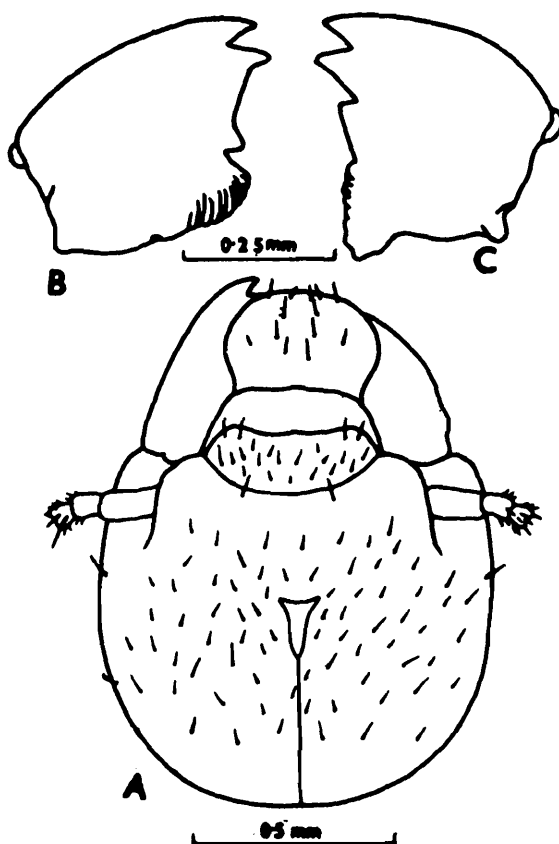


Fig. 350 : *Ampoulitermes wynaadensis*. Worker. (A) Head, dorsal view. (B), (C) Left and right mandibles. (Ex Mathur and Thapa, 1962c).

Distribution : INDIA : Kerala : Wynaad (Periyar Forest Range), type-locality. Known only from the type-locality.

Genus 53. *Hospitalitermes* Holmgren

1. Subgenus *Hospitalitermes* (Of *Eutermes*) Holmgren :

1912. Holmgren, K. *Svensk. vetensk.-Akad Handl.*, **48**(4), 60, 62, 66, 72.

2. Genus *Hospitalitermes* Holmgren :

1923. Oshima, *Cap. Zool.*, **2**(3) : 18.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 318. Synonymy.

1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** (Art. 2) : 60, 61.
1955. Emerson, *Fieldiana : Zool.*, **37** : 477, 478, 481, 514.
1958. Ahmad, *Biologia*, Lahore, **4**(1-2) : 85, 89.
1960. Prashad and Sen-Sarma, *Rev. Termite Gen. Hospitalitermes Indian Region* (ICAR Monogr. No. 10.29) : 1-3. Synonymy, characters, etc.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 9.
1968. Sen-Sarma, *Oriental Insects*, **2**(1) : 7, 9, 10, 22, 23, 39, 34.
1970. Roonwal and Bose, *Rec. zool. Surv. India*, **62**(3-4) : 120.
1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 148, 149.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 380.
1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235, 236.
1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab*, Art. 7 : 61.
1981. Roonwal, et al. *Proc. Indian natn. Sci. Acad.*, (B) **47**(3) : 345.
1982. Thapa, *Sabah For. Rec.*, No. 12 : 7, 8.
1983. Sen-Sarma and Verma, *Oriental Insects*, **17** : 86, 90, 91-92. Characters.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 104, 236.
1987. Chhotani, *Beitr. Ent.*, **37** : 413, 414.
- In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.
3. Subgenus *Eutermes* (of *Termes*) Heer (Part) :
1904. Desneux. *Gen. Insect.*, Fasc. 25 : 39-46.
4. Genus *Eutermes* Heer (Part) :
1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : 52-54. Synonymy, characters, etc.

Type of genus : *Termes hospitalis* Haviland

1. Characters of Genus *Hospitalitermes*

Imago : Blackish brown species with dark brown wings. Head-capsule subcircular, rather broad; epicranial suture distinct, prominent. Eyes subcircular, large, projecting out. Ocelli oval, separated from eyes. Antennae long, with 15 segments; segment 3 longer than 2. Postclypeus swollen; length slightly less than 1/2 width. Mandibles each with an apical and two marginals; apical shorter than 1st marginal. Left mandible

with 1st marginal having long, incurved posterior margin; 2nd marginal small, triangular; widely separated from 1st and without any cut or notch between posterior margin of 1st and anterior margin of 2nd. Right mandible with 1st marginal triangular having a slightly longer posterior margin and 2nd marginal short with long, straight posterior margin; molar plate larger than posterior margin of 2nd marginal. Pronotum trapezoidal. Legs short, hairy; with 2 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Wings long, brown, densely hairy; microsculpture consists of a row of papillae on anterior and posterior margins, pimples all over and micrasters arranged in subcircular curves and circles (*monoceros*); wing venation consists of costa along anterior margin, radius running close to and parallel with costa and thinner media and cubitus with varying number of branches, media arising independently from scale in forewing and from radius outside scale in hindwing. Abdomen densely hairy; cerci short, 2-jointed.

Soldier : Monomorphic. Brown to blackish brown, without long hairs on head and dorsal surface of body. Head pear-shaped without rostrum and strongly constricted behind antennae. Rostrum cylindrical, length variable in relation to head-length without rostrum. Fontanelle tube prominent. Antennae markedly elongate, generally with 14 segments. Mandibles vestigial, each with a long, spine-like, pointed process. Pronotum saddle-shaped, deeply incised antero-laterally. Legs rather long, pilose; apical tibial spurs 2 : 2 : 2; tarsi 4-jointed. Abdomen without long hairs on tergites and fairly hairy on sternites; cerci 2-jointed, hairy.

Worker : Dimorphic. *Worker major* : Brown to dark brown; without any hairs on dorsal surface generally. Head-capsule squarishly subcircular to circular; epicranial suture prominent. Fontanelle plate elongate, translucent. Antennae with 15 segments. Postclypeus swollen, length almost half of width. Mandibles as in Imago. Pronotum, legs and abdomen as in soldier, legs however shorter. *Worker minor*. As in worker major except for its smaller size, and not deeply incised pronotum at antero-lateral angles.

2. *Distribution and Composition of Hospitalitermes*

(Fig. 293)

Distribution : The genus *Hospitalitermes* is mainly Oriental, except for a single species occurring in the Papuan region. In the Oriental Region,

it is recorded from almost all over except for Pakistan. Chhotani 1987 has discussed the zoogeography of this genus.

Composition : Snyder 1949 has catalogued 23 species and subspecies of this genus. Prashad and Sen Sarma 1960 recognized 26 including two described by them, while Chhotani 1987 has taken into account 25 species of which only seven species, as follows, occur in the Indian region.

1. *Hospitalitermes ataramensis* Prashad and Sen-Sarma—Burma, Thailand, Cambodia and Vietnam
2. *H. blairi* Roonwal and Sen-Sarma—India (S. Andaman Isls.).
3. *H. birmanicus* Snyder—Burma
4. *H. brevirostratus* Prashad and Sen-Sarma—Burma
5. *H. jepsoni* Snyder—India, Bangladesh, Burma, Thailand and Cambodia.
6. *H. madrasi* Snyder—India
7. *H. monoceros* (König)—Sri Lanka

3. Keys to Indian Species of *Hospitalitermes*

IMAGOES

The imago is known only in case of the species *monoceros*.

SOLDIERS

- 1(2) Smaller. Head-length with rostrum 1.42-1.74, head-length without rostrum 1.02-1.14, max. width of head 0.96-1.08, max. width of pronotum 0.54-0.60 mm. Head more strongly produced behind (posterior-bulge of head 0.36-0.56 mm, head-production index i.e. posterior-bulge/head without rostrum 0.53-0.58).....*blairi*
- 2(1) Larger. Head-length with rostrum 1.76-2.00, head-length without rostrum 1.10-1.35, max. width of head 1.10-1.35, max. width of pronotum 0.60-0.70 mm. Head less so produced behind (posterior-bulge of head 0.40-0.62 mm, head-production index 0.33-0.50)
- 3(4) Rostrum darker than posterior part of head.....*jepsoni*
- 4(3) Rostrum either paler or as dark as head
- 5(8) Darker species. Head-capsule dark castaneous brown to blackish brown

- 6(7) Head blackish brown, paler anteriorly; abdomen paler, pale brown. Third segment of antennae always 2.0 times as long as second.....*monoceros*
- 7(6) Head dark castaneous brown to dark reddish brown; abdomen brown with smoky tinge. Third segment of antennae 2.2-2.5 times as long as second.....*madrasi*
- 8(5) Paler species. Head-capsule brown to smoky brown
- 9(10) Head paler brown to reddish brown; rostrum paler than head; abdomen dark brown. Pronotum 1/2 or longer than 1/2 of width.....*ataramensis*
- 10(9) Head brown with smoky tinge, rostrum of same colour as head; abdomen brown to smoky brown. Pronotum 1/2 of width
- 11(12) Abdomen smoky brown; thorax pale brown. Third segment of antennae 2-2.2 times as long as second*brevirostratus*
- 12(11) Abdomen brown without smoky tinge; thorax brown. Third segment of antennae 2.2-2.5 times as long as second.....*birmanicus*

318. *Hospitalitermes ataramensis* Prashad and Sen-Sarma

(Figs. 351,352)

Hospitalitermes ataramensis Prashad and Sen-Sarma :

1960. Prashad and Sen-Sarma, *Rev. Termite Genus Hospitalitermes Indian Region* (ICAR Monogr. 10. 29) : 4, 5-10. S, W maj. and W min. Holotype : S, in FRI. Type-locality : Ataram, Pokabo Reserve, Burma.
1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 2.
1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 88, 89-90.
1968. Harris, *Opusc. Ent.*, **33** : 152, 153.
1973. Morimoto, *Bull. Govt. For. exp. Sta.*, No. 257 : 76, 79.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 36.

IMAGO : Unknown.

SOLDIER (Fig. 351) : Head-capsule pale brown to reddish brown, rostrum paler than head; antennae straw coloured to pale brownish; thorax pale brown to brown; abdominal tergites dark brown (almost black); sternites stramineous. Head without long hairs, a short hair on either

side on vertex and another one on either side of base of rostrum however present; thorax and abdominal tergites without long hairs; sternites with numerous hairs. Total body-length 4.50-4.90 mm. Head-capsule pyriform, with a strong constriction behind antennae; almost as long as wide (length with rostrum 1.80-1.90, length without rostrum 1.20-1.30, max. width 1.20-1.30, width at constriction 0.80-0.90 mm, head-constriction index i.e. width at constriction/max. width 0.66-0.72); posteriorly strongly bulged (posterior bulge 0.40-0.60 mm, head-bulge index i.e. posterior bulge of head/head-length without rostrum 0.33-0.48); in profile strongly incurved behind base of rostrum and strongly uplifted at occiput. Eyes present as whitish, suboval, indistinct spots just behind antennae. Rostrum short, conical, nearly half of head-length (length 0.60-0.65 mm, index rostrum-length/head-length without rostrum 0.46-0.50); apex strongly uplifted in profile and with a few hairs at tip; rostral hump absent. Antennae rather long, 14-segmented; segment 3 twice to little more than twice as long as 2 and a little longer than 4. Mandibles vestigial; each with a long, pointed, spine-like process. Thorax with a fine, median, longitudinal, whitish line. Pronotum strongly saddle-shaped; anterior margin convex without any

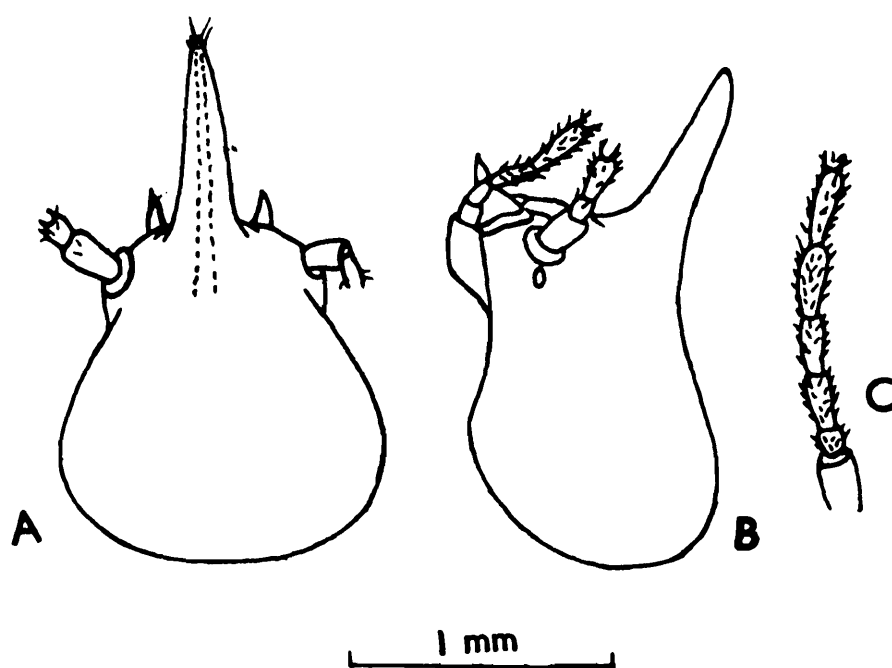


Fig. 351 : *Hospitalitermes ataramensis*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal segments of antenna. (Ex Prashad and Sen-Sarma, 1960).

notch; posterior margin strongly convex, not notched; laterally deeply incised at junction of anterior and posterior lobes; length 0.35, width 0.70 mm.

WORKER : Dimorphic. *Worker major* (Fig. 352) : Head-capsule brown, paler anteriorly; antennae, thorax and femora pale brown; abdominal tergites blackish brown with smoky tinge, sternites whitish. Body without any hairs on dorsal surface, ventrally with numerous long hairs. Total body-length 4.0-5.0 mm. Head-capsule subsquarish, widest at base of mandibles (max. width 1.35 mm); epicranial suture prominent. Fontanelle plate elongate, translucent white. Antennae with 15 segments, elongate; segment 3 much larger than 2 or 4. Postclypeus brown, swollen, length less than half of width (length 0.20, width 0.75 mm). Pronotum strongly saddle-shaped; with a faint median notch anteriorly, otherwise as in soldier (length 0.52, width 0.73 mm). *Worker minor* : As in worker major except for shorter antennal segments and segment 3 being as long as 2, and pronotum very weakly or not at all incised antero-laterally.

Distribution : BURMA, THAILAND, CAMBODIA and VIETNAM.

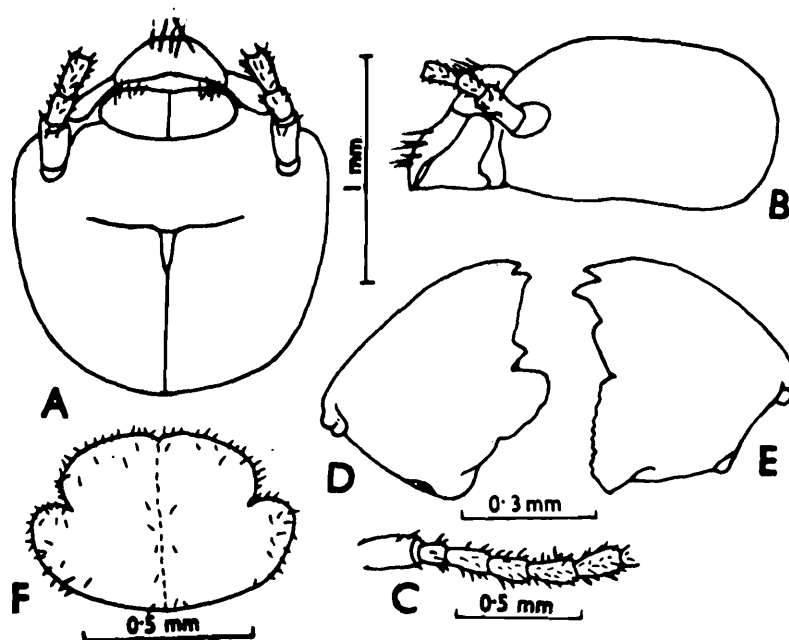


Fig. 352 : *Hospitalitermes ataramensis*. Worker. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna. (D), (E). Left and right mandibles. (F) Pronotum. (Ex Prashad and Sen-Sarma, 1960).

319. *Hospitalitermes birmanicus* Snyder

(Fig. 353)

1. *Nasutitermes (Hospitalitermes) birmanicus* Snyder :

1934. Snyder, *Indian For. Rec.*, **20**(11) : 15-16. Lectotype : S. in FRI.
Type-locality : Hsipaw, Burma.

2. *Hospitalitermes birmanicus* Snyder :

1958. Ahmad, *Biologia*, Lahore, **4** : 142.

1960. Prashad and Sen-Sarma, *Rev. Termite Genus Hospitalitermes Indian Region* (ICAR Monogr. 10. 29) : 4, 11-14. Synonymy, description, etc.

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 2.

1973. Morimoto, *Bull. Gov. For. exp. Sta.*, No. 257 : 76, 79.

1967. Roonwal and Chhotani, *J. Bombay nat. Hist. Soc.*, **60**(2) : 359, 364.

IMAGO : Unknown.

SOLDIER (Fig. 353) : Head-capsule and rostrum brown with smoky tinge; antennae smoky brown; thorax and abdomen above and femora brown. Head and abdominal tergites without long hairs; pronotum with many short hairs; legs and abdominal sternites with short and long hairs. Total body-length 4.30-4.50 mm. Head-capsule without rostrum pyriform, with a well marked constriction behind antennae (length with rostrum

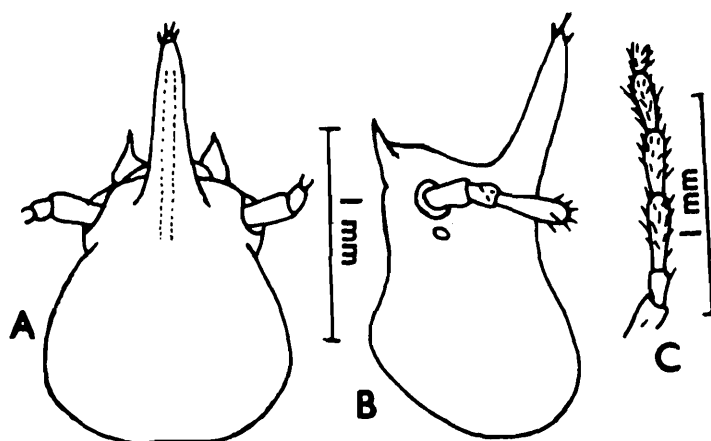


Fig. 353 : *Hospitalitermes birmanicus*. Soldier. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna. (Ex Prashad and Sen-Sarma, 1960).

1.90-1.95, length without rostrum 1.30, max. width 1.20*, width at constriction 0.78* mm); in profile strongly incurved behind rostrum, prominently raised at occiput and rostral hump absent; posteriorly strongly produced (posterior bulge 0.50-0.55 mm, head-bulge index i.e. posterior bulge/head-length without rostrum 0.38-0.42). Rostrum cylindrical; a little shorter than 1/2 head-length (length 0.60-0.65 mm, index rostrum-length/head-length without rostrum 0.462-0.50). Eyes small, white, indistinct spots behind antennae. Antennae very long, with 14 segments; segment 3 about twice to two-and-a-half times of 2; 4 about twice of 2 and shorter than 3. Mandibles vestigial, each with a long, dark brown, spine-like process. Pronotum strongly saddle-shaped; almost as long as 1/2 width (length 0.30-0.32, width 0.60-0.62 mm). Hind tibia long (2.0 mm).

WORKER : Unknown.

Distribution : BURMA.

320. *Hospitalitermes blairi* Roonwal and Sen-Sarma

(Figs. 354-356)

Hospitalitermes blairi Roonwal and Sen-Sarma :

1956. Roonwal and Sen-Sarma, *Indian J. agric. Sci.*, **26**(1) : 29-36. S and W. Holotype. S, in ZSI. Type-locality : S. Corbyn's Cave, Port Blair, South Andaman Islands, India.
1960. Prashad and Sen-Sarma, *Rev. Termite Genus Hospitalitermes Indian Region* (ICAR Monogr. No. 10. 29) : 4, 10-11.
1970. Roonwal and Bose, *Rec. zool. Surv. India*, **62**(3&4) : 118, 120, 165, 167, Pl. 13 fig. 9.
1980. Bose, *Rec. zool. Surv. India*, **77** : 108.

IMAGO : Unknown.

SOLDIER (Fig. 354) : Head-capsule brown with reddish tinge; rostrum paler than head; antennae brown proximally, paler distally; thorax, coxae and femora pale brown; abdomen dark brown above and brownish yellow below; tibiae and tarsi brownish yellow. Head with a pair of hairs at vertex, a pair at base of rostrum and a few hairs on rostrum and at its tip; pronotum with minute hairs on anterior margin; last 3 abdominal

* Calculated from figure given by Prashad and Sen-Sarma 1960.

tergites with a few hairs otherwise without any hairs, sternites densely hairy. Total body-length 4.0-4.5 mm. Head-capsule pear-shaped, with a strong constriction behind antennae; nearly as wide as long (length with rostrum 1.42-1.74, length without rostrum 1.02-1.14, max. width 0.96-1.08, width at constriction 0.66-0.72 mm, head-constriction index i.e. width at constriction/head-width 0.667-0.687); in profile strongly incurved behind rostrum, rostral hump absent and occiput prominently raised; strongly produced behind (posterior bulge 0.36-0.54 mm, head-bulge index i.e. posterior bulge/head-length 0.53-0.58). Rostrum cylindrical, slender; shorter than head without rostrum (length 0.60-0.68 mm; index rostrum-length/head-length 0.53-0.68). Fontanelle tube and gland prominent. Eyes suboval, white spots behind antennae. Antennae very elongate; with 14 segments; segment 3 generally more than twice as long as 2, 4 a little shorter than 3. Mandibles vestigial, each with a long, dark brown, pointed, spine-like process. Thoracic terga with a fine, white, median line. Pronotum saddle-shaped, with short hairs on anterior margin and body; a little longer than 1/2 width (length 0.36, width 0.54-0.60 mm). Hind tibia long (2.40-2.46 mm).

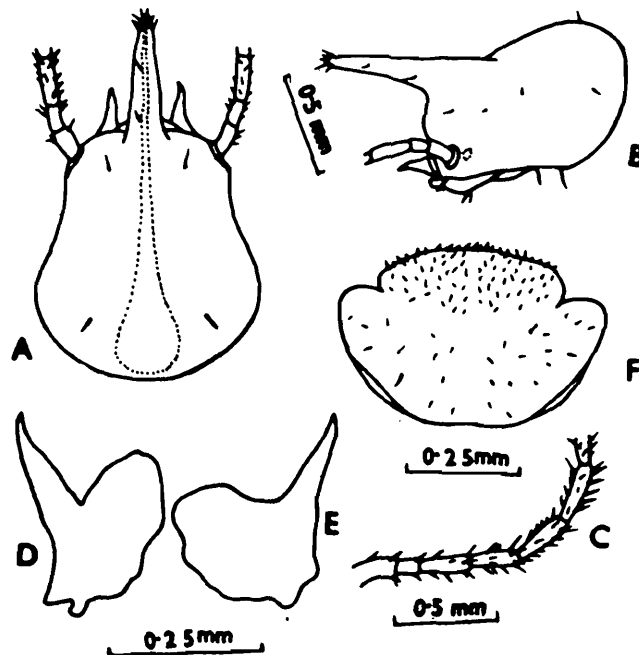


Fig. 354 : *Hospitalitermes blairi*. Soldier. (A) Head, dorsal view. (B) Head, side view. (C) Basal portion of antenna. (D), (E) Left and right mandibles. (F) Pronotum. (Ex Roonwal and Sen-Sarma 1956).

