

OCCASIONAL PAPER NO. 171

**RECORDS OF THE
ZOOLOGICAL SURVEY OF INDIA**

Termite Fauna of North Eastern India

GEETA BOSE

ZOOLOGICAL SURVEY OF INDIA

OCCASIONAL PAPER NO. 171

**RECORDS OF THE
ZOOLOGICAL SURVEY OF INDIA**

Termite Fauna of North Eastern India

GEETA BOSE

Emeritus Scientist, Zoological Survey of India, Calcutta

Edited by the Director, Zoological Survey of India, Calcutta



सत्यमेव जयते

**Zoological Survey of India
Calcutta
1999**

Published : March, 1999

ISBN 81-85874-12-3

© *Government of India, 1999*

ALL RIGHTS RESERVED

- No part of this publication may be reproduced stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior permission of the publisher.
- This book is sold subject to the condition that it shall not, by way of trade, be lent, resold hired out or otherwise disposed of without the publisher's consent, in any form of binding or cover other than that in which it is published.
- The correct price of this publication is the price printed on this page. Any revised price indicated by a rubber stamp or by a sticker or by any other means is incorrect and should be unacceptable

PRICE :

Rs. 200/-

\$ 15 £ 10

Published at the Publication Division by the Director, Zoological Survey of India, 234/4 AJC Bose Road, 2nd MSO Building (13th Floor), Nizam Palace, Calcutta-700 020 after laser typesetting by Krishna Printing Works, 106 Vivekananda Road, Calcutta-700 006 and printed by Hooghly Printing Co. Ltd. (A Govt. of India Enterprises), Calcutta-700 071

Records of the Zoological Survey of India

OCCASIONAL PAPER

No. 171

1999

Pages 1 -148

CONTENTS

INTRODUCTION	1
COLLECTIONS STUDIED	21
REVIEW AND PRESENT STATUS OF TERMITE FAUNA OF NORTH-EASTERN INDIA	22
A. Review	22
B. Present Status	23
SYSTEMATIC ACCOUNT	
A. Keys for the Identification of Termite Families of North-Eastern India	23
B. Keys for the Identification of Subfamilies and Genera of Termites	24
C. Keys for the Identification of Termite species of North-Eastern India	29
D. Studies on Termite Collections from North-Eastern India	39
Family I Kalotermitidae Froggatt	39
Family II Rhinotermitidae Froggatt	44
Family III Indotermitidae Roonwal and Sen-Sarma	59
Family IV Termitidae Westwood	61
DISTRIBUTION AND ZOOGEOGRAPHY OF TERMITES OF NORTH-EASTERN INDIA	143
ACKNOWLEDGEMENTS	145

INTRODUCTION

North eastern part of India, comprising states of Assam, Meghalaya, Arunachal Pradesh, Nagaland, Mizoram, Manipur and Tripura (Commonly known as the seven sisters), covers an area of 2,66,360 sq.km., lying between 89° 42' and 97° 25' East longitudes and 21° 56' and 29° 27' North latitudes. To North of it, are Tibet and Sikiang (China); to South, Bengal, India; to East, Burma and to West, Bhutan and Bengal. Most of the area is hilly mountainous. In the North are the rugged Himalayas, in the East the Naga and the Lushai Hills, and the Garo, Khasi and Jaintia Hills in the Centre. The fertile plains of Assam also lie in the centre.

This region experiences moderate to heavy rainfall almost throughout the year, but it is heaviest during the monsoon, the average rainfall varying from 127–165 cms. and above; the heaviest being about 1100 cms., in the Khasi and Jaintia hills, at Cherrapunji, which is the highest not only in Assam but also in the world. Due to this, the hilly areas are covered mostly with tropical rain forests. Some thirty years back, more than 50 percent of the area was fairly densely forested but with population pressure large areas are now denuded for cultivation.

Numerous hill streams and rivulets feed this region, and the Brahmaputra, the largest river of the country, flows through the central plains of Assam. As a consequence of heavy rains, devastating floods are experienced every monsoon season in the state of Assam, because of the rising of this river.

For administrative purposes the different states are divided into districts—Assam into 23 districts, Meghalaya into 7, Arunachal Pradesh into 11, Nagaland into 7, Manipur into 7, Mizoram into 3 and Tripura into 11 districts. The collections for the present study were available from all the states and from varied ecological habitats, and from several localities. A list of collecting localities is given in (Table 1).

The climate being favourable for tropical rain forests, the region is very rich in its flora and fauna and the same is true of termites. As many as 76 species of termites belonging to 27 genera of families Kalotermitidae, Rhinotermitidae, Stylotermitidae, Indotermitidae and Termitidae, have been revealed through studies of these insects. This comprises 25 percent of the termite fauna of the Indian region (i.e., India, Pakistan, Nepal, Bhutan, Bangladesh, Burma and Sri Lanka) and about 3.5 percent of the world termite fauna (Table 2).

However, 55 species only were obtained in the present study from a very large collection (nearly 2000 samples) accumulated over 30 years or more at the Zoological Survey of India, through about 32 surveys, conducted by the Survey staff and the present author, which have brought to light one genus and 10 species new to science and another 12 have been reported for the first time from North East India. Of the remaining of species of which no new material was available for study in the presently studied collection, either types or other identified material

wherever possible and present in the Zoological Survey of India collections were examined so as to include them in the identification keys; such material has not been referred to here, as the same has already been reported by other workers.

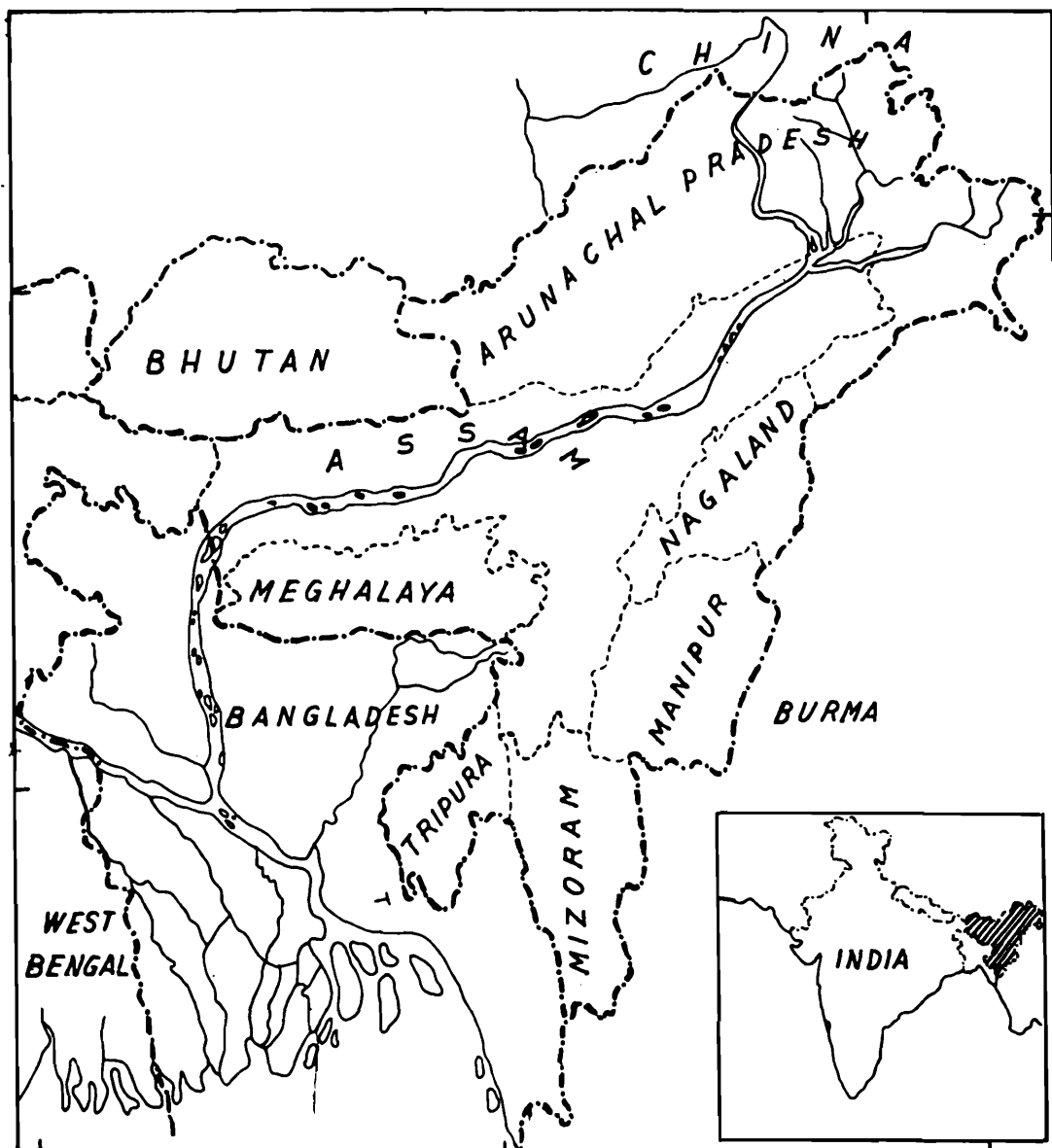


Fig. 1 Map of North-eastern India, showing states of Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura.

Even now this may not be the complete picture since still there is every possibility of some more new species and new records coming to light through further intensive surveys. Also the imago caste of as many as 38 species and imago and soldier castes of at least 4 species are so far not known.

In the 'Systematic Account', keys for the identification of the families and genera, based on imago and soldier castes, and of all the species so far reported are given at the beginning. The present material available for this study, however, belongs to 55 species and under each of these some important measurements, distribution and some remarks wherever necessary are given.

Abbreviations used : coll., collection/collector; ex.exs., examples and extracted from; Im., imago; Ny., nymph; N.Z.C., National Zoological Collection; Pw., pseudoworker; Q., queen; S. Soldier; S¹., soldier major; S². soldier minor; W., Worker; W¹., Worker major; W²., worker minor; Z.S.I., Zoological Survey of India, Calcutta.

Table 1

List of collecting localities of states of North-eastern India, giving their approximate latitudes and longitudes. The localities are arranged in alphabetical order in the different states since the district boundaries have changed from time to time.

	Locality	Latitude	Longitude
(1)	ASSAM STATE		
	Amsoi		
	Baguri	26°30'	93°15'
	Barjan	20°20'	95°30'
	Barpeta	26°40'	92°25'
	Bongaigaon	26°25'	90°30'
	Cachar	—	—
	Charduar	26°50'	92°45'
	Chingai	25°15'	94°30'
	Dambak	—	—
	Darrang	26°45'	91°30'
	Dhimagi	—	—
	Dhubri	26°00'	89°55'
	Dibru Reserve Forest	27°00'	93°05'
	Dibrugarh	27°25'	94°50'
	Digboi	27°20'	95°35'
	Dum Duma	27°30'	95°35'
	Gali Forest	27°45'	95°10'
	Gauhati (Guwahati)	24°35'	91°10'
	Goalpara	26°10'	90°35'
	Gosaingaon	25°20'	87°05'
	Holalpath	—	—
	Hyla Kandi	—	—
	Hila Gaon	26°25'	93°40' (?)
	Halai Khunda	26°15'	92°00'
	Jorhat	26°45'	94°10'
	Kamrup	—	—
	Kandul	—	—
	Karbi Along	—	—
	Kachergaon	—	—
	Karimgunj	24°50'	92°20'
	Kaziranga Reserve Forest	26°40'	93°25'
	Khorangina	—	—
	Kochugaon	26°30'	89°55'
	Kokraghar	26°20'	90°15'

Locality	Latitude	Longitude
Lakhimpur	27°14'	94°07'
Margherita	27°15'	95°40'
Marigaon	27°15'	95°40'
Messamari	—	—
Mikir Hills	26°20'	93°20'
Nowgong (Nowgaon)	26°21'	92°45'
Puma Lacka	—	—
Raimoni	26°35'	89°55'
Sadiya	27°50'	95°35'
Sadiya Road	27°50'	95°35'
Seijusa	—	—
Shantipur	—	—
Sibsagar	26°55'	94°35'
Silachar	24°45'	92°45'
Sonai Rupai forest		
Sonaitpur		
Tezpur	26°35'	92°45'
Tinsukhia	26°40'	93°50'
MEGHALAYA STATE	—	—
Baghmara	—	—
Balphakram National Park	25°31'	91°58'
Barapani (near Shillong)	"	"
Chambalgiri	"	"
Chandmari (Tura)	—	—
Cherrapunji	25°17'	91°47'
Damra	25°55'	90°45'
Dudhnai	25°10'	90°00'
Dynadubi Reserve Forest	25°50'	90°45'
Garo Hills	—	—
Jaintia Hills	—	—
Khasi Hills	—	—
Laikat	25°20'	93°55'
Lalchand Basti	24°10'	91°25'
Lausatham	—	—
Maghi	—	—
Mawphlong	25°50'	92°45'
Mawprem	—	—
Mawpran	—	—
Mawrah	—	—
Mowrang	25°50'	91°55'
Mausamai Cave	25°10'	91°45'
Mausamai to Shella	—	—
Nakrek	—	—
Nong-Priang Stream	—	—
Panda	—	—
Pynurusula	25°15'	91°50'
Rongrengiri	25°30'	90°30'

Locality	Latitude	Longitude
Sangsok	—	—
Shillong (and vicinity)	25°31'	91°58'
Siju cave	25°55'	91°10'
Titinkar	—	—
Tobangiri	—	—
Tura Peak	25°30'	90°10'
Umlan	25°10'	92°15'
Umnan	—	—
Umrans	25°45'	91°50'
Umsa Nongkherai	25°40'	91°50'
Umsing (Umsi)	25°20'	92°00'
Umthan	25°55'	91°40'
ARUNACHAL PRADESH	26°50'N – 29°45'N	91°25'E – 97°50'E
Abdul Nalla	—	—
Along	28°10'	94°45'
Alubari	26°15'	88°10'
Amalulla River Bank	—	—
Ankling	—	—
Arun Vihar	—	—
Bame village	28°0'	94°40'
Barjan	—	—
Barkham village	—	—
Basar village	27°55'	94°40'
Bela	—	—
Belsiri river bank	26°50'	92°25'
Bhairav Konda	—	—
Bhalukpong	—	—
Bitsilleng village	27°0'	92°05'
Bokhar	—	—
Bokeng	—	—
Promdilla	27°15'	92°20'
Butt	27°20'	92°25'
Chakma village	26°20'	90°00'
Changhiki	26°25'	94°00'
Changlang	—	—
Charduar forest	—	—
Ching village	—	—
Chorba road	—	—
Chowkham	—	—
Chukru village	27°40'	96°25'
Dali village	28°15'	95°35'
Damin	—	—
Damporigo	—	—
Daporijo	—	—
Deban	27°25'	96°20'
Denbe Tezu	—	—
Denling forest	—	—

Locality	Latitude	Longitude
Dibang valley	—	—
Dibru	—	—
Didi Camp	—	—
Digien River bank	27°20'	92°20'
Dogi nalla	—	—
Dulla Tapi	—	—
Galensinaik	—	—
Gibbon's Land	—	—
Glo Hawai	27°40'	96°25'
Gugar village	—	—
Hornbill	—	—
Itanagar	—	—
Jinning	28°10'	94°50'
(New Jinning)	—	—
Kalaktang	27°05'	92°05'
Kambang (Kambong)	28°10'	94°35'
Kameng	27°40'	93°05'
Khonsai	—	—
Kimin	—	—
Lake Ganga	—	—
Lemeking	—	—
Lichi	—	—
Lohit	—	—
Lohitpur road	—	—
Maghi Basti	—	—
Manbhum	—	—
Maru	28°35'	95°50'
Miao	—	—
Minon camp	27°25'	96°10'
Monai River bank	26°50'	92°10'
Naba	—	—
Nacho	—	—
Nambung	28°20'	94°55'
Namchik	27°10'	95°55'
Namdapha Reserve Forest	—	—
Nampung	—	—
Namsai	—	—
Namsang	27°05'	92°25'
Nirjuli	—	—
Norgum river bank	—	—
Pabin	—	—
Pading village	—	—
Pakkha camp (Damorijo)	—	—
Pamir bridge	—	—
Pasighat	—	—
Pasmer Garu	—	—
Payring	—	—

Locality	Latitude	Longitude
Pinjuli	—	—
Rahung village	27°15'	92°20'
Rani (near Pasighat)	28°00'	95°20'
	(or 26°05')	91°35')
Rupa	27°10'	92°20'
Sangam village	—	—
Shaitan Bridge	—	—
Siggon village	27°10'	92°20'
Siji	—	—
Sijosa (Seijosa ?)	—	—
Siki (Sike ?)	28°40'	94°35'
Silari (Salari)	—	—
Sille	—	—
Siram	—	—
Siyam	—	—
Subansiri village/bridge	27°30'	94°20'
Tachidoni	—	—
Tago	27°45'	94°05'
Tali	28°00'	93°40'
Taliha	—	—
Tamien (Tammu ?)	27°50'	94°20'
Tappi	26°55'	95°25'
Tengapani Forest (near Tenga River)	27°10'	94°35'
Tenga river bank	27°10'	92°35'
Tezu	—	—
Tapi	26°40'	95°00'
Vidak village	—	—
Wakru	—	—
Yazalli	—	—
Yingkiong (Yingong ?)	28°45'	94°40'
Zero	—	—
(Ziro)	—	—
Zorom	—	—
NAGALAND STATE	25°06'N – 27°04'N	93°20'E – 95°15'E
Chumukedima (near Dimapur)	25°50'	93°45'
Dimapur	25°50'	93°45'
Kohima	25°40'	94°05'
Rangapahar (near Dimapur)	—	—
MANIPUR STATE	92°50'E – 94°45'E	23°45'N – 25°40'N
Churachandpur	24°15'	93°40'
Imphal	24°40'	93°55'
Lai Manai Village	24°30'	93°40'
Laithungching	—	—
Langor	24°50'	93°50'

Locality	Latitude	Longitude
Lockhchau river Bank	—	—
Loktak (Hydel Pro. area) a little away from Imphal	—	—
Mahabali, Imphal	24°40'	93°40'
Manipur Tea Plantations	—	—
Moreh Reserve Forest	—	—
Singnath	—	—
Swayambung	—	—
Tarung	—	—
Thongmei bund	—	—
Ukhral (East Dist.)	—	—
TRIPURA STATE	22°50'N – 24°30' N	91°10'E – 92°16'E
Abhanga	—	—
Agartala	—	—
Ambassa	23°55'N	91°50'E
Ampi	23°40'	91°35'E
Belonia	23°10'	91°25'E
Chailengta	—	—
Choraibari	—	—
Ganganagar	24°50'	91°55'E
Garjee	—	—
Juduram Bari Beat	—	—
Jarul chera	23°20'	92°00'
Kanchanpur	24°35'	92°25'
Khairpur	—	—
Khowai	24°00'	91°35'
West Khowai	—	—
Kolabagan	—	—
Korilung	—	—
Kunjban	—	—
Kunjmura	—	—
Lalchhuri	—	—
Manu	—	—
Mongaibari	24°25'	91°55'
Paratiya	—	—
Salema	—	—
Shantibazar	—	—
Tiliamura	—	—
MIZORAM STATE	20°56'N – 24°40' N	92°15'E – 93°30'E
Aizwal	23°40'	92°40'
Aizwal – Silchar Road (a little away from Aizwal)		
Aizwal – Zoological Gardens (near Aizwal)		
Durtlong	23°35'	92°40'
Fwipak – (Blue mountains)		
Kolashib – (on road from Silchar to Aizwal)		

Table 2

List of Species of Isoptera known from different states of North-eastern India

* New Records

Sl. No.	Species	Castes known	Recorded from						
			Assam	Meghalaya	Arunachal Pradesh	Tripura	Nagaland	Manipur	Mizoram
1	2	3	4	5	6	7	8	9	10
Family	I. KALOTERMITIDAE Froggatt								
Genus	1. <i>Neotermes</i> Holmgren								
1.	<i>megaoculatus lakhimpuri</i> Roonwal & Sen-Sarma	S., Pw	+	-	-		-	-	
2.	<i>paratensis</i> Sen-Sarma & Thakur	Im., S., Pw.		-	-		+	-	-
3.	sp.	Pw.		-	+			-	
4.	sp.	Pw.	-	-	+			-	-
Genus	2. <i>Glyptotermes</i> Froggatt								
5.	<i>taruni</i> n. sp.	S., W.	-	-	+			-	-
6.	<i>tikaderi</i> Chhotani & Bose	S., W.	-	-	+		-	-	-
7.	<i>tripurensis</i> Sen-Sarma & Thakur	S., W.	-	-	-		+	-	-
Genus	3. <i>Cryptotermes</i> Banks								
8.	<i>bengalensis</i> Snyder	Im., S., Pw.	+	-	-		+	-	-
Family	II. RHINOTERMITIDAE Light								
Subfamily	(i) Coptotermitinae Holmgren								
Genus	4. <i>Coptotermes</i> Wasmann								
9.	<i>gestroi</i> Wasmann	S., W.	+	-	+		-	-	-
10.	<i>heimi</i> (Wasmann)	Im., S., W.	+	+	+		+	-	-
11.	<i>kishori</i> Roonwal & Chhotani	S., W.	-	-	-		+	-	-
12.	<i>travians</i> Haviland	Im., S., W.	+	+	-		+	-	-
Subfamily	(ii) Heterotermitinae Froggatt								
Genus	5. <i>Reticulitermes</i> Holmgren								
13.	<i>assamensis</i> Gardner	Im., S., W.	+	+	+		-	-	-
14.	<i>chinensis</i> Snyder	Im., S., W.	+	-	+		-		
15.	<i>ganga</i> n. sp.	S., W.			+		-		

Sl. No.	Species	Castes known	Recorded from							
			Assam	Meghalaya	Arunachal Pradesh	Tripura	Nagaland	Manipur	Mizoram	
1	2	3	4	5	6	7	8	9	10	
16.	<i>saraswati</i> Roonwal & Chhotani	S.,W.	-	+	-	-	-	-	-	
17.	<i>tirapi</i> Chhotani & Das	S.,W.	-	-	+	-	-	-	-	
Subfamily (iii) Rhinotermitinae Froggatt										
Genus 6.	<i>Parrhinotermes</i> Holmgren									
18.	<i>hasii khasii</i> Roonwal & Sen-Sarma	S.,W.	-	+	-	-	-	-	-	
19.	<i>shamimi</i> n. sp.	S.,W.	-	-	+	-	-	-	-	
Genus 7.	<i>Schedorhinotermes</i> Silvestri									
20.	<i>translucens</i> (Haviland)	Im.,S. ¹⁻² , W.	-	+	-	-	-	-	-	
Family III. Stylotermitidae Holmgren & Holmgren										
Genus 8.	<i>stylotermes</i> Holmgren & Holmgren									
21.	<i>beesoni</i> Thakur	S.,W	-	-	-	+	-	-	-	
Family IV. INDOTERMITIDAE Roonwal & Sen-Sarma										
Genus 9.	<i>Indotermes</i> Roonwal & Sen-Sarma									
22.	<i>rongrensis</i> (Roonwal & Chhotani)	Im, S.,W.	-	+	+	+	-	-	+	
23.	sp.	W.	-	-	-	-	-	+	-	
Family V. TERMITIDAE Westwood										
Subfamily (i) Amitermitinae Kemner										
Genus 10.	<i>Anoplotermes</i> Müller									
24.	<i>shillongensis</i> Roonwal & Chhotani	W.	-	+	-	-	-	-	-	
Genus 11.	<i>Euhamitermes</i> Holmgren									
25.	<i>aruna</i> Chhotani	S.,W	-	-	+	-	-	-	-	
26.	<i>kanhaensis</i> Roonwal & Chhotani *	Im, S., W	-	-	+	-	-	-	-	
Genus 12.	<i>Synhamitermes</i> Holmgren									
27.	<i>quadriceps</i> (Wasmann)	Im, S., W.	+	-	-	+	-	-	-	
Genus 13.	<i>Microcerotermes</i> Silvestri									
28.	<i>annandalei</i> Silvestri	Im, S., W	-	-	-	+	-	-	-	
29.	<i>beesoni</i> Snyder	Im, S., W.	+	-	+	-	-	-	-	

Sl. No.	Species	Castes known	Recorded from							
			Assam	Meghalaya	Arunachal Pradesh	Tripura	Nagaland	Manipur	Mizoram	
1	2	3	4	5	6	7	8	9	10	
30.	<i>crassus</i> Snyder	Im., S., W.		-	-	+		+		
31.	<i>labioangulatus</i> Sen-Sarma & Thakur	S., W.		-		+	+			
Subfamily (ii) Termitinae Sjöstedt										
Genus 14. <i>Angulitermes</i> Sjöstedt										
32.	<i>mishrai</i> Sen-Sarma & Thakur	S., W.		-	-	+	-			
Genus 15. <i>Dicuspitermes</i> Krishna										
33.	<i>laetus</i> Silvestri *	Im., S., W.		-	+		-			
34.	<i>tripurensis</i> Sen-Sarma & Thakur	S., W.	-	-	-	+	-	-		
Genus 16. <i>Pericapritermes</i> Silvestri										
35.	<i>assamensis</i> Mathur & Thapa	S., W.	+	-	-				-	
36.	<i>dunensis</i> Roonwal & Sen-Sarma	Im., S., W.		+	+		-			
37.	<i>durga</i> Roonwal & Chhotani	S., W.	-	+	+	+		+		
Genus 17. <i>Pseudocapritermes</i> Kemner										
38.	<i>karticki</i> n. sp.	S., W.	-		+		-		-	
39.	<i>tikaderi</i> Roonwal & Sen-Sarma	S., W.	+	+	+	-		-	-	
Genus 18. <i>Malaysiocapritermes</i> Ahmad & Akhtar										
40.	<i>holmgreni</i> Akhtar *	Im., S., W.		+	+			-		
Subfamily (iii) Macrotermitinae										
Genus 19. <i>Macrotermes</i> Holmgren										
41.	<i>aleemi</i> Akhtar *	S. ¹⁻² , W. ¹⁻²	-	-	+	-	-	-		
42.	<i>annandalei</i> Silvestri	S. ¹⁻² , W. ¹⁻²	-	+	-			-		
43.	<i>khajuriai</i> Roonwal & Chhotani	S. ¹⁻² , W. ¹⁻²	+	+	+	-	-		+	
44.	<i>serrulatus hopini</i> Roonwal and Sen-Sarma	S. ¹⁻² , W. ¹⁻²			-	+		+		
Genus 20. <i>Odontotermes</i> Holmgren										
45.	<i>adampurensis</i> Akhtar *	S.,	+	+	+	-	-		-	
46.	<i>assmuthi</i> Holmgren *	Im., S., W. ¹⁻²	-			-	-	+	-	
47.	<i>feae</i> (Wasmann)	Im., S., W. ¹⁻²	+	+	+	+	+	+	+	

Sl. No.	Species	Castes known	Recorded from							
			Assam	Meghalaya	Arunāchal Pradesh	Tripura	Nagaland	Manipur	Mizoram	
1	2	3	4	5	6	7	8	9	10	
48.	<i>ganpati</i> n. sp.	S.	+	-	-	-	-	-	-	
49.	<i>giriensis</i> Roonwal & Chhotani	Im., S., W. ¹⁻²	+	+	+	+	-	+	-	
50.	<i>horai</i> Roonwal & Chhotani	Im., S. W.	-	+	+	-	+	-	-	
51.	<i>kapuri</i> Roonwal & Chhotani	S., W.	-	+	-	+			-	
52.	<i>obesus</i> (Rambur)	Im., S., W. ¹⁻²	+	+	+	+	+	-	-	
53.	<i>profeae</i> Akhtar	S.	-		-	-	+	-	-	
54.	<i>paralatigula</i> Sen-Sarma *	S.	-		-	-		+	-	
55.	<i>parvidens</i> Holmgren & Holmgren	Im., S., W.	+	+	+	-	+	+	-	
56.	<i>proformosanus</i> Akhtar *	Im., S.	-	-	+	-	-	-	-	
57.	<i>prolatigula</i> n. sp.	S., W.	-	-	+	-	-	-	-	
58.	<i>singsiti</i> n. sp.	S., W.	-	-	-	-		+	-	
Genus 21.	<i>Hypotermes</i> Holmgren									
59.	<i>xenotermitis</i> Wasmann	Im., S., W.	+	+	+	+	+	-	-	
Genus 22.	<i>Microtermes</i> Wasmann									
60.	<i>imphalensis</i> Roonwal & Chhotani	Im., S., W.	-	-	+	-	-	+	-	
61.	<i>obesi</i> Holmgren	Im., S., W.	+	+	+	+	+	-	+	
Genus 23.	<i>Ancistrotermes</i> Silvestri									
62.	<i>pakistanicus</i> Ahmad	Im., S. W.	+	+	+	+	+	-	+	
Subfamily (iv) Nasutitermitinae Banks										
Genus 24.	<i>Nasutitermes</i> Banks									
63.	<i>cherraensis</i> Roonwal & Chhotani	S. ¹⁻² , W.	-	+	+	-	-	-	-	
64.	<i>chhotanii</i> n. sp.	Im., S., W.	-	-	+			-	-	
65.	<i>emersoni</i> Snyder	Im., S., W.	-	-		+	-		-	
66.	<i>gardneri</i> Snyder	Im., S., W.	+	-	+	-	-	+	-	

Sl. No.	Species	Castes known	Recorded from						
			Assam	Meghalaya	Arunachal Pradesh	Tripura	Nagaland	Manipur	Mizoram
1	2	3	4	5	6	7	8	9	10
67.	<i>garoensis</i> Roonwal & Chhotani	Im., S., W.	+	+	+		+	-	-
68.	<i>jalpaigurensis</i> Prashad & Sen-Sarma *	S., W.	-	-	+	+	-	-	-
69.	<i>kali</i> Roonwal & Chhotani	S., W.	+	+	-	-	-		-
70.	<i>matangensisiformis</i> (Holmgren) *	Im., S. W.	-	-	+	-	-		-
71.	<i>moratus</i> Silvestri	S., W.	-	-	+	-	-	-	-
72.	<i>tandoni</i> n. sp.	S., W.	-	-	+	-	-	-	-
Genus 25.	<i>Bulbitermes</i> Emerson								
73.	<i>emersoni</i> Maiti *	S., W.	-	-	+	-	-		-
74.	<i>parapusilus</i> Ahmad *	Im., S., W	-	+	-	-	-	-	-
Genus 26.	<i>Hospitalitermes</i> Holmgren								
75.	<i>jepsoni</i> Snyder *	S.	+	-	-	-	-	-	-
Genus 27.	<i>Roonwalitermes</i> Bose								
76.	<i>wadhwai</i> Bose	S. ¹⁻² , W.	-	+	-	-	-	-	-

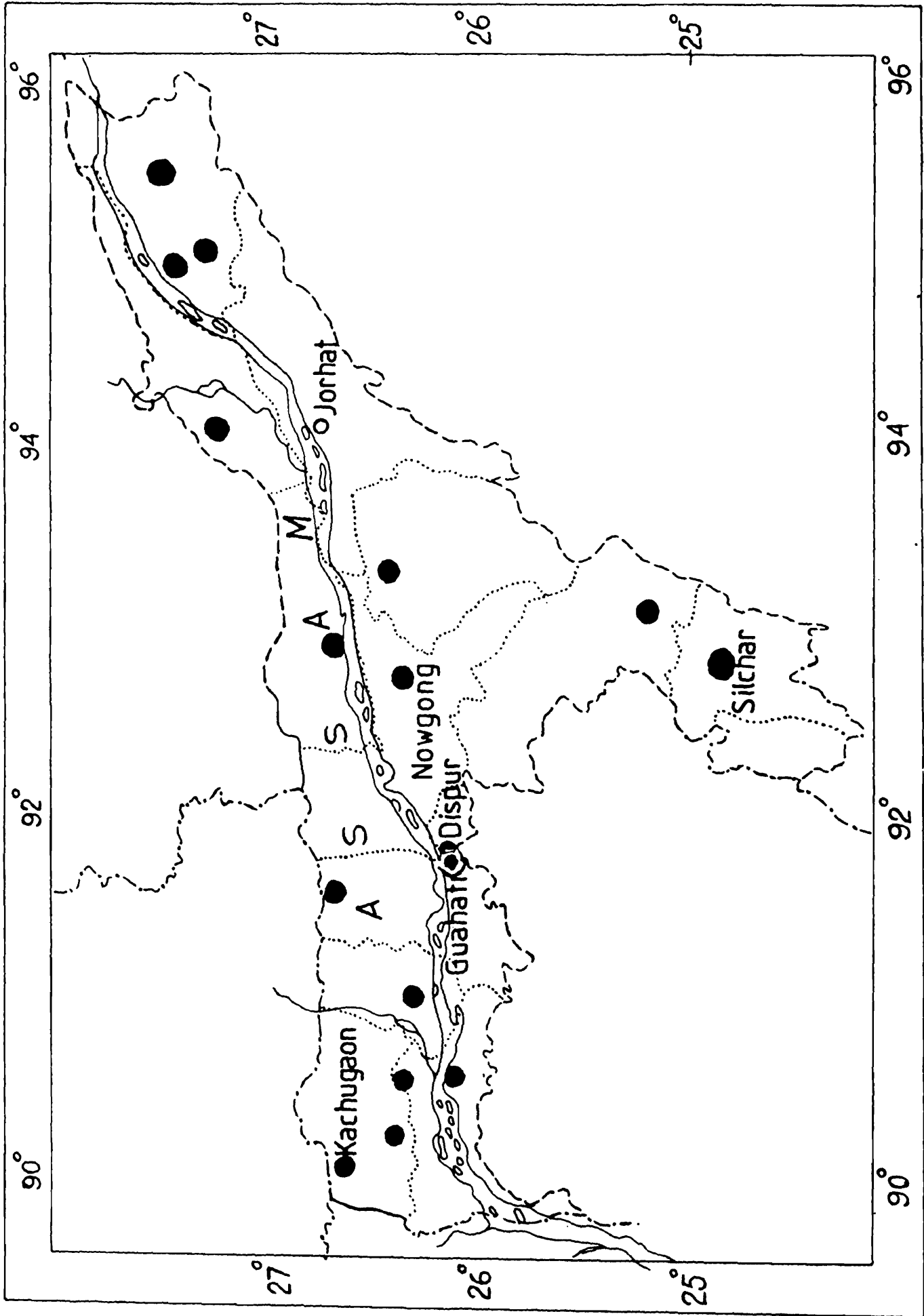


Fig. 2 Map of Assam state, showing the collection localities and district boundaries.

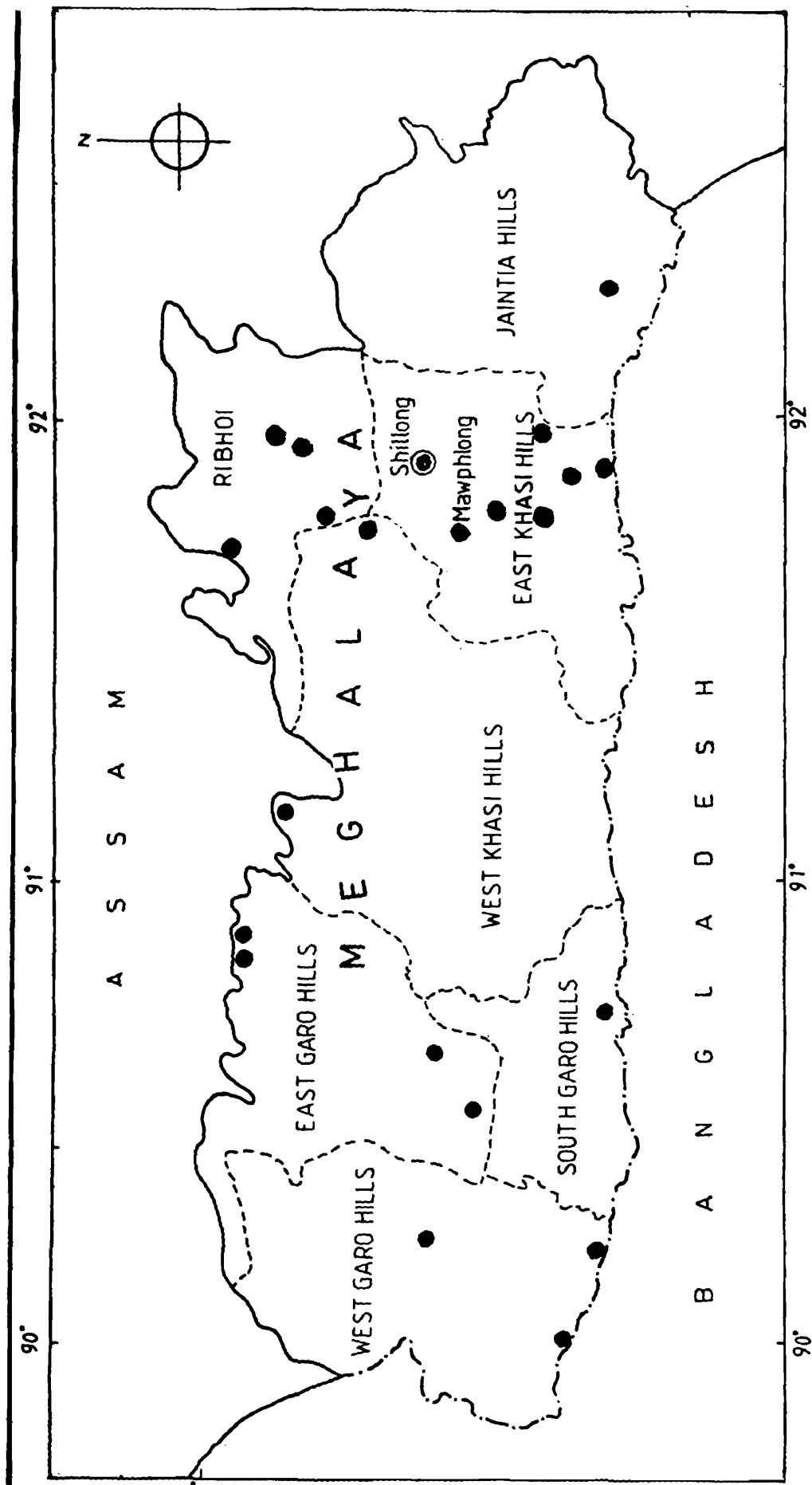


Fig. 3 Map of Meghalaya, showing collection sites and district boundaries.

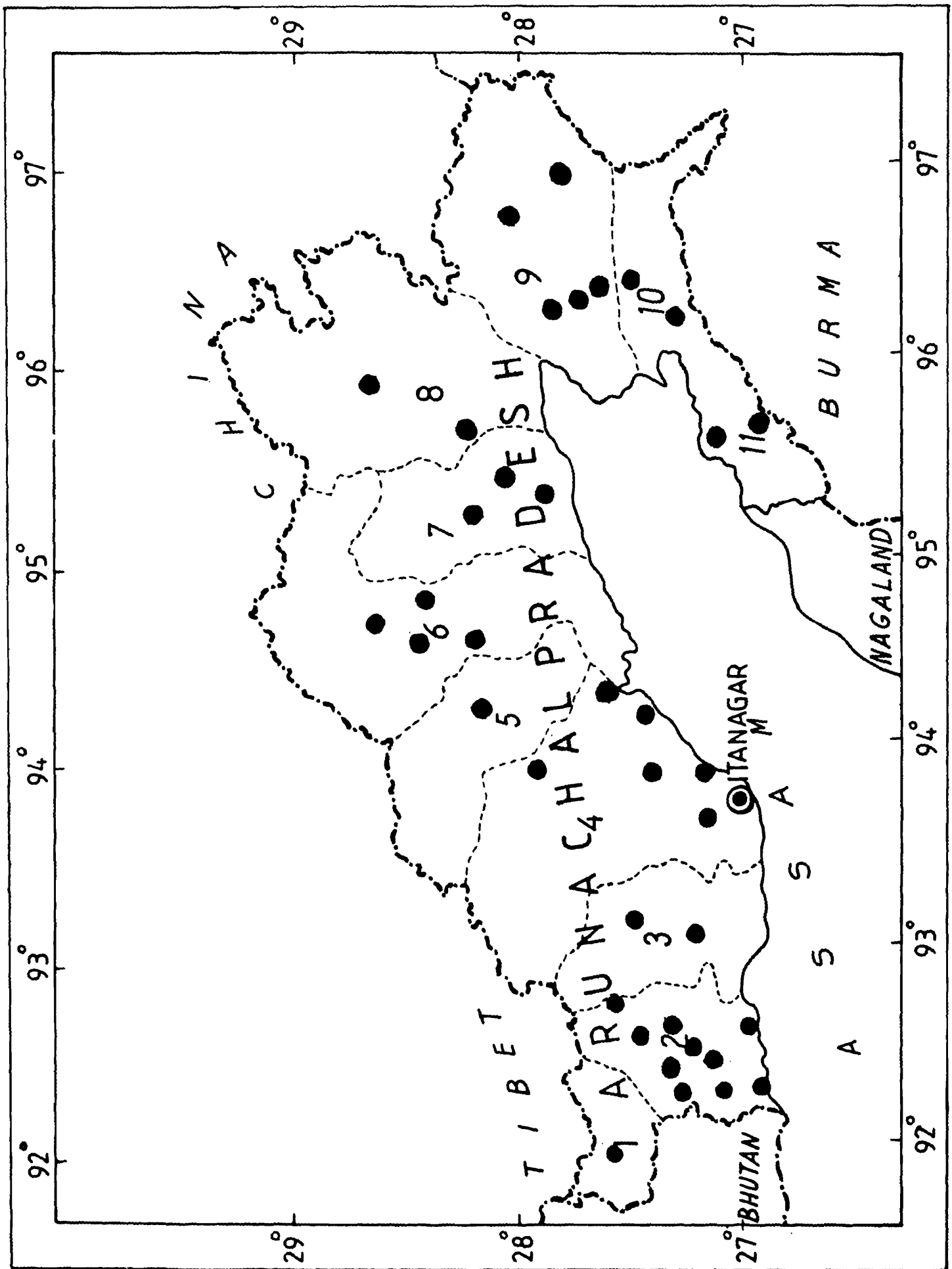


Fig. 4 Map of Arunachal Pradesh, showing collection sites and district boundaries.

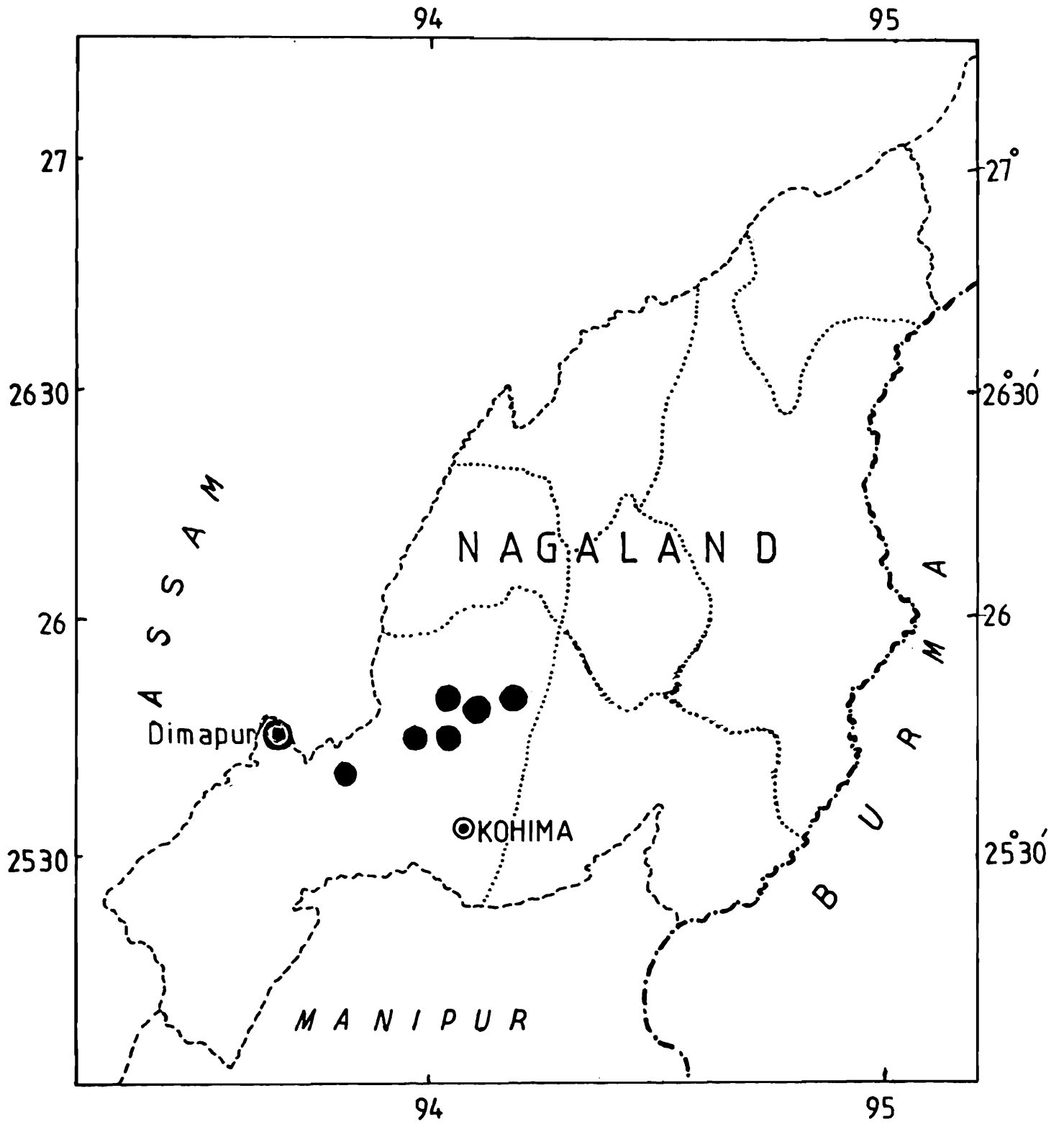


Fig. 5 Map of Nagaland, showing collection sites and district boundaries.

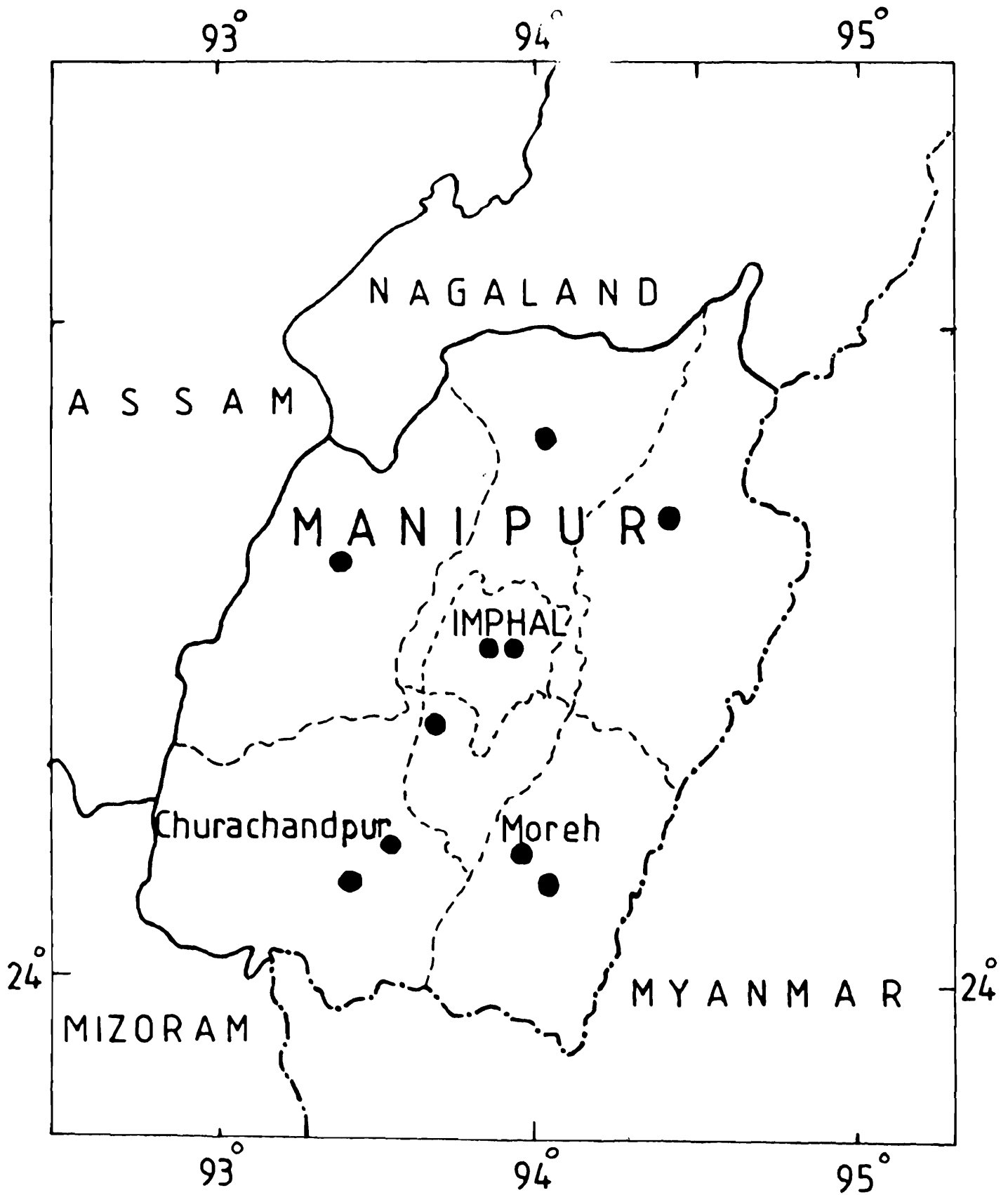


Fig. 6 Map of Manipur, showing collection sites and district boundaries.

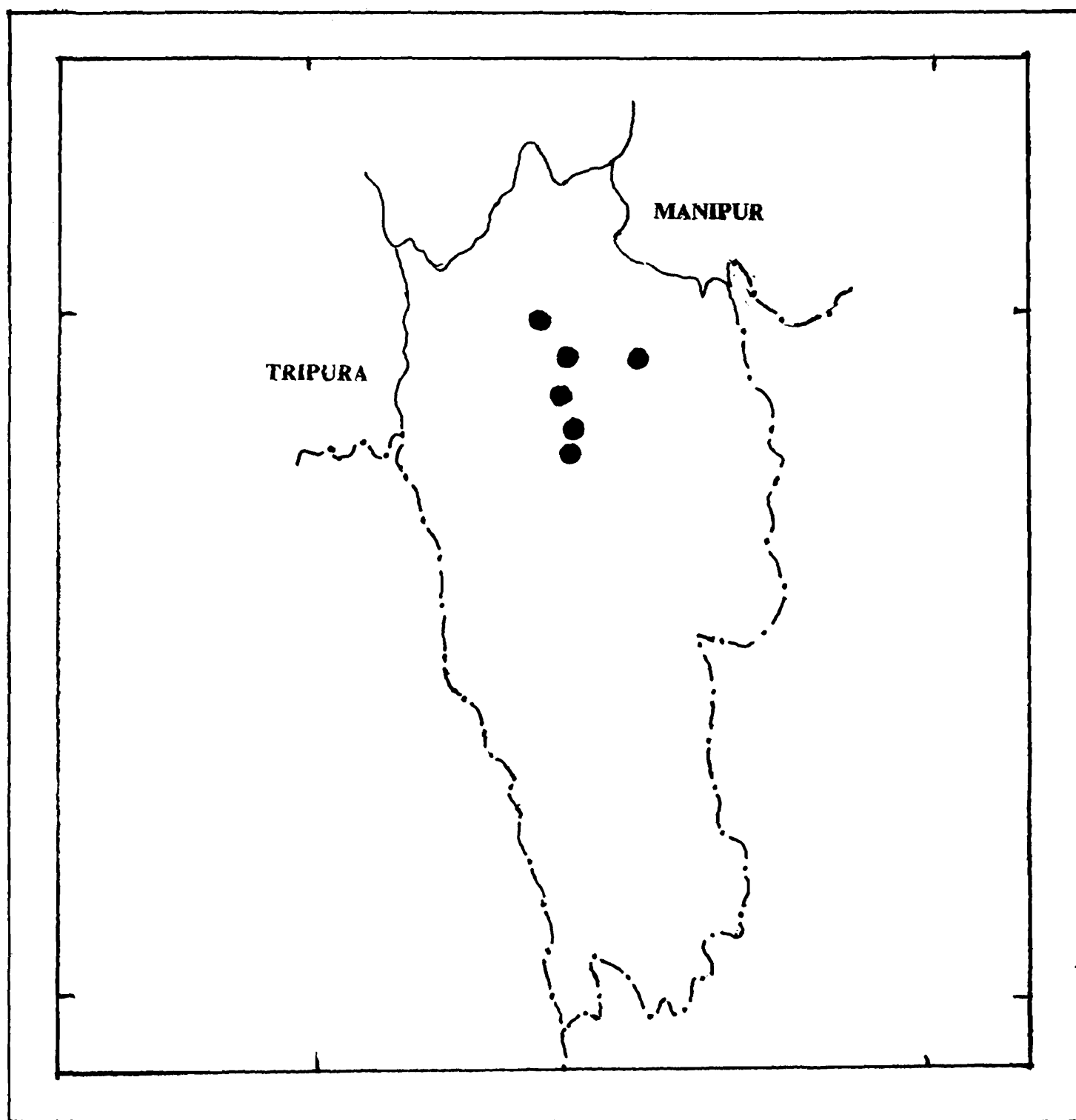


Fig. 7 Map of Mizoram, showing collection sites and district boundaries.

