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TAXONOMY AND ZOOGEOGRAPHY OF THE TERMITE FAUNA OF ANDAMAN AND NICOBAR ISLANDS, INDIAN OCEAN

By

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(With 9 Tables, 15 Text-figures and 4 Plates)

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I—INTRODUCTION

1. *Topography, climate and geology of Andamans and Nicobar*

The Andaman and Nicobar Islands form a narrow, curved chain of islands in the Bay of Bengal between Cape Negrin in Lower Burma and the north-western tip of Sumatra, and represent the exposed portions of a long submarine mountain chain which is a continuation of the Arakan

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Yomas of Burma. The Andaman group forms the northern of the two chains and the Nicobar group the Southern. The two groups stretch north-south from about 13°34' N. (the northernmost point of the Andamans) to 6°45' N. (the southernmost point of the Nicobars). The entire chain covers a distance of about 700 miles and consists of 223 islands (204 in the Andamans group and 19 in the Nicobars group). The total land area of these islands is about 3,143 sq. miles—2,508 sq. miles in the Andamans and 635 in the Nicobars. The islands form a mass of hills enclosing narrow valleys. About 75 per cent. of the territory is covered with dense evergreen tropical forests. The highest point is Saddle Peak (2,400 ft.) in the North Andamans. In the Andamans about 5,000 hectares are under cultivation, entirely of paddy ; no cultivation is practised in the Nicobars.

The climate is hot and humid, the mean temperatures near sea-level in the Andamans being as follows :—

			January	May	
Mean	..	..	81·1°F	83·8°F
Diurnal range	10·8°F	10·7°F

The rainfall is heavy, and both the south-west (May-September) and the north-east (October-December) monsoons occur. The total annual rainfall is about 315 cm., most of it being received during the north-west monsoon. January and April are the dry months.

The soil varies from sandy (along the coastal strips) to heavy clayey loam further inland.

According to the account of Karunakaran (1962), the islands first arose from the ocean bed in the Cretaceous period (c. 110 million years ago) of the Mesozoic Era. During subsequent periods the islands underwent elevations and partial submergence several times. (Also *vide infra*, the Section on Zoogeography).

2. History of termite study of Andamans and Nicobars

Until very recent years the termites of the Andaman and Nicobar groups of islands received little attention. Brauer (1865, 1866) mentioned two species from the Nicobars. In his 1865 paper he mentioned two species from the Nicobars, thus : A "Termes" sp. close to "Termes australis" (which a year later, 1866, he described as a new species, *T. longirostris*) and a species with nasute soldiers [=Nasutitermitinae]. In his 1866 paper he described (pp. 47-48) the new species, *Termes longirostris* [=our *Schedorhinotermes longirostris*], based on soldiers (major and minor), workers and nymphs, from the Kondul Is. ; and also mentioned (p. 49) the unnamed species, with nasute soldiers, workers and nymphs, from the Nankauri Is.

Holmgren (1913, p. 86) referred to Brauer's specimens of *S. longirostris*, and described (p. 185) a new species, *Nasutitermes matangensis* [later on considered by Roonwal & Sen-Sarma, 1956, p. 27, as

a subspecies of *N. matangensis* (Haviland) from the Nicobars. Anandale (1924) briefly described the mounds of an *Odontotermes* species from the South Andamans ; this species was stated by him, on the authority of Silvestri's determination, as *Od. obesus* (Rambur), but is really *Od. latigula* (Snyder), a species first described by Snyder (1934) from the North Andamans. Earlier, Snyder (1933) had described a new species, *Neotermes andamanensis* (Sny.), based on imagos only, from the North Andamans. Rattan Lal & Menon (1953) referred in their catalogue to some of these species from the Andamans and Nicobars, but added no new information. Roonwal & Pant (1953) referred in their catalogue to 3 species, namely, *Neotermes andamanensis* (Snyder's record), *Schedorhinotermes longirostris* (new record from the Andamans) and *Odontotermes latigula* from the Andamans.

Thus, up to the year 1953, only four species were known from the Andamans and the Nicobars, namely, *Neotermes andamanensis*, *Schedorhinotermes longirostris*, *Odontotermes latigula* and *Nasutitermes matangensis matangensisformis*.

Roonwal & Sen-Sarma (1956) described a new species, *Hospitalitermes blairi*, from Port Blair, South Andamans. They also recorded *Nasutitermes matangensis matangensisformis* from another island (Camorta Is.) in the Nicobars (Prashad & Sen-Sarma, 1959, p. 51, evidently refer to the same specimens). Roonwal & Sen-Sarma (1960, pp. 144-145), in their revision of the oriental Kalotermitidae, referred briefly to *Neotermes andamanensis* and reproduced Snyder's (1933) description of the imago, the only caste so far known. Roonwal & Thakur (1963) described two new species, *Prorhinotermes shiva* and *Schedorhinotermes tiwarii*, from the Andamans, thus bringing the total number of species to seven.

In the present paper 17 species are recorded from the Andamans and the Nicobars. Of these, the following 4 species are new to science :—

Schedorhinotermes eleanorae sp. n.

Microcerotermes danieli sp. n.

Microcerotermes nicobarensis sp. n.

Nasutitermes krishna sp. n.

The following 5 species are new distributional records from these islands :—

Cryptoitermes dudleyi Banks

Cryptotermes havilandi (Sjöstedt)

Coptotermes heimi (Wasmann)

Coptotermes travians (Haviland)

Prorhinotermes flavus (Bugnion & Popoff)

In the next section a list of the 17 species so far known is given, together with a key for identification. In the Systematic Account which then follows, 14 species, which are present in the collections under study, are dealt with in some detail. Finally, the zoogeography of the termites of the Andamans and the Nicobars is discussed.

3. Collections studied and the collecting localities

(Table 1)

TABLE 1.—List of termite collecting localities in the Andaman and Nicobar Islands. (Also see Plates 11 and 12.)

Abbreviations.—AD, Dr. A. Daniel ; HSR, Dr. H. Srinivasa Rao ; KKT, Dr. K. K. Tiwari ; NA, Dr. N. Annandale ; OP, O. Paiva ; RBSS, Lt.-Col. R. B. Seymour Sewell.

Locality	Latitude (approx.)	Longitude (approx.)	Collector and date of collection
1	2	3	4
(A) ANDAMANS			
1. North Andamans			
1. Diglipur	13°17'N	92°59'E	KKT (2. ii. 1959)
2. Interview Island	12°47'N 12°60'N	92°40'E 92°44'E	KKT (7-8. ii & 8. iv. 1959)
3. Maya Bunder	12°52'N	92°57'E	KKT (28. ii. 1959)
4. Port Cornwallis	13°16' N	92°59'E	KKT (2. ii. 1959)
2. Middle Andamans			
5. Long Island	12°22'— 12°26'N	92°58'— 92°59'E	KKT (23. i. 1959)
3. South Andamans			
6. Aberdeen Bay	11°38'N 11°42'N	92°39'E 92°46'E	KKT (12. i. & 5. iii. 1959)
7. Chouldhari	11°38'N	92°39'E	KKT (26. ii. 1959)
8. Collinpur	11°43'N	92°42'E	KKT (15. iii. 1959)
9. Corbyn's Cove (South)	11°38'N	92°46'E	HSR (15. xii. 1934)
10. Garacharama	11°38'N	92°44'E	OP (30. iii. & 2-3. iv. 1911)
11. Herbertabad	11°43'N	92°37'E	KKT (15. iii. 1959)
12. Hope Town, Ranighat	11°48'N	92°44'E	RBSS (27. viii. 1928)
13. Mount Harriet Range (several Stations from base to summit, ca. 1193 ft.).	11°42'— 11°56'N	92°45'— 92°47'E	NA (xi. & xii. 1923)

TABLE 1—*contd.*

Locality	Latitude (approx.)	Longitude (approx.)	Collector and date of collection
1	2	3	4
14. Port Blair	11°41'N	92°46'E	KKT (5 & 8. iii. 1959) ; AD (8. ii. 1961)
15. Ross Island	11°40'N	92°46'E	OP (30. iii. 1911); KKT (14. iii. 1959)
16. Wright Myo	11°47'N	92°43'E	KKT (13. i. & 15. iii. 1959)
4. Little Andamans			
17. Bedeabdulu, 19 km. south of Tokoibuea.	10°43'N	92°35'E	AD (16. ii. 1961)
18. Benyabobera	10°33'N	92°27'E	AD (23. ii. 1961)
19. Bugenabera	10°40'N	92°31'E	AD (20. ii. 1960)
20. Chai River, 16 km. west of Tokoibuea.	10°47'N	92°32'E	AD (15. ii. 1961)
21. Dugong Creek near Tokoibuea	10°47'N	92°34'E	AD (1. iii. 1961)
22. Entizebera, 16 km. west of Tokoibuea.	10°47'N	92°32'E	AD (15. ii. 1961)
23. Gaje	10°40'N	92°26'E	AD (25. ii. 1961)
24. Ingatijala forest, 8 km. south of Gaje.	10°34'N	92°25'E	AD (25. ii. 1961)
25. Ingitekudda	10°49'N	92°29'E	AD (28. ii. 1961)
26. Ingoie	10°31'N	92°29'E	AD (21. ii. 1961)
27. Kwateneabo forest, near Bumila Creek.	10°52'N	92°33'E	AD (28. ii. 1961)
28. Kwate-tu-Kwage	10°40'N	92°32'E	AD (18. ii. 1961)
29. Laitora forest, 7 km. north of Tokoibuea.	10°50'N	92°34'E	AD (14. ii. 1961)
30. Nachugea	10°47'N	92°26'E	AD (28. ii. 1961)
31. Otirubera-Korale, 17 km. west of Ingoie.	10°33'N	92°26'E	AD (23. ii. 1961)
32. Taib-eh River (forest in between Taib-eh R. Taib-eh and Bugenabera, 16 km. south of Kwate-tu-Kwage).	10°40'N	92°31'E	AD (20. ii. 1961)

TABLE 1—concl'd.

Locality	Latitude (approx.)	Longitude (approx.)	Collector and date of collection
1	2	3	4
33. Taibalowe, 16 km. east of Ingoie.	10°31'N	92°31'E	AD (22. ii. 1961)
34. Tailanda, ca. 24 km. north of Kwate-tu-Kwage.	10°40'N	92°35'E	AD (19. ii. 1961)
35. Tokoibuea . . .	10°47'N	92°34'E	AD (1. iii. 1961)
(B) NICOBARS			
1. Car Nicobar			
36. Arong village . . .	09°00'N	92°43'E	KKT (31. iii. 1959)
37. Malacca village . . .	09°09'N	92°50'E	KKT (23. iii. & 8. iv. 1959)
38. Mus village . . .	09°16'N	92°47'E	KKT (28. iii. 1959)
39. Sawi village . . .	09°15'N	92°43'E	KKT (5. iv. 1959)
40. Tamalu village . . .	09°13'N	92°50'E	KKT (24. iii. 1959)
2. Other islands of Nicobars			
41. Camorta Island . . .	08°03'— 08°15'N	93°27'— 93°34'E	
42. Kondul Island . . .	07°17'N	93°39'E	—

(i) Collections studied :

The following collections, present in the Zoological Survey of India, were studied :—(1) A small collection by O. Paiva, March and April, 1911, from the South Andamans. (2) A small collection by Dr. N. Annandale, November and December, 1923, from the South Andamans. (3) A small collection by Lt.-Col. R. B. Seymour Sewell, August, 1928, from the South Andamans. (4) A collection by Dr. K. K. Tiwari, January to April, 1959, from the Andamans (North, Middle and South Andamans) and the Nicobars (Car Nicobar Is. and Camorta Is.). (5) A collection by Dr. A. Daniel, January to March, 1961, from the Little Andamans. (6) The *Schedorhinotermes* material in the collection of the Forest Research Institute, Dehra Dun.

(ii) *Collecting localities (Table 1) :*

Collections were made from 43 different localities in the Andamans and the Nicobars (Table 1), and are summarised below :—

(A) ANDAMANS :	No. of localities
1. North Andamans	4
2. Middle Andamans	1
3. South Andamans	11
4. Little Andamans	19
 (B) NICOBARS :	
1. Car Nicobar	5
2. Other islands	2
	42

The bulk of the material is from the Andamans ; and here again the largest number of localities are from the South Andamans (11) and the Little Andamans (19).

4. *Abbreviations used*

The following abbreviations have been used :—

Alt., altitude (above mean sea-level).

Coll., collected by ; collection.

Coll. Sta. No., Collecting Station Number.

Det., determined (identified) by.

Ex., from ; out of.

F.R.I., Forest Research Institute, Dehra Dun.

Fd. Coll. No., Field Collection Number.

I.A.R.I., Indian Agricultural Research Institute, New Delhi.

Im., imago.

Ny., nymph.

Pw., pseudoworker.

Reg. No., Registered Number.

S., soldier.

W., worker.

Z.S.I., Zoological Survey of India, Calcutta.

5. *Acknowledgements*

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II—LIST OF SPECIES AND KEY FOR IDENTIFICATION

1. List of species

(Pl. 13 and Text-figs. 1-15)

The following is a list of termites known from the Andamans and the Nicobars, together with the castes known and the geographical distribution.

Family 1. KALOTERMITIDAE

Subfamily *Kalotermitinae*

1. *Neotermes andamanensis* (Snyder, 1933).

Castes known : Im.—a dealated ♀ (holotype) and an apterous ♂ (morphotype)*. Snyder's (1933) original description of the imago has been reproduced by Roonwal & Sen-Sarma (1960, pp. 144-145).

Andamans only : North Andamans.

2. *Cryptotermes dudleyi* Banks, 1918.

Castes known : Im., S. and Pw.

Andamans : North Andamans (present record). *Nicobars* : Not yet recorded. *Elsewhere* : A widely distributed species, almost all over the world.

3. *Cryptotermes havilandi* (Sjöstedt, 1897). (Pl. 13, Fig. 1.)

Castes known : Im., S. and Pw.

Andamans : Little Andamans (present record). *Nicobars* : Not yet recorded. *Elsewhere* : A widely distributed species (India, Africa, Madagascar, etc.).

Family 2. RHINOTERMITIDAE

Subfamily (i) *Coptotermitinae*

4. *Coptotermes heimi* (Wasmann, 1902). (Pl. 13, Fig. 2.)