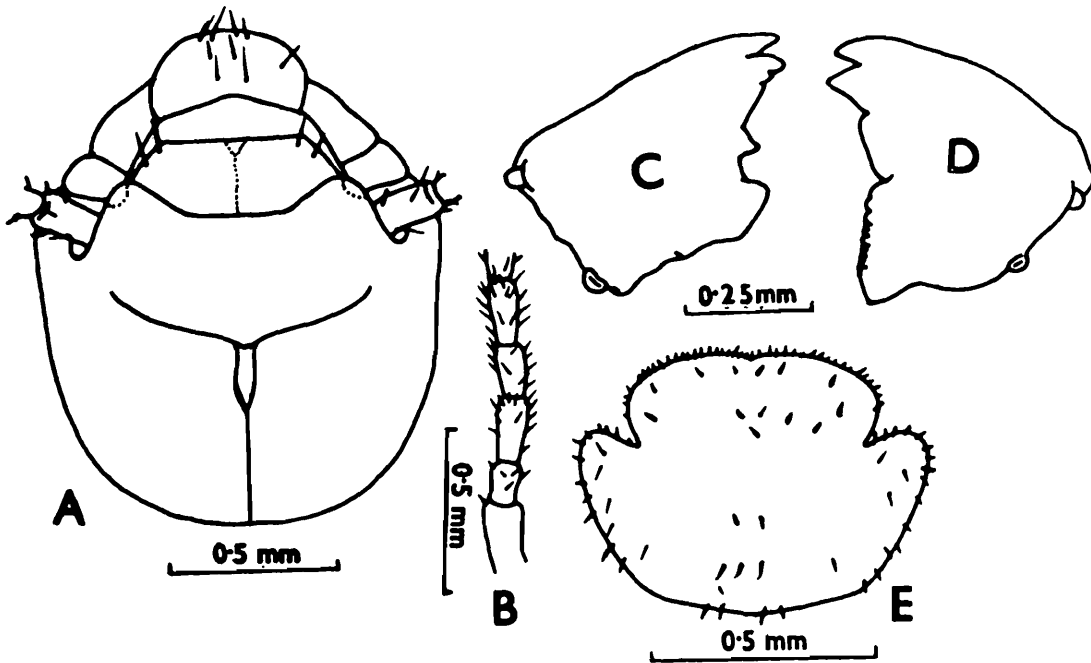


Fig. 355 : *Hospitalitermes blairi*. Worker major. (A) Head, dorsal view. (B) Basal portion of antenna. (C), (D) Left and right mandibles. (E) Pronotum. (Ex Roonwal and Sen-Sarma, 1956).

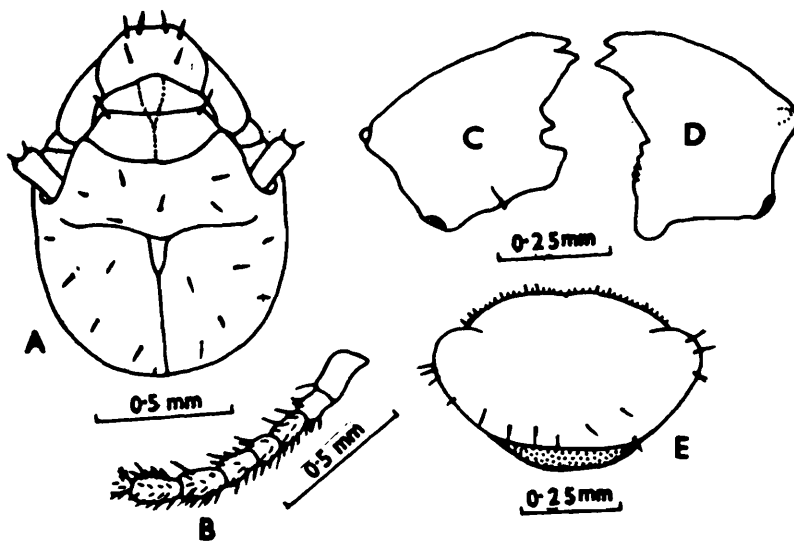


Fig. 356 : *Hospitalitermes blairi*. Worker minor. (A) Head, dorsal view. (B) Basal portion of antenna. (C), (D) Left and right mandibles. (E) Pronotum. (Ex Roonwal and Sen-Sarma, 1956).

WORKER Dimorphic. *Worker major* (Fig. 355) Head-capsule brown; postclypeus and abdominal tergites dark brown; antennae and pronotum paler; abdominal sternites and tibiae and tarsi straw coloured. Sparsely hairy dorsally and densely hairy ventrally. Total body-length 3.96-4.26 mm. Head-capsule subsquarish (length to base of mandibles 1.02, max. width 1.14 mm); Y-suture prominently marked. Fontanelle plate suboval or longish, translucent. Antennae with 15 segments; segment 3 much longer than 2 or 4. Postclypeus swollen; length about 1/2 width. Pronotum strongly saddle-shaped; anterior margin not notched; length more than 1/2 width (length 0.54, width 0.72 mm). *Worker minor* (Fig. 356) : As in worker major except for its smaller size and 3rd antennal segment only a little longer than 2 and 4 subequal to 2. Total body-length 3.72-3.96, length of head to base of mandibles 0.90-0.96, max. width of head 1.02, length of pronotum 0.30-0.42 and width of pronotum 0.60-0.66 mm.

Distribution : INDIA : Andaman and Nicobar Islands.

321. *Hospitalitermes brevisrostratus* Prashad and Sen-Sarma

(Fig. 357)

Hospitalitermes brevisrostratus Prashad and Sen-Sarma :

1960. Prashad and Sen-Sarma, *Rev. Termite Genus Hospitalitermes Indian Region* (ICAR Monogr. 10.29) : 4, 14-17.

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 2.

1977 Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 36.

IMAGO Unknown.

SOLDIER (Fig. 357) : Head and rostrum brown with smoky tinge; antennae dark brown; thorax pale brown above; femora smoky brown, tibiae and tarsi much paler than femora; abdominal tergites smoky brown, sternites pale. Head and body without long hairs above, ventrally with numerous hairs; head with a short hair on either side of occiput, another on either side of rostrum, two short hairs on body and a few at tip of rostrum. Total body-length 4.8-5.0 mm. Head-capsule pyriform, with a strong constriction behind antennae (length with rostrum 1.85-2.00, length without rostrum 1.25-1.35, max. width 1.20-1.30, width at constriction 0.80-0.90 mm, head-constriction index i.e. width at constriction/head-width 0.66-0.69); strongly bulged posteriorly (head-bulge

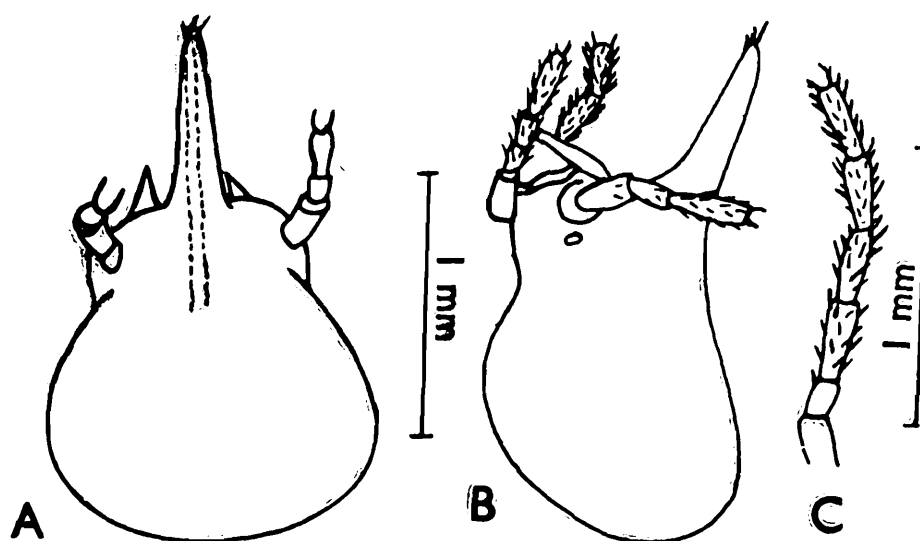


Fig. 357 : *Hospitalitermes brevisrostratus*. Soldier. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna. (Ex Prashad and Sen-Sarma, 1960).

0.45-0.62 mm, head-bulge index 0.33-0.49); in profile strongly incurved behind rostrum and raised at occiput, rostral hump absent; posterior margin strongly convex. Eyes as small, suboval, whitish, indistinct spots behind antennae. Rostrum short, conical; about 1/2 as long as head (length 0.60-0.65 mm, index rostrum-length/head-length 0.44-0.48); apically uplifted in profile. Antennae very long; with 14 segments; segment 3 twice as long as 2 and only little longer than 4. Mandibles vestigial, each with a dark brown, long, spine-like process. Thoracic terga with a white, fine, median line. Pronotum saddle-shaped; length 1/2 width (length 0.35, width 0.75 mm). Hind femur elongate, 1.80-2.00 mm long.

WORKER : Unknown.

Distribution : BURMA : Maymyo (type-locality).

322. *Hospitalitermes jepsoni* Snyder

(Fig. 358)

1. *Nasutitermes (Hospitalitermes) jepsoni* Snyder

1934. Snyder, *Indian For. Rec.*, **20**(11) : 16. S and W. Lectotype : S, in FRI. Type-locality : Pynmana, Kaing Range, Burma.

2. *Hospitalitermes jepsoni* Snyder :

1958. Ahmad, *Biologia*, Lahore, 4 : 142.

1960. Prashad and Sen-Sarma, *Rev. Termite Genus Hospitalitermes Indian Region* (ICAR Monogr. 10. 29) : 4, 17-21. Synonymy, description.

1965. Ahmad, *Bull. Am. Mus. nat. Hist.*, 131 (Art. 1) : 88-89.

1965. Krishna, *Am. Mus. Novit.*, No. 2210 : 2.

1968. Harris, *Opus. Ent.*, 33 : 153.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 60, fig. 72.

1973. Morimoto, *Bull. Gov. For. exp. Sta.*, No. 257 : 76, 79.

1975. Akhtar, *Bull. Dept. Zool. Univ. Panjab* (N.S.), Art. 7 : 147-150.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*. No.

IMAGO : Unknown.

SOLDIER (Fig. 358) : Head-capsule pale reddish brown to dark brown; rostrum darker than head; antennae brown to dark brown; tibiae and tarsi pale brown; abdominal tergites dark smoky brown, sternites pale brown. Head without or with a pair of hairs on vertex and some two short

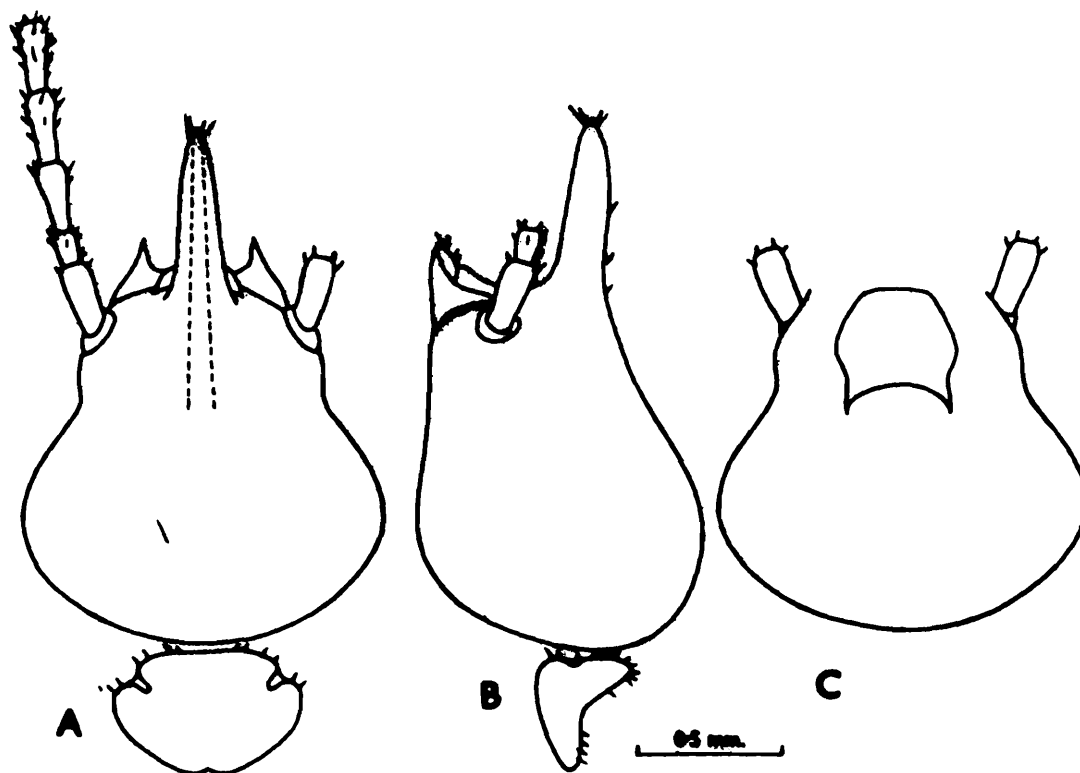


Fig. 358 : *Hospitalitermes jepsoni*. Soldier. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Head, ventral view, showing postmentum.

hairs behind base of rostrum; rostrum tip with 2 pairs of small hairs; pronotum with several short hairs; abdominal tergites with microscopic hairs, sternites with short and long hairs. Total body-length 4.0-5.2 mm. Head-capsule without rostrum pyriform, strongly constricted behind antennae (length with rostrum 1.58-1.95, length without rostrum 1.09-1.35, max. width 0.98--1.30, width at constriction 0.70-0.75 mm, index width at constriction/max. width 0.63-0.70); posteriorly strongly produced (head-bulge 0.40-0.55 mm, head-bulge index i.e. head-bulge/head-length 0.33-0.46); in profile strongly incurved behind rostrum and raised at occiput; rostral hump absent. Eyes as white, suboval, indistinct spots present behind antennae. Rostrum cylindrical, raised apically in profile, length 1/2 of head-length without rostrum (length 0.55-0.60 mm, index rostral-length/head-length without rostrum 0.50-0.54). Antennae very long, with 14 segments; segment 3 about 2.5 times of 2, 4 shorter than 3. Mandibles vestigial, each with an elongate, dark brown, pointed, spine-like process. Pronotum strongly saddle-shaped (length 0.30-0.48, max. width 0.60-0.70 mm); anterior margin not notched. Hind femora slightly projecting beyond abdomen, length 1.70-1.80 mm.

WORKER : Dimorphic. *Worker major* : Head-capsule brown with reddish tinge; antennae and pronotum paler than head; femora brown with smoky tinge; abdominal tergites castaneous brown; tibiae, tarsi and abdominal sternites straw coloured. Head and body sparsely pilose with minute hairs dorsally, body densely pilose ventrally. Total body-length 4.00-4.50 mm. Head-capsule subsquarish (length to base of mandibles 1.10-1.15, max. width 1.30 mm); Y-suture prominent. Fontanelle plate white, translucent, elongate. Antennae elongate with 15 segments; segment 3 longer than 2 or 4. Postclypeus swollen, pilose; less than 1/2 as long as wide (length 0.23-0.25, width 0.60 mm). Pronotum strongly saddle-shaped; about 1/2 as long as wide (length 0.48-0.50, width 0.70 mm). *Worker minor* : As in worker major but smaller in size and has smaller antennae with 3rd segment either as long as or slightly longer than 2 or 4. Total body-length 3.0-3.20, head-length to base of mandibles 0.75-0.90, max. width of head 1.00-1.13, length of pronotum 0.30-0.35, width of pronotum 0.50-0.60 mm.

Distribution : INDIA (Assam), BANGLADESH, BURMA, THAILAND, CAMBODIA.

323. *Hospitalitermes madrasi* Snyder

(Figs. 359, 360)

1. *Nasutitermes (Hospitalitermes) madrasi* Snyder :

1934. Snyder, *Indian For. Rec.*, **20**(11) : 16-17. S only. Lectotype : **S**, in FRI. Type-locality : North Vellore, Tamil Nadu, India.

2. *Hospitalitermes madrasi* Snyder :

1960. Prashad and Sen-Sarma, *Rev. Termite Genus Hospitalitermes Indian Region* (ICAR Monogr. 10.29) : 4, 21-26. Synonymy, description and lectotype designation.

1973. Morimoto, *Bull. Govt. For. exp. Sta.*, No. 257 : 76.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*. No. 49 : 99, 236-238.

IMAGO : Unknown.

SOLDIER (Fig. 359) : Head-capsule dark castaneous brown; antennae and femora dark brown; thorax above pale brown; tibiae and tarsi stramineous; abdominal tergites brown with smoky tinge. Head and body without long hairs on dorsal surface, ventrally with numerous hairs. Total body-length 5.00-5.30 mm. Head-capsule pyriform, with a strong constriction behind antennae (length with rostrum 1.75-1.85, length without rostrum 1.20-1.30, max. width 1.20-1.35 and width at constriction 0.80-0.90 mm, head-constriction index i.e. width at constriction/max. width 0.66-0.72; strongly produced behind (posterior-bulge 0.40-0.60 mm, head-production index i.e. posterior-bulge/head-length 0.30-0.45); in profile strongly incurved behind rostrum and raised at occiput. Rostrum conical, short (length 0.55-0.60 mm, rostrum-length/head-length index 0.42-0.52); in profile raised anteriorly. Antennae long; with 14 segments; segment 3 about 2 to 2.5 times as long as 2; 4 shorter than 3 and longer than 2. Mandibles vestigial; each with a long, dark brown, spine-like process. Pronotum saddle-shaped, without any short hairs on body (length 0.35, width 0.70 mm); anterior margin convex, without notch; posterior margin markedly convex, without any emargination. Hind tibia long (2.35-2.40 mm).

WORKER Dimorphic. *Worker major* (Fig. 360) Head-capsule blackish brown; antennae, thorax and femora brown; abdominal tergites pale, smoky brown; sternites yellowish white. Head and body not pilose

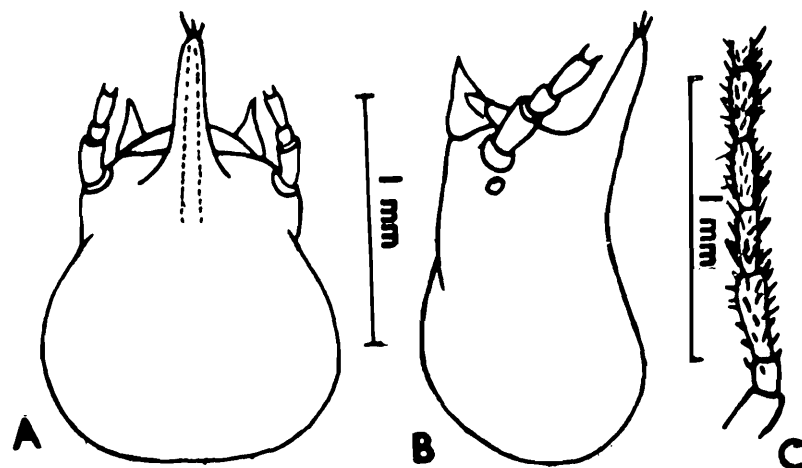


Fig. 359 : *Hospitalitermes madrasi*. Soldier. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna. (Ex Prashad and Sen-Sarma, 1960).

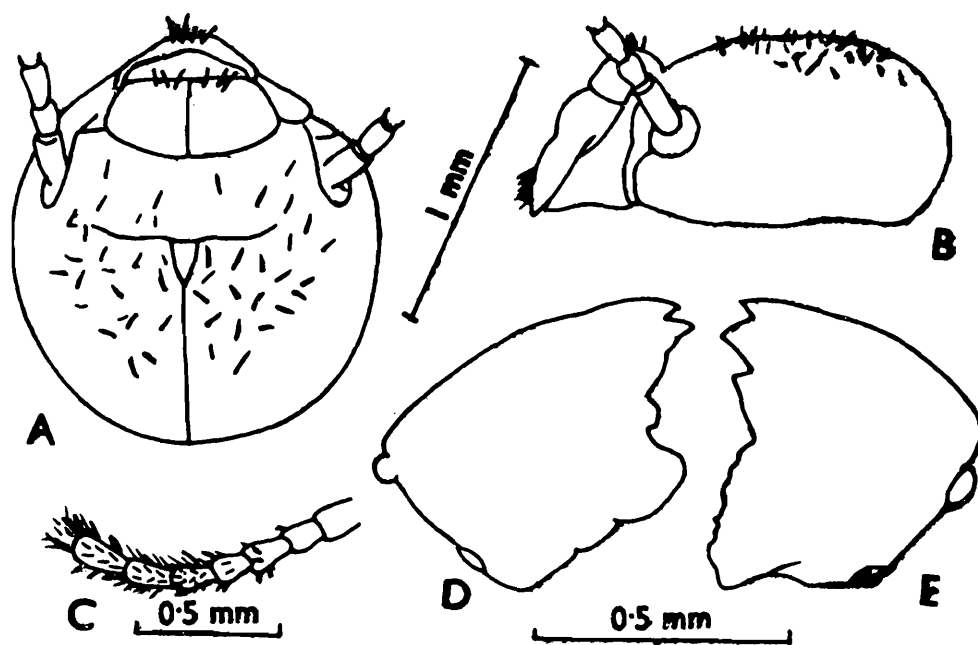


Fig. 360 : *Hospitalitermes madrasi*. Worker. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna. (D), (E) Left and right mandibles. (Ex Prashad and Sen-Sarma, 1960)

dorsally but ventrally densely pilose (vide Prashad and Sen-Sarma 1960 but hairs shown on head in the syntype worker drawing). Head-capsule subsquarish (length to base of mandibles 1.10, width 1.28 mm); epicranial Y-suture distinct. Fontanelle plate elongate, whitish. Antennae with 15 segments; segment 3 much longer than 2, 4 slightly shorter than 3. Postclypeus swollen with a few short hairs anteriorly; length less than 1/2 width (length 0.26, width 0.62 mm). Pronotum strongly saddle-shaped, length more than 1/2 width; without emargination at anterior and posterior margins. *Worker minor* : As worker major except for its smaller size, 3rd antennal segment as long as 2nd (vs longer) and pronotum not deeply incised antero-laterally (vs deeply incised).