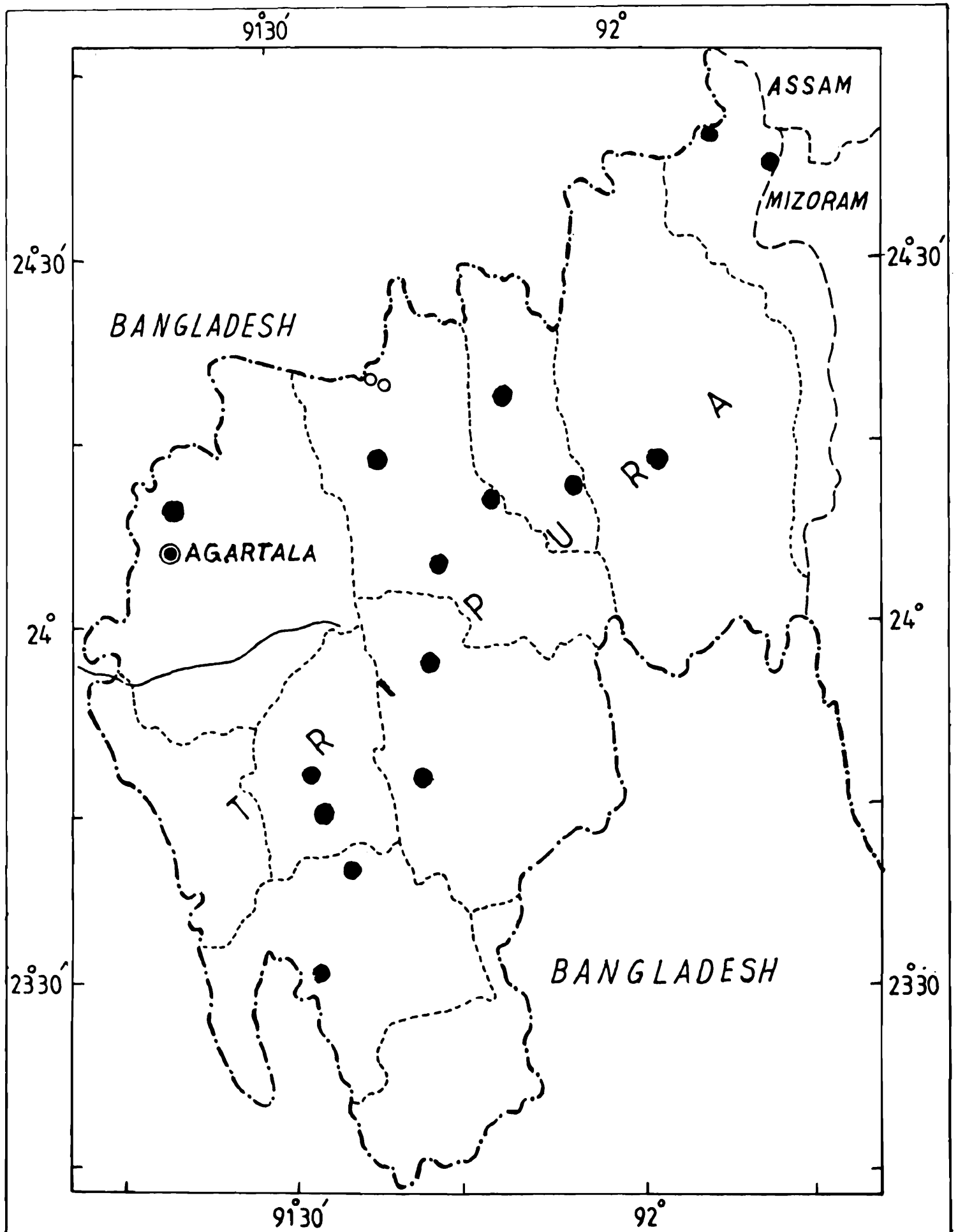


Fig. 8 Map of Tripura, showing collection sites and district boundaries.

COLLECTIONS STUDIED

For the present studies collections were available from as many as 32 surveys conducted by the Zoological Survey of India in different parts of the region and also by the author in Assam, Meghalaya, Manipur and Mizoram states in 1990. A list of collections so available is as follows:-

1. Eastern Regional Station, Shillong, collection by various staff members mostly from Meghalaya 1960 onwards
2. K. C. Jayaramakrishnan collection from Kameng district of Arunachal Pradesh 1961
3. Ganpat Singh Roonwal collection from mounds in Messamari Tea Estate, Assam 1961
4. S. Biswas collection from Arunachal Pradesh 1961
5. C. B. Srivastava collection from Arunachal Pradesh (Namdapha) 1962
6. S. K. Bhattacharyya collection from Arunachal Pradesh 1965
7. S. K. Tandon and G. S. Arora collection from Arunachal Pradesh 1966
8. A. N. T. Joseph collection from Arunachal Pradesh 1966
9. S. K. Tandon collection from Arunachal Pradesh and Assam 1969 and 1973
10. J. M. Julka collection from Arunachal Pradesh 1969 and 1974
11. M. Dutta Collection from Assam 1974
12. S. K. Gupta collection from Assam and Meghalaya 1974
13. T. Sengupta collection from Assam and Meghalaya 1974
14. P. T. Cherian collection from Manipur 1975
15. G. K. Srivastava collections from Meghalaya 1979
and Tripura 1991
16. S. K. Gupta and M. Prashad collection from Arunachal Pradesh 1981
17. S. Biswas collections from Namdapha Res. Forest, Arunachal Pradesh 1982, 1984
18. S. K. Gupta and Y. N. Gupta collection from Arunachal Pradesh 1983
19. A. K. Sanyal collection from Tripura 1983
20. D. P. Sanyal collection from Arunachal Pradesh 1987
21. C. P. Prasad collection from Arunachal Pradesh 1987
22. Arunachal Pradesh Fld. Stn. collections 1987 onwards
23. H. C. Ghosh collection from Mizoram 1987
24. O. B. Chhotani collection from Arunachal Pradesh 1989
25. G. Bose collection from Assam, Meghalaya, Nagaland,
Mizoram, and Manipur 1990
26. Manipur State Forest Deptt. collection from Manipur 1990
27. J.R.B. Alfred collection from Meghalaya 1991.

From the above surveys more than two thousand samples comprising several thousands of specimens were examined for the present study.

Map of North-Eastern India, the area of the Indian Subcontinent which was taken up for the present study and those of its different states, showing the collection sites, are provided.

REVIEW AND PRESENT STATUS OF TERMITE FAUNA OF NORTH-EASTERN INDIA

A. Review

The first ever reference to a termite from North-eastern India is of Holmgren (1913) who described the species *Odontotermes assamensis* [now a synonym of *O. obesus* (Rambur)] from Assam. The next work on the termites from this region is that of Silvestri (1914) who worked out a collection obtained through an expedition of Abor Hills in Arunachal Pradesh by S. W. Kemp of the Zoological Survey of India, recording four species viz. *Odontotermes assamensis* Holmgren (syn. of *O. obesus*), *Odontotermes microdens* Silvestri (Nom. nud.) = *O. parvidens* Holmgren and Holmgren, *Odontotermes feae* (Wasmann) and *Eutermes moratus* Silvestri i.e. *Nasutitermes moratus* (Silvestri). Holmgren and Holmgren (1917) studied a large collection of termites from various parts of India sent to them by the Department of Agriculture, Govt. of India, and recorded *Coptotermes gestroi* Wasmann and described the termite *Odontotermes flavomaculatus* [now a synonym of *O. obesus* (Rambur)] and *Odontotermes parvidens* (syn. *O. microdens* Silvestri, nom. nud.). Gardner (1945) described the species *Reticulitermes assamensis*. All these species and *Hypotermes xenotermitis* (Wasmann) are recorded by Snyder (1949) in his catalogue of world termites. Rattan Lal and Menon (1953) and Roonwal and Pant (1953) in their catalogues have listed some species including *Cryptotermes bengalensis* Snyder and *Coptotermes curvignathus* Holmgren [later determined as *Coptotermes gestroi* (Wasmann)] and *Microcerotermes* sp. Roonwal and Sen-Sarma (1956) described another two species viz. *Parrhinotermes khasii* and *Hypotermes nongpriangi* [now treated as a synonym of *H. xenotermitis* (Wasmann)]. Roonwal and Chhotani (1959 and 1962) reported the occurrence of the genus *Anoplotermes* and described the species *A. shillongensis*. The genus *Anoplotermes* according to Sands (1972) is restricted to the Neotropical Region. Since the soldier or the imago of this species have not been available, it is not possible to assign the species to any other genus at the present moment. Roonwal and Sen-Sarma (1960) described the species *Neotermes megaoculatus lakhimpuri* from Assam. Thus in all 14 species were known when Roonwal and Chhotani (1962), considering the ecological and faunistic diversity and richness of this region, took up the study of the collections available from there at the Zoological Survey of India; they reported 34 species in all. But their study was not complete in all respects since they did not have any collections from Arunachal Pradesh Nagaland, Mizoram and Tripura states. Since Roonwal and Chhotani (1962), some more works on small collections from certain parts/states of this region, such as those of Mathur and Thapa (1965) on Assam collection; Chhotani (1976) and Sen-Sarma and Thakur (1979) on Tripura collections; Lahiri, Ghosh and Biswas (1977) on Meghalaya collections; Lahiri and Ghosh (1980) on Manipur collections; Verma (1984) on Nagaland collection; and Chhotani and Bose

(1985) on a collection from Namdapha Reserve Forest, have also appeared. Some other contributions on the species *Reticulitermes assamensis* Gardner by Thakur (1977) on *Indotermes rongrensis* (Roonwal and Chhotani) by Roonwal and Chhotani (1986), on a new species of genus *Euhamitermes* and imago of *Nasutitermes garoensis* Roonwal and Chhotani by Chhotani (1975) and on the *Reticulitermes* by Chhotani and Das (1983) pertain to some species from this region.

Thus, till recently 49 species of termites were known from this region. The list of termites given at the end of this contribution includes all these species and others recorded or described now, showing their distribution in different states.

B. Present status

The present study as well as on review of the literature on the termite fauna of this region, 76 species of termites are now found to occur in this area. These belong to 27 genera (one new to science) included in the families Kalotermitidae, Rhinotermitidae, Stylotermitidae, Indotermitidae and Termitidae, and a list of the same is given in Table 2 at the end of this paper, giving their records in the different states in this region and the castes so far known. As many as 10 species are described as new to science, 12 species are recorded for the first time and the so far unknown imago caste of two species viz. *Odontotermes giriensis* Roonwal and Chhotani and *Nasutitermes gardneri* Snyder and soldier and worker castes of *Microtermes imphalensis* Roonwal and Chhotani are described herein.

SYSTEMATIC ACCOUNT

A. Keys for Identification of Termite Families from North-Eastern India

Imagoes :

- | | |
|--|---|
| 1. Fontanelle absent. Tarsi 4-jointed | Kalotermitidae |
| – Fontanelle present. Tarsi 3 or 4 jointed | 2 |
| 2. Tarsi 4-jointed | 3 |
| – Tarsi 3-jointed | 4 |
| 3. Basal scale of forewing large (except Psammotermitinae), covering hindwing scale partly, Pronotum flat | Rhinotermitidae |
| – Basal scale of forewing small, not covering hindwing scale. Pronotum slightly saddle-shaped | Termitidae |
| 4. Pronotum flat, Wings with media usually unbranched, rarely bifurcated. Wing microsculpture consists of papillae, pimpules and arrowheads. | Stylotermitidae
(<i>Stylotermes</i>) |
| – Pronotum strongly saddle-shaped, Wings with media having several branches. Wing microsculpture consists of papillae and simple nonasteroid micrasters..... | Indotermitidae
(<i>Indotermes</i>) |

Soldiers

- | | |
|----------------------------|----------------|
| 1. Fontanelle absent | Kalotermitidae |
| – Fontanelle present | 2 |

2. Tarsi 4-jointed	3
– Tarsi 3-jointed	4
3. Pronotum flat	Rhinotermitidae
– Pronotum saddle-shaped	Termitidae
4. Pronotum flat	Stylotermitidae
	(<i>Stylotermes</i>)
– Pronotum saddle-shaped	Indotermitidae

B. Keys for identification of Subfamilies and Genera from North-Eastern India

Family I : KALOTERMITIDAE

Imagoes

1. Media of wings strongly sclerotised	2
– Media of wings weakly sclerotised and curving up to meet radial sector	<i>Cryptotermes</i>
2. Radial sector of forewing with branches	<i>Neotermes</i>
– Radial sector of forewing without branches	<i>Glyptotermes</i>

Soldiers

1. Head generally long and gradually inclined in front; mandibles well developed	2
– Head short and truncate in front; mandibles short and stunted	<i>Cryptotermes</i>
2. Frons not bilobed and without any antero-lateral prominences at base..	<i>Neotermes</i>
– Frons bilobed and with a pair of antero-lateral prominences at base ...	<i>Glyptotermes</i>

Family II : RHINOTERMITIDAE

Imagoes

1. Postclypeus strongly swollen, mostly projected in front medially; a median groove running from fontanelle onwards upto tip of labrum or sometimes stopping short	Rhinotermitinae
– Antennae 16–17 segmented	<i>Parrhinotermes</i>
– Antennae 20-segmented	<i>Schedorhinotermes</i>
– Postclypeus flat or weakly swollen, not projected in front medially; without any median groove running from fontanelle onwards	2
2. Head oval, sides substraight	Heterotermitinae
	(<i>Reticulitermes</i>)
– Head rounded, sides also rounded	Coptotermitinae
	(<i>Coptotermes</i>)

Soldiers

1. Head rectangular..... Heterotermitinae
(*Reticulitermes*)
- Head oval or roundly oval..... 2
2. Mandibles with only a few crenulations in basal half; fontanelle large, situated at base of clypeus Coptotermitinae
(*Coptotermes*)
- Mandibles each with 1–2 sharply pointed teeth; fontanelle situated on head-dorsum in between antennal carinae Rhinotermitinae
- i) Monomorphic. Mandibles finely serrated basally *Parrhinotermes*
- Dimorphic. Mandibles not serrated basally*Schedorhinotermes*

Family III : TERMITIDAE

Imagoes

1. Tibial spurs 3 : 2 : 2 2
- Tibial spurs 2 : 2 : 2 Nasutitermitinae
- i) Apical tooth of left mandible very much reduced *Hospitalitermes*
- Apical tooth of left mandibles not reduced
- ii) Fontanelle plate linear, narrow *Nasutitermes*
- Fontanelle plate wide *Bulbitermes*
2. Apical tooth of mandibles shorter than to as long as 1st marginal tooth (except *Synhamitermes*)..... Amitermitinae
- i) Head parallel sided; margin between 1st and 2nd marginal teeth of left mandible incurved and without any cut in front of 2nd marginal; antennae with 13–14 (usually 14) segments *Microcerotermes*
- Head rounded; margin between 1st and 2nd marginal teeth of left mandible straight and either deeply cut in front of 2nd marginal or without any cut
- ii) Apical tooth of mandibles longer than 1st marginal and cutting edge between 1st and 2nd marginals without cut in front of 2nd marginal *Synhamitermes*
- Apical tooth of mandibles as long as 1st marginal and cutting edge between 1st and 2nd marginal with a cut in front of 2nd marginal *Euhamitermes*
- Apical tooth of mandibles longer than 1st marginal..... 3
3. Labrum with a sclerotised transverse band. Left mandible with a deep cut in front of 2nd marginal Macrotermitinae
- i) Larger species. Right mandible with an indistinct / faint subsidiary tooth at base of 1st marginal tooth..... *Macrotermes*

- Smaller species. Right mandible without any subsidiary tooth ii
- ii) Postclypeus much paler than head; antennae with 15–18 segments.....
.....*Microtermes / Ancistrotermes*
- Postclypeus not much paler than head; antennae with 19-20 segments.....iii
- iii) Fontanelle raised *Odontotermes*
Fontanelle not raised..... *Hypotermes*
- Labrum without sclerotised, transverse band; left mandible without deep cut in front of 2nd marginal
 - i) Apical tooth of mandibles much longer than 1st marginal; 2nd marginal tooth of left mandible reduced..... *Pseudocapratermes*
 - Apical tooth of mandibles either shorter or as long as 1st marginal; 2nd marginal tooth of left mandible prominent.....ii
 - ii) Posterior margin of 1st marginal of left mandible short, only slightly longer than that of anterior margin *Angulitermes*
 - Posterior margin of 1st marginal of left mandible long, much longer than that of anterior margin. iii
 - iii) Fontanelle large, oval..... *Pericapritermes*
 - Fontanelle, long, narrow *Dicuspitermes*

Soldiers

1. Head not retort-shaped, not produced into a rostrum 2
- Head retort-shaped, produced into a rostrum. Mandibles generally degenerate, not functional *Nasutitermitinae*
 - i) Head not constricted behind antennae *Nasutitermes*
 - Head constricted behind antennae..... ii
 - ii) Darker species. Head greatly produced behind and strongly incurved at base of rostrum. Mandibles with long, lateral, spines-like process. Antennae and legs long *Hospitalitermes*
 - Paler species. Head not so greatly produced behind and less so incurved at base of rostrum. Mandibles without or with small, spine-like process. Antennae and legs shorter..... iii
 - iii) Mandibles with short, spine-like process *Bulbitermes*
 - Mandibles without spine-like process *Ahmaditermes*
2. Mandibles hooked, strongly incurved anteriorly and shorter than head; with a prominent tooth on each, or serrated *Amitermitinae*

- i) Mandibles sickle-shaped and faintly to strongly serrated *Microcerotermes*
 — Mandibles strongly incurved at tip and not serrated ii
- ii) Mandibles very broad at base; each with an anteriorly directed tooth; larger species
 *Euhamitermes*
 — Mandibles normal, not exceptionally broad at base; each with a tooth directed at right
 angle *Synhamitermes*
 — Mandibles not hooked either symmetrical and sabre-shaped and weakly incurved
 anteriorly or long and asymmetrical (rod-like or twisted.) 3
3. Mandibles asymmetrical, left faintly to strongly twisted. Labrum more or less deeply
 incurved at anterior margin Termitinae
- i) Mandibles rod-like. Frons weakly to appreciably produced in front conically
 *Angulitermes*
 Mandibles asymmetrical, generally twisted left mandible weakly to strongly twisted.
 Frons not produced in front; generally sloping in front gradually, sometimes abruptly
 sloping ii
- ii) Labrum sinuate, not incurved at anterior margin. Mandibles much shorter than head;
 left mandible strongly twisted *Pericapritermes*
 — Labrum strongly incurved at anterior margin. Mandible as long as or a little
 shorter than head; left mandible less so twisted iii
- iii) Apical tibial spurs 2 : 2 : 2 *Malaysiocapritermes*
 Apical tibial spurs 3 : 2 : 2 iv
- iv) Antero-lateral corners of head produced into tubercle- like projections
 *Dicuspiditermes*
 — Antero-lateral corners of head not produced into tubercle-like projections
 *Pseudocapritermes*
 — Mandibles symmetrical, sabre-shaped. Labrum not incurved at anterior margin, either
 pointed or rounded Macrotermitinae
- i) Dimorphic. Labrum with a hyaline tip. Meso- and metanotum laterally expanded
 *Macrotermes*
 — Monomorphic. Labrum without hyaline tip. Meso- and metanotum not laterally
 expanded ii
- ii) Small and delicate species. Mandibles without any tooth or crenulations; left
 sometimes with a faint tooth iii
 — Larger species. Left mandible with a tooth on inner margin or crenulated in basal
 half iv

- iii) Head broadly round or squarish; mandibles strongly incurved anteriorly
 *Ancistrotermes*
 — Head oval, converging in front; mandibles weakly incurved anteriorly
 *Microtermes*
- iv) Left mandible with a tooth on inner margin; position of tooth variable
 *Odontotermes*
 — Left mandible with crenulations in basal half *Hypotermes*

C. Keys for the Identification of Termite species from North-Eastern India

Family I : KALOTERMITIDAE

Genus *Neotermes* Holmgren

Only two species of the genus are known from North-Eastern India. However, two more species are recorded here, through pseudoworkers and are referred as sp. 1 and 2 in the text.

Soldiers

1. Larger species. Head-length to base of mandibles 4.1 – 5.1, head-width 2.6 – 3.0 mm. Antennae 16 – 17 segmented. Eyes larger 0.30 – 0.40 mm
 *megaoculatus lakhimpuri*
- Smaller species. Head-length to base of mandibles 2.90 – 3.20, head-width 1.94 – 2.05 mm. Antennae 13 – 14 segmented. Eyes smaller 0.20 mm *paratensis*

Genus : *Glyptotermes* Froggatt

Three species of the genus *Glyptotermes* are known from North-Eastern India, including a new one described here. These are all known by soldier and pseudoworker castes.

Key to the species

Soldiers

1. Head gradually inclined in region of frons at an angle of 45° Smaller species : Head length to base of mandibles 1.18 – 1.40, width 0.88 – 0.93 mm. Antennae 8–10 segmented
 *tripurensis*
- Head sharply inclined in region of frons at an angle of about 70° Larger species : Head-length to base of mandibles 2.25 – 3.50, width 1.48 – 2.05 mm. Antennae 14 – 15 segmented 2
2. Larger species : Head length to base of mandibles 3.2 – 3.50, head-width 1.90 – 2.05 mm. Pronotum sinuate, wavy at anterior margin. *tikaderi*
- Smaller species : Head length 2.25, head-width 1.48. Pronotum weakly incurved at anterior margin *taruni* n. sp.

Family II : RHINOTERMITIDAE

Subfamily (i) COPTOTERMITINAE

Genus *Coptotermes* Wasmann

Three species of the genus *Coptotermes* are known from North-Eastern India.

Key to the species

Imagoes

The imago caste of two species viz. *heimi* Wasmann and *travians* Haviland are known.

1. Head generally larger, width with eyes 1.30 – 1.40 mm. Wings shorter 8.6 – 9.75 mm ..
..... *heimi*
- Head generally smaller, width with eyes 1.18 – 1.45 mm. Wings longer 9.5 – 10.0 mm.
..... *travians*

Soldiers

1. Waist of postmentum lying below middle. Smaller species : Head-length to base of mandibles 1.13 – 1.25 mm *kishori*
- Waist of postmentum lying at middle. Larger species. Head length to base of mandibles 1.20 – 1.60 mm 2
2. Head dorsum neither swollen nor wavy as seen in lateral view. Generally larger, head-length to base of mandibles 1.40 – 1.60 mm *gestroi*
- Head dorsum swollen and wavy in lateral view. Generally smaller, head length 1.14 – 1.50 mm 3
3. Postmentum wider at waist, minimum width 0.25 – 0.34 mm, contraction widex 0.63 – 0.76 *heimi*
- Postmentum narrower at waist, minimum width 0.23 – 0.29 mm, contraction widex 0.57 – 0.69 *travians*

Subfamily (ii) HETEROTERMITINAE

Genus *Reticulitermes* Holmgren

The genus *Reticulitermes* is restricted only to North-eastern India and Bhutan in the Indian subregion and is known by 5 species including a new one described here.

Key to the Species

The imagoes of only 2 species are known and are separated as follows :

Imagoes

1. Ocelli separated from eyes by long diameter of ocellus; pronotum yellow; tibia basally one fourth brownish, rest yellowish *assamensis*

- Ocelli separated from eyes by less than short diameter of ocellus; pronotum dark brown; tibia yellowish all through..... *chinensis*

Soldiers

1. Smaller species : Head-length without mandibles 1.53 – 1.55, head-width 1.00 – 1.18 mm2
- Larger species : Head-length without mandibles 1.75 – 2.82, head-width 1.05 – 1.25 mm3
2. Head wider; sides of head convex (head-width 1.18 mm, index width/length 0.761). Postmentum waist shorter*ganga* n. sp.
- Head narrower, sides of head substraight (head-width 1.00 mm, index width/length 0.654). Postmentum waist longer..... *saraswati*
3. Labrum with a sharply pointed tip; frontal protuberances absent or ill developed *chinensis*
- Labrum with a blunt tip; frontal protuberances well developed4
4. Head narrower and flat; head-width (1.05 – 1.12 mean 1.07 mm), head-width (0.90 – 0.95 mean 0.93 mm) Pronotum narrower (width 0.80 – 0.87, mean 0.82 mm) *tirapi*
- Head wider and swollen; head-width 1.08 – 1.30 (Mean 1.18 mm) head-height 0.87 – 1.10, (mean 1.01mm). Pronotum wider (width 0.77 – 0.92, mean 0.84 mm) *assamensis*

Subfamily III : RHINOTERMITINAE

Genus *Parrhinotermes* Holmgren

Only two species of this genus are known from North-eastern India. The imago caste of neither of the two species is known.

Key to the species

Soldiers

1. Larger species : Head-length to base of mandibles 1.26, max. width of head 1.08, pronotum-width 0.72 mm *khasii khasii*
- Smaller species : Head-length to base of mandibles 0.95 – 0.98, max. width of head 0.85, pronotum-width 0.50 – 0.53 mm *shamimi* n. sp.

Family III : TERMITIDAE

Subfamily (i) AMITERMITINAE

Genus *Euhamitermes* Holmgren

Two species of this genus are known.

Key to the species***Soldiers***

1. Smaller species : Head-length to base of mandibles 1.27; head-width 0.97 mm
..... *aruna*
- Larger species : Head-length to base of mandibles 1.40 ; head-width 1.08 mm
..... *kanhaensis*

Genus *Microcerotermes* Silvestri

Four species of this genus are known from North-eastern India.

Key to the species***Imagoes***

1. Smaller species : Head-width with eyes 0.77 – 0.86; Forewing length 6.0 – 7.6 mm.
Y-suture present, fontanelle plate distinct 2
- Larger species : Head-width with eyes 0.90 – 1.00; forewing-length 7.8 – 8.90 mm. Y-suture
and fontanelle indistinct *crassus*
2. Postclypeus-length slightly shorter than half of width; anterior margin concave. Forewing
shorter 6.00 – 6.4 mm *annandalei*
- Postclypeus-length nearly equal to half of width; anterior margin straight. Forewing longer
6.4 – 7.6mm *beesoni*

Soldiers

1. Mandibles coarsely serrated 2
- Mandibles finely serrated..... *crassus*
2. Smaller species : Head-length to base of mandibles 1.28 – 1.55, max. width of head 0.77
– 0.91, left mandible-length 0.80 – 0.92, width of pronotum 0.47 – 0.60 mm.....*beesoni*
- Larger species : Head-length to base of mandibles 1.57 – 1.90, max. width of head 0.91 –
1.13, left mandible-length 0.90 – 1.15, width of pronotum 0.55 – 0.73 mm..... 3
3. Mandibles moderately arched at outer margin; labrum with rounded anterolateral corners
and head less so wide (0.91 – 0.95 mm) *annandalei*
- Mandibles strongly arched at outer margin; labrum with pointed (angular) anterolateral
corners and head wider (1.10 – 1.13 mm) *labioangulatus*

Subfamily (ii) TERMITINAE

Genus *Dicuspiditermes* Krishna

Only two species of the genus *Dicuspiditermes* are known from North-eastern India.

Key to the species

Soldiers

1. Labrum without lateral processes and longer than wide. Frons sharply inclined..... *laetus*
- Labrum without lateral processes and shorter than wide. Frons less so sharply inclined *tripurensis*

Genus *Pericapritermes* Silvestri

Four species of the genus *Pericapritermes* are known from North-eastern India.

Key to the species

Imagoes

The imagoes of only two species viz. *dunensis* Roonwal and Sen-Sarma and *tetraphilus* Silvestri are known and keyed as under :

1. Head smaller, width with eyes 1.27 – 1.30 mm. Fontanelle plate narrow, linear. Median line of suture distinct, lateral sutures faint..... *dunensis*
- Head longer; width with eyes 1.31 – 1.38 mm. Fontanelle plate large, oval. Sutures indistinct *tetraphilus*

Soldiers

1. Smaller species. Head-length to base of mandibles 2.05 – 2.20, max. width of head 1.19 – 1.27 mm. Median suture not extending upto fontanelle *assamensis*
- Larger species. Head-length to base of mandibles 2.30 – 3.05, max. width of head 1.30 – 1.76 mm. Median suture reaching almost upto fontanelle 2
2. Abdominal tergites each with 4 long bristles..... *tetraphilus*
- Abdominal tergites each with several long bristles 3
3. Smaller species. Head-length to base of mandibles 2.30 – 2.50, max. width of head 1.30 – 1.45 mm. Labrum incurved at anterior margin..... *dunensis*
- Larger species. Head-length to base of mandibles 2.66 – 3.00, max. width of head 1.47 – 1.60 mm. Labrum somewhat convex at anterior margin *durga*

Genus *Pseudocapritermes* Kemner

Only two species of the genus *Pseudocapritermes* including a new one described here, are known from North-eastern India.

Key to the species

Soldiers

1. Head smaller and wider in comparison to length (head-length to base of mandibles 1.87 – 2.00 and width 1.35 – 1.40 mm; index width/length 0.70 – 0.722). Left mandible with sharper and more incurved tip *karticki*
- Head larger and narrower in comparison to length (head-length 2.00 – 2.50 and width 1.23 – 1.36 mm; index width/length 0.53 – 0.63). Left mandible with less sharp, and weakly incurved tip *tikadari*

Subfamily (iii) MACROTERMITINAE

Genus *Macrotermes* Holmgren

From North-eastern India four species of this genus are recorded here. The imago caste of none of these species is known. The keys to the soldiers major and minor are provided here.

Key to the species

Soldiers Major

1. Larger forms : Head-length to base of mandibles more than 4 mm, max. head-width more than 3.00 mm 2
- Smaller forms : Head-length to base of mandibles less than 4.0 mm, max. head-width less than 3.00 mm 3
2. Smaller species : Head-length to base of mandibles 2.75 – 3.10, max. head-width 2.30 – 2.40, max. width of pronotum 1.48 – 1.65 mm. Labrum bluntly tipped. 3rd segment of antenna only a little longer than 2nd..... *aleemi*
- Larger species : Head-length 3.60 – 3.90, max. head-width 2.90 – 3.00, max. width of pronotum 1.83 – 2.03 mm. Labrum pointedly tipped. 3rd segment of antenna much longer than 2nd *khajuriai*
3. Larger species : Head-length to base of mandibles 4.78 – 5.05, max. width of head 3.84 – 4.36 mm. Head sides straighter, weakly converging in front..... *annandalei*
- Smaller species : Head – length to base of mandibles 4.30 – 4.86, max. width of head 3.53 – 3.96 mm. Head sides convex and fairly strongly converging in front*serrulatus hopini*

Soldiers minor

1. Smaller forms : Head-length to base of mandibles generally less than 2 mm, max. head-width also less than 2 mm2
- Larger forms : Head-length to base of mandibles more than 2 mm, max. head-width also more than 2 mm3
2. Labrum tip broadly rounded and short *aleemi*
- Labrum tip pointed and long *khajuriai*
3. Larger species and sides of head straighter. Head length to base of mandibles 2.96 – 3.12, max. width of head 2.34 – 2.6 mm *annandalei*
- Smaller species and sides of head convex and more convergent in front. Head length to base of mandibles 2.40 – 2.60, max. width of head 2.05 – 2.10 mm. *serrulatus hopini*

Genus *Odontotermes* Holmgren

The genus *Odontotermes* is the best represented genus in the region and is known by 13 species including 3 new species.

Key to the species

Imagoes

1. Smaller species : Head-width with eyes less than 2.40 mm2
- Larger species : Head-width with eyes more than 2.40 mm4
2. Ocelli larger (long diameter 0.25–0.29, short diameter 0.16 – 0.20 mm), separated from eyes by their short diameter; postclypeus–length about half of its width. *horai*
- Ocelli smaller (long diameter 0.21 – 0.25, short diameter 0.20 mm) and separated from eyes by their long diameter or more; postclypeus–length less than half of its width3
3. Darker (fuscous) and smaller species (head-width with eyes 2.20 – 2.35, pronotum-length 1.05 – 1.15, pronotum-width 2.00 – 2.25, forewing-length 20.00 – 22.50 mm) *assmuthi*
- Paler (reddish brown) and larger species (head-width 2.30 – 2.40, pronotum-length 1.20 – 1.25, pronotum- width 2.13 – 2.15, forewing-length 23.00 – 24.00 mm) *giriensis*
4. Ocelli smaller and separated from eyes by more than their long diameter (long diameter of ocellus 0.20 – 0.27, short diameter 0.15 – 0.20, and eye – ocellus distance 0.23 – 0.30 mm)5
- Ocelli larger and separated from eyes by less than, to equal to their short diameter (long diameter 0.30 – 0.38, short diameter 0.81 – 0.30 mm)6

5. Smaller species (head-width with eyes 2.42 – 2.47 mm) and eyes smaller (diameter 0.54 – 0.55 mm) *proformosanus*
 — Larger species (head-width with eyes 2.50 – 2.80 mm) and eyes larger (diameter 0.58 – 0.65 mm) *parvidens*
6. Smaller (head-width with eyes 2.40 – 2.70 mm); ocelli wider and separated from eyes by less than their short diameter (short diameter 0.23 – 0.30, eye-ocellus distance 0.15 – 0.20 mm) *obesus*
 — Larger (head-width with eyes 2.65 – 2.90 mm); ocelli narrower and separated from eyes by about their short diameter (short diameter 0.18 – 0.26, eye-ocellus distance 0.18 – 0.26 mm) *feae*

Soldiers

1. Tooth of left mandible situated in distal half, from about distal third to further in front 2
 — Tooth of left mandible situated at middle or below middle 10
2. Antennae uniformly coloured or very faintly darker distally 3
 — Antennae getting darker distally distinctly 6
3. Head-capsule subrectangular, sides sub-parallel. Postmentum flat, subrectangular *assmuthi*
 Head capsule oval, sides convex. Postmentum swollen, sides convex 4
4. Larger species. Head-length to base of mandibles 1.78 – 1.87, max. head-width 1.55 – 1.65 mm. Antenna 17-segmented *ganpati* n. sp.
 — Smaller species. Head-length to base of mandibles 1.05 – 1.31, max. head-width 0.91 – 1.22 mm. Antenna 15 – 16 segmented 5
5. Head oval, widest in middle. Postmentum strongly bulging and only slightly longer than its width. Mandibles thinner and straighter and roundly incurved posteriorly at outer margin *proformosanus*
 Head subrectangularly oval, widest behind middle. Postmentum less so bulging and length appreciably more than its width. Mandibles stronger and more curved apically and sharply incurved posteriorly at outer margin *adampurensis*
6. Left mandibular tooth situated at about distal third (index tooth-distance/mandible-length 0.30 – 0.40) 7
 Left mandibular tooth situated anterior to distal third (index tooth-distance/mandible-length 0.21 – 0.27) 8

7. Head broadly oval (length to base of mandibles 1.50 – 1.75, max. width 1.40–1.60 mm). Mandibles comparative to head-length shorter, index mandible-length/head-length 0.53–0.62. Postmentum much wider and swollen (length 0.80 – 1.00, width 0.70 – 0.80 mm) *paralatigula*
- Head not broadly oval (length to base of mandibles 1.20 –1.67, max. width 1.10 – 1.38 mm). Mandibles comparative to head-length longer, index mandible-length/head-length 0.59 – 0.72. Postmentum less wide and swollen (length 0.74 – 0.96, width 0.45 – 0.58 mm) *obesus*
8. Head broadly oval. Head-length to base of mandibles 1.38 – 1.58, max. width of head 1.33 – 1.38 mm. Mandibles comparative to head shorter (index mandible-length/head-length 0.51–0.52)..... *kapuri*
- Head not broadly oval, head-length to base of mandibles 1.18 – 1.40, max. width of head 1.00 – 1.20 mm Mandibles comparative to head longer (index mandible-length / head-length 0.56 – 0.60).....9
9. Generally smaller species : Head-length to base of mandibles 1.18 – 1.35, max. width of head 1.00 – 1.20 mm. Tooth of left mandible more forwardly placed (index tooth-distance/mandible-length 0.21 – 0.26). Postmentum not very wide (length 0.70 – 0.83, width 0.50 – 0.60 mm) *giriensis*
- Generally larger species : Head-length to base of mandibles 1.28 – 1.40, max. width of head 1.13 – 1.15 mm. Tooth of left mandible less so forwardly placed (index tooth-distance/mandible-length 0.25 – 0.27). Postmentum very wide (length 0.75 – 0.87, width 0.55–0.63 mm)..... *prolatigula* n. sp.
10. Tooth of left mandible large, prominent and situated at about middle of mandible.... 11
- Tooth of left mandible small, rudimentary and situated in basal third 12
11. Larger species : Head-length to base of mandibles 2.25 – 3.10, max., width of head 1.80 – 2.50 mm. Head sides, narrowed anteriorly. Tooth of left mandible somewhat forwardly placed (index tooth-distance / mandible-length 0.50 – 0.55) *feae*
- Smaller species : Head-length to base of mandibles 2.00 – 2.15, max. width of head 1.53 – 1.70 mm. Head sides substraight. Tooth of left mandible somewhat posteriorly placed (index tooth-distance/mandible-length 0.566 – 0.58 *singsiti* n. sp.
12. Larger species : Head-length to base of mandibles 1.86 – 2.70, max. width of head 1.45 – 2.15 mm. Sides of head converging in front. Antennae 16 – 17 segmented. *parvidens*
- Smaller species : Head-length to base of mandibles 1.65 – 2.00, max. width of head 1.28 – 1.65 mm. Sides of head subparallel. Antennae 15 – 16. segmented. *horai*

Genus *Microtermes* Wasmann

Only two species of the genus *Microtermes* are known from North-eastern India.

Key to the species

Imagoes

1. Larger species : Head-length to base of mandibles 1.05 – 1.10, head-width with eyes 1.45 – 1.53 and long diameter of eye 0.44 – 0.45 mm; eye-ocellus distance less (0.03 – 0.035 mm); fontanelle fairly large *imphalensis*
- Smaller species : Head-length to base of mandibles 0.92 – 1.04, head-width with eyes 1.31 – 1.38 and long diameter of eye 0.36 – 0.40 mm; eye-ocellus distance more (0.05 – 0.07 mm); fontanelle small *obesi*

Soldiers

1. Head strongly convergent anteriorly; labrum elongately tongue shaped, tip of labrum very faintly lanceolate *imphalensis*
- Head oval, weakly converging anteriorly; labrum strongly lanceolate *obesi*

Subfamily (iv) NASUTITERMITINAE

Genus *Nasutitermes* Banks

Nine species of the genus *Nasutitermes* are known from North-eastern India. Of these, two new to science are described here.

Key to the species

Imagoes

The imago caste of only four species are known and are differentiated as follows :—

1. Larger species : Head-width with eyes more than 1.50 mm, pronotum-width more than 1.20 mm 2
- Smaller species : Head-width less than 1.40 mm pronotum-width less than 1.00..... 3
2. Eyes smaller (max. diameter 0.40 – 0.43 mm) and ocellus well separated from eye (eye-ocellus distance 0.10 mm). Pronotum larger (length 0.83 – 0.84, max. width 1.35–1.43 mm *gardneri*
- Eyes larger (max. diameter 0.57 – 0.62 mm) and ocellus very close to eye (eye-ocellus distance 0.02 – 0.05 mm). Pronotum smaller (length 0.70 – 0.76, max. width 1.22–1.32 mm)..... *matangensiformis*

3. Smaller and darker (dark brown) species. Head-width with eyes 1.10 – 1.18 mm. Eyes smaller, max. diameter 0.30 – 0.35 mm; ocellus smaller (0.13 x 0.10 mm) and separated from eye by 1/2 short diameter *chhotanii*
- Larger and paler (brown with reddish tinge) species. Head-width with eyes 1.21 – 1.37 mm. Eyes larger, max. diameter 0.42–0.50 mm; ocellus larger (0.17 – 0.18 x 0.13 – 0.14 mm) and separated from eye by 1/4 short diameter4
4. Head a little larger (length to tip of labrum 1.4 – 1.67, to base of mandibles 1.00 – 1.10, width with eyes 1.23 – 1.37 mm). Y-suture distinct. Antennae 15 segmented, segment 5 shortest *garoensis*
- Head a little smaller (length to tip of labrum 1.36 – 1.44, to base of mandibles 0.92 – 0.98, width with eyes 1.21 – 1.27 mm). Y-suture slightly indicated, lateral arms not distinct. Antennae 14 segmented, segment 3 shortest *emersoni*

Soldiers

1. Mandibles without any lateral spine-like process2
- mandibles with lateral spine-like process5
2. Rostrum conical and thick. Head sub-circular. 3rd segment of antennae subequal to 2nd or shorter3
- Rostrum cylindrical, narrow and slender. Head pyriform. 3rd segment of antennae longer than 2nd4
3. Larger species : Head-length with rostrum 1.70 – 1.80; without rostrum 0.98 – 1.05; width 0.98 – 1.08 mm. Rostrum thicker *tandoni* n. sp.
- Smaller species : Head-length with rostrum 1.58 – 1.70, without rostrum 0.90 – 1.03; width 0.95 – 1.02 mm. Rostrum thinner *chhotanii* n. sp.
4. Monomorphic. Head wider, head-width almost equal to length without rostrum, index width/length 0.96 – 1.08. Antennae 13-segmented. Head with a pair of long hairs at vertex and a pair at base of rostrum *gardneri*
- Dimorphic. Head narrower, head-width less than length without rostrum, index width/length 0.86 – 0.97. Antennae 12–14 segmented. Head with a single pair of long hairs at vertex *cherraensis*
5. Head subcircular, width equal to or more than length without rostrum
..... *matangensiformis*
- Head pyriform, width less than length without rostrum6
6. Smaller species : Head-length with rostrum less than 1.50, length without rostrum and width less than 0.90 mm7

- Larger species : Head-length with rostrum more than 1.50 and length without rostrum and width generally more than 0.90 mm..... 8
- 7. Head with rostrum 1.30 – 1.36, without rostrum 0.80 – 0.83 and width 0.73 – 0.77 mm. Head without any projection at base of rostrum. Antennae with 11–12 segments..... *kali*
- Head with rostrum 1.40 – 1.60, without rostrum 0.85 – 1.0 and width 0.85 – 1.03 mm. Head with very minute projection at base of rostrum. Antennae with 12 segments
.....*jalpaigurensis*
- 8. Antennae 13-segmented. Head-length with rostrum 1.67 – 1.73, without rostrum 1.00 – 1.05, width 0.96 – 1.00 mm. *moratus*
- Antennae 12-segmented. Head-length with rostrum 1.50 – 1.70, without rostrum 0.87 – 1.05, width 0.87 – 1.05 mm 9
- 9. Head-capsule faintly invaginated at posterior margin. Size smaller. head-length with rostrum 1.50 – 1.60, without rostrum 0.87 – 0.93, width 0.87 – 0.93 mm *garoensis*
- Head capsule straight at posterior margin. Size larger. Head-length with rostrum 1.55–1.70, without rostrum 0.98 – 1.05, width 0.95 – 1.05 mm*emersoni*

Genus *Bulbitermes* Emerson

Only two species of genus *Bulbitermes* are reported from North-eastern India. The imago of only one is known therefore the soldiers of the two species viz. *emersoni* Maiti and *parapusillus* Ahmad are keyed as follows :-

Key to the species

- 1. Head broadly violin shaped; constriction behind antennae fairly marked; mandibles without points or apical processes *emersoni* Maiti
- Head elongately oval; constriction behind antennae very slight; mandibles with distinct apical processes..... *parapusillus* Ahmad

D. Studies on Termite Collections from North-eastern India

Family I : KALOTERMITIDAE

Genus 1. *Neotermes* Holmgren

1. *Neotermes* sp. 1

Material : Pseudoworkers only, Monai River Bank, Kameng Dist., K. C. Jayaramakrishnan, 6. iii. 1961.

Distribution : INDIA : North-eastern India : Arunachal Pradesh : As above under "Material"

2. *Neotermes* sp. 2

Material : Nymphs and pseudoworkers, Lake Ganga, Itanagar, Lower Subansiri Dist., O B. Chhotani, 15. v. 1989, ex "log of wood"

Distribution : INDIA : North-eastern India : Arunachal Pradesh : As above under "Material"

Remarks on Neotermes sp. 1 and sp 2.

The soldiers were not available in both the species of the wood destroying genus *Neotermes*, reported here, so the identification upto specific level was not possible. Also, the pseudoworkers are different from the other already known two species (i.e. *Neotermes megaoculatus lakhimpuri* and *N. paratensis*) from this region, and so could not be placed under either of them.

Genus 2. *Glyptotermes* Froggatt

3. *Glyptotermes taruni* *n. sp.

Material : A vial with one S. and Sev Pw., near Lichi, 23 km from Yazali, Lower Subansiri Dist., Arunachal Pradesh, T. K. Pal and Party, 16. ix. 1988.

Description : IMAGO : Unknown.

SOLDIER (Fig. 9) : Head yellowish brown, darker anteriorly; antennae brownish yellow; mandibles dark brown, somewhat paler basally; labrum pale brown; pronotum dirty brown; leg with femur creamish brown and tibia paler; mesonotum, metanotum and abdominal tergites creamish brown, shiny, the former two somewhat darker, last abdominal tergite and sternite pale brownish; seventh sternite somewhat paler, the remaining sternites creamish yellow. Head and body sparsely hairy; last few abdominal tergites and sternites more hairy. Total body-length 8.40 mm. Head-capsule subrectangular, longer than wide, length a little more than 1.5 times that of width; sides substraight; posterior margin rounded; frons sharply inclined in front and depressed medially giving a bilobed impression; Y-suture present. Eye-spots present, subcircular, 0.15 mm in diameter, translucent. Ocelli minute, whitish, dot-like. Antennae with 14 segments, segment 3 ring-like, shortest; 4 onwards gradually increasing in length, becoming broad and pyriform; last segment narrow, ovate. Clypeus subtrapezoidal, faintly differentiated from frons; divided into an ante- and a postclypeus. Postclypeus of same colour as frons, with a few hairs; anteclypeus pale brownish, paler than postclypeus, apilose. Labrum subsquarish with long hairs near tip and few short ones on body. Mandibles short, thick, stout, weakly incurved at tips; with a few minute hairs on basal portion; outer margin faintly incurved behind middle; left mandible with 3 marginal teeth and right with 2, as shown in figure, Postmentum long, club shaped; with a narrow, long waist; sides in front of maximum width slightly incurved; minimum width less than half maximum width; contraction index 0.42. Pronotum subrectangular; slightly narrower than head, length a little more than half of width; anterior margin broadly incurved, without notch; posterior margin weakly invaginated medially. Meso- and metanotum with small pleural processes. Legs short, stout; apical tibial spurs 3 : 3 : 3; tarsi 4 jointed. Abdomen elongate, subcylindrical, a little narrowing near distal end; cerci 2-jointed, hairy, 0.15 mm long; styli short, single jointed, 0.1 mm long, finger like.

* Named after Dr. Tarun K. Pal, the collector.

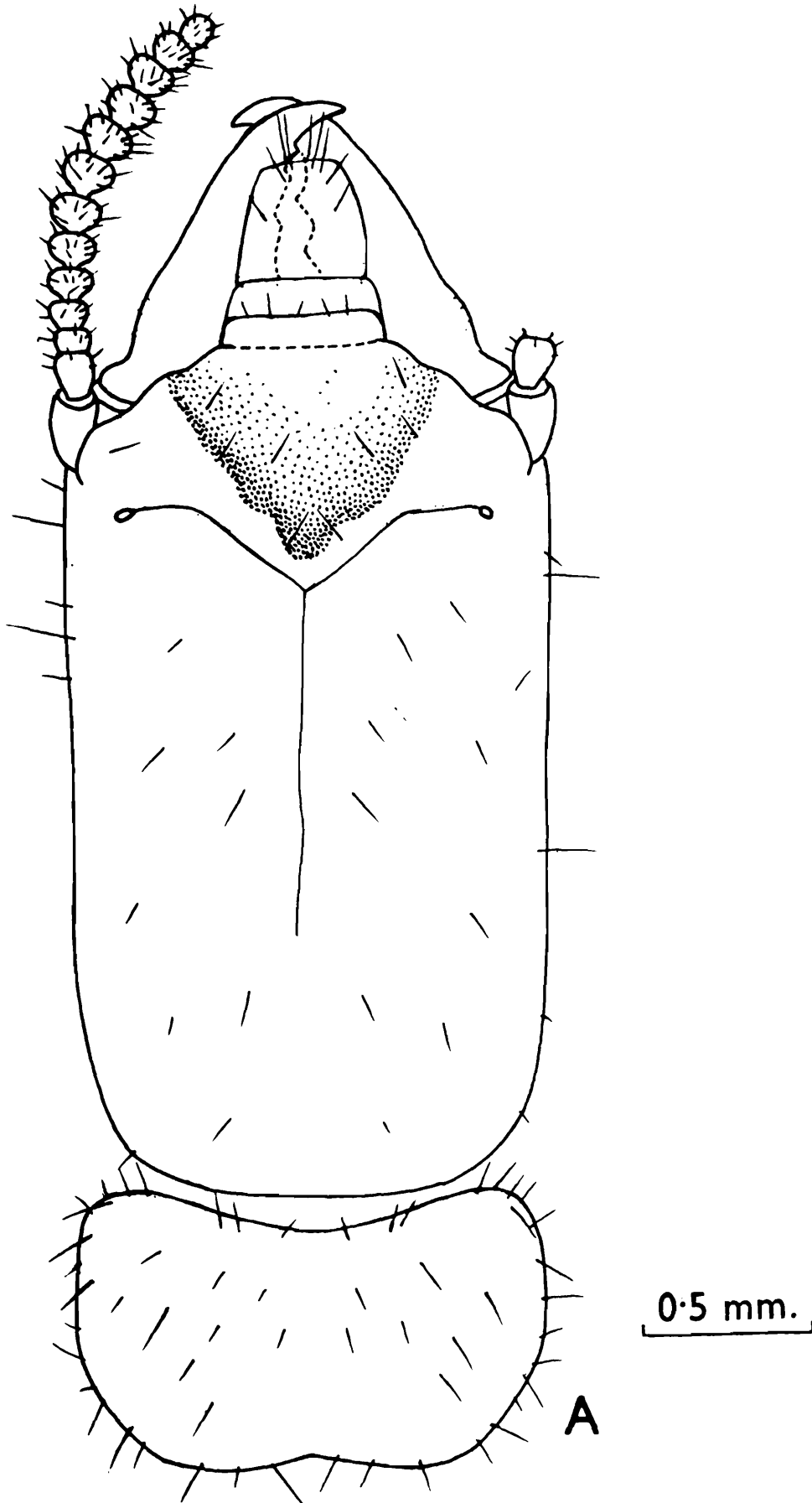


Fig. 9 *Glyptotermes taruni* n. sp. Holotype soldier. A. Head and pronotum, dorsal view.

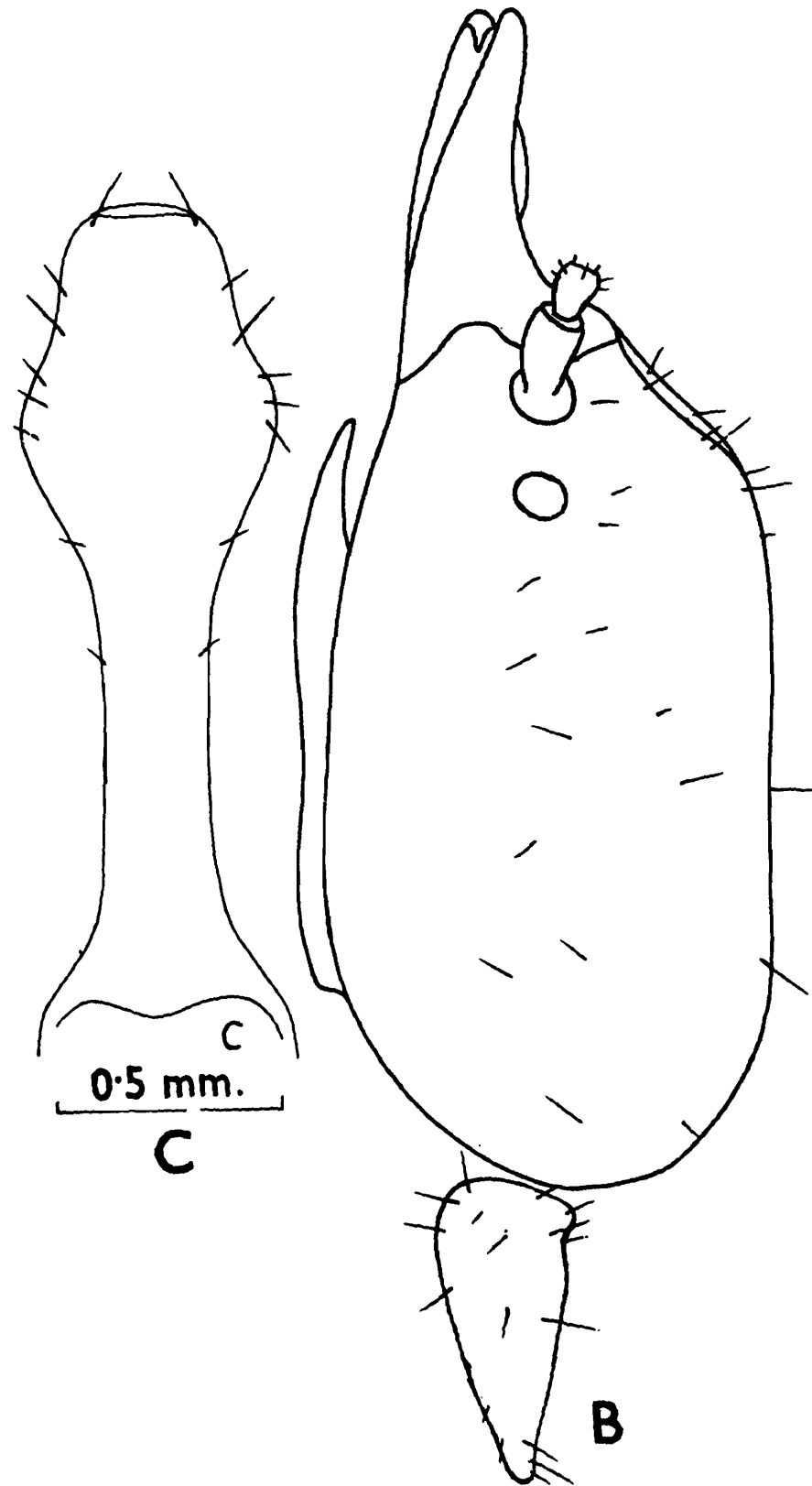


Fig 9. B. Ditto, side view. C. Postmentum.