Castes known : Im., S. and W.

*Snyder (1933, p. 2) described the species from just a few nymphs and two imagos—a dealate ♀ (the holotype, now in the British Museum Nat. Hist., London) and an apterous ♂ (the morphotype stated to have been deposited in F.R.I., Dehra Dun, but not present there. *vide* Roonwal & Pant, 1953, p. 45, and Roonwal & Sen-Sarma, pp. 144-145). No other castes are so far known.

Andamans : Little Andamans (present record). *Nicobars* : Not yet recorded. *Elsewhere* : All over India ; West Pakistan ; and middle Java (the last needs confirmation).

5. *Coptotermes travians* (Haviland, 1898). (Pl. 13, Fig. 3.)

Castes known : Im., S. and W.

Andamans : North Andamans and Middle Andamans (Interview Is.) (present record). *Nicobars* : Car Nicobar. *Elsewhere* : Eastern India, East Pakistan, Burma, Malaya and Indonesia (Sumatra, Java, Borneo).

Subfamily (ii) *Rhinotermitinae*

6. *Prorhinotermes flavus* (Bugnion & Popoff, 1910). (Pl. 13, Fig. 4.)

Castes known : S. and W.

Andamans : Little Andamans (present record). *Nicobars* : Not yet recorded. *Elsewhere* : Ceylon.

7. *Prorhinotermes shiva* Roonwal & Thakur, 1963. (Pl. 13, Fig. 5.)

Castes known : S. and W. (major and minor).

Andamans only : Middle Andamans (Long Is.).

8. *Schedorhinotermes eleanorae* n. sp. (Tables 2 and 3 ; and Text-figs. 1-3.)

Castes known : Im., S. (minor) and W.

Andamans only : Little Andamans (present record).

9. *Schedorhinotermes longirostris* (Brauer, 1866). (Table 4 ; and Text-figs. 4-6.)

Castes known : S. (major and minor) and W.

Andamans : "Andaman Islands" (Roonwal & Pant, 1953, p. 49). *Nicobars* : Kondul Is. (Brauer, 1865).

10. *Schedorhinotermes medioobscurus* (Holmgren, 1914). (Text-figs. 7 and 8.)

Castes known : Im., S. and W.

Andamans : South Andamans (Mt. Harriet, alt. 900 ft., *vide* Roonwal & Thakur, 1963, p. 102) ; (also present account). *Nicobars* : Not yet recorded. *Elsewhere* : Malaya (Malacca, Kuala Lumpur and Singapore).

11. *Schedorhinotermes tiwarii* Roonwal & Thakur, 1963. (Pl. 13, Figs. 6 and 6a.)

Castes known : S. (major and minor) and W.

Andamans only : South Andamans and Little Andamans (Roonwal & Thakur, 1963).

Family 3. TERMITIDAE

Subfamily (i) *Amitermitinae*

12. *Microcerotermes danieli* n. sp. (Table 5 ; and Text-figs. 9 and 10.)

Castes known : S. and W.

Andamans only : North, South and Little Andamans (present record).

13. *Microcerotermes nicobarensis* n. sp. (Tables 6 and 7 ; Text-figs. 11-13 ; and Pl. 13, Fig. 7.)

Castes known : Im., S. and W. (major and minor).

Andamans : South Andamans (Ross Is., present record). *Nicobars* : Car Nicobar (present record).

Subfamily (ii) *Macrotermitinae*

14. *Odontotermes latigula* (Snyder, 1934). (Pl. 13, Fig. 8.)

Castes known : S. and W.

Andamans : North Andaman Is. (Snyder, 1934). Also Middle, South and Little Andamans (present record). *Nicobars* : Car Nicobar (present record).

Subfamily (iii) *Nasutitermitinae*

15. *Nasutitermes krishna* n. sp. (Table 8 ; and Text-figs. 14 and 15.)

Castes known : S. and W. (major and minor).

Andamans only : North Andamans (Interview Is.) and Little Andamans (present record).

16. *Nasutitermes matangensis matangensisformis* (Holmgren, 1913). (Pl. 13, Fig. 9.)

Castes known : Im., S. and W.

Andamans : Middle Andamans (present record). *Nicobars* : Nankaüri Is. (Holmgren, 1913), Camorta Is. (Roonwal & Sen-Sarma, 1956) and Car Nicobar Is. (present record). *Elsewhere* : Malaya, Java and Sumatra.

17. *Hospitalitermes blairi* Roonwal & Sen-Sarma, 1956. (Pl. 13, Fig. 10.)

Castes known : S. and W. (major and minor).

Andamans only : South Andamans.

2. Key for identification

KEY TO GENERA AND SPECIES OF TERMITES OF THE ANDAMANS AND THE NICOBARS, BASED ON SOLDIERS.

Note : The Soldier caste is not yet known in *Nectermes andamanensis*, and that species is, therefore, not included in the key.

1(20). Pronotum flat.

2(5). Head sharply truncated in front ; fontanelle absent .. Genus (1) *Cryptotermes*

3(4). Larger species ; head-length (to lateral base of mandibles) 1.58—1.71 mm. .. 1. *Cryptotermes dudleyi*

4(3). Smaller species ; head-length (to lateral base of mandibles) 1.03—1.42 mm. .. 2. *Cryptotermes havilandi*

5(2). Head not sharply truncated in front, fontanelle present.

6(13). Inner margins of mandibles without teeth but with a few weak basal crenulations on left mandible.

- 7(10). Fontanelle large, placed at anterior margin of head just below clypeus. Genus (2) *Coptotermes*
- 8(9). Postmentum narrower at waist (width at waist 0.20—0.29 mm. ; Contraction Index* 0.57—0.69) 3. *Coptotermes travians*
- 9(8). Postmentum broader at waist (width at waist 0.25—0.39 mm. ; Contraction Index* 0.63—0.79) 4. *Coptotermes heimi*
- 10(7). Fontanelle small, placed near middle or a little above the middle of head-dorsum .. Genus (3) *Prorhinotermes*
- 11(12). Smaller species. Head-length (to lateral base of mandibles) 1.55—1.79 mm. .. 5. *Prorhinotermes flavus*
- 12(11). Larger species. Head-length (to lateral base of mandibles) 1.85—1.88 mm. .. 6. *Prorhinotermes shiva*
- 13(6). Inner margins of mandibles with prominent teeth and without any basal crenulations on left mandible Genus (4) *Schedorhinotermes*
- 14(15). Antennae in soldier minor with 14 segments. . 7. *Schedorhinotermes eleanorae* sp.n.
- 15(14). Antennae in soldier minor with 15-16 segments.
- 16(17). Soldier minor larger (head-length to tip of mandibles 1.45—1.60 mm. ; to lateral base of mandibles 0.90—1.07 mm.). [Soldier major : Large and with 16 antennal segments (head-length with mandibles 2.51—2.80 mm. ; to base of mandibles 1.68—1.85 mm. ; head width 1.60—1.68 mm.).] 8. *Schedorhinotermes tiwarii*
- 17(16). Soldier minor smaller (head-length to tip of mandibles 1.30—1.40 mm. ; to lateral base of mandibles 0.77—0.88 mm.).
- 18(19) Soldier minor : Head smaller (length to base of mandibles 0.80 mm.). Pronotum narrower (width 0.43—0.47 mm. ; index Pronotum-width/Head-width 0.60—0.64). [Soldier major : Small and with 16 antennal segments (head-length with mandibles 2.03 mm., to base of mandibles 1.40 mm. ; head-width 1.33 mm.).] 9. *Schedorhinotermes longirostris*
- 19(18). Soldier minor : Head larger (length to base of mandibles 0.83—0.88 mm.). Pronotum broader (width 0.53—0.57 mm. ; index Pronotum-width/Head-width 0.71—0.78). [Soldier major : Large and with 17 antennal segments (head-length with mandibles 2.34—2.60 mm., to base of mandibles 1.45—1.80 mm. ; head-width 1.48—1.60 mm.).] .. 10. *Schedorhinotermes medioobscurus*

*Minimum width
of the postmentum.
Maximum width_h

- 20(1). Pronotum saddle-shaped.
- 21(26). Head not nasute ; mandibles well-developed and easily visible.
- 22(25). Mandibles with inner margins serrated but without definite dentition Genus (5). *Microcerotermes*
- 23(24). Labrum tongue-shaped, with a broad anterior tip 11. *Microcerotermes danieli* sp.n.
- 24(23). Labrum subpentagonal, with a pointed tip . 12. *Microcerotermes nicobaren-sis* sp.n.
- 25(22). Mandibles with inner margin not serrated but with definite dentition ; left mandible with a prominent tooth Genus (6). *Odontotermes*
13. *Odontotermes latigula*
- 26(21). Head nasute ; mandibles minute and not easily visible.
- 27(28). Head greatly produced behind and strongly constricted behind antennae Genus (7). *Hospitalitermes*
14. *Hospitalitermes blairi*
- 28(27). Head not greatly produced behind and not constricted behind antennae Genus (8). *Nasutitermes*
- 29(30). Larger and darker species ; antennae with 13 segments . .. 15. *Nasutitermes matangensis matangensisformis*
- 30(29). Smaller and paler species ; antennae with 12 segments 16. *Nasutitermes krishna* sp. n.

III—SYSTEMATIC ACCOUNT

Family 1. KALOTERMITIDAE

Subfamily *Kalotermitinae*

Genus (1) *Cryptotermes* Banks

1. *Cryptotermes dudleyi* Banks

1918. *Cryptotermes dudleyi* N. Banks, *Bull. Amer. Mus. nat. Hist.*, New York, 38(17), p. 660. Im. *Type-locality*: Panama (Central America).

(a) *Material*.—2 vials, from the Andamans as follows :—(i) Z.S.I. Reg. No. 8043/18, 1 Im., Ross Is., South Andamans, coll. O. Paiva, 24. iii. 1911. *Det.* Silvestri, as “*Cryptotermes domesticus* (Hav.)”. (ii) One vial, Fd. Coll. No. 373, 3 S. and several Pw., Coll. Sta. No. 14, Maya Bunder, North Andamans, coll. K. K. Tiwari, 28. ii. 1959.

(b) *Measurements* (in mm.).—*Imago* (1 example) :

1. Total body-length without antennae, <i>ca.</i>	..	..	5.9
2. Length of head to tip of labrum	..	..	1.23
3. Length of head to lateral base of mandibles	..	..	0.96
4. Maximum width of head with eyes	..	..	0.95
5. Maximum diameter of eye with ocular sclerite	..	..	0.34
6. Maximum diameter of ocellus	..	..	0.15
7. Minimum eye-ocellus distance	..	..	0.03
8. Maximum length of pronotum	..	..	0.60
9. Maximum width of pronotum	..	..	0.88
10. No. of antennal segments (antennae damaged)	..	..	(13 present)

Soldiers (3 examples) :

1. Total body-length without antennae, <i>ca.</i>	..	..	5.5—6.0
2. Length of head with mandibles	..	..	2.35—2.38
3. Length of head to lateral base of mandibles	..	..	1.58—1.60
4. Maximum width of head	..	..	1.25
5. Maximum length of pronotum	..	..	0.65—0.70
6. Maximum width of pronotum	..	..	1.10—1.15
7. No. of antennal segments	..	..	12

(c) *Geographical Distribution*.—*Andamans* : North Andamans (Maya Bunder) ; and South Andamans (Ross Is.). *Elsewhere* : A widely distributed species. Recorded from India, Ceylon, Sumatra, Java, the Philippines, Middle and South America, Australia and New Guinea.

2. *Cryptotermes havilandi* (Sjöstedt)

(Pl. 13, Fig. 1)

1897. *Calotermes domesticus* Y. Sjöstedt, *Ent. Tidskr.*, Stockholm, 18(4), p. 212, Im. *Type-locality* : Fernando Po. Camerun, West Africa. *Name preoccupied.*

1900. *Calotermes havilandi*: Y. Sjöstedt, *K. Sv. Vet. Akad. Handl.*, Stockholm, 34(4), p. 43, pl. 1, figs. C 1-3. Im.

1926. *Cryptotermes havilandi*: Y. Sjöstedt, *K. Sv. Vet. Akad. Handl.*, Stockholm, (3) 3 (1), pp. 29-30, Im., S.

(a) *Material*.—3 vials, Im., S. and Pw., Little Andamans, coll. A. Daniel, February 1961, as follows :—(i) Fd. Coll. No. 140, Coll. Sta. No. 2, 2 km. inside the forest at Laitora (7 km. north of Tokoibuea), 14. ii. 1961, ex. "dead tree" (ii) Fd. Coll. No. 398, Coll. Sta. No. 4, Taibalowe, 16 km. east of Ingoie, 22. ii. 1961, ex. "dead log in ground". (iii) Fd. Coll. No. 437, Coll. Sta. No. 4, Otirubera-Korale, 17 km. west of Ingoie, 23. ii. 1961, ex. "dead tree".

(b) *Measurements* (in mm.).—*Imagos* (5 examples) :

1. Total body-length without antennae, <i>ca.</i>	..	..	4.6—4.7
2. Length of head to lateral base of mandibles	..	..	0.79—0.80
3. Maximum width of head		..	0.70—0.78
4. Maximum diameter of eye with ocular sclerite		..	0.28—0.30
5. Maximum diameter of ocellus	..	..	0.10
6. Minimum eye-ocellus distance	..	..	0.13—0.15
7. Maximum length of pronotum	..	..	0.53
8. Maximum width of pronotum	..	..	0.70—0.73
9. No. of antennal segments	.	.	14—16

Soldiers (9 examples) :

1. Total body-length without antennae, <i>ca.</i>	..	..	4.5—4.8
2. Length of head with mandibles	..	..	1.53—1.60
3. Length of head to lateral base of mandibles	..	..	1.05—1.08
4. Maximum width of head	..	..	1.00—1.08
5. Maximum length of pronotum	..*	..	0.53—0.58
6. Maximum width of pronotum	..	..	0.93—0.98
7. No. of antennal segments	..	..	10—13

(c) *Geographical Distribution*.—*Andamans* : Little Andamans (Laitora forest ; Otirubera-Korale and Taibalowe). *Elsewhere* : A widely distributed species. Known from India, Africa, Zanzibar, Madagascar, West Indies and South America.