Distribution INDIA : Tamil Nadu (North Vellore, type-locality). Known only from type-locality.

324. *Hospitalitermes monoceros* (König)

(Figs. 361, 362)

1. *Termes monoceros* König

1979. König, *Beschäft Berlin. Naturf. Freunde*, 4 : 25, Pl. 1. figs. 10, 11. S only. Syntypes in Selys Longchamps Coll., Brussels. **Type-locality** : Sri Lanka.

2. *Hospitalitermes monoceros* (König) :

1958. Ahmad, *Biologia*. Lahore, 4 : 139, 141.

1960. Prashad and Sen-Sarma, *Rev. Termite Genus Hospitalitermes Indian Region* (ICAR Monogr. 10.29) : 4, 26-32. See for synonymy, description, etc.

1977 Chhotani, *Occ. Pap. Rec. zool. Surv. India*. No. 9 : 1, 2.

IMAGO (Fig. 361) : Head-capsule blackish brown; postclypeus castaneous brown with reddish tinge; antennae brown; abdominal tergites castaneous brown, sternites pale brown. Head sparsely and body densely hairy. Total body-length with wings about 18.0 and without wings 9.0 mm. Head-capsule subsquarish (length to base of mandibles 1.10, width with eyes 1.63-1.75 mm); epicranial suture indistinct. Fontanelle plate elongate, creamy white. Eyes large, circular, max. diameter 0.60 mm. Ocelli oval, translucent (long diameter 0.20, short diameter 0.15 mm.); situated at about 1/2 of short diameter from eyes (eye-ocellus distance

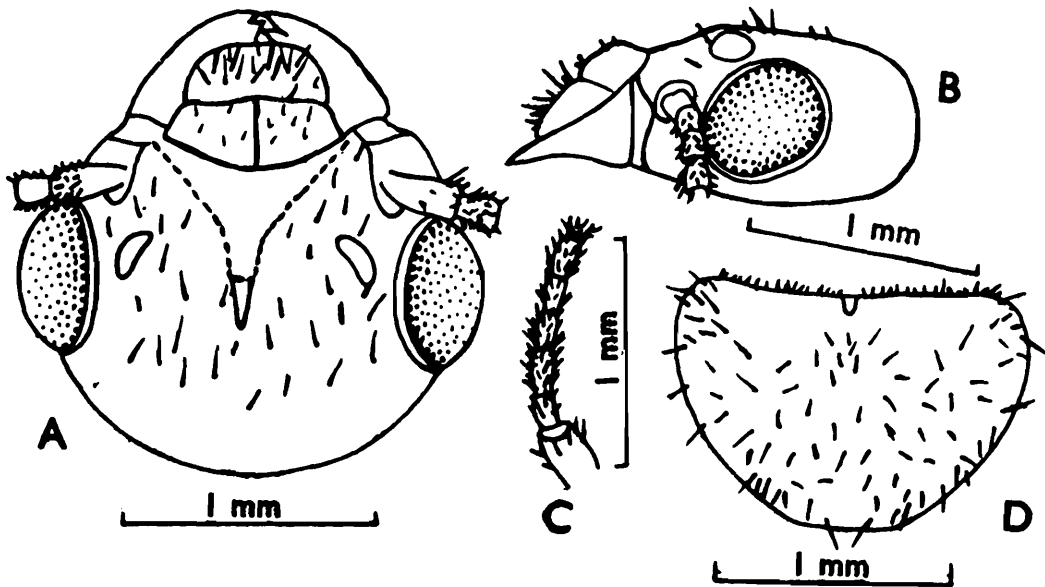


Fig. 361 : *Hospitalitermes monoceros*. Imago. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna. (D) Pronotum, (Ex Prashad and Sen-Sarma, 1960).

0.07 mm). Antennae with 15 segments; segment 3 about one-and-a-half times to nearly twice as long as 2, 4 shorter than 3. Postclypeus swollen, scantily hairy, length less than half of width. Pronotum trapezoidal, much longer than half width (length 0.90-0.99, width 1.45 mm); anterior margin substraight, without median notch; posterior margin substraight. Wings pale smoky brown, densely covered with short hairs; microsculpturing consists of small, thin, pointed, horny papillae (a row on anterior and posterior margins), pimpules all over and non-asteroid micrasters in proximal part, in between veins, arranged in subcircular curves and circles; forewing-length c 14.45-16.00, hindwing-length c 13.70 mm.

SOLDIER (Fig. 362) : Head-capsule blackish brown; rostrum little paler; antennae brown to dark brown; tibiae and tarsi paler; abdominal tergites brownish, sternites paler. Head with 4 long hairs, dorsum of body without hairs, some hairs present on last 2 tergites and sternites. Total body-length 4.0-4.70 mm. Head-capsule pyriform with a strong constriction behind antennae (length with rostrum 1.70-1.80, length without rostrum 1.06-1.20, max. width 1.14-1.20, width at constriction 0.75-0.80 mm, head-constriction index, i.e. width at constriction/max. width

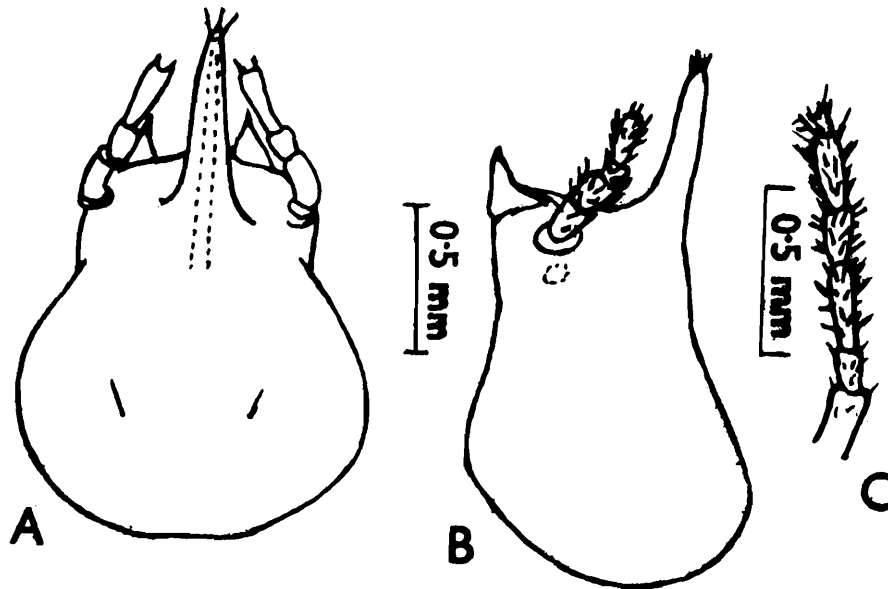


Fig. 362 : *Hospitalitermes monoceros*. Soldier. (A) Head, dorsal view. (B) Head side view. (C) Basal segments of antenna. (Ex Prashad and Sen-Sarma, 1960).

0.65-0.69; posteriorly strongly produced (head-bulge 0.40-0.50 mm, head-bulge index i.e. head-bulge/head-length 0.33-0.42); in profile strongly incurved and prominently raised at occiput. Eyes small, whitish spots. Rostrum conical, short, nearly half of head-length (length 0.50-0.60 mm, rostrum/head-length index 0.42-0.50). Antennae elongate, with 14 segments; segment 3 twice as long as 2, 4 shorter than 3. Mandibles vestigial, each with brown, long, pointed, spine-like process. Thorax with a fine, whitish, line medially. Pronotum strongly saddle-shaped, almost half as long as wide (length 0.35-0.40, width 0.65 mm); anterior margin weakly convex, without notch; posterior margin strongly convex, without notch. Hind tibiae elongate, 2.40-2.50 mm long.

WORKER Dimorphic. *Worker major* : Head-capsule dark brown; antennae and femora brown; thorax castaneous brown; abdominal tergites pale brown. Head and body without hairs dorsally, ventrally with numerous hairs. Total body-length 5.0-5.8 mm. Head-capsule subsquarish (length to base of mandibles 1.15-1.20, max. width 1.30-1.35 mm); epicranial suture prominent. Fontanelle plate longish, white. Antennae with 15 segments; segment 3 much longer than 2 and 4 slightly longer

than 2. Postclypeus swollen, length less than 1/2 width. Pronotum strongly saddle-shaped, length a little more than 1/2 width (length 0.45-0.50, width 0.65-0.70 mm); anterior margin weakly convex, without notch; posterior margin strongly convex, not notched. *Worker minor* : As worker major but for smaller size; 3rd antennal segment as long as 2 (longer in worker major) and pronotum not deeply notched antero-laterally (deeply notched in worker major).

Distribution : SRI LANKA (widely distributed).

Genus 54. *Trinervitermes* Holmgren

1. Subgenus *Trinervitermes* (of *Eutermes*) Holmgren :

1912. Holmgren, K. *Svenska Vetensk.-Akad Handl.*, **48**(4) : 59, 61, 64-65, 70, 71.

2. Genus *Trinervitermes* Holmgren :

1949. Snyder, *Smiths. misc. Coll.*, **112** : 322. Synonymy.

1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95**(Art. 2) : 60, 63.

1955. Emerson, *Fieldiana : Zool.*, **37** : 473, 481, 486, 514.

1960. Emerson, *Am. Mus. Novit.*, No. 1986 : 7.

1964. Roonwal and Bose, *Zoologica*, **40**(113) : 8, 45.

1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 247 : 2-5. Synonymy, characters, relationship Indian species.

1966. Bouillon and Mathot, *Zooleo*, No. 1 (Suppl. 1) : 2, 4, 5, 11-13, Tab.

1968. Sen-Sarma, *Orient. Insects*, **2**(1) : 7, 11, 12, 23, 28, 34.

1969. Roonwal and Bose, *Rec. zool. Surv. India*, **61** (3 & 4) : 444.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 148, 149.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 383.

1971. Bouillon and Mathot, *Zooleo*, No. 1(Suppl. 2) : 5, 15, Tab.

1972. Coaton and Sheasby, *Cimbebasia*, **2** : 24, 93-95.

1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 60-61.

1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235, 236.

1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 1, 2.

1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 57.
1981. Roonwal, Chhotani and Verma, *Proc. Indian natn. Sci. Acad.*, (B) 47(3) : 341, 398, 366. Wing microsculpture.
1982. Bose and Das, *Rec. zool. Surv. India*, 80 : 199.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 27.
1983. Sen-Sarma and Verma, *Oriental Insects*, 17 : 83, 87, 91, 95. Characters.
1983. Roonwal, *Proc. Indian natn. Sci. Acad.*, (B) 49 (5) : 365.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 103, 239-240.
1987. Chhotani, *Beitr. Ent.*, 37 : 413, 414.
1987. Bose and Das, In : *Fauna of Orissa*, Pt. 1 (State Fauna Sr. 1) : 108.
3. Subgenus *Eutermes* (of *Termes*) Heer (Part) :
1904. Desneux, *Gen. Insect.*, Fasc. 25 : 39-46.
4. Genus *Eutermes* Heer (Part)
1953. Rattan Lal and Menon, *Cat. Indian Insects*, Pt. 27-Isoptera : 52-64. Synonymy, characters, etc.
- Type of genus : *Termes trinervius* Rambur.

1. Characters of Genus *Trinervitermes*

Imago Brown to dark brown species. Head-capsule subcircular; epicranial suture absent or distinct. Fontanelle plate triangular or Y-shaped. Eyes moderately large, subcircular. Ocelli broadly oval, separated from eyes, eye-ocellus distance variable. Antennae with 15-16 segments. Postclypeus swollen, length slightly less than 1/2 of width. Mandibles each with an apical and two marginal teeth. Left mandible with 1st marginal subequal to or smaller than apical, close to it and with a long incurved posterior margin ending into a small 2nd marginal situated basally; molar projection small. Right mandible with triangular 1st marginal having longer posterior margin; 2nd marginal small with straight posterior margin; molar plate longer than posterior margin of 2nd marginal. Pronotum trapezoidal. Legs short, pilose; apical tibial spurs 2 : 2 : 2; tarsi 4-jointed. Wings long, membrane covered with minute hairs and micrasters; microsculpture consists of papillae on anterior and posterior margins and non-asteroid micrasters; costa and radius thick, brown; costa running along anterior margin; radius close to and parallel with costa; radial streak present; media thin, running medially; cubitus

weak with a number of branches to posterior margin; media arising independently from scale in forewing and from radius in hindwing.

Soldier : Dimorphic. *Soldier major* : Pale yellow to dark brown; generally having minute microscopic hairs on head and abdominal tergites, longer hairs present only on abdominal sternites. Head-capsule without rostrum broadly pyriform to almost circular, not constricted behind antennae; in profile weakly to fairly incurved behind rostrum, rostral hump absent, occiput strongly arched. Rostrum conical, shorter than head. Antennae with 12-14 segments, markedly elongate. Mandibles vestigial, without any spinose process. Pronotum strongly saddle-shaped. Legs moderately long, hairy; tibial spurs 2 : 2 : 2 ; tarsi 4-jointed. Abdomen elongate; cerci 2-jointed, styli absent. *Soldier minor* : Colour and hairiness as in soldier major. Head-capsule elongately pyriform to subrectangular. Rostrum long, cylindrical, narrow; comparative to head-length longer than in soldier major. Antennae with 12-14 segments; longer in comparison to those in soldier major. Mandibles, pronotum, legs and abdomen as in soldier major.

Worker : Monomorphic. Pale yellow to pale brown. Head-capsule subcircular, wider than length to base of mandibles; epicranial suture distinct. Fontanelle plate triangular, translucent. Antennae with 15 segments. Postclypeus swollen, hairy; shorter than 1/2 width. Mandibles as in imago. Pronotum, legs and abdomen as in soldier.

2. *Distribution and Composition of Trinervitermes*

(Fig. 293)

Distribution : The genus *Trinervitermes* is known from the Ethiopian and the Oriental zoogeographical regions. It is mainly Ethiopian (13 species) and from the Oriental it is known by 7 species only. From the Oriental Region it is reported from India, Pakistan, Sri Lanka and Indochina. The species *Trinervitermes biformis* (Wasmann) is very widely distributed in India.

Composition : Snyder 1949 recorded 62 species but after the study of Sands 1965, now only 20 species are known from the Ethiopian (13 spp.) and the Oriental (7 spp.) regions. From the Indian subregion the following 6 species are reported :

1. *Trinervitermes biformis* (Wasmann)—India, Pakistan, Sri Lanka

2. *T fletcheri* Chatterjee and Thakur—India
3. *T indicus* Snyder—India
4. *T nigrirostris* Mathur and Sen-Sarma—India
5. *T rubidus* (Hagen)—Sri Lanka, India
6. *T sensarmai*—India

3. Keys to Indian Species of *Trinervitermes*

IMAGOES

- 1(2) Smaller in size. Head-width with eyes 1.48-1.58, pronotum-width 1.30 mm. Eyes smaller (max. diameter 0.45 mm.). Wings smaller (forewing-length 12.8, hindwing-length 12.4 mm). Radial streak separated from radius at about middle *rubidus*
- 2(1) Larger in size. Head-width with eyes 1.52-2.00, pronotum-width 1.50-1.90 mm. Eyes larger (max. diameter 0.50-0.55 mm.). Wings longer (forewing-length 15.8-18.0, hindwing-length 15.1-17.0 mm). Radial streak separated from radius at proximal 1/5 or 1/6
- 3(4) Head-capsule brown with reddish tinge. Head smaller, head-width with eyes 1.52-1.87 mm. Ocellus smaller (long diameter 0.23, short diameter 0.15 mm.) *biformis*
- 4(3) Head-capsule castaneous brown to black. Head larger, head-width with eyes 1.90-2.00 mm. Ocellus larger (long diameter 0.24-0.30, short diameter 0.16-0.18 mm) *nigrirostris*

SOLDIERS MAJOR

- 1(2) Smaller species. Head-length with rostrum 1.78-2.00, head-length without rostrum 1.10-1.20, head-width 1.06-1.15, pronotum-width 0.50-0.60 mm *sensarmai*
- 2(1) Larger species. Head-length with rostrum 2.15-2.55, head-length without rostrum 1.33-1.73, head-width 1.15-1.65, pronotum-width 0.58-0.80 mm
- 3(6) Head-capsule with posterior bulge prominently produced and large, head-bulge index i.e. head-production/head-length without rostrum 0.72-0.82

- 4(5) Larger in size. Head-length without rostrum 1.63-1.73, head-width 1.53-1.65 mm. Antennae 14 segmented *indicus*
- 5(4) Smaller in size. Head-length without rostrum 1.37-1.40, head-width 1.15-1.32 mm Antennae 12 to 13-segmented.....*rubidus*
- 6(3) Head-capsule with posterior bulge weakly produced and smaller, head-bulge index 0.28-0.48
- 7(8) Rostrum darker, blackish brown with paler apex and comparatively longer. Posterior bulge of head less marked, head-bulge index 0.28-0.35 *nigrirostris*
- 8(7) Rostrum reddish to dark brown with reddish brown apex and comparatively shorter. Posterior bulge of head well marked and large, head-bulge index 0.35-0.48
- 9(10) Antennae 14-segmented; in 14-segmented condition, segment 3 about 1.5 times of 2. Pronotum markedly invaginated at anterior margin *fletcheri*
- 10(9) Antennae 12 to 14-segmented; in 14 segmented condition segment 3 slightly longer than 2. Pronotum weakly invaginated at anterior margin *biformis*

SOLDIERS MINOR

Soldiers minor of the Indian species are not easily differentiated, the following key, however, may help to some extent.

- 1(6) Smaller species : Head-length with rostrum 1.40-1.64, head-length without rostrum 0.77-0.93, head-width 0.55-0.63, pronotum-width 0.38-0.45 mm
- 2(3) Rostrum longer (length 0.70-0.76 mm) in comparison to head without rostrum (index rostrum-length/head-length 0.82-0.86) *nigrirostris*
- 3(2) Rostrum shorter (length 0.60-0.68 mm) in comparison to head without rostrum (index rostrum-length/head-length 0.73-0.80)
- 4(5) Smaller in size. Head-length with rostrum 1.40, head-length without rostrum 0.77-0.80, head-width 0.55 mm. Rostrum longer in comparison to head-length, index rostrum-length/head-length 0.78-0.80. Anterior margin of pronotum weakly notched. Antennae

- with 12-13 segments; segment 3 a little longer than 2
 *sensarmai*
- 5(4) Larger in size. Head-length with rostrum 1.43-1.64, head-length without rostrum 0.83-0.93, head-width 0.59-0.63 mm. Rostrum shorter in comparison to head-length, index 0.73-0.75. Anterior margin of pronotum not notched. Antennae with 12 segments; segment 3 twice as long as 2 *rubidus*
- 6(1) Larger species : Head-length with rostrum 1.40-1.85, head-length without rostrum 0.85-1.13, head-width 0.55-0.80, pronotum width 0.40-0.50 mm
- 7(8) Generally larger. Head-length with rostrum 1.76-1.85, head-length without rostrum 1.10-1.13, head-width 0.76-0.80 mm. Rostrum shorter in comparison to head, index rostrum-length/head-length 0.61-0.64 *indicus*
- 8(7) Generally smaller. Head-length with rostrum 1.40-1.80, head-length without rostrum 0.85-1.10, head-width 0.55-0.70 mm. Rostrum longer in comparison to head, index rostrum-length/head-length 0.62-0.78
- 9(10) Anterior margin of pronotum without any emargination/indentation
 *biformis*
- 10(9) Anterior margin of pronotum weakly to deeply emarginate
 *flectcheri*

325. *Trinervitermes biformis* (Wasmann)

(Synonyms : *Eutermes heimi* Wasmann and *Nasutitermes*
(Trinervitermes) longinotus Snyder)

(Figs. 363-366)

1. *Eutermes biformis* Wasmann :

1902. Wasmann, *Zool. Jb. Syst.*, **17** (1) : 133-135, Pl. 4 figs. 10, 10a.
 Lectotype : S. maj (designated here), in NHM. Type-locality :
 Bandarawella, Sri Lanka.

2. *Trinervitermes biformis* (Wasmann) :

1963. Mathur and Thapa, *Indian Forester*, **3** (3 & 4) : 110.

1964. Roonwal and Bose, *Zoologica*, **40**(113) : 45-46.
1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 247 : 1, 6, 7-26, 41.
See for synonymy, description, etc.
1969. van Boven, *Publ. nat-hist. Genootschap Limburg*, **19** : 54.
1969. Roonwal and Bose, *Rec. zool. Surv. India*, **61** (3 & 4) : 444.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 383.
1972. Chaudhry, et al. *Termites of Pakistan* (Final Tech. Rep. PL 480 Proj. No. A17-FS-12) : 61, figs. 73, 74.
1974. Akhtar, *Pakistan J. Zool.*, **6**(1 & 2) : 93, 94, 102.
1975. Sen-Sarma, et al. *Wood Destroying Termites of India* (Final Tech. Rep. PL 480 Proj. No. A7-FS-58) : 17, 61.
1976. Roonwal, In : *Natural Resources Rajasthan* (Ed Roonwal) : 376, Pl. 3, figs. s and t.
1977. Roonwal and Verma, *Rec. zool. Surv. India*, **72** : 458-459.
1978. Roonwal, *Zeits. ang. Ent.*, **85**(1) : 26-28.
1980. Chhotani, *Tech. Monogr. zool. Surv. India*, No. 4 : 57-59.
1981. Roonwal, et al., *Proc. Indian natn. Sci. Acad.*, (B) **47**(3) : 348-350.
Microsculpture of wings.
1982. Verma and Thakur (R.K.), *Rec. zool. Surv. India*, **79** : 317.
1982. Bose and Das, *Rec. zool. Surv. India*, **80** : 209, 211, 212.
1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 96.
1983. Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. 42 : 129-131.
1984. Verma, *Indian J. Forestry*, **7**(4) : 310.
1987. Bose and Das, *Fauna of Orissa Pt. 1* (State Fauna Sr. 1) : 107, 108.
1987. Chhotani, *Beitr. Ent.*, **37** : 444.
3. *Eutermes heimi* Wasmann :
1902. Wasmann, *Zool. Jb. Syst.*, **17** (1) : 135-137.
4. *Trinervitermes heimi* (Wasmann) :
1964. Roonwal and Bose, *Zoologica*, **40**(113) : 45, 46-48.
1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 247 : 7, 8. Treats *heimi* as synonym of *biformis*.
1969. van Boven, *Publ. nat.-his. Genootschap Limburg*, **19** : 54.
5. *Nasutitermes (Trinervitermes) longinotus* Snyder :
1934. Snyder, *Indian For. Rec.*, **20**(11) : 14-15.