<i>Measurements (in mm), etc :</i>	Holotype
Total body-length c	8.40
Length of head with mandibles	3.20
Length of head to base of mandibles	2.25
Max. width of head	1.48
Height of head	1.23
Head-index (width/length to base of mandibles)	0.657
Diameter of eye-spots	0.15
Length of mandibles : Left	1.00
Right	1.00
Length of labrum	0.33
Width of labrum	0.38
Length of postmentum	1.78
Max. width of postmentum	0.55
Width of postmentum at waist	0.23
Postmentum contraction index	0.42
Length of pronotum	0.83
Max. width of pronotum	1.40

PSEUDOWORKER : Head creamish yellow, a little paler in front; antennae and legs creamish white; pronotum and abdomen a little paler than head. Head and body fairly pilose. Total body-length c 6.3 – 7.5 mm. Head subcircular, a little wider than length to base of mandibles (length to tip of labrum 1.45 – 1.60, length to base of mandibles 1.2 – 1.30, maximum width 1.25 – 1.40 mm); Y-suture absent. Eyes small, suboval, long diameter 0.175 – 0.20, short diameter 0.125 – 0.17 mm; slightly pigmented in larger specimens. Antennae with 12 – 13 segments; segments 3 and 4 short, ring-like; remaining short, broader than long and becoming broadly pyriform; last segment short, ovate. Clypeus trapezoidal, weakly demarcated into a light brown, weakly pilose postclypeus and an apilose, translucent anteclypeus. Labrum dome-shaped, broader than long (length 0.25 – 0.30, width 0.40 – 0.50 mm); hairy near anterior margin and with a few short hairs on body. Mandibles of *Glyptotermes*-type. Pronotum almost as wide as head, width 1.25 – 1.40, length 0.75 – 0.80 mm; similar to soldier pronotum but with narrower anterior angles and sides somewhat more narrowed behind. Legs as in soldier but shorter. Abdomen elongate, cylindrical; cerci and styli as in soldier.

Type-specimens : Holotype soldier (Z. S. I. Regn. No.) in a vial and sev. paratype pseudoworkers (ZSI Regn. No.) in a separate vial in National Zoological Collections, ZSI, Calcutta.

Type-locality and distribution : Near Lichi, Lower Subansiri Dist., Arunachal Pradesh, Known only from the type-locality.

Affinities : The soldier of this new species is close to that of *G. tikaderi*, but is separable for its smaller size, shorter mandibles in comparison to head-length and differently shaped pronotum and postmentum.

4. *Glyptotermes tikaderi* Chhotani and Bose

1985. *Glyptotermes tikaderi* Chhotani and Bose, *Rec. zool. Surv. India*, **82** : 53–56.

1989. *Glyptotermes tikaderi*; Roonwal and Chhotani, *Fauna of India Isoptera*, Vol. 1 : 318–320.

Material : S. and Pw., Miao, Tirap Dist., Arunachal Pradesh, *S. Biswas*, 30. xi. 1982.

Measurements (in mm), etc : Soldier (2 ex.) :

Total body-length c	8.30	–	9.20
Length of head to base of mandibles	3.00	–	3.25
Max. width of head	1.85	–	1.90
Length of mandibles :			
Left	1.33	–	1.35
Right	1.30	–	1.45
Max. diameter of eye	0.28	–	0.30
Length of pronotum	1.00	–	1.10
Max. width of pronotum	1.75	–	1.78

Distribution : INDIA : North-eastern India : Arunachal Pradesh (Tirap Dist., Miao, type-locality). Known only from the type - locality.

Family II : RHINOTERMITIDAE

Sub-family (i) Coptotermitinae

Genus 3. *Coptotermes* Wasmann

5. *Coptotermes gestroi* Wasmann

1896. *Termes (Coptotermes) gestroi* Wasmann, *Ann. Mus. Civ. Stor. Nat. Genoa*, (2) **16** : 628 – 629.

1962. *Coptotermes gestroi*; Roonwal & Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 306, 307, 393.

1965. *Coptotermes gestroi*; Mathur & Thapa, *Bull. Ent.*, No. **6** : 3.

1989. *Coptotermes gestroi*; Roonwal & Chhotani, *Fauna of India : Isoptera (Termites)*, Vol. 1 : 422, 445 – 449.

Material : S. and W. Assam : Kaziranga (stn. No. 1, 100 m), *S. K. Tandon*, 20. ii. 1969;

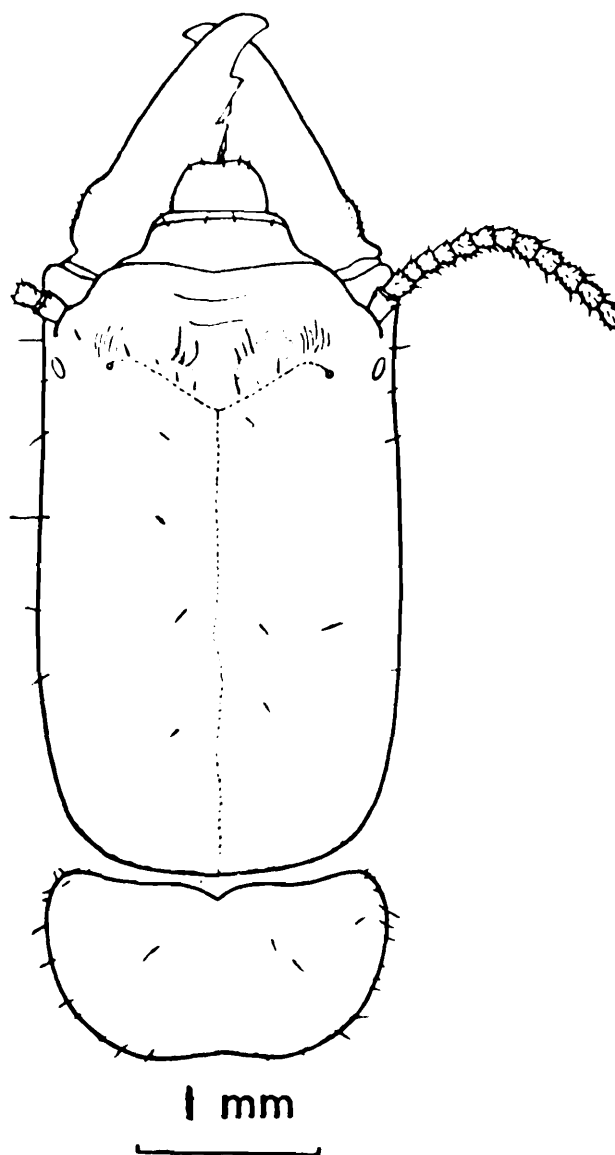


Fig. 10 *Glyptotermes tikaderi* Chhotani and Bose. Soldier. Head and pronotum in dorsal view (After Chhotani and Bose 1985).

Rangamati, Kaziranga, *M. Datta*, 20. xii. 1974. *Arunachal Pradesh* : Near Chakma village (Daphabum Expdtn.) (Stn. No. 4, 800 ft), *J. M. Julka*, 25. xi. 1969; Sille, *P. T. Bhutia*, 22. xi. 1988 (2 vials); Nambang, 7 km. from Bolang, *T. K. Pal*, 23. ii. 1989; Dibru, 15 km off Seijusa, *D. P. Sanyal*, 12. x 1987; Zoological Garden, Itanagar (Stn. No. 3), *O. B. Chhotani* (07/12.5.89), 12. v. 1989. ex "a stump of wood"; Itanagar, 16. v. 85 (?); Bhalukpong, Tippi (213 m), *A. N. T. Joseph*. 3. v. 1966.

Measurements (in mm) etc : Soldier (5 exs) :

Total body-length	4.78 – 4.90
Length of head to base of mandibles	1.35 – 1.43
Maximum width of head	1.10 – 1.13
Length of pronotum	0.43 – 0.45
Maximum width of pronotum	0.83 – 0.85
No. of antennal segments	14

Distribution : INDIA : North-eastern India : Assam : Kaziranga, Dibrugarh, Jaipur Range. Arunachal Pradesh ; As above under Material. Elsewhere : BURMA : Bhamo (North Burma), type-locality.

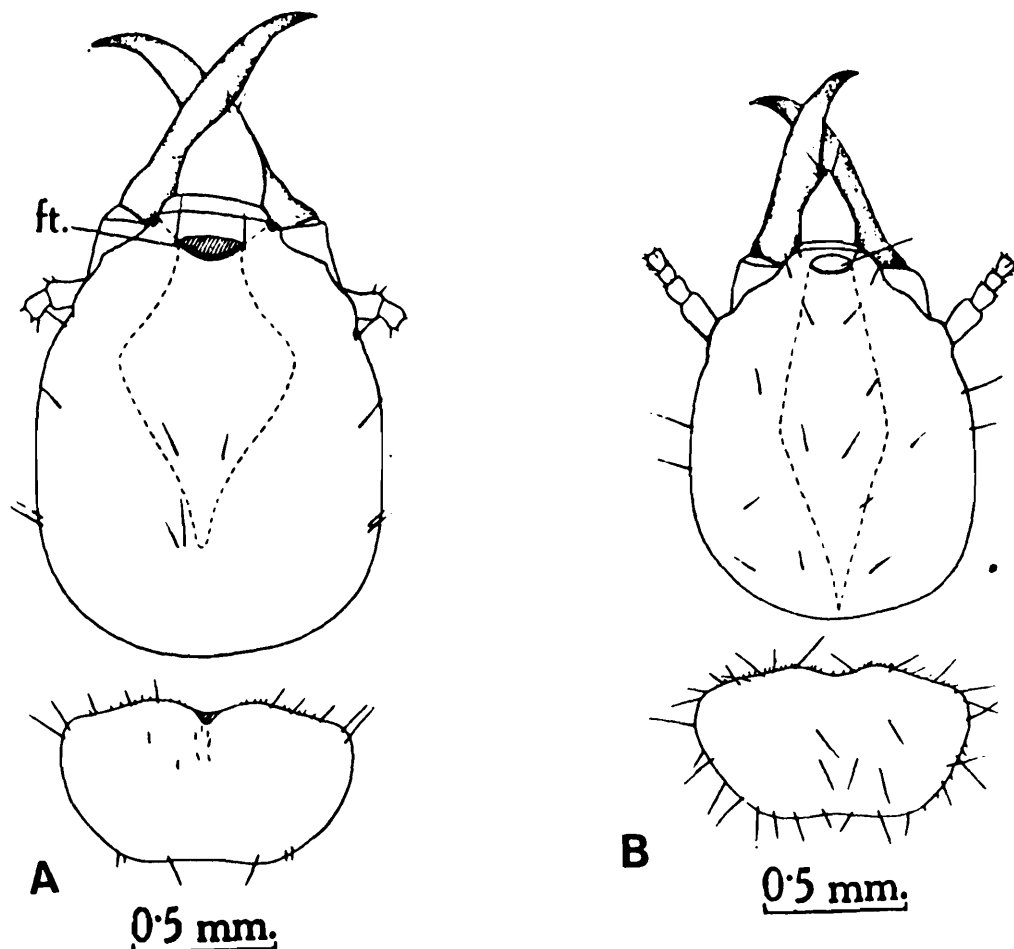


Fig. 11 (A) *Coptotermes gestroi* (Wasmann). Soldier. Head and pronotum, in dorsal view. (B) *Coptotermes heimi* (Wasmann). Soldier. Head and pronotum, in dorsal view.

6. *Coptotermes heimi* (Wasmann)

1902. *Arrhinotermes heimi* Wasmann, *Zool. Jb. (Syst.)*, 17(1) : 104; Pl. 4 (Fig. 1, a-f).
 1962. *Coptotermes heimi*; Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4); 295, 308 – 309, 393.
 1977. *Coptotermes heimi*; Lahiri, Ghosh & Biswas, *Bull. Megh. Sci. Soc.*, 2 : 36.
 1985. *Coptotermes heimi*; Chhotani & Bose. *Rec. zool. Surv. India*, 82 : 57.
 1989. *Coptotermes heimi*; Roonwal & Chhotani, *Fauna of India Isoptera (Termites)* Vol. 1 : 421, 422, 449–457.

Material : S. and W. Assam : Lakhimpur (Stn. No. 1) O. B. Chhotani (02/11.5.89), 11. v. 1989, ex “nest in log of wood” Arunachal Pradesh : Likhali (Stn. No. 5), S. K. Tandon, 6. x. 1966, Siji, S. K. Gupta and M. Prasad, 15. x 1981, ex. “leaf litter” (mixed with *O. parvidens*); Nirjuli, P. T. Bhutia, 3. vi. 1987; Pinjuli (Stn. No. 8), A.N.T. Joseph, 4. v. 1966; Bhairavkonda, K. C. Jayaramakrishnan, 20. v. 1976; Deban, 27 km from Miao, S. Biswas, 7.

iv. 1981. *Nagaland* : Dimapur (Circuit House), *G. Bose*, 3. vi. 1990, ex wood (2 vials). *Tripura*: Ambasa Forest, North Tripura, *V. C. Agarwal* and *R. K. Kacker*, Jan. 1973; Garjee, South Tripura, *G. K. Srivastava*, 23. ii. 1991, ex under bark of log.

Measurements (in mm) etc : Soldier (10 exs) :

Total body-length	5.20	–	5.73
Length of head to base of mandibles	1.38	–	1.40
Maximum width of head	1.15	–	1.18
Length of pronotum	0.48	–	0.50
Maximum width of pronotum	0.78	–	0.83
No. of antennal segments	14		

Distribution : INDIA : *North-eastern India* : Assam : Gauhati; North Lakhimpur. *Arunachal Pradesh, Nagaland* and *Tripura* : As under “Material” above. Also all over Indian subcontinent, for details Roonwal and Chhotani 1962. Introduced to OMAN (Chhotani 1988).

Sub-family (ii) : HETEROTERMITINAE

Genus 4. *Reticulitermes* Holmgren

7. *Reticulitermes assamensis* Gardner

1945. *Reticulitermes assamensis* Gardner, *Indian J. Ent.*, 6 : 105–106.
 1949. *Reticulitermes chinensis*; Snyder, *Smiths. misc. Colls.*, 112 : 71 (Part)
 1962. *Reticulitermes chinensis*; Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 301–302 (wrong determination).
 1997. *Reticulitermes chinensis*; Lahiri, Ghosh and Biswas, *Bull. Megh. Sci. Soc.*, 2 : 35 (wrong determination).
 1977. *Reticulitermes assamensis*; Roonwal and Chhotani, *Ent. Basil.*, 2 : 46–48.
 1977. *Reticulitermes assamensis*; Thakur, *J. Bombay nat. Hist. Soc.*, 74 (1) : 191–195.
 1989. *Reticulitermes assamensis*; *Fauna of India : Isoptera (Termites)*, Vol. 1 : 497, 498–501.

Material : Im., S. and W. Meghalaya : Mawphlong, *S. Biswas*, 5.10. 1963; Mawphlong, *G. Bose*, 9. vi. 1990 (17 vials) Cherrapunji, *G. Bose*, 11. vi. 1990; Shillong, *R. Zoramthanga*, 26. vi. 1974; Pynursula, *B. K. Tikader*, 18. i. 1966. *Arunachal Pradesh* : Lower Siggon Village (6600 ft), *K. C. Jayaramakrishnan*, 4. v. 1961, “below bark of tree and dead log of wood; ditto, Rupa (5100 ft), 2. v. 1961, ex “rotten piece of wood”; ditto, Bhairavkonda (900 ft), 20. v. 1961; Shaitan Bridge (Stn. No. 4 alt. 1524 m.), *A.N.T. Joseph* 23. vi. 1966; 4 miles North of Chug village on Chug river, tributary of Digin River (2430 m.), *S. Biswas*, 28. vii. 1961; Dulla Tapi (Stn. 25,500 m.), *S. K. Tandon & G. S. Arora*, 22 x 1966; Dofe, 21 km from Ziro to Along, *T. K. Pal & Party*, 6. iii. 1989; Itanagar (Stn. No. 2), *O. B. Chhotani* (01/12.5.89), 12. v. 1989,

ex. "damp log of wood"; Lake Ganga, Itanagar, *O. B. Chhotani*, 13- and 15. v. 1989. ex. "logs of wood"; Natural Forest 1 km. from Lake Ganga, Itanagar, *O. B. Chhotani* (05/3.5.89), 13. v. 1989, ex. "dead stump of wood lying on ground"; Road side on Kimin-Zero Road, *O. B. Chhotani*, 16. v. 1989, ex. log of wood (4 dealate Im.); Ditto, S. W.

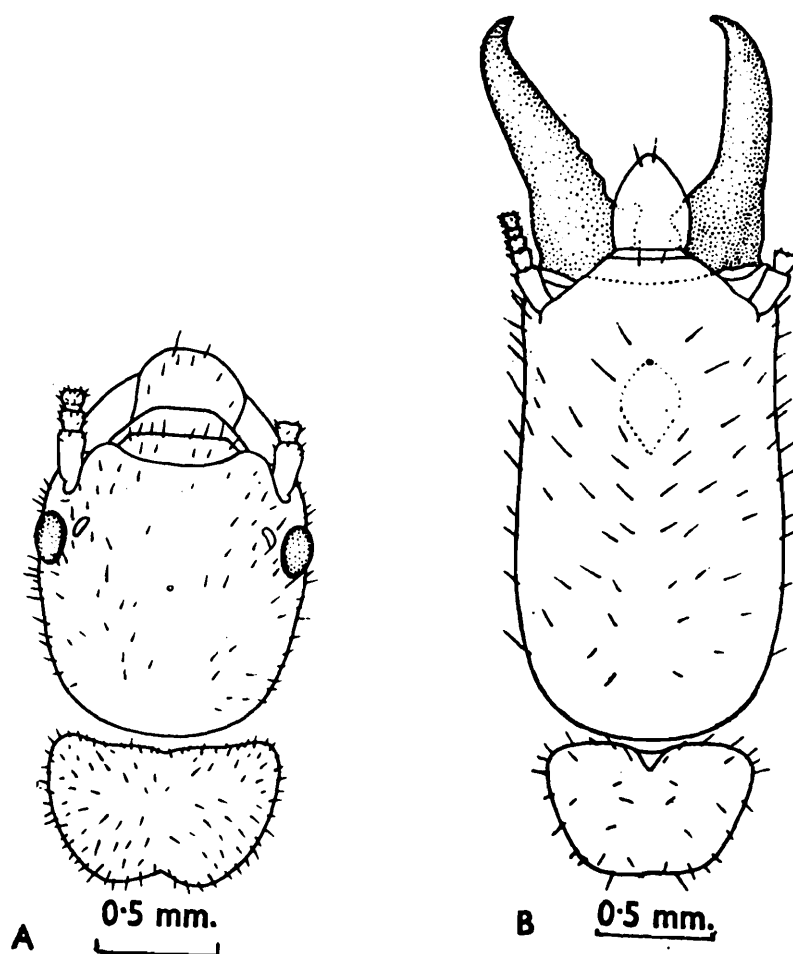


Fig. 12 *Reticulitermes assamensis* Gardner (A) Imago. Head and pronotum in dorsal view. (B) Soldier. Ditto (Paralectotype). (A) After Roonwal and Chhotani 1977. (B) After Chhotani and Das 1983.

Measurements (in mm) etc : Soldier (10 exs) :

Total body-length	5.25 – 6.30
Length of head to base of mandibles	1.72 – 2.30
Maximum width of head	1.06 – 1.25
Maximum length of pronotum	0.40 – 0.60
Width of pronotum	0.75 – 0.95

Distribution : INDIA : North-eastern India : Assam : Lakhimpur district (Sadiya, type-locality) Meghalaya : Khasi and Jaintia Hills Dist and as in "Material" above. Arunachal Pradesh : Lower Subanbsiri (Itanagar, Lake Ganga; East Kameng (Lower Siggong village, Rupa, Bhairvkonda, Shaitan Bridge), West Kameng (Chug village), East Siang (Dulla Tapi), West Siang (Dofe) and Tirap (Namdapha) districts. Also West Bengal and Sikkim States. Elsewhere : BHUTAN : (Sampa Kothoka).

8. *Reticulitermes chinensis* Snyder

1923. *Reticulitermes chinensis* Snyder, *J. Wash. Acad. Sci.*, **13** : 107 – 109.
 1949. *Reticulitermes chinensis*; Snyder, *Smiths, misc. Colls.* **112**: 71 (Part).
 1962. *Reticulitermes chinensis*; Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28**(9): 301–303 (Part).
 1989. *Reticulitermes chinensis*; Roonwal and Chhotani, *Fauna of India: Isoptera (Termites)*, Vol. 1 : 497, 501–505.

Material : S. and W. Arunachal Pradesh : Kalaktung (St. No. 17, 4500 ft), K. C. Jayaramakrishnan, 17. iii. 1961; Bomdilla Road (St. No. 12, 6500 ft), S. K. Tandon, 18. iii. 1973 (2 vials); Charduar Forest (125 m), S. K. Tandon, 24. iii. 1973. Assam : Shantipur, S. K. Tandon.

Measurements (in mm), etc : Soldier (10 exs) :

Total body-length	5.80 – 7.00
Length of head to base of mandibles	1.80 – 2.22
Maximum width of head	1.05 – 1.30
Length of pronotum	0.50 – 0.54
Maximum width of pronotum	0.80 – 0.93

Distribution : INDIA : North-eastern India : Assam (Shantipur). Arunachal Pradesh : West Kameng district (Kalaktung, Bomdilla Road, Charduar Forest, Rupa, Siggon village). Elsewhere CHINA: Widely distributed, vide Hsia and Fan 1968, for details.

9. *Reticulitermes ganga* n. sp.

Material : A vial with a soldier and a worker, Lake Ganga, Itanagar, Lower Subansiri Dist., Arunachal Pradesh, O. B. Chhotani, 15. v. 1989, ex. "a log of wood"

Distribution : IMAGO : Unknown.

SOLDIER (Fig. 14) : Head-capsule pale yellow; antennae somewhat paler; labrum transparent yellowish brown; mandibles reddish brown, basally reddish yellow; legs and body creamish. Head fairly and body densely hairy. Total body length 5.10 mm. Head rectangularly oval, sides weakly convex; maximum width in middle whence weakly converging anteriorly and posteriorly; posterior margin rounded. Frons sloping anteriorly at an angle of 45°; frontal region medially depressed forming a weak protuberance on either side at base. Fontanelle minute situated at about two thirds of head-length to base of mandibles from posterior margin. Eyes and ocelli absent. Antennae with 16 segments; segment 3 shortest; segment 4 a little larger than 3, 5 a little smaller than 4 but larger, than 3; remaining segments pyriform. Postclypeus flat, narrow, faintly demarcated from frons; with a small hair on either side. Anteclypeus translucent, apilose, narrow, strip-like. Labrum triangular, as long as wide; tip broadly rounded; with a pair of long hairs at tip and a few short ones on body. Mandibles sabre-shaped weakly incurved at tips; outer margin of left faintly incurved and that of right weakly convex. Left mandible with very faint crenulations in basal half of inner margin. Postmentum club-shaped; strongly incurved

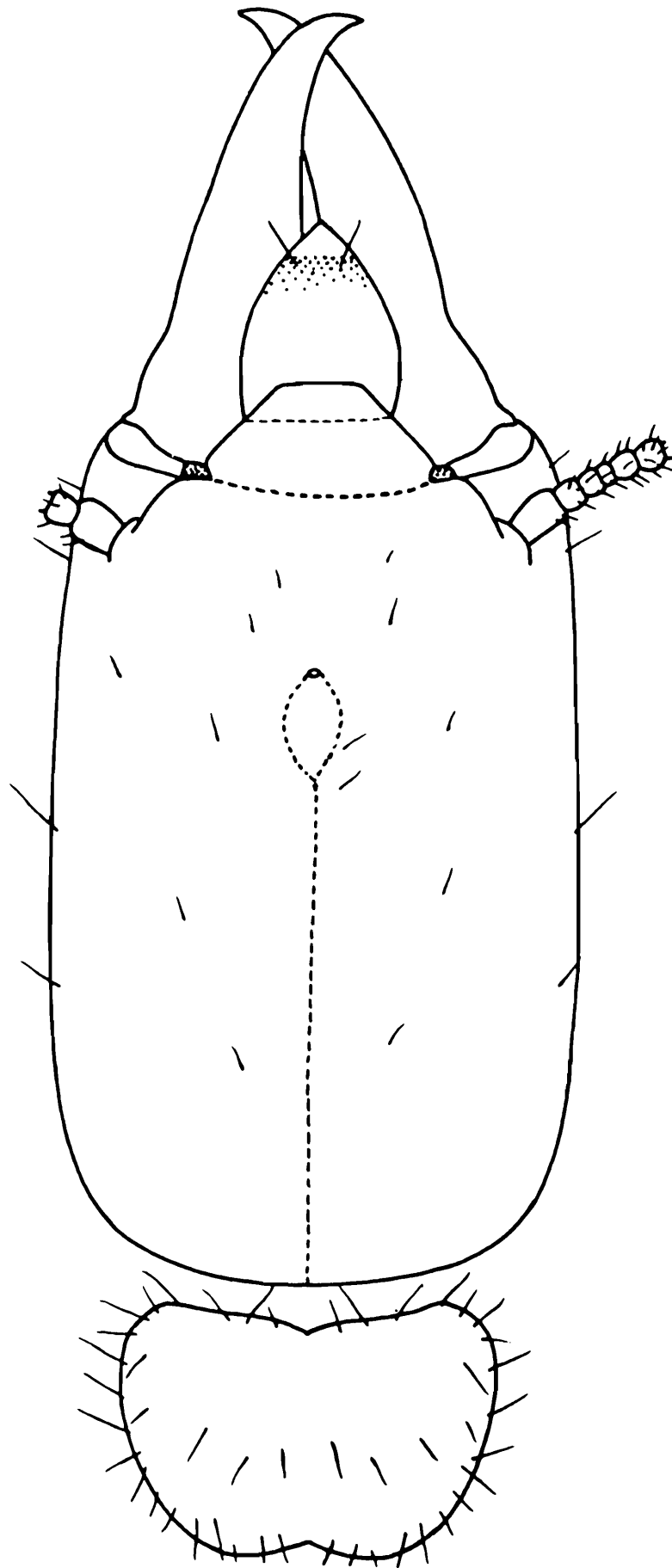


Fig. 13 *Reticulitermes chinensis* Snyder. Soldier. Head and pronotum in dorsal view.

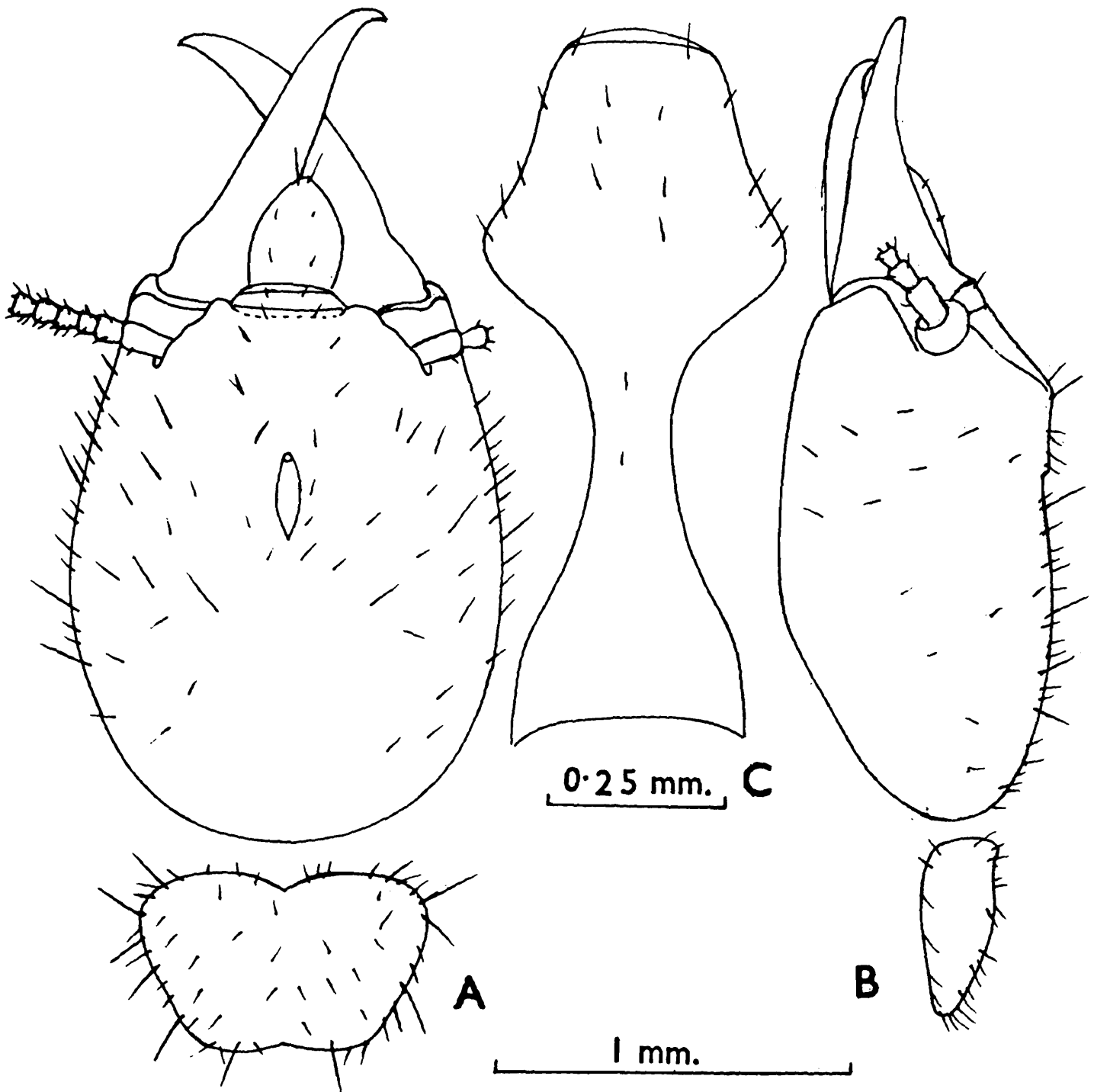


Fig. 14 *Reticulitermes ganga* n. sp. Soldier. Holotype. (A) Head and pronotum in dorsal view. (B) Ditto, side view. (C) Postmentum.

at waist. Pronotum flat, with weak medial notch at anterior margin; anterior margin slightly raised in lateral view; posterior margin weakly emarginate. Mesonotum semicircular, narrower than pronotum and metanotum a little wider than mesonotum, as wide as pronotum; both with weakly convex posterior margins. Legs short, pilose; tibial spurs 3:2:2; tarsi 4-jointed. Abdomen oblong, cerci and styli present.

<i>Measurements (in mm), etc :</i>	Holotype
Total body-length	5.10
Length of head including mandibles	2.40
Length of head upto base of mandibles	1.55
Max. width of head	1.18
Width of head at base of mandibles	0.90
Height of head	0.80
Occipito-fontanelle distance from posterior margin of head	1.08
Head index (width/length to base of mandibles)	0.761
Head-contraction index (width at base of mandibles / max. width)	0.763
Occipito-fontanelle index (Occipito-fontanelle distance/head-length to base of mandibles)	0.697
Length of labrum	0.28
Width of labrum	0.25
Length of Mandibles :	
Left	0.95
Right	0.93
Mandible-head length index (left mandible length/head-length to base of mandibles)	0.613
Median length of postmentum	1.00
Max. width of postmentum	0.43
Width of postmentum at waist	0.15
Length of pronotum	0.50
Width of pronotum	0.80

WORKER : Head pale creamish; antennae, legs, and body whitish. Head and body densely hairy. Total body-length 4.10 mm. Head-capsule subcircular wider than its length to base of mandibles (head-length including labrum 1.15, length of head to base of mandibles 0.93, width 1.00 mm). Fontanelle indistinct. Eyes and ocelli absent. Postclypeus faintly raised; length one-fourth of its width (length 0.1, width 0.40 mm). Labrum broad, dome-like, with a few hairs anteriorly and on body (length 0.25, width 0.43 mm). Antennae with 14 segments; segment 3 a little shorter than 2 and in the process of division; segment 4 shortest; remaining segments

broadly pyriform. Mandibles not examined in single specimen available. Pronotum flat (length 0.38; width 0.67 mm); anterior margin incurved with a median notch, slightly upturned when viewed laterally; sides narrowing to weakly incurved posterior margin. Legs short, pilose. Abdomen oblong, whitish; cerci and styli present.

Type-specimens : Holotype soldier and Paratype worker (Z. S. I. Regn. No.) in a vial in National Zoological Collections, Z.S.I., Calcutta.

Type-locality and distribution : INDIA : Lake Ganga, Itanagar, Arunachal Pradesh; known only from type-locality.

Affinities : In size the soldier of this species comes close to *R. saraswati* Roonwal & Chhotani from which it is separable for having its head sides convexical (parallel in *R. saraswati*) and postmentum having a short and very narrow waist (vs. long waist in *R. saraswati*). From all the other Indian species it is much smaller in size.

10. *Reticulitermes tirapi* Chhotani and Das

1983. *Reticulitermes tirapi* Chhotani and Das, *Rec. zool. Sury. India*, 80 : 316, 324 – 327, 328, 329.

1989. *Reticulitermes tirapi*; Roonwal and Chhotani, *Fauna of India: Isoptera (Termites)*, Vol. 1 : 497. 508–510.

Material : S. and W. Arunachal Pradesh : Deban, 27 km from Miao, S. Biswas, 8. xii. 1982; Gibbons Land, 16 km E. of Miao, S. Biswas, 18. xii. 1982.

Measurements (in mm), etc : Soldier (5 exs) :

Total body-length	6.10 – 6.65
Length of head to base of mandibles	1.80 – 2.20
Maximum width of head	1.00 – 1.08
Length of pronotum	0.43 – 0.52
Maximum width of pronotum	0.80 – 0.85

Distribution : North-eastern India : Arunachal Pradesh : Changlang District : Nampong (type-locality), Deban and Gibbons Land.

Sub-family (iii) : RHINOTERMITINAE

Genus 5. *Parrhinotermes* Holmgren

11. *Parrhinotermes khasii khasii* Roonwal and Sen-Sarma

1956. *Parrhinotermes khasii* Roonwal and Sen-Sarma, *Indian J. Agric. Sci.*, 26 (1) : 6–11.

1962. *Parrhinotermes khasii*; Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28(4) : 310 – 312.

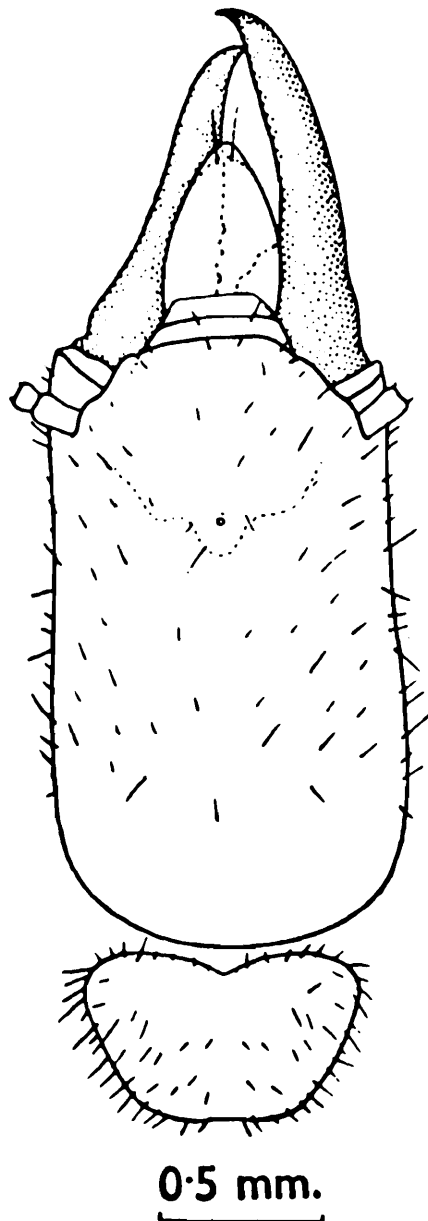


Fig. 15 *Reticulitermes tirapi* Chhotani and Das. Soldier (Paratype). Head and pronotum, in dorsal view. (After Chhotani and Das, 1983).

1977. *Parrhinotermes khasil*; Lahiri, Ghosh and Biswas, *Bull. Meg. Sci. Soc.*, 2 : 36.

1989. *Parrhinotermes khasii khasii*; Roonwal and Chhotani, *Fauna of India Isoptera (Termites)*, Vol. 1 : 529–432.

Material : S. and W. Arunachal Pradesh : Rahung village, Bank of Digien River (1800 m), Kameng Dist., K. C. Jayaramakrishnan, 25. iv. 1961; Rupa (Kameng For. Div.) East Kameng Dist., K. C. Jayaramakrishnan, 2. v. 1961; Naba, c 24 km from nacho (1060 m), Upper Subansiri Dist., J. M. Julka, 30. xi. 1974; Damin (1100 m), Upper Subansiri Dist. J. M. Julka, 22. i. 1975.

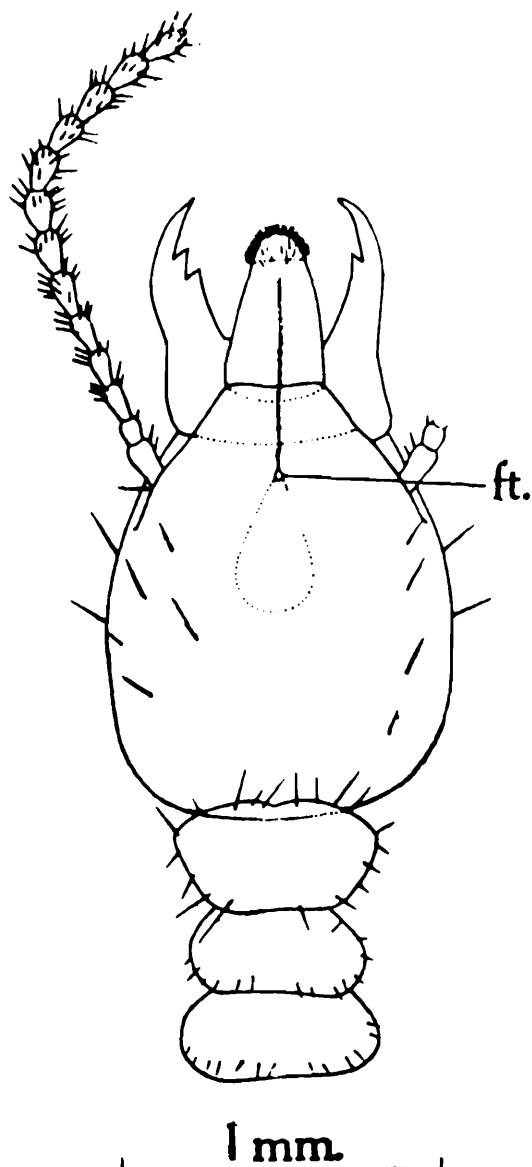


Fig. 16 *Parrhinotermes khasii khasii* Roonwal and Sen Sarma. Soldier. Head and thorax, in dorsal view. (After Roonwal and Chhotani 1962 a).

Measurements (in mm), etc : Soldier (5 exs) :

Total body-length c	3.5	–	4.45
Length of head to tip of labrum	1.60	–	1.70
Length of head to base of mandibles	1.18	–	1.30
Maximum width of head	1.00	–	1.12
Length of mandibles	0.65	–	0.75
Length of pronotum	0.34	–	0.47
Maximum width of pronotum	0.65	–	0.70

Distribution : INDIA : North-eastern India : Meghalaya : Bank of Nong Priang Stream, c 366 m, Khasi Hills – type-locality. Arunachal Pradesh. As above under ‘Material’ *Elsewhere* : Not known from any other locality.

12. *Parrhinotermes shamimi*, *n. sp.

Material : A vial with 2 S. and 5 W., Itanagar (natural forest c 1 km from Lake Ganga), Arunachal Pradesh, O. B. Chhotani (0.6/13.5.89), 13. v. 1989, ex. “stump of wood”

Description : IMAGO : Unknown.

SOLDIER (Fig. 17) : Head-capsule pale yellow, whitish in frontal region; mandibles brownish, basally brownish yellow; antennae, thorax, legs and abdomen pale creamy white. Head and body sparsely pilose. Total body-length 3.0 – 3.3 mm. Head-capsule subrectangularly oval, longer than broad; sides weakly converging in front; with rounded posterior angles and convex posterior margin. Fontanelle small situated medially with a groove running from it to tip of labrum; fontanelle gland as in fig. Eyes and ocelli absent. Antennae with 12 segments, pilose; segment 1 long, cylindrical; 2 short, about half of 1, cylindrical; 3 longer than 2, club shaped; 4 and 5 globular, subequal, shortest; remaining segments subequal, globular; last short. Postclypeus small, flat, not differentiated from frons. Anteclypeus narrow, whitish. Mandibles somewhat sabre-shaped, sharply pointed at tips; outer margins strongly incurved in basal half and somewhat angularly and abruptly incurved in apical half. Left mandible with 2 marginal teeth; inner margin between apex and 1st marginal leaf like; 1st marginal triangular, pointed; 2nd marginal also pointed, with long posterior margin and with a sharp notch at beginning of molar plate; molar plate with fine serrations. Right mandible with one marginal tooth; part between apex and 1st marginal leaf-like; 1st marginal triangular with a long posterior margin; molar plate short, serrated. Labrum tongue-shaped, longer than broad, reaching almost upto tip of mandibles; with a hyaline tip fringed with hairs and a few longer hairs present at anterior end. Postmentum vase-shaped, much longer than broad, broadest at anterior one-third; waist (minimum width) near base; profusely hairy. Pronotum sparsely pilose; much broader than long and somewhat trapezoidal; anterior margin convex, with a median notch; antero-lateral corners rounded; posterior margin substraight, with a very weak medial incurving. Mesonotum slightly narrower than pronotum; sides rounded; faintly incurved or substraight at posterior margin. Metanotum as wide as pronotum, with substraight posterior margin. Legs delicate, short, hairy; tarsi 4-jointed. Abdomen, globose, hairy; cerci 2-jointed.

* Named after Prof. Shamim Jairajpuri, former Director, Zoological Survey of India.

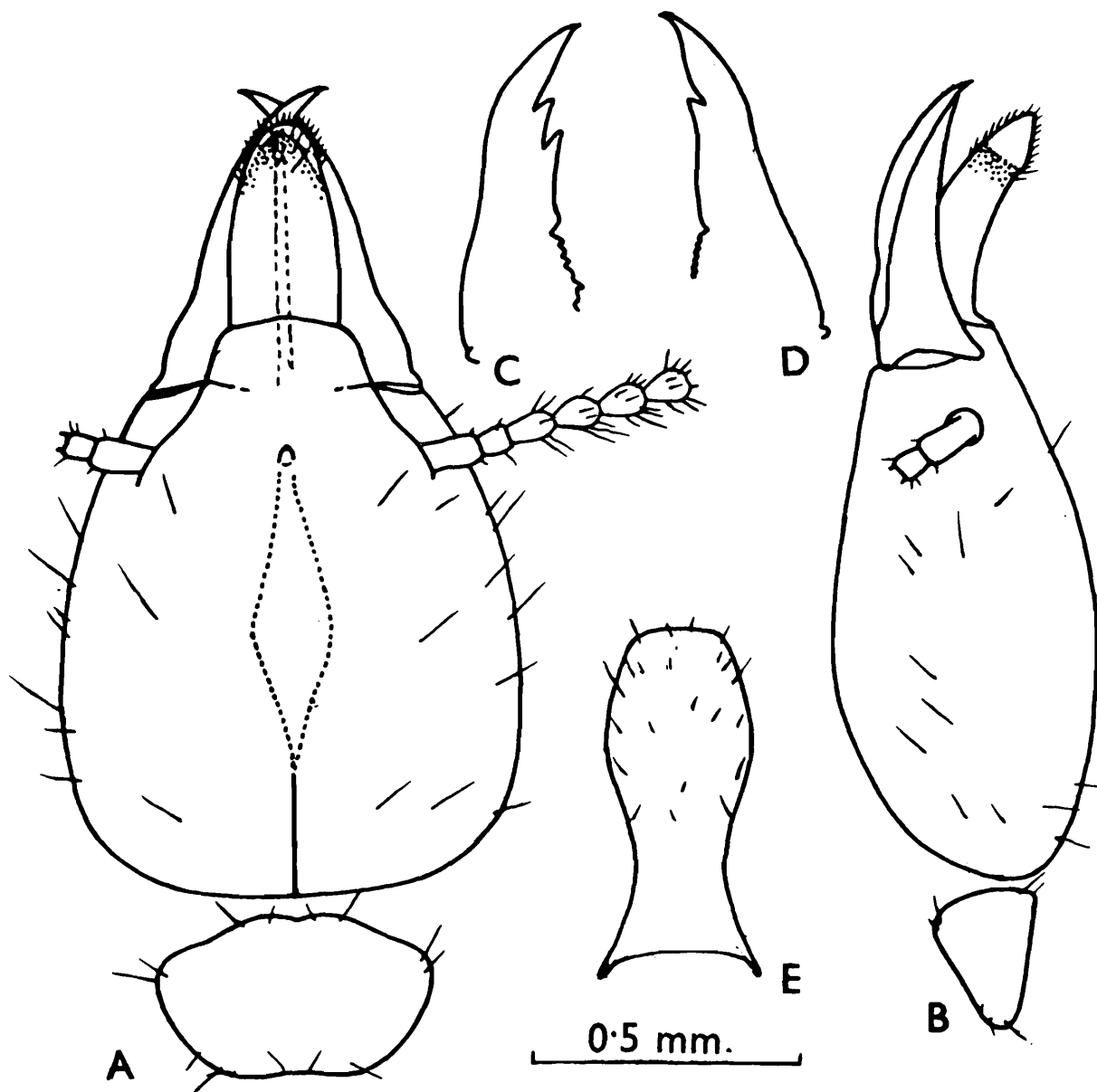


Fig. 17 *Parrhinotermes shamimi* n. sp. Soldier, Paratype. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) and (D) Left and Right mandibles. (E) Postmentum.

<i>Measurements (in mm), etc</i>	Range (2 exs)	Holotype
Total body-length c	3.00 - 3.25	3.25
Length of head to base of mandibles	0.95 - 0.98	0.98
Max. width of head	0.85 - 0.90	0.85
Head index (width / length)	0.814 - 0.894	0.814
Length of mandibles :		
Left	0.63	0.63
Right	0.60 - 0.63	0.60
Head-mandible length Index (mandible-length/ head-length)	0.642 - 0.663	0.642

<i>Measurements (in mm), etc</i>	Range (2 exs)	Holotype
Length of labrum with hyaline tip	0.38 – 0.40	0.40
Width of labrum	0.25 – 0.28	0.28
Length of postmentum	0.63 – 0.65	0.65
Max. width of postmentum	0.28	0.28
Min. width of postmentum (waist)	0.18	0.18
Length of pronotum	0.28	0.28
Max. width of pronotum	0.50 – 0.53	0.53
Width of mesotum	0.45	0.45
Width of metanotum	0.53	0.53

WORKER : Head creamy white; antennae, legs and thorax whitish; abdomen translucent, pinkish due to intestinal contents showing through. Head and body fairly hairy. Total body-length 2.80 – 3.59 mm. Head subsquarish, broader than length to base of mandibles (head-length to tip of labrum 1.0-1.20; head-length to base of mandibles 0.80 – 0.90 and head-width 1.0 – 1.13 mm); with weakly rounded sides and rounded posterior margin. Fontanelle indistinct. Eyes and ocelli absent. Postclypeus raised, hairy, much broader than long (width 0.40 – 0.50, length 0.10 – 0.13mm); anteclypeus thin, hyaline. Antennae with 12–13 segments; segment 3 long, club-hoped, longer than 2 in 12 –segmented antenna and shortest in 13-segmented one; remaining segments globular. Labrum dome-shaped, broader than long (width 0.37 – 0.43, length 0.20 – 0.25 mm). Mandibles squarish, of *Parrhinotermes*-type. Pronotum slightly saddle-shaped, hairy (width 0.50 – 0.53, length 0.20 – 0.25 mm); anterior margin with a weak median notch; posterior margin weakly incurved; Legs and abdomen as in soldier.

Type-specimens : Holotype soldier in a vial (Z. S. I. Regn. No. _____) and paratypes one soldier and workers in a vial (Z.S.I. Regn. No. _____), deposited in National Zoological Collections, Z. S. I., Calcutta.

Type-locality and distribution : INDIA : Itanagar, Lake Ganga, Arunachal Pradesh, **type-locality**. Known only from type – locality.

Affinities : The soldier of *P. shamimi* is separable from the other Indian species *P. khasii khasii* for its much smaller size (length of head to base of mandibles 0.95 – 0.98; head-width 0.85 (vs. 1.26 and 1.08 mm respectively in *P. khasii khasii*; mandibles shorter 0.63 mm vs 0.65 – 0.75 mm); pronotum much smaller; width 0.50 – 0.53, length 0.28 (vs. 0.65 – 0.72 and 0.34 – 0.47 mm, respectively).

Family (III) : **INDOTERMITIDAE**Genus 6. *Indotermes* Roonwal and Sen-Sarma**13. *Indotermes rongrensis* (Roonwal & Chhotani)**
(Synonym : *Indotermes bangladeshiensis* Akhtar)

1962. *Speculitermes cyclops rongrensis* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 314.
1986. *Indotermes rongrensis*, Roonwal and Chhotani, *Rec. zool. Surv. India*, 83 (3 & 4) : 155-162.
1975. *Indotermes bangladeshiensis* Akhtar, *Bull. Dept. Zool. Univ. Punjab (N. S.)*, Art. 7 : 113, 114, 115-120.

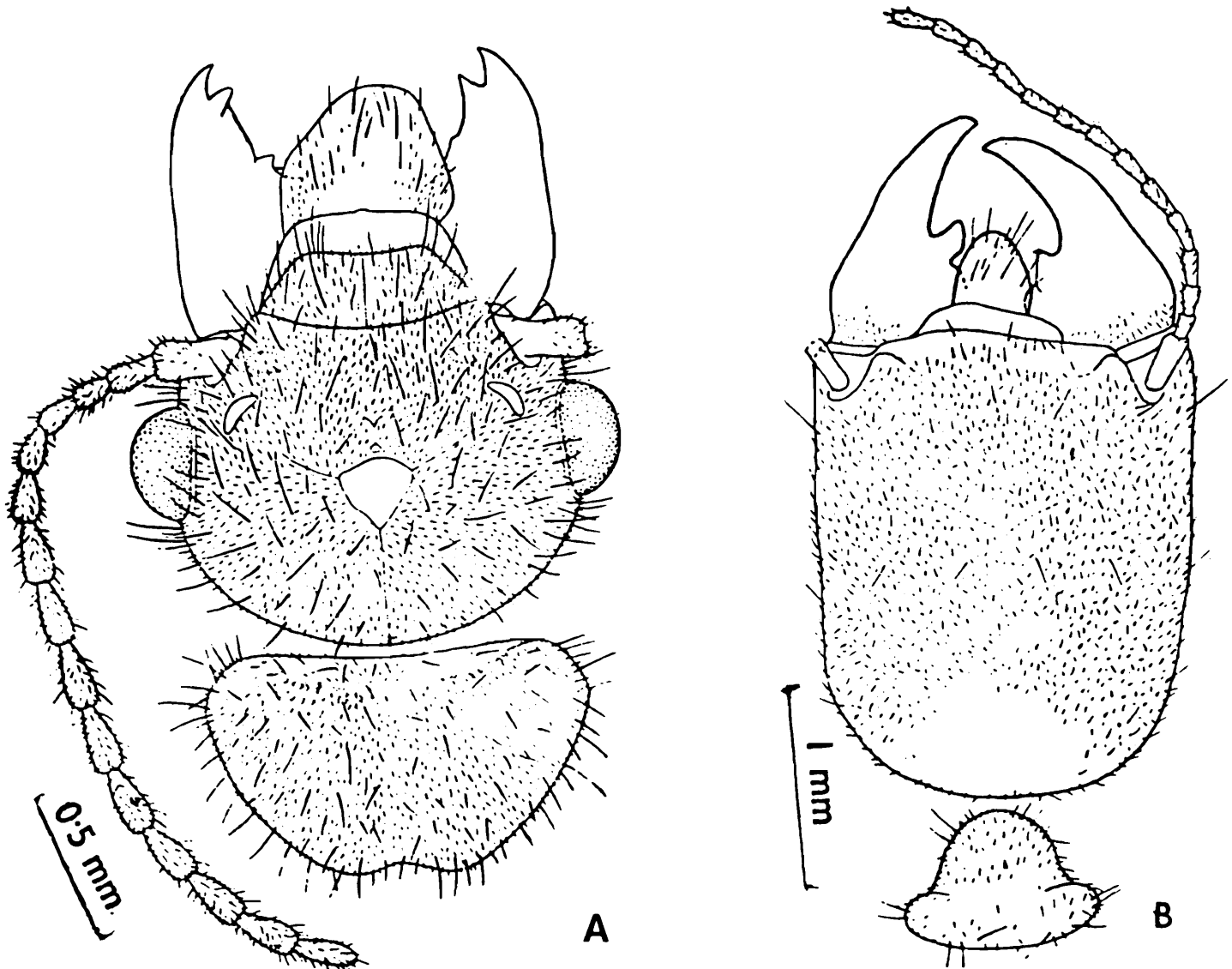


Fig. 18 *Indotermes rongrensis* (Roonwal and Chhotani). (A) Imago. Head and pronotum, in dorsal view. (After Roonwal and Chhotani 1977. (B) Soldier. Head and pronotum in dorsal view. (After Roonwal and Chhotani 1986).