(d) *Biological Remarks*.—The species was collected from a dead log on ground and from a dead tree.

Family 2. RHINOTERMITIDAE

Subfamily (i) *Coptotermitinae*Genus (2) *Coptotermes* Wasmann3. *Coptotermes heimi* (Wasmann)

(Pl. 13. Fig. 2)

1902. *Arrhinotermes heimi* E. Wasmann, *Zool. Jb. (Syst.)*, Jena, 17 (1), p. 104, pl. 4. Im. *Type-locality* : India : Wallon (Ahmednagar District, Maharashtra).

1962. *Coptotermes heimi*, M. L. Roonwal & O. B. Chhotani, *Indian Species of Termite Genus Coptotermes*, New Delhi (*I.C.A.R. Entom. Monogr.*, No. 2), pp. 38-57, pls. 11-14.

(a) *Material*.—5 vials, S. and W., Little Andamans, coll. A. Daniel, February 1961, as follows :—(i) Fd. coll. No. 165, Coll. Sta. No. 2, near Chai River, 16 km. west of Tokoibuea, 15. ii. 1961, ex. “dead tree”. (ii) Fd. Coll. No. 273, Coll. Sta. No. 3, Kwate-tu-Kwage, 18. ii. 1961, ex. “tree”. (iii) Fd. Coll. No. 315, Coll. Sta. No. 5, Tailanda, ca. 22 km. north of Kwate-tu-Kwage, 19. ii. 1961, ex. “dead wood”. (iv) Fd. Coll. No. 340, Coll. Sta. No. 3, forest in between Taib-eh River and Bugenabera, 16 km. south of Kwate-tu-Kwage, 20. ii. 1961, ex. “dead wood”. (v) Fd. Coll. No. 585, Coll. Sta. No. 6, Kwateneabo forest near Bumila Creek, 28. ii. 1961, ex. “dead tree”.

(b) *Measurements* (in mm.).—*Soldiers* (10 examples) :

1. Total body-length without antennae, ca.	..	..	4.5—4.7
2. Length of head with mandibles	..	..	2.11—2.14
3. Length of head to lateral base of mandibles	..	..	1.33—1.35
4. Maximum width of head	..	..	1.15
5. Maximum length of pronotum	..	..	0.45—0.46
6. Maximum width of pronotum	..	..	0.83—0.84
7. No. of antennal segments	..	..	14—15

(c) *Geographical Distribution*.—*Andamans* : Little Andamans (Tokoibuea ; Kwate-tu-Kwage ; Kwateneabo forest near Bumila Creek). *Elsewhere* : All over India ; West Pakistan ; Indonesia (Middle Java, needs confirmation).

(d) *Biological Remarks*.—The species was obtained from dead wood and dead trees in jungle.

4. *Coptotermes travians* (Haviland)

(Pl. 13, Fig. 3)

1898. *Termes travians* G. D. Haviland, *J. Linn. Soc. Lond. (Zool.)*, London, 26 (169), p. 391, pl. 23, figs. 19-22, Im. S. and W. *Type-localities* : Singapore (Malaya) and Sarawak (Borneo).

1962. *Coptotermes travians* : M.L. Roonwal & O. B. Chhotani, *Indian Species of Termite Genus Coptotermes*, New Delhi (I.C.A.R. Entom. Monogr. No. 2), pp. 61-69, pls. 17 and 18.

(a) *Material*.—3 vials, S. and W., Andamans and Nicobars, coll. K. K. Tiwari, 1959, as follows :—(i) Fd. Coll. No. 261, Coll. Sta. No. 11, Port Cornwallis (North Andamans), 31. i. 1959, ex. “decaying log of wood”. (ii) Fd. Coll. No. 323, Coll. Sta. No. 13, Interview Is. (North Andamans), 8. iv. 1959. (iii) Fd. Coll. No. 886, Coll. Sta. No. 30, Mus village, Car Nicobar Is. (the Nicobars), 28. iii. 1959, ex. “rotten wooden log”.

(b) *Measurements* (in mm).—*Soldiers* (7 examples) :

1. Total body-length without antennae, <i>ca.</i>	..	..	4.2—4.7
2. Length of head with mandibles	..	..	2.00—2.98
3. Length of head to lateral base of mandibles	..	..	1.20—1.33
4. Maximum width of head	..	..	1.06—1.15
5. Maximum length of pronotum	..	..	0.38—0.43
6. Maximum width of pronotum	..	..	0.73—0.83
7. No. of antennal segments	..	..	14

(c) *Geographical Distribution*.—*Andamans* : North Andamans (Port Cornwallis ; and Interview Is.). *Nicobars* : Car Nicobar (Mus village). *Elsewhere* : Eastern India ; E. Pakistan ; Burma, Malaya Peninsula ; Indonesia (Sumatra, Java and Borneo).

(d) *Biological Remarks*.—The species was obtained from decaying wood.

Subfamily (ii) *Rhinotermitinae*Genus (3) *Prorhinotermes* Silvestri5. *Prorhinotermes flavus* (Bugnion & Popoff)

(Pl. 13; Fig. 4)

1910. *Coptotermes flavus* E. Bugnion & N. Popoff, *Mem. Soc. Zool. Fr.*, Paris, 23 (8), pp. 117-120, pl. 2. S. and W. *Type-locality* : Ceylon : Border of Lake Ambalangoda.

(a) *Material*.—2 vials, S. and W., Little Andaman Is., coll. A. Daniel, February 1961, as follows :—(i) Fd. Coll. No. 357, Coll. Sta. No. 4, Ingoie, 21. ii. 1961, ex. "dead tree". (ii) Fd. Coll. No. 471, Coll. Sta. No. 5, Ingatijala forest, 8 km. south of Gaje, 25. ii. 1961, ex. "dead tree".

(b) *Measurements* (in mm).—*Soldiers* (6 examples) :

1. Total body-length without antennae, <i>ca.</i>	.	..	5.0—5.7
2. Length of head with mandibles	..	..	2.40—2.80
3. Length of head to lateral base of mandibles	..	..	1.55—1.75
4. Maximum width of head	..	..	1.30—1.48
5. Distance of fontanelle from posterior margin of head	..	..	0.40—0.53
6. Maximum length of pronotum	..	..	0.55—0.58
7. Maximum width of pronotum	..	..	1.05—1.13
8. No. of antennal segments	..	..	17—18

(c) *Geographical Distribution*.—*Andamans* : Little Andamans (Ingoie and Ingatijala). *Elsewhere* : Ceylon : Ambalangoda (the type-locality).

(d) *Biological Remarks*.—The species was obtained from "dead trees".

Genus (4) *Schedorhinotermes* Silvestri

6. *Schedorhinotermes eleanorae** n. sp.

(Tables 2 and 3; and Text-figs. 1-3).

(a) *Material*.—One vial, Fd. Coll. No. 216 ; 2 dealate Im. (1♂, 1♀), 9 S. (minor) and several W., Bedeabdulu, 19 km. south of Tokoibuea, Little Andaman Is., coll. A. Daniel, 16.ii.1961, ex. "dead tree"

(b) *Description*.—1(a). IMAGO ♂ (Table 2; and Text-fig. 1) :

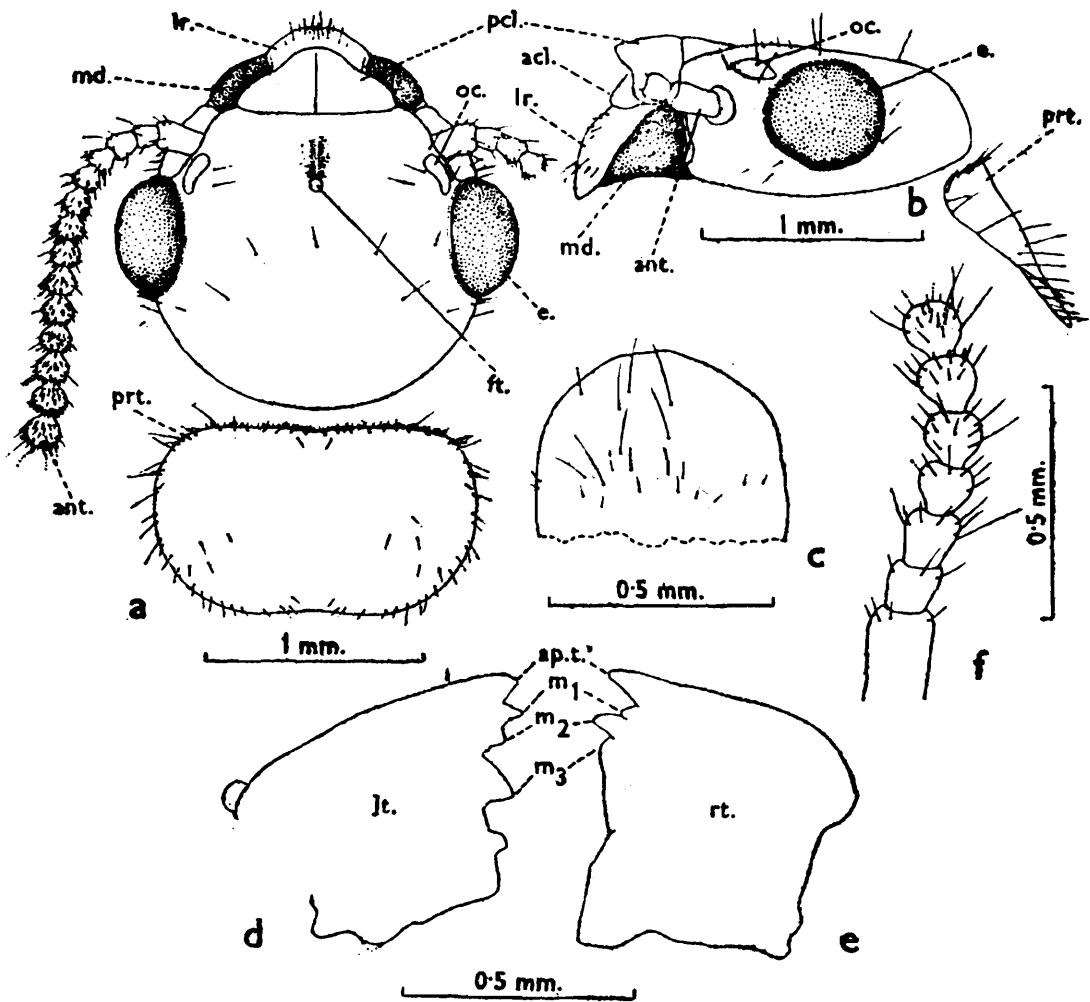
General : Head-capsule, mandibles, pronotum and wing-scales, golden brown ; mandibular teeth dark brown ; fontanelle and anteclypeus whitish ; postclypeus and labrum yellowish, antenna and legs paler : thorax and abdomen pale golden yellow. Head sparsely, and body fairly densely, pilose. Total length without wings, ca. 6.8-7.0 mm.

TABLE 2.—*Body-measurements (in mm.) of Schedorhinotermes eleanorae n. sp. (Roonwal & Bose). Caste : Imago.*

Body-parts.	Range (2 examples)
1. Total body-length (without wings) ca.	6.8—7.0
2. Head-length to tip of labrum	1.75—1.78
3. Head-length to lateral base of mandibles	1.38—1.40
4. Head-width (with eyes)	1.75
5. Maximum height of head	0.73
6. Maximum length of labrum	0.37
7. Maximum width of labrum	0.53
8. Maximum diameter of eye (with ocular sclerite)	0.50—0.53
9. Minimum diameter of eye (with ocular sclerite)	0.48
10. Maximum diameter of ocellus	0.18
11. Minimum diameter of ocellus	0.13
12. Minimum eye-ocellus distance	0.05—0.08
13. Minimum eye-antennal distance	0.10—0.13
14. Minimum distance between ocellus and antennal base	0.04
15. Length of pronotum	0.85—0.90
16. Width of pronotum	1.48—1.55
17. Length of forewing scale	1.30
18. Length of hindwing scale	0.78

* Named after Mrs. Eleanor Emerson, the wife of the well-known termitologist, Professor Alfred E. Emerson, and herself a collector of note.

Head : Subspherical, broader than long (length 1.38-1.40 ; width 1.75 mm.). **Fontanelle** : Distinct, circular, situated in middle of anterior half of headcapsule in level of ocelli. **Eyes** : A pair, one on either side ; large, round and bulging (maximum diameter 0.50-0.53 mm.). **Ocelli** : Small, suboval, paired, one on each side ; separated from the eye of its side by less than its short diameter (minimum eye-ocellus distance *ca.* 0.05-0.08 mm.). **Antennae** : Incomplete (tip broken), only 14 segments present ; segment 1 long, cylindrical ; 2 subequal to 3 ; 4 shortest, smaller than 2 or 3 ; 5 onward gradually increasing in size. **Clypeus** : Anteclypeus narrow, apilose and with a somewhat pointed tip ; hardly visible from above. Postclypeus large, sparsely pilose, distinctly demarcated from frons. **Labrum** : Subrectangular, with distal margin rounded ; broader than long ; with a few long and short hairs on body. **Mandibles** : Subsquamish. Right mandible with an apical and 3 marginal teeth on inner margin ; apical finger-like ; 1st marginal



TEXT-FIG. 1.—*Schedorhinotermes eleanorae* n. sp. Imago (paramorphotype), from the Little Andamans.

(a) Head and pronotum, in dorsal view. (b) Ditto, in lateral view. (c) Labrum, in dorsal view. (d) and (e) Left and right mandibles, respectively, in dorsal view. (f) Basal part of right antenna.

ac., anteclypeus ; *ant.*, antenna ; *e.*, eye ; *ft.*, fontanelle ; *lt.*, left ; *lr.*, labrum ; *md.*, mandible ; *oc.*, ocellus ; *pcl.*, postclypeus ; *prt.*, pronotum ; *rt.*, right.

rudimentary ; 2nd well developed, subequal to apical ; 3rd very short and blunt. Left mandible with an apical and 3 marginal teeth ; apical rather short, finger-like and blunt ; 1st marginal pointed, slightly longer than apical ; 2nd short and blunt ; 3rd well developed and triangular.