IMAGO (Fig. 363) : Head-capsule brown with reddish tinge; antennae and postclypeus brown to dark brown; pronotum and legs brown with reddish tinge as in head; sternites pale brown medially and brownish laterally. Head and body densely hairy. Total body-length with wings 17.5-20.0, without wings 9.0-12.5 mm. Head-capsule subcircular (length to base of mandibles 1.20-1.42, width with eyes 1.52-1.87 mm); medially slightly depressed around fontanelle plate; epicranial suture either absent or present. Fontanelle plate generally Y-shaped (sometimes triangular), translucent. Eyes moderately large, subcircular (max. diameter 0.50-0.55). Ocelli suboval, translucent (long diameter 0.18-0.23, short diameter 0.15 mm); situated very close to eyes, $1/3$ to $1/2$ of their short diameter (eyecellus distance 0.05-0.075). Antennae with 15-16 segments; segment 3 longer than 2; 4 and 5 subequal to 2. Postclypeus swollen, hairy; length less than half width; anterior margin weakly incurved and posterior margin slightly convex. Pronotum trapezoidal (length 0.90-1.12, width 1.50-1.82 mm); anterior margin substraight, without any incision at middle; posterior margin substraight to weakly convex, faintly to strongly

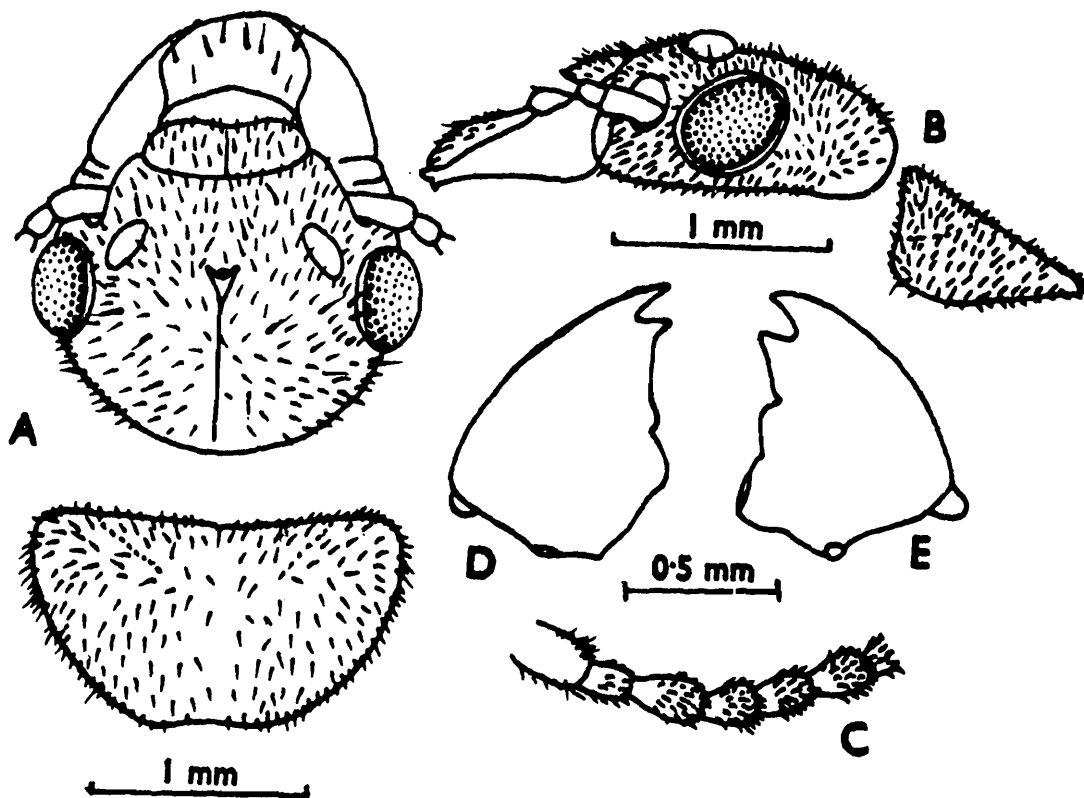


Fig. 363 : *Trinervitermes biformis*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Basal portion of antenna. (D), (E) Left and right mandibles.

emarginate at middle. Wings yellowish transparent ; membrane covered with minute hairs; microsculpture consists of pointed and thorny papillae (8-15 rows on anterior margin and 1-5 rows of smaller size on posterior margin) and non-asteroid micrasters all over; radial streak pale brownish, separated from radius at about proximal sixth of wing-length. Forewing-length 15.8-18.0, hindwing-length 15.0-17.0 mm.

SOLDIER : Dimorphic. *Soldier major* (Figs. 364, 365) : Head dark golden yellow to brown, fontanelle gland area paler; rostrum reddish to dark brown, apically reddish brown; antennae brown, apical segments slightly paler; abdomen pale brown to dark smoky brown above; sternites and legs paler, straw coloured. Head with minute hairs all over, longer hairs generally absent, in the *Lectotype* (designated here) a pair at about middle; nasute with minute hairs all over and 1 or 2 slightly longer hairs at tip; pronotum with minute hairs along margins; abdominal tergites with short hairs, a few longer hairs present on distal tergites, sternites

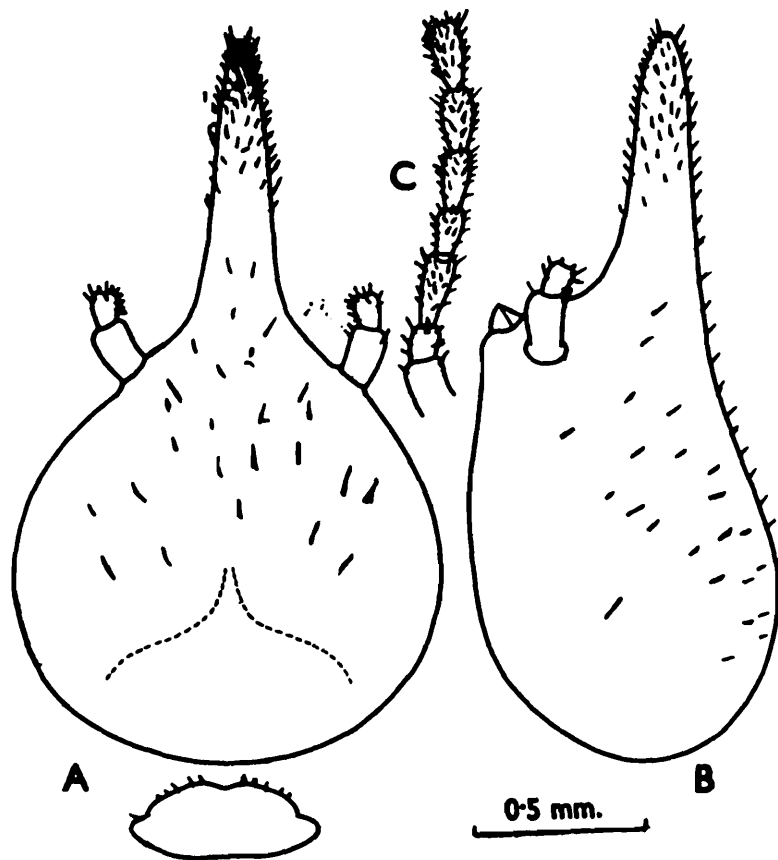


Fig. 364 : *Trinervitermes biformis*. Lectotype, soldier major. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Basal portion of antenna.

with short and long hairs. Total body-length 4.00-5.30 mm. Head-capsule without rostrum broadly pyriform to almost round, anteriorly sharply convergent (length with rostrum 2.15-2.52, length without rostrum 1.35-1.62, max. width 1.23-1.63 mm); in profile fairly incurved behind rostrum and strongly arched at occiput. Rostrum short, conical, width at base variable, in profile a little raised anteriorly (length 0.77-0.95 mm); about 1/2 to 2/3 of head-length without rostrum (index rostrum-length/head-length 0.50-0.67). Antennae with 12-14 segments; segment 3, two-and-a half times as long as 2 and subequal to 4 in 12 segmented one, almost 2.5 times as long as 2 and 2.0 times as long as 4 in 13 segmented one and a little longer than 2 in 14 segmented one. In Lectotype, antennae broken, only 7 segments in left and 2 in right antennae present, segment 3 about 2.5 times as long as 2, and 4 about 1/2 of 3; in the types of *T heimi* (now a synonym of *T biformis*), antennae 14 segmented, with segment 3 a little longer than 2 and subequal to 4. Mandibles vestigial without spines. Pronotum strongly saddle-shaped, anterior margin weakly emarginate at middle. *Soldier minor* (Fig. 366) : Body colour and pilosity as in soldier

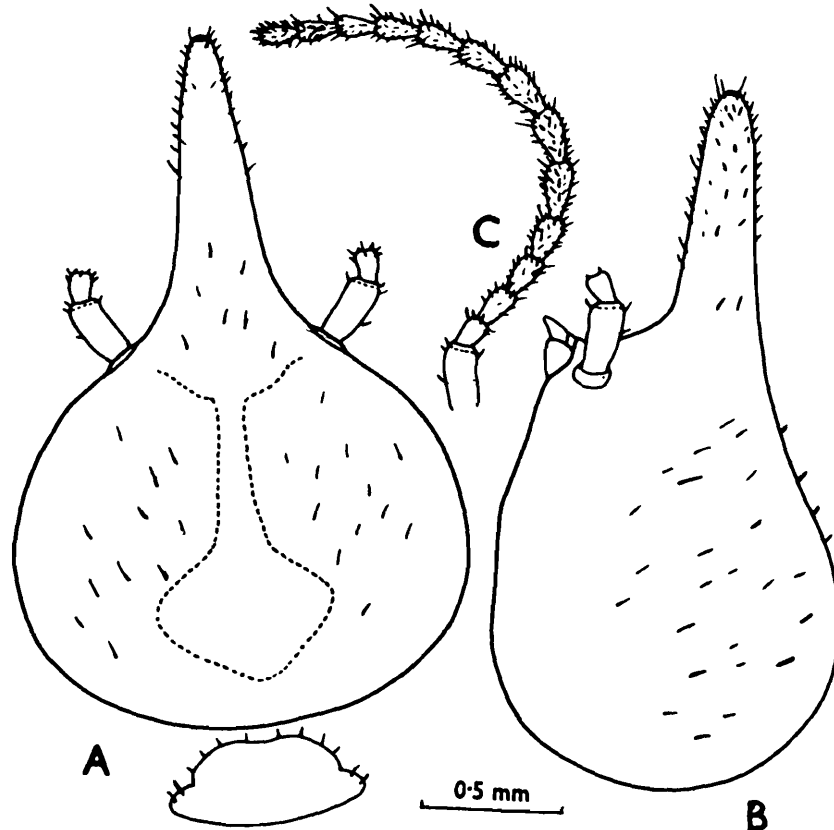


Fig. 365 : *Trinervitermes biformis*. Syntype soldier major of *Trinervitermes heimi* (Wasmann). (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Antenna.

major, rostrum somewhat paler or darker. Total body-length c 3.0-4.0 mm. Head-capsule elongately pyriform (paralectotype) to subrectangular (length with rostrum 1.40-1.73, length without rostrum 0.85-1.10, width 0.55-0.70 mm); in profile weakly to appreciably incurved, sometimes with a faint indication of hump. Rostrum thin, long, cylindrical; comparatively longer in relation to head-length than in soldier major (length 0.58-0.73 mm, index rostrum-length/head-length 0.62-0.76); in profile weakly to appreciably raised anteriorly. Antennae with 12-14 segments; segment 3 more than twice to nearly three times that of segment 2 in length; segment 4 a little shorter than 3; in paralectotypes, segment 3 nearly three times 2 and one-and-a-half times of 4. Mandibles and pronotum as in major soldier; anterior margin of pronotum sometimes without any emargination.

Worker : Head-capsule brown to smoky brown, anteriorly yellowish brown, somewhat paler laterally and translucent along Y-suture; antennae,

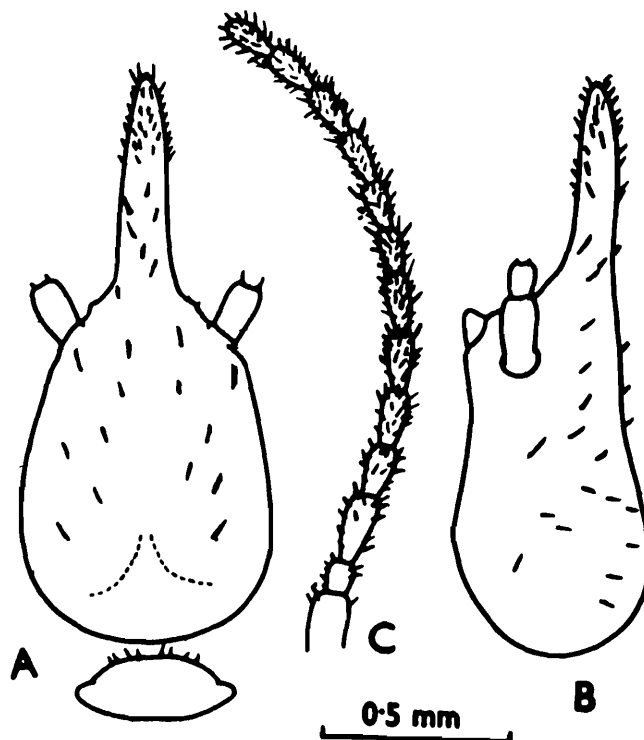


Fig. 366 : *Trinervitermes biformis*. Paralectotype soldier minor. (A) Head and pronotum, dorsal view. (B) Head side view. (C) Antenna.

postclypeus, legs and abdominal tergites yellowish to pale yellowish brown. Head and body with numerous minute and few long hairs; sternites more hairy. Total body-length 3.90-4.80 mm. Head-capsule subcircular (length to base of mandibles 1.25-1.50, width 1.35-1.63 mm); Y-suture prominent. Fontanelle plate oval, whitish. Antennae with 15-segments; segments 2, 3 and 4 subequal. Postclypeus swollen, hairy; length about 1/2 width (length 0.33, width 0.65-0.68 mm). Pronotum strongly saddle-shaped (length 0.25-0.38, width 0.55-0.73 mm); anterior lobe greatly upturned and weakly to strongly emarginate at middle; posterior margin convex, without notch.

Distribution : INDIA : Widely distributed and is reported from Maharashtra, Madhya Pradesh, Rajasthan, West Bengal, Tamil Nadu, Andhra Pradesh and Kerala states. Also SRI LANKA and PAKISTAN.

326. *Trinervitermes fletcheri* Chatterjee and Thakur

(Figs. 367, 368)

Trinervitermes fletcheri Chatterjee and Thakur :

1965. Chatterjee and Thakur, *Bull. syst. Zool.*, **1** (1) : 11-18. S maj., S min., and W. Holotype : S maj., in FRI. Type-locality : Coimbatore, Tamil Nadu, India.
1977. Chhotani, *Occ. Pap. Rec. zool. Surv. India*, No. 9 : 36.
1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 96.
1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 99, 240, 245-246.

IMAGO : Unknown.

SOLDIER Dimorphic. *Soldier major* (Fig. 367) : Head-capsule yellowish brown to brown; rostrum dark brown; antennae rusty yellow; abdominal tergites pale brown; sternites and legs pale yellow. Head and abdominal tergites without any long hairs ; rostrum tip with a few short hairs; abdominal sternites with short and long hairs. Total body-length 4.50-5.00 mm. Head-capsule without rostrum pear-shaped (length with rostrum 2.40-2.55, length without rostrum 1.55-1.65, width 1.35-1.50 mm); in profile weakly incurved behind base of rostrum, arched at occiput; rostral hump absent. Rostrum weakly conical; anteriorly uplifted a little; length about half of head-length without rostrum (length 0.80-0.90 mm, index rostrum-length/head-length 0.49-0.55). Antennae with 14 segments;

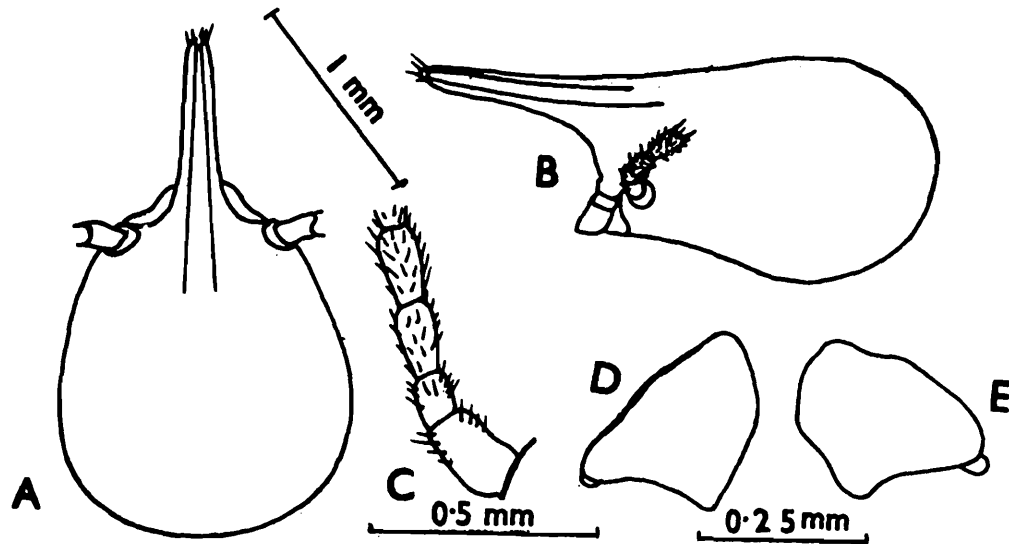


Fig. 367 : *Trinervitermes fletcheri*. Soldier major. (A) Head, dorsal view. (B) Same, side view. (C) Basal segments of antenna. (D), (E) Left and right mandibles.

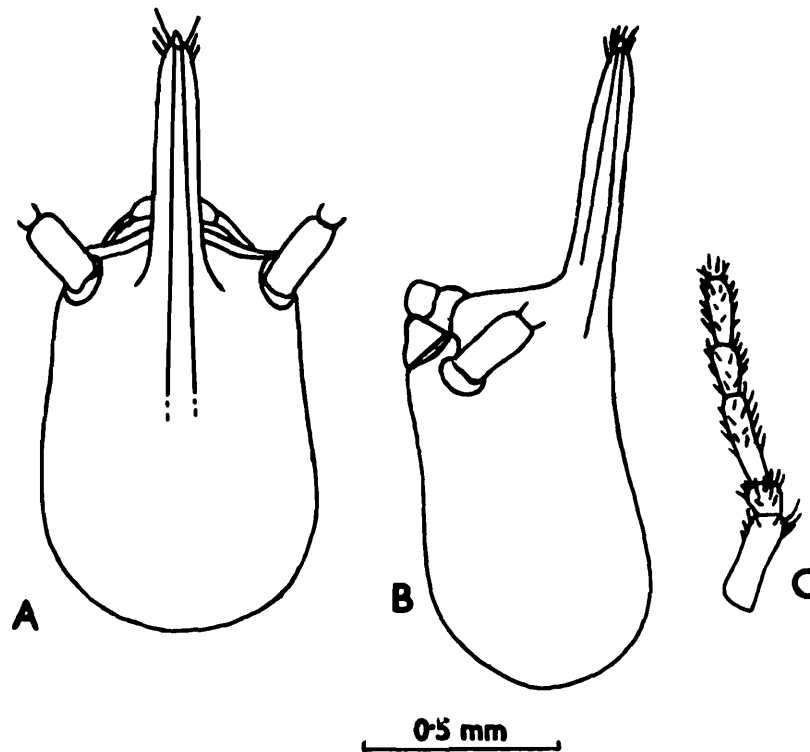


Fig. 368 : *Trinervitermes fletcheri*. Soldier minor. (A) Head, dorsal view. (B) Same, side view. (C) Basal portion of antenna.

segment 3 about one-and-half times 2; 4 almost as long as 3. Mandibles vestigial, without spines. Pronotum saddle-shaped (length 0.25-0.30, width 0.60-0.75 mm); anterior lobe strongly raised and with a strong invagination at anterior margin; posterior margin subconvex. *Soldier minor* (Fig. 368) : Head-capsule yellow; legs and abdominal sternites pale yellow; abdominal tergites pale brownish. Hairiness as in *S maj*. Total body-length 3.0-3.5 mm. Head-capsule subrectangular; sides slightly incurved behind antennae (length with rostrum 1.65-1.80, length without rostrum 0.98-1.05, width 0.63-0.70 mm); in profile incurved appreciably behind rostrum. Rostrum long, cylindrical, raised a little anteriorly (length 0.65-0.80 mm); nearly 2/3 to 3/4 of head-length (index rostrum- length/head-length 0.67-0.78). Antennae long; with 12-14 (generally 13) segments; segment 3 in 12 and 13 segmented ones nearly twice as long as 2 and slightly longer than 2 in 14-segmented one. Mandibles as in *S maj*. Pronotum small, saddle-shaped (length 0.15-0.20, width 0.45-0.50 mm).

WORKER : Head-capsule brown to reddish brown; antennae, postclypeus, labrum, pronotum and legs straw coloured; abdominal tergites brownish. Head and body with a few microscopic hairs; sternites with long and short hairs. Total body-length 5.0-5.9 mm. Head-capsule subsquarish, wider than long (length to base of mandibles 1.55-1.70, width 1.68-1.80 mm.); epicranial suture prominent. Fontanelle plate subtriangular, white, translucent. Antennae with 15 segments; segment 3 about one-and-a half times 2; 4 a little shorter than 3. Postclypeus swollen; length less than 1/2 width. Pronotum strongly saddle-shaped (length 0.45-0.50, width 0.80-0.93 mm); anterior margin with deep emargination; posterior margin convex.

Distribution : INDIA : Tamil Nadu (Coimbatore, known only from type-locality).

327. *Trinervitermes indicus* Snyder

(Figs. 369, 370)

1. *Nasutitermes (Trinervitermes) indicus* Snyder :

1934. Snyder, *Indian. For. Rec. (N.S.) Ent.*, **20**(11) : 12-14. *S maj*. Lectotype : *S maj*, in FRI. Type-locality : Kalyanpur, Jhansi Forest Div., Uttar Pradesh.

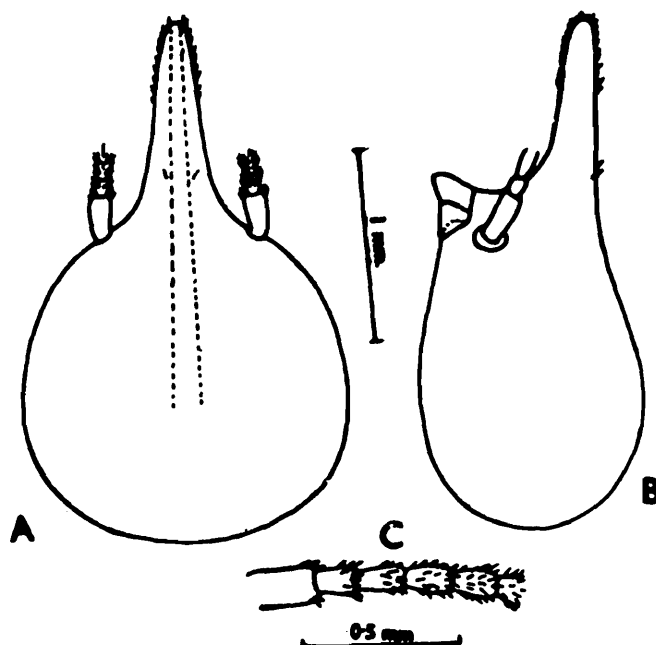


Fig. 369 : *Trinervitermes indicus*. Soldier major. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna.