Material : Arunachal Pradesh : Im., Ny., S. and W. Itanagar, Lake Ganga, O. B. Chhotani, 15. v. 1989, ex. embankment on pathway (2 vials); Kimin – Ziro Road, O. B. Chhotani, 16. v. 1989; Yazalli (Lower Subansiri, T. K. Pal, 18. ix. 1989. Mizoram : Aizwal (Zoological Gardens), G. Bose, 27, v. 90, ex “soil making galleries and pockets in embankment” (3 vials). Meghalaya : Barapani, Shillong, G. Bose, 10. vi. 1990; Mawroh, Shillong, S. N. Prasad and R. Rhynt, 18. vii. 1963; Umsing, Shillong, V. D. Srivastava, 25. viii. 1963; Mowing, Shillong B. K. Tikader, 7. xii. 1967. Assam : Sonai Rupai Forest, Missamari, S. K. Biswas, 28. xi. 1965.

Measurements (in mm), etc : Queen (1 ex) :

Total body-length (abdomen distended) c	19.20
Length of head to tip of labrum	2.05
Length of head to base of mandibles	1.25
Length of head to postclypeus	1.22
Maximum width of head	1.67
Length of postclypeus	0.30
Width of postclypeus	0.73
Length of mid-dorsal spot	0.18
Width of mid-dorsal spot	0.175
Long diameter of eye	0.40
Length of ocellus	0.20
Width of ocellus	0.12
Eye-ocellus distance	0.10
Ocellus-antennal distance	0.20
No. of antennal segments	12 (3 subequal to 2)
Total <i>Soldier</i> (2 <i>exs.</i>) body length - c	7.0 – 7.5
Length of head to base of mandibles	2.30 – 2.32
Max. width of head	2.00 – 2.07
Length of left mandible	1.33 – 1.35
Tooth distance from tip (left mandible)	0.58 – 0.60
Length of right mandible	1.34 – 1.38
Tooth distance from tip (right mandible)	0.58 – 0.62
Length of labrum	0.35 – 0.40
Width of labrum	0.40 – 0.43
Length of pronotum	0.70 – 0.75
Width of pronotum	0.97 – 1.03
Width of mesonotum	0.73 – 0.80
Width of metanotum	0.90 – 1.00
No. of antennal segments	14 (3 longer than 2)

Distribution : INDIA : *North-eastern India* : Assam : Sonai Rupai Forest, Missamari. Meghalaya : Barapani, Shillong. Mawroh Umsing and Mowing. Mizoram : Aizwal. Arunachal Pradesh : Itanagar, Lake Ganga and Kimin–Ziro Rond. Elsewhere : BHUTAN, BANGLADESH and THAILAND.

14. *Indotermes* sp.

Material : Manipur : W. only, Loktak vicinity, G. Bose, 31. v. 90 (2 vials).

Remarks : The material collected from Loktak vicinity did not have any specimens of the soldier caste. As such it was not possible to identify these upto the species level. From workers of *Indotermes rongrensis*, these workers differ, in their darker colouration, for being a little smaller in size and in the shape of the head.

Family (IV) : TERMITIDAE

Sub-family (i) AMITERMITINAE

Genus 7. *Euhamitermes* Holmgren

15. *Euhamitermes kanhaensis* Roonwal and Chhotani

1965. *Euhamitermes kanhaensis* Roonwal and Chhotani, *Proc. zool. Soc. Calcutta*, **18** : 11–16, 19.

Material : S. and W. Arunachal Pradesh : About 4 km from Kimin on road to Ziro, O. B. Chhotani, 17. v. 1989, from soil.

Measurements (in mm), etc : Soldier (1 ex) :

Total body-length c	4.78
Length of head of base of mandibles	1.40
Max. width of head	1.08
Length of mandibles	0.74
Length of pronotum	0.40
Max. width of pronotum	0.65
No. of antennal segments	14 (4th shortest)

Distribution : INDIA : *North-eastern India* : Arunachal Pradesh (Lower Subansiri Dist.). Also Madhya Pradesh (Kanha National Park – type – locality). Elsewhere : BANGLADESH.

Genus 8. *Microcerotermes* Silvestri

16. *Microcerotermes beelsoni* Snyder

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

1933. *Microcerotermes beelsoni* Snyder, *Proc. U. S. natn. Mus.*, **82** (Art. 16) : 12 – 14

1933. *Microcerotermes* *Synonym vide chhotani* 1977c : *Championi* Snyder *Proc. U. S. natn. Mus.*, **82** (Art. 16) : 14-15.
1962. *Microcerotermes heimi*; Roonwal and Chhotani, *Proc. nat. Inst. Sci. India.* (B) **28** (4) : 319. Wrong determination.
1965. *Microcerotermes lanceolatus* Mathur and Thapa, *Bull. Ent.*, **67** : 46.

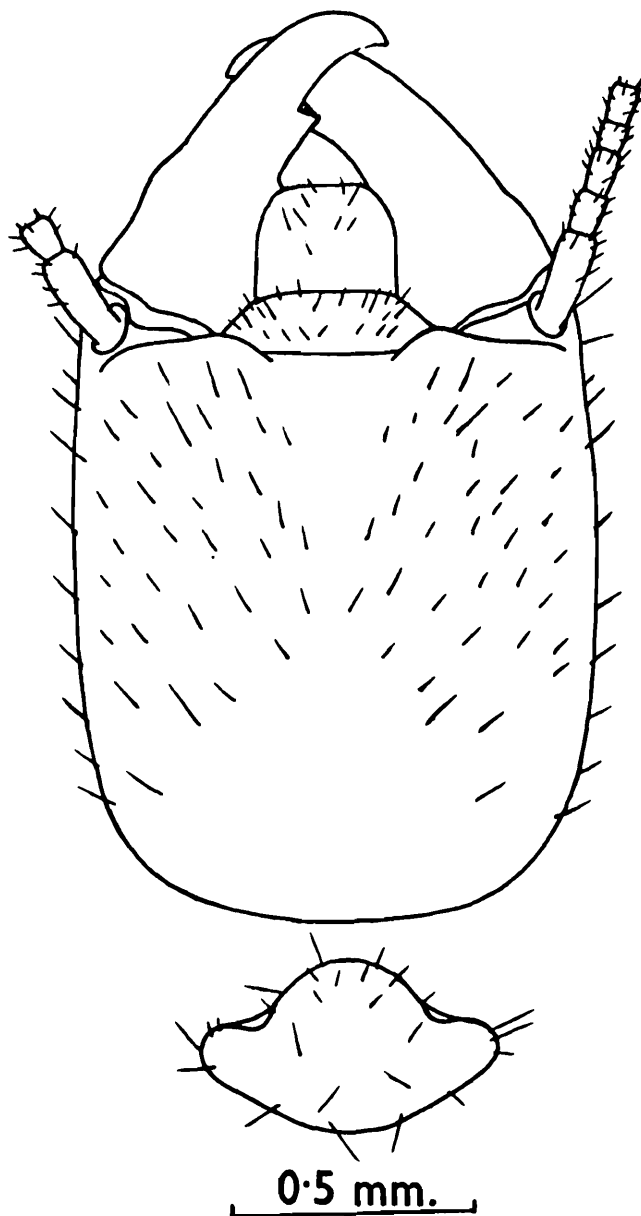


Fig. 19 *Euhamitermes kanhaensis* Roonwal and Chhotani. Soldier. Head and pronotum, in dorsal view.

Material : S. and W. Assam : Mikir Hills, S. K. Gupta, 3. xi. 1974. Arunachal Pradesh : Nirjuli, P. T. Bhutia, 3. vi. 1987 (3 vials); Bomdila, K. C. Jayaramakrishnan, 15. vi. 1961 Tenga River side and Charduar Forest towards Bhalukpong. S. K. Bhattacharyya, 19. xii. 1965 and 27, xii. 1965, respectively; Likhali, S. K. Tandon and G. S. Arora, 7. x. 1966.

Measurements (in mm), etc : Soldier (5 exs) :

Total body-length c	4.25 – 5.10
Length of head of base of mandibles	1.45 – 1.58
Max. width of head	0.84 – 0.93
Length of left mandible	0.85 – 0.92
Length of pronotum	0.30 – 0.32
Max. width of pronotum	0.52 – 0.58
No. of antennal segments	13 (3rd shortest)

Distribution : INDIA : *North-eastern India* : Assam (Goalpara and Nowgong Dists. and Mikir Hills). *Arunachal Pradesh* (Lower Subansiri, W Kameng and W. Siang Dists.) Also Widely distributed in northern India (West Bengal, Uttar Pradesh, Madhya Pradesh, Delhi, Orissa, Panjab, Haryana). *Elsewhere*; BHUTAN, BANGLADESH and PAKISTAN.

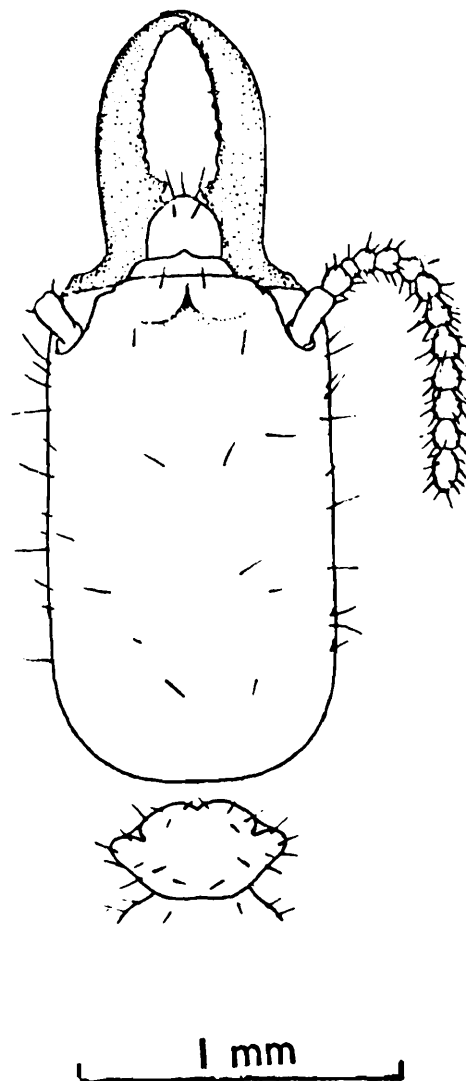


Fig. 20 *Microcerotermes beelsoni* Snyder. Soldier. Head and pronotum, in dorsal view.

Subfamily (ii) TERMITINAE

Genus 9. *Discuspiditermes* Krishna17. *Dicuspiditermes laetus* (Silvestri)

1914. *Capritermes laetus* Silvestri, *Rec. Indian Mus.*, **8** : 434–435.
 1945. *Capritermes garthwaiti* Gardner, *Indian J. Ent.*, **6** : 106–108.
 1949. *Capritermes laetus*; Snyder, *Smiths. misc. Colls.*, **112** :195.
 1965. *Dicuspiditermes laetus*; Krishna, *Amer. Mus. Novit*; No. 2210 : 18
 1968. *Dicuspiditermes laetus*; Krishna, *Bull. Am. Mus. nat. Hist.*, **138** (Art. 5) : 290 (treats *garthwaiti* as synonym of *laetus*).
 1975 *Dicuspiditermes garthwaiti*; Akhtar, *Bull. Dept. Zool. Univ. Punjab* (N. S.) Art. 7, : 175 – 179.

Material : 2 vials, Im, S, W. as follows : Arunachal Pradesh : Itanagar, C. B. Prasad. 24. iv. 1987.

Measurements (in mm), etc : Imago (5 exs) :

Total length with wings c	14.10 – 15.10
Total length without wings c	8.50 – 8.60
Length of head of tip of labrum	1.50 – 1.51
Length of head of base of mandibles	0.90 – 0.95
Max. width of head with eyes	1.35 – 1.38
Max. diameter of eye	0.35 – 0.38
Max. diameter of ocellus	0.18 – 0.20
Min. diameter of ocellus	0.13 – 0.14
Eye-ocellus distance	0.08 – 0.10
Length of postclypeus	0.23
Width of postclypeus	0.55
Max. width of pronotum	1.13 – 1.23
Length of pronotum	0.60 – 0.70
Length of forewing with scale	12.20 – 12.60
Length of forewing scale	0.75 – 0.83
Length of hindwing with scale	11.3 – 11.5
Length of hindwing scale	0.63 – 0.70
No. of antennal segments	15 (3rd shortest)

Measurements (in mm), etc : Imago (5 exs) :

Soldier (2 exs) :

Total body length c	6.55	–	6.88
Length of head to base of mandibles	2.10	–	2.20
Max. width of head	1.48	–	1.50
Length of mandibles :			
Left	2.05	–	2.08
Right	2.00	–	2.05
Max. Length of labrum	0.80	–	0.83
Median length of labrum	0.53	–	0.55
Width of labrum	0.32	–	0.33
Length of pronotum	0.40	–	0.43
Width of pronotum	0.80	–	0.83
No. of antennal segments	14		

Distribution : INDIA : *North-eastern India* : Arunachal Pradesh (Lower Subansiri Dist. Itanagar), first record from N. E. India. *Elsewhere* : BURMA, BANGLADESH and THAILAND.

Genus 10. *Pericapritermes* Silvestri18. *Pericapritermes dunensis* (Roonwal and Sen-Sarma)

1960. *Capritermes dunensis* Roonwal & Sen Sarma, *Contr. Syst. Orient. Termites. ICAR Ent. Mongr.* 1 : 28–33, Pl. 4.
1962. *Capritermes dunensis*; Roonwal & Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 324–325.
1968. *Pericapritermes dunensis*; Krishna, *Bull. Am. Mus. nat. Hist.*, 138 (Art 5) : 294.
1977. *Pericapritermes dunensis*; Roonwal & Chhotani, *Ent. Basil.*, 2 : 64 – 68.
1977. *Pericapritermes dunensis*; Lahiri, Ghosh and Biswas, *Bull. Megh. Sci. Soc.*, 2 : 36.
1983. *Pericapritermes dunensis*; Maiti, *Occ. pap. Rec. zool. Surv. India*, No. 42 : 86–87.
1985. *Pericapritermes dunensis*, Chhotani and Bose, *Rec. zool. Surv. India*, 82 : 58.

Material : S., W. as follows : *Meghalaya* : Shillong (6 vials), thus : S. N. Prasad, 7. vi. 1960, 16. viii. 1960 and 1. vi. 1961; S. Biswas, 25. xi. 1966; and V. D. Srivastava, 8. viii. 1963 and 15. x. 1963; Umtham, R. K. Varshney, 25. iv. 1967; Pynursula, B. K. Tikader, 15. i. 1966; Mawphlong, S. Biswas, 22. viii. 1963 and G. Bose, 9. vi. 1990; and Umsing, S. Biswas, 3. viii. 1963. *Arunachal Pradesh* : Deban, 27 km. from Miao, S. Biswas, 7. iv. 1981 and 8. xii. 1982 (2 vials).

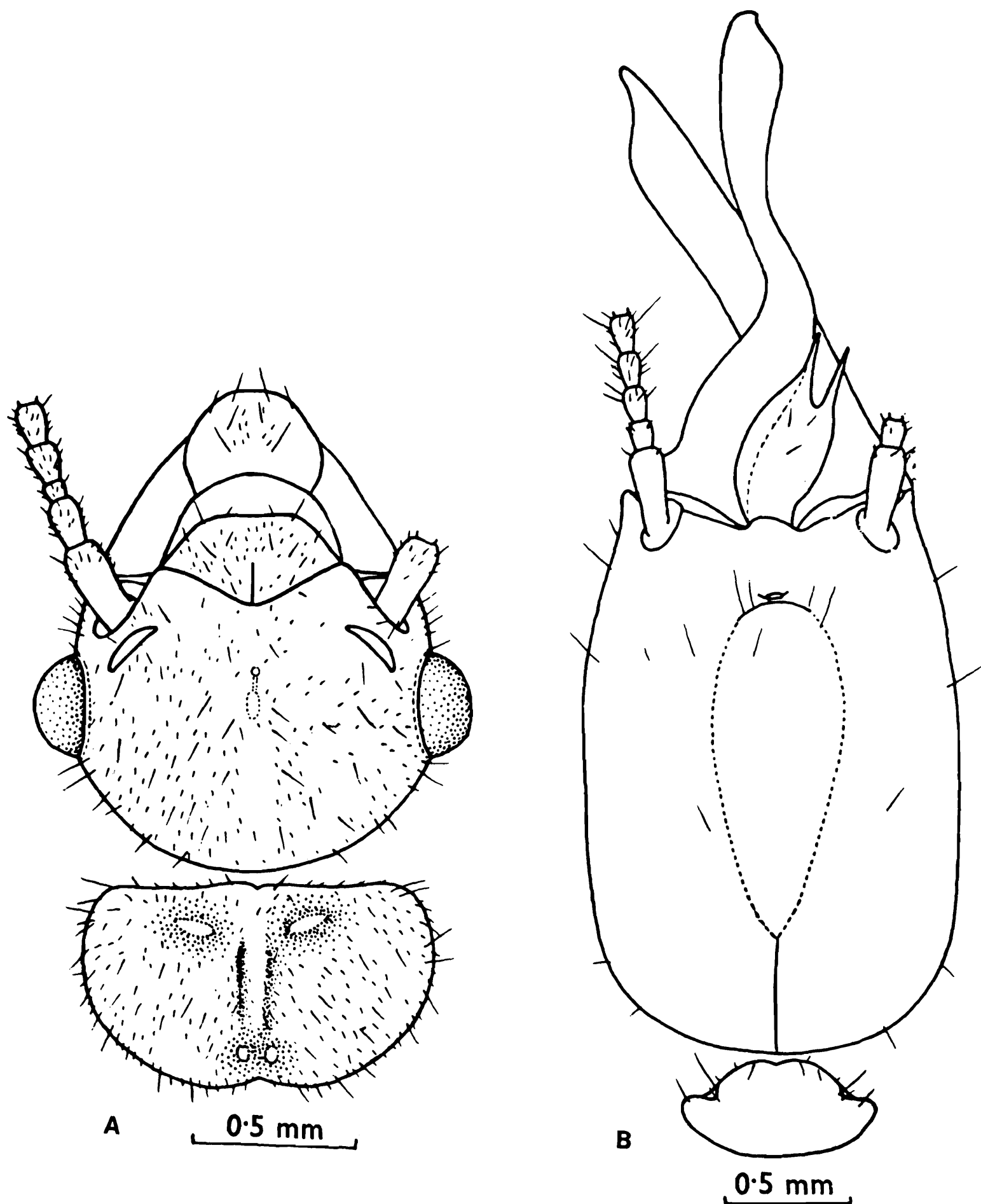


Fig. 21 *Discuspiditermes laetus* (Silvestri). Imago. (A). Head and pronotum, in dorsal view. (B). Soldier. Head and pronotum, in dorsal view.



Fig. 22 *Pericapritermes dunensis* (Roonwal and Sen-Sarma). Soldier, head and pronotum, in dorsal view.

Measurements (in. mm) etc : Soldiers (5 exs) :

Total body-length c	5.6	–	6.2
Length of head to base of mandibles	2.30	–	2.50
Max. width of head	1.30	–	1.45
Length of mandibles : Left	1.40	–	1.65
Right	1.35	–	1.53
Length of labrum with tip	0.25	–	0.45
Max. width of labrum	0.25	–	0.38
Length of pronotum	0.33	–	0.43
Max. width of pronotum	0.80	–	0.88
No. of antennal segments	14		

Distribution : INDIA : *North-Eastern India* : *Meghalaya* : As under "Material" above. *Arunachal Pradesh* (Tirap Dist.) Also U.P. (Dehra Dun, type-locality) and West Bengal. *Elsewhere* : BHUTAN.

19. *Pericapritermes durga* (Roonwal and Chhotani)

1962. *Capritermes latignathus durga* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 325-329.
1977. *Pericapritermes latignathus durga*; Lahiri, Ghosh and Biswas, *Bull. Megh. Sci. Soc.*, 2 : 36.
1977. *Pericapritermes durga*; Roonwal and Chhotani, *Ent. Basil.*, 2 : 64, 66, 68.
1979. *Pericapritermes durga*; Sen Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.* 13 (1) : 23.
1980. *Pericapritermes durga*; Lahiri and Ghosh. *Rec. zool. Surv. India*, 76 : 66.

Material : S. and W. : *Meghalaya* : Shillong, S. N. Prasad, 8. vi. 1960, 16. viii. 1960, xii. 1960 and 1 and 4. vi. 1961 (5 vials); Pynursala, B. K. Tikader, 18. iv. 1966. *Arunachal Pradesh* : Bhairavkonda, K. C. Jayaramakrishnan, 20. v. 1961; S. Biswas, 10. vii. 1961; Didi Camp, Chukru, A. N. T. Joseph, 20. v. 1966; Dali village S. K. Tandon and G. S. Arora, 10. x. 1966 and 11. x. 1966; Lake Ganga, Itanagar, O. B. Chhotani, 13. v. 1989, "under and from stump of wood"

Measurements (in mm) etc : Soldiers (5 exs) :

Total body-length c	6.0	-	6.2
Length of head to base of mandibles	2.45	-	2.60
Max. width of head	1.45	-	1.55
Length of mandibles : Left	1.80	-	1.88
Right	1.60	-	1.75
Length of labrum	0.23	-	0.25
Width of labrum	0.28	-	0.35
Length of pronotum	0.35	-	0.38
Max. width of pronotum	0.75	-	0.90
No. of antennal segments	14		

Distribution : INDIA : *North-Eastern India* : *Meghalaya* : (Cherrapunji - type locality). *Arunachal Pradesh* : As under Material above (Kameng, Subansiri and Siang Dists.). *Manipur* : Morch Res. Forest, eastern Manipur. *Elsewhere* : BHUTAN.

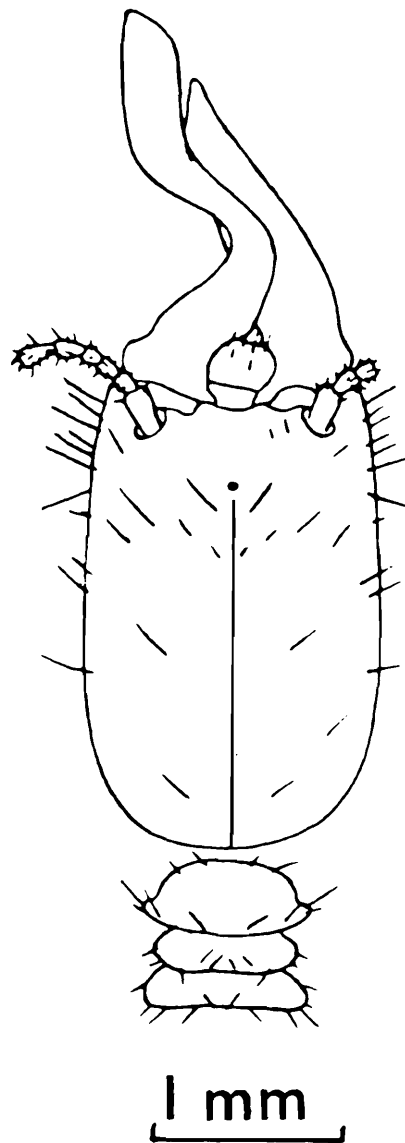


Fig. 23 *Pericapritermes durga* (Roonwal and Chhotani) Soldier. Head and thorax, dorsal view.

Genus 11. *Pseudocapritermes* Kemner

20. *Pseudocapritermes karticki* n. sp.

Material : Two vials with one S. and several W. each, Mawphlong (Meghalaya), *G. Bose*, 9, vi. 1990, "under logs of wood in natural rain forest" and two vials with W. only, other data same as above. One vial with a soldier, *Mawphlong*, *S. Biswas*, 22. viii. 1963.

Description : IMAGO : Unknown.

SOLDIER (Fig. 24) : Head yellowish; antennae pale brown; labrum translucent white; mandibles dark brown, paler near base; body and legs creamy white. Head and body fairly densely hairy. Total body-length 6.25 – 7.00 mm.

Head subrectangular, sides subparallel; longer than wide, length 1.34 – 1.38 times that of width; frons weakly sloping in front; median suture extending upto a little more than one-fourth of head-length from posterior margin; lateral sutures absent. Fontanelle small, with a transverse

chitinoid rim; situated at base of frons; a short tube runs from fontanelle gland to the opening. Eyes and Ocelli absent. Postclypeus small, semi-circular; indistinctly separated from frons; with a hair on each side near anterior margin. Anteclypeus translucent, subtrapezoidal, apilose. Labrum translucent; with sharp long apices; anterior margin deeply incurved; with short hairs on body and anterior margin. Antennae 14-segmented segments elongate; segment 3 longer than 2; 4 shortest. Mandibles asymmetrical; as long as length of head to base of mandibles. Left mandible with a short apical beak; broad blade-like just below tip; further behind moderately incurved. Right mandible with a short tip and a long apical blade; outer margin weakly incurved uniformly. Postmentum short, club-shaped; waist very close to posterior margin, a little narrower than maximum width; with three pairs of long hairs in the anterior part and a few minute ones on body. Pronotum saddle-shaped; with many long hairs along margins and a few on body; with a faint median notch on anterior margin; posterior margin without emargination. Mesonotum narrower and metanotum wider than pronotum; posterior margins of both faintly incurved. Legs thin, long, pilose; apical tibial spurs 2:2:2; dorsal spur on foreleg not discernible; tarsi 4-segmented. Abdomen elongate, densely hair; cerci present, 2-segmented; styli absent.

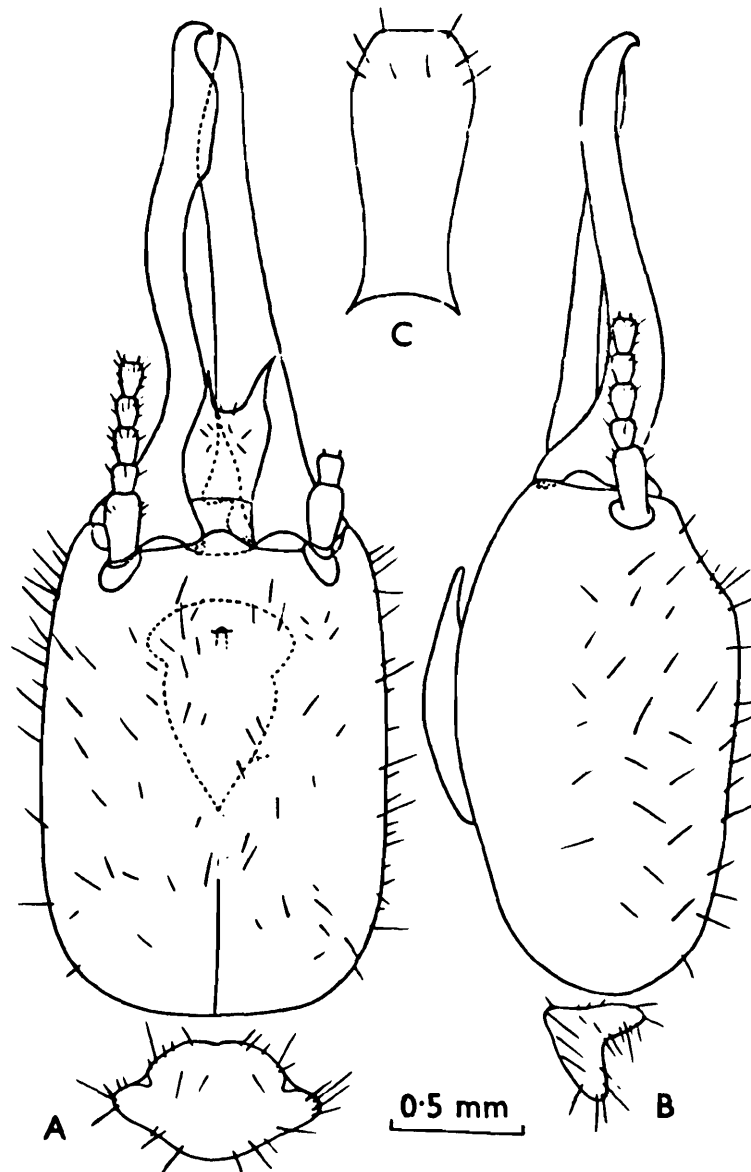


Fig. 24 *Pseudocapritermes karticki* n. sp. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Postmentum.

<i>Measurements (in mm), etc :</i>	Range (3 exs)	Holotype
Total body-length	6.25 – 3.77	6.50
Length of head including mandibles	3.73 – 3.77	3.77
Length of head to base of mandibles	1.87 – 2.00	1.87
Max. width of head	1.35 – 1.40	1.35
Width of head at anterior end	1.00 – 1.10	1.10
Index max. width of head/length of head to base of mandibles	0.70 – 0.722	0.722
Height of head	0.90 – 1.00	0.99
Length of mandibles :		
Left	1.87 – 2.00	1.87
Right	1.88 – 2.00	1.88
Head-mandible Index (length of left mandible/head-length to base of mandibles)	1.00 – 1.07	1.00
Length of labrum including apices	0.49 – 0.55	0.49
Median length of labrum	0.35 – 0.40	0.35
Max. width of labrum	0.28 – 0.30	0.28
Median length of postmentum	1.00 – 1.05	1.00
Max. width of postmentum	0.40 – 0.45	0.40
Min. width of postmentum at waist	0.25 – 0.30	0.25
Length of pronotum	0.40 – 0.42	0.40
Max. width of pronotum	0.80 – 0.82	0.80

WORKER : Head-capsule creamish; thorax legs and antennae whitish; abdomen greyish due to intestinal contents showing through, Head and body fairly densely pilose. Total body-length 3.30 – 3.40 mm.

Head-capsule subcircular (head -length to tip of labrum 1.20 – 1.30; head- length to base of mandibles 0.75 – 0.85; max. width of head 0.95 – 1.03 mm); widest at base of mandibles; sides rounded converging posteriorly. Fontanelle plate round, translucent, about 0.13 mm in diameter. Eyes and Ocelli absent. Antennae with 14 segments; segment 4 shortest. Postclypeus hairy, swollen (length 0.20 – 0.22; width 0.53 – 0.55); anterior margin substraight, posterior margin weakly incurved like a notch. Anteclypeus subtrapezoidal, apilose, with anterior margin projecting in front. Labrum dome shaped, broader, than long; with a number of hairs near anterior margin and on body. Mandibles each with a somewhat large, leaf-like apical tooth and

2 marginal teeth. Left mandible: 1st marginal with a long, straight posterior margin and 2nd marginal very small; molar plate fairly large and convex. Right mandible : 1st marginal triangular having a slightly longer posterior margin than anterior margin; 2nd marginal a little shorter and with an incurved posterior margin; molar plate fairly long; incurved. Pronotum (length 0.25 – 0.28; width 0.55 – 0.60 mm); legs and abdomen as in soldier; anterior margin of pronotum, however, without a notch and tibia of forelegs slightly swollen.

Type specimens : Holotype soldier, Mawphlong, G. Bose, 9. vi. 1990. and paratypes – all the remaining specimens as mentioned under “Material” above in National Zoological Collections, ZSI, Calcutta.

Type-locality and distribution : Mawphlong, Meghalaya, known only from type-locality.

Affinities : The soldier of *Pseudocapritermes karticki* is close to that of *P. tikadari* Roonwal and Chhotani and *P. bhutanensis* (Roonwal and Chhotani) (= *Procapritermes bhutanensis* Roonwal and Chhotani – new combination) but differs from both these species for its size being smaller.

From *P. tikadari* : It can also be differentiated for its left mandible having sharper and more incurved tip and differently shaped broader portion below the tip and for its right mandible having more pointed and slightly incurved tip and weakly incurved outer margin (tip not incurved and outer margin straight). Its head is smaller and wider (length to base of mandibles 1.87 – 2.00 vs 2.23 – 2.50 mm), apical processes of labrum are shorter and postmentum is different in shape.

From *P. bhutanensis* : The soldier of this species is separable for its smaller size (length of head to mandible–base 1.87 – 2.00 vs 2.18 mm); head sides being weakly convex and a little converging in front (vs substraight in *P. bhutanensis*); for the head being wider in comparison to length index head-width / head-length to base of mandibles 0.70 – 0.73 vs. 0.64 in *P. bhutanensis*); and for its more incurved left mandible and more prominently incurved beak.

21. *Pseudocapritermes tikadari* Roonwal & Chhotani

1962. *Pseudocapritermes tikadari* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28(4): 319–323.
1968. *Procapritermes tikadari*; Krishna, *Bull. Am. Mus. nat. Hist.*, 138 (Art 5) : 298, 300, 304.
1977. *Procapritermes tikadari*; Roonwal & Chhotani, *Ent. Basil.*, 2 : 62–63.
1977. *Procapritermes tikadari*; Lahiri, Ghosh & Biswas, *Bull. Megh. Sci. Soc.*, 2 : 36
1980. *Procapritermes tikadari*; Lahiri and Ghosh, *Rec. zool. Surv. India*, 76 : 66, (Manipur)
1981. *Pseudocapritermes tikadari*; Ahmed and Akhtar, *Pakistan J. Zool.*, 13 (1–2) : 20 (sp. name wrongly spelt as *tikadri*).

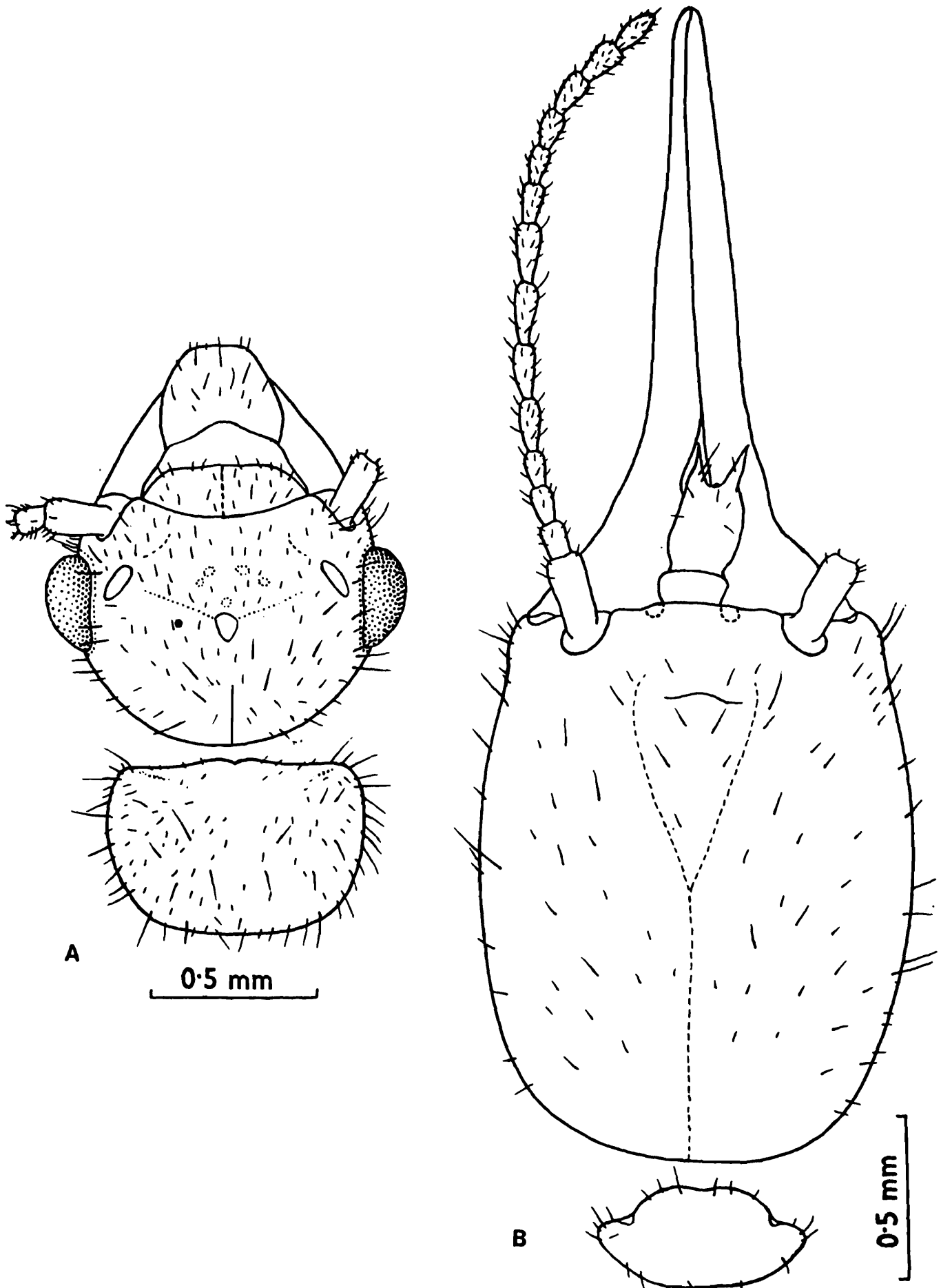


Fig. 26 *Malysiocapritermes holmgreni* (Akhtar). (A) Imago. Head and pronotum, in dorsal view. (B) Soldier, Head and pronotum, dorsal view.

Distribution : INDIA : *North-eastern India* : Meghalaya (Mawphlong, Umsing, Cherrapunji-type-locality). Arunachal Pradesh (East Siang Dist.). Manipur. Elsewhere : BHUTAN.

Genus 12. *Malaysiocapritermes* Ahmad and Akhtar

22. *Malaysiocapritermes holmgreni* (Akhtar)

1975. *Procapritermes holmgreni* Akhtar, *Bull. Dept. Zool. Univ. Panjab (N.S.)*, Art. 7 : 179-183.

1981. *Malaysiocapritermes holmgreni* : Ahmad and Akhtar, *Pakistan J. Zool.*, 13 (1-2) : 10.

Material : Meghalaya : Im., S., W., Barapani, Shillong, B. K. Tikader, 31. v. 1967 (2 vials). Arunachal Pradesh : S., W., Lake Ganga, Itanagar, O. B. Chhotani, 15. v. 1989 (02/ 15.v.89).

Measurements (in mm), etc : Imago (5 exs) :

Total body-length with wings c	12.4	-	12.60
Total body length without wings c	6.1	-	6.50
Length of head to base of mandibles	0.75	-	0.80
Width of head (with eyes)	1.08	-	1.08
Max. diameter of eyes	0.30		
Max. diameter of ocellus	0.13	-	0.15
Min. diameter of ocellus	0.10		
Eye-ocellus distance	0.05	-	0.08
Length of postclypeus	0.18	-	0.20
Width of postclypeus	0.45	-	0.50
Length of forewing with scale	9.20	-	10.60
Length of forewing scale	0.63	-	0.65
Length of hindwing with scale	8.20	-	9.80
Length of hindwing scale	0.45	-	0.55
Length of pronotum	0.47	-	0.53
Width of pronotum	0.78	-	0.88
No. of antennal segments	15		(3rd shortest)
Soldier (3 exs) :			
Total body-length c	5.3	-	5.6
Length of head to base of mandibles	1.63	-	1.65
Max. width of head	1.23	-	1.25
Max. length of labrum	0.38	-	0.45

Measurements (in mm), etc : Imago (5 exs) :

Min. length of labrum	0.28 – 0.30
Width of labrum	0.20 – 0.23
Length of pronotum	0.28
Width of pronotum	0.65
No. of antennal segments	14 (4th shortest subequal to 3)

Distribution : INDIA : North-eastern India : Meghalaya (Shillong, Barapani) and Arunachal Pradesh (Lake Ganga, Itanagar); new record for N. E. India : Elsewhere : BANGLADESH.

Subfamily (iii) MACROTERMITINAE

Genus 13. *Macrotermes* Holmgren23. *Macrotermes aleemi* Akhtar

1972. *Macrotermes aleemi* Chaudhury, et. al. *Termites of Pakistan* (Final Tech. Rept. PL480 A17-FS-12) : 21–22. (Nom. nud.)

1975. *Macrotermes aleemi* Akhtar, *Bull. Dept. Zool. Univ. Punjab (N. S.)*, Art. 7 : 61 – 65.

Material : S. major, S. minor and W. Arunachal Pradesh : One vial with 1 S. major, 7 S. minor and several W., Lake Ganga, Itanagar, O. B. Chhotani, 15. v. 1989, 2 vials, S. minor and W., Bame village, Siang Div., alt. 600 m., S. K. Tandon and G. S. Arora, 30. x. 1966; 1 vial, 2 S. minor and sev. W., Lemeking, upper Subansiri, J. M. Julka, 3. xii. 1974; 1 S. minor and 1 W., R. Nacho, upper Subansiri, alt. 500 m., J. M. Julka and party, 28, xi. 1974; 1 vial, 1 S. minor and 2 W., Along, West Siang, P. T. Bhutia, 2. xii. 1988.

Measurements (in mm), etc : Soldiers : Major (1 ex) Minor (5 exs)

Total body-length	8.65	5.73 – 6.15
Length of head to base of mandibles	3.10	1.88 – 2.05
Max. width of head	2.40	1.58 – 1.65
Length of mandibles : Left	1.45	1.20 – 1.25
Right	1.45	1.20 – 1.25
Length of pronotum	0.98	0.65 – 0.73
Width of pronotum	1.65	1.13 – 1.15
No. of antennal segments	Broken	17

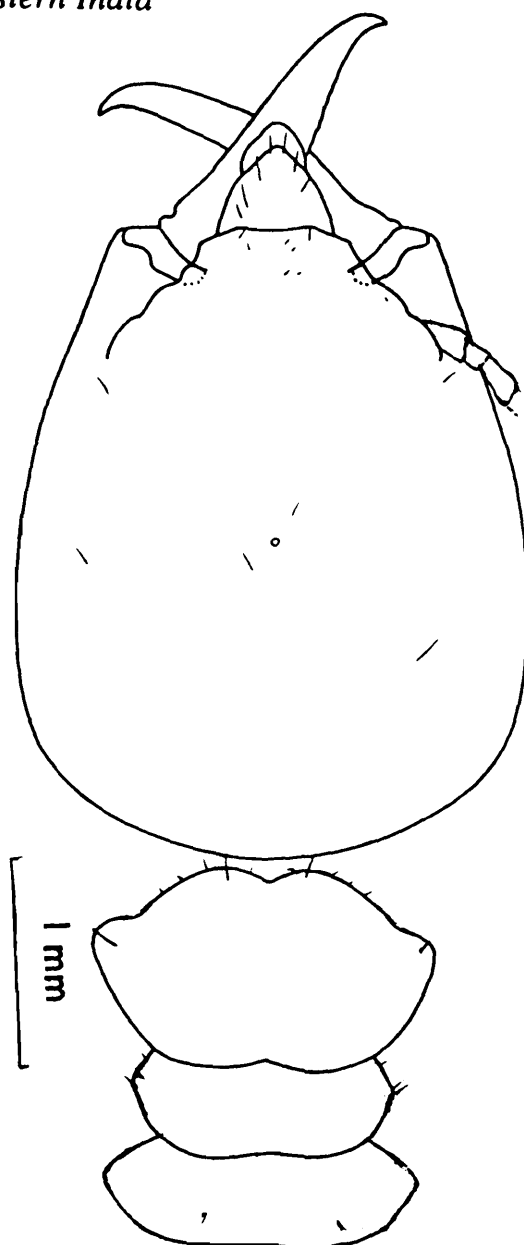


Fig. 27 *Macrotermes aleemi* Akhtar. Soldier major. Head and thorax, in dorsal view.

Distribution : INDIA : *Arunachal Pradesh* : Itanagar (Lake Ganga); Bame village, Siang Div.; Along, West Siang; Lemeking and Nacho, upper Subansiri. *Elsewhere* : BANGLADESH (Ukhia; type locality). New record for India.

24. *Macrotermes khajuriae* Roonwal and Chhotani

1962. *Macrotermes khajuriae* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 329–334.

1985. *Macrotermes khajuriae* : Chhotani and Bose, *Rec. zool. Surv. India*, **82** : 58.

Material : S. major, S. minor and W. *Meghalaya* : Barapani, Shillong, 17 i. 1967 and Lower Mawprem, 24. iv. 1968, R. K. Varshney; Tura Peak (Garo Hills), A. S. Rajagopal, 27. ii. 1965. *Arunachal Pradesh* : Sirum Bridge, Kumbung (West Siang Dist.), S. K. Tandon and G. S. Arora, 14. x. 1966; New Jinning, Tarak villge, S. K. Tandon and G. S. Arora, 18.x.1966;

New Jinning (200 m, West Siang Dist.) and Road to Along, 19. x. 1966 (2 vials) and 20.x.1966 (1 vial); Denling Forest (229 m, Kameng Dist.), A. N. T. Joseph, 5. v. 1966; Miao Reserve Forest Tirap Dist., S. Biswas, 1. xii. 1982 (2 vials); Kimin, (Lower Subansiri Dist.), O. B. Chhotani, 17. v. 1989 (4 vials), "wood" Mizoram : Fwipak, H. C. Ghosh, 27.i.1987.

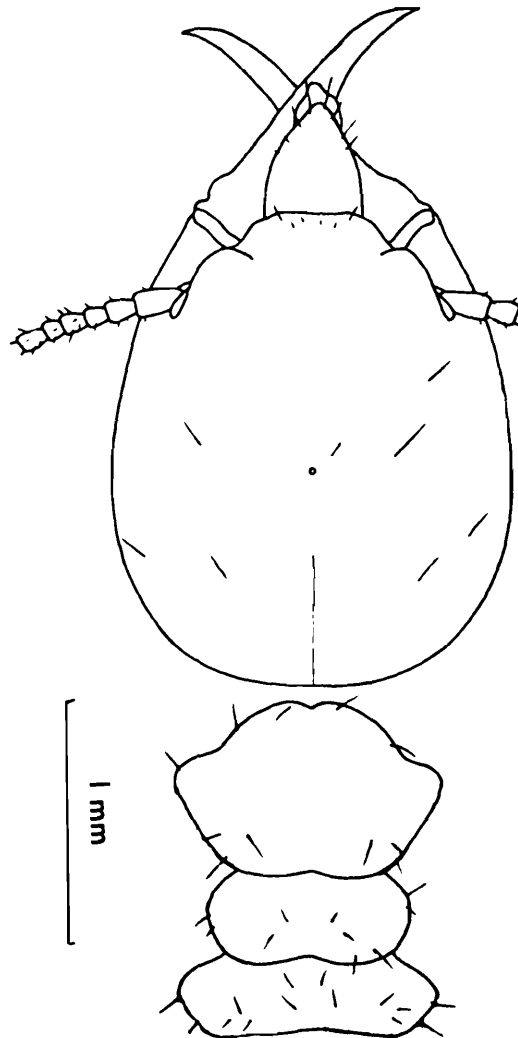


Fig. 28 *Macrotermes aleemi* Akhtar. Soldier minor. Head and thorax, in dorsal view.

Measurements (in mm), etc :	Soldiers Major (5 exs)		Soldiers Minor (5 exs)	
Total body-length c	9.00	– 9.45	4.95	– 5.00
Length of head to base of Mandibles	3.50	– 3.75	1.80	– 1.85
Max. width of head	2.85	– 2.93	1.45	– 1.50
Length of mandibles	1.60	– 1.70	1.20	– 1.25
Occipito–fontanelle distance	2.00	– 2.10	0.85	– 0.86
Length of pronotum	1.00	– 1.10	0.65	– 0.72
Max. width of pronotum	1.78	– 2.00	1.00	– 1.10
No. of antennal segments	17		16	

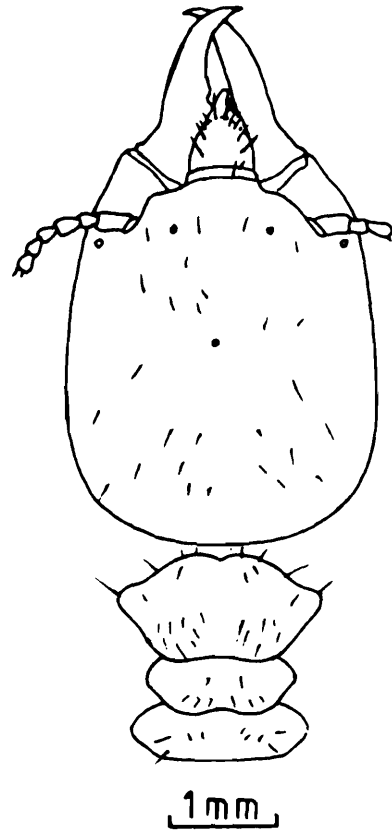


Fig. 29 *Macrotermes khajuriai* Roonwal and Chhotani. Soldier major. Head and thorax, in dorsal view.

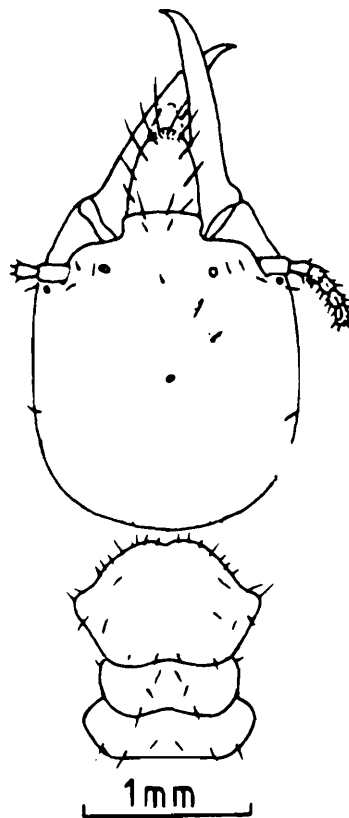


Fig. 30 *Macrotermes khajuriai* Roonwal and Chhatani. Soldier minor. Head and thorax, dorsal view.

Distribution : INDIA : *Meghalaya* (Barapani, Lower Mawprem, Tura Peak and Umsa Nongkharai – type-locality). *Arunachal Pradesh* : As above, under “Material”, West Siang, Tirap and Lower Subansiri Dists. *Elsewhere* : BHUTAN.

25. *Macrotermes serrulatus hopini* Roonwal and Sen-Sarma

1956. *Macrotermes serrulatus hopini* Roonwal & Sen Sarma, *Indian J. Agric. Sci.*, **26** (1) : 15–21.

1979. *Macrotermes serrulatus hopini*, Sen Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 23–24, 49.

Material : *Manipur* : S. minor and W., Moreh (Lockchou River bank, South Dist.), P. T. Cherian, 22. ii. 1975; S. minor, Langor, Imphal, S. Singsit, 31. v. 1990; S. major and minor and W., Laithung Ching, 4 km. from Imphal, Huri Golmai, 31. v. 1990, ex. bamboo. *Tripura* : S. minor and W., Jaduram Bari Beat, Abhanga, North Tripura, G. K. Srivastava, 1. iii. 91, ex “under rotten log embedded in soil. On being disturbed, soldiers seen picking nymphs in jaws” S. major, S. minor and W., Khowai (West Tripura) G. K. Srivastava, 4. iii. 91, ex “under bark of rotten wood” (3 vails).

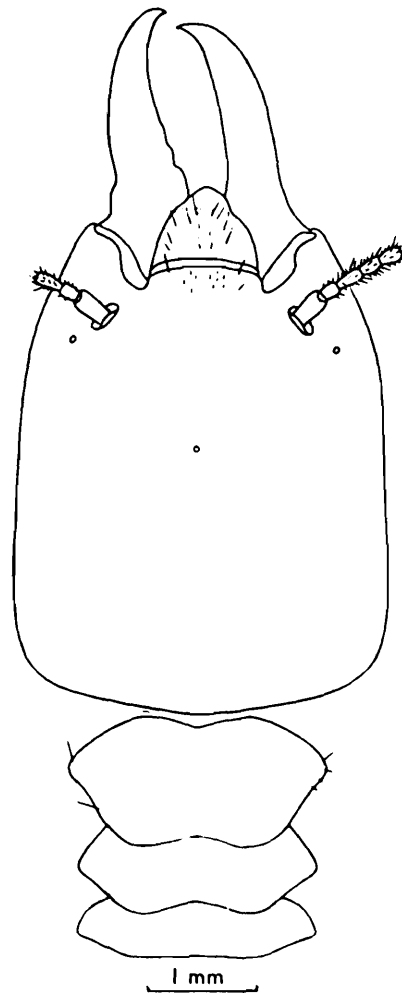


Fig. 31 *Macrotermes serrulatus hopini* Roonwal and Sen-Sarma. Soldier major. Head and thorax, in dorsal view.