Thorax : Pronotum : Flat, sparsely pilose, subtrapezoidal, much broader than long (width 1.48-1.55 ; length 0.85-0.90 mm.) ; anterior and posterior corners rounded ; anterior margin substraight, without a median notch ; posterior margin with a weak median notch. *Wings* : Broken. *Legs* : Long, sparsely pilose ; apical tibial spur formula 3: 2: 2.

Abdomen : Oblong, fairly pilose. Cerci 2-jointed, 0.2 mm. long. Styli 1-jointed, 0.04 mm. long.

1 (b). IMAGO ♀: Same as ♂.

2. SOLDIER MAJOR : Unknown.

3. SOLDIER MINOR (Table 3 ; and Text-fig. 2) :

General : Head-capsule, labrum and antenna pale yellow ; mandibles deep yellowish brown ; legs and abdomen pale yellowish white. Head and thorax sparsely, and body moderately, pilose. Total body-length (including mandibles and to tip of labrum which extends beyond mandibles) *ca.* 2.95-3.30 mm.

Head : Subpentagonal, with posterior end rounded ; widest in anterior one-third ; longer than broad (length to lateral base of mandibles 0.73-0.79 ; maximum width 0.68-0.70 mm.). *Fontanelle* : Distinct, circular ; lying in anterior one-fourth of head ; with a narrow median

TABLE 3.—*Body-measurements (in mm.) of Schedorhinotermes eleanorae n. sp. (Roonwal & Bose) Caste : Soldier Minor.*

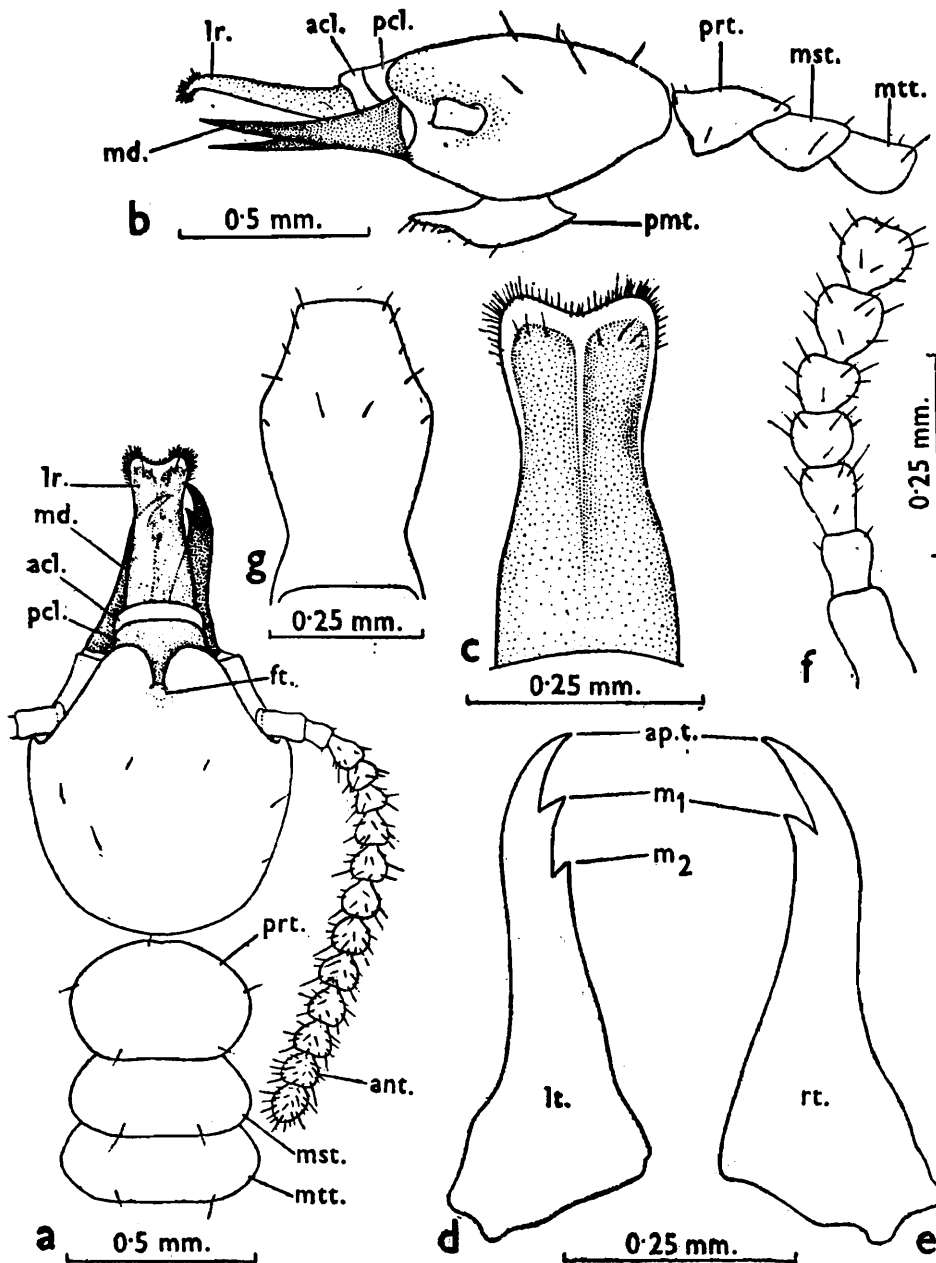
Body-parts	Range (5 examples)	Holotype
1. Total length to tip of labrum	2.95—3.30	3.30
2. Head-length to tip of labrum	1.25—1.30	1.30
3. Head-length to tip of mandibles	1.23—1.26	1.23
4. Head-length to lateral base of mandibles	0.73—0.79	0.78
5. Maximum width of head	0.68—0.70	0.68
6. Width of head at anterior end	0.47—0.50	0.47
7. Maximum height of head	0.43—0.48	0.44

TABLE 3.—*contd.*

Body-parts	Range (5 examples)	Holotype
8. Length of mandibles :		
(a) Right mandible	0.45—0.50	0.50
(b) Left mandible	0.45—0.50	0.50
9. Maximum length of labrum	0.38—0.43	0.40
10. Maximum width of labrum	0.15—0.20	0.15
11. Median length of postmentum	0.38—0.40	0.40
12. Maximum width of postmentum	0.28	0.28
13. Width at waist of postmentum	0.18—0.20	0.19
14. Width at anterior margin of postmentum	0.17—0.19	0.18
15. Head Index I (Width/Length)	0.86—0.91	0.87
16. Head Index II (Height/Width)	0.63—0.71	0.65
17. Head Index III (Height/Length)	0.55—0.62	0.56
18. Maximum length of pronotum	0.30	0.30
19. Maximum width of pronotum	0.43—0.48	0.43
20. Maximum width of mesonotum	0.43—0.48	0.44
21. Maximum width of metanotum	0.48—0.53	0.50
22. No. of antennal segments	14	14

dorsal groove running from fontanelle to the tip of labrum. *Antennae* : With 14 segments ; segment 1 longest, cylindrical ; 2 and 3 smaller and subequal ; 4 shortest ; 5 onward gradually increasing in size ; apical (14) club-shaped. *Clypeus* : Anteclypeus a narrow, apilose strip. Postclypeus pilose ; indistinctly separated from frons. *Labrum* : Long, flap-like and extending a little beyond mandibles ; much longer than broad ; distal end bifid, the two lobes fringed with numerous short hairs. *Mandibles* : Long, slender, broad basally and pointed distally ; distal end slightly incurved. Right mandible with a large, sharp-pointed tooth situated distally in anterior one-fourth of inner margin. Left

mandible with 2 such sharp teeth in distal third of inner margin. *Postmentum* : Longer than broad and bulged in middle ; shorter than head-capsule ; broadest anteriorly at about its distal one-third, whence the sides converge anteriorly and posteriorly ; anterior margin narrow and substraight, posterior two-thirds with a waist near proximal end ; posterior margin weakly concave.



TEXT-FIG. 2.—*Schedorhinotermes eleanorae* n. sp. Soldier minor (paratype) from the Little Andamans.

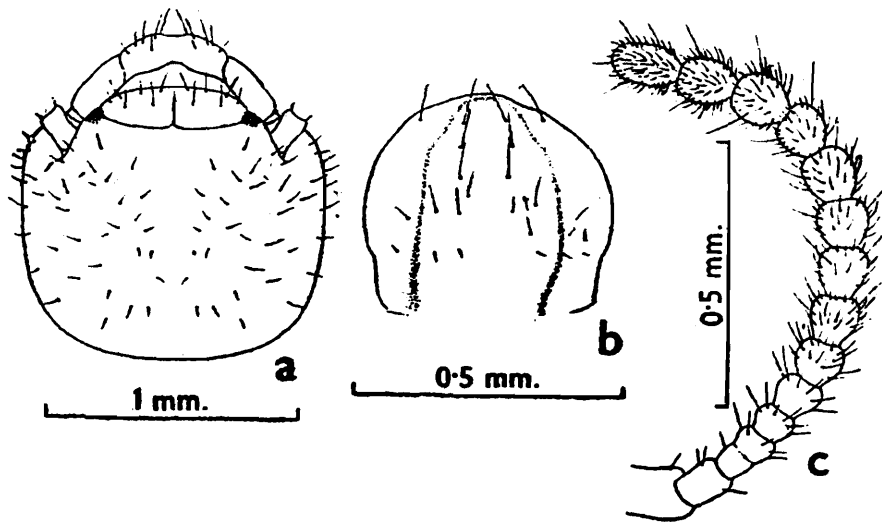
(a) Head and thorax, in dorsal view. (b) Ditto, in lateral view. (c) Labrum, in dorsal view. (d) and (e) Left and right mandibles, respectively, in dorsal view. (f) Basal part of left antenna. (g) Post mentum, in ventral view.

acl., anteclypeus ; *ant.*, antenna ; *ap.t.*, apical tooth of mandible ; *ft.*, fontanelle ; *lr.*, labrum ; *lt.*, left ; *m₁*, *m₂*, 1st and 2nd mandibular teeth respectively ; *md.*, mandible ; *mst.*, mesonotum ; *mtt.*, metanotum ; *pcl.*, postclypeus ; *prt.*, pronotum ; *rt.*, right.

Thorax : Pronotum : With very few hairs ; flat, rhomboidal, and narrowing anteriorly ; anterior and posterior angles rounded ; anterior and posterior margins with a weak median notch. *Mesonotum* : Sparsely pilose ; slightly broader than pronotum ; posterior margin straight. *Metanotum* : Sparsely pilose ; suboval ; slightly broader than mesonotum ; posterior margin straight. *Legs* : Long, fairly pilose ; apical tibial spur formula 3: 2: 2.

Abdomen : Oblong, hairy. Cerci 2-jointed, 0.10 mm. long. Styli minute single-jointed, ca. 0.03 mm. long.

4. WORKER (Text-fig. 3) : Generally pale yellow. Head subsquarish ; moderately hairy. Eyes and ocelli absent. Fontanelle indistinct. Antenna with 15 segments ; segment 1 longest ; 2 longer than 3 or 4 ; 3 and 4 smallest and subequal ; 5 to last (15) gradually increasing in size and becoming club shaped. Postclypeus separated from frons by clear suture. Labrum subsquarish, slightly broader than long ; distal



TEXT-FIG. 3.—*Schedorhinotermes eleanorae* n. sp. Worker, from the Little Andamans.

(a) Head, in dorsal view. (b) Labrum, in dorsal view. (c) Antenna.

end-rounded. Mandibles as in imago (*vide* above). Pronotum moderately hairy ; saddle-shaped ; anterior and posterior margins with a weak median notch ; mesonotum and metanotum slightly broader than pronotum. Legs long, pilose ; apical tibial spur formula 3: 2: 2. Abdomen oblong, fairly pilose ; cerci 2-jointed, ca. 0.13 mm. long ; styli 1-jointed, ca. 0.05 mm. long.

Body-measurements (in mm.) of workers of Schedorhinotermes eleanorae n. sp. (9 examples)

1. Total length including mandibles, ca.	..	..	..	..	..	3.9—4.4
2. Length of head to lateral base of mandibles	..	..	..	..	..	0.98—1.05
3. Maximum width of head	..	..	..	..	..	1.13—1.18
4. Maximum height of head	..	..	..	..	..	0.55
5. Maximum length of pronotum	..	..	..	..	..	0.23—0.25
6. Maximum width of pronotum	..	..	..	..	..	0.55—0.58

(c) *Type-Specimens* :—All types are from the holotype lot, *vide* "Material" above. *Holotype* : A soldier minor, in a vial, Z.S.I. Reg. No. 3716/H8 ; deposited in Z.S.I. *Morphotypes* : A dealate imago ♂ and a worker in a vial, Z.S.I. Reg. No. 3717/H8 ; deposited in Z.S.I. *Paratypes and paramorphotypes* : Deposited as follows : (i) 2 paratype soldiers minor, one paramorphotype dealate imago ♀ (its labrum, head, mandibles and 2 legs mounted on 3 slides under the same Reg. No. as the whole specimens) and 2 paramorphotype workers in a vial, Z.S.I., Reg. No. 3718/H8. (ii) A paratype soldier minor and a paramorphotype worker, in a vial, in F.R.I., Dehra Dun. (iii) A paratype soldier minor and a paramorphotype worker, in a vial, with Prof. A.E. Emerson, U.S.A.

(d) *Type-locality and Geographical Distribution*.—*Type-locality* : Bedeabdulu, 19 km. south of Toikoibuea, Little Andaman Is. Known only from the type-locality.

(e) *Comparisons*.—*Schedorhinotermes eleanorae* n. sp. is close to *S. tiwarii* (Roonwal & Thakur, 1963, from the South Andamans), *S. longirostris* (Brauer, 1865, from the Nicobars), *S. translucens* (Haviland, 1898 from Borneo), and *S. medioobosenus* Holmgren, 1914, from the Andamans, Nicobars and Malaya but is separable from these as follows :—

1. From *S. tiwarii*

SOLDIER MINOR : (i) Much smaller (head-length with mandibles 1.23—1.26 *vs.* 1.45—1.60 mm.; head-length to lateral base of mandibles 0.73—0.79 *vs.* 0.90—1.07 mm.). (ii) Antennae with 14 segments (*vs.* 15) ; segment 3 longer than 2 (*vs.* shorter). (iii) Sides of postmentum more bulged and with a more pronounced waist (*vs.* almost straight and with a less marked waist).