2. *Trinervitermes indicus* Snyder :

1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 247 : 6, 25, 26-30.

See for synonymy, description, etc. and lectotype designation.

1983. Sen-Sarma and Verma, *Orient. Insects*, 17 : 96.

IMAGO : Unknown.

SOLDIER : Dimorphic. *Soldier major* (Fig. 369) : Head-capsule brown, fontanelle gland area a little paler; rostrum black; antennae brown, apical segments slightly paler; abdomen pale brown above, straw coloured below; legs straw coloured. Head and abdominal tergites with minute hairs, long hairs absent; sternites with short and long hairs. Total body-length 5.18-5.30 mm. Head without rostrum subpyriform to circular; length without rostrum slightly more than width (length with rostrum 2.45-2.50, length without rostrum 1.63-1.73, width 1.53-1.65 mm); in profile fairly incurved behind base of rostrum; occiput arched. Rostrum conical, rather short (length 0.78-0.88 mm), nearly half of head-length without rostrum (index rostrum-length/head-length 0.45-0.54). Antennae with 14 segments; segment 3 a little longer than 2; 4 slightly smaller than 3 ; 5

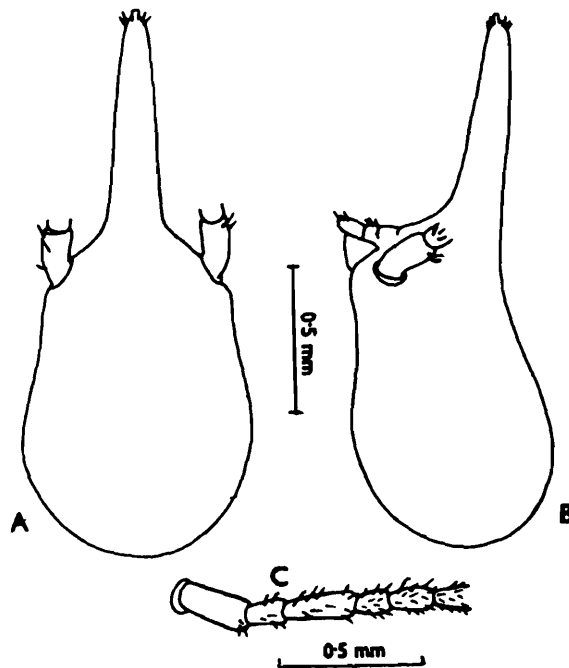


Fig. 370 : *Trinervitermes indicus*. Soldier minor. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna.

shorter than 4 and subequal to 2. Mandibles vestigial, without any spine-like process. Pronotum saddle-shaped (length 0.28-0.30, width 0.73-0.80 mm); anterior margin convex, with a weak invagination at middle; posterior margin convex. *Soldier minor* (Fig. 370): Head brown; rostrum blackish brown; abdominal tergites with minute hairs, without any long hairs; rostrum with a few hairs at tip; sternites with long and short hairs. Total body-length 3.50-4.35 mm. Head-capsule subrectangular; sides slightly incurved anteriorly just behind antennae; length about one-and-a-half times of width (length with rostrum 1.76-1.85, length without rostrum 1.10-1.13, width 0.76-0.80 mm); in profile strongly incurved behind base of rostrum, rostral hump absent. Rostrum long, cylindrical and narrow; length less than head-length without rostrum; apex raised (length 0.68-0.73 mm, index rostrum-length/head-length 0.61-0.64). Antennae with 12-13 segments; segment 3 about 2 to 2.5 times longer than 2; 4 shorter than 5. Mandibles as in soldier major. Pronotum saddle-shaped (length 0.23, width 0.50 mm).

WORKER : Not available

Distribution : INDIA : Uttar Pradesh (Kalyanpur, Jhansi For. Div., type-locality), known only from the type-locality.

328. *Trinervitermes nigrirostris* Mathur and Sen-Sarma

(Figs. 371-373)

Trinervitermes nigrirostris Mathur and Sen-Sarma :

1959. Mathur and Sen-Sarma, *Z. ang. Ent.*, 45(1) : 71-77. Im, S maj., S min., W. Holotype : S major, in FRI. Type-locality : Mandapam, Tamil Nadu, India.

1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 247 : 6, 30-31.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 99, 240, 246-248.

IMAGO (Fig. 371) : Head-capsule and abdominal tergites castaneous brown; antennae, postclypeus, labrum, pronotum and legs brown; abdominal sternites pale brown. Head and body fairly densely hairy. Total body-length with wings 19.0-19.5 mm, without wings 9.0-10.8 mm. Head-capsule subcircular (length to base of mandibles 1.40-1.60, width with eyes 1.90-2.00 mm); dorsum slightly depressed at middle; epicranial suture absent. Fontanelle plate small, Y-shaped, creamy white. Eyes moderately large, subcircular (max. diameter 0.55-0.60 mm). Ocelli oval; situated very close to eyes i.e. less than half to nearly half of short

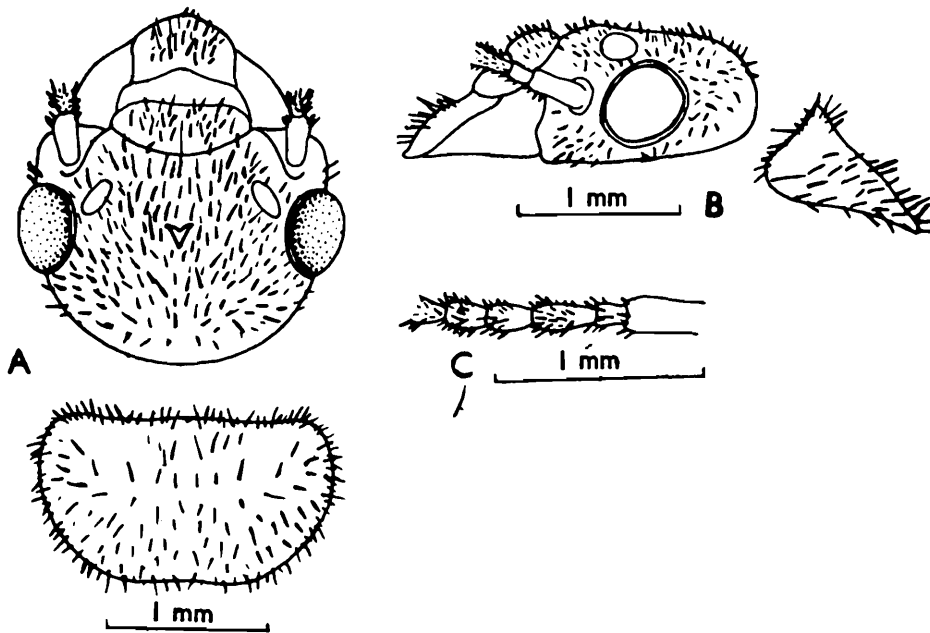


Fig. 371 : *Trinervitermes nigrirostris*. Imago (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Basal segments of antenna. (Ex Mathur and Sen-Sarma, 1959).

diameter (long diameter 0.24-0.30, short diameter 0.16-0.18, eye-ocellus distance 0.06-0.09 mm). Antennae with 15 segments; segment 2 shortest, 3 about twice as long as 2, 4 shorter than 3. Postclypeus swollen, hairy, length less than half of width. Pronotum subtrapezoidal (length 0.90-1.05, width 1.70-1.90 mm.); anterior margin substraight, not notched at middle; posterior margin substraight or slightly convex with a deep median invagination. Wings yellow; membrane hairy and punctate; microsculpture consists of papillae (9-10 rows on anterior and 2-3 rows on posterior margins) and thin, non-asteroid micrasters; forewing-length 16.25-16.60, hindwing-length 14.50-15.50 mm.

SOLDIER : Dimorphic. *Soldier major* (Fig. 372) : Head-capsule brown, blackish brown anteriorly; rostrum blackish brown, tip slightly paler; antennae pale brown; abdominal tergites smoky brown, sternites stramineous. Head with a few minute hairs, longer hairs wanting; pronotum with small hairs on margins and some on body; abdominal tergites without any long hairs, sternites with long and short hairs. Total body-length 4.1-4.7 mm. Head capsule without rostrum subcircular (length with rostrum 2.15-2.38, length without rostrum 1.33-1.50, max. width 1.20-1.30 mm); in profile incurved appreciably behind rostrum; rostral hump absent. Rostrum subcylindrical (length 0.75-0.85 mm, index rostrum-length/head-length 0.56-0.60). Antennae with 14 segments; segment 3 long, about one-and-a-half times of 2; 4 slightly longer than 3 and 5. Mandibles vestigial, without any spines. Pronotum saddle-shaped (length 0.20-0.28, width 0.58-0.65 mm); anteriorly strongly raised; anterior margin rounded with a broad, shallow, median depression; posterior margin convex. *Soldier minor* (Fig. 373) : Head-capsule pale brown to brown, anteriorly blackish; rostrum blackish; abdomen above smoky brown. Head with only minute scattered hairs; pronotum with some small hairs along margins; abdominal tergites with long and short hairs. Total body-length 3.20-3.50 mm. Head-capsule without rostrum subrectangular, sides incurved a little behind antennae (length with rostrum 1.55-1.64, length without rostrum 0.85-0.88, width 0.62-0.63 mm); in profile concave, without rostral hump. Rostrum long, cylindrical; a little shorter than head without rostrum (length 0.70-0.76 mm). Antennae long, with 13 segments; segment 3 more than twice as long as 2; 4 about one-and-a-half times that of 2. Pronotum saddle-shaped, smaller than in soldier major (length 0.19-0.20, width 0.43-0.45 mm).

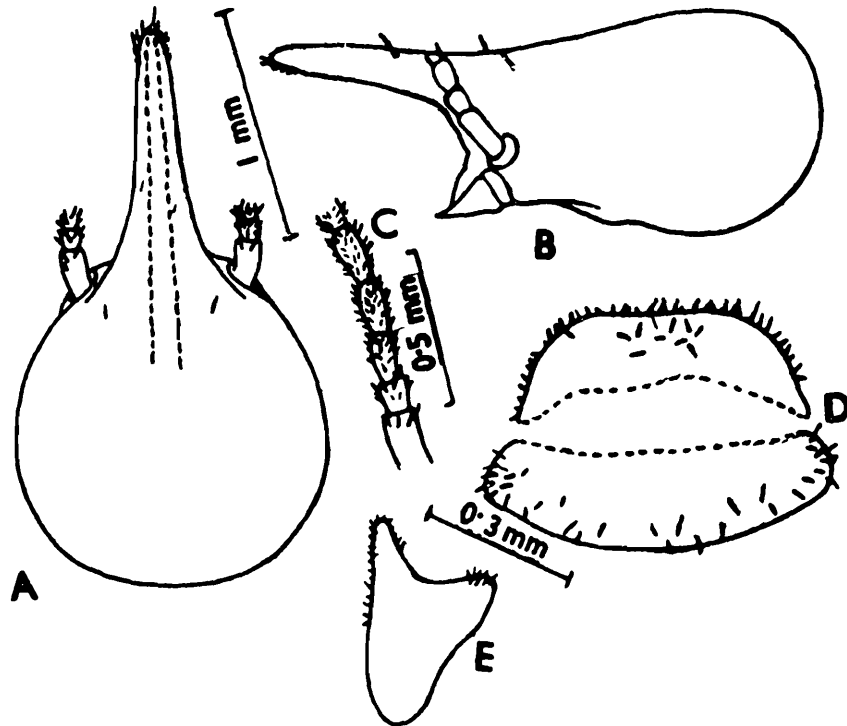


Fig. 372 : *Trinervitermes nigrirostris*. Soldier major. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna. (D) Pronotum, dorsal view. (E) Pronotum, side view. (Ex Mathur and Sen-Sarma, 1959).

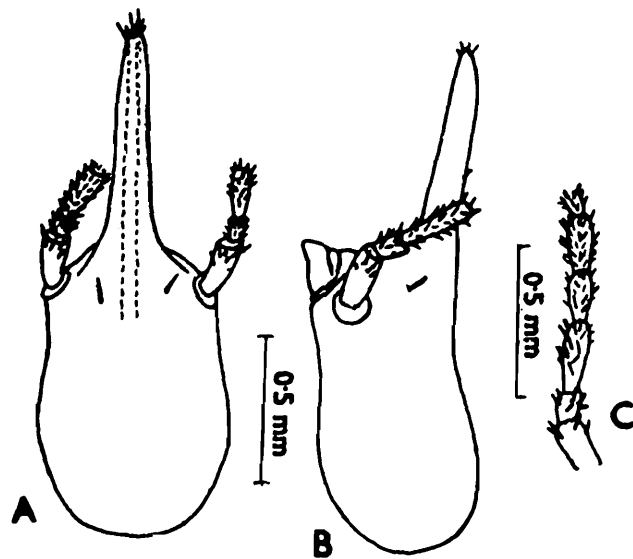


Fig. 373 : *Trinervitermes nigrirostris*. Soldier minor. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna (Ex Mathur and Sen-Sarma, 1959).

WORKER : Head and abdomen above smoky; antennae and postclypeus pale brown; abdominal sternites and legs whitish. Head and body fairly pilose. Total body-length 4.0-5.0 mm. Head-capsule subcircular, wider at base of antennae (length to base of mandibles 1.30-1.40, width 1.50-1.58 mm); epicranial suture distinct. Fontanelle plate long and translucent. Antennae with 15 segments; segment 3 longer than 2. Postclypeus swollen, pilose; length nearly half of width. Pronotum strongly saddle-shaped (length 0.30, width 0.55-0.65 mm); anterior margin deeply notched, posterior margin subconvex.

Distribution : INDIA : Tamil Nadu.

329. *Trinervitermes rubidus* (Hagen)

(Figs. 374-376)

1. *Termes rubidus* Hagen :

1860. Hagen, *Linn. Ent.*, **14** : 117-118. S maj., W. Syntypes : S maj., in Selys Longchamps Coll., Brussels, AMNH and FRI. Type-locality : Colombo, Sri Lanka.

2. *Trinervitermes rubidus* (Hagen) :

1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 247 : 6, 32-41. See for synonymy, description, etc.

1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 96.

IMAGO (Fig. 374) : Head-capsule dark brown; abdomen brown above; deep straw coloured in middle and brownish laterally underneath; pronotum pale brown. Head and body with numerous hairs. Total body-length with wings 17.0, without wings 7.5-8.5 mm. Head-capsule subsquarishly subcircular, posteriorly rounded (length to base of mandibles 1.13, width with eyes 1.48-1.59 mm); dorsum slightly depressed medially; epicranial suture not very distinct. Fontanelle plate translucent, Y-shaped (triangular vide Holmgren 1913b). Eyes moderately large, subcircular (max. diameter 0.45 mm). Ocelli suboval (long diameter 0.23, short diameter 0.20 mm); situated very close to eyes (eye-ocellus distance 0.05 mm). Antennae with 15-segments; segment 3 only a little longer than 2; 4 a little shorter than 2. Postclypeus moderately swollen, hairy; length a little less than half of its width. Pronotum subtrapezoidal (length 0.85, width 1.30 mm); anterior margin substraight not incised medially; posterior margin faintly convex, without notch. Wings yellowish to brown; covered with minute hairs, punctate (i.e. micrasters present); forewing-length 12.80, hindwing-length 12.40 mm.

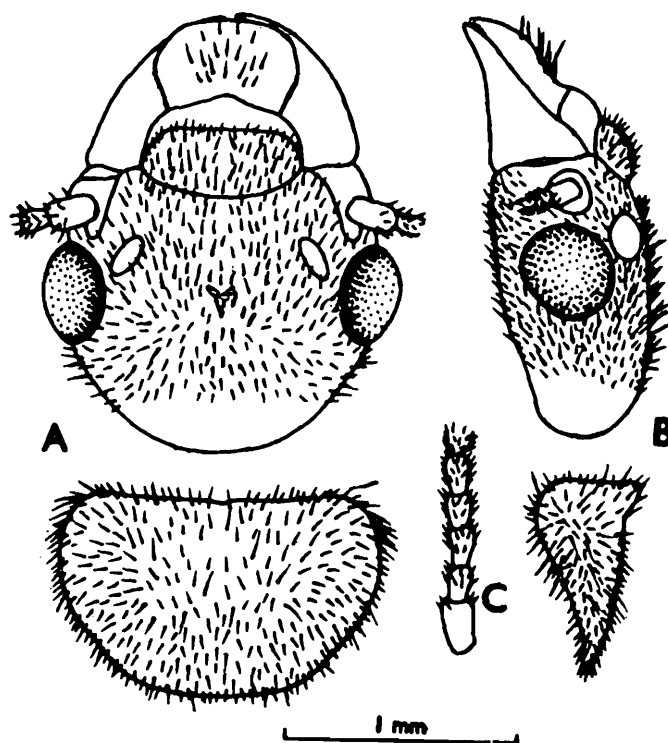


Fig. 374 : *Trinervitermes rubidus*. Imago. (A) Head and pronotum, dorsal view. (B) Same, side view. (C) Basal segments of antenna.

SOLDIER : Dimorphic. *Soldier major* (Fig. 375) : Head-capsule and rostrum reddish brown; fontanelle gland area paler; abdominal tergites deep straw coloured. Head and abdominal tergites without any long hairs, sternite with short and long hairs; rostrum tip with a few short hairs and pronotum with minute hairs. Total body-length 4.20-5.30 mm. Head-capsule without rostrum subpyriform to almost round; length without rostrum subequal to width (length with rostrum 2.15-2.35, length without rostrum 1.37-1.40, max. width 1.15-1.32 mm); in profile strongly incurved behind rostrum; occiput arched; rostral hump absent; posteriorly strongly bulging (head-bulge index i.e. posterior bulge/head-length without rostrum 0.73-0.75). Rostrum short, conical (length 0.78-0.95 mm, rostrum-length/head-length index 0.56-0.68). Antennae with 12-13 segments; segment 3 twice so long as 2; 4 so long as 2. Mandibles vestigial, without spines. Pronotum saddle-shaped (length 0.20, width 0.58-0.63 mm); anterior lobe greatly upturned and anterior margin strongly and broadly invaginated; posterior margin subconvex. *Soldier minor* (Fig. 376) : Head-capsule brown; rostrum blackish brownish, apically brownish; abdominal tergites brown. Head with a few small hairs; rostrum tip with some short and long hairs;

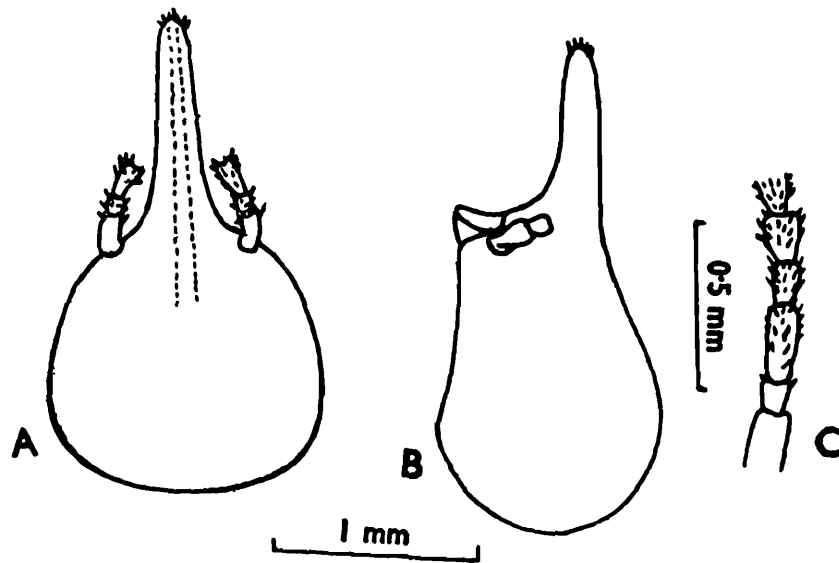


Fig. 375 : *Trinervitermes rubidus*. Soldier major. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna

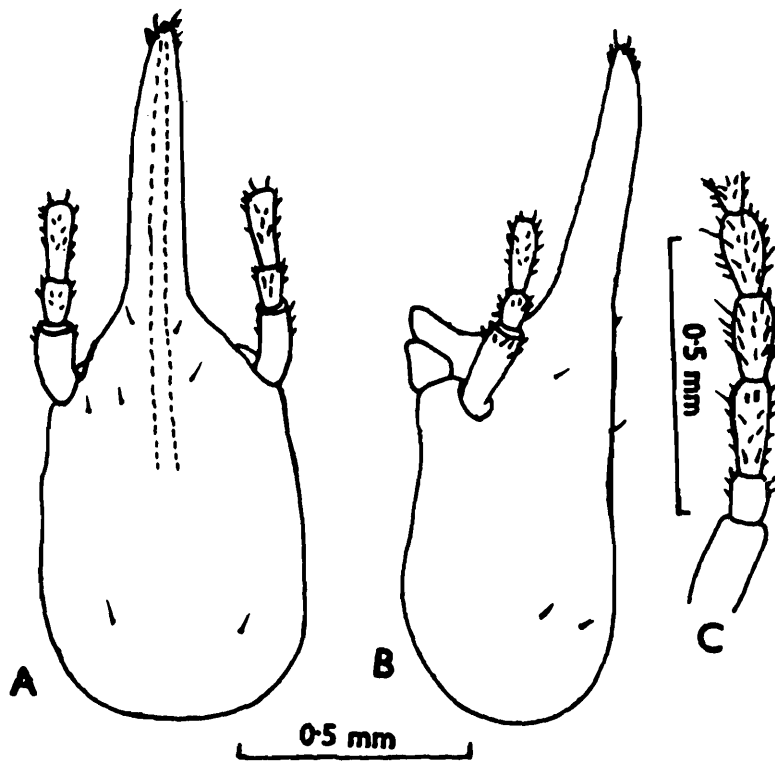


Fig. 376 : *Trinervitermes rubidus*. Soldier minor. (A) Head, dorsal view. (B) Head, side view. (C) Basal segments of antenna.

abdominal tergites without long hairs, sternites with long and short hairs. Total body-length 3.50-3.80 mm. Head-capsule without rostrum subrectangular; sides substraight (length with rostrum 1.43-1.60, length without rostrum 0.83-0.93, max. width 0.59-0.60 mm); in profile weakly incurved; rostral hump absent; posterior bulge of head prominent (head-bulge index i.e. posterior bulge of head/head-length without rostrum 0.65-0.70). Rostrum long, slender, cylindrical; length about 3/4 of head-length without rostrum (length 0.60-0.68 mm, index rostrum-length/head-length 0.73-0.75). Antennae markedly long; with 12 segments; segment 3 about twice as long as 2; 4 shorter than 3 but longer than 2. Mandibles vestigial, without spines. Pronotum small, saddle-shaped (length 0.15-0.18, width 0.38-0.48 mm); anterior margin round, not emarginate; posterior margin convex.