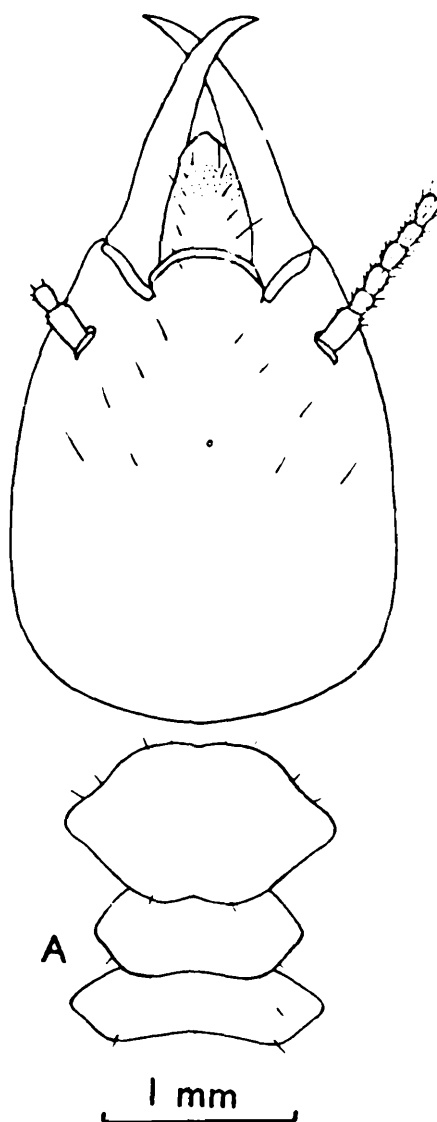


Fig. 32 *Macrotermes serrulatus hopini* Roonwal and Sen-Sarma. Soldier minor. Head and thorax, in dorsal view.

<i>Measurements (in mm), etc :</i>	Soldiers Major (4 exs)	Soldiers Minor (5 exs)
Total body-length c	11.0 – 11.30	6.90 – 7.40
Length of head to base of mandibles	4.30 – 4.35	2.40 – 2.60
Max. width of head	3.53 – 3.65	2.05 – 2.10
Length of mandibles	2.05 – 2.15	1.45 – 1.50
Occipito-fontanelle distance	2.28 – 2.48	1.60 – 1.70
Length of pronotum	1.20 – 1.28	0.80 – 0.85
Max. width of pronotum	2.30 – 2.35	1.38 – 1.43
No. of antennal segments	17 (3rd segment larger than 2)	16 (2nd segment larger than 3)

Distribution : INDIA : North-eastern India : Manipur : Moreh; Langor, Imphal; Laithung Ching (near Imphal). Tripura : Jadurambari Beat, Abhanga, North Tripura Dist., Khowai, West Tripura Dist., Ambasa, North Tripura Dist; Belonia and Paratia, South Tripura Dist. Elsewhere : BURMA. (Hopin, Myitkyina Dist., Upper Burma, type-locality).

Genus 14. *Odontotermes* Holmgren

26. *Odontotermes adampurensis* Akhtar

1975. *Odontotermes adampurensis* Akhtar, *Bull. Dept. Zool. Univ. Punjab (N. S.)*, Art. 7 : 70, 71-73.

Material : S., W. Assam : Bongaigaon, Goalpara Dist., S. K. Gupta, 9. xi. 1974. Meghalaya : Mawphlong, S. K. Gupta, 21. x. 1974. Arunachal Pradesh : Deban, Miao and Hornbill (Namdapha Reserve Forest, Tirap Dist.) S. Biswas, 8. iv. 1981 and 11. iv. 1981, respectively; Miao Namdapha, S. Biswas, 30. xi. 1982; Nambung, 7 kms from Zero to Boleng (East Siang Dist), T. K. Pal, 23. ii. 1989. Tripura : Ambassa, V. C. Agarwal and party, 1. i. 1973.

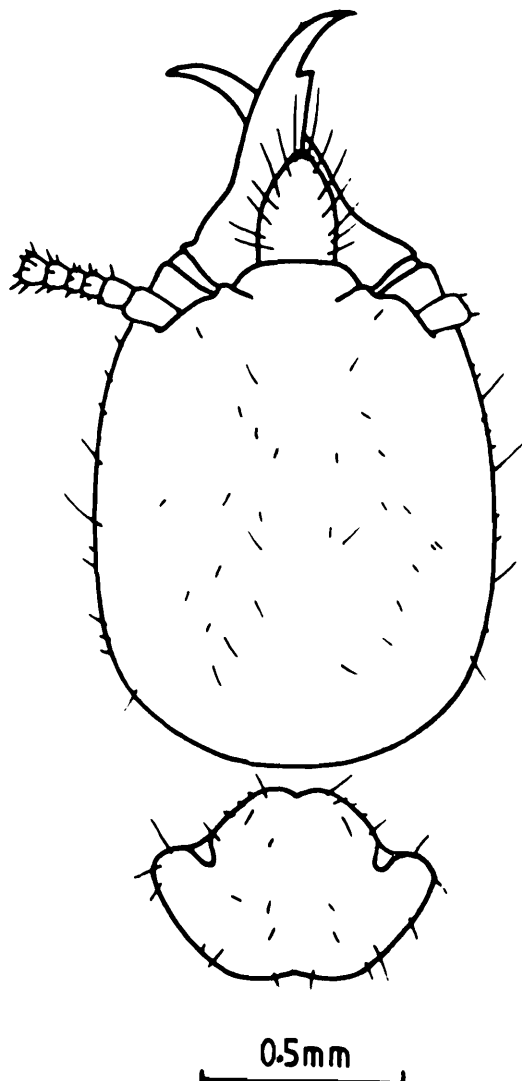


Fig. 33 *Odontotermes adampurensis* Akhtar. Soldier. Head and pronotum in dorsal view.

Measurements (in mm), etc : Soldier (5 exs) :

Total body-length c	5.00 – 5.10
Length of head to base of mandibles	1.18 – 1.30
Max. width of head	0.97 – 1.06
Length of mandibles	0.68 – 0.73
Tooth–distance of left mandible from tip	0.19 – 0.21
Length of pronotum	0.42 – 0.45
Max. width of pronotum	0.71 – 0.73
No. of antennal segments	16 (4th shortest)

Distribution : INDIA : *North-eastern India* : Assam, Meghalaya and Arunachal Pradesh and Tripura as under Material above. New record for India. *Elsewhere* : BANGLADESH : Adampur–type–locality, Kaptai and Srimangal.

27. *Odontotermes assmuthi* Holmgren

1913. *Odontotermes (Odontotermes) assmuthi* Holmgren, *J. Bombay nat. Hist. Soc.*, **32** (1) : 112–113.

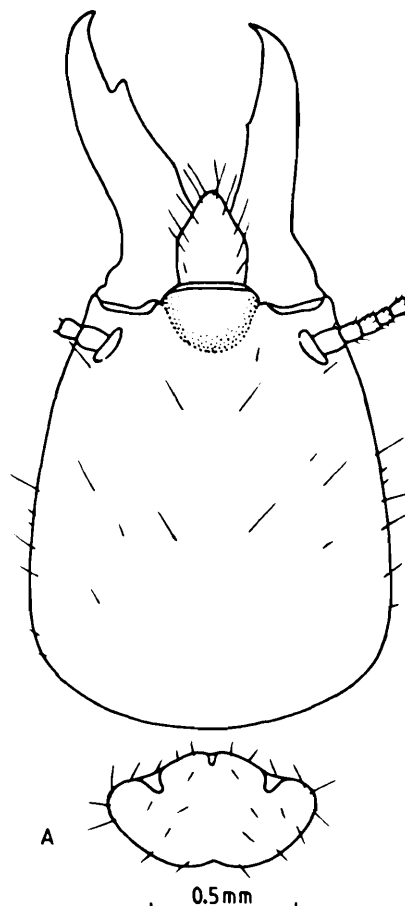


Fig. 34 *Odontotermes assmuthi* Holmgren. Soldier. Head and pronotum, in dorsal view.

Material : S. W., Near Moreh Forest Office (Manipur)

Measurements (in mm), etc : Soldier (1 ex)

Total body-length	4.48
Head length to base of mandibles	1.50
Max. width of head	1.25
Length of pronotum	0.40
Max. width of pronotum	0.72

Distribution : INDIA : North-eastern India : Manipur : Moreh, new record from N. E. India. *Elsewhere* : It is a widely distributed species in India and is also recorded from Pakistan (single record) and Bangladesh.

28. *Odontotermes feae* (Wasmann)

1896. *Termes feae* Wasmann, *Ann. Mus. Stor. nat. Genova*, (2) 16 : 625 – 626.
 1962. *Odontotermes feae*; Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 296, 337 – 339.
 1976. *Odontotermes feae*; Chhotani, *Newsl. zool. Surv. India*, 2 (1) : 12.
 1977. *Odontotermes feae*; Lahiri, Ghosh and Biswas, *Bull. Megh. Sci. Soc.*, 2 : 37.
 1979. *Odontotermes feae*; Sen-Sarma and Thakur, *Indian For. Rec. (N. S.) Ent.*, 13 (1) : 5, 24–25.
 1980. *Odontotermes feae*; Lahiri and Ghosh, *Rec. zool. Surv. India*, 76 : 67.
 1984. *Odontotermes feae*; Verma, *Indian J. Forestry*, 7(1) : 82.
 1985. *Odontotermes feae*; Chhotani and Bose, *Rec. zool. Surv. India*, 82 : 58.

Material : S. and W. Assam : Sonai Rupai Forest (Darrang Dist.), K. C. Jayaramakrishnan, 28, ii. 1961; and S. K. Bhattacharyya, 28-30. xi. 1965 (2 vials); Kaziranga, S. K. Tandon, 24–25. ii. 1969 (2 vials); Sadiya, S. K. Tandon, 1. iii. 1969; Puma Lacka (Dibru Res. Forest, Lakhimpur Dist.), A. K. Mukherjee, 23. ii. 1961; Kaziranga Res. Forest, T. Sengupta 14. xi. 1974. Meghalaya : Barapani near Shillong, R. K. Varshney, 17. i. 1967, 24. vi. 1967 and 6. iv. 1968 (3 vials) and G. K. Srivastava, 21. v. 1979; on Road from Mawsamai to Shella, G. K. Srivastava, 26. v. 1979; Umsing, Shillong, S. Biswas, 8. vii. 1963 (2 vials) and M. R. Rynth, 29. viii. 1963; Shillong (Botanical Garden), B. K. Tikader, 28. x. 1965; Lalchand Basti, Shillong, V. D. Srivastava, 26. iv. 1963; Umnan, R. K. Varshney, 28. vi. 1967; Tintinkar Tura, S. K. Gupta, 17. x. 1974; Dainadubi Res. Forest and Tura (Garo Hills), T. Sengupta, 18.xi.1974 and 23.xi.1974; Balphakram National Park, West Garo Hills, J.R.B. Alfred, 20. ii. 91. Arunachal Pradesh; Tipi, Bhalukpong (Kameng Dist.), A. N. T. Joseph, 3. v. 1966; Khonsa (Tirap Dist.) C. B. Srivastava, 8. i. 1962 and Miao, Tirap Dist., 26. i. 1962; Miao, Tirap Dist., S. Biswas, 30. xi. 1982 – 2. xii. 1984 (4 vials); Manabhum, Tengapani Forest Namsai, S. K. Tandon,

15. iii. and 17. iii. 1969 (3 vials); Changlong, (Changlong Dist.), *C. B. Srivastava*, 11. i. 1962; On road to Yazalli, (Lower Subansiri Dist.), *S.K. Gupta* and *M. Prashad*, 30. x. 1981; Zorom, Lower Subansiri, *T. K. Pal*, 1989; Lake Ganga, Itanagar and Kimin (Lower Subansiri) *O. B. Chhotani*, 15. v., 16. v., and on road from Kimin to Ziro (2 vials) *O. B. Chhotani*, 17. v. 1989; Dehan, 27 km east of Miao and Gibbons Land, 16 km. east of Miao, Tirap Dist., *S. Biswas*, 10. xii – 27. xii. 1982 (5 vials); Wakro, Lohit Dist., 1. xii. and 3. xii. 1969 (2 vials), Alu Bari, 23. xi. 1969 and Chowkham, 22. xi. – 27. xi. 1969 (3 vials) all *J. M. Julka*; Denbe Tezu, Lohit Dist., *S. K. Gupta* and *Y. N. Gupta*, 23. i. 1983, Rani (14 kms from Pasighat), East Siang Dist., *T. K. Pal*, 17. ii. 1989. *Nagaland* : Dimapur, *G. Bose*, 3. vi. and 5. vi. 90 (6 vials);

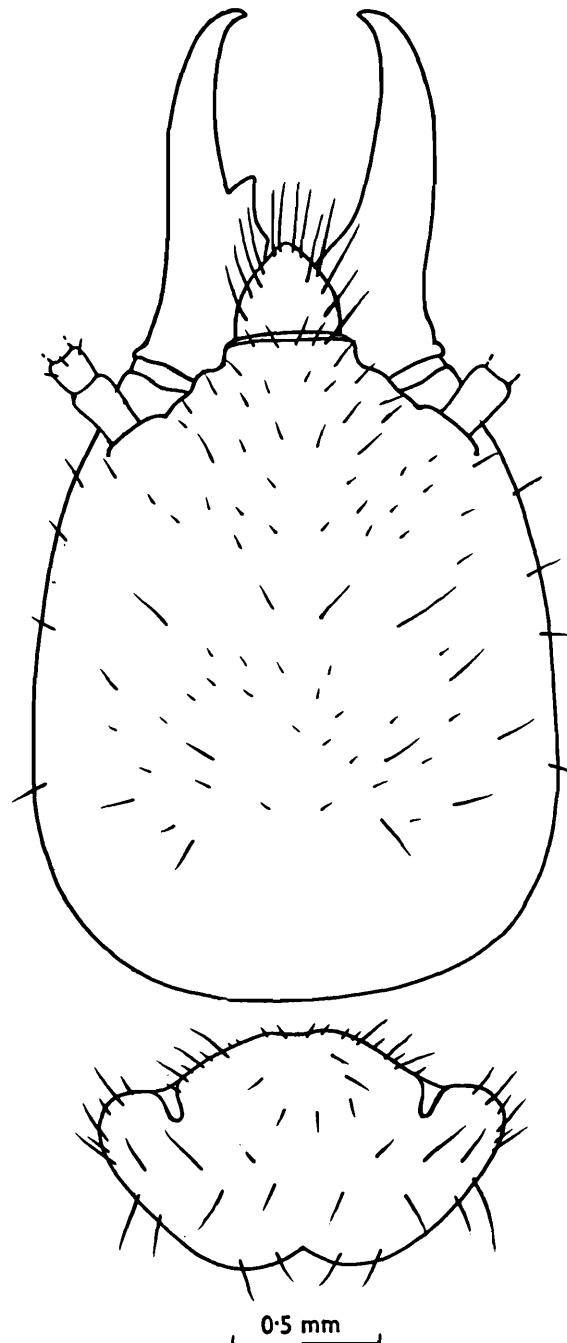


Fig. 35 *Odontotermes feae* (Wasmann). Soldier. Head and thorax, in dorsal view. (After Roonwal and Chhotani 1962 a).

Chumukedima, 14 kms from Dimapur on road to Kohima, *G. Bose*, 4. vi. 1990, (2 vials); Rangapahar Reserve Forest, *G. Bose*, 5. vi. 1990 (5 vials) *Manipur*: Moreh, Lockchou river bank, South Dist., *P. T. Cherian* 22. ii. 1975; Ukhral, East Dist., *P. T. Cherian*, 4. iii. 1975 (2 vials); Imphal, *G. Bose*, 30. v. 1990; Mahabali, Imphal, *G. Bose*, 1. vi. 1990, ex mound in a hut"; Swangbung, 12 kms east of Imphal, *G. Bose*, 31. v. 1990 (6 vials); Tarung 5 kms from Imphal, *Napatlak Gangubi*, 1. vi. 1990; Thungmeiband, Imphal, *Huri Golmei*, 31. v. 1990; ditto, Laimanai village 5 kms from Imphal on road to Langor; Langor, *S. Singsit*, 1. vi. 1990. *Mizoram* : Fwipak, *H. C. Ghosh*, 27. i, 1987; Aizwal (Zoo gardens), *G. Bose*, 27. v. 1990; Durtlong, about 12 kms from Aizwal, *G. Bose*, 28. v. 1990 (3 vials). *Tripura* : Mongaibari, 6. ii. 1991, ex under bark of dead tree; Agartala, Kunjban, Dist. Agartala, *G. K. Srivastava*, 19. ii. 1991; Kolabagan, Agartala, alt. 75 m., West Tripura, *G. K. Srivastava*, 20. ii. 1991 ex soil; Salema, 200 m., North Tripura, *G. K. Srivastava* 28. ii. 1991 ex rotten banana stem; Jadurambari beat (Abhanga) North Tripura, *G. K. Srivastava*, 1. iii. 1991; Khowai, West Tripura *G. K. Srivastava*, 4. iii. 1991 ex "under bark of rotten wood" also Ambassa Forest, North Ganganagar, Kanchanpur, Kurigmura (Teliamura), *V. C. Agarwal and Party*, Jan. 1973.

Measurements (in mm), etc : Soldier (30 exs) :

Total body-length c	6.00 – 8.50
Length of head to base of mandibles	2.25 – 3.10
Max. width of head	1.80 – 2.50
Left mandible length	1.20 – 1.64
Tooth distance from tip (left mandible)	0.60 – 0.83
Length of pronotum	0.75 – 1.00
Max. width of pronotum	1.40 – 1.83
No. of antennal segments	17

Distribution : INDIA : *North-eastern India* : Widely distributed throughout the region. Also; West Bengal, Bihar, Orissa, Karnataka, Tamil Nadu. *Elsewhere*. BHUTAN, BANGLADESH, NEPAL, BURMA, THAILAND.

29. *Odontotermes ganpati n. sp.**

Material : One vial with S. only, Messamari Tea Estate, Assam, *G. S. Roonwal* (GS/ 31.v.61), 31.v.61, from a mound of *Odontotermes* (found mixed with a collection of *Odontotermes obesus* from a mound now separated.)

Distribution : IMAGO : Unknown.

SOLDIER (Fig. 36) : Head yellowish brown to brown; antennae uniformly pale brown;

* Named after Shri Ganpat Singh Roonwal, the collector.

labrum of same colour as head; mandibles dark brown, basally yellowish brown; body and legs creamy yellow; pronotum, meso- and metanotum yellowish with brown patches medially. Head moderately and body and legs fairly densely hairy. Total body-length 6.10 – 6.40 mm. Head-capsule broadly oval, longer than broad; broadest in middle from whence weakly converging in front; max. width one-and-a-half times the min. width; length about 1.2 of max. width. Fontanelle indistinct. Eyes and Ocelli absent. Clypeus trapezoidal, separated from frons by a faint semicircular suture; divided into an apilose, semi-hyaline anteclypeus and postclypeus of same colour as head, having a long hair on either side. Labrum broadly tongue-shaped with rounded anterior margin; with two pairs of long hairs at anterior margin and three or four pairs of somewhat shorter ones and a few minute hairs on body. Antennae with 17 segments; segment

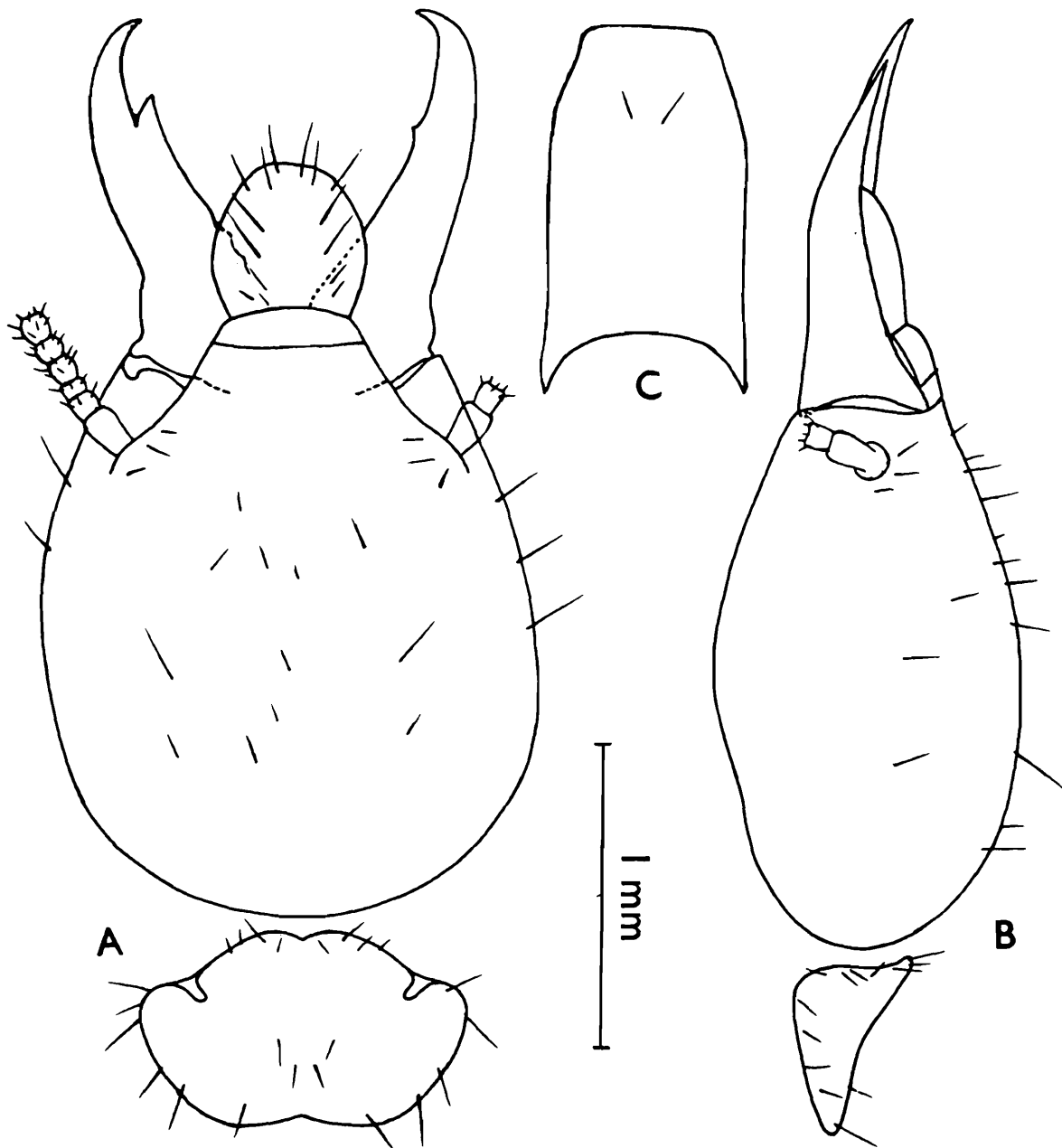


Fig. 36 *Odontotermes ganpati* n. sp. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Postmentum.

3 shortest; 4 longer than 5, latter slightly longer than 3; 6–8 gradually increasing in length; 9 onwards subequal; last ovate. Mandibles thick, stout and short; only a little longer than half of head-length without mandibles (index mandible-length / head length 0.546–0.590). Left mandible with a prominent, acute angled tooth at distal third, tooth index i.e. tooth-distance/mandible-length 0.28–0.32. Right mandible with a minute tooth a little below the corresponding tooth of left mandible. Postmentum subrectangular; sides weakly convex and converging weakly in distal one-third; anterior margin substraight; posterior margin incurved. Pronotum saddle-shaped; wider than long (index length/width 0.509–0.550) and narrower than head; anterior margin with a prominent median notch; posterior margin weakly incurved. Mesonotum narrower and metanotum slightly wider than pronotum; both with weakly incurved posterior margins. Legs stout and pilose; apical tibial spurs 3 : 2 : 2; tarsi 4-jointed. Abdomen oblong, fairly densely hairy; cerci 2-jointed, 0.175 mm long; styli single-jointed, 0.10 mm long.

<i>Measurements (in mm) etc :</i>	Range (5 exs)	Holotype
Total body-length c	6.10 – 6.40	6.40
Length of head with mandibles	2.80 – 2.90	2.80
Length of head to base of mandibles	1.78 – 1.87	1.87
Max. width of head	1.55 – 1.65	1.55
Width of head at base of mandibles	1.00 – 1.03	1.00
Max. height of head	0.85 – 0.95	0.95
Head-index (max. width/head-length to base of mandibles)	0.829 – 0.90	0.829
Head-index (width at base of mandibles/max. width)	0.624 – 0.645	0.645
Length of mandibles : Left	1.05 – 1.08	1.07
Right	1.03 – 1.10	1.05
Mandible-head length index (left mandible-length/head length to base of mandibles)	0.546 – 0.590	0.572
Left mandible tooth-distance from tip	0.30 – 0.35	0.30
Left mandible-tooth index (tooth distance/mandible-length)	0.280 – 0.324	0.280
Length of labrum	0.40 – 0.48	0.40
Max. width of labrum	0.35 – 0.50	0.50
Median length of postmentum	1.00 – 1.08	1.00
Max. width of postmentum	0.58 – 0.60	0.58
Width of postmentum at distal end	0.35 – 0.38	0.35

<i>Measurements (in mm), etc :</i>	Range (5 exs)	Holotype
Length of pronotum	0.55 – 0.65	0.55
Max. width of pronotum	1.00 – 1.08	1.03
Pronotum-head-width index	0.633 – 0.675	0.665
Pronotum index (length/width)	0.509 – 0.550	0.534

Type specimens : Holotype soldier (Z. S. I. Reg. No) and paratype soldiers (12) (Z.S.I. Reg. No.) in National Zoological Collections, Z. S. I., Calcutta.

Type-locality and Distribution : Mesamari Tea Estate, Assam, type locality. Known only from the type-locality.

Affinities : The soldier of *Odontotermes ganpati* has an oval head and tooth of mandible in distal third. On the basis of this *O. ganpati* can be referred to *O. obesus* group but can be separated for having uniformly coloured antennae and for its much larger size. It is, however, close in size to *O. brunneus* from which it is separable for having broadly oval head (vs. rectangularly oval) and shorter, thicker and less incurved mandibles and for its labrum having a broadly rounded anterior margin (vs. less so rounded in *O. brunneus*).

30. *Odontotermes giriensis* Roonwal & Chhotani

1962. *Odontotermes giriensis* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 296, 341–345.

1977. *Odontotermes giriensis*; Lahiri, Ghosh and Biswas, *Bull. Megh. Sci. Soc.*, 2 : 37.

1979. *Odontotermes giriensis*; Sen-Sarma and Thakur, *Indian. For. Rec. (N.S.) Ent.*, 13 (1) : 6, 35, 26.

Material : Im. S. W., Meghalaya : Shillong, S. Subhani 25. vi. 1961, S. N. Prashad, Jan, Feb., July 1961 (6 vials) R. K. Varshney, 13 and 14. iv. 1967 and B. K. Tikader, 6. vii. 1967; Pynursula, B. K. Tikader, 18. i. 1966 and 28. i. 1966; Mawphlong, S. Biswas, 10 and 12. ix. 1963, 5 and 6. x. 1963 and 16. iv. 1964; G. Bose, 8. vi. and 9. vi. 1990 (4 vials) and V. D. Srivastava 15 and 25. vii. 1963 and 6. viii. 1963; Cherrapunji, B. K. Tikader 10. xi. 1965; Laikat, Khasi and Jaintia Hills, R. K. Varshney 4. vi. 1967; Panda Baghmari Road, (Garo Hills) A. S. Rajagopal 2. iii. 1965. Arunachal Pradesh : Kalaktang, West Kameng, K. C. Jayaramakrishnan, 14. v. 1961; Butt and Salari, S. Biswas 5 – 8. vii and 10. vii. 1961 (4 vials); Dali and Pading, West Siang (2 vials); Daporigo (2 vials); Likhali (3 vials), Peyring Kambung, all S. K. Tandon and G. S. Arora, Oct. 1966; Pamir Bridge and Tamen, Lower Subansiri, A. N. T. Joseph, 17. v. 1966 and 20. v. 1966; Basar village, West Siang, P. T. Bhutia 6. xii. 1988; On way to Maru, Upper Subansiri, 25. x. 1981 (2 vials); Pasmer, Garu and Likhali Oct 1981 (3 vials) Baskham village and Tamen, Lower Subansiri all S. K. Gupta and Mahavir Prashad, Oct. 1981; Subansiri River near Taliba, 19. xi. 1974; Vidak 8. 1. 1975 and Siki, 15 km. from Taliba 19. xi. 1974;

Vidak, 8. i. 1975 and Siki, 15 km. from Taliba 24. x. 1974, Lower Subansiri, and Serum, 25. xi. 1974; Nacho River 28. xi. 1974; Upper Subansiri all Coll. *J. M. Julka*. Miao Res. Forest, Namdapha, *S. Biswas*, 1. xii. 1982 (2 vials), Tirap Dist., Lohitpur Road, Lohit Dist., *S. K. Tandon*, 13. iii. 1969; Abdul Nalla, 10 km. from Yazalli, *T. K. Pal*, 15. ix. 1988; Lake Ganga, Itanagar, *O. B. Chhotani*, 15. v. 1989. *Manipur* : Churachandpur, *P. T. Cherian*, 17. xi. 1975.

Description : The hitherto unknown imago of this species is described here from a collection from Shillong, Meghalaya, mentioned above under 'Material'

IMAGO (Fig. 37) : Head dark reddish brown; postclypeus, antennae and legs brownish yellow; pronotum slightly paler than head and with a pale T-mark and shoulder spots; abdominal

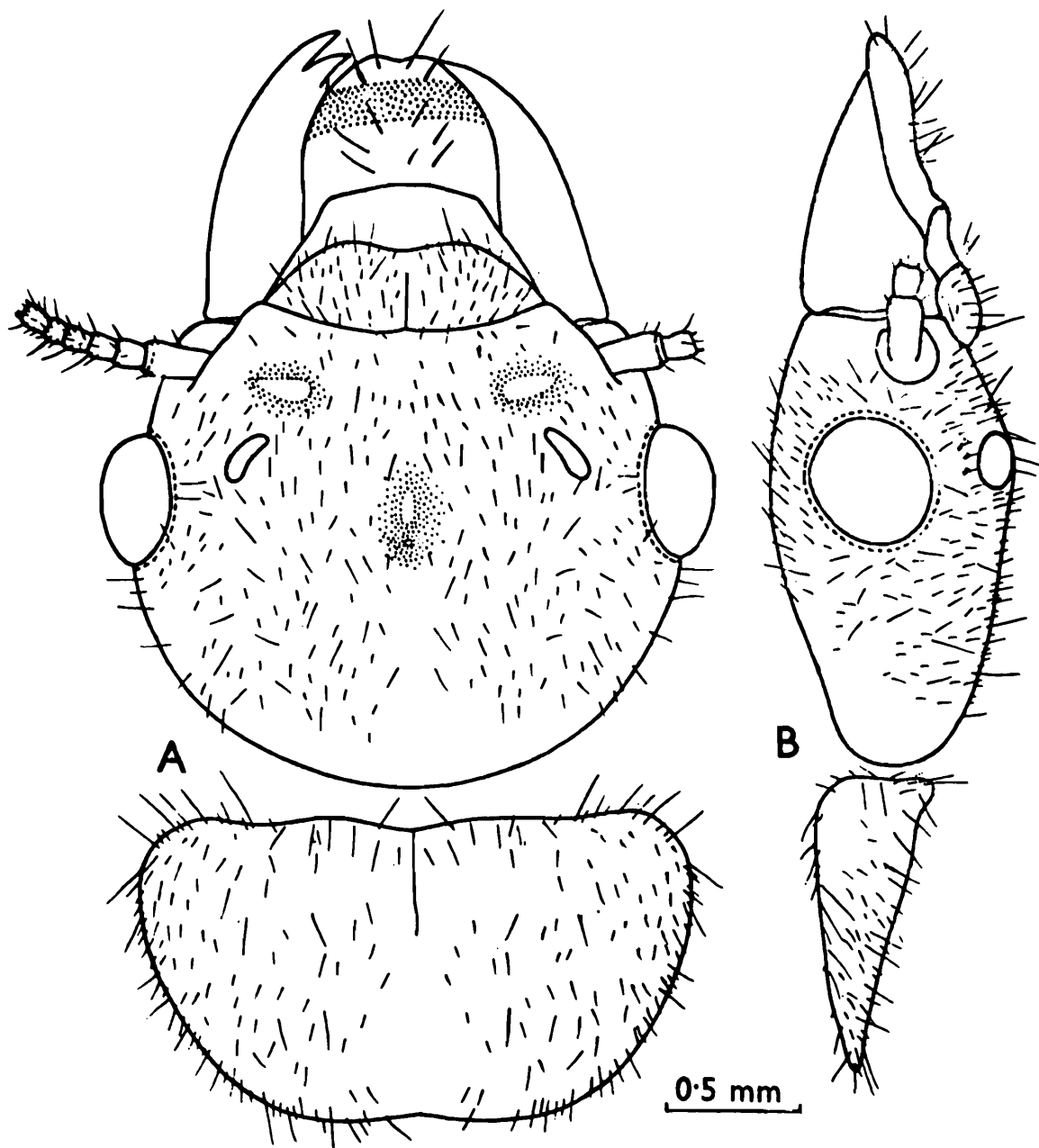


Fig. 37 *Odontotermes giriensis* Roonwal and Chhotani. Imago. (A) Head and pronotum, in dorsal view. (B) Ditto, side view.

tergites pale-reddish brown, sternites paler; wings pale brownish, hairy along costal margin and weakly so in distal half of membrane and on lower margin. Head and body densely hairy. Total length with wings c. 27.0 – 28.0; without wings c 10.3 – 10.6 mm.

Head capsule subcircular, depressed in region of fontanelle; length to base of mandibles less than maximum width with eyes. Fontanelle minute, situated medially, very slightly raised. Eyes subcircular, slightly longer than wide (maximum diameter 0.53 – 0.55; minimum diameter 0.45 – 0.50 mm). Ocelli broadly oval, (maximum diameter 0.23 – 0.25; minimum diameter 0.20 mm) situated at a distance of their long diameter or a little more away from antennae and the eyes (eye-ocellus distance 0.25 – 0.32, ocellus antennal distance 0.26 – 0.33 mm). Antennae with 19 – 20 segments; segment 3 slightly smaller than 2, 4 slightly smaller than 3, 5 slightly smaller than 4, shortest; from 6 onwards gradually increasing in length; rest subequal. Postclypeus very weakly swollen, pilose, length much less than half of width (length 0.30 – 0.35; width 0.90 – 0.95 mm). Anteclypeus trapezoidal hyaline, apilose. Labrum broader than long, with a pale brownish transverse band, hairy near anterior margin and on body. Mandibles of *Odontotermes* type. Pronotum wider than long and narrower than head; anterior margin weakly incurved medially; posterior margin weakly invaginated. Meso- and metanotum broadly and angularly invaginated. Legs elongate., hairy, apical tibial spurs 3:2:2; tarsi 4-jointed. Wings : Fore wings little longer than hind wings. Costa thick; subcosta short joining costa just outside scale in forewing, absent in hind wing; radius running parallel and close to Costa + Subcosta; radial streak separating at about middle of wing length; media and cubitus coming out jointly from scale and separating a little outside scale in forewing and media coming out of radius near scale in hindwing; radius sometimes with 1 or 2 short branches near tip; media running upto distal tip with 4 – 5 branches to posterior margin and sometimes bifurcating a little beyond the scale and sometimes with a branch or two running upto radius. Abdomen oblong, hairy; cerci 2-jointed, c 0.25 mm. long; styli in male finger – like, single jointed, c 0.13 mm. long.

Measurements (in mm), etc. Imago (Range 3 exs) :

Total body-length with wings	27.0	–	28.0
Total body-length without wings	10.30	–	10.60
Length of head to tip of labrum	2.50	–	2.90
Length of head to base of mandibles	1.80	–	1.90
Max. width of head with eyes	2.30	–	2.40
Max. diameter of eye	0.53	–	0.55
Min. diameter of eye	0.45	–	0.50
Max. diameter of ocellus	0.23	–	0.25
Min. diameter of ocellus	0.20		
Eye-ocellus distance	0.25	–	0.32

Measurements (in mm), etc. Imago (Range 3 exs) :

Ocellus - antennal distance	0.26	-	0.33
Length of postclypeus	0.30	-	0.35
Width of postclypeus	0.90	-	0.95
Length of labrum	0.65	-	0.73
Width of labrum	0.70	-	0.80
Length of pronotum	1.20	-	1.25
Width of pronotum	2.13	-	2.15
Length of forewing with scale	23.50	-	24.00
Length of forewing scale	1.20		
Length of hindwing with scale	22.50	-	23.50
Length of hindwing scale	1.00	-	1.05
Soldier (15 exs.) :			
Total body-length	4.50	-	5.00
Length of head to base of mandibles	1.20	-	1.25
Max. width of head	1.15	-	1.18
Length of mandibles	0.72	-	0.76
Length of pronotum	0.50	-	0.58
Width of pronotum	0.80	-	0.85
No. of antennal segments	15	-	16

Distribution : It is quite a widely distributed species in Assam, Meghalaya, Arunachal Pradesh, Tripura and Manipur. Also reported from Kumaon Hills and Doon valley, Uttar Pradesh and Orissa (Thakur, 1981). *Elsewhere* : BANGLADESH.

31. *Odontotermes horai* Roonwal and Chhotani

1962. *Odontotermes horai* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 296, 346-349.

Material : S. and W. Meghalaya : Rongrengiri, Garo Hills, H. Khajuria, 17. i. 1957; Shillong, V. D. Srivastava 13. iii. 1963; Barapani, R. K. Varshney, 17. i. 1967 and 30. iv. 1968 (2 vials) and G. Bose, 10. vi. 1990 (1 vial).

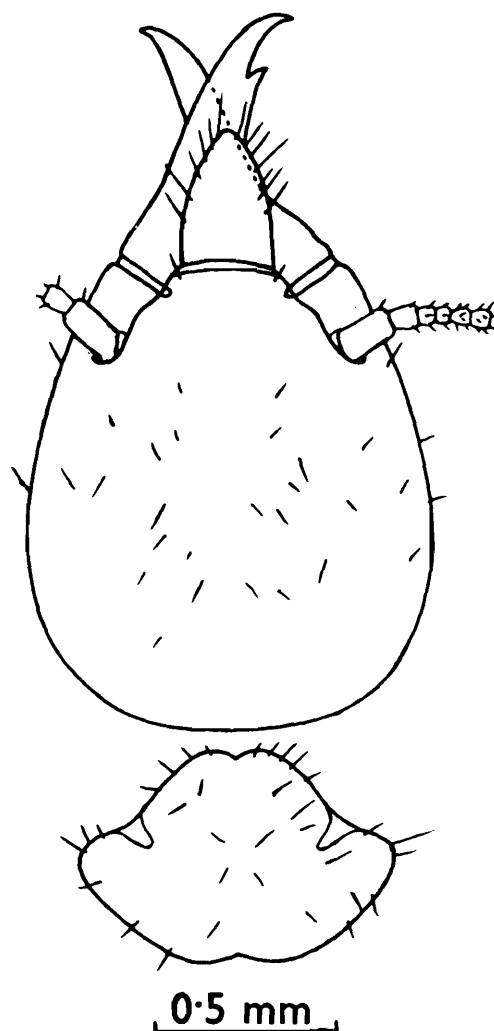


Fig. 38 *Odontotermes giriensis* Roonwal and Chhotani. Soldier. Head and pronotum, in dorsal view.

Measurements (in mm), etc : Soldier (5 exs) :

Total body length c	5.00 – 5.88
Length of head to base of mandibles	1.75 – 1.83
Max. width of head	1.40 – 1.43
Length of left mandible	1.08 – 1.13
Tooth–distance from tip (Left mandible)	0.68 – 0.73
Length of pronotum	0.60 – 0.62
Max. width of pronotum	0.98 – 1.00
No. of antennal segments	16 (4th shortest)

Distribution : INDIA : North-eastern India : Meghalaya (Shillong, Barapani, Nong-Priang stream Bank - type locality, Rongrengiri). Nagaland (Dimapur). Also West Bengal and Uttar Pradesh. *Elsewhere* : NEPAL and PAKISTAN.

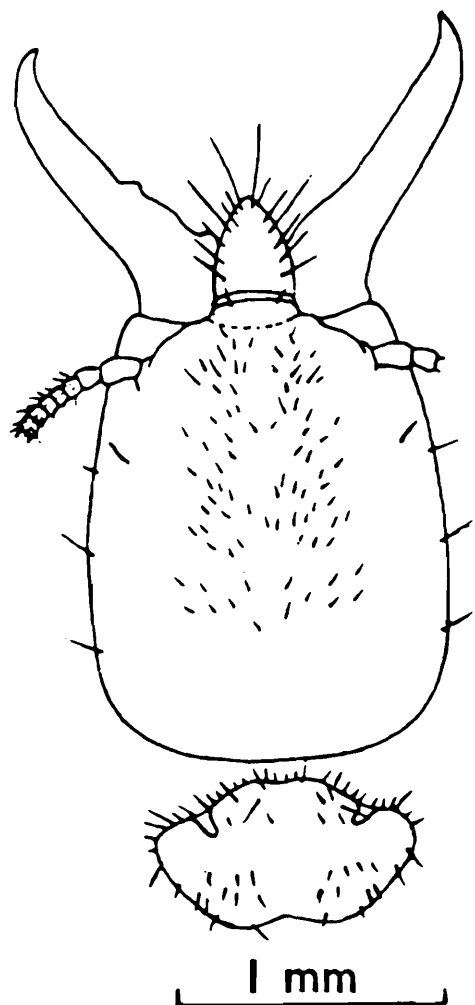


Fig. 39 *Odontotermes horai* Roonwal and Chhotani. Soldier. Head and pronotum, in dorsal view.

32. *Odontotermes kapuri* Roonwal and Chhotani

1962. *Odontotermes kapuri* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 296, 352 – 356.

Material : S. and W. Meghalaya : Mawphlong, G. Bose, 9. vi. 1990 (3 vials); Nakrek, Balphakram, West Garo Hill, J. R. B. Alfred, 25. ii. 1991.

Measurements (in mm), etc : Soldier (10 exs) :

Total body-length c	4.60 – 4.90
Length of head to base of mandibles	1.58 – 1.60
Max. width of head	1.30 – 1.38
Length of left mandible	0.84 – 0.85
Tooth-distance from tip (left mandible)	0.20 – 0.20
Length of pronotum	0.58 – 0.65
Max. width of pronotum	1.00 – 1.03
No. of antennal segments	17 – (3 shortest subequal to 5)

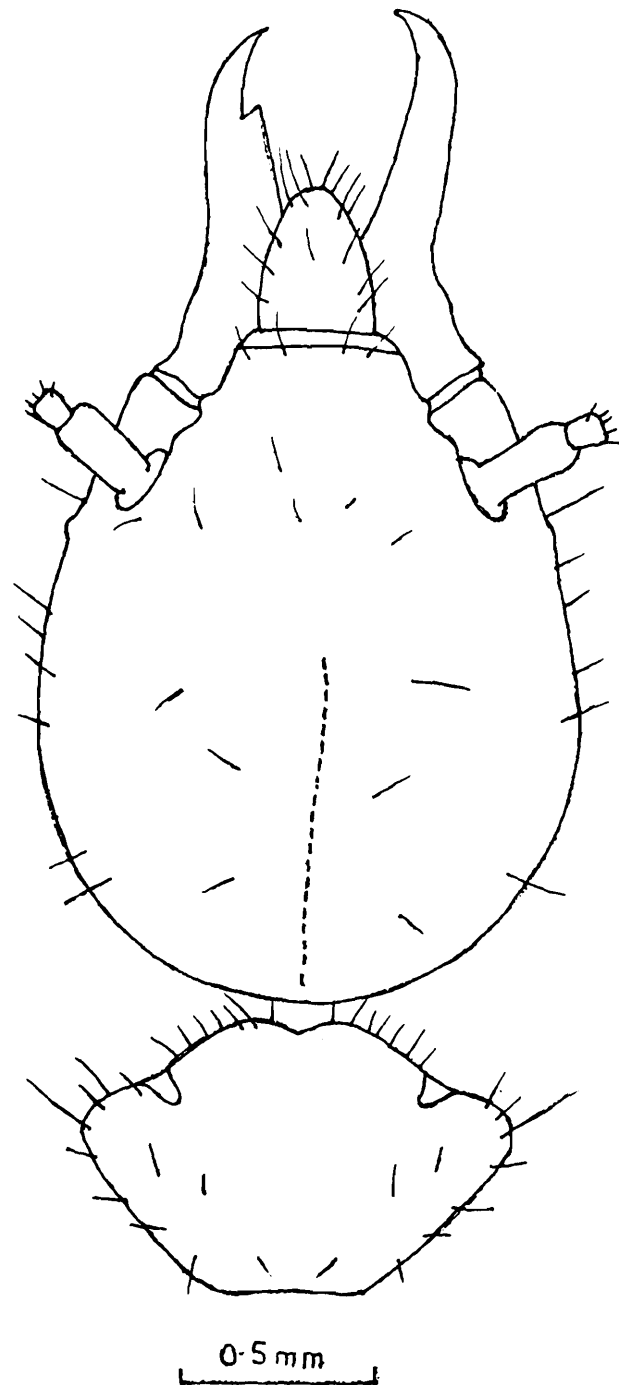


Fig. 40 *Odontotermes kapuri* Roonwal and Chhotani. Soldier. Head and thorax, in dorsal view.

Distribution : INDIA : *North-eastern India: Meghalaya* : Cherrapunji-type-locality and Mawphlong. Tripura : Ambasa, Tiliamura, *Elsewhere* : BHUTAN.

33. *Odontotermes obesus* (Rambur)

1842. *Termes obesus* Rambur, *Histoire naturelle des insectes Nèvroptères* : 304.

1962. *Odontotermes assamensis*; Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 296, 335-337.

1977. *Odontotermes obesus*; Lahiri, Ghosh and Biswas, *Bull. Megh. Sci. Soc.*, 2 : 38.

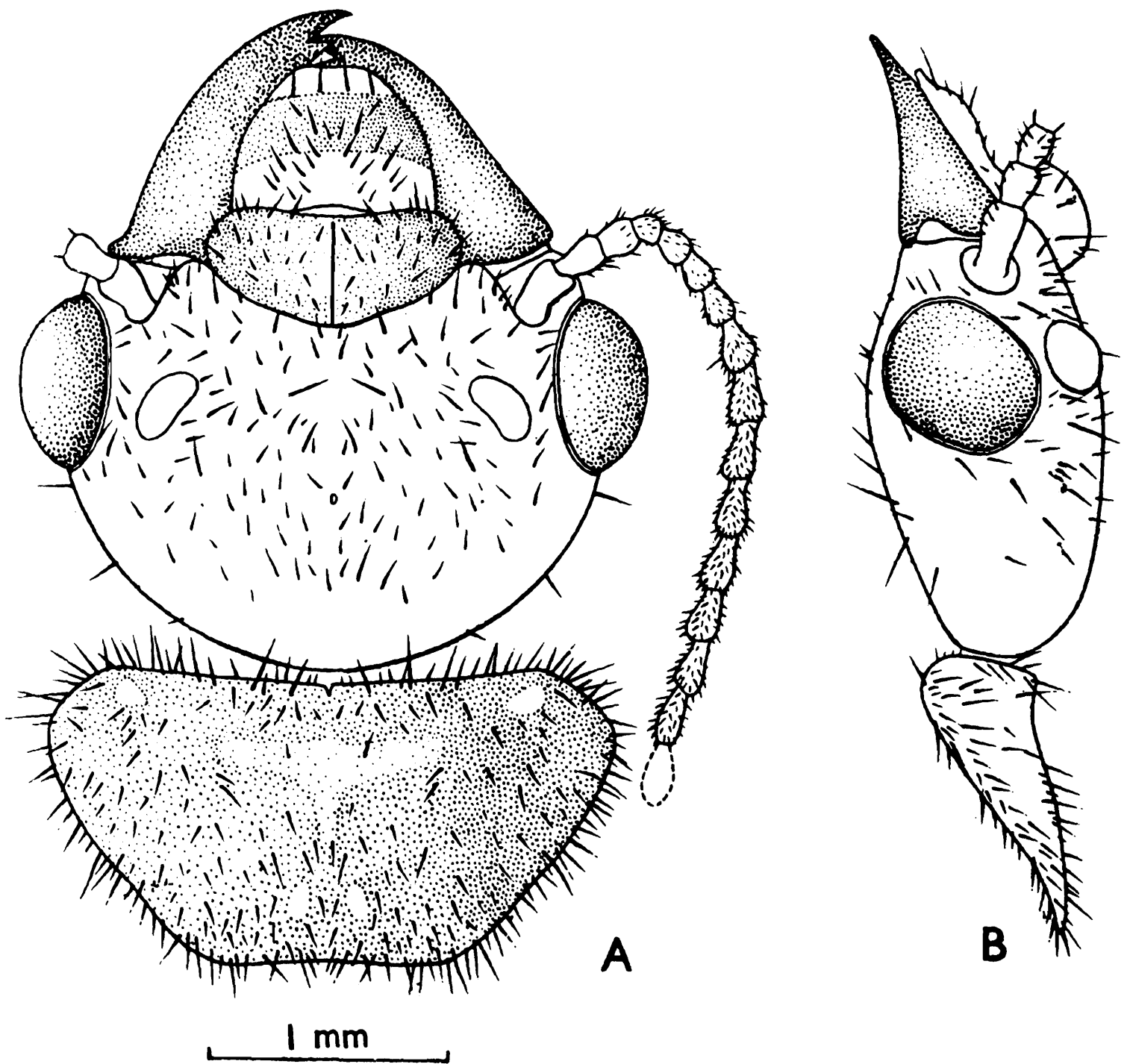


Fig. 41 *Odontotermes obesus* (Rambur). Imago. Head and pronotum in dorsal view.

1979. *Odontotermes obesus*; Sen Sarma and Thakur, *Indian For. Rec. (N.S.) Ent.*, **13** (1) : 5, 26.
 1980. *Odontotermes obesus*; Lahiri and Ghosh, *Rec. Zool. Surv. India*, **76** : 67 – 68.
 1985. *Odontotermes obesus*; Chhotani and Bose, *Rec. Zool. Surv. India*, **82** : 59.

Material : Im., S., W. Assam : Gali Forest, North Lakhimpur, A. K. Mukherjee, 7. iii. 1961; Sadiya, S. K. Tandon, 8. iii. 1969; Gosiangaon, Goalpara Dist., Dhubri and Raimoni, S. K. Gupta, 8–11. xi. 1974. Meghalaya : Shillong, Khasi and Jaintia Hills Dist., S. N. Prasad, 28. vii. 1961 and R. K. Varshney, 16. iv. 1968; Mawphlong, S. Biswas, 15. v. 1964. Arunachal Pradesh : West Bank of River Monai near Bhairavkond, Kameng Dist., K. C. Jayaramakrishnan, 5. iii. and 6. iii. 1961 (2 vials); Charduar Forest, Bhalukpong, S. K. Bhattacharyya, 29. x. 1965. Lekhabali Jeep Camp, Siang Dist., S. K. Tandon and G. S. Arora, 6. x. 1966; Dali village 10. x. 1966; Pading village, 11. x. 1966; Dulla Tapi, 22. x. 1966, Tachidoni 24. x. 1966; Subansiri bridge, (Lower Subansiri Dist.), 28. x. 1966; Basar village, 31. x. 1966, all S. K. Tandon and G. S. Arora; Sunpura, Namsai and Kandu, S. K. Tandon, 3–15. iii. 1969; Drak, Upper Subansiri J. M. Julka, 5. iii. 1974; Abdul Nalla, 5 km from Yazalli, T. K. Pal, 15. ix. 1988; Itanagar, and Lake Ganga, Itanagar, O. B. Chhotani, 13. v. 1989 ex “mound” and 15. v. 1989; and on road connecting Kimin and Tezpur–Lakhimpur road, 17. v. 1989, ex “mound” Nagaland : Dimapur, On road to Kohima, Chumukedima and Rangapahar Reserve Forest (6 vials), G. Bose, June’90.