2. From *S. longirostris* (compared with types of *longirostris*).

SOLDIER MINOR : (i) Antennae with 14 segments (*vs.* 15-16, mostly 15) ; segment 3 subequal to 2 (*vs.* shorter than 2). (ii) Postmentum narrower at waist ; width at waist 0.18—0.20 *vs.* 0.23—0.25 mm.; postmentum contraction index *i.e.*, Width at waist/Maximum width 0.64—0.74 *vs.* 0.77—0.83. (iii) Somewhat smaller (head-length with mandibles 1.25—1.30 *vs.* 1.30—1.37 mm.; head-length to lateral base of mandibles 0.72—0.78 *vs.* 0.80 mm.; head-width 0.68—0.70 *vs.* 0.71—0.73 mm.).

3. From *S. translucens*

IMAGO : (i) Larger (head-length to lateral base of mandibles 1.38—1.40 *vs.* 1.30 mm.). (ii) Eyes larger (maximum diameter 0.50—0.53 *vs.* 0.49 mm.; minimum diameter 0.48 mm. *vs.* 0.41 mm.).

SOLDIER MINOR : (i) Much smaller (head-length with mandibles 1.25—1.30 mm. *vs.* 1.45—1.60 mm.; head-length to lateral base of mandibles 0.72—0.78 *vs.* 0.85—1.07 mm.; maximum head-width 0.68—0.70 *vs.* 0.73—0.91 mm.). (ii) Labrum extending beyond tip of mandibles (*vs.* up to tip of mandibles).

4. From *S. medioobscurus*

IMAGO*: (i) Generally larger (head-length without mandibles 1.38—1.40 vs. 1.27—1.32 mm.; head-width 1.75 vs. 1.61—1.71 mm.; pronotum-width 1.48—1.55 vs. 1.22—1.37 mm.). (ii) Eyes and ocelli larger (maximum diameter of eyes 0.50—0.53 vs. 0.41—0.44 mm., of ocelli 0.18 vs. 0.13—0.15 mm.). (iii) Ocelli separated from eyes by a distance of 0.05—0.08 mm. vs. 0.10 mm.

SOLDIER MINOR : (i) Somewhat smaller (head-length with mandibles 1.25—1.30 vs. 1.33—1.43 mm.; head-length to base of mandibles 0.72—0.78 vs. 0.83—0.88 mm., head-width 0.68—0.70 vs. 0.70—0.80 mm. (ii) Antennae with 14 (vs. 15-16) segments. (iii) Postmentum narrower at waist (Postmentum contraction index, i.e., Width at Waist/Maximum width 0.64—0.74 vs. 0.76—0.77 mm.).

(f) *Biological Remarks.*—The material was obtained from a dead tree.

7. *Schedorhinotermes longirostris* (Brauer)

(Table 4 ; and Text-figs. 4-6)

1865. *Termes* sp. F. Brauer, *Verh. zool. bot. Ges. Wien*, Vienna, 15, p. 977.

1866. *Termes longirostris*: F. Brauer, *Reise der Fregatte 'Novara' (Zool. Theil)*, Vienna, Bd. 2 (Abth. 1, Art. 4), pp. 47-48, S., W. and Ny. *Type-locality*: Kondul Is., Nicobars.

1949. *Schedorhinotermes longirostris* (Br.) (in part), T.E. Snyder, *Smiths. misc. coll.*, Washington, 112, p. 93.

1953. *Schedorhinotermes longirostris* (Br.), M.L. Roonwal & G.D. Pant, *Indiaⁿ Forest Leaflet* (Ent.), Delhi, No. 121 (3), p. 49. Andamans. (Now *det.* as *S. medioobscurus*.)

(a) *Material*:—In Naturhistorisches Museum, Vienna ; One vial, in spirit, with 2 Ny. 1 S. (major), 6 S. (minor, 1 immature) and 11 W (1 immature), Kondul Is. (Nicobars, Indian Ocean), 1857-59. *Types*. With the following label :

“*Termes* (= *Schedorhinotermes*) *longirostris* Brauer, *Reise der Fregatte 'Novara'*, “Nicobaren, 1857-59.”

(b) *Description.*—Brauer (1866), gave a brief description of nymphs, worker and soldier major and a fuller one of soldier minor, but gave no illustrations. We have here re-described the species, with illustrations.

1. IMAGO : Unknown.

2. SOLDIER MAJOR (Table 4 ; and Text-fig. 4)

General : Head-capsule yellowish, labrum, antennae, legs and body paler ; mandibles reddish brown, yellowish basally. Head and body sparsely hairy with long bristle-like hairs ; abdominal tergites with a row each of a few long hairs near posterior margin and a few short hairs elsewhere. Total body-length with mandibles *ca.* 4.8 mm.

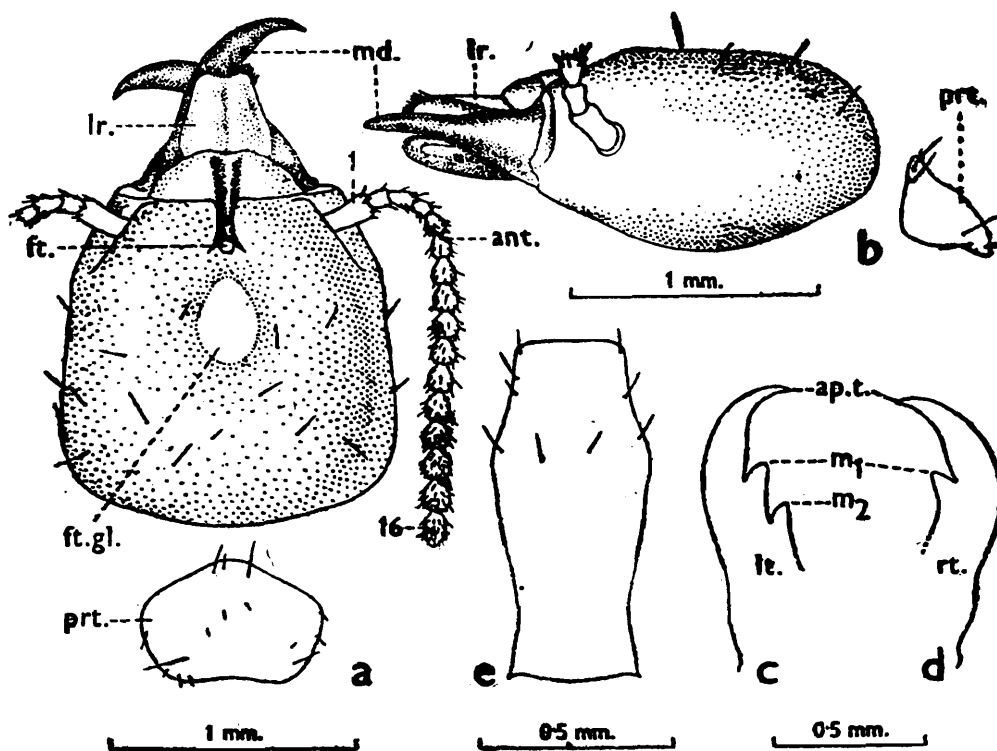
Head : Head-capsule subrectangular, with rounded hind angles ; a little longer than broad (length to lateral base of mandibles 1.40 mm.; maximum width 1.33 mm.); sides gradually narrowing anteriorly, but

* Measurements of *S. medioobscurus* imago are taken from Holmgren 1914 (original description) and Ahmad (*Biologia*, Lahore, 4, p. 79, 1958).

TABLE 4.—*Body-measurements (in mm.), etc., of Schedorhinotermes longirostris (Brauer) Caste : Soldier.*

Body-parts	Soldier major (Lectotype)	Soldier minor (5 examples)
1	2	3
1. Total body-length, excluding antennae, <i>ca.</i> ..	4.78 (to tip of mandibles)	3.30—3.80 (to tip of labrum)
2. Length of head including mandibles and/or labrum	2.03 (to tip of mandibles)	1.30—1.33 (to tip of labrum)
3. Length of head to lateral base of mandibles	.. 1.40	0.80
4. Maximum width of head .. .. .	.. 1.33	0.71—0.73
5. Width of head-capsule at anterior end .. .. .	.. 0.70	0.49—0.50
6. Maximum height of head .. .. .	.. 0.80	0.41—0.43
7. Length of mandibles :		
(a) Right mandible .. .. .	.. 0.80	0.51—0.53
(b) Left mandible .. .. .	.. 0.80	0.51—0.53
8. Maximum length of labrum .. .. .	.. 0.37	0.37—0.40
9. Maximum width of labrum .. .. .	.. 0.37	0.17—0.20
10. Median length of postmentum .. .. .	.. 0.90	0.47—0.50
11. Maximum width of postmentum .. .. .	.. 0.40	0.30
12. Width at waist of postmentum .. .. .	.. 0.27	0.23—0.25
13. Width at anterior margin of postmentum .. .. .	.. 0.25	0.17
14. Head Index I (Width/Length) .. .. .	.. 0.95	0.89—0.91
15. Head Index II (Height/Width) .. .. .	.. 0.60	0.56—0.59
16. Head Index III (Height/Length) .. .. .	.. 0.57	0.51—0.54
17. Maximum length of pronotum .. .. .	.. 0.50	0.30—0.33
18. Maximum width of pronotum .. .. .	.. 0.70	0.43—0.47
19. Maximum width of mesonotum .. .. .	.. 0.66	0.47—0.50
20. Maximum width of metanotum .. .. .	.. 0.73	0.50—0.53
21. No. of antennal segments .. .. .	.. 16	15—16

abruptly narrowing near insertion of antennae ; posterior margin round. *Fontanelle* : Small, round, situated at about one-fifth of head-capsule from anterior end ; leading behind into a fontanelle gland, and in front on head-surface, into a groove to almost the front margin of labrum. *Eyes and ocelli* : Absent. *Antennae* : Only right antenna of specimen complete ; with 16-segments ; segments 1 and 2 sparsely, and the remainder fairly, pilose ; segment 1 longest, cylindrical ; 2 a little longer than half of 1, cylindrical ; 3 slightly longer than 2 and club-shaped ; 4 shortest ; 5-8 gradually increasing in length and becoming pyriform ; 9 to the penultimate one (15) subequal and pyriform ; last (16) ovate and smaller than 15. *Clypeus* : Subelliptical ; with a weak median notch in anterior margin ; not clearly differentiated into an ante- and a postclypeus. *Labrum* : Broadly tongue-shaped and reaching up to two-thirds of the length of mandibles ; broadest posteriorly ; length subequal to maximum width ; with a median longitudinal groove ; anterior margin weakly bifid and with a fringe of short hairs. *Mandibles* : Sabre-shaped, strongly incurved near apices. Left mandible with two prominent teeth in anterior half of inner margin. Right mandible with only one such tooth a little above the middle of mandible. *Postmentum* : Club-shaped ; with a few longish hairs on anterior one-third ; shorter than head-capsule ; broadest at anterior one-third ; waist lying a little below the hind two-third portion ; anterior margin substraight ; posterior margin weakly convex.



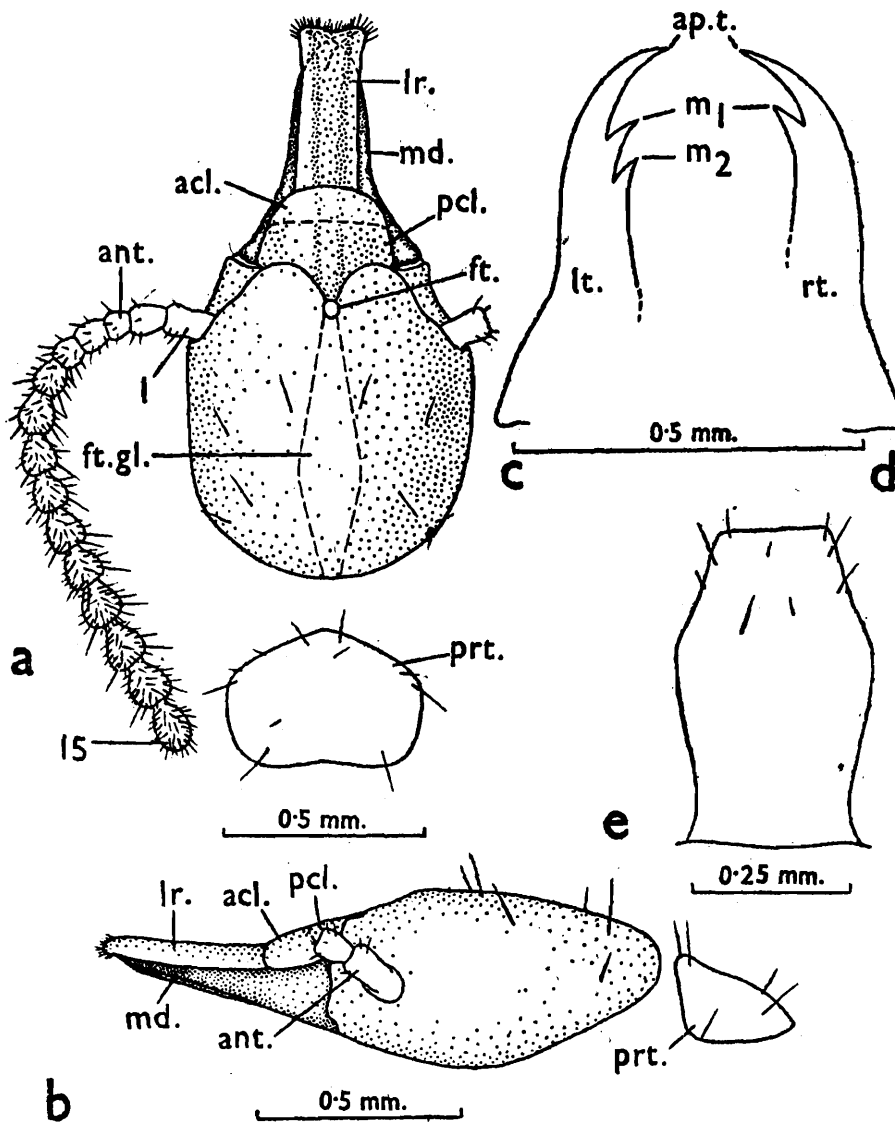
TEXT-FIG. 4.—*Schedorhinotermes longirosiris* (Brauer). Soldier major, *lectotype*. Kondul Is., Nicobars.