WORKER : Head-capsule brown; antennae, postclypeus, pronotum and legs straw coloured; abdominal tergites pale brownish. Head and body with a few small hairs; abdominal sternites with long and short hairs. Total body-length 4.00-5.75 mm. Head-capsule subsquarish (length to base of mandibles 0.80-1.20, width 0.93-1.38 mm); epicranial suture distinct. Fontanelle plate subtriangular, translucent. Antennae 15-segmented, segments 2, 3 and 4 subequal. Postclypeus swollen, with a few hairs; length about 1/2 width. Pronotum saddle-shaped (length 0.13-0.23, width 0.45-0.53 mm); anterior and posterior margins convex, without notch.

Distribution : INDIA (Tamil Nadu). SRI LANKA.

330. *Trinervitermes sensarmai* Bose

(Figs. 377, 378)

Trinervitermes sensarmai Bose :

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 240, 248-253, S (maj. and min.) and W. Holotype S(maj.), in ZSI. Type locality : Western slope of Hill colony, North Vijayapuri, Andhra Pradesh. Type examined.

IMAGO' : Unknown.

SOLDIER : Types examined. Dimorphic. *Soldier major* (Fig. 377) : Head-capsule golden brown; rostrum reddish brown, apically a little paler;

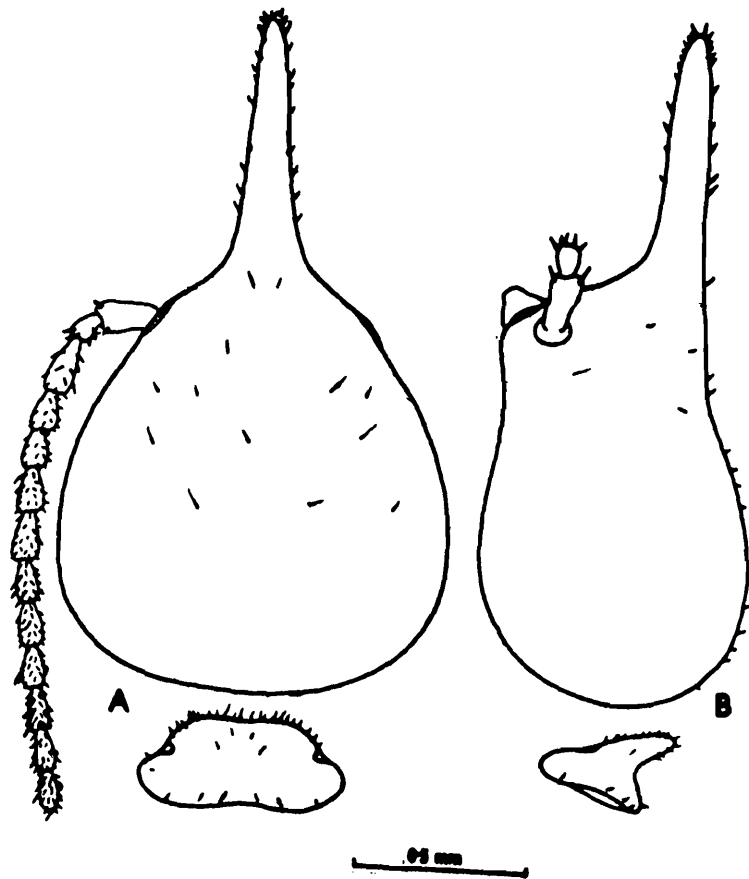


Fig. 377 : *Trinervitermes sensarmai*. Soldier major. (A) Head and pronotum, dorsal view.(B) Same, side view.

antennae golden yellow; thorax, legs and abdomen brownish yellow; abdominal tergites dark brownish. Head covered with minute hairs; body sparsely hairy. Total body-length 3.8-4.2 mm. Head-capsule roundly pear-shaped; length without rostrum only slightly more than max. width (length with rostrum 1.78-2.00, length to base of mandibles 1.10-1.20, max. width 1.06-1.15 mm); in profile head incurved behind rostrum and with a slight hump. Rostrum narrow, long; about $\frac{2}{3}$ of head-length without rostrum; length 0.68-0.80 mm, index rostrum-length/head-length 0.62-0.69. Antennae with 13 segments; segment 2 and 4 subequal; 3 about twice the length of 2. Mandibles vestigial, without spine-like process. Postmentum short and broad, length 0.22-0.32, max. width 0.30-0.38 mm. Pronotum small, saddle shaped, upper lobe short; anterior margin with a weak median notch; length 0.20-0.25, width 0.50-0.60 mm. Legs long and robust. *Soldier minor* (Fig. 378) : Head-capsule dark golden yellow, paler posteriorly and reddish brown at base of rostrum; rostrum reddish brown with a hyaline tip; antennae and body creamy yellow. Head and body

sparsely hairy. Total body-length 3.10-3.25 mm. Head-capsule subrectangularly oval, slightly constricted behind antennae; length with rostrum 1.40, length without rostrum 0.77-0.80, max. width 0.55 mm; in profile head with a weak incurving behind rostrum and a little more prominent buldge. Rostrum long and narrow about $\frac{4}{5}$ of head-length; length 0.63 mm, index rostrum-length/head-length to base of mandibles 0.78-0.80. Antennae with 12-13 segments; segments 2 and 4 subequal; 3 longer than 2 or 4. Pronotum small, saddle-shaped; anterior margin with a weak median notch, posterior margin substraight; length 0.18, max. width 0.38-0.40 mm. Legs long and slender.

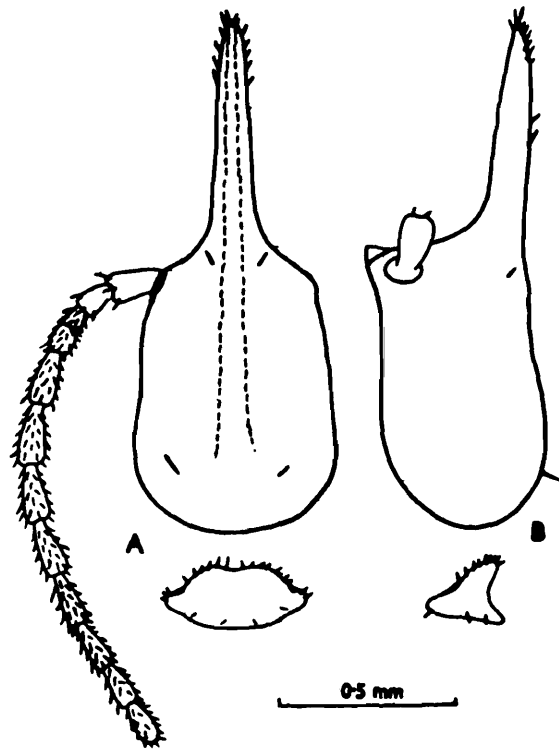


Fig. 378 : *Trinervitermes sensarmai* Soldier minor. (A) Head and pronotum, dorsal view. (B) Same, side view.

WORKER : Head-capsule dark golden brown, pale yellowish anteriorly; antennae and postclypeus pale golden yellow; thorax, legs and abdomen dark golden yellow. Head sparsely and body moderately hairy. Total body-length 5.2-5.5 mm. Head-capsule subcircular; a little broader than long; length to base of mandibles 1.10-1.23, max. width 1.30-1.43 mm. Fontanelle plate translucent, oval. Antennae with 15 segments; segment 3 shortest, 4 and 5 subequal. Postclypeus swollen, length a little less

than 1/2 of width. Pronotum saddle-shaped; with a large anterior lobe having a faint notch at middle; length 0.20-0.40, width 0.60-0.68 mm; posterior margin without notch.

Distribution : INDIA : Andhra Pradesh : Western slope of Hill Colony, North Vijayapuri, type-locality. Known only from the type-locality.

Genus 55. **Roonwalitermes** Bose

Genus *Roonwalitermes* Bose :

1992. Bose, *J. zool. Soc. India*, **42** (1 & 2) : 73-74.

In press. Bose, *Occ. Pap. Rec. zool. Surv. India*, No.

Type of genus : *Roonwalitermes wadhwai* Bose

1. *Characters of Genus Roonwalitermes*

Imago : Unknown.

Soldier : Dimorphic. *Soldier major* : Head-capsule globularly rounded, not converging behind antennae; with several minute hairs all over; in front sharply narrowed into a long narrow, cylindrical nasute of almost same length as head; in profile head weakly incurved at base of nasute. Antennae with 13 segments; segment 3 long, narrow, club-shaped; segment 4 shortest. Mandibles vestigial, each with a short, spine-like process without tooth. Pronotum strongly saddle-shaped. Legs thin and long; apical tibial spurs 2 : 2 : 2 ; tarsi 4-jointed. *Soldier minor* : Head pear-shaped, not converged behind antennae; in front narrowing into a long, narrow nasute; with several minute hairs all over; in profile with a weak hump at base of nasute. Antennae with 11-12 segments. Mandibles vestigial, with short spines. Pronotum and legs as in soldier major.

Worker : Head subcircular; fontanelle round; epicranial suture present. Antennae with 13 segments; segments short and broadly rounded. Postclypeus weakly swollen; length about 1/4 of width. Mandibles each with an apical and two marginal teeth; apical and 1st marginal subequal in both mandibles; angles between two narrow. Left mandible: 1st marginal with a long straight posterior margin; 2nd short, triangular, margin between 2nd marginal and molar plate strongly incurved; molar process small and pointed. Right mandible : Posterior margin of 1st marginal longer than anterior margin; 2nd marginal short with a long, straight

posterior margin; molar plate about one and a quarter times that of posterior margin of 2nd marginal. Pronotum and legs as in soldier.

2. *Distribution and Composition of Roonwalitermes*

(Fig. 294)

Distribution : The genus *Roonwalitermes* is endemic in the Indian Region and is restricted to North-eastern India.

Composition : It is known by a single species i.e. *R. wadhwai* Bose and is taken into account here.

331. *Roonwalitermes wadhwai* Bose

(Figs. 379-381)

Roonwalitermes wadhwai Bose :

1992. Bose, *J. zool. Soc. India*, **42** (1 & 2) : 74-78. S and W. Holotype : S, in ZSI. Type-locality : Mawphlong, Meghalaya, India. Types examined.

In press. Bose *Occ. Pap. Rec. zool. Surv. India*, No.

IMAGO : Unknown.

SOLDIER (Figs. 379, 380) Dimorphic. *Soldier major* (Fig. 379) : Head dark brown; nasute a little darker; antennae pale brown; legs and abdomen a little paler than head; pronotum darker than head. Head with several minute hairs all over; nasute with one or 2 long hairs at tip; antennae and legs densely hairy; thorax and abdomen densely hairy with short hairs, last 2 abdominal segments with several longer hairs. Total body-length 4.0-4.5 mm. Head-capsule broad, globularly rounded, broader than length to base of mandibles (length with nasute 2.35-2.45, length without nasute 1.25-1.30, max. width 1.35-1.43 mm, index max. width/length to base of mandibles 1.04-1.10; in profile weakly incurved, without any hump; posterior margin slightly invaginated; anteriorly sharply converging into a long, tubular nasute a little shorter than head-capsule (length of nasute 1.05-1.20 mm; nasute/head-length index 0.81-0.92). Antennae with 13 segments; segment 3 long, narrow, club-shaped, subequal to 1 ; 4 shortest. Labrum short and broad. Mandibles vestigial, each with a short , spine-like process without tooth. Postmentum short, club-like, slightly narrowed at waist (length 0.43-0.45, max. width 0.33-0.35, min. width 0.25-0.30 mm). Pronotum strongly saddle-shaped, with anterior lobe

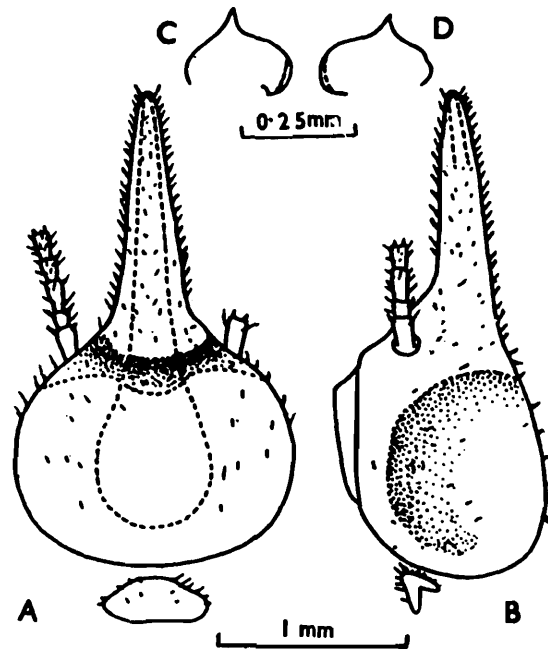


Fig. 379 : *Roonwalitermes wadhwai*. Soldier major. (A) Head and pronotum, dorsal view. (B) Same, side view. (C), (D) Left and right mandibles. (After Bose, 1992a).

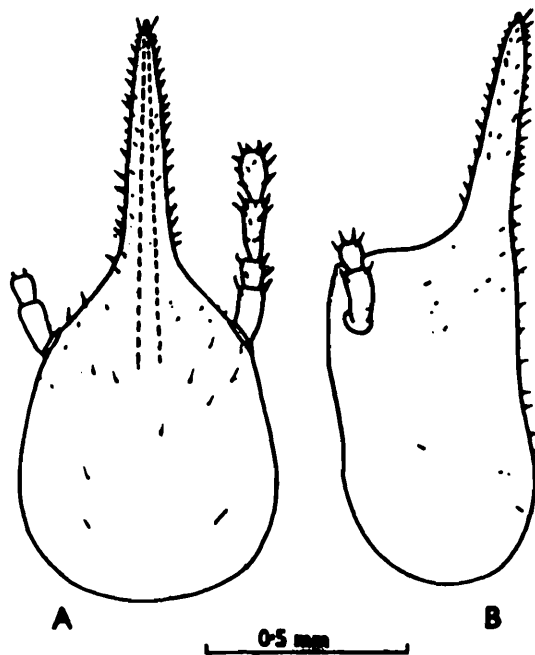


Fig. 380 : *Roonwalitermes wadhwai*. Soldier minor. (A) Head, dorsal view. (B) Head, side view. (After Bose, 1992a).

strongly upturned; anterior margin without notch; posterior margin faintly emarginate (length 0.20-0.23, width 0.53-0.55 mm). Mesonotum narrower and metanotum as wide as pronotum. *Soldier minor* (Fig. 380) : Head brownish, paler than soldier major; nasute reddish brown. Head with several short hairs; a pair of long bristle-like hairs sometimes present but generally absent. Total body-length 2.9-3.0 mm. Head pyriform, without any convergence behind antennae; almost as long as broad (length with nasute 1.38-1.43, length without nasute 0.70-0.78, max. width 0.64-0.65 mm, index width/length 0.83-0.93); in profile slightly incurved and with a weak hump at base of nasute. Antennae with 11-12 segments; segment 3 in 11-segmented antenna longer than 2 or 4; in 12-segmented one short, as long as 2 and 4 longer than 3. Mandibles vestigial, with short spine-like processes. Postmentum short, hexagonal, weakly incurved at waist; length 0.20-0.23, max. width 0.23-0.25, min. width at waist 0.20-0.23 mm. Pronotum as in soldier major (length 0.15-0.18, width 0.30-0.35 mm).

WORKER (Fig. 381) : Head-capsule brownish; labrum, antennae, legs and body paler. Head and body fairly hairy with short and long hairs. Total body-length 3.0-3.5 mm. Head subcircular, broader than long (length to base of mandibles 1.0, max. width 1.10-1.15 mm); epicranial suture present. Fontanelle plate large, circular. Antennae short, with 13 segments; all segments short and broad. Postclypeus weakly swollen; length nearly 1/4 of width (length 0.15, width 0.60-0.65 mm). Mandibles as in genus. Pronotum strongly saddle-shaped; anterior margin without median emargination.

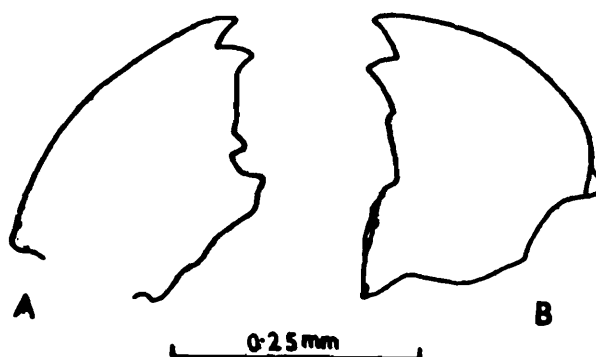


Fig. 381 : *Roonwalitermes wadhwai*. Worker. (A) and (B) Left and right mandibles. (After Bose, 1992a).

Distribution : INDIA : Meghalaya : Mawphlong (type-locality); known only from the type-locality.

Genus 56. *Grallatotermes* Holmgren

(Synonyms : *Phillipinitermes* Sen-Sarma, *Indograllatotermes* Sen-Sarma and *Afrograllatotermes* Sen-Sarma)

1. Subgenus *Grallatotermes* (of *Eutermes*) Holmgren :

1912. Holmgren, *K. Svenska Vetensk.-Akad Handl.*, **48** : 61, 65.

1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : **36**.

2. Genus *Grallatotermes* Holmgren :

1930. Light, *Phillippine J. Sci.*, **42**(1) : 16-17, 19, 40.

1949. Snyder, *Smiths. misc. Colls.*, **112** : 314.

1950. Ahmad, *Bull. Am. Mus. nat. Hist.*, **95** : 58, 61.

1955. Emerson, *Fieldiana: Zool.*, **37** : 478, 481, 486, 514.

1958. Ahmad, *Biologia, Lahore*, **4** : 127.

1966. Bouillon and Mathot, *Zooleo*, No. 1 (Suppl. 1) : 2, 11, Table.

1966. Sen-Sarma, *J. Bombay nat. Hist. Soc.*, **63** : 168-172. Synonymy.

1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 248 : 2, 6-8.

1967. Sands, *Compt. Rendus vth Congr. UIEIS (Toulouse 1965)* : **161-162**.

1968. Sen-Sarma, *Orient. Insects*, **2** (1) : 6, 13, 14, 24, 31, 34.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. **2** : 148, 149.

1971. Bouillon and Mathot, *Zooleo*, No. 1(Suppl. 2) : 15, Table.

1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235.

1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 86, 91, 93-94.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 103, 233-234.

1987. Chhotani, *Beitr. Ent.*, **37** : 414-416.

3. Genus *Eutermes* Heer (Part) :

1942. Hill, *Termites (Isoptera) from Australian Region* : 202-205, 223-234. Synonymy, characters, etc.

1953. Rattan Lal and Menon, *Cat. Indian Insects, Pt. 27-Isoptera* : **52-64**. Synonymy.

4. *Indograllatotermes* Sen-Sarma :

1966. Sen-Sarma, *J. Bombay nat. Hist. Soc.*, **63** : 176-180.

1968. Sen-Sarma, *Orient. Insects*, **2**(1) : 13, 14, 24, 34.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 149.

5. *Afrograllotermes* Sen-Sarma :

1966. Sen-Sarma, *J. Bombay nat. Hist. Soc.*, **63** : 180-183.

1968. Sen-Sarma, *Orient. Insects*, **2** (1) : 7, 13, 14, 24, 34.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 149.

6. *Philippinitermes* Sen-Sarma :

1966. Sen-Sarma, *J. Bombay nat. Hist. Soc.*, **63** : 172-176.

1967. Sands, *Compt. Rendus vth Congr. UIEIS* (Toulouse 1965): 161.

1968. Sen-Sarma, *Orient. Insects*, **2** (1) : 13, 14, 34.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 149.

Type of genus : *Termes* (*Eutermes*) *grallator* Desneux.

1. *Characters of Genus Grallatotermes*

Imago : Head dark brown to black; postclypeus a little paler or as dark as head; wings pale brown to brown, having numerous short hairs. Head broader than length to base of mandibles. Fontanelle plate triangular, translucent. Eyes large, prominent. Ocelli oval, large, almost touching eyes. Postclypeus moderately swollen, length less than half of width. Antennae 15 to 16-segmented; segment 4 shortest; 3 either as long as or longer than 2. Mandibles each with an apical and two marginals; apical shorter than 1st marginal. Left mandible : Posterior margin of 1st marginal undulated and with broad indentation just distal to short 2nd marginal; basal projection short, not projecting up to 1st marginal. Right mandible : 1st marginal isolaterally triangular; 2nd short, posterior margin long; molar plate longer than posterior margin of 2nd marginal. Pronotum as wide as head. Legs with 2 : 2 : 2 apical tibial spurs; tarsi 4-jointed. Wings hairy, with 3-4 rows of pointed, thorny papillae and thick asteroid or non-asteroid micrasters. Abdomen with short, pale hairs all over; cerci 2-jointed; styli absent.

Soldier : Monomorphic. Head broad, pear-shaped; broader than length without rostrum. Rostrum short, conical. Antennae short, with 13-

14 segments, segment 3 about twice as long as 2. Mandibles vestigial; each with prominent, spine-like process. Pronotum saddle-shaped; without or with a weak emargination. Legs long; apical tibial spurs 2 : 2 : 2, tarsi 4-jointed. Cerci 2-segmented; styli absent.

Worker : Head brown to black. Head broad, oval; epicranial suture prominent. Fontanelle plate large, triangular or suboval. Antennae with 12-15 segments. Postclypeus swollen, length distinctly less than 1/2 width. Mandibles as in imago. Pronotum and legs as in soldier.

2. *Distribution and Composition of Grallatotermes*

(Fig. 294)

Distribution : This genus is known from the Oriental (4 species), Papuan (2 species) and Ethiopian (one species) zoogeographical regions. From the Oriental Region it is reported from India (southern India) and the Philippines.

Composition : In all 7 species of the genus *Grallatotermes* are known and of the four oriental species two viz., *grallatoriformis*. Holmgren and Holmgren and *niger* Chattejee and Thapa, occur in the Indian subregion.