Measurements (in mm), etc : Imago (10 exs) :

Total body-length with wings c	25.00 – 29.50
Total body-length without wings c	10.50 – 15.00
Length of head to base of mandibles	1.80 – 2.50
Max. width of head	2.50 – 2.70
Max. diameter of eyes	0.65 – 0.75
Max. diameter of ocellus	0.30 – 0.38
Min. diameter of ocellus	0.23 – 0.30
Eye-ocellus distance	0.15 – 0.20
Length of pronotum	1.00 – 1.33
Max. width of pronotum	2.30 – 2.60
Length of forewing with scale	22.40 – 25.50
Length of hindwing with scale	20.50 – 22.50
No. of antennal segments	16 – 17

Measurements (in mm), etc : Imago (10 exs) :

Soldier (10 exs)

Total body-length c	4.15 – 5.5
Length of head to base of mandibles	1.25 – 1.47
Max. width of head	1.15 – 1.28
Length of mandibles	0.70 – 0.80
Length of pronotum	0.51 – 0.64
Max. width of pronotum	0.80 – 1.13
No. of antennal segments	16 – 17

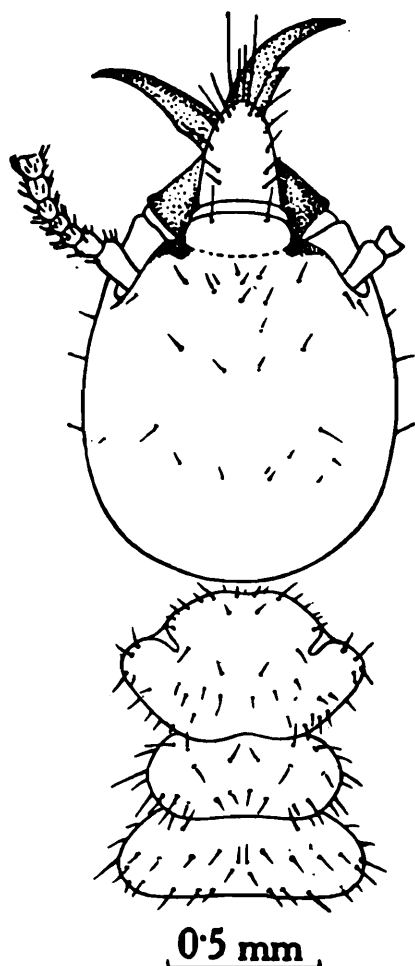


Fig. 42 *Odontotermes obesus* (Rambur). Soldier. Head and thorax, in dorsal view.
(After Roonwal and Chhotani 1962 a).

Distribution : INDIA : *North-eastern India* : This is a very widely distributed species in the north-east, being found in Assam, Meghalaya, Arunachal Pradesh, Manipur, Nagaland and Tripura. It is also commonly found all throughout the country. *Elsewhere* : BANGLADESH and BHUTAN.

34. *Odontotermes paralatigula* Chatterjee and Sen-Sarma

1863. *Odontotermes paralatigula* Chatterjee and Sen-Sarma, *I. Bombay nat. Hist. Soc.*, **59** (3) : 822-826.

Material : S., W. Moreh, Lockchou River Bank (S. dist., Manipur) P. T. Cherian, 22. ii. 1975.

Measurements (in mm), etc : Soldier (5 exs) :

Total body length c	5.40 – 5.88
Head-length of base of mandibles	1.45 – 1.50
Max. width of head	1.40 – 1.43
Length of pronotum	0.62 – 0.63
Max. width of pronotum	0.98 – 1.00
No. of antennal segments	17 (5th shortest)

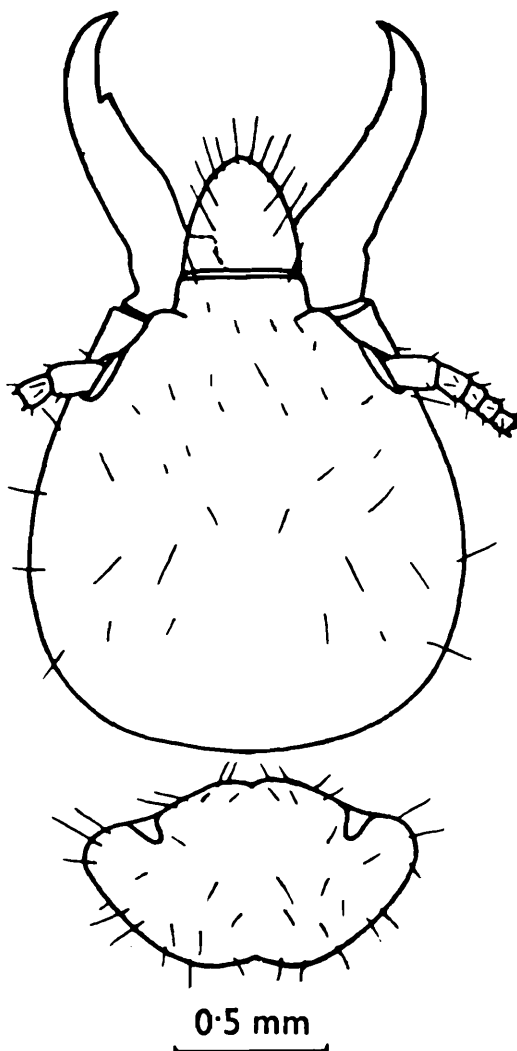


Fig. 43 *Odontotermes paralatigula* Chatterjee and Sen-Sarma. Soldier. Head and pronotum, in dorsal view.

Distribution : INDIA : North-eastern India : Manipur : Moreh; new record for India.
Elsewhere : BURMA : Hlegu Range, Insein Forest Division, type-locality.

35. *Odontotermes parvidens* Holmgren and Holmgren

1917. *Odontotermes (Odontotermes) parvidens* Holmgren and Holmgren, *Mem. Dept. Agric. (Ent.)*, 5 : 154.
 1962. *Odontotermes parvidens*; Roonwal & Chhotani, *Proc. natn. Inst. Sci., India*, (B) 28 (4) : 356-359.
 1977. *Odontotermes parvidens*; Lahiri, Ghosh and Biswas, *Bull. Megh. Sci. Soc.*, 2 : 38.
 1980. *Odontotermes parvidens* : Lahiri and Ghosh, *Rec. zool. Surv. India*, 76 : 68.

Material : Im., S., and W. Assam : 4 miles off Kharongma Inspection Bungalow, K. Reddiah, 21. xi. 1960; Dum Duma (Lakhimpur Dist.) A. K. Mukherjee, 26. ii. 1961 and 28. ii. 1961 (3 vials) : 10 miles S. W. Kochugaon, Assam, E. S. Ross and D. Cavagnaro, 19. x. 1961. Kaziranga, S. K. Gupta, 2. xi. 1974; Shantipur, S. K. Tandon, 2. iii. 1969; Dambak, S. K. Tandon, 5. iii. 1969; Sadiya Road, S. K. Tandon, 8.iii. 1969; Kandu, S. K. Tandon (2 vials) 7. iii. 1969.; Mikir Hills, S. K. Gupta, 3. xi. 1979 (2 vials) : North lakhimpur, O. B. Chhotani 11. v. 1989; Holalpath, Kaziranga, M. Datta, 21. ii. 1971. Meghalaya : Shillong, A. P. Kapur, 5. iv. 1959; Cherrapunji, M. L. Roonwal and A. P. Kapur, 7. v. 1959; Umsing, Shillong, M. Rynth, Nov-Dec. 1963; Umlon (Khasi and Jaintia Hills), V. D. Srivastava, 19. iii. 1963 lalchand Basti, Shillong, V. D. Srivastava, 8. viii. 1963; Mawroh, Shillong, M. Rynth, 13. viii. 1963; Umran, R. K. Varshney, 28. vii. 1969. Arunachal Pradesh : Bank of Norgum River (Kameng Dist.), K. C. Jayaramakrishnan, 10. iii. 1961; Amatulla River Bank (2 vials) (Kameng Dist.), K. C. Jayaramakrishnan, 8. iii. 1961 (2 vials) Bhalukpong (Elephant Flat), S. K. Bhattacharyya, 23. xii. 1964; Namchik (Tirap Dist.), C. B. Srivastava, 18. i. and 22. i. 1962 (2 vials); Maghibasti, Lekhabali (W. Siang Dist), S. K. Tandon and G. S. Arora, 8. x. 1966; Kambang (W. Siang Dist., S. K. Tandon and G. S. Arora, 14-15-16. x. 1966 (6 vials) and New Jinning (W. Siang Dist., S. K. Tandon and G. S. Arora 18-19. x. 1966 (8 vials) and 20. x. 1966; Basar Village (W. Siang Dist.) S. K. Tandon and G. S. Arora, 31. x. 1966; Dial (W. Siang Dist.) S. K. Tandon and G. S. Arora, 10. x. 1966 (6 vials) and Lekhabali River East Bank, S. K. Tandon and G. S. Arora, 2. xi. 1966; Tipi, Bhalukpong (Kameng Dist.), A. N. T. Joseph, 3. v. 1966 (3 vials) and Kimin (Lower Subansiri Dist.), A. N. T. Joseph 11. v. 1966; Tezu (Lohit Dist.), S. K. Tandon, 12-13. iii. 1969 (2 vials); Kimin (Lower Subansiri Dist.), A. N. T. Joseph, 11. v. 1966; Tezu (Lohit Dist), S. K. Tandon, 12-13. iii. 1969 (2 vials); Kimin (Lower Subansiri Dist.), S. K. Gupta and M. Prashad, 4. xi. 1981; Skji, S. K. Gupta and M. Prashad, 15. x. 1981, and on way ot Bolang S. K. Gupta and M. Prasad 21. x. 1981 (Dibang Valley Dist.); Wakro (Lohit Dist). J. M. Julka 1. xi. 1969; Charduar Forest (Siang Dist.), S. K. Tandon, (2 vials), 24. iii. 1973; Arun Bihar, Tazu (Lohit Dist.), S. K. Gupta and Y. N. Gupta, 21. i. 1983 Miao (Tirap Dist., S. K. Gupta and S. Biswas, 30. xi. 1982; Sille 28 km from Pasighat (E. Siang Dist) (2 vials), T. K. Pal, 17. ii. 1989 and P. T. Bhutia 22. xi. 1988 (2 vials); and Gogar Village, Lekhabali, (W. Siang Dist.), T. K. Pal, 13. iii. 1989; 7 km from Yingkiong (E. Siang Dist.), T. K. Pal, 26. 11. 1989; Basar and Garu (West Siang Dist.), P. T. Bhutia, 5. xii. 1988 and 9. xii. 1988 respectively; Pasighat (E. Siang Dist), P. T. Bhutia, 18. xi. 1988 (3 vials); Yambung (E. Siang Dist.), P. T. Bhutia, ? 1988. Nagaland : Chumukedima, 14 km from Dimapur on road to Kohima, G. Bose 4. vi. 1990 (2 vials); and Rangapahar, 16 km from Dimapur G. Bose, 5. vi. 1990.

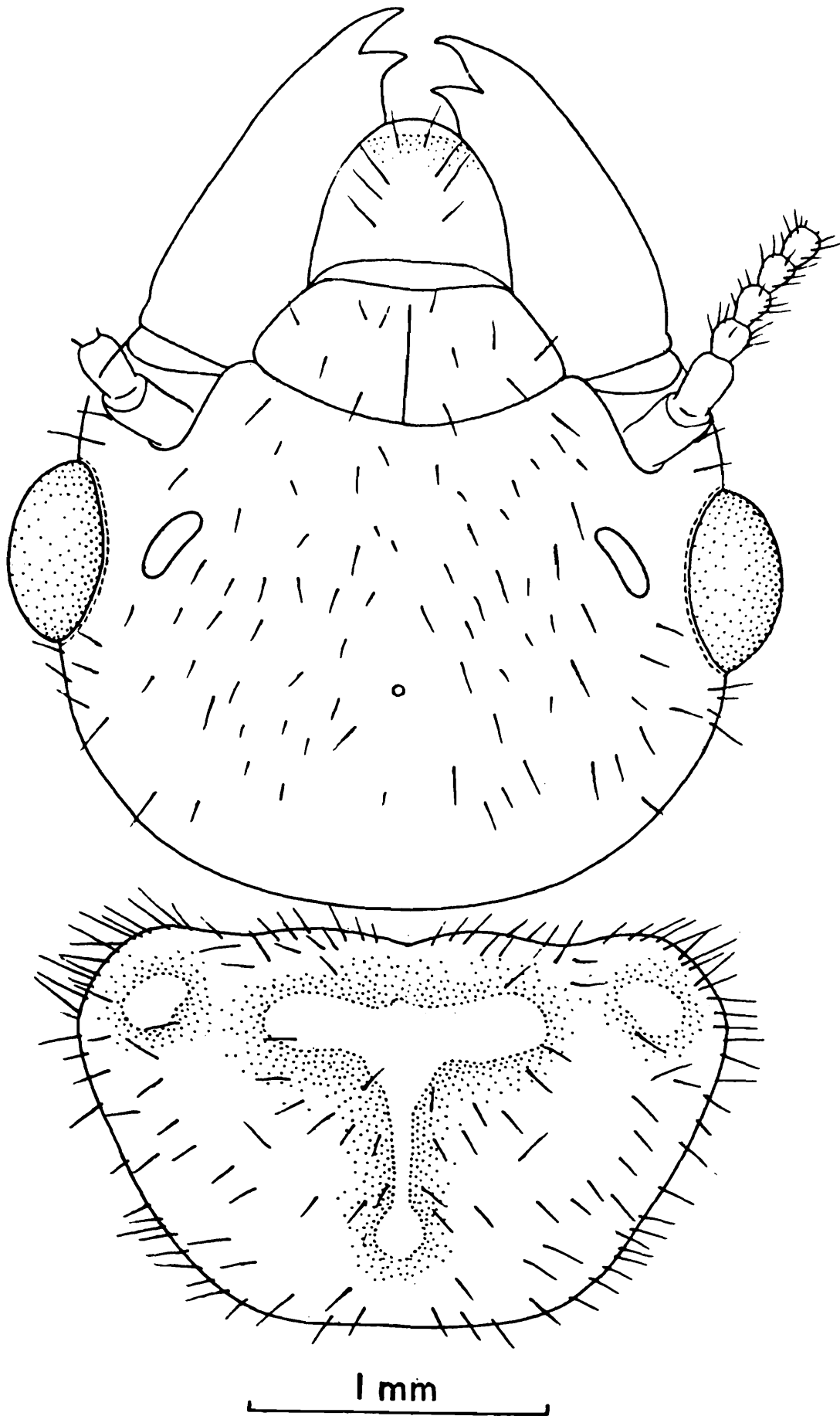


Fig. 44 *Odontotermes parvidens* Holmgren and Holmgren. Imago. Head and pronotum, in dorsal view.

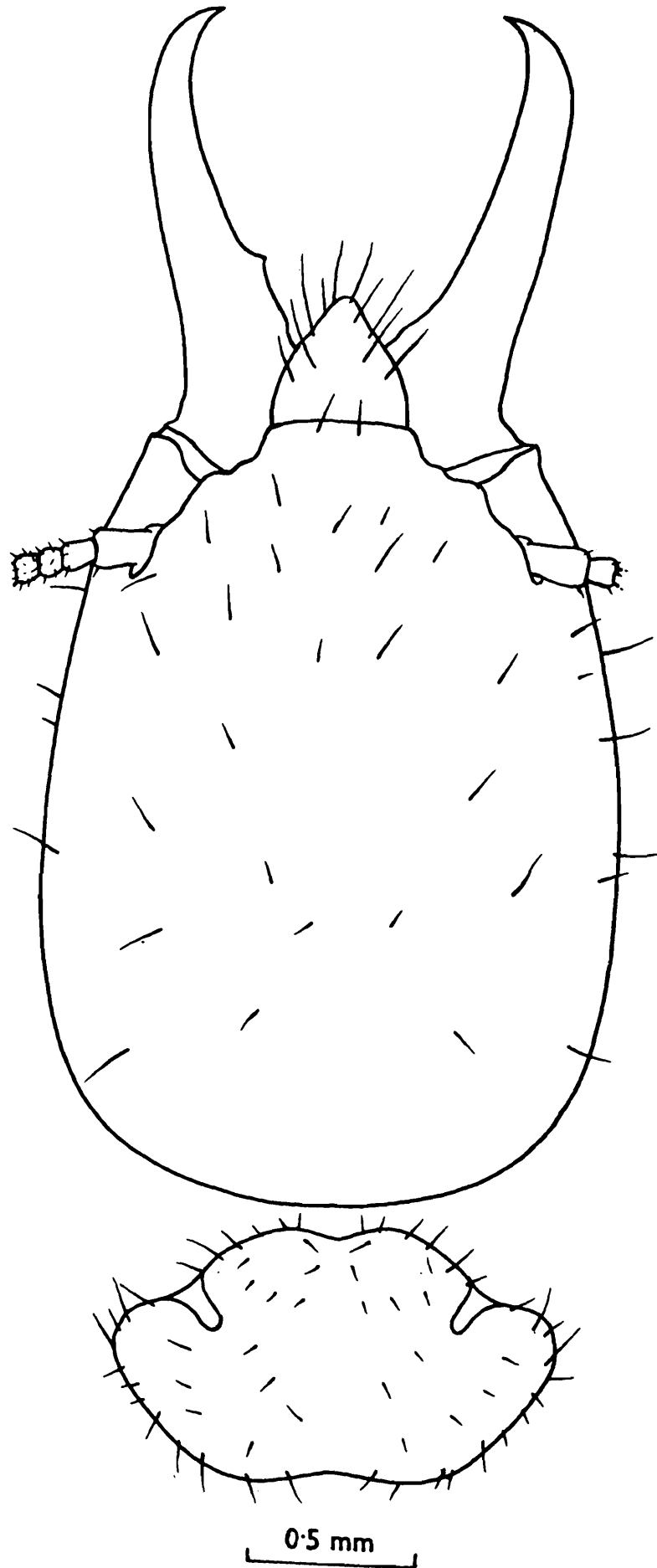


Fig. 45 *Odontotermes parvidens* Holmgren and Holmgren. Soldier. Head and thorax, in dorsal view (After Roonwal and Chhotani 1962 a).

Measurements (in mm), etc : Imago (10 exs) :

Total body-length c with wings c	26.50 – 30.50
Total body-length without wings c	10.50 – 14.00
Length of head to base of mandibles	1.80 – 2.40
Max. width of head with eyes	2.50 – 2.80
Max. diameter of eyes	0.58 – 0.65
Max. diameter of ocellus	0.20 – 0.27
Min. diameter of ocellus	0.15 – 0.20
Eye-ocellus distance	0.23 – 0.30
Length of pronotum	1.00 – 1.33
Max. width of pronotum	2.00 – 2.50
Length of forewing with scale	25.50 – 27.50
Length of hindwing with scale	24.00 – 25.00
No. of antennal segments	18 – 19
Soldier (40 exs.) :	
Total body-length c	5.40 – 7.45
Length of head to base of mandibles	1.86 – 2.70
Max. width of head	1.45 – 2.15
Left mandible length	1.19 – 1.38
Tooth distance from tip (Left mandible)	0.74 – 0.86
Length of pronotum	0.60 – 0.93
Max. width of pronotum	1.05 – 1.65
No. of antennal segments	16 – 17

Distribution : INDIA : North-eastern India : Assam, Meghalaya, Arunachal Pradesh, Nagaland and Manipur. It is a very common species in the region. *Elsewhere* : BHUTAN and BANGLADESH.

36. *Odontotermes proformosanus* Ahmad

1965. *Odontotermes proformosanus* Ahmad, *Bull. Am. Mus. nat. Hist.*, 131 (Art. 1) : 43, 46–48.

1975. *Odontotermes proformosanus*; Akhtar, *Bull. Dept. Zool. Univ. Panjab (N. S.)*, Art. 7 : 70, 93–97.

Material : S., and W. Arunachal Pradesh : Lihabali, Siang Dist., S. K. Gupta, 17. x. 1981.

<i>Measurement (in mm), etc : Soldier (5 exs) :</i>	
Total body-length c	3.90 – 4.00
Length of head to base of mandibles	1.00 – 1.08
Max. width of head	0.92 – 0.95
Length of mandibles	0.68 – 0.70
Tooth-distance of left mandible from tip	0.15 – 0.17
Length of pronotum	0.33 – 0.40
Max. width of pronotum	0.65 – 0.70
No. of antennal segments	15 (3rd shortest)

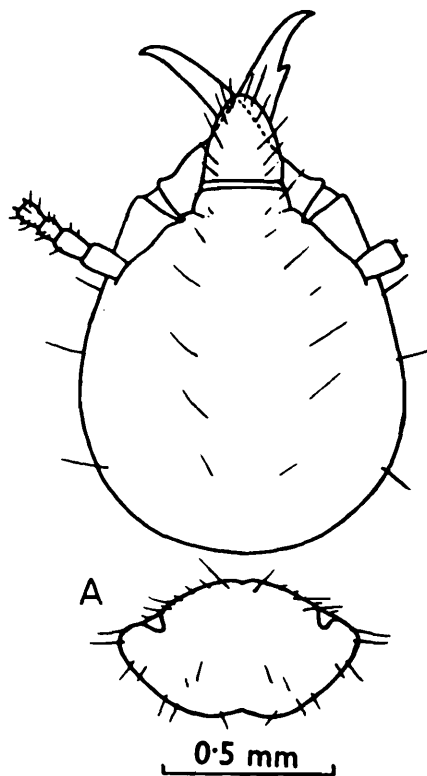


Fig. 46 *Odontotermes proformosanus* Ahmad. Soldier. Head and pronotum, in dorsal view.

Distribution : INDIA : Arunachal Pradesh : Likhabali, Siang Dist., new record for India.
Elsewhere : BANGLADESH, THAILAND and MALAYSIA.

37. *Odontotermes prolatigula* n. sp.

Material : A vial with 4 soldiers and two workers, Nambung, East Siang Dist., Arunachal Pradesh (7 km from Zero to Boleng), T. K. Pal, 23. ii. 1989.

Description : IMAGO : Unknown.

SOLDIER (Fig. 47) : Head-capsule yellow or yellowish brown or dark brown; antennae brownish getting darker distally; labrum pale brown; mandibles dark brown, basally pale brown;

pronotum and legs pale yellow or pale brownish; abdomen creamish yellow to pale brownish. Head and abdomen fairly densely hairy. Total body-length 4.60 – 4.73. head oval, appreciably narrowing in front, length about one-and-a-quarter times that of width; width at base of mandibles generally less than two thirds of maximum width. Fontanelle indistinct. Eyes and Ocelli absent. Antennae with 16 segments; segment 3 a little shorter than 2, 4 shortest; remaining segments short, pyriform. Postclypeus trapezoidal, not distinctly separated from frons; with a long hair on either side near anterior margin. Anteclypeus thin, line-like. Labrum triangularly tongue-shaped, narrowed in front; with 4 pairs of long hairs. Mandibles moderately robust, long, sabre-shaped; a little longer than half of head-length to mandible base. Left mandible with a prominent tooth a little beyond distal third. Right mandible with a minute tooth a little below distal third (left mandible tooth-index 0.253 – 0.287, right mandible tooth index 0.337 – 0.361). Postmentum broad, cast-like; with a few hairs anteriorly; maximum width about

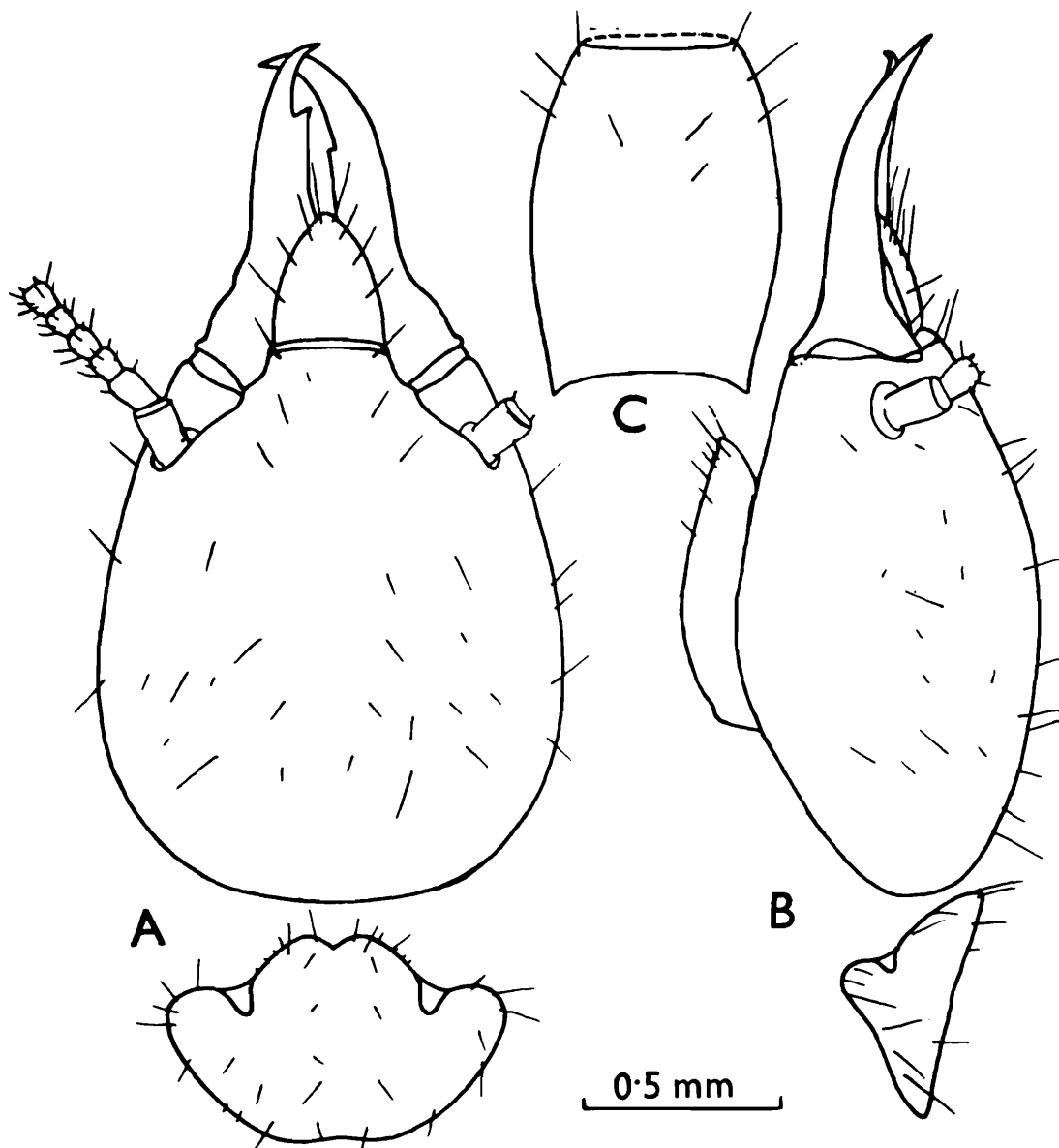


Fig. 47 *Odontotermes prolatigula* n. sp. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Postmentum.

four-fifth of length and width at anterior margin half of its length; anterior margin hyaline. Pronotum saddle-shaped; narrower than head; anterior margin fairly to deeply notched; posterior margin weakly incurved. Mesonotum narrower and metanotum almost as wide as pronotum; posterior margins of both weakly incurved. Legs, thin, long, pilose, apical tibial spurs 3:2:2; tarsi 4-jointed. Abdomen oblong, fairly densely hairy. Cerci and styli present.

<i>Measurements (in mm), etc :</i>	Range (4 exs)	Holotype
Total body-length c	4.60 – 4.93	4.60
Length of head with mandibles	2.05 – 2.23	2.10
Length of head to base of mandibles	1.28 – 1.40	1.30
Width of head at base of mandibles	0.70 – 0.75	0.68
Max. width of head	1.13 – 1.15	1.13
Height of head		
Head-index (width/Length to base of mandibles)	0.821 – 0.883	0.869
Head-convergence index (Width at base of mandibles/Max. width)	0.602 – 0.664	0.662
Length of mandibles : Left	0.78 – 0.83	0.78
Right	0.78 – 0.83	0.78
Left mandibular tooth-distance from tip	0.21 – 0.23	0.21
Right mandibular tooth distance	0.28 – 0.30	0.28
Mandible-head length index (left mandible-length/head-length to base of mandible)	0.593 – 0.625	0.60
Left mandibular tooth-index (tooth distance/mandible-length)	0.253 – 0.287	0.269
Right mandibular tooth-index (tooth distance/mandible-length)	0.337 – 0.361	0.352
Length of labrum	0.33 – 0.35	0.33
Width of labrum	0.27 – 0.30	0.275
Median length of postmentum	0.75 – 0.87	0.75
Max. width of postmentum	0.58 – 0.63	0.59
Width at anterior margin of postmentum	0.35 – 0.38	0.35
Length of pronotum	0.50 – 0.53	0.50
Width of pronotum	0.80 – 0.87	0.80

WORKER : Head-capsule pale yellow; postclypeus paler; antennae pale brown, getting darker distally; pronotum and legs creamish; abdomen whitish. Head and body fairly densely hairy. Total body-length 4.30 – 4.80 mm. Head-capsule subcircular wider than its length to base of mandibles 1.23 – 1.25, maximum width 1.40 – 1.43 mm). Eyes and ocelli absent. Antennae with 19 segments, segment 3 shortest, 4 and 5 subequal. Postclypeus swollen, pilose; divided into two halves; length less than half of width (width 0.70, length 0.25 mm); anteclypeus subtrapezoidal, apilose. Labrum broadly tongue-shaped (length 0.45 – 0.50, width 0.50 – 0.50 mm); hairy along anterior margin and on body. Mandibles not examined in the two specimens available. Pronotum, legs and abdomen as in soldier; anterior and posterior margins of pronotum appreciably notched; pronotum length 0.45 – 0.48; width 0.75 0.75 mm.

Type-specimens : Holotype S (Z. S. I. Reg. No. / H/11) and 3 paratype S. and 2 paratype W. (Z. S. I. Reg. No. /H/11) vide 'Material' above in National Zoological Collection at Z. S. I., Calcutta.

Type-locality and Distribution : INDIA : *Arunachal Pradesh* : Nambung East Siang District. Known only from the type-locality.

Affinities : The soldier of *Odonotermes prolatigula* is very close to that of *O. latigula* from which it is separated for having anteriorly more convergent head-capsule (width at base of mandibles 0.68 – 0.74 vs. 0.75 – 0.88 mm). Mandibles shorter in comparison to head, index 0.593 – 0.625 vs. 0.60 – 0.69. Left mandibular tooth more forwardly placed (index-tooth distance/mandible-length 0.253 0.287 vs 0.30 – 0.34). Mandibles delicate and finely tapered beyond tooth vs mandibles more robust.

38. *Odontotermes singsiti* *n. sp.

Material : Several S. and W. in a vial from Langor, 3 km. from Imphal, Manipur, *S. Singsit*, 1. vi. 1990, ex. "piece of wood"

Description : IMAGO : Unknown.

SOLDIER (Fig. 48) : Head -capsule yellowish brown; brownish near base of mandibles; antennae uniformly coloured, a little paler than head; labrum brown; mandibles blackish brown, basally brownish; thorax, abdomen and legs pale creamish yellow. Head and thorax sparsely hairy; abdomen densely hairy, each tergite with a row of hairs at posterior margin and a few on body. Total body-length 5.70 – 6.70 mm.

Head subrectangular, sides weakly convex, converging in front; length approx. 1.27–1.33 times of width; head-convergence index 0.64–0.66; in side view gradually inclined in front. Fontanelle indistinct. Eyes and Ocelli absent. Antennae with 17 segments; segments 3 and 5 subequal, shortest. Postclypeus of same colour as head, with one or two hairs on either side, anteriorly; posteriorly not clearly demarcated from frons. Anteclypeus line-like, transparent, Labrum triangular with pointed tip, with 4 pairs of long hairs on either side and one or two pairs

* Named after Shri. Singsit, D.F.O. Imphal, State Forest Dept., Manipur.

of smaller ones near base. Mandibles a little longer than half of head-length, finely tapering in front and incurved at tips. Left mandible with a prominent tooth fairly below its middle. Right

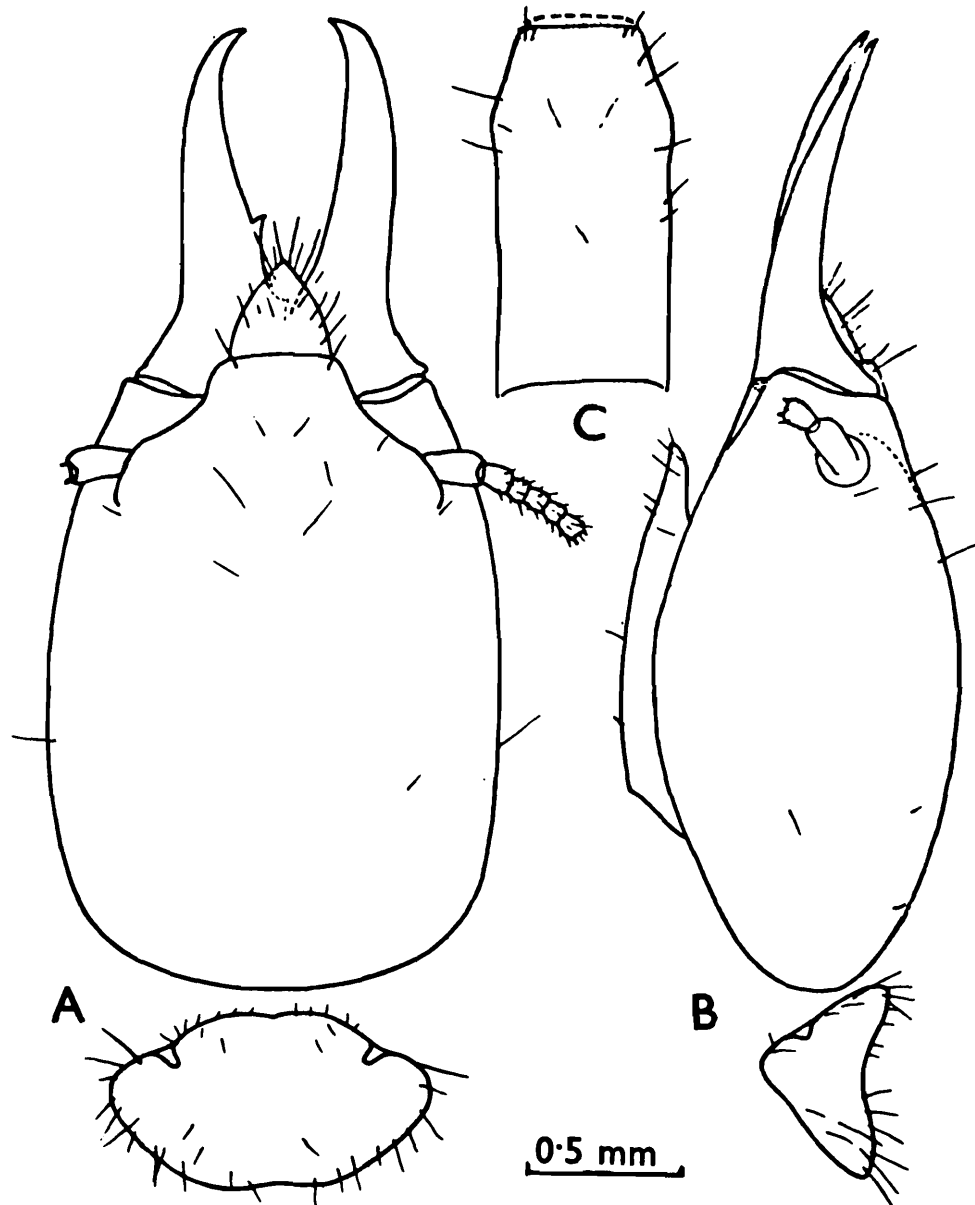


Fig. 48 *Odontotermes singsiti* n. sp. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Postmentum.

mandible with a very minute, point-like (or sometimes not discernible) tooth at about the same position as in left. Postmentum subrectangular; widest at about distal third; only slightly narrowed a little behind widest point; anterior margin straight, posterior margin weakly incurved. Pronotum saddle-shaped with longish hairs on margins and very few short ones on body; anterior margin with a faint median notch; posterior margin weakly emarginate medially. Mesonotum a little narrower than pronotum and metanotum as wide as or slightly wider than pronotum; former with a faint median incurving at posterior margin and latter without any incurving. Legs moderately long and hairy; apical tibial spurs 3 : 2 : 2; tarsi 4-jointed. Abdomen elongate; cerci and styli present.

<i>Measurements (in mm), etc :</i>	Range (5 exs)	Holotype
Total body-length c	5.70 – 6.70	5.90
Length of head with mandibles	3.10 – 3.40	3.20
Length of head to base of mandibles	2.00 – 2.15	2.10
Max. width of head	1.53 – 1.70	1.58
Width of head at base of mandibles	1.03 – 1.10	1.05
Max. height of head	1.00 – 1.05	1.00
Head index (width/length to base of mandibles)	0.75 – 0.79	0.75
Head convergence index (width at base of mandibles / Max. width)	0.64 – 0.66	0.66
Length of labrum	0.37 – 0.43	0.38
Max. width of labrum	0.33 – 0.38	0.38
Length of mandibles : Left	1.15 – 1.27	1.20
Right	1.15 – 1.30	1.20
Left mandibular tooth-distance from tip	0.66 – 0.73	0.68
Mandible-head length index (left mandible length/head-length to base of mandible)	0.56 – 0.59	0.57
Left mandibular-tooth index (tooth-distance/mandible-length)	0.566 – 0.580	0.566
Median length of postmentum	1.15 – 1.30	1.30
Max. width of postmentum	0.60 – 0.63	0.63
Width of postmentum at anterior margin	0.38 – 0.40	0.40
Length of pronotum	0.63 – 0.70	0.63
Max. width of pronotum	1.07 – 1.20	1.08
Pronotum-head width index (pronotum-width/Max. width of head)	0.68 – 0.706	0.68

WORKER : Dimorphic. *Worker Major* : Head-capsule yellow; antennae pale brown; postclypeus of same colour as head or slightly paler; anteclypeus translucent with a semicircular chitinoid band; labrum pale brown, tip hyaline; thorax and abdomen creamish white. Head and body fairly densely hairy. Total body-length 4.70 – 5.03 mm.

Head-capsule subsquarish with rounded posterior margin; wider than long (length to tip of labrum 1.90 – 2.03, to base of mandibles 1.35 – 1.40, max. width 1.60 – 1.78 mm). Fontanelle plate round, circular, situated on mid-dorsum. Eyes and ocelli absent. Antennae with 17–19 segments; 3rd segment sometimes in the process of division. In 17–segmented-one segment 5 shortest; in 19–segmented-one segments 3 and 5 subequal, shortest. Postclypeus swollen, pilose; shorter than half of width (length 0.31, width 0.75 – 0.85 mm). Anteclypeus apilose, subtrapezoidal. Labrum wider than long, dome-shaped. Mandibles of *Odontotermes*-type. Pronotum saddle-shaped (length 0.45 – 0.50, max. width 0.80 – 1.10 mm). Legs and abdomen as in soldier.

Worker Minor : As in worker major but smaller in size and has subcircular head and 17 segmented antennae with segments 3 and 4 subequal and 5 slightly shorter. Total body-length c 3.70 – 3.90, head-length to tip of labrum 1.33 – 1.40, head-length to base of mandibles 0.85, 0.38-0.40 and pronotum-width 0.65-0.70 mm. max. width of head 1.05 – 1.10, postclypeus-length 0.25, postclypeus-width 0.63, pronotum-length 0.38–0.40 and pronotum-width 0.65 – 0.70 mm.

Type-specimens : Holotype soldier (Z. S. I. Reg. No. and paratype soldiers and worker (several) Z. S. I. Reg. No. in N. Z. C., Z. S. I., Calcutta.)

Type-locality and Distribution : Langor, 3 km off Imphal, Manipur. Known only from the type-locality.

Affinities : The soldier of *O. singsiti* is very close to *O. profeae* Akhtar from which it is separable because of its narrower head in comparison to head-length, maximum head-width 1.53 – 1.70 (vs. 1.73 – 2.0 in *profeae*) and head length 2.0 – 2.15 (vs. 1.96 – 2.39 in *profeae*); for its antennae as a whole and antennal segments being shorter; for the left mandibular-tooth being smaller and lying more posteriorly; and for the right mandibular-tooth being minute or undiscernible (vs. quite prominent in *O. profeae*).

It is also close to that of *O. horai* from which it is separated for its larger head and more prominent left mandibular-tooth which is situated more anteriorly than in *horai*. Antennae are also 17 segmented (vs. 16 in *horai*).

Genus 15. *Hypotermes* Holmgren

39. *Hypotermes xenotermitis* (Wasmann)

1896. *Termes xenotermitis* Wasmann, *Ann. Mus. Civ. Stor. Nat.*, (2) 16 (36) : 628.

1962. *Hypotermes xenotermitis*; Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 297, 362.

1963. *Hypotermes xenotermitis*; Chatterjee and Thakur, *Indian For. Rec. (N. S) Ent.*, 10 (9) : 174, 197-203.

Material : Im. S., and W. Meghalaya : Shillong, V. D. Srivastava, 15. x. 1963, 25. xii. 1963, 7. xi. 1963; Umtham, Khasi-Jaintia Hills, A. K. Mandal, 21. iv. 1964; Lausohum,

R. K. Varshney, 28. ii. 1967; Hill Forest behind DFO Office, Shillong, Chandmari, Tura (Garo Hills) and Polo Ground, Shillong, 15. x., 16. x. and 29. x. 1974 all *S. K. Gupta*, (4 vials); Cherrapunji, *G. Bose*, 11. vi. 1990; Chambalgiri West Garo Hills, *J. R. B. Alfred*, 19.ii. 1991, and Balphakram National Park, West Garo Hills, *J. R. B. Alfred*, 20. ii. 1991. *Arunachal Pradesh* : Bank of River Belsiri (Kameng Dist.), *K. C. Jayaramakrishnan*, 1961 and Ankling (Kameng Dist.), *K. C. Jayaramakrishnan*, 10. iii. 1961; Khonsa, and Changhi (Tirap Dist), *C. B. Srivastava*, 7. i and 11. i. 1962; Pinjali (Kameng Dist), *A.N.T. Joseph*, 4. v. 1966; and Gibbons Land, 16 km. of Miao, Miao Res. Forest (Tirap Dist.), *S. Biswas* 1. xii. 1982 and 27.xii. 1982 respectively and Miao, *S. K. Gupta* and *Y. N. Gupta*, 9. i. 1983. *Nagaland* : Chumukedima,

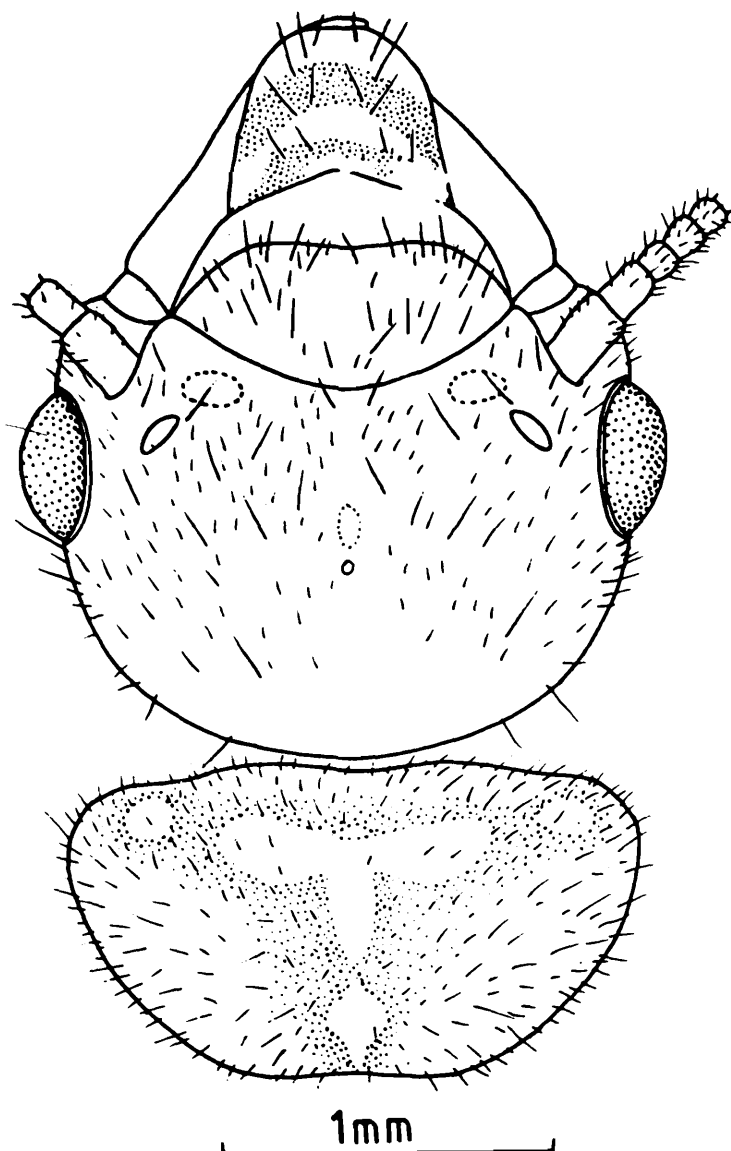


Fig. 49 *Hypotermes xenotermitis* (Wasmann).
Imago. Head and pronotum, in dorsal view.

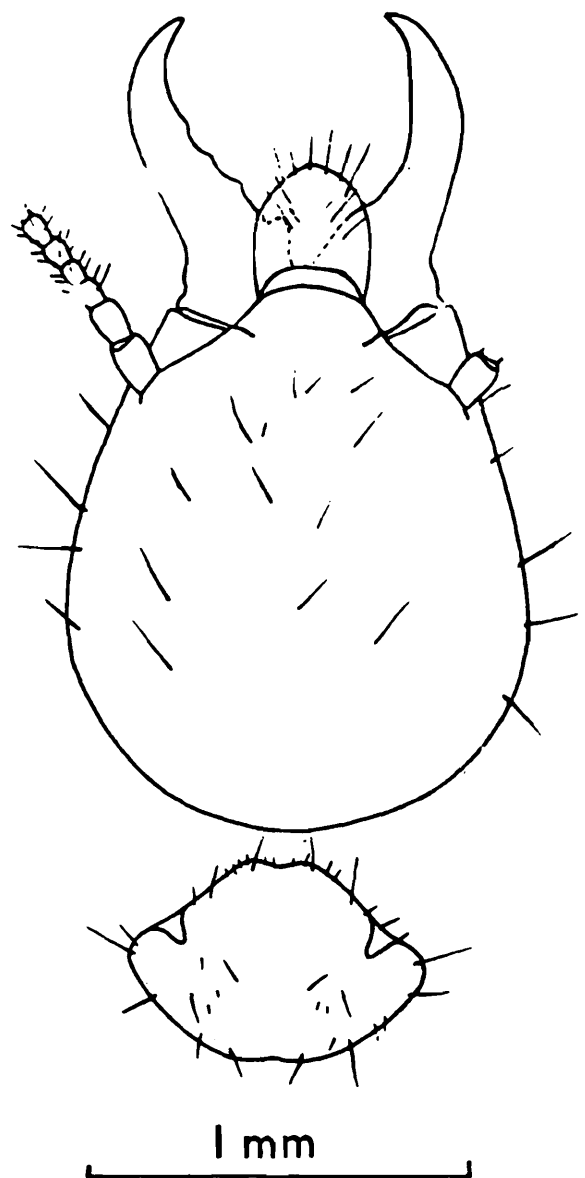


Fig. 50 *Hypotermes xenotermitis* (Wasmann).
Soldier. Head and pronotum, in dorsal view.

14 km from Dimapur on road to Kohima, *G. Bose*, 4. vi. 1990 (2 vials). *Tripura* : Lalchhuri, Ambasa and Khairpur, Agartala, *A. K. Sanyal*, 22. ii. and 27. ii. 1983 respectively. Salema, 200 m. *G. K. Srivastava*, 28. ii. 1991 ex "Cowdung"; also Ampu Ambassa, Ambassa Forest North, Jarul Cherra (Manu), Korilong (Teliamura), *V. C. Agarwal and Party*, Jan. 1973.

Measurements (in mm), etc : Imago (5 exs) :

Total body length with wings c	23.00 – 25.00
Total body-length without wings c	11.05 – 12.00
Length of head to base of mandibles	1.65 – 1.80
Max. width of head with eyes	2.10 – 2.20
Max. diameter of eyes	0.55 – 0.63
Max. diameter of ocellus	0.25 – 0.30
Min. diameter of ocellus	0.10
Eye-ocellus distance	0.12 – 0.15
Length of pronotum	1.00 – 1.15
Max. width of pronotum	1.92 – 2.00
Length of forewing with scale	20.50 – 22.00
Length of hindwing with scale	19.10 – 20.00
No. of antennal segments	19
Soldier (10 exs) :	
Total body length c	3.50 – 4.50
Length of head to base of mandibles	1.10 – 1.35
Max. width of head	1.05 – 1.15
Length of mandibles	0.50 – 0.68
Length of pronotum	0.38 – 0.50
Max. width of pronotum	0.63 – 0.80
No. of antennal segments	15 – 16

Distributionn : INDIA : *North-eastern India*. : It is a widely distributed species in the North-east and is reported from Assam, Meghalaya, Arunachal Pradesh, Nagaland and Tripura states. It is not recorded so far from Manipur and Mizoram but very likely will be found there subsequently on more extensive survey of the states. Also in West Bengal. *Elsewhere* : BHUTAN, BANGLADESH, BURMA, THAILAND.

Genus 16. *Microtermes* Wasmann**40. *Microtermes imphalensis* Roonwal and Chhotani**

1962. *Microtermes imphalensis* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 364 –369.

1964. *Microtermes imphalensis*; Chatterjee and Thakur, *Indian For. Rec. (Ent.)*, 10 (11) : 225 – 226.

Material : Im. S., and W. Manipur : Tea plantation 5 km North of Moreh, Southern Dist., P. T. Cherian, 26. ii. 1975. Arunachal Pradesh : On road to Kimin, 5 km from Lakhimpur. O. B. Chhotani (02/17.5.89), 17. v. 1989, ex. "soil near bamboo fence"; lake Ganga, Itanagar, O. B. Chhotani (01/15. 5. 89), 15. v. 1989, ex "soil on embankment of forest path"; Itanagar, O. B. Chhotani (05/12. 5. 89, 09/12. 5. 89, 011/13. v. 89, 013/13. v. 89, 014/13. v. 89 and 019/13. 5. 89 – 6 vials); 12–13 v. 1981; Nirjuli, near Itanagar, P. T. Bhutia, 3. vi. 1987.

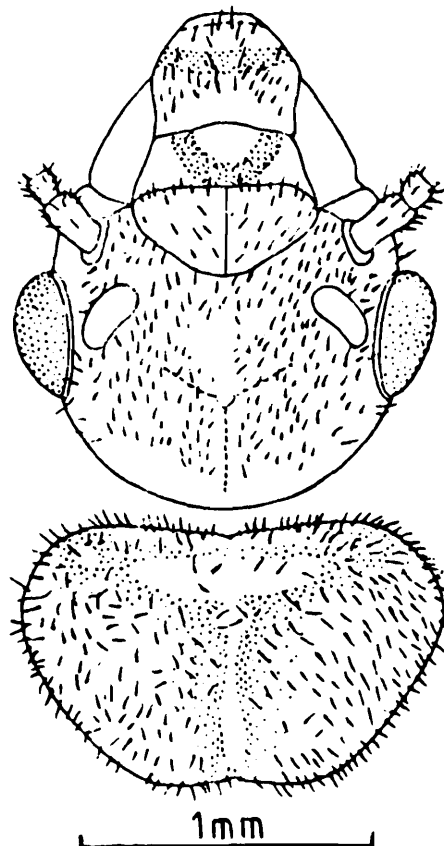


Fig. 51 *Microtermes imphalensis* Roonwal and Chhotani. Imago. Head and pronotum, in dorsal view.

Measurements (in mm), etc : Images (5 exs.) :

Total body-length with wings	15.00 – 15.50
Total body-length without wings	8.70 – 8.90
Length of head to base of mandibles	1.05 – 1.10
Max. head-width with eyes	1.45 – 1.53

Measurements (in mm), etc : Images (5 exs.) :

Max. diameter of eye	0.44 – 0.45
Max. diameter of ocellus	0.20 – 0.23
Eye-ocellus distance	0.03 – 0.035
Length of postclypeus	0.33 – 0.35
Width of postclypeus	0.60 – 0.63
Length of pronotum	0.85 – 0.88
Width of pronotum	1.30 – 1.35
Length of forewing	14.00 – 14.50
Length of hind wing	12.00 – 12.30
No. of antennal segments	15 – 16

(3 shortest in 15 segmented and longer than 4 in 16-segmented)

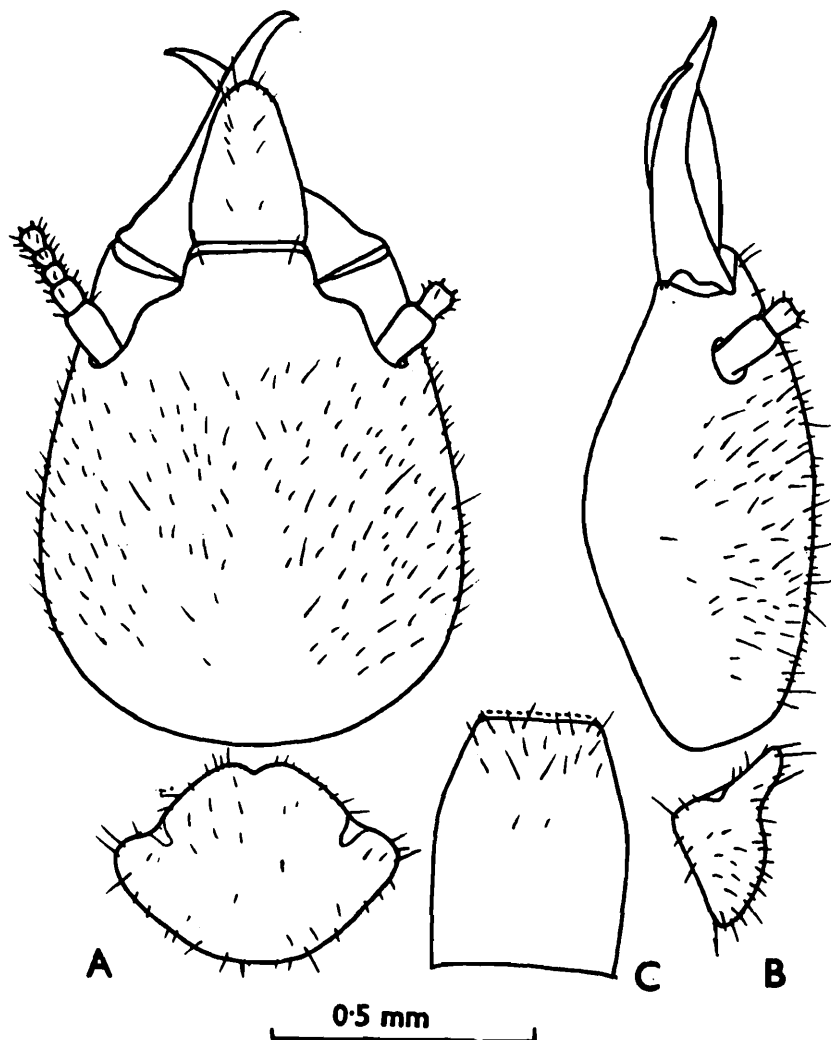


Fig. 52 *Microtermes imphalensis* Roonwal and Chhotani. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) Postmentum.