(a) Head and pronotum, in dorsal view. (b) Ditto, in side view. (c) Left mandible, in dorsal view. (d) Ditto, right mandible. (e) Postmentum, in ventral view.

ant., antenna ; *ap. t.*, apical tooth of mandibles ; *ft.*, fontanelle ; *ft. gl.*, fontanelle gland ; *lr.*, labrum ; *lt.*, left ; *m₁*, *m₂* ; 1st and 2nd marginal teeth of mandibles respectively ; *md.*, mandible ; *prt.*, pronotum ; *rt.*, right.

Thorax : Pronotum : Rhomboidal ; broader than long (length 0.50; width 0.70 mm.); anterior margin weakly raised and projected forward medially ; sides rounded and somewhat narrowed behind ; posterior margin incurved medially. **Mesonotum :** Slightly narrower than pronotum ; posterior margin weakly incurved ; sides rounded. **Metanotum :** Slightly broader than pronotum ; posterior margin medially incurved ; sides rounded. **Legs :** Thin, long and hairy ; apical tibial spur formula 3 : 2 : 2. Tarsi 4-jointed.

Abdomen : Oblong, hairy. Cerci 2-jointed ; 0.13 mm. long. Styli small, 1-jointed, 0.03 mm. long.



TEXT-FIG. 5.—*Schedorhinotermes longirostris* (Brauer). Soldier minor, *lectromorphotype*. Kondul Is., Nicobars.

(a) Head and pronotum, in dorsal view. (b) Ditto, in side view. (c) Left mandible, in dorsal view. (d) Ditto, right mandible. (e) Postmentum, in ventral view.

acl., anteclypeus ; *ant.*, antenna ; *ap. t.*, apical tooth of mandibles ; *ft.*, fontanelle ; *ft. gl.*, fontanelle gland ; *lr.*, labrum ; *lt.*, left ; *m₁*, *m₂*, 1st and 2nd marginal teeth of mandibles respectively ; *md.*, mandible ; *pcl.*, postclypeus ; *prt.*, pronotum ; *rt.*, right.

3. SOLDIER MINOR (Table 4 ; and Text-fig. 5)

General : Head-capsule and labrum yellowish ; antennae, legs and body pale yellow ; mandibles pale brown distally, yellowish proximally. Head and thorax sparsely, and abdomen fairly hairy, with long bristle-like hairs ; abdominal hairs arranged in a row on posterior margin of each tergite. Total body-length *ca.* 3.3—3.8 mm.

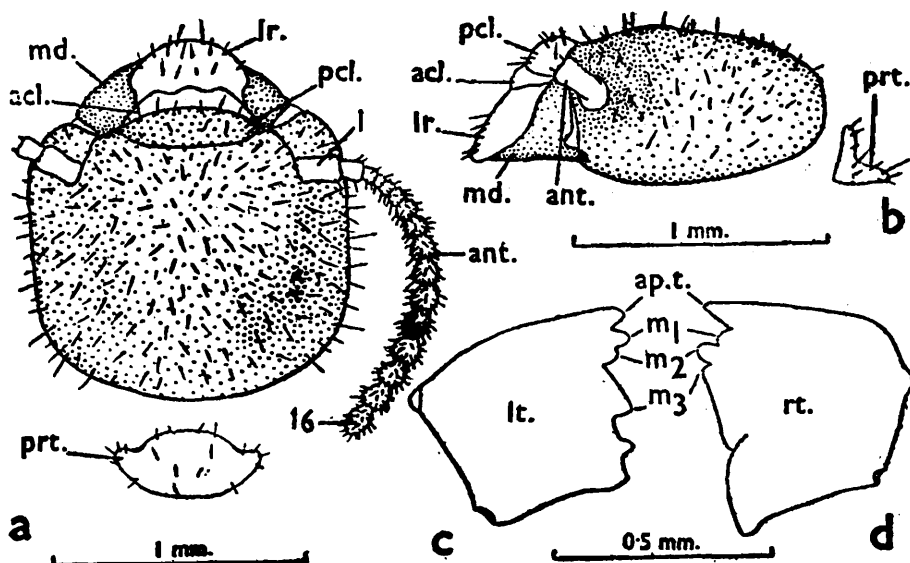
Head : Head-capsule suboval, converging sharply beyond the base of antennae ; slightly longer than wide (length to base of mandibles 0.80 ; width 0.71—0.73 mm.) ; sides weakly convex ; posterior margin strongly rounded. *Fontanelle* : Circular, small but clear, situated a little behind the clypeus ; maximum diameter 0.03—0.04 mm. ; leading behind into a fontanelle gland ; with a median dorsal groove running from fontanelle to the tip of labrum. *Eyes and ocelli* : Absent. *Antennae* : With 15-16 (mostly 15) segments (in one specimen the right antenna with 15 segments, the left with 16) ; segments 1 and 2 sparsely, and the remainder fairly, pilose ; segment 1 longest, cylindrical ; 2 smaller and narrower than 1 and subcylindrical ; 3 (in 15-segmented) and 4 (in 16-segmented antennae) shortest ; 4-9 pyriform and increasing in length gradually ; 10 to the penultimate one subequal and pyriform ; the last one ovate, narrower and slightly shorter than the penultimate one. *Clypeus* : Subtrapezoidal, rounded anteriorly ; demarcation of ante- and postclypeus not distinct. *Labrum* : Long, subrectangular, flap-like, extending up to or slightly beyond the tip of mandibles ; much longer than broad ; distal end weakly bifid and with a fringe of numerous short hairs. *Mandibles* : Long, sabre-shaped and slender, incurved distally. Left mandible with 2 sharp teeth directed forwards in the distal one-third. Right mandible with a single tooth in distal one-fifth of mandible. *Postmentum* : Longer than broad ; sides bulged in middle, and broadest at its distal one-third ; weakly narrowed at waist which lies near posterior end ; anterior margin substraight and small ; posterior margin weakly concave and wider.

Thorax : *Pronotum* : Flat, rhomboidal, broader than long (length 0.30—0.33 ; width 0.43—0.47 mm.) ; anterior and posterior corners rounded ; anterior margin projecting forward medially and without a median notch ; posterior margin with a weak median incurving. *Mesonotum* : As wide as pronotum ; posterior margin substraight or with a weak median incurving. *Metanotum* : Slightly wider than pronotum ; with a weakly incurved posterior margin. *Legs* : Long, fairly pilose ; apical tibial spur formula 3 : 2 : 2. Tarsi 4-jointed.

Abdomen : Long and hairy. Cerci 2-jointed, 0.10—0.13 mm. long. Styli absent (one specimen with a weak impression of their presence).

4. WORKER (Text-fig. 6) : Head yellowish, body paler. Head-capsule dusky ; fontanelle indistinct. Eyes and ocelli absent. Antennae with 16 segments ; segment 1 longest ; 2 one-half of 1 and subequal to 3 and 4 combined ; 4 shortest ; 5 to the penultimate one pyriform and gradually increasing in length ; the last one ovate, shorter than the penultimate one. Clypeus divided into an ante- and a postclypeus, the latter clearly separated from the frons. Labrum broadly tongue-shaped and much wider than long. Mandibles of typically

Schedorhinotermes-type (Text-fig. 6). Pronotum much narrower than head ; weakly saddle-shaped, anterior lobe raised ; anterior and posterior margins substraight and without a notch. Legs long and pilose ; apical tibial spur formula 3 : 2 : 2. Tarsi 4-jointed. Abdomen long, hairy ; cerci 2-jointed, 0.1 mm. long ; styli 1-jointed, 0.07 mm. long.



TEXT-FIG. 6.—*Schedorhinotermes longirostris* (Brauer). Worker, *lectomorphotype*. Kondul Is., Nicobars.

(a) Head and pronotum, in dorsal view. (b) Ditto, in side view. (c) Left mandible, in dorsal view. (d) Ditto, right mandible.

acl., anteclypeus ; *ant.*, antenna ; *ap.t.*, apical tooth ; *lr.*, labrum ; *lt.*, left ; *m₁-m₃*, 1st to 3rd marginal teeth of mandibles respectively ; *md.*, mandible ; *pcl.*, postclypeus ; *prt.*, pronotum ; *rt.*, right.

Body-measurements (in mm.) of workers of Schedorhinotermes longirostris (Brauer). (5 examples.)

1. Total body-length (excluding antennae) <i>ca.</i>	..	..	..	..	..	3.4 —4.5
2. Length of head to lateral base of mandibles	..	..	..	..	..	1.03—1.07
3. Maximum width of head ...	..	..	..	..	..	1.20—1.30
4. Maximum height of head ..	..	..	..	..	..	0.60—0.63
5. Maximum length of pronotum ..	..	..	..	..	..	0.17—0.23
6. Maximum width of pronotum ..	..	..	..	..	..	0.50—0.57

(c) *Type-specimens*.—Cotypes present in the Naturhistorisches Museum, Vienna ; now designated by us as follows :—*Lectotype* : One soldier major, *vide* "Material" above. *Lectomorphotypes* : One soldier minor and one worker. *Paralectomorphotypes* : Five soldiers minor, 10 workers, and 2 nymphs (of them, 1 soldier and 1 worker has been deposited in the collection of the Zoological Survey of India, Calcutta).

(d) *Type-locality and Geographical Distribution*.—*Type-locality* : Kondul Is. (Nicobars, Indian Ocean), *c.* 7°17' N. lat. and 93°39' E. long. Known only from type-locality. Other records given in the literature really refer to other species.

(e) *Comparison*.—*Schedorhinotermes longirostris* is close to *S. medioobscurus* Holmg., *S. tiwarii* R. & T. and *S. translucens* (Havil.),

but the soldiers (major and minor) are generally smaller ; for other differences, *vide supra*, Key for Identification. It is also close to *S. eleanorae* n. sp.; for differences, see under that species above.

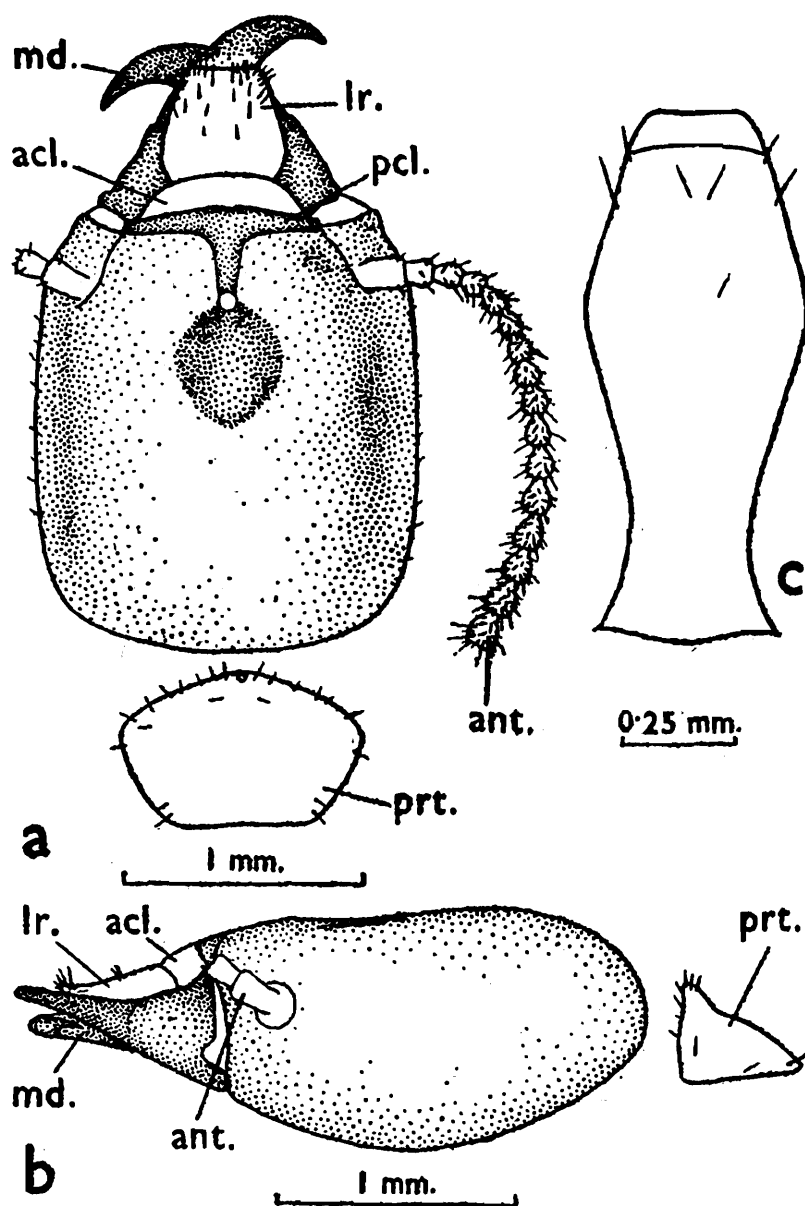
8. *Schedorhinotermes medioobscurus* Holmgren

1914. *Rhinotermes* (*Schedorhinotermes*) *brevialatus* f. *medioobscurus* N. Holmgren, *Zool. Jb. (Syst.)*, Jena, 36, p. 241. Im., S., W. *Type-locality*: Trong in Taiping, Malacca, only. (Specimens from Tandjong-Slamat, E. Sumatra, are not *medioobscurus*, *vide* Snyder, 1949, *infra*.)

1949. *Schedorhinotermes medioobscurus* (Holmg.), T.E. Snyder, *Smiths. misc. Coll.*, Washington, 112, p. 94., Malacca.

1953. *Schedorhinotermes longirostris*: M.L. Roonwal & G.D. Pant, *Indian Forest Leaflet. (Ent.)*, Delhi, No. 121 (3), p. 49. (Now det. as *S. medioobscurus*.)