2. *Key to Indian Species of Grallatotermes*

SOLDIER

- 1(2) Smaller and paler (blackish brown head). Head-length with rostrum 1.80-5.90, head-length without rostrum 1.1p, max. width of head 1.10-1.18mm*grallatoriformis*
- 2(1) Larger and darker (blackish head). Head-length with rostrum 1.87-2.05, head-length without rostrum 1.30-1.37, max. head-width 1.20-1.27 mm.....*niger*

332. *Grallatotermes grallatoriformis* Holmgren and Holmgren

(Figs. 382, 383)

1. *Eutermes (Grallatotermes) grallatoriformis* Holmgren and Holmgren :

1917. Holmgren and Holmgren, *Mem. Dept. Agric. India*, 5(3) : 163-164.
S and W. Syntypes : Probably in Risksmus., Stockholm, AMNH and

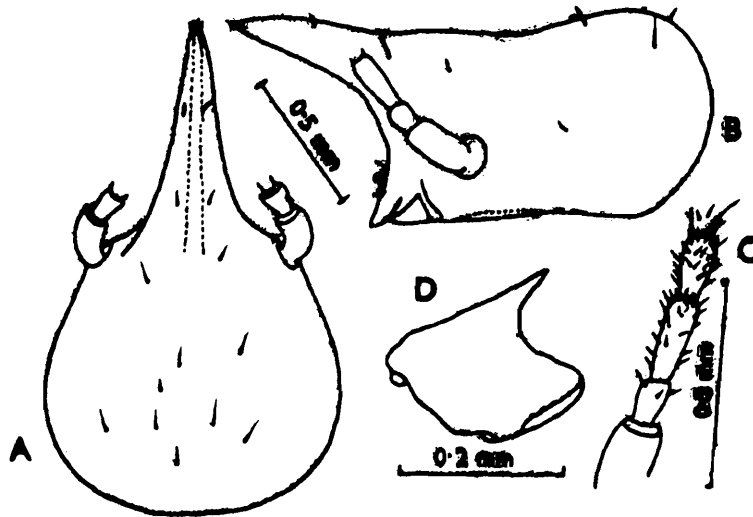


Fig. 382 : *Grallatotermes grallatoriformis*. Soldier. (A) Head, dorsal view. (B) Head, side view. (C) Basal portion of antenna. (D) Left mandible. (Ex Prashad and Sen-Sarma, 1966b).

FRI Type-localities : Tellkadi, Anamalai Hills, Tamil Nadu and Aryapur, South Kanara (Karnataka).

1934. Margabandhu, *J. Bombay nat. Hist. Soc.*, 37(3) : 713.

2. *Grallatotermes grallatoriformis* Holmgren and Holmgren :

1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 248 : 8-10. Synonymy, description, etc.

3. *Indograllatotermes grallatoriformis* (Holmgren and Holmgren) :

1966. Sen-Sarma, *J. Bombay nat. Hist. Soc.*, 63(1) : 176-179.

IMAGO : Unknown.

SOLDIER (Fig. 382) : Head-capsule blackish brown; area around antennal sockets paler; antennae dark brown; rest of body pale brown. Head with a few short hairs; abdominal tergites with microscopic, short hairs. Total body-length 4.20 mm. Head-capsule pyriform; weakly constricted behind antennae (length with rostrum 1.80-1.90*, length without rostrum 1.10*, max. width 1.10-1.28* mm); in profile strongly depressed behind rostrum and with a weak hump. Rostrum conical,

* Measurement taken from Holmgren and Holmgren 1917 and calculated from figure given in Sen-Sarma 1966.

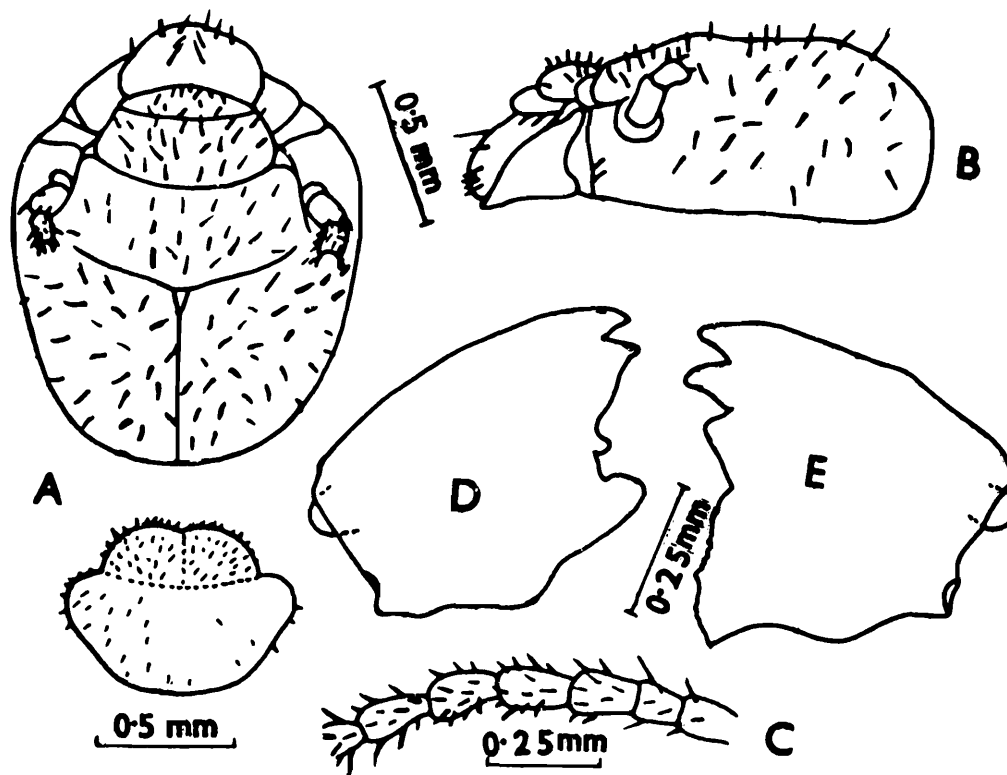


Fig. 383 : *Grallatotermes grallatoriformis*. Worker. (A) Head and pronotum, dorsal view. (B) Head, side view. (C) Basal portion of antenna. (D), (E) Left and right mandibles. (Ex Prashad and Sen-Sarma, 1966b).

0.60* mm long, raised anteriorly. Antennae with 13 segments; segment 3 twice as long as 2; 4 longer than 2. Mandibles vestigial, each with a prominent, lateral, spine-like process. Pronotum saddle-shaped; not indented anteriorly, max. width 0.65 mm.

WORKER (Fig. 383) : Head blackish brown; antennae rather paler; thorax pale brown; abdominal tergites greyish brown, sternites paler. Head with scattered hairs; abdominal tergites with scattered, short hairs. Total body-length 5.00-5.70 mm. Head-capsule subcircular (length to base of mandibles 1.10*, max. width 1.22-1.40 mm); epicranial suture prominent. Fontanelle plate small, oval. Antennae with 14 segments; segment 3 longer than 2 and 4 subequal to 2. Postclypeus pilose, swollen, shorter than 1/2 width (length 0.20* width 0.68* mm). Pronotum saddle-shaped, anterior margin notched (width 0.72-0.95 mm).

Distribution : INDIA : Tamil Nadu and Karnataka states.

* Measurement taken from Holmgren and Holmgren 1917 and calculated from figure given in Sen-Sarma 1966.

† Calculated from figure given by Prashad and Sen-Sarma 1966.

333. *Grallatotermes niger* Chatterjee and Thapa

(Figs. 384, 385)

1. *Grallatotermes niger* Chatterjee and Thapa :

1964. Chatterjee and Thapa, *Indian Forester*, **90** (4) : 210-214, S and W.
Holotype : S, in FRI. Type-locality : Mt. Stuart Block, Tunacadur Range, Top Slip (Tamil Nadu).

1966. Prashad and Sen-Sarma, *Indian For. Bull. (N.S.)*, No. 248 : 8-10.

1983. Sen-Sarma and Verma, *Oriental Insects*, **17** : 94.

1984. Bose., *Occ Pap. Rec. zool. Surv. India*, No. 49 : 234-235.

2. *Indograllatotermes niger* (Chatterjee and Thapa) :

1966. Sen-Sarma, *J. Bombay nat. Hist. Soc.*, **63** (1) : 176, 178, 179.

IMAGO : Unknown.

SOLDIER (Fig. 384) : Head-capsule and antennae blackish except yellowish area around antennal sockets; femora smoky brown and body yellowish. Head scantily hairy; pronotum with a fringe of short hairs at anterior margin; abdominal tergites with microscopic hairs and a few short hairs, sternites with short and long hairs. Total body-length 5.30-5.70 mm. Head-capsule pyriform, constricted behind antennae and posteriorly rounded (length with rostrum 1.87-2.05, length without rostrum 1.30-1.37, max. width 1.20-1.27 mm); strongly produced behind (posterior bulge 0.72-0.75 mm, head-bulge index 0.54-0.58); in profile depressed behind rostrum. Rostrum conical, shorter than 1/2 to about 1/2 of head-length (length 0.55-0.67 mm, rostrum-length/head-length index 0.41-0.52); tip with a few short hairs. Antennae with 13 segments; segment 2 shorter; 3 about 2.5 times that of 2; 4 and 5 subequal, shorter than 3. Mandibles rudimentary, each with a prominent, spine-like process laterally. Pronotum saddle-shaped; anterior lobe shorter than posterior one (length 0.37-0.45, width 0.72-0.77 mm); anterior margin notched medially and posterior margin emarginate.

WORKER (Fig. 385) : Head-capsule blackish with whitish eye spots; antennae, labrum, tergites and femora smoky brown; thorax yellowish brown; sternites yellowish. Head fairly hairy; pronotum with a fringe of short hairs on anterior margin; abdominal tergites with microscopic and few short hairs, sternites with short and long hairs. Total body-length 5.00-6.25 mm. Head-capsule subcircular (length to base of mandibles

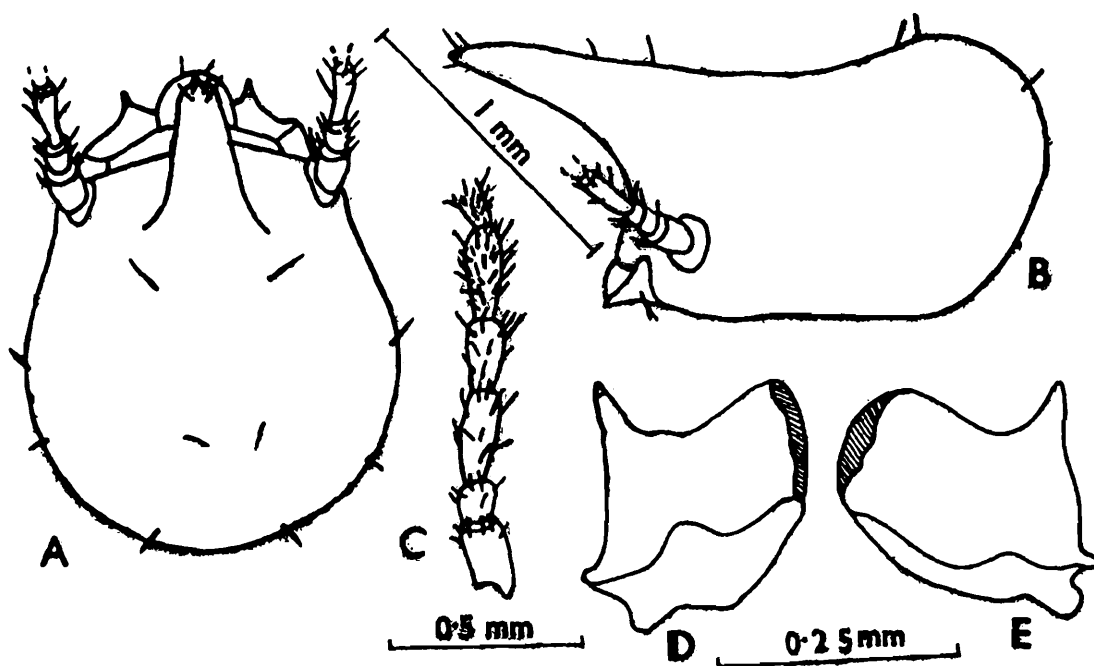


Fig. 384 : *Grallatotermes niger*. Soldier. (A) Head, dorsal view. (B) Same, side view. (C) Basal portion of antenna. (D), (E) Left and right mandibles. (Ex Chatterjee and Thapa 1964).

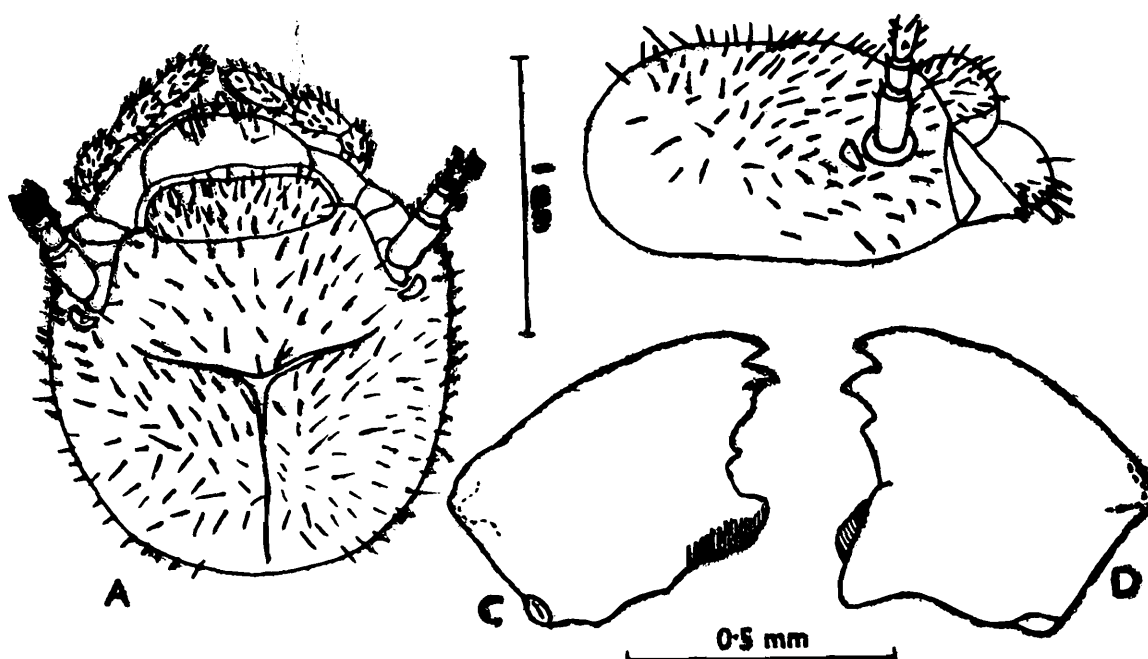


Fig. 385 : *Grallatotermes niger*. Worker. (A) Head, dorsal view. (B) Head, side view. (C), (D) Left and right mandibles. (Ex Chatterjee and Thapa, 1964).

1.12-1.37, max. width 1.17-1.40 mm); epicranial suture prominent. Fontanelle plate Y-shaped, whitish. Eye spots whitish, kidney-shaped. Antennae with 14-segments; segment 3 long, about 1.5 times of 2; 4 subequal to 2. Postclypeus hairy, swollen; length less than 1/2 of width (length 0.22, width 0.66 mm). Pronotum saddle-shaped; anterior margin notched medially, posterior margin weakly emarginate (length 0.42-0.60, width 0.75-0.95 mm).

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

Genus 57. *Emersonitermes* Mathur and Sen-Sarma

Genus *Emersonitermes* Mathur and Sen-Sarma :

1959. Mathur and Sen-Sarma, *Z. ang. Ent.*, **45** : 67-68.

1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 248 : 2, 10-11.

1968. Sen-Sarma, *Orient. Insects*, **2**(1) : 13, 15, 24, 34.

1970. Chhotani and Bose, *Zool. Anz.*, **190** : 235, 236.

1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 148.

1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 371.

1983. Sen-Sarma and Verma, *Orient. Insects*, **17** : 83, 87, 90, 91, 102.

1984. Bose, *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 103, 232.

1987. Chhotani, *Beitr. Ent.*, **37** : 415, 416.

Type of genus : *Emersonitermes thekadensis* Mathur and Sen-Sarma

1. Characters of Genus *Emersonitermes*

Imago : Unknown.

Soldier : Head-capsule creamish, pear-shaped and densely pilose with minute hairs interspersed with long hairs; rostrum reddish brown, long, thin, awl-shaped. Antennae with 14 segments. Mandibles vestigial, without spines. Pronotum saddle-shaped, without emargination at anterior margin. Legs with 2 : 2 : 2 apical tibial spurs; tarsi 4 jointed. Abdomen elongate. each tergite with 4 long hairs.

Worker : Head-capsule subcircular; densely hairy; epicranial suture not visible. Fontanelle plate oval, whitish. Antennae with 13 segments.

Postclypeus swollen, length half of width. Mandibles each with an apical and two marginal teeth. Left mandible apical acute and subequal to 1st marginal; 1st marginal large narrow, triangular and with a long posterior margin; 2nd marginal small and widely separated; basal projection large, projecting beyond 2nd marginal. Right mandible apical subequal to 1st marginal; 1st marginal isolaterally triangular; 2nd marginal short, and with posterior margin longer than its anterior margin; angle between two marginals obtuse; molar plate longer than posterior margin of 2nd marginal. Pronotum and legs as in soldier.

2. *Distribution and Composition of Emersonitermes*

(Fig. 294)

Distribution : The genus *Emersonitermes* is endemic to southern India.

Composition : Only one species i.e. *E. thekadensis* Mathur and Sen-Sarma is known.

334. *Emersonitermes thekadensis* Mathur and Sen-Sarma

(Figs. 386,387)

Emersonitermes thekadensis Mathur and Sen-Sarma :

- 1959. Mathur and Sen-Sarma, *Z. ang. Ent.*, **45** : 68-71. S and W. Holotype : S, in FRI. Type-locality: Thekaday (Thekadi), Kerala, India. Types examined.
- 1966. Prashad and Sen-Sarma, *Indian For. Bull.*, No. 248: 11-12.
- 1978. Roonwal, *Z. ang. Ent.*, **85** : 25.
- 1983. Sen-Sarma and Verma, *Orient. Insects* , **17** : 88, 102.
- 1984. Bose *Occ. Pap. Rec. zool. Surv. India*, No. 49 : 232-233.

SOLDIER (Fig. 386) Head-capsule creamish in colour, fontanelle gland area paler; rostrum reddish brown; antennae brownish; pronotum yellow; legs and abdomen creamy white. Head with several minute and 2 pairs of long hairs, one pair posteriorly and one pair in between antennae at base of rostrum; rostrum with several hairs near tip ; abdominal tergites each with several short and 4 long hairs. Total body-length 3.5-4.2 mm. Head-capsule pear-shaped, not constricted behind antennae; length without rostrum 0.95, max. width 0.80 mm; in profile substraight, faintly raised behind rostrum. Rostrum long (0.80-0.85 mm), thin, narrow, awl-shaped; only slightly shorter than head. Antennae with 14 segments;

segment 3 long, club-like and longest, about twice of 2nd. Mandibles vestigial; without any lateral, spine-like processes, molar area convex, dark brown. Pronotum small, saddle-shaped; anterior lobe strongly upturned and without any notch at anterior margin; posterior margin substraight (length 0.20, width 0.40 mm). Legs thin, hairy, not exceptionally long; apical tibial spurs 2:2:2; tarsi 4-jointed. Abdomen elongate, hairy; cerci 2-jointed; styli absent.

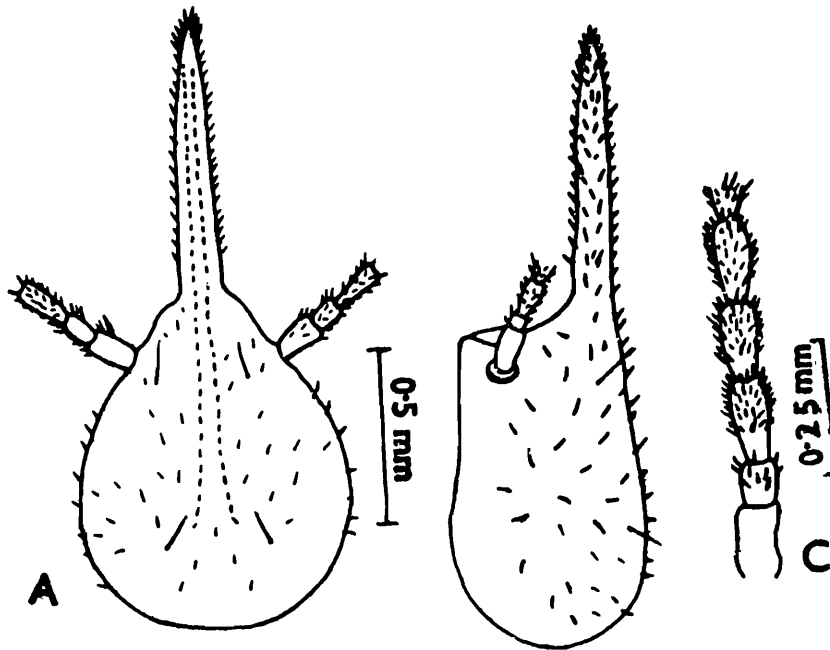


Fig. 386 : *Emersonitermes thekadensis*. Soldier. (A) Head, dorsal view. (B) Head, side view. (C) Basal portion of antenna. (Ex Mathur and Sen-Sarma, 1959).

WORKER (Fig. 387): Head-capsule creamish to pale yellowish; antennae and labrum of same colour as head; thorax, abdomen and legs

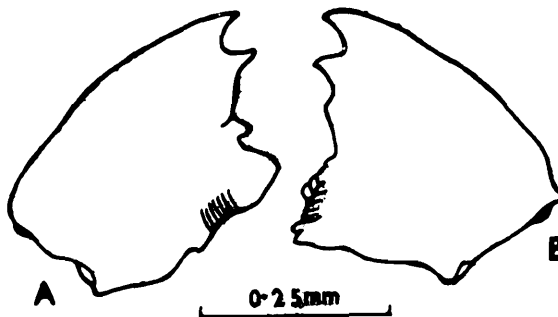


Fig. 387 : *Emersonitermes thekadensis*. Worker. (A) Left mandible. (B) Right mandible. (Ex Mathur and Sen-Sarma, 1959).

whitish. Head and body densely hairy. Total body-length 3.3-4.0 mm. Head-capsule subcircular (max. width 0.70-0.75 mm) ; epicranial suture indistinct. Fontanelle plate oval, translucent. Antennae with 13 segments; segment 3 longer than either 2 or 4. Postclypeus swollen, hairy; length about 1/2 of width. Pronotum strongly saddle-shaped (length 0.20, max. width 0.40 mm).

Distribution : INDIA : Kerala and Karnataka states.

Genus 58. *Ceylonitermellus* Emerson

1. Genus *Ceylonitermellus* Emerson :

1955. Emerson, *Fieldiana : Zool.*, **37** : 469, 515. No description.
 1960. Emerson, *Am.Mus.Novit.*, No. 1986 : 12-13.
 1966. Prashad and Sen-Sarma, *Indian For. Bull. (N.S.) Ent.*, No. 248 : 12-13.
 1968. Sen-Sarma, *Oriental Insects*, **2** (1) : 5,6, 13,15,16,34.
 1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 148.
 1973. Chhotani and Bose, *Zool. Anz.*, **190** : 235-236.
 1987. Chhotani, *Beitr. Ent.*, **37** : 415, 416.

2. Subgenus *Subulitermes* (of *Eutermes*) Holmgren (Part) :

1923. Holmgren, *K. Svenska Vetensk.-Akad. Handl.*, **48**(4) : 59, 61, 64.
 1913. Holmgren, *K. Svenska Vetensk.- Akad. Handl.*, **50**(2) : 153.
 1931. Kemner, *Acta Univ. Lund (N.S.)*, **27**(13) : 153.