Description : The hitherto unknown soldier and worker of *Microtermes imphalensis* are being described here for the first time.

SOLDIER (Fig. 52) : Head-capsule pale brownish yellow, centrally paler; postclypeus and labrum of same colour as head; mandibles reddish brown; antennae, legs and abdomen creamy white. Head and body fairly hairy. Total body-length c 3.70 – 3.90 mm.

Head oval, sides strongly convergent to anterior end. Postclypeus not well differentiated from frons; anteclypeus thin, narrow with a medial tip. Labrum elongately tongue-shaped, reaching upto less than two thirds of mandibles, and with a weakly lanceolately pointed tip. Antennae with 14 segments, segment 3 shortest. Mandibles delicate; slightly concave on outer margin in the basal half; tips fairly incurved. Postmentum somewhat hexagonal, a little longer than broad; sides parallel in basal half then convergent to a straight anterior margin; posterior margin also straight. Pronotum saddle-shaped; broader than long, narrower than head. Forelegs with tibiae somewhat inflated (fossorial); apical tibial spurs 3:2:2. Abdomen oblong; cerci 2-jointed, hairy.

Measurements (in mm), etc : Range (5 exs) :

Total body-length	3.70 – 3.90
Length of head to base of mandibles	0.88 – 0.93
Width of head at anterior end	0.50 – 0.58
Max. head-width	0.80 – 0.85
Head index (max. width/length)	0.892– 0.909
Head-convergence index (width at anterior end/max. width)	0.625– 0.682
Length of mandibles : Left	0.50 – 0.53
Right	0.50 – 0.53
Length of labrum	0.25 – 0.28
Width of labrum	0.18 – 0.23
Length of pronotum	0.33 – 0.35
Width of pronotum	0.54 – 0.55

WORKER : Dimorphic. *Worker Major* : Head-capsule pale creamy yellow; postclypeus and labrum of same colour as head; anteclypeus whitish; antennae, legs and abdomen very pale creamy white. Head and body fairly densely hairy. Total body-length c 4.25 – 4.30 mm.

Head subsquarish, little longer than wide. Length of head to base of mandibles 0.93 – 0.95 mm. Antennae with 14 segments; segment 3 subequal to 4. Postclypeus swollen, broader than long (Length 0.15 – 0.20; width 0.40 – 0.43 mm) and divided into right and left halves by a median suture; anteclypeus narrow, apilose, with a medial tip. Labrum broad, tongue-

shaped. Pronotum broader than long (length 0.26 – 0.28; width 0.46 – 0.50 mm). Legs as in soldier. Abdomen oblong; cerci hairy, 2-jointed. *Worker Minor* : Much smaller in size. Head-capsule subrounded; otherwise as in worker major (length to base of mandibles 0.60 – 0.63, max. width 0.73 – 0.75 mm).

Distribution : INDIA : North eastern India : Manipur : Moreh, Southern Dist. and Imphal, type-locality. Arunachal Pradesh : Kimin, Tezpur-Lakhimpur Road, Lake Ganga (Itanagar) and Nirjuli near Itanagar.

Affinities : The Soldier of *Microtermes imphalensis* is close to *M. obesi* from which it is separated for its head sides being very strong convergent at the anterior end, for labrum being elongately tongue-shaped and with a faintly lanceolate tip.

41. *Microtermes obesi* Holmgren
(Synonym *Microtermes anandi* Holmgren)

1912. *Microtermes obesi* Holmgren, *J. Bombay nat. Hist. Soc.*, **21** :787.

1913. *Microtermes Anandi* Holmgren, *J. Bombay. nat. Hist. Soc.*, **22** : 114.

1962. *Microtermes anandi*; Roonwal & Chhotani, *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 362 – 364.

1964. *Microtermes obesi*; Chatterjee and Thakur, *Indian For. Rec. (N. S.) Ent.*, **10** : 236 – 237.

1979. *Microtermes obesi*; Sen-Sarma and Thakur, *Indian For. Rec. (N. S.) Ent.*, **13** : 6, 28 – 29, 52.

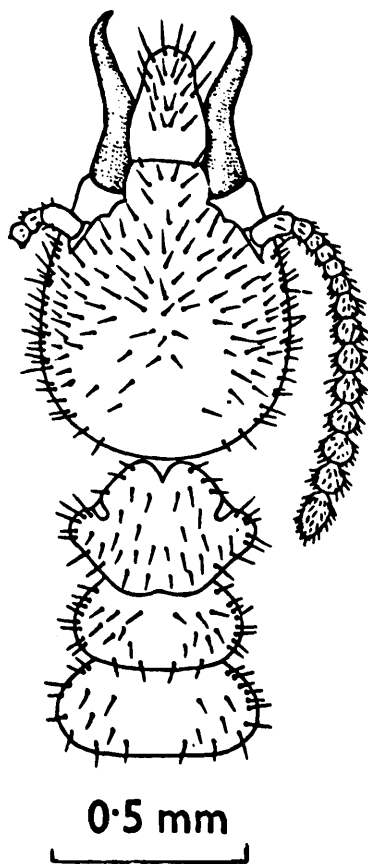


Fig. 53 *Microtermes obesi* Holmgren. Soldier. Head and thorax, in dorsal view.

Material : Im. S., and W. Assam : Nowgong (Dist. Nowgong), S. K. Gupta, 4. xi. 1974. Meghalaya : Dynadubi, 9 km. S. of Dudhnai I. B. (Garo Hills Dist.), R. S. Pillai, 9. iv. 1971, Titinkar, (Tura Dist.), S. K. Gupta, 17. x. 1974. Arunachal Pradesh : Dist. Lower Subansiri : Kimin, A.N.T. Joseph, 9. v. 1966 (2 vials) and S. K. Gupta and Mahavir Prashad, 2. xi. 1981; On road to Zero, 4 miles from Kimin, O.B. Chhotani, 17. v. 1989 (2 vials) ex "soil", Itanagar, O. B. Chhotani, 12. v. 1989 ex. "dry-twig" Mizoram : Aizwal, Zoological Gardens, G. Bose. 27. v. 1990 (3 vials); Durtlong, 10 kms from Aizwal on road to Silchar, G. Bose, 28. v. 1990 (3 vials). Nagaland : Dimapur, G. Bose, 3. vi. 1990 (1 vial) and 5. vi. 1990 (3 vials), ex. "rotten logs of wood"; Rangapahar, 10 kms from Dimapur, 5. vi. 1990 (3 vials). Tripura : Chailengta, Ganganagar, Teliamura, V. C. Agarwal and Party, Jan. 1973.

Measurements (in mm), etc : Soldier (20 exs) :

Total body-length c	3.25 – 4.50
Length of head to base of mandibles	0.73 – 0.85
Max. width of head	0.75 – 0.85
Length of mandibles	0.46 – 0.53
Max. length of pronotum	0.35 – 0.38
Max. width of pronotum	0.47 – 0.56
No. of antennal segments	14

Distribution : INDIA : North-eastern India : Assam : Nowgong (Nowgong Dist., Jamduar and Raimona (Goalpara Dist.) Meghalaya : Dynadubi and Rongrengiri, Garo Hills Dist. and Titinkar (Tura Dist.) Arunachal Pradesh : Kimin on road to Zero and Itanagar. Kimin. Mizoram : Aizwal and Durtlong (near Aizwal). Nagaland : Dimapur and Rangapahar. Tripura: Agartala, Paratia, Tiliamura, Ambasa, Belonia, Choraibari, Chailengta. Also widely distributed all over India. Elsewhere : BANGLADESH, THAILAND, SRILANKA AND PAKISTAN.

Genus 17. *Ancistrotermes* Silvestri

42. *Ancistrotermes pakistanicus* (Ahmad)

(Synonym *Microtermes umsae* Roonwal and Chhotani)

1955. *Microtermes pakistanicus* Ahmad, *Biologia*, 1 (1) : 25 – 27.
1962. *Microtermes* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 370 – 374.
1964. *Microtermes pakistanicus*; Chatterjee and Thakur, *Indian For. Rec.* (N. S.), 10 (11): 239 – 242.
1965. *Microtermes pakistanicus*; Mathur and Thapa, *Bull. Ent.*, 6 : 7.
1979. *Microtermes pakistanicus*; Sen-Sarma and Thakur, *Indian For. Rec.*, (N. S.) 13 (1) : 29 – 30.
1980. *Ancistrotermes pakistanicus*, Akhtar and Hussain, *sociobiology*, 5 : 261 – 271.

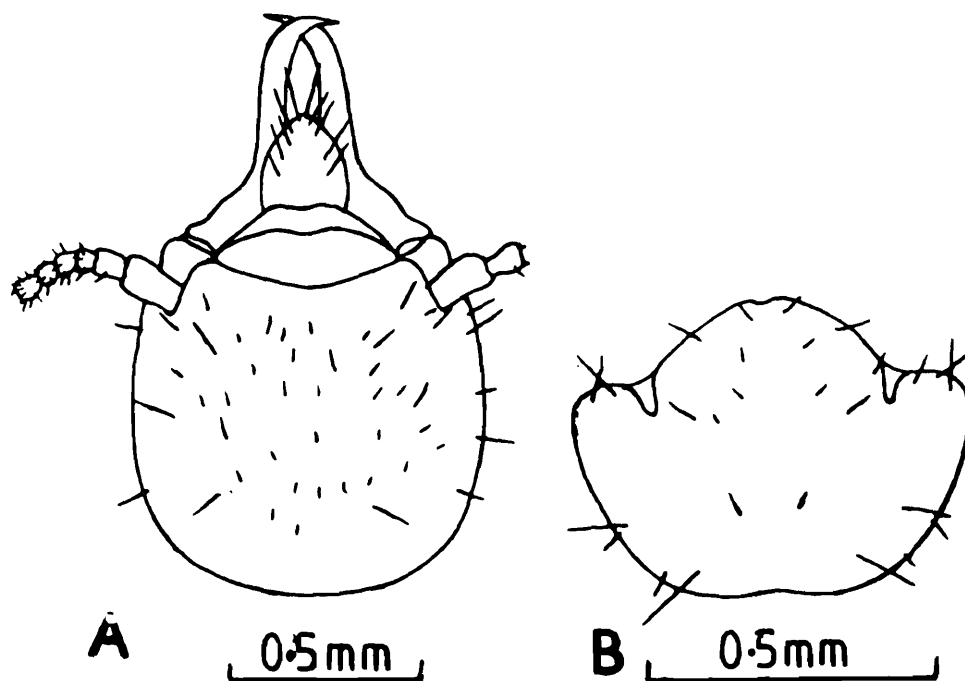


Fig. 54 *Ancistrotermes pakistanicus* (Ahmad). Soldier. (A) Head, in dorsal view. (B) Pronotum, in dorsal view.

Material : S., and W. as follows : " *Assam* : Kaziranga, *S. K. Gupta*, 2. xi. 1974 (2 vials) and *S. K. Tandon*, 24. ii. 1969 (2 vials); Nowgong, *S. K. Gupta*, 4. xi. 1974. *Arunachal Pradesh* : Kimin, *O. B. Chhotani*, 17. v. 1989, ex "wood" (2 vials); About 4 km from Kimin on road to Zero, *O. B. Chhotani*, 17. v. 1989, ex "soil in embankment" (2 vials). *Nagaland* : Dimapur, *G. Bose*, 3. vi. 90, ex "wood"; Rangapahar, *G. Bose*, 5. vi. 90. *Mizoram* : Aizwal (Zoo Gardens), *G. Bose*, 27. v. 90, ex "soil under leaves" (2 vials); Durtlong, on way to Silchar, *G. Bose*, 28. v. 90, ex rotten wood (2 vials). *Tripura* : Shantibazar, South District, *G. K. Srivastava*, 22. ii. 1991, ex under bark of log; Ambasa, *V. C. Agarwal* and party, Jan 1973.

Measurements (in mm), etc : Soldier (10 exs) :

Total body length c	4.0 – 4.30
Length of head to base of mandibles	0.90 – 0.95
Max. width of head	0.88 – 0.93
Length of mandibles	0.63 – 0.65
Length of pronotum	0.40 – 0.45
Width of pronotum	0.63 – 0.65
No. of antennal segments	15 (3rd shrottest)

Distributionn : INDIA : *North-eastern India.* : *Meghalaya* : Rongrengiri and Umsa Nongk-horai, Khasi-Jaintia Hills (Type-locality for *Microtermes umsa*). *Assam*: Amsoi, Barjan. Gauhati, Kachergaon; Kaziranga and Nowgong. *Arunachal Pradesh* : Kimin and on road from Kimin to Zero. *Mizoram* : Aizwal and Durtlong. *Nagaland* : Dimapur and Rangapahar. *Tripura* : Ambasa, Belonia, Choraibari, Paratia and Tiliamura. *Elsewhere* : BANGLADESH, BURMA, THAILAND, SINGAPORE, MALAYSIA and INDONESIA.

Subfamily (iv) NASUTITERMITINAE

Genus 18. *Nasutitermes* Banks

43. *Nasutitermes cherraensis* Roonwal and Chhotani

1962. *Nasutitermes cherraensis* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 374-379.

Material : S., W. *Meghalaya* : Forest around Mawsamai cave, G. K. *Srivastava*, 25. v. 1979. *Arunachal Pradesh* : On road from Ziro to Yazali, T. K. *Pal*, 16. ix. 1988; Ganga Lake, Itanagar, O. B. *Chhotani*, 15. v. 1989 (2 vials).

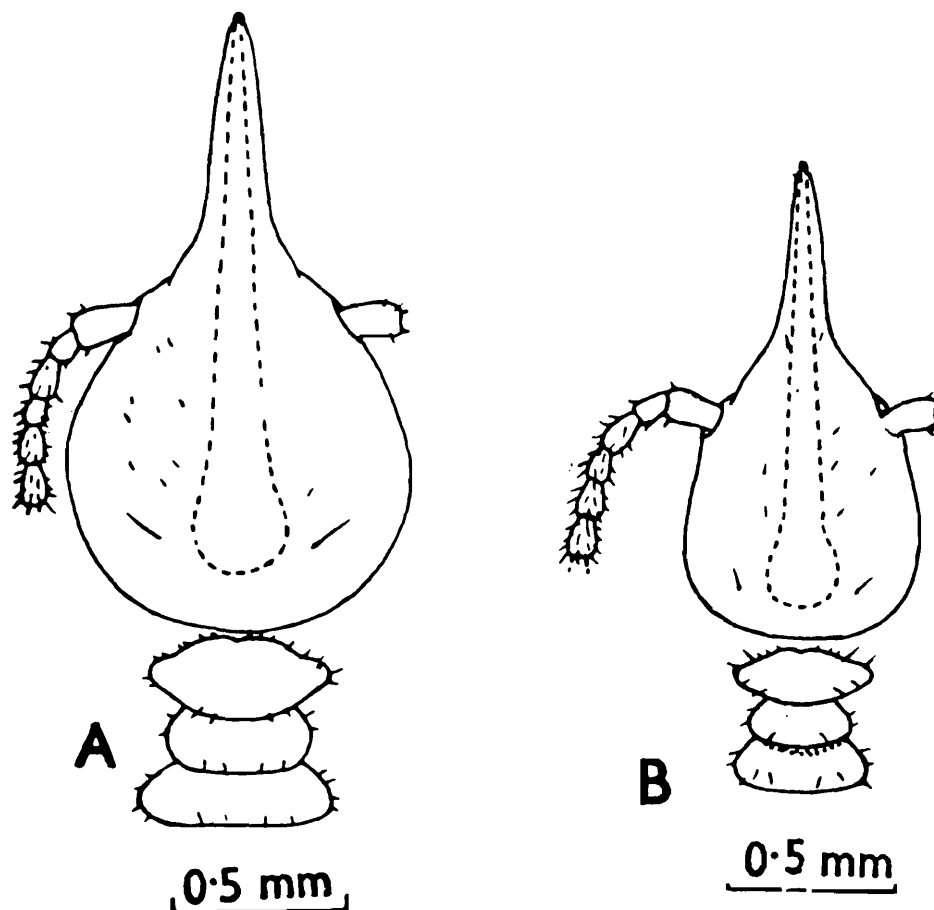


Fig. 55 *Nasutitermes cherraensis* Roonwal and Chhotani. (A) & (B) soldiers, (major and minor, respectively), head and thorax, in dorsal view. (Redrawn from Roonwal and Chhotani 1962 a).

<i>Measurements (in mm), etc :</i>	S. Major (10 exs.)	S. Minor (2 exs)
Total body-length c	3.50 – 4.00	2.90 – 3.00
Length of head with rostrum	1.50 – 1.73	1.25 – 1.30
Length of head without rostrum	0.90 – 1.08	0.68 – 0.70
Max. width of head	0.80 – 0.90	
Length of pronotum	0.20 – 0.24	0.20
Max. width of pronotum	0.48 – 0.50	0.40
No. of antennal segments	12 – 13	11– 12

Distributionn : INDIA : *North-eastern India*. : *Meghalaya* : Cherrapunji – type – locality and Mawsamai cave (Khasi and Jaintia Hills Dist.). *Arunachal Pradesh* : Itanagar and on road from Zero to Yazali (Lower Subansiri Dist.).

44. *Nasutitermes chhotanii* *n. sp.

Material : One vial with 4 Im. and several S. and W., lake Ganga, Itanagar, Arunachal Pradesh, O. B. Chhotani, 15. v. 89 ex “damaged portion of tree trunk”

Description : IMAGO (Fig. 56) : Head-capsule dark brown with a pair of horizontal, thin, line-like, whitish spots in between fontanelle plate and postclypeus on either side; antennae and legs pale brown; labrum paler; mandibles pale brown with toothed region brownish; pronotum a little paler than head; with a paler T-marking having a short stump and a pair of paler spots little above posterior margin in middle; abdominal tergites as dark as pronotum, sternites a little paler, medially more pale; wings pale brown. Head and body densely hairy. Total body-length with wings 10.00 – 12.50, without wings 6.00 – 7.20 mm. Head-capsule subcircular, width with eyes more than length to base of mandibles; Y-suture present, lateral arms clearer near fontanelle plate; dorsum around fontanelle plate slightly depressed. Fontanelle plate elongate, elliptical (length 0.10 – 0.13, width 0.05 – 0.06 mm). Eyes subcircular, maximum diameter 0.30 – 0.35, minimum diameter 0.28 – 0.30 mm; from lower margin situated at a distance of about 1/4 of its diameter. Ocelli broadly oval, translucent; from eyes situated at about half their short diameter and about their short diameter from antennae. Antennae with 15 segments; segment 3 shortest; 4 larger than 3 or 5; the latter larger than 3rd; remaining segments increasing in length; last ovate. Postclypeus moderately swollen, hairy; length less than half its width. Anteclypeus hyaline, narrow, trapezoidal; projected medially in front. Labrum dome-shaped; hairy near anterior margin and on body; broader than long. Mandibles of *Nasutitermes*-type. Pronotum

* Named after Dr. O. B. Chhotani, the well known termitologist.

trapezoidal, wider than long; a little narrower than head and slightly raised anteriorly; anterior margin substraight; with an imperceptible median notch; posterior margin convex, with prominent median invagination. Mesonotum and metanotum deeply incurved medially at posterior margin,

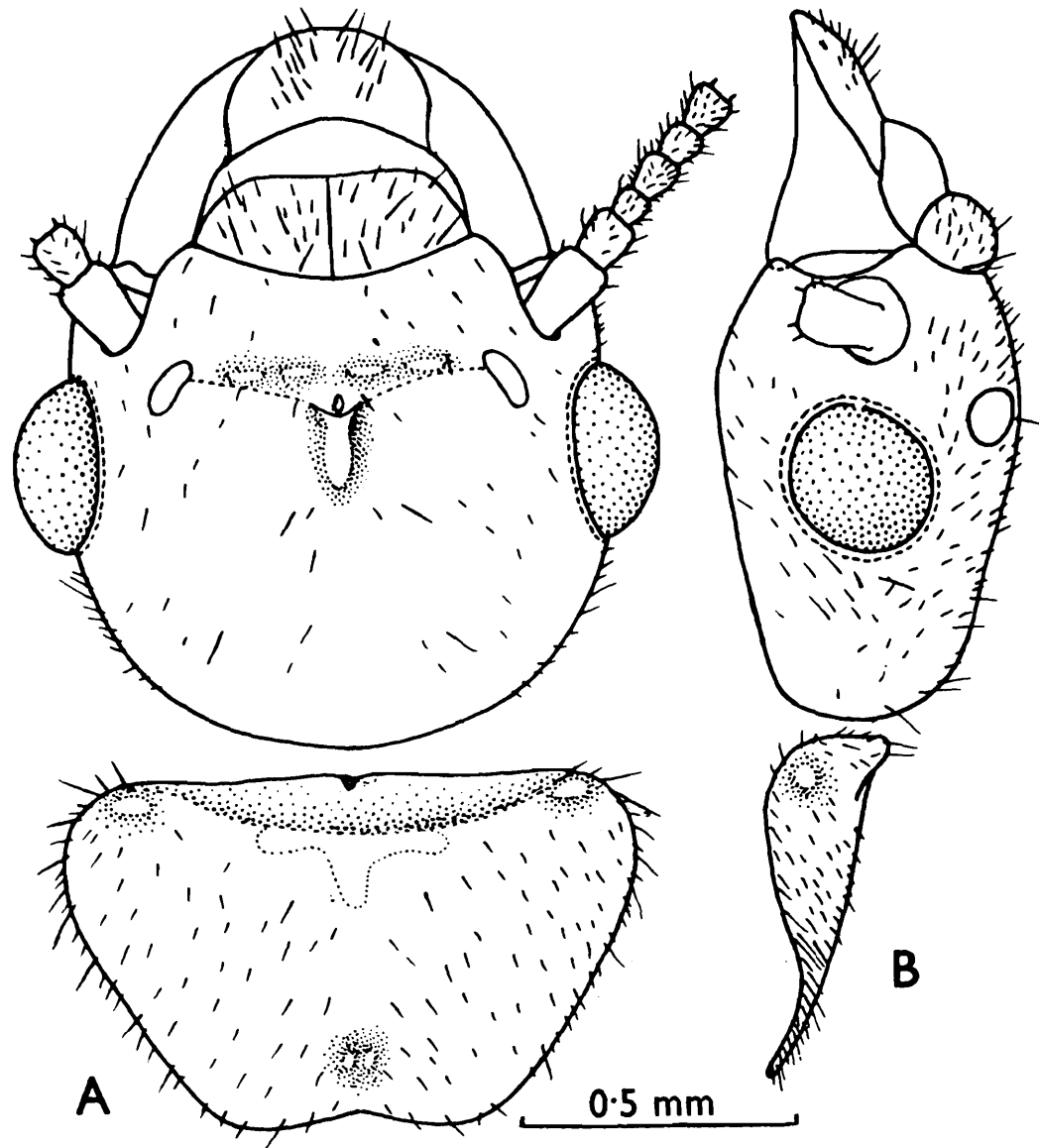


Fig. 56 *Nasutitermes chhotanii* n. sp. Imago. (A) Head and pronotum, in dorsal view. (B) Ditto, side view.

forming sharp angles at corners. Legs thin and long, hairy; tarsi 4-jointed; tibial spurs 2 : 2 : 2. Wings hairy along margins and on distal part of wing-membrane; micrasters present on membrane. Costa thick, brown, darker than membrane. Radius as thick as costa, close to and running parallel to it. Media running medially and branching near distal end. Cubitus with 8–10 branches to posterior margin; proximal branches thicker and more prominent. In forewing subcosta very short; meeting costa just outside scale; media arising separately from scale. In hindwing subcosta absent and media coming out of radius just outside scale. Abdomen elongate, hairy; cerci 2-jointed, basal joint large and broad, apical joint thin, finger like, tapering; styli absent.

Measurements (in mm) :

Total body-length with wings c	10.0 – 12.5
Total body-length without wings c	6.00 – 7.20
Length of head to tip of labrum	1.23 – 1.25
Length of head to base of mandibles	0.85 – 0.95
Width of head with eyes	1.10 – 1.18
Max. diameter of eye	0.30 – 0.35
Min. diameter of eye	0.28 – 0.33
Max. diameter of ocellus	0.13
Min. diameter of ocellus	0.10
Eye-ocellus distance	0.06 – 0.08
Ocellus-antennal distance	0.10 – 0.13
Length of postclypeus	0.18
Width of postclypeus	0.45 – 0.50
Length of labrum	0.28 – 0.30
Width of labrum	0.35 – 0.43
Length of pronotum	0.60 – 0.68
Max. width of pronotum	0.88 – 0.98
Length of forewing with scale	9.50 – 11.00
Length of forewing scale	0.50 – 0.65
Length of hindwing with scale	9.00 – 10.00
Length of hindwing scale	0.30 – 0.40

SOLDIER (Fig. 57) : Head-capsule yellowish brown to pale brown; rostrum dark reddish brown, basally pale as head-capsule; antennae pale brown, paler than head; thorax creamish, pronotum brownish along anterior margin; legs creamish; abdomen transparent with greyish intestinal contents showing through. Head with a pair of hairs at base of rostrum and a pair of long hairs at a little below middle of head and with several short hairs; rostrum with a pair of long hairs near tip (sometimes 1 or 2 more) and several short ones; pronotum with few short hairs on margins and on body; abdominal tergites with several short hairs and a pair of longer hairs near posterior margin, one on either side; last abdominal tergites and sternites with several long and short hairs. Total body length 4.20 – 4.50 mm. Head subcircular, broader than its length without rostrum; widest posteriorly; posterior margin rounded; in profile depressed behind nasute. Rostrum thick, subconical, gradually narrowing in front; shorter than head without

rostrum. fontanelle tube prominently clear in part of head and rostrum. Antennae with 13 segments, segment 4 shortest. Eyes and ocelli absent. Mandibles vestigial, without any apical

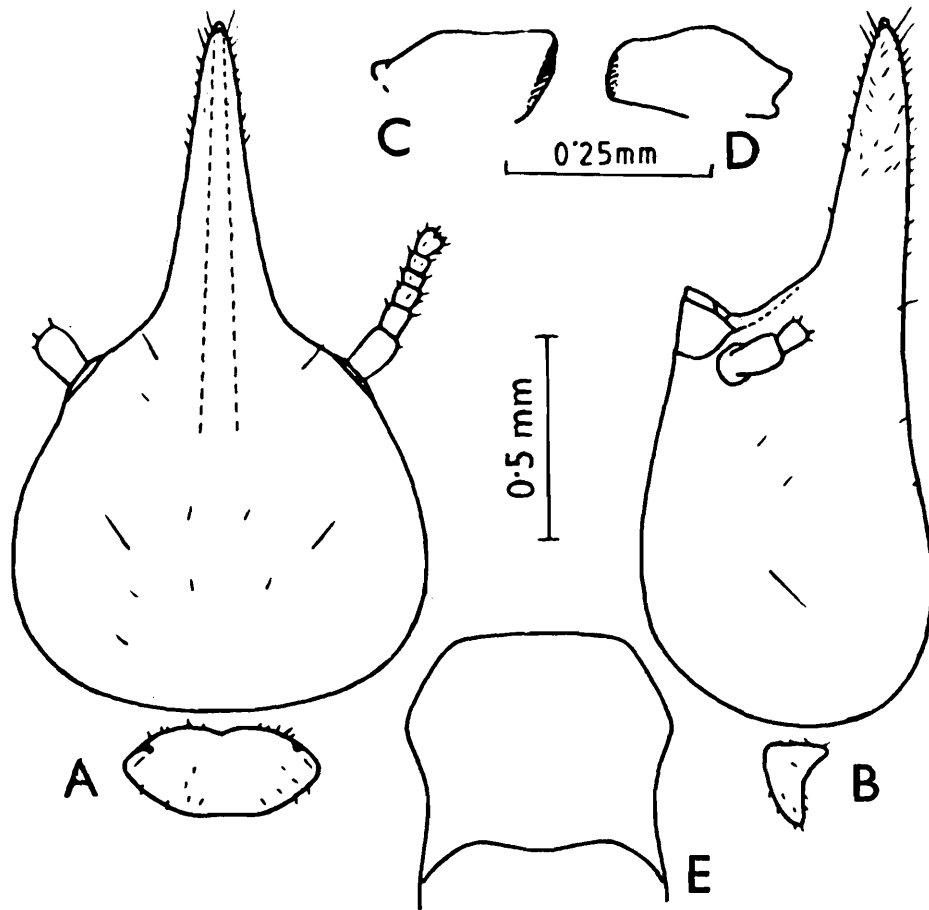


Fig. 57 *Nasutitermes chhotanii* n. sp. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) and (D) Left and right mandibles, respectively. (E)

spine. Postmentum squat, subsquarish; weakly incurved at waist. Pronotum saddle-shaped; broader than long; anterior margin slightly notched in middle; posterior margin substraight. Legs short, creamish, hairy; tarsi 4-jointed; tibial spurs 2 : 2 : 2. Abdomen elongate, hairy; cerci 2-jointed.

<i>Measurements (in mm), etc :</i>	Range (10 exs)	Holotype
Total body-length	4.20 – 4.50	4.20
Length of head with nasute	1.58 – 1.70	1.70
Length of head without nasute	0.90 – 1.03	1.03
Length of nasute	0.68 – 0.75	0.73
Height of head	0.65 – 0.68	0.68
Max. width of head	0.95 – 1.02	1.02

<i>Measurements (in mm), etc :</i>	Range (10 exs)	Holotype
Head bulge	0.25 – 0.30	0.30
Head index (max. width/length with rostrum)	0.600 – 0.606	0.600
Head index (max. width/length without rostrum)	0.969 – 1.111	0.990
Nasute-head length index (length of nasute/head-length without nasute)	0.709 – 0.806	0.709
Head production index (head-bulge/head-length without rostrum)	0.269 – 0.291	0.291
Length of postmentum	0.28 – 0.30	0.28
Max. width of postmentum	0.25 – 0.28	0.28
Min. width of postmentum	0.23 – 0.25	0.25
Length of pronotum	0.24 – 0.28	0.24
Max. width of pronotum	0.48 – 0.50	0.48

WORKER MAJOR : Head-capsule creamish to pale yellow, frontal region whitish; antennae, legs and postclypeus paler than head; thoracreamy white; abdomen transparent with greyish intestinal contents showing through. Head fairly and body densely hairy. Total body-length 4.0 – 4.60 mm. Head-capsule subcircular, broader than its length to base of mandibles (head length to tip of labrum 1.15 – 1.20, to base of mandibles 0.77 – 0.83 and head-width 0.90 – 1.03 mm); Y-suture indistinct. Fontanelle plate as elliptical, translucent marking. Eyes and ocelli absent. Antennae with 13–14 segments; in 13 segmented antennae, segment 3 and 4 subequal; segment 4 sometimes longer and subdivided; in 14 segmented one, segment 4 shortest. Postclypeus weakly swollen, length less than half its width (width 0.45, length 0.15 – 0.17 mm). Labrum and mandibles as in Imago. Pronotum, legs and abdomen as in soldier.

WORKER MINOR : Like worker major but smaller in size.

Type-specimens : ~~Holotype~~ S. (Z. S. I. Regn. No.....) and paratypes, Imagoes, soldiers (Z. S. I. Regn. No) and workers vide 'Material' above, in National Zoological Collection in Zoological Survey of India.

Type-locality and Distribution : Itanagar, Arunachal Pradesh (type-locality), known only from the type-locality.

Affinities : The soldier of this new species differ from that of *N. anamalaiensis* in having thinner rostrum and being smaller in size; from *N. fletcheri* in having thicker rostrum, head rounded vs pear shaped, and for head in profile incurved and without bulge; from *N. gardneri* for having thicker rostrum, head rounded and without bulge behind rostrum and from *N. tandoni* n. sp. infra for being smaller in size, for thinner rostrum and head rounded and incurved in profile.

45. *Nasutitermes gardneri* Snyder

1933. *Nasutitermes (Subulitermes) gardneri* Snyder. *Proc. U. S. natn. Mus.*, **82** (Art. 16) : 12.

Material : Im., S. and W. Assam : Khorangma (Mikir Hills), A. S. Rajagopal, 21. xii. 1963; Sadiya Road (300 m), S. K. Tandon, 8. iii. 1969. Meghalaya : Chambalgiri, West Garo Hills, J. R. B. Alfred, 19. ii. 1991. Balphakram National Park, West Garo Hills, J.R.B. Alfred, 20. ii. 1991. Siju Cave West Garo Hill, J. R. B. Alfred, 23. ii. 1991. Nakrek, Balphakram, West Garo Hills, J. R. B. Alfred, 25. ii. 1991. Arunachal Pradesh : Upper Subansiri : Dogi nala, c 12 km from nacho (800 m), 29. xi. 1974; Galensinaik (1300 m), 8. xii. 1974 and Damin (1100 m), 22. i. 1975, all J. M. Julka. Lohit : Glo Howel (1000 m), 4. xii. 1969, J. M. Julka (2 vial one with Im, S. and W. and other with S. and W.). Kameng : Norgum River Bank K. C. Jayaramakrishnan, iii. 1961 (3 vials, S. and W.), v. 1961; Pinjali (244 m), A. N. T. Joseph 4. v. 1966; Chorba Road (1500 m), S. K. Tandon, 17. iii. 1973 and Minon Camp., Pinjali, S. K. Bhattacharyya, 24. xii. 1965 Siang : Sangam village, R. S. Pillai, 9. ii. 1973. Manipur : 2 km from Singnath, K. R. Rao 27. iii. 1974 (S. and W.)

Description : The imago of this species was so far not known; it is described here from a collection from Glo Howel, mentioned above under "Material"

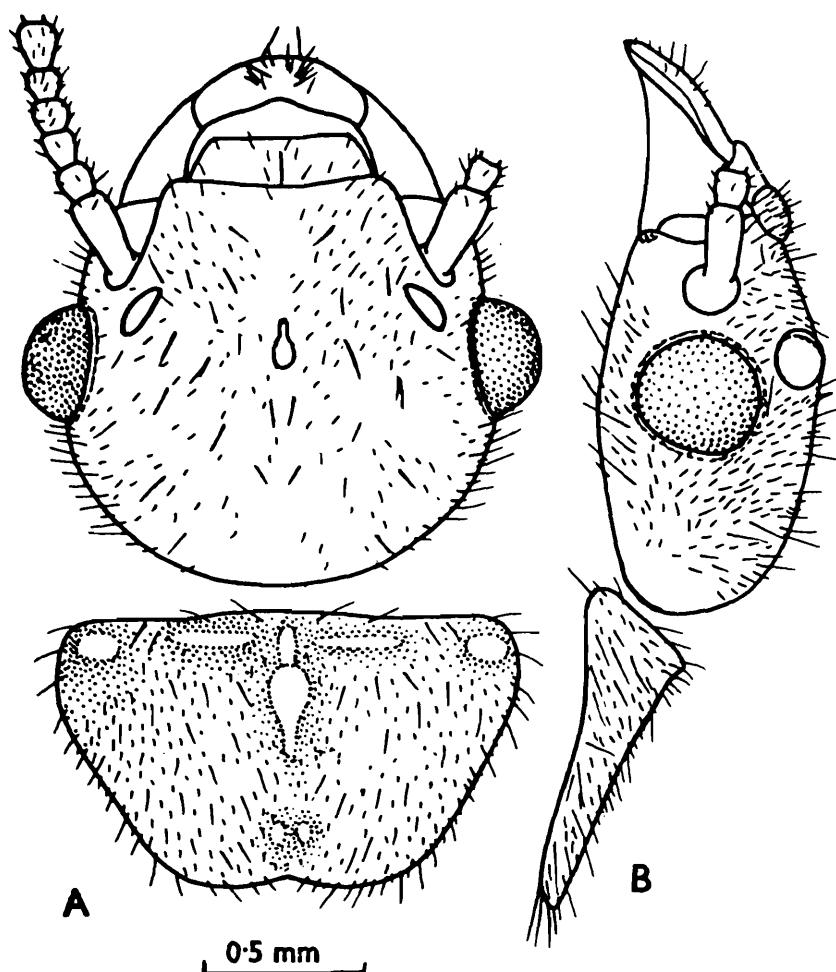


Fig. 58 *Nasutitermes gardneri* Snyder. Imago. (A) Head and pronotum, in dorsal view. (B) Ditto, in side view.

IMAGO (Fig. 58) : Head capsule reddish brown, labrum, postclypeus, antennae and legs brownish yellow; pronotum brownish with a faint T-shaped marking, a pair of shoulder spots and a pair of whitish spots at tail of T; abdomen above brownish, paler than pronotum, below yellowish brown; anterior 4–5 sternites paler medially. Head and body densely hairy with a thick coat of fine hairs interspersed with several long hairs. Wings pale brown, margins and membrane with several hairs; membrane also densely covered with micrasters. Head subcircular, depressed

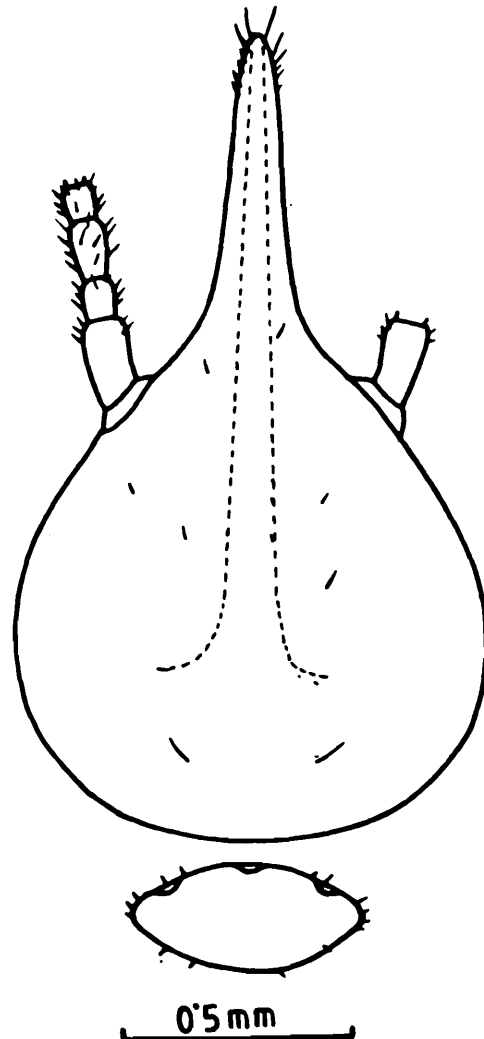


Fig. 59 *Nasutitermes gardneri* Snyder. Soldier. Head and pronotum, in dorsal view.

the region of fontanelle plate; with eyes broader than long; with a faint impression of lateral suture and a darker line running behind the fontanelle. Fontanelle plate pale brown, linearly oval; a white spot present just anterior to fontanelle plate. Eyes subcircular antero-laterally elongated somewhat; situated equidistantly from antennae and lower margin of head; maximum diameter 0.40 – 0.43 and minimum diameter 0.35 – 0.38 mm. Ocelli broadly oval, long diameter 0.16 – 0.18, short diameter 0.13 – 0.15 mm; from eyes situated at a distance less than their short diameter and about their long diameter from antennae. Postclypeus slightly swollen, hairy; length less than half its width. Anteclypeus flat, apilose, trapezoidal; anterior margin weakly projecting in front. Labrum broadly dome-shaped with long and short hairs. Antennae with 15 segments;

segment 3 a little shorter and narrower than 2; 4 rounded, somewhat broader but shorter than 3; 5 shortest, rounded. Mandibles of *Nasutiteemes*-type. Pronotum trapezoidal, broader than long and a little narrower than head; slightly raised at anterior margin; anterior margin faintly incurved without any notch; posterior margin rounded with a well marked emargination at middle. Meso and metanotum roundly incurved at posterior margin. Legs elongate, tibial spurs 2 : 2 : 2; tarsi 4-segmented. Wings pale brown, with brownish venation; hairy along margins and veins; membrane covered with micrasters appearing granular under low power; fairly hairy in distal half, scantily hairy in proximal part. Forewing with costa thick, stout bordering anterior margin; subcosta short, stump-like ending just outside scale; radius as thick as costa, running close to and parallel with it, *media* arising separately from scale, running medially and with 3 – 4 branches at distal end; cubitus with about 10 branches to posterior margin. Hindwing with venation generally as in forewing; subcosta not marked in membrane; *media* arises from radius outside scale. Abdomen elongate, cerci 2-jointed, hairy, conical; styli absent.

Measurements (in mm), : Imago (5 exs) :

Total body-length with wings	16.20 – 17.75
Total body length without wings	8.75 – 8.98
Length of head to tip of labrum	1.65 – 1.78
Length of head to base of mandibles	1.20 – 1.30
Width of head with eyes	1.55 – 1.60
Length of postclypeus	0.18 – 0.20
Width of postclypeus	0.50 – 0.55
Length of labrum	0.30 – 0.38
Width of labrum	0.43 – 0.45
Length of fontanelle plate	0.125– 0.15
Max. diameter of eye	0.40 – 0.43
Long diameter of ocellus	0.16 – 0.18
Short diameter of ocellus	0.35 – 0.38
Short diameter of eye	0.13 – 0.15
Eye-ocellus distance	0.10 – 0.11
Eye-antennal distance	0.04 – 0.07
Ocellus-antennal distance	0.17 – 0.18
Max. width of pronotum	1.35 – 1.43
Max. length of pronotum	0.83 – 0.84
Length of forewing with scale	15.50 – 15.70
Length of forewing scale	0.80 – 0.84
Length of hindwing with scale	14.50 – 14.52
Length of hind wing scale	0.70 – 0.75

Distribution : INDIA : North-eastern India. : Assam, Arunachal Pradesh, Manipur. Also West Bengal. Elsewhere : BHUTAN.

46. *Nasutitermes garoensis* Roonwal and Chhotani

1962. *Nasutitermes garoensis* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 379 – 384.

1975. *Nasutitermes garoensis*; Chhotani, *Orient. Ins.* 9(2) : 153 – 155.

1977. *Nasutitermes garoensis*; Roonwal and Chhotani, *Ent. Basil.*, 2 : 77 – 78.

1977. *Nasutitermes garoensis* : Lahiri, Ghosh and Biswas, *Bull. Megh. Sci. Soc.*, 2: 38.

Material : Im., S., and W. Assam : Gali Forest, North Lakhimpur (400 ft. 27°39'N, 95°11'E), A. K. Mukherji, 7. iii. 1961; Kaziranga Central Path, A. K. Ghosh, 17. xii. 1972 (2 vials) & 19. xii. 1972. Meghalaya : Barapani, R. K. Varshney, 24. vii. 1967; Damra, Garo Hills, S. Biswas 20. xi. 1973. Arunachal Pradesh : Forest 1 km. E. of Bairavkonda (900 ft) Monai River bank, Dist. Kameng, K. C. Jayaramakrishnan, 5. iii. 1961 and 6. iii. 1961 (2 vials) ex. tree; Norgum River bank (below Bitselling village 3000 ft.) Kameng Dist., K. C. Jayaramakrishnan, 16. v. 1961 (2 vials); 3 km. N. to Bokhar on way to Kalaktang (3000 ft. Kameng Dist.),

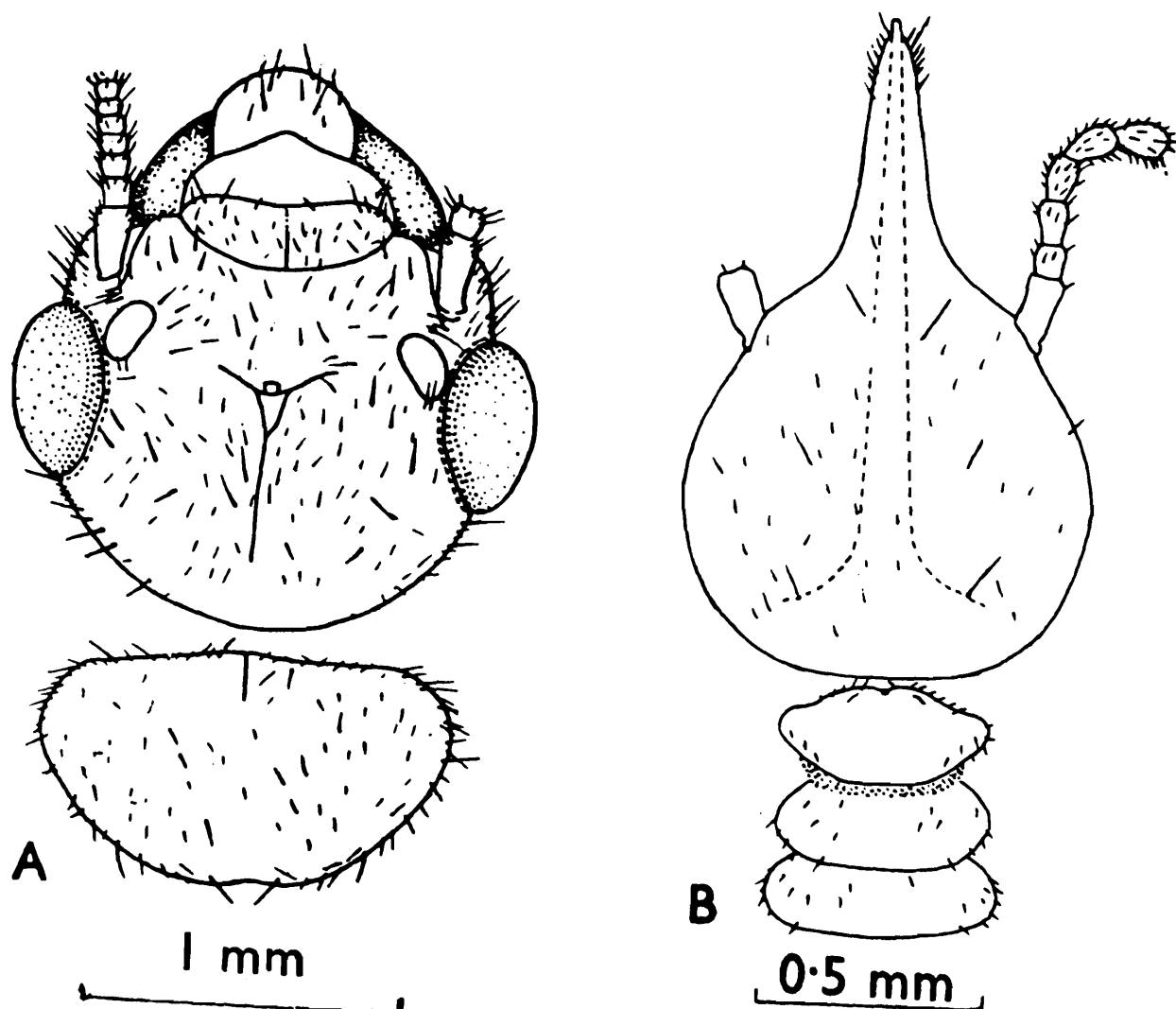


Fig. 60 *Nasutitermes garoensis* Roonwal and Chhotani. (A) Imago. Head and pronotum, in dorsal view. (B) Soldier, Head and thorax, dorsal view.

28. v. 1961, ex. "rotting log of wood"; Tanga Riverside, opp. Mount Brigade 24°35N, 78.35E, *S. K. Bhattacharya*, 19. xii. 1965, ex living tree; Bhalukpong, Tipi, Kameng Dist., 213m., *A.N.T. Joseph*, 3. v. 1966 and 6. v. 1966 (2 vials); Kimin, Lower South Subansiri *A. N. T. Joseph*, 9. v. 1966 (2 vials) and 11. v. 1966 (1 vial); Pading, Siang Dist., *S. K. Tandon* and *G. S. Arora*, 11. x. 1966 (4 vials); Tapi, Siang Dist., (600 m.) *S. K. Tandon* and *G. S. Arora*, 23. x. 1966, ex "wood (2 vials); Pakha Camp., Daporijo, Upper Subansiri, *S. K. Tandon* and *G. S. Arora*, 26. x. 1966 (3 vials); Bela, Daporijo, Upper Subansiri (150 m.), *S. K. Tandon* and *G. S. Arora*, 27. x. 1966; Siki, about 15 km. from Taliha, Upper Subansiri, *J. M. Julka*, 24. xi. 1974; Pabin (650 m.), Subansiri, *J. M. Julka* 17. i. 1975. Likabali West Siang Dist., *S. K. Gupta* and *M. Prasad*, 17. x. 1981 (2 vials); Miao Res. Forest, Tirap Dist. (Changlang Dist.), *S. Biswas*, 1. xii. 1982; Gibbons Land, 16 km. East of Miao, Changlang Dist., *S. Biswas*, 27. xii. 1982; Nirjuli, Itanagar, *P. T. Bhutia*, 3. vi. 1987 (2 vials) Near Lichi, Lower Subansiri, 23 kms. from Zero to Yazali, *T. K. Pal*, 16. ix. 1988; Tago, 10 kms from Yazali *T. K. Pal*, 17. ix. 1988 (2 vials); Along, West Siang Dist., *P. T. Bhutia*, 2. xii. 1988; Zoological Gardens, Itanagar, *O. B. Chhotani*, 12. v. 1989 ex. stump of wood etc. (2 vials); Natural Forest 1 km. from lake Ganga, Itanagar, *O. B. Chhotani* (05 / 13. 5. 1989) 13. v. 1989 ex "dead stump of wood on ground" nest in hollow of trees etc. (9 vials); Ganga Lake, Itanagar, *O. B. Chhotani*, 13. v. 1981, ex. nest in a tree stump" Kimin, *O. B. Chhotani*, 17. v. 1989, ex. wood.

Measurements (in mm) : Imagos (10 exs) :

Total length with wings c	13.00 – 14.50
Total length without wings c	6.80 – 7.00
Length of head to base of mandibles	0.90 – 1.05
Max. width of head with eyes	1.20 – 1.30
Max. diameter of eyes	0.38 – 0.45
Max. diameter of ocellus	0.17 – 0.18
Min. diameter of ocellus	0.14 – 0.15
Eye-ocellus distance	0.02 – 0.04
Length of pronotum	0.60 – 0.68
Max. width of pronotum	1.00 – 1.10
Length of forewing with scale	10.50 – 11.30
Length of hindwing with scale	9.50 – 10.40
No. of antennal segments	15

Measurements (in mm) : Imagos (10 exs) :

Soldier (40 exs) :

Total body-length c	3.30 – 4.50
Length of head to tip of rostrum	1.40 – 1.50
Length of head without rostrum	0.85 – 0.88
Length of rostrum	0.57 – 0.62
Max. width of head	0.85 – 0.88
Length of pronotum	0.15 – 0.18
Width of pronotum	0.43 – 0.48
No. of antennal segments	12

Distribution : INDIA : North-eastern India. : Assam, Meghalaya, Arunachal Pradesh, Elsewhere : BHUTAN.

47. *Nasutitermes jalpaigurensis* Prashad and Sen-Sarma

1959. *Nasutitermes jalpaigurensis* Prashad and Sen-Sarma, *Rev. Termite Genue Nasutitermes Banks* (Isoptera :Termitidae : Nasutitermitinae) *Indian Region* (ICAR Monogr. 10.23): 5, 38, 3941, 43.

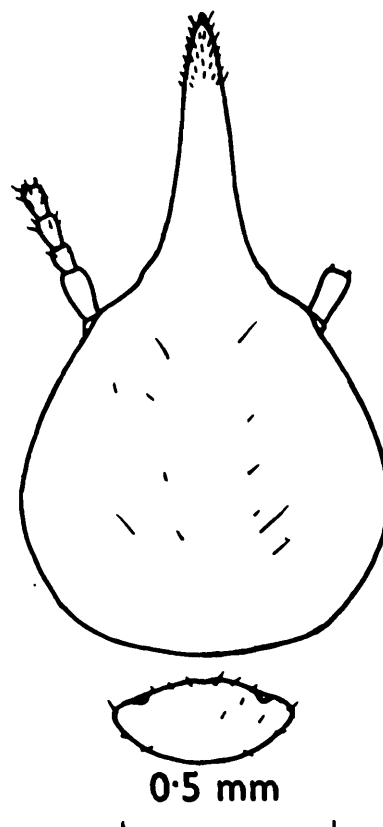


Fig. 61 *Nasutitermes jalpaigurensis* Prashad and Sen-Sarma. Soldier. Head and pronotum, in dorsal view.

Material : S., and W. Arunachal Pradesh : Charduar Forest, Bhalukpong, S. K. Bhattacharyya, 27. xii. 1965; Tapi, S. K. Tandon and G. S. Arora, 23. x. 1966.