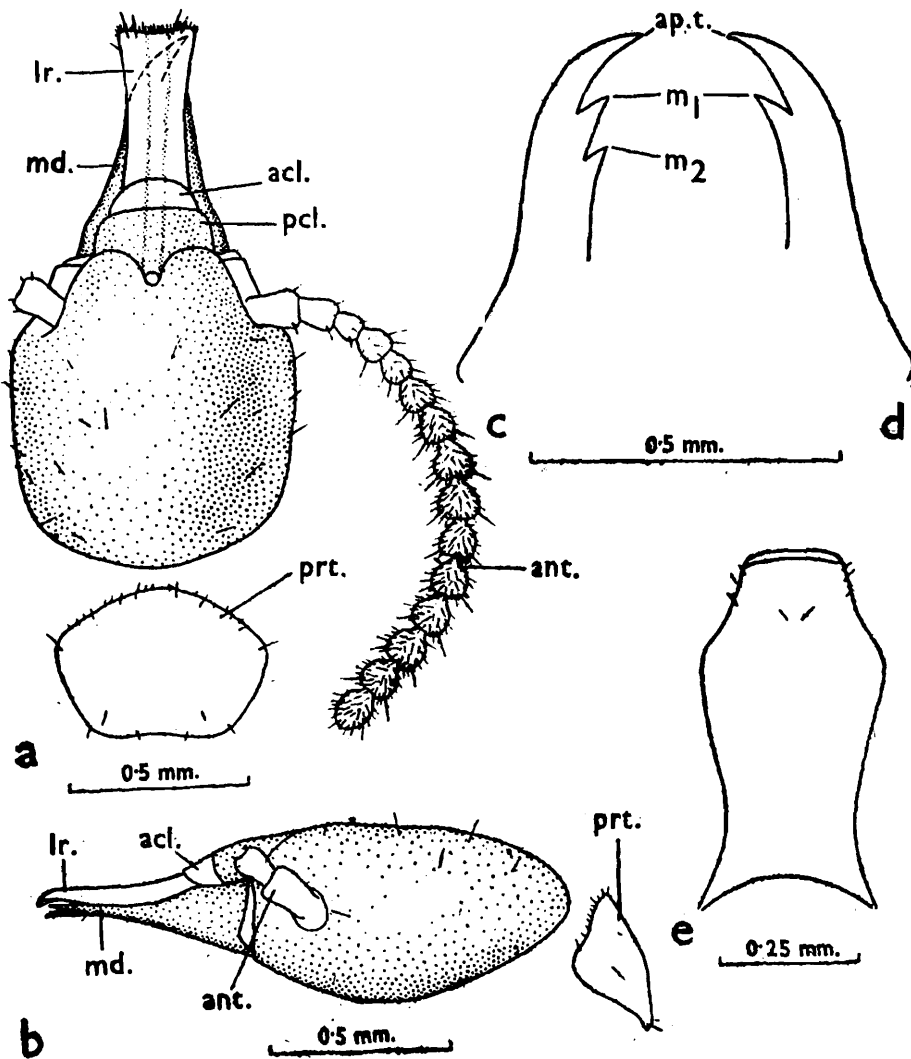
(a) *Material*.—(A) *Present in Z.S.I.* : (i) One vial, Z.S.I. Reg. No. 7378/H2, 5 S. (minor) and several W., Station 10, Mt. Harriet, c. 900 ft,



TEXT-FIG. 7.—*Schedorhinotermes medioobscurus* Holmgren. Soldier major from Malaya.

(a) Head and pronotum, in dorsal view. (b) Ditto, in lateral view. (c) Left mandible, in dorsal view. (d) Ditto, right mandible. (e) Postmentum, in ventral view. *acl.*, anteclypeus ; *ant.*, antenna ; *ap.t.*, apical tooth ; *ft.*, fontanelle ; *lr.*, labrum ; *lt.*, left ; *m₁*, *m₂* ; 1st and 2nd apical tooth of mandibles respectively ; *md.*, mandible ; *pcl.*, postclypeus ; *prt.*, pronotum ; *rt.*, right.

South Andaman Is., coll. *N. Annandale*, December 1923, ex "dead log on jungle floor, very small soldiers. Collembola, white, abundant in galleries in the wood" *Det.* F. Silvestri as *S. longirostris*; *redet.* by us as *S. medioobscurus*.



TEXT-FIG. 8.—*Schedorhinotermes medioobscurus* Holmgren. Soldier minor from the South Andamans.

(a) Head and pronotum in dorsal view. (b) Ditto, in lateral view. (c) Left mandible, in dorsal view. (d) Ditto, right mandible. (e) Postmentum, in ventral view.

acl., anteclypeus; *ant.*, antenna; *ft.*, fontanelle; *lr.*, labrum; *lt.*, left; *m₁*, *m₂*; 1st and 2nd apical tooth of mandibles respectively; *md.*, mandible; *pcl.*, postclypeus; *prt.*, pronotum; *rt.*, right.

(B) *Present in F.R.I.*: (ii) One vial, M.C. No. 18813/1, 1 S. (minor) and 2 W., same data as in (i) above. (iii) One vial, M.C. No. 19204/1, 2 S. (minor) and 1 W., Singapore, coll. *H. Kirby* (T 4592), 29.vii.1935. (iv) One vial, M.C. No. 19204/2, 1, S. (major), Kuala Lumpur, Malaya, 21.ix.1931 (No. 7980, Ent. Div. Agr. Dept.).

(b) *Measurements (in mm.)*.—

				Soldiers major (1 ex., Kuala Lumpur)	Soldiers minor (5 exs.)
1. Total body-length (without antennae), <i>ca.</i>	..	..	..		3.5—4.3
2. Length of head to tip of mandibles	..	..	..	2.60	1.33—1.40
3. Length of head to lateral base of mandibles	..	..	..	1.83	0.83—0.88
4. Maximum width of head	..	..	..	1.60	0.70—0.80
5. Maximum length of pronotum	..	..	..	0.60	0.37—0.40
6. Maximum width of pronotum	..	..	..	1.00	0.53—0.57
7. No. of antennal segments	..	..	..		15—16

(c) *Geographical Distribution*.—*Andamans* : South Andamans : Mt. Harriet. *Nicobars* : Not yet recorded. *Elsewhere* : Malaya : Trong in Taiping, Malacca, (the type-locality) ; Kuala Lumpur and Singapore.

(d) *Biological Remarks*.—Found in dead log of wood in jungle. Small white spring-tails (*Collembola*) were abundant in the galleries and were probably associated with the termite.

(e) *Systematic Remarks*.—We have compared the soldiers minor from Mt. Harriet, Andamans (*vide* "Material (i) & (ii)" above) with types of *S. longirostris* (Brauer). They are a little larger than the latter and have a broader pronotum (head-length 0.83—0.88 mm. *vs.* 0.80 mm. pronotum width 0.53—0.57 *vs.* 0.43—0.47 ; pronotum-head index, *i.e.*, Pronotum-width/Head-width 0.71—0.78 *vs.* 0.60—0.64). They also closely agree with specimens, from Singapore, *vide* "Material (iii)" above.

9. *Schedorhinotermes tiwarii* Roonwal & Thakur

(Pl. 13, Figs. 6 and 6a)

1963. *Schedorhinotermes tiwarii*, M.L. Roonwal & M.L. Thakur, *Indian J. agric. Sci.*, Delhi, 33 (2), pp. 109-117, S. and W. *Type-locality* : Chouldhari, South Andaman Is.

(a) *Material*.—One vial, Fd. Coll. No. 139, several S. (minor) and W., Coll. Sta. No. 2, 1 km. inside forest at Laitora (15 km. north of Tokoibuea), Little Andamans, coll. A. Daniel, 14.ii.1961, ex. "log lying on ground".

(b) *Measurements* (in mm.) :—

Soldiers major (4 examples) (from Roonwal & Thakur, 1963) :

1. Total body-length without antennae, <i>ca.</i>	.. .. .	5.5—6.3
2. Length of head with mandibles	.. .. .	2.51—2.80
3. Length of head to lateral base of mandibles	.. .. .	1.60—1.75
4. Maximum width of head	.. .. .	1.58—1.60
5. Maximum length of pronotum	.. .. .	0.55—0.58
6. Maximum width of pronotum	.. .. .	1.00—1.05
7. No. of antennal segments	.. .. .	16

Soldiers minor (6 examples) :

1. Total body-length without antennae, <i>ca.</i>	.. .. .	3.5—4.9
2. Length of head to tip of labrum	.. .. .	1.50—1.60
3. Length of head to lateral base of mandibles	.. .. .	0.90—0.95
4. Maximum width of head	.. .. .	0.80—0.83
5. Maximum length of pronotum	.. .. .	0.38—0.40
6. Maximum width of pronotum	.. .. .	0.58—0.60
7. No. of antennal segments	.. .. .	15

(c) *Geographical Distribution.*—*Andamans only* : Little Andaman Is, (Laitora, near Tokoibuea) and South Andamans (Chouldhari, the type-locality).

Family 3. TERMITIDAE

Subfamily (i) *Amitermitinae*

Genus (5) *Microcerotermes* Silvestri

10. *Microcerotermes danieli** n. sp.

(Table 5 ; and Text-figs. 9 and 10)

(a) *Material.*—4 vials, 1 Ny., S. and W., Andaman Islands, as follows : Lot (A). (i) Fd. Coll. No. 323, 1 S., 1 W., Coll. Sta. No. 13, Interview Is. (North Andamans), coll. *K.K. Tiwari*, 8.iv.1959.

Lot (B). 3 vials, several S. and W., coll. *A. Daniel*, February-March 1961, as follows :—(ii) Fd. Coll. No. 9, 1 Ny. 6 S., several W., Coll. Sta. No. 1, near *nullah* (streamlet) near Phoenix Bay, Port Blair, South Andamans, 8.ii.1961, ex. (“2 ft. from ground level, from a fallen palm tree”). (iii) Fd. Coll. No. 614, 10 S., several W., Coll. Sta. No. 2, near camp at Tokoibuea, Little Andaman Is., 1.iii.1961, ex. “cocoanut tree” (iv) Fd. Coll. No. 588, 10 S., several W., Coll. Sta. No. 6, Kwateneabo forest, Little Andaman Is., 28.ii.1961, ex. “pillar of Onge hut”

* Named after the collector, Dr. A. Daniel, who made an excellent collection from the Little Andaman Is. and some other islands of the Andaman group.

(b) *Description.*—

1. IMAGO : Unknown.

2. SOLDIER (Table 5 ; and Text-fig. 9) :

General : Head-capsule yellowish, anterior part and labrum reddish yellow ; mandibles reddish at base, dark reddish brown distally ; anteclypeus whitish ; antenna and pronotum pale yellow ; rest of thorax, legs and abdomen pale creamish white. Head sparsely, and body moderately pilose. Total length with mandibles but excluding antenna, *ca.* 4.6—5.0 mm.

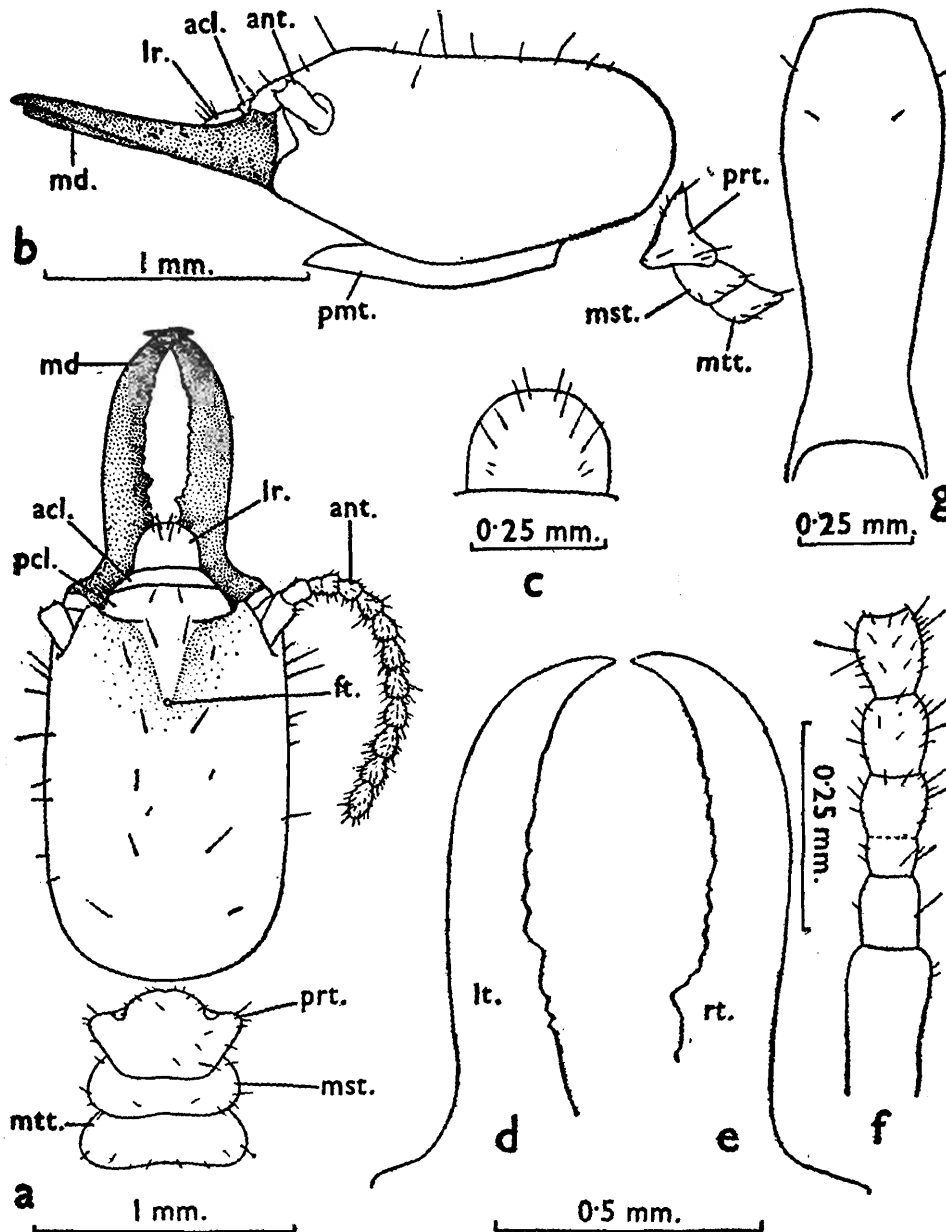
TABLE 5.—*Body-measurements (in mm.), etc. of Microcero-termes danieli n. sp. (Roonwal & Bose). Caste : Soldier.*

Body-parts	Range (9 examples)	Holotype
1. Total length including mandibles, <i>ca.</i>	4.6 — 5.0	4.9
2. Length of head including mandibles	2.50—2.58	2.49
3. Length of head to lateral base of mandibles	1.54—1.63	1.54
4. Maximum width of head	0.95—1.00	0.95
5. Maximum height of head	0.73—0.78	0.73
6. Length of mandibles	0.95—1.03	0.95
7. Head Index I (Width/Length*)	0.58—0.63	0.62
8. Head Index II (Height/Width)	0.75—0.85	0.77
9. Head Index III (Height/Length*)	0.46—0.50	0.47
10. Maximum length of labrum	0.18—0.20	0.20
11. Maximum width of labrum	0.28—0.29	0.29
12. Median length of postmentum	0.85—0.98	0.90
13. Maximum width of postmentum	0.34—0.38	0.34
14. Width of postmentum at waist	0.20—0.23	0.20
15. Width of postmentum at anterior margin	0.20—0.23	0.20
16. Maximum width of pronotum	0.58—0.68	0.58
17. Maximum length of pronotum	0.30—0.34	0.33
18. Width of mesonotum	0.55—0.63	0.55
19. Width of metanotum	0.65—0.70	0.65
20. No. of antennal segments	13	13

Head: Subrectangular, much longer than broad (length to lateral base of mandibles 1.54—1.63 ; maximum width 0.95—1.00 mm.) ; head sloping down anteriorly ; anterior part with two indistinct grooves running on either side from fontanelle to base of postclypeus ; posterior end rounded. *Fontanelle* : Small but distinct, lying in middle of anterior half of head-capsule. *Eyes and ocelli* : Absent. *Antennae* : With 13 segments ; segment 1 longest, cylindrical ; 2 subequal to 3 and 4 combined ; 3 shortest ; 4 longer than 3 ; 5-12 subequal ; the apical (13) ovate ; longer than 12. *Clypeus* : Anteclypeus a narrow apilose strip. Postclypeus indistinctly demarcated from frons ; very sparsely pilose. *Labrum* : Subsquamish, with distal end rounded ; broader than long ; with a few long and a few short hairs on anterior part and on body. *Mandibles* :

*Length to lateral base of mandibles.

Long and apically pointed and incurved ; with inner margins coarsely serrated. Right mandible with a tooth-like projection at about two-thirds of the mandible length from the distal tip and many smaller coarse serrations above and a few below it. Left mandible similar to right, but the tooth, a little more distally situated. *Postmentum* : Long, club-shaped, sides convex ; with maximum width at its distal one-fourth whence the sides converging anteriorly and posteriorly ; with waist at its proximal one-fifth ; anterior margin substraight to weakly convex posterior margin strongly concave.



TEXT-FIG. 9.—*Microcerotermes danieli* n., sp. Soldier (paratype), from the South Andamans.

(a) Head and thorax, in dorsal view. (b) Ditto, in lateral view. (c) Labrum, in dorsal view. (d) and (e) Left and right mandibles, respectively, in dorsal view. (f) Base of right antenna. (g) Postmentum, in ventral view.

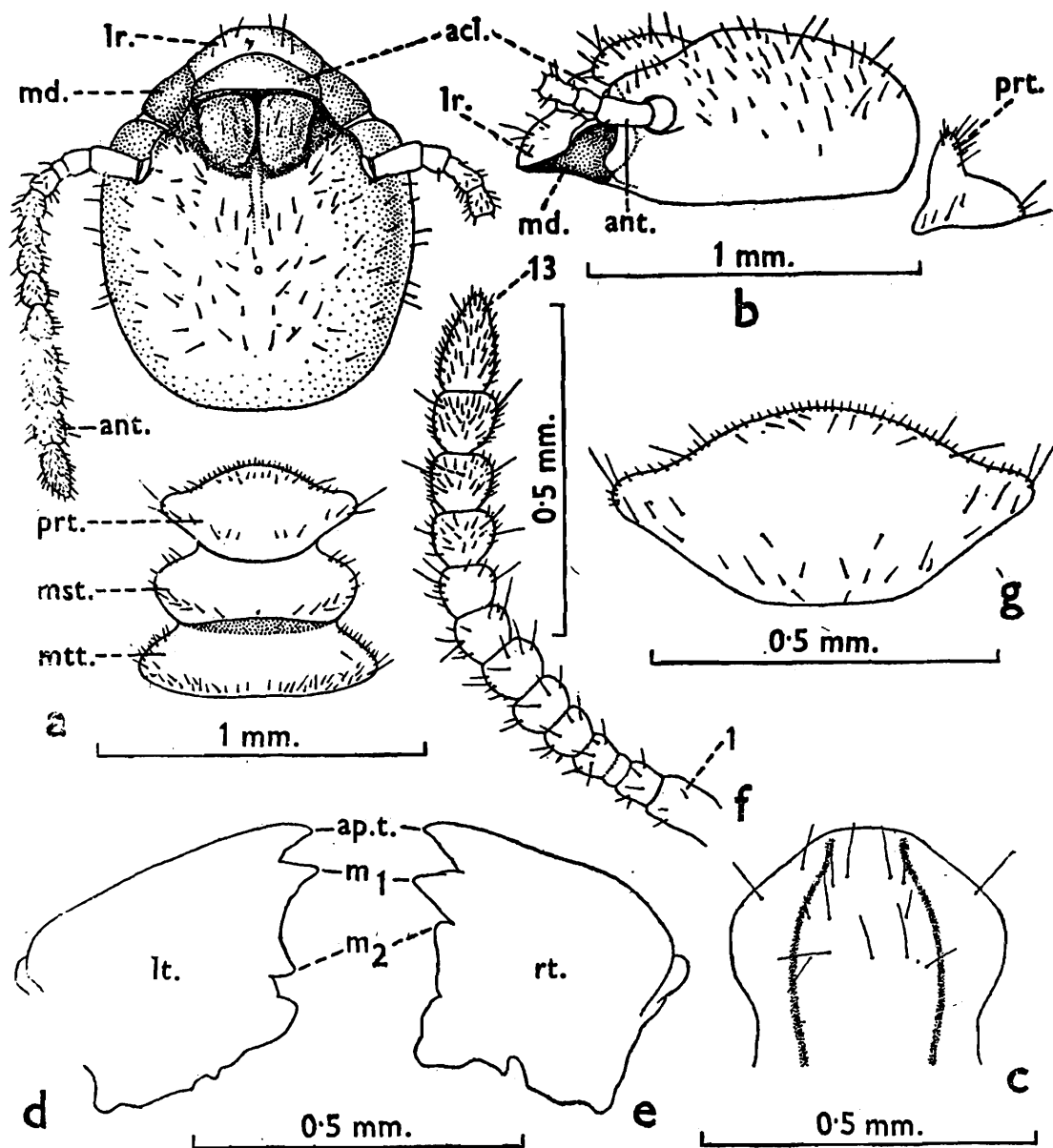
acl., anteclypeus ; ant., antenna ; ft., fontanelle ; lr., labrum ; lt., left ; md., mandible ; mst., mesonotum ; mtt., metanotum ; pcl., postclypeus ; pmt., postmerum ; prt., pronotum ; rt., right.

Thorax : Much narrower than head. **Pronotum** : Saddle-shaped, broader than long ; anterior lobe convex ; anterior and posterior margins with a very weak median notch ; anterior and posterior corners rounded. **Mesonotum** : Oval, broader than long, almost as broad as pronotum. **Metanotum** : Oval, much broader than long, broader than mesonotum. **Legs** : Long, fairly pilose ; apical tibial spur formula 3 : 2 : 2.

Abdomen : Oblong, pilose. Cerci 2-jointed, *ca.* 0.05 mm. long. Styli one-jointed, *ca.* 0.04 mm. long.

3. WORKER (Text-fig. 10) :

General : Posterior part of head-capsule, clypeus, labrum and mandibles pale golden yellow ; mandibular teeth darker ; anterior part of head,



TEXT-FIG. 10.—*Microcerotermes danieli* n. sp. Worker (paramorphotype), from the South Andamans.

(a) Head and thorax, in dorsal view. (b) Ditto, in lateral view. (c) Labrum, in dorsal view. (d) and (e) Left and right mandibles respectively, in dorsal view. (f) Right antenna. (g) Pronotum, in dorsal view.

acl., anteclypeus ; *ant.*, antenna ; *ap.t.*, apical tooth of mandible ; *lr.*, labrum ; *lt.*, left ; *md.*, mandible ; *m₁*, *m₂*, 1st and 2nd mandibular teeth respectively ; *mst.*, mesonotum ; *mtt.*, metanotum ; *pcl.*, postclypeus ; *prt.*, pronotum ; *rt.*, right.

antenna and pronotum pale yellow ; rest of thorax, legs and abdomen pale yellowish white. Head and body moderately pilose. Total length including mandibles (but excluding antennae) *ca.* 3·8—4·6 mm.

Head : Subsquamish, broader than long. *Fontanelle* : Indistinct. *Eyes and ocelli* : Absent. *Antennae* : With 13 segments ; segment 1 longest ; 2 longer than either 3 or 4 ; 3 shortest, 4-12 gradually increasing in size ; the apical (13) ovate, slightly longer than 12 and with a pointed tip. *Clypeus* : Anteclypeus an apilose narrow strip ; distal end projected medially. Postclypeus swollen, sparsely pilose ; divided into right and left halves by a median vertical suture. *Labrum* : Subsquamish, but swollen laterally in middle ; broader than long ; with a few long hairs on anterior part and on body. *Mandibles* : Subsquamish: Right mandible with an apical and 2 marginal teeth ; apical finger-like and pointed ; 1st marginal like apical but slightly smaller ; 2nd short and blunt and widely separated from 1st. Left mandible with an apical and 2 marginal teeth ; apical long and finger-like ; 1st marginal like apical ; 2nd small and blunt and close to 1st.

Thorax : Moderately pilose. *Pronotum* : Saddle-shaped ; much broader than long (length 0·23—0·26 ; width 0·53—0·58 mm.) ; anterior margin convex, without a median notch ; posterior margin weakly convex ; also without a median notch. *Mesonotum* : broader than pronotum ; sides rounded. *Metanotum* : broader than mesonotum ; sides somewhat projected and acutely rounded. *Legs* : long, fairly pilose ; apical tibial spur formula 3 : 2 : 2.

Abdomen : Oblong, fairly pilose. Cerci 2-jointed, *ca.* 0·08 mm. long. Styli 1-jointed, *ca.* 0·05 mm. long.

Body-measurements (in mm.) of workers of Microcerotermes danieli n. sp. (7 examples).

1. Total body-length including mandibles (but excluding antennae), <i>ca.</i>	3·8	—	4·6
2. Head-length to lateral base of mandibles	0·73	—	0·98
3. Maximum width of head	0·80	—	0·98
4. Maximum height of head	0·48	—	0·55
5. Maximum length of pronotum .. .	0·23	—	0·26
6. Maximum width of pronotum	0·53	—	0·58

(c) *Type specimens*.—*Holotype* : A soldier, in a vial, Z.S.I. Reg. No. 3563/H8, from Material, Lot (B) (ii), Fd. Coll. No. 9, Coll. Sta. No. 1, near streamlet near Phoenix Bay, Port Blair, South Andaman Is., coll. A. Daniel, 9.ii.1961, ex. "2ft. from ground-level, from a fallen palm tree" ; deposited in Z.S.I. *Morphotype* : A worker, in a vial, Z.S.I. Reg. No. 3564/H8, from holotype lot ; deposited in Z.S.I. *Paratypes* and

Paramorphotypes : (i) 3 paratype soldiers and 6 paramorphotype workers, in a vial. Z.S.I. Reg. No. 3565/H8 ; from holotype lot and with the same data ; deposited in Z.S.I. (ii) One paratype soldier and one paramorphotype worker, from holotype lot in F.R.I., Dehra Dun. (iii) 1 paratype soldier and 1 paramorphotype worker, from holotype lot, with Prof. A.E. Emerson, U.S.A.

(d) *Type-locality and Geographical distribution.*—*Type-locality.*—Coll. Sta. No. 1, streamlet near Phoenix Bay, Port Blair, South Andaman Is.

Geographical distribution.—*Andamans Only* : North Andamans (Interview Is.), South Andamans (Phoenix Bay, Port Blair, the type-locality) and Little Andamans (Tokoibuea and Kwateneabo).

(e) *Comparisons.*—The soldiers of *Microcerotermes danieli* n. sp. are close to *M. cameroni* Snyder and *M. celebensis* Kemner., but differ from them as follows :—

From M. cameroni : (i) Fontanelle distinct (vs. indistinct). (ii) Mandibles stouter and longer (length 0.95-1.03 vs. 0.90 mm.) (Head Mandible Index, i.e., Mandible-length/Head-length, 0.61-0.67 vs. 0.55). (iii) Anterior margin of pronotum with a very weak median notch (vs. with well developed notch). (iv) Pronotum narrower (width 0.58-0.63 vs. 0.65 mm.). (v) Antennae with segment 3 shorter than 4 (vs. subequal).

From M. celebensis : (i) Labrum rounded and a little broader than long (vs. pointed and as long as wide). (ii) Mandibles longer (0.95-1.03 vs. 0.73-0.83 mm.). (iii) Postmentum shorter (length 0.87-0.88 vs. 0.93 mm.). (iv) Antenna with segment 2 equal to 3 and 4 together (vs. shorter than 3 and 4).

(f) *Biological Remarks.*—The species was obtained from a fallen palm tree, the trunk of a cocoanut tree and the wooden pillar of a hut.

11. *Microcerotermes nicobarensis* n. sp.

(Tables 6 and 7 ; Text-figs. 11-13 ; and Pl. 13, Fig. 7)

(a) *Material.*— 2 vials in spirit, Im., Ny., S. and W., Andamans and Nicobars, coll. K. K. Tiwari, March, 1959, as follows :—(i) Fd. Coll. No. 622, Im. 1 Ny., 1. S. and sev. W., Ross Is., South Andamans, 14.iii.1959. (ii) Fd. Coll. No. 959, several Im., 2 S. and several W., Arong village, Car Nicobar Is., 31.iii.1959, ex. " mounds on cocoanut tree ".