3. Genus *Subulitermes* Holmgren (Part) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 338.

4. Genus *Eutermes* Heer (Part) :

1953. Rattan Lal and Menon, *Cat. Indian Insects-Isoptera, Pt. 27* : 52-54, 64.

Type of genus : *Eutermes hantanae* Holmgren.

1. Characters of Genus *Ceylonitermellus*

Imago : Brown, medium sized. Head ovoid, head-capsule subcircular. Fontanelle large, oval. Eyes medium sized, round. Ocelli oval, separated from eyes. Antennae 15-segmented. Postclypeus swollen, width 2.5 times

of length. Mandibles description of the two species given by Bugnion 1914 and 1914a is not easy to interpret in present context; see worker mandibles description. Pronotum trapezoidal, a little narrower than head.

Soldier : Small, yellow, delicate, nasutiform. Head pyriform, not narrowed behind antennae. Rostrum narrow, cylindrical, tip hairy. Antennae with 12 segments; segment 3 slightly longer than 2. Mandibles vestigial, without spine-like process. Pronotum saddle-shaped.

Worker : Pale, delicate, fairly hairy. Head subcircular. Antennae 13-segmented; segment 3 slightly shorter than 2. Postclypeus swollen, length $1/2$ or less than $1/2$ width. Mandibles each with a large apical and two marginals, as in figure; angle between apical and 1st marginal wider than in other related genera. Left mandible with a characteristically long 1st marginal; 2nd marginal small, separated by a cut. Right mandible 1st marginal triangular; 2nd small with straight posterior margin; molar plate concave. Pronotum saddle-shaped.

2. *Distribution and Composition of Ceylonitermellus*

(Fig. 294)

The genus is endemic to Sri Lanka and is known by two species, viz. *C. hantanae* Holmgren and *C. kotuae* Bugnion.

The specimens of these two species were not available to me, as such the following keys and descriptions have been drawn up from the original descriptions and the description of the imago and other castes of *C. hantanae* as given by Bugnion (1914c). The worker-nymph mandibles drawing is taken from Emerson (1960), who relegated these two species to his new genus *Ceylonitermellus* described in that publication.

3. *Keys to Indian Species of Ceylonitermellus* *

IMAGOES

From the descriptions of Bugnion (1914a, 1914c) it is not easy to differentiate the two species.

* The imagoes of the two species are not easy to differentiate from the descriptions and the key to the soldiers is also drawn from the descriptions given by different authors.

SOLDIERS

- 1(2) Larger : Head-length with rostrum 1.8-1.9, width 0.98-1.05 mm. Head in profile weakly humped behind base of rostrum*hantanae*
- 2(1) Smaller : Head-length with rostrum 1.4, width 0.87 mm. Head in profile straight behind rostrum, not humped.....*kotuae*

335. *Ceylonitermellus hantanae* (Holmgren)

(Figs. 388, 389)

1. *Eutermes Hantanae/hantanae* Holmgren :

1911. Holmgren, In Escherich's *Termitenleben auf Ceylon* : 198, Pl. 3 fig. P 1-2. S and W. Syntypes : Probably in Riksmus., Stockholm. Type-locality : Hantana, Sri Lanka.
1914. Bugnion, *Spolia Zeyl.*, 9 : 155-162, 2 pls.
1953. Rattan Lal and Menon. *Cat. Indian Insects, Pt.27-Isoptera* : 58. See for synonymy.

2. *Eutermes (Subulitermes) Hantanae* (Holmgren) :

1912. Holmgren. *K. Svenska Vetensk.-Akad. Handl.*, 48(4) : 64.
1913. Holmgren. *K. Svenska Vetensk.-Akad. Handl.*, 50(2) : 158, Pl. 7, fig. 3.

3. *Subulitermes hantanae* (Holmgren) :

1949. Snyder, *Smiths. misc. Colls.*, 112 : 339.
1958. Ahmad, *Biologia*. Lahore, 4(1-2) : 161.

4. *Ceylonitermellus hantanae* (Holmgren) :

1960. Emerson, *Am. Mus. Novit.*, No. 1986 : 9, 12-13. See for synonymy.
1966. Prashad and Sen-Sarma, *Indian For. Bull (N.S.) Ent.*, No. 248 : 13-16. Synonymy, description, etc.

IMAGO (Fig. 388A) : Head brown; eyes black; rest of body brown with yellowish pubescence; wings smoky brown; antennae and postclypeus yellow. Total body-length with wings 12.0, without wings 5.5 mm. Head ovoid (1.25 mm long). Fontanelle large, clear, elongate, oval. Eyes round, large. Ocelli elongate, oval; situated at their short diameter from eyes. Antennae with 15 segments; 3 + 4 segments slightly longer than 2; 3 very slightly longer and narrower than 4; 5 very slightly smaller than 4.

Postclypeus swollen, convex; width 2.5 times of length. Pronotum a little narrower than head with eyes; transverse, trapezoidal; wider than long; anterior margin straight; anterior angles rounded; lateral margins weakly convex; and posterior margin incurved a little. Wings brown; membrane punctate; hairy along border and on apex.

SOLDIER (Fig. 388,B,C) : Head pale yellow, rostrum brownish. Body whitish. Head thinly hairy with moderately short hairs; abdominal tergites and sternites moderately thickly hairy with longer hairs near tip. Total body-length c 4.0 mm. Head rounded when seen from above (length with rostrum 1.8-1.90, length without rostrum 0.87, width 0.98-1.05 mm); in profile humped behind rostrum. Rostrum narrow, cylindrical; almost as long as head without rostrum (0.75 mm). Antennae with 12 segments, moderately long; segment 3 almost twice as long as 2; 4 and 5 subequal,

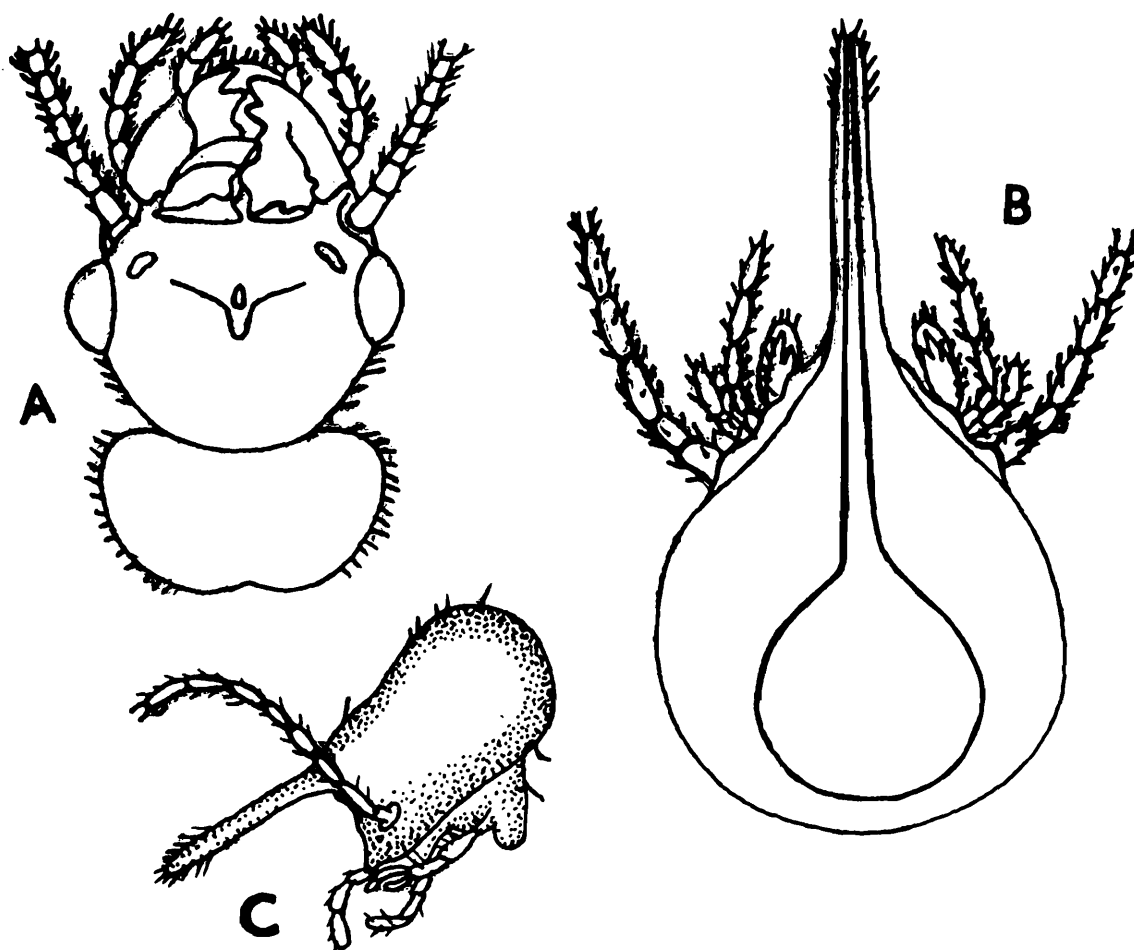


Fig. 388 : *Ceylonitermellus hantanae*. Imago. (A) Head and pronotum, dorsal view. Soldier. (B) Head, dorsal view. (C) Head, side view. (Ex Bugnion, 1914c).

a little longer than 2. Mandibles vestigial, without any spine-like process. Pronotum saddle-shaped (0.49 mm wide); anterior lobe projecting and without notch. Abdomen large and thick.

WORKER (Fig. 389) : Head and body whitish, greyish intestinal contents showing through abdomen. Head and abdominal tergites moderately hairy. Total body-length c 4.00 mm. Head pentagonally rounded. Head-capsule subcircular, widest at antennae (length of head to tip of labrum 0.99-1.30, head-width 1.04). Fontanelle plate shining, at middle of head. Antennae with 13 segments; segment 2 slightly longer than 3 and as long as 4. Postclypeus swollen; straight anteriorly, rounded posteriorly; length much shorter than 1/2 width. Pronotum with a large, strongly projecting anterior lobe; not notched at anterior margin (width 0.53 mm).

Distribution : SRI LANKA : Hantana (type-locality).

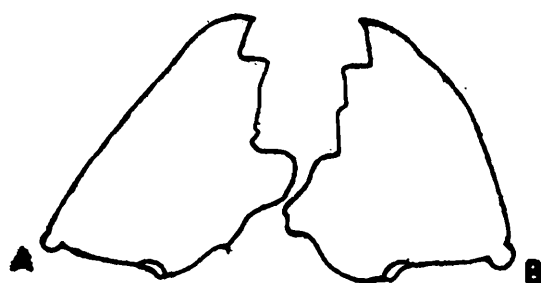


Fig. 389 : *Ceylonitermellus hantanae*. Worker-nymph mandibles.(A) Left. (B) Right. (After Emerson, 1960).

336. *Ceylonitermellus kotuae* (Bugnion)

(Fig. 390)

1. *Eutermes Kotuae/kotuae* Bugnion :

1914. Bugnion, *Bull. Soc. Ent. Suisse*, **12** : 193-200, Pls. 12-14. Im. S, W and Ny. Repository of types not known. Type-locality : Kotua, about 8 miles from Galle, Sri Lanka.

1953. Rattan Lal and Menon, *Cat. Indian Insects-Isoptera*, Pt. 27 : 60. See for synonymy.

2. *Subulitermes kotuae* (Bugnion) :

1949. Snyder, *Smiths. misc. Colls.*, **112** : 340.

3. *Ceylonitermellus kotuae* (Bugnion) :

1960. Emerson, *Am. Mus. Novit.*, No. 1986 : 13. See for Synonymy.

1966. Prashad and Sen-Sarma, *Indian For. Bull (N.S.) Ent.*, No. 248 : 16-17. Synonymy, description, etc.

IMAGO (K and Q) : Brownish, with head and wing scales darker; antennae and legs yellowish; abdominal tergites brown with yellowish pubescence; membranous parts between tergites yellow, hairy. Total body-length without wings 5.5 (K). and 11.5 (Q). Head ovoid (length to tip of labrum c 1.0, max. width c 1.0 mm). Fontanelle whitish, oblong, slightly widened in front; concave V-shaped at anterior margin at level of transverse sutures. Eyes black, round. Ocelli obliquely placed; close to eyes and separated by their width (Q). Antennae broken, maximum of 13 segments present in Q, 15-segmented in nymph; segment 3 small, shorter than 2; 4 a little thicker than 3; the following a little thicker, oval and elongate. Postclypeus convex, swollen; about 2.5 times wider than long. Pronotum a little narrower than head and 1.66 times wider than long; anterior margin hardly raised and with a small notch; posterior margin rounded, more widely emarginate; with a whitish, oblique shoulder spot on either side and a faint T-shaped mark on disc. Posterior wing scales a little smaller than anterior ones.

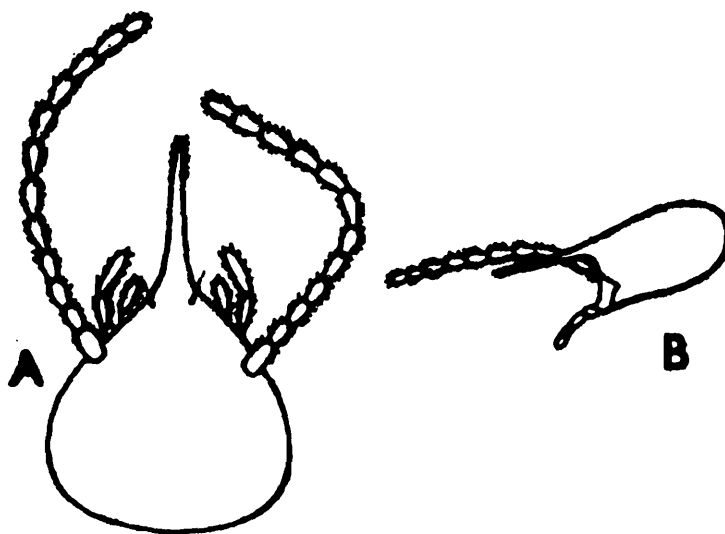


Fig. 390 : *Ceylonitermellus kotuae*. Soldier. (A) Head, dorsal view. (B) Same, side view. (Ex Bugnion 1914a)

SOLDIER (Fig. 390) : Head yellow with brownish red rostrum; thorax clear with yellow margins; abdomen transparent. Head nearly smooth; abdomen with oblique hairs interspersed with a few long and erect hairs. Total body-length 3.50-3.75 mm. Head round, not narrowed behind antennae (length with rostrum 1.4, width 0.87 mm); in profile straight behind rostrum. Rostrum narrow, cylindrical, 0.56 mm long; rostral hump absent; tip with a few hairs. Antennae with 12 segments; segment 3 a little longer than 2; 4, 5 and 6 hardly longer than 3; 7-11 a little longer. Mandibles rudimentary, triangular, without spine-like process. Pronotum saddle-shaped, small; half as wide as head.

WORKER : Head and body whitish; appreciably hairy; brownish grey intestines showing through abdomen. Total body-length c 4.0 mm. Head round; Y-suture weak; Antennae with 13 segments; segment 3 a little shorter than 2, also a little smaller than 4; following segments oval, elongate and a little longer. Postclypeus swollen, convex; twice as wide as long. Pronotum saddle-shaped; anterior margin raised; half as wide as head.

Distribution : SRI LANKA (Kotua, type-locality). Known only from type-locality.

Remarks : Since the specimens of this species were not available, the above description is drawn from the original description and drawings given by Bugnion (1914a). The measurements of imago head are approximate and calculated from the figure.

Genus 59. *Aciculitermes* Emerson

1. Section with *Termes regularis* Haviland for type (Part) :

1898. Haviland, *J. Linn. Soc. London*, **26**(169) : 424-426.

2. Subgenus *Eutermes* (of *Termes*) Heer (Part) :

1904. Desneux, *Genera Insect.*, Fasc. 25 : 39-40.

3. Subgenus *Subulitermes* (of *Eutermes*) Holmgren (Part) :

1912. Holmgren, *K. Svenska Vetensk.-Akad. Handl.*, **48** : 59, 61, 64.

4. Genus *Aciculitermes* Emerson :

1955. Emerson, *Fieldiana : Zool.*, **37** : 515. No. description.

1960. Emerson, *Am. Mus. Novit.*, No. 1986 : 10-11, fig. 3 (W mandibles) S and W. See for synonymy also.
1968. Ahmad, *Bull. Dept. Zool. Univ. Panjab*, Art. 3 : 9, 19.
1968. Sen-Sarma, *Orient. Insects*, 2 (1) : 6, 13, 15, 16, 24.
1970. Krishna, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 148.
1970. Roonwal, In : *Biology of Termites* (Eds Krishna and Weesner) Vol. 2 : 383-384.
1973. Chhotani and Bose, *Zool. Anz.*, 190 : 235, 236.
1987. Chhotani, *Beitr. Ent.*, 37 : 415, 416.

Type of genus : *Termes aciculatus* Haviland.

1. Characters of Genus *Aciculitermes*

Imago was described by John (1925) and Kemner (1931) under the name *aciculatus* Haviland but Emerson (1960) did not give the characters of this caste as the specimens were not available to him for verification and description. Also since Haviland's (1898) syntype material of *Termes aciculatus* belonged to two genera, Emerson preferred not to give the imago characters. Here also the imago characters are not given since the imago caste is still not known in either of two species so far reported and the characters of soldier and worker are based on the descriptions of the two species given by various authorities. The author, however, had no access to any material of the genus.

Soldier : Head pear-shaped with many short and few long hairs. Rostrum slender and shorter than head. Antennae with 12 segments, segment 3 shorter than 2. Mandibles vestigial, without points. Pronotum saddle shaped.

Worker (Fig. 391) : Slender and long. Antennae with 14 segments. Mandibles each with an apical and 2 marginals; apical slightly longer than 1st marginal. Left mandibular index (distance between apical and 1st marginal tooth/distance between 1st and 2nd marginals) 0.73 and margin immediately after 1st marginal without any notch. Pronotum saddle-shaped.

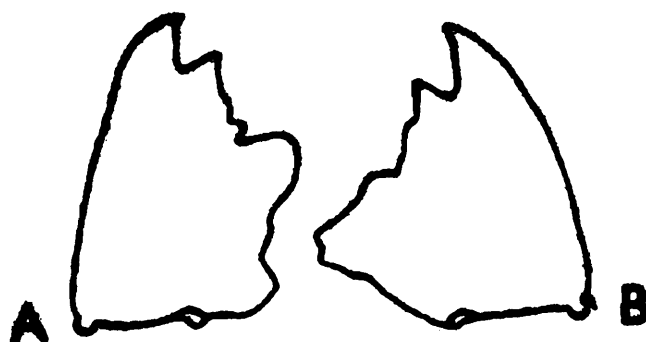


Fig. 391 : *Aciculitermes aciculatus* Worker mandibles. (A) Left, (B) Right. (After Emerson, 1960).

2. *Distribution and Composition of Aciculitermes*

(Fig. 294)

Distribution : This genus is endemic to the Oriental Region and is reported so far from Malaysia (Sarawak), Thailand and Burma.

Composition : Only two species of the genus are known, of which one i.e. *A. maymyoensis* Krishna occurs in the Indian subregion in Burma.

337. *Aciculitermes maymyoensis* Krishna

(Figs. 392)

Aciculitermes maymyoensis Krishna :

1965. Krishna, *Am. Mus. Novit*, No. 2210 : 3, 29-30, 31. S only. Holotype : S, In AMNH. Type-locality : Maymyo, Burma.

IMAGO : Unknown.

SOLDIER (Fig. 392) : Head pale yellowish; rostrum brown; antennae pale brownish yellow. Head fairly hairy; rostrum with many hairs in anterior half, posterior half without hairs; pronotum sparsely hairy and abdomen with many rows of short hairs. Head-capsule pear-shaped; without rostrum longer than wide (length with rostrum 1.56-1.61 and without rostrum c 0.90 mm, max. width 0.75-0.79 mm); in profile with a weak hump behind rostrum. Rostrum thin, cylindrical, length 0.65-0.69 mm; about 2/3 of head without rostrum. Antennae with 12 segments; segment 3 subequal to 2 or 4. Mandibles vestigial, without points.

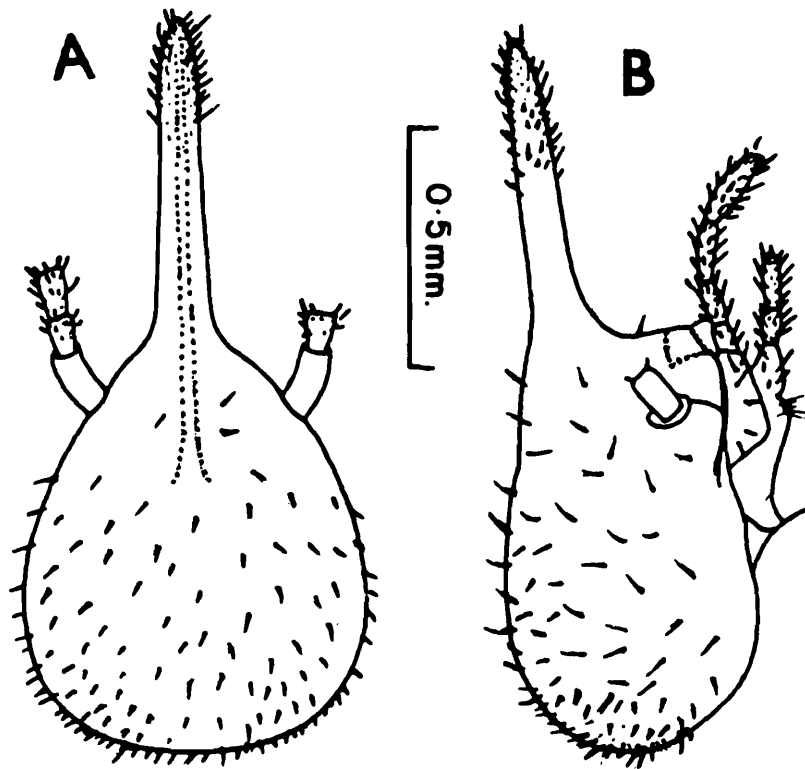


Fig. 392 : *Aciculitermes mamyoensis*. Soldier. (A) Head, dorsal view. (B) Same side view. (After Krishna, 1965b)

Pronotum saddle-shaped, anterior margin without notch. Fore tibia slightly swollen.

Distribution : BURMA : Maymyo, type-locality. Known only from the type-locality.

Remarks : Ahmad (1965) had reported this species from Khao Yai, Thailand and given the description and drawings of the soldier caste. On perusal of his description, measurements, etc. and Krishna's description it is observed that Ahmad's soldier specimens are smaller in size; have more hairy head with short points on sides of rostrum and the head is a little convergent behind antennae and without any hump when viewed laterally. Due to these differences it is felt that Ahmad's specimens belong to a different species and, therefore, Ahmad's description is not taken into account here for this species.

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INDEX TO TERMITE TAXA

[The synonyms are given in italics. The supra generic categories are given in capital letters]

A

- Acanthotermes 393, 394, 395
Aciculitermes 600, 601, 603, **766-768**
 maymyoensis **768-769**
Afrograllatotermes 750, 751
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