Measurements (in mm), etc : Soldier (5 examples) :

Total body-length	3.8 – 4.0
Length of head with nasute	1.43 – 1.50
Length of head without nasute	0.80 – 0.85
Max. width of head	0.83 – 0.85
Length of pronotum	0.18 – 0.20
Max. width of pronotum	0.42 – 0.43
No. of antennal segments	12

Distribution : INDIA : North-eastern India : Arunachal Pradesh : Charduar Forest, Bhalukpong and Tapi. Tripura : Tiliamura, Also West Bengal. Elsewhere : BANGLADESH.

48. *Nasutitermes kali* Roonwal and Chhotani

1962. *Nasutitermes kali* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28 (4) : 297, 384 – 389.

Material : S. and W. Meghalaya : Sangsok (Garo Hills), S. Biswas, 17. xi. 1973.

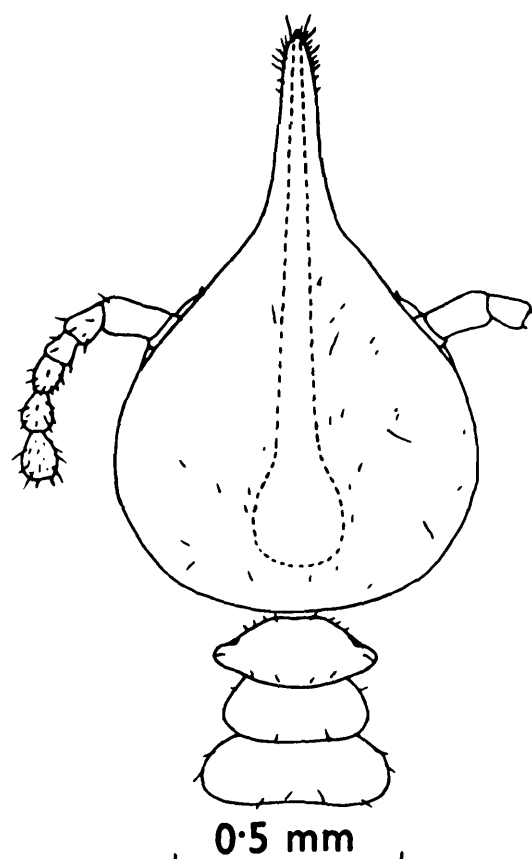


Fig. 62 *Nasutitermes kali* Roonwal and Chhotani. Soldier. Head and thorax, in dorsal view.

Measurements (in mm), etc : Soldier (5 examples) :

Total body-length	3.50 – 3.80
Length of head with nasute	1.43 – 1.58
Length of head without nasute	0.78 – 0.83
Max. width of head	0.78 – 0.90
Length of pronotum	0.15 – 0.18
Max. width of pronotum	0.45 – 0.48
No. of antennal segments	12

Distribution : INDIA : North-eastern India : Meghalaya : Umsa Nongkharai (Khasi and Jaintia Hills) ; Sangsok (Garo Hills). Assam : Baguri, Kaziranga Sanctuary.

49. *Nasutitermes matangensiformis* (Holmgren)

1913. *Eutermes (Eutermes) matangensiformis* Holmgren, *K. Svenska Vetensk-Akad. Handl.*, 50 (2) : 185.

1975. *Nasutitermes matangensiformis*; Akhtar, *Bull. Dept. Zool. Univ. Panjab (N. S.)*, Art 7 : 131, 138 –139.

Material : S. and W. Arunachal Pradesh : Miao Res. Forest (Tirap Dist.), *S. Biswas*, 1. xii. 82.

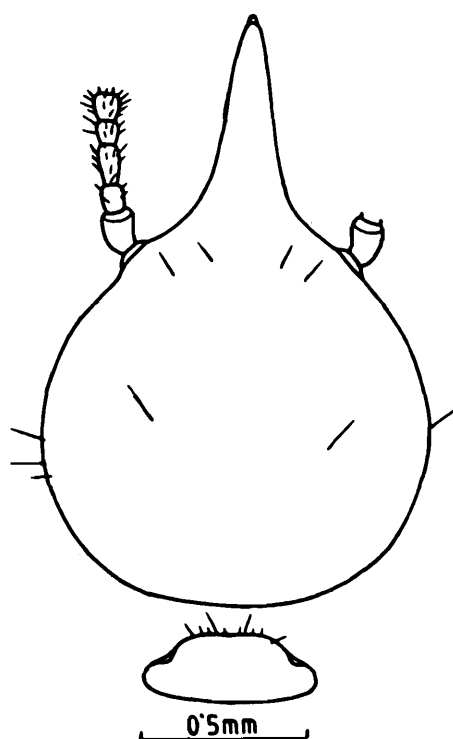


Fig. 63 *Nasutitermes matangensiformis* (Holmgren). Soldier. Head and pronotum, in dorsal view.

Measurements (in mm), etc : Soldier (5 examples) :

Total body-length c	4.0 – 4.20
Length of head with nasute	1.53 – 1.70
Length of head without nasute	0.98 – 1.00
Length of nasute	0.55 – 0.70
Max. width of head	0.95 – 1.13
Length of pronotum	0.20 – 0.25
Max. width of pronotum	0.48 – 0.60
No. of antennal segments	13

Distributionn : INDIA : North-eastern India : Arunachal Pradesh : Miao (Tirap Dist., first record from N. E. India. Also Andaman and Nicobar Island. *Elsewhere* : BANGLADESH. THAILAND, MALAYSIA (Sarawak), INDONESIA (Java, Sumatra, Borneo).

50. *Nasutitermes moratus* (Silvestri)

1914. *Eutermes moratus* Silvestri, *Rec. Indian Mus.*, 8(5) : 431 – 432.

1962. *Nasutitermes moratus* : Roonwal and Chhotani, *Proc. natn. Inst. Sci. India*, (B) 28(4) : 297, 389 – 390.

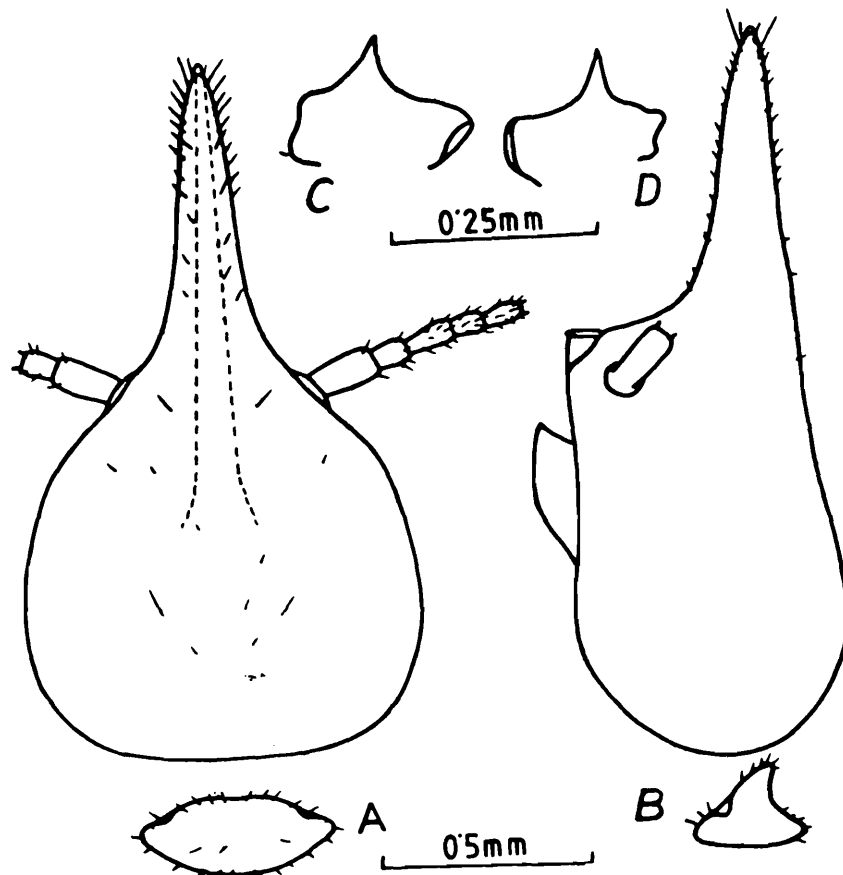


Fig. 64 *Nasutitermes moratus* (Silvestri). Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) and (D) Left and right mandibles, respectively.

Material : S. and W. Arunachal Pradesh : Lemeking (1400 m, Upper Subansiri Dist.),
J. M. Julka, 3. xii. 1974.

Measurements (in mm), etc : Soldier (5 examples) :

Total body-length c	3.65 – 3.70
Length of head with nasute	1.67 – 1.73
Length of head without nasute	1.03 – 1.05
Max. width of head	0.96 – 1.00
Max. length of pronotum	0.20 – 0.25
Max. width of pronotum	0.45 – 0.50
No. of antennal segments	13

Distribution : INDIA : North-eastern India : Arunachal Pradesh : Yambung (Siang Dist. – type – locality) and Lemeking (Upper Subansiri Dist.). *Elsewhere* : Not recorded from any other locality.

51. *Nasutitermes tandoni* *n. sp.

Material : Two vials with S. and W., Tappi, Siang Dist., Arunachal Pradesh, *S. K. Tandon* and *G. S. Arora*, 23. x. 1966, ex “wood.”

Description : IMAGO : Unknown.

SOLDIER (Fig. 65) : Head pale yellowish brown, rostrum pale brown; antennae, legs and pronotum creamish; abdominal tergites and sternites translucent, greyish intestinal contents showing through. Head with a pair of long hairs at vertex, a pair or two on rostrum and a pair (sometimes absent) at level of antennae and several minute hairs; tip of rostrum with a number of short hairs, a pair or two of longer ones at distal end; pronotum with short hairs along margins and a few on body; abdominal tergites with several short hairs, each tergite with a few longer ones near distal margin; sternites more hairy and with several long and short hairs. Total body-length 4.00 – 4.50 mm.

Head broadly pyriform, wider than head-length without rostrum (length with rostrum 1.70 – 1.80, without rostrum 0.98 – 1.05, width 0.98 – 1.08 mm, index width length 1.00 – 1.05); in profile depressed behind rostrum; head weakly produced behind; rostrum thick, conical, length less than three fourths of head-length without rostrum. Antennae short with 13 segments; segment 3rd slightly shorter than 2nd, 4th shortest; 5th subequal to 3rd; remaining segments broadly pyriform. Mandibles knob-like, without spines. Postmentum short, hexagonal; sides weakly incurved. Pronotum saddle-shaped, small; margins with minute hairs and one or two

* Named after Dr. S. K. Tandon, one of the collectors

longer hairs; anterior margin appreciably notched; posterior margin substraight, not indented; mesonotum narrower and metanotum a little wider than pronotum; both without emargination at posterior margin. Legs thin, long, pilose; apical tibial spurs 2 : 2 : 2; tarsi 4-jointed. Abdomen oblong, hairy; cerci 2-segmented, 0.13 – 0.15 mm long; styli absent.

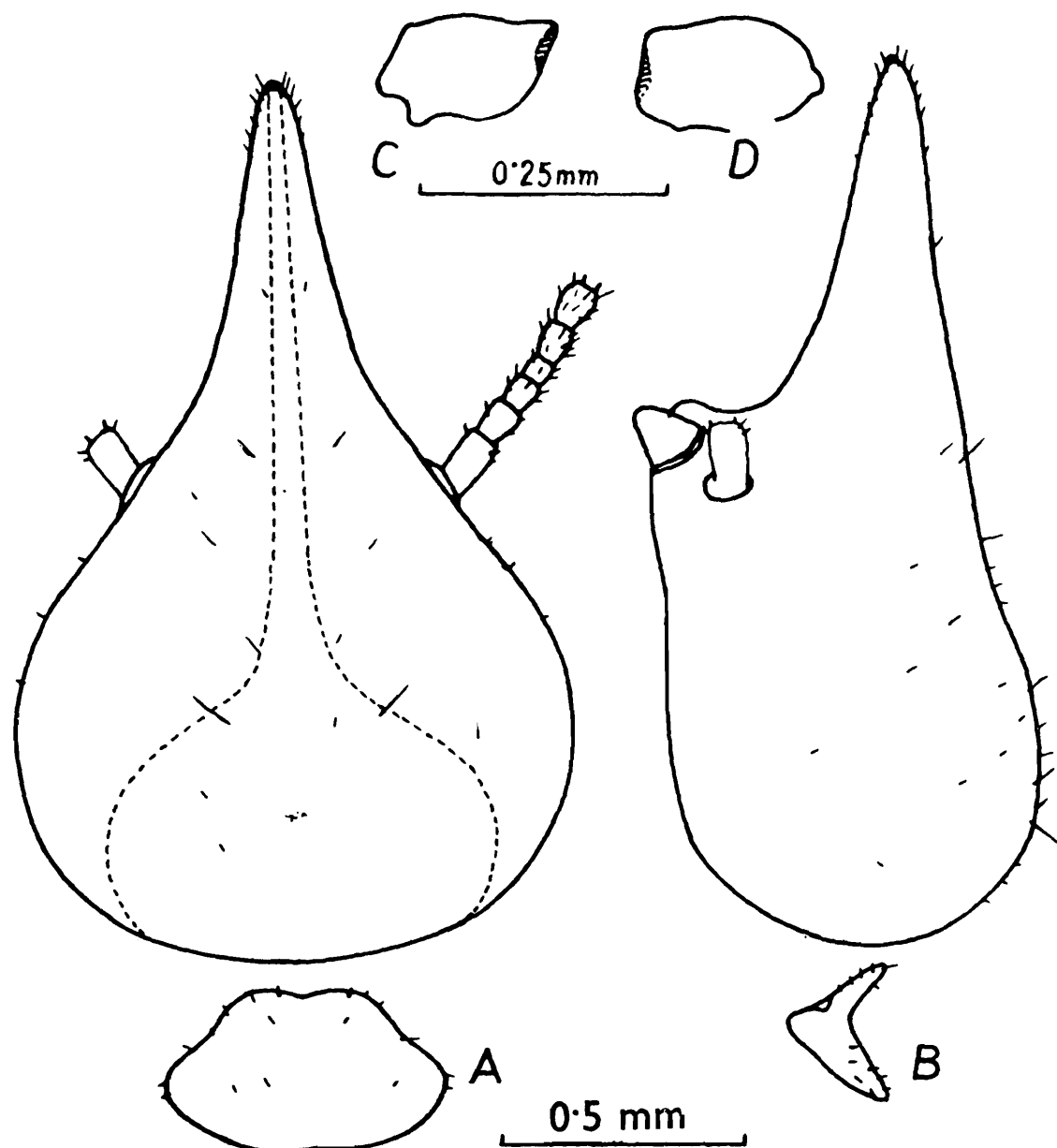


Fig. 65 *Nasutitermes tandoni* n. sp. Soldier. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) and (D) Left and right mandibles, respectively.

<i>Measurements (in mm), etc :</i>	Range (6 exs)	Holotype
Total body-length	4.00 – 4.50	4.50
Length of head with nasute	1.70 – 1.80	1.70
Length of head without nasute	0.98 – 1.05	1.05

<i>Measurements (in mm), etc :</i>	Range (6 exs)	Holotype
Length of nasute	0.70 – 0.75	0.70
Height of head	0.70 – 0.75	0.70
Max. width of head	0.98 – 1.08	1.03
Head bulge	0.35 – 0.36	0.35
Head index (max. width/length with nasute)	0.57 – 0.617	0.617
Head index (max. width/length without nasute)	1.00 – 1.05	1.00
Nasute head-length index (length of nasute/head-length without nasute)	0.68 – 0.80	0.75
Head production index (head bulge/head-length without nasute)	0.333 – 0.357	0.333
Length of postmentum	0.26 – 0.38	0.26
Max. width of postmentum	0.30 – 0.35	0.30
Min. width of postmentum	0.28 – 0.29	0.28
Length of pronotum	0.23 – 0.25	0.23
Max. width of pronotum	0.48 – 0.55	0.48

WORKER : Dimorphic : **WORKER MAJOR** : Head-capsule and postclypeus pale yellow; thorax a little paler than head; antennae and legs creamish; abdominal tergites and sternites transparent, with contents showing through. Head and body fairly densely pilose. Total body-length 4.30 – 4.40 mm. Head-capsule subsquarish, broader than length to base of mandibles (head length to tip of labrum 1.30 – 1.32, length to base of mandibles 0.90 – 0.92, maximum width 1.00 – 1.05 mm) frons behind clypeus weakly depressed. Fontanelle plate oval, elongate, length about 0.20 – 0.25 width 0.07 – 0.075 mm. Eyes and ocelli absent, Antennae with 14 segments, segment 4 shortest. Postclypeus weakly swollen, fairly hairy; length less than half of width (length 0.18 – 0.19; width 0.50 – 0.53 mm); posterior margin weakly indented medially, anterior margin weakly incurved. Anteclypeus trapezoidal with anterior margin weakly projected in front, apilose. Labrum dome-shaped, broader than long (width 0.40 – 0.43, length 0.30 – 0.33 mm); with several hairs at anterior margin and on body. Mandibles each with an apical and 2 marginal teeth, of typically *Nasutitermes* – type. Thorax and legs as in soldier. (Pronotum-length 0.37 – 0.40, width 0.60 – 0.65 mm). Abdomen a little wider otherwise as in soldier.

WORKER MINOR : As in worker major but is a little smaller in size. Head length to tip of labrum 1.08 – 1.15, head-length to base of mandibles 0.78 – 0.80, maximum head-width 0.88 – 0.95, pronotum- width 0.45 – 0.47 and pronotum-length 0.20 – 0.25 mm.

Type-specimens : Holotype soldier (Z. S. I. Regn. No. and paratype soldiers and workers in 2 vials) Regn. Nos. in National Zoological Collections, Z. S. I. Calcutta.

Type-locality and Distribution : Tappi, Siang Dist. Arunachal Pradesh – type-locality. Known only from the type-locality.

Affinities : The soldier of this species does not have spines on mandibles, it comes close to *N. chhotanii* n. sp. described above (for differences see under that species). In shape of head it somewhat resembles *N. matangensiformis* but differs for having thicker rostrum and for absence of spines on mandibles.

Genus 19. *Bulbitermes* Emerson

52. *Bulbitermes emersoni* Maiti

1977. *Bulbitermes emersoni* Maiti (in Roonwal and Chhotani), *Ent. Basil.*, **2** : 78 – 79.

1979. *Bulbitermes emersoni*: Maiti, *Proc. zool. Soc.*, **30** : 135 – 139.

1983. *Bulbitermes emersoni*; Maiti, *Occ. Pap. Rec. zool. Surv. India*, No. **42** : 26, 127–129.

Material : One S., Miao, Tirap Dist. Arunachal Pradesh, *S. Biswas and Party*, 30. xi. 1982.

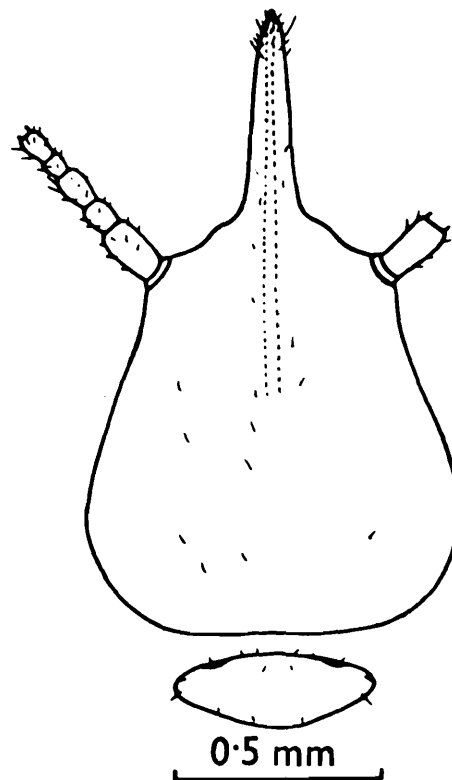


Fig. 66 *Bulbitermes emersoni* Maiti. Soldier. Head, in dorsal view.

Measurements (in mm), etc : Soldier (1 example) :

Total body-length	3.45
Length of head with nasute	1.45
Length of head without nasute	0.90

Measurements (in mm), etc : Soldier (1 example) :

Length of nasute	0.55
Max. width of head	0.93
Length of pronotum	0.20
Max. width of pronotum	0.53

Distribution : INDIA : North-eastern India : Arunachal Pradesh : (Miao Tirap Dist.). Also West Bengal. Elsewhere : BHUTAN.

53. *Bulbitermes parapusillus* Ahmad

1965. *Bulbitermes parapusillus* Ahmad, *Bull. Am. Mus. nat. Hist.*, **131** : 85-88.

1975. *Bulbitermes parapusillus*; Akhtar, *Bull. Dept. Zool. Univ. Panjab. (N.S.)*, Art. 7 : 143-146.

Material : Meghalaya, Tobongiri, Garo Hills, S. Biswas, 11. xi. 1973.

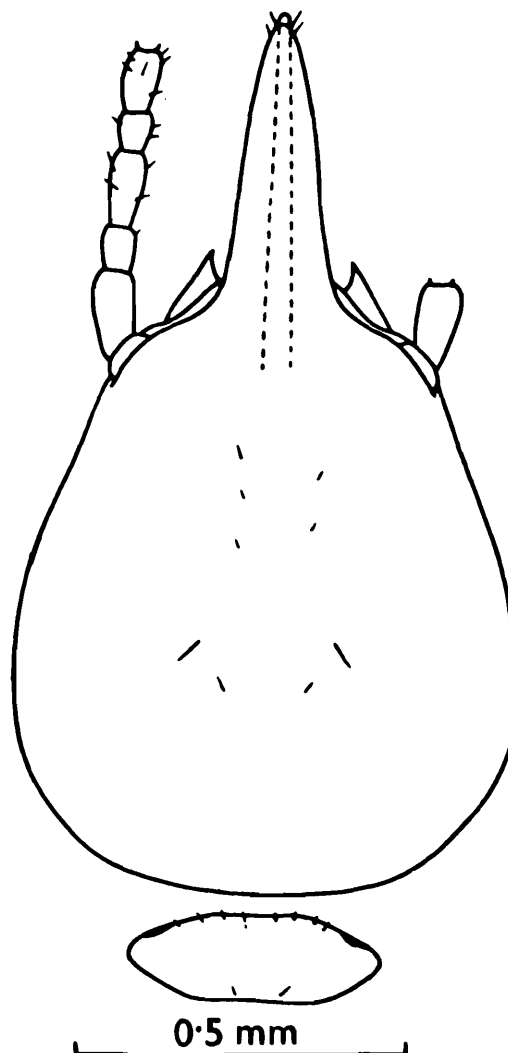


Fig. 67 *Bulbitermes parapusillus* Ahmad. Soldier. Head and pronotum, in dorsal view.

Measurements (in mm), etc : Soldier (5 examples) :

Total body-length c	3.23 – 3.65
Length of head with nasute	1.33 – 1.45
Length of head without nasute	0.78 – 0.85
Length of nasute	0.53 – 0.60
Max. width of head	0.70 – 0.78
Max. Length of pronotum	0.25 – 0.25
Max. width of pronotum	0.43 – 0.47
No. of antennal segments	13 (4th shortest)

Distribution : INDIA : North-eastern India : Meghalaya : Tobongiri, Garo Hills.
Elsewhere : BANGLADESH, THAILAND.

Genus 21. *Hospitalitermes* Holmgren

54. *Hospitalitermes jepsoni* Snyder

1934. *Nasutitermes (Hospitalitermes) jepsoni* Snyder, *Indian For. Rec.*, 20 (11) : 16.

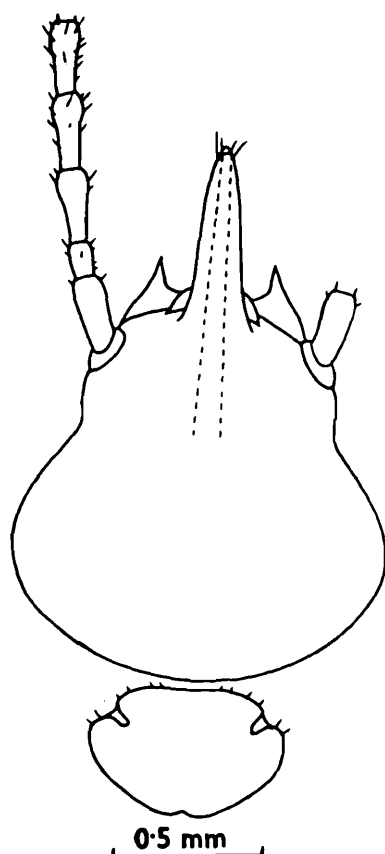


Fig. 68 *Hospitalitermes jepsoni* Snyder. Soldier. Head and pronotum, in dorsal view.

Material : S., W., 10 miles from Kochugaon (50 m), Assam, *E. S. Ross* and *D. Cavagnaro*, 19. x. 1961.

<i>Measurements (in mm), etc</i> : Soldier (10 examples) :	
Total body-length	4.90 – 5.15
Length of head to tip of rostrum	1.90 – 1.95
Length of head to base of rostrum	1.32 – 1.35
Length of rostrum	0.58 – 0.60
Max. width of head	1.28 – 1.30
Length of pronotum	0.45 – 0.48
Width of pronotum	0.68 – 0.70
No. of antennal segments	14 (segment 2 shortest)

Distribution : INDIA : North-eastern India : Assam : 10 miles S. W. of Kochugaon. Elsewhere : BANGLADESH and BURMA.

Genus 22. *Roonwalitermes* Bose

55. *Roonwalitermes wadhwai* Bose

1992. *Roonwalitermes wadhwai* Bose, *J. zool. Soc. India*, 42 (1 and 2) : 73 – 80.

Material : A vial with a holotype S. major and another with paratype S. major and minor and workers, Mawphlong (Meghalaya), *G. Bose*, 9. vi. 1990.

<i>Measurements (in mm), etc</i> :	Soldier Major	Soldier Minor
Total body-length c	4.0 – 4.5	2.90 – 3.00
Length of head with rostrum	2.35 – 2.45	1.38 – 1.43
Length of head without rostrum	1.25 – 1.30	0.70 – 0.78
Max. width of head	1.35 – 1.43	0.40 – 0.65
Length of pronotum	0.20 – 0.23	0.15 – 0.18
Max. width of pronotum	0.53 – 0.55	0.30 – 0.35
No. of antennal segments	13	11 – 12

Distribution : INDIA : North-eastern India : Meghalaya : Mawphlong - type - locality. Known only from type-locality.

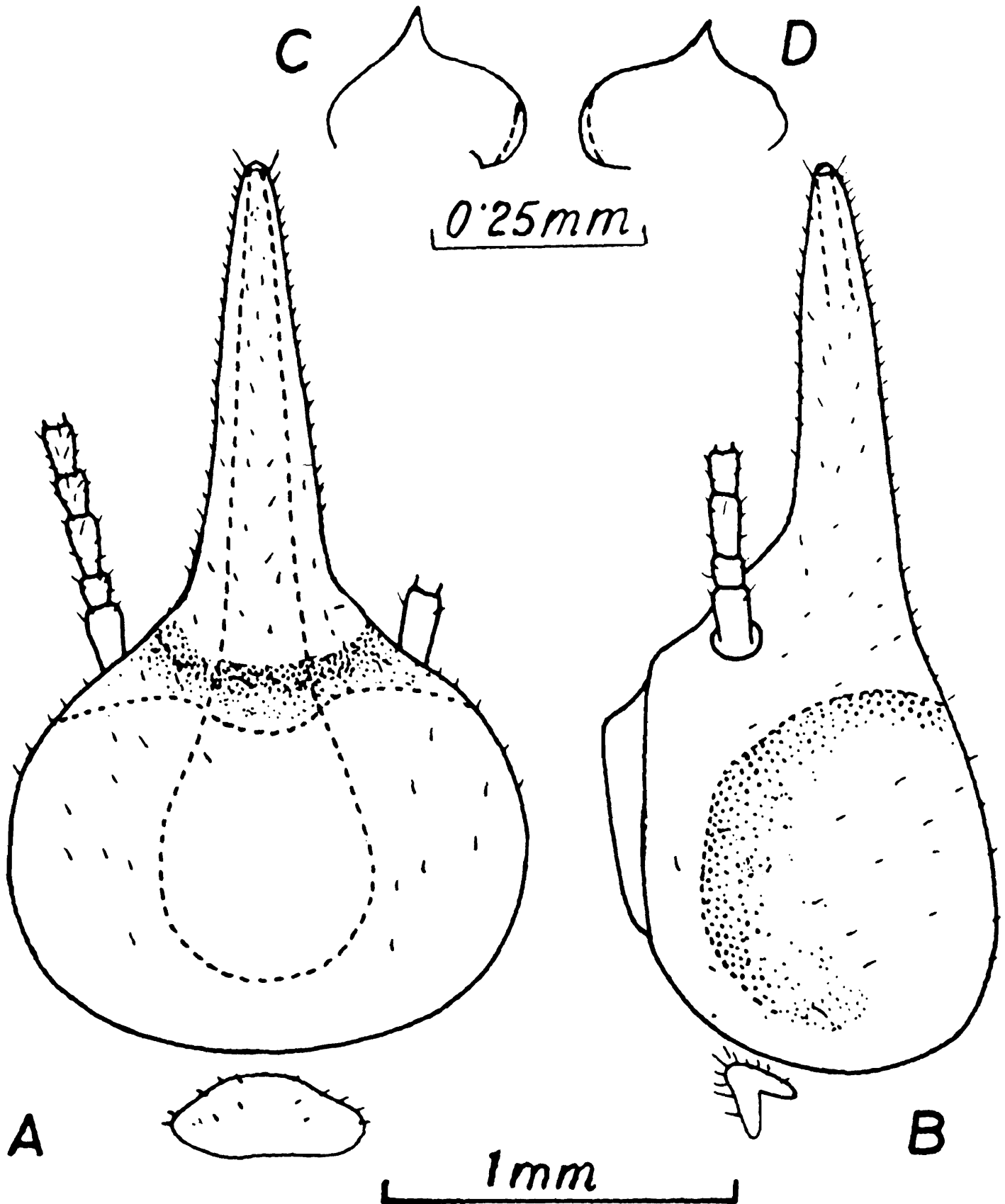


Fig. 69 *Roonwalitermes wadhwai* Bose. Soldier major. (A) Head and pronotum, in dorsal view. (B) Ditto, side view. (C) and (D) Left and right mandibles. (After Bose 1991).

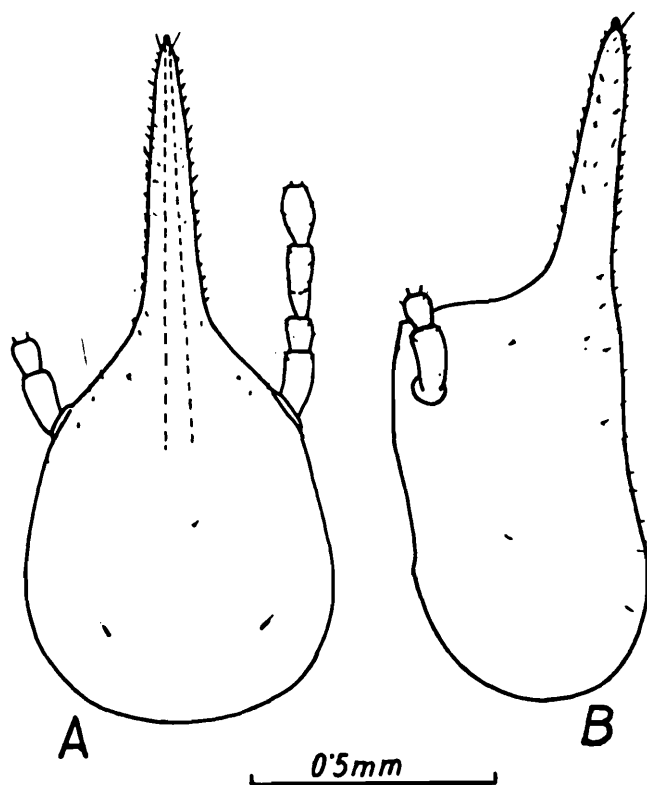


Fig. 70 *Roonwalitermes wadhwa* Bose. Soldier minor. (A) Head, in dorsal view. (B) Ditto, side view. (After Bose 1991).

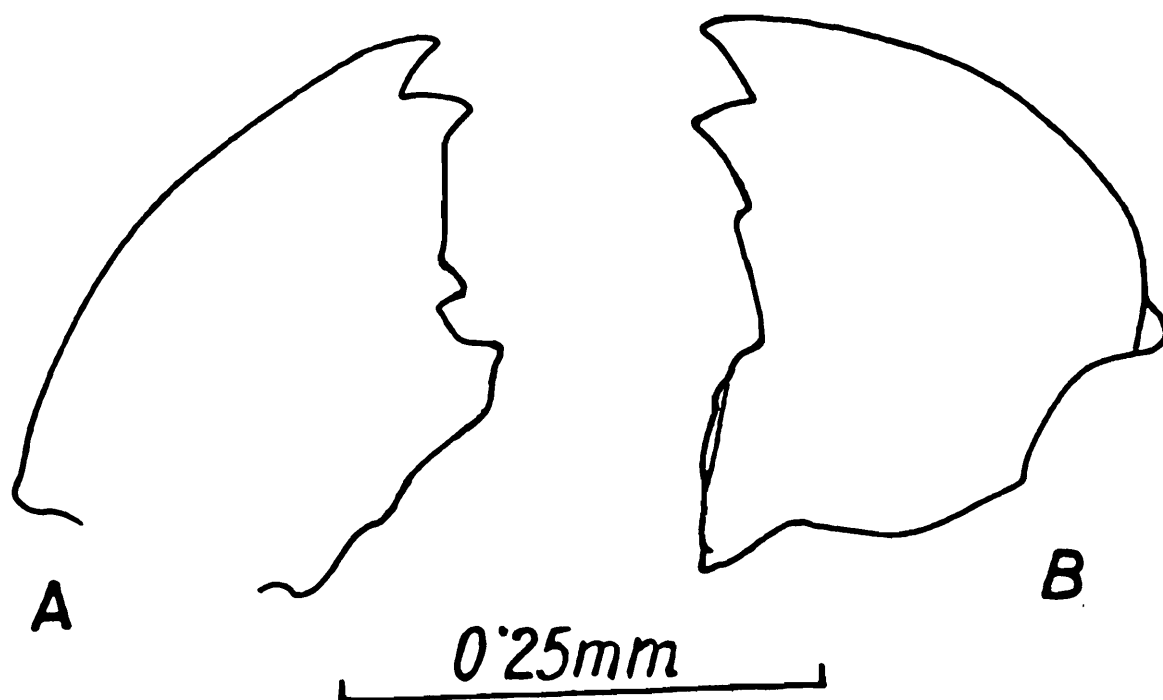


Fig. 71 *Roonwalitermes wadhwa* Bose. Worker. (A) and (B) Left and right mandibles, respectively.

DISTRIBUTION AND ZOOGEOGRAPHY OF ISOPTERA OF NORTH-EASTERN INDIA

The Isoptera of North-eastern India is represented by 76 species belonging to 27 genera under families Kalotermitidae, Rhinotermitidae, Stylotermitidae, Indotermitidae and Termitidae (Table 2). The Kalotermitidae is known by 3 genera and 8 species, the Rhinotermitidae by 4 genera and 12 species, the Stylotermitidae and Indotermitidae by a single genus and single species each and Termitidae by 18 genera and 54 species.

The Kalotermitid genera *Neotermes* and *Glyptotermes* have a wide distribution in the tropics, but the species reported from North-eastern India are endemic to this region. The genus *Cryptotermes* with a single species is known from this part of the country, but this particular species is also found in other parts of the Indian subregion.

The Rhinotermitid genera *Reticulitermes* (5 spp.) and *Parrhinotermes* (2 spp.) are so far found only in this part of the Indian subregion and all the species of these two genera found here, are endemic, except for *Reticulitermes chinensis* Snyder, which is also found in Southern China. Genus *Coptotermes* is cosmopolitan and all the species found therein are well represented in other parts of the Indian subregion and in the far south-east; *Coprotermes heimi* (Wasmann) and *C. kishori* Roonwal and Chhotani are common with the rest of India, *C. gestroi* with North Burma and *C. travians* with eastern India, Bangladesh and Malayan subregion; genus *Schedorhinotermes* and its species *translucens* (Haviland) with Bangladesh and further east. The genus *Schedorhinotermes* is strangely absent further West in the Indian subcontinent even though it is known from the remaining parts of the Indo-Malayan Region, the Australian and Papuan regions in the East and the Ethiopian Region in the West.

Genus *Stylotermes* (Stylotermitidae) is represented by a species endemic to North-eastern India but the genus, however, is common with Bangladesh, China and Southern and North-western India.

The *Indotermes* (Indotermitidae) genus is also found in Bangladesh, Burma, Thailand and China and the species *I. rongrensis* Roonwal and Chhotani is common with Bhutan, Bangladesh and Thailand.

Of the family Termitidae, the genus *Euhamitermes*, which is endemic to the Indo-malayan region, has one endemic species in the North-east and one common with Bangladesh and Central India. Genus *Synhamitermes* and the species *S. quadriceps* are common to the remaining parts of India and Bangladesh. *Microcerotermes* a cosmopolitan genus is represented by 4 species of which one is endemic, and the remaining 3 are common with other parts of the Indian and Indo-chinese subregions. *Angulitermes* is known by a single endemic species, but the genus, however, is well represented in the Indomalayan, Ethiopian and Palaearctic regions. Genera *Discuspiditermes* (2 spp.), *Pseudocapritermes* (2 spp.) and *Malaysiocapritermes* (one sp.) are Indo-malayan in

distribution; of *Dicuspiditermes* one species is endemic and the other is common with Bangladesh and Burma, and of *Pseudocapritermes* one species is endemic and the other common with Bhutan. The single species of *Malaysiocapritermes* is also found in Bangladesh.

Genera *Macrotermes* (4 spp.), *Odontotermes* (14 spp.), *Hypotermes* (one sp.), *Microtermes* (2 spp.) and *Ancistrotermes* (one sp.) belonging to the subfamily Macrotermitinae, are the most well represented fungus-growing termites in North-eastern India, as is the general case in the Indo-malayan and Ethiopian regions. Of *Macrotermes* (4 species), one species each is common with Bhutan, Bangladesh and Burma and one extends further east to Thailand and South China. The genus *Odontotermes* as in other parts of the Indian mprgion subregion, is most common with 14 species reported here ; of these 3 are endemic (described new here), 4 are common with the contiguous Bangladesh with one extending to Thailand and Malaysia, 3 are widely distrbluted all over the Indian subregion into one (*peae*) extending further east upto Thailand and Vietnam and 4 are distributed westwards along the sub-himalayan tract with one upto Pakistan. The genus *Hypotermes* (one.sp.) is common to the Indo-malayan Region, but in India it is confined to this part and southern India and Sri Lanka, being absent in Central, Western and Northern India; the species, however, is present in Bangladesh and Burma. In the genus *Microtermes* one species is endemic, whereas the other (*M. obesi*) is widely distributed throughout the Indo-malayan Region. *Ancistrotermes* is confined to this part of India, Bangladesh and further East; its absence in rest of India and Pakistan is difficult to explain, since it is again found in the Ethiopian Region.

The nasutiform termites are represented by the genera *Nasutitermes* (10 spp.) *Bulbitermes* (2 spp.), *Hospitalitermes* (one sp.) and *Roonwalitermes* (one sp.). Next to the genus *Odontotermes* the cosmotropical genus *Nasutitermes* is well represented in North-eastern India; 5 species are endemic, 3 common with Bangladesh and 3 with West Bengal, one being common to Bangladesh and West Bengal. The Indomalayan genus *Bulbitermes* is represented by 2 species one common with West Bengal and Bhutan and the other with Bangladesh. Genus *Hospitalitermes* (one species) is known from the Oriental and Papuan regions; *H. jepsoni* recorded from North-eastern India is common to Bangladesh, Burma and Thailand. The new genus *Roonwalitermes* known by a single species is endemic to North-eastern India.

In all, 36 out of 76 species are found only in North-eastern India, showing a very high degree of endemism; 26 species are common with the Indo-chinese subregion, Burma, Bangladesh and Bengal. Thus, nearly 68 percent are found in North-eastern India and in the near vicinities. From this it is evident that North-eastern India along with the Indo-chinese subregion has been a seat of speciation. Ten species are common with the rest of India and the remaining are found all over the Indo-Malayan Region. Some species, however, have overlapping distribution. Some of the species have extended their distribution to North-west along the sub-himalayan tracts upto Pakistan, and some have gone down right upto Southern India. Thus, there has been a to and fro movement, but most of the species mentioned above are endemic to North-eastern India. The

present conclusions in respect of distribution, endemism, speciation and zoogeography confirm the earlier observations of Roonwal and Chhotani (1965) and Chhotani (1986).

ACKNOWLEDGEMENTS

The author is grateful to the Director, Zoological Survey of India and the Ministry of Environment & forests for the award of the position of Scientist Emeritus after her retirement to complete the study in hand. She is also very thankful to the staff of the Isoptera section of the Survey for allowing access to the invaluable determined and undetermined collections of termites from North eastern India for the present studies and to Shri Arun Ghosh, retired Artist for his help in making of drawings. To Dr. J. R. B. Alfred for his encouragements and to Dr. O. B. Chhotani for assistance in many ways, the author is especially grateful. To Dr. Kamble and Dr. Wadhwa, officers-in-charge of Eastern Regional Stations respectively of Zoological Survey of India and the Botanical Survey of India and to the Chief conservator of forests of Mizoram, Manipur and Nagaland states and Shri S. Singrit of Manipur Forest Department for their help in her survey and collection work in North-eastern India.

BIBLIOGRAPHY

- Ahmad, M. 1950. The phylogeny of termite genera based on imago-worker mandibles. *Bull. Am. Mus. nat. Hist.*, **95** (Art. 2) : (1-6) + 43-86.
- Ahmad, M. 1958a. Key to Indomalayan termites. (Part 1.) *Biologia* (Lahore) **4**, (1) : 33-118.
- Ahmad, M. 1958b. Key to Indomalayan termites (concluded). *Biologia* (Lahore), **4**(2) : 119-198 + i - xii (index).
- Ahmad, M. 1963 (July). On the phylogenetic position of *Indotermes*, with description of a new species (Isoptera, Termitidae). *Ann. Mag. nat. Hist.*, (13) **6** : 395-399.
- Ahmad, M. 1965. Termites (Isoptera) of Thailand. *Bull. Am. Mus. nat. Hist.*, **131** (Art. 1) : 1-113.
- Akhtar, M. S. 1974a. New termites from Pakistan. *Biologia* (Lahore), **20** (1) : 23-61.
- Akhtar, M. S. 1974b. Zoogeography of the termites of Pakistan. *Pakistan J. Zool.*, **6** : 85 - 104.
- Akhtar, M. S. 1975. Taxonomy and zoogeography of the termites (Isoptera) of Bangladesh. *Bull. Dept. Zool. Univ. Panjab*, (N. S.), Art. 7 : 1-199.
- Akhtar, M. S. 1979. On a palaeartic termite genus *Anacanthotermes* Jacobson (Isoptera) in Pakistan. *Biologia* (Lahore), **25** : 161-170.
- Bose, Geeta, 1976. A further record of *Neotermes andamanensis* Snyder, the little known termite of the Andamans. *Newsl. zool. Surv. India*, **2** (3) : p. 104.

- Bose, Geeta, 1979. A new species from India of the termite genus *Procryptotermes* Holmgren (Kalotermitidae), with a description of the hitherto unknown imago of *P. dhari* Roonwal and Chhotani. *Bull. zool. Surv. India*, 2(1) : 53–59.
- Bose, Geeta, 1980. A further contribution to the study of termite fauna of Andaman and Nicobar Islands. *Rec. zool. Surv. India*, 77 : 93–109.
- Bose, G. 1984. Termite fauna of Southern India. *Occ. Pap. Rec. zool. Surv. India*, No. 49 : ix + 1 – 270 + 1 pp.
- Bose, Geeta and Das, B. C. 1982 (Dec.). Termite fauna of Orissa, eastern India, *Rec. zool. Surv. India*, 80(1–2) : 197 – 213, 1 figd. table.
- Bose, Geeta and Maiti, P. K. 1976. Genus *Prorhinotermes* Silvestri from the Indian mainland. *Newsl. zool. Surv. India*, 2(1) : 15–16.
- Bose, G. and Roy, P. H. 1984. On a small collection of termites (Isoptera, Insecta) from Bangladesh, with notes on distribution. *Bull. zool. Surv. India*, 5(2–3) : 189–190.
- Chaudhury, M. I. et. al. 1972. *Termites of Pakistan. Identity, Distribution and Ecological Relationships. (Final Technical Report PL 480 Proj. No. A 17 – FS–12)*. xiv + 70 + 3 pp. + 15 pls. + 2 pp. (errata) + 81 pp. (figs.) + 3 pp. (index). Peshawar (Pakistan Forest Inst.). PL–480 programme. [Both West Pakistan and East Pakistan (Bangladesh). 36 genera and 89 species listed. One n. g., 33 n. sp., all are *nomen nuda* ; but distribution and habits given].
- Chhotani, O. B. 1975a. Revision of the genus *Glyptotermes* Froggatt (Kalotermitidae, Isoptera, Insecta) from the Indian Region. *Rec. zool. Surv. India*, 60 (1–4) (1970) : 109–159.
- Chhotani, 1976. Report on a collection of termites from Tripura – *Newsl. zool. Surv. India*, 2(1) : 12 – 13.
- Chhotani, O. B. 1977b. A review of taxonomy of Indian termites. *Occ. Pap. Rec. zool. Surv. India*, No. 9, 4 + 36 pp.
- Chhotani, O. B. 1977b. Distribution and zoogeography of the oriental termites of families Termopsidae, Hodotermitidae, Stylotermitidae and Rhinotermitidae. *Proc. 8th int. Congr. Int. Un. Stud. Soc. Insects.* (Wageningen, Sept. 1977) (Ed. by J. de Wilde), Wageningen : 116 – 117.
- Chhotani, O. B. 1977C. Termites of Kanha National Park (Madhya Pradesh), India, *Rec. zool. Surv. India*, 72 : 367–388, 5 Pls.
- Chhotani, O. B. 1979. A review of Oriental Rhinotermitidae and Stylotermitidae (Isoptera). *Abstrs. Workshop. Adv. Insect. Taxon. India & Orient.* (Manali, Oct. 1979) : 43 – 44.
- Chhotani, O. B. 1980. Termite pests of agriculture in the Indian Region and their control. *Tech. Monogr. Zool. Surv. India*, No. 4 : 4 + 94 pp., 7 pls.
- Chhotani, O. B. 1981. Soil termites of India. In *Progress in Soil Biology and Ecology in India* (Ed. by G. K. Veeresh) : 229 – 236. Bangalore (Univ. Agric. Sci.)
- Chhotani, O. B. 1983. A review of the Rhinotermitidae and Stylotermitidae (Isoptera) from the Oriental Region. *Orient. Insects*, 17 : 109 – 125.

- Chhotani, O. B. 1985. Distribution and zoogeography of the Oriental termites of families Termopsidae, Hodotermitidae, Stylotermitidae and Rhinotermitidae. *Z. ang. Ent.*, **100** : 88-95.
- Chhotani, O. B. 1986. Affinities of Indian North-eastern borderland termites with those from other parts of the Oriental Region. *Rec. zool. Surv. India*, **83**(3 & 4) : 19 - 21.
- Chhotani, O. B. and Bose, G. 1973. Distribution of termites in relation to the ecology of the Indian region. *Zool. Anz.*, **190**(3-4) : 231 - 236.
- Chhotani, O. B. and Bose, G. 1985. Fauna of Namdapha : Arunachal Pradesh 'A proposed Biosphere Reserve' Insecta : Isoptera. *Rec. zool. Surv. India*, **82** (1-4) : 53 - 60.
- Chhotani, O. B. and Das, B. C. 1979. Variability in size and morphometric analysis of the soldier caste in *Heterotermes indicola* (Wasmann) (Rhinotermitidae : Heterotermitinae). *Zool. Surv. India Special Publ. (Proc. of Symposia)*, No. 1 : 47 - 52.
- Chhotani, O. B. and Das, B. C. 1983. A review of the Indian species of the genus *Reticulitermes* Holmgren (Isoptera : Rhinotermitidae). *Rec. zool. Surv. India*, **80** (3-4) (1982) : 315 - 329.
- Garner, J. C. M. (1945) (June 30). New Termitidae from India and Burma (Isoptera). *Indian J. Ent.*, **6** (1-2) (1944) : 103 - 110.
- Holmgren, N. 1913 (May 23). Termitenstudien. 4. Versuch einer Systematischen Monographie der Termiten der orientalischen Region. *K. svenska Vetensk-Akad. Handl.*, **50**(2) : 1-276, 8 pls.
- Holmgren, K. and Holmgren, N. 1917 (Aug.). Report on a collection of termites from India. *Mem. Dept. Agric. India (Ent.)*, **5** (3) : 137 - 171. [with notes on synonymy by T. B. Fletcher].
- Krishna, K. 1965. Termites (Isoptera) of Burma. *Am. Mus., Novit.*, No. 2210 : 1 - 34.
- Lahiri, A. R. and Ghosh, A. K. 1980. Termites of Manipur, India, with new records (Insecta : Isoptera). *Rec. zool. Surv. India*, **76** : 65 - 70.
- Lahiri, A. R. Ghosh, A. K. and Biswas, S. 1977. A preliminary study of the insect fauna of Meghalaya. 11. Isoptera : Four new records and notes on other species. *Bull. Meghalaya Sci. Soc.*, **2** : 35 - 38.
- Mathur, R. N. and Thapa, R. S. 1965. Some termītes from Assam (India) with descriptions of three new species. *Bull. Ent.*, No. **6** : 1 - 14.
- Rattan Lal and Menon, R. D. 1953. *Catalogue of Indian Insects*. Part 27. *Isoptera*. 4 + 94 pp. Delhi (Govt. of India Press).
- Roonwal, M. L. and Chhotani, O. B. 1959. New neotropical element (*Anopletermes*) in Indian termite fauna. *Nature*. **184** : 1967-1968.
- Roonwal, M. L. and Chhotani, O. B. 1962 a (Aug. 26). Termite fauna of Assam region, eastern India. *Proc. natn. Inst. Sci. India*, (B) **28** (4) : 281-406, 26 pls.
- Roonwal, M. L. and Chhotani, O. B. 1962 b. (Dec. 28). A new neotropical element (*Anoplotermes*) in the Indian termite fauna, with fuller description of *A. shillongensis* from Assam. *Rec. Indian Mus.*, **58** (3 & 4) (1960) : 159-168, 1 pl.

- Roonwal, M. L. and Chhotani, O. B. 1965. Zoogeography of termites of Assam Region, India, with remarks on speciation. *J. Bombay nat. Hist. Soc.*, **62** (1) : 19-31.
- Roonwal, M. L. and Chhotani, O. B. 1977. Ergebnisse der Bhutan Expedition 1972 des Naturhistorischen Museums Basel. Isoptera (termites). *Entomologica Basilliensia*, **2** : 39-84.
- Roonwal, M. L. and Chhotani, O. B. 1986. The identity of South Asian termite *Indotermes rongrensis* (R. & C.) (Synonyms *Speculitermes cyclops rongrensis* and *I. bangladeshiensis*) (Isoptera, Indotermitidae). *Rec. zool. Surv. India*, **83** (3 & 4) : 155-163.
- Roonwal, M. L. and Pant, G. D. 1953. A Systematic Catalogue of the Main Identified Entomological Collection at the Forest Research Institute, Dehra Dun. Pat 9. Isoptera. *Indian Forest Leaflet*. (Ent.), Delhi, No. 121 (Pt. 3) : 39-60.
- Roonwal, M. L. and Sen-Sarma, P. K. 1956 (Apr. 20). Systematics of oriental termites. (Isoptera). No. 3. Zoological Survey of India collections from India and Burma, with new termites of the genera *Parrhinotermes*, *Macrotermes*, *Hypotermes* and *Hospitalitermes*. *Indian J. agric. Sci.*, **26** (1) : 1-37.
- Roonwal, M. L. and Sen-Sarma, P. K. 1960 (Jan.). *Contributions to the Systematics of Oriental Termites*. xiv + 407 pp. (65 pls.). New Delhi (Ent. Monogr. No. 1, Indian Council. Agric. Res.).
- Sands, W. A. 1972. The soldierless termites of Africa (Isoptera : Termitidae). *Bull. Br. Mus. nat. Hist. (Ent.)*. *Suppl.*, No. 18 : 1-244, 9 pls.
- Sen-Sarma, P. K. and Thakur, M. L. 1979 (Feb.) Termites of Tripura (Insecta : Isoptera). *Indian Forest Rec. (N. S.) (Ent.)*, **13** (1) : i-ii + 1-67 (11 pls).
- Silvestri, F. 1914. (July). Zoological results of the Abor Expedition, 1911-12, XXXII. Termitidae. *Rec. Indian Mus.*, **8** (5) : 425-435.
- Snyder, T. E. 1949. Catalog of the termites (Isoptera) of the world. *Smiths. misc. Colls.*, **112** : 2 + 490 pp.
- Thakur, M. L. 1977. On the specific identity of termite *Reticulitermes assamensis* Gardner (Isoptera : Rhinotermitidae : Heterotermitinae) from Assam, India. *J. Bombay nat. Hist. Soc.*, **74** (1) : 191-195.
- Verma, S. C. 1984. On a Collection of termites (Isoptera : Insecta) from Nagaland, North-east India. *Indian J. Forestry*, **7** (1) : 81-82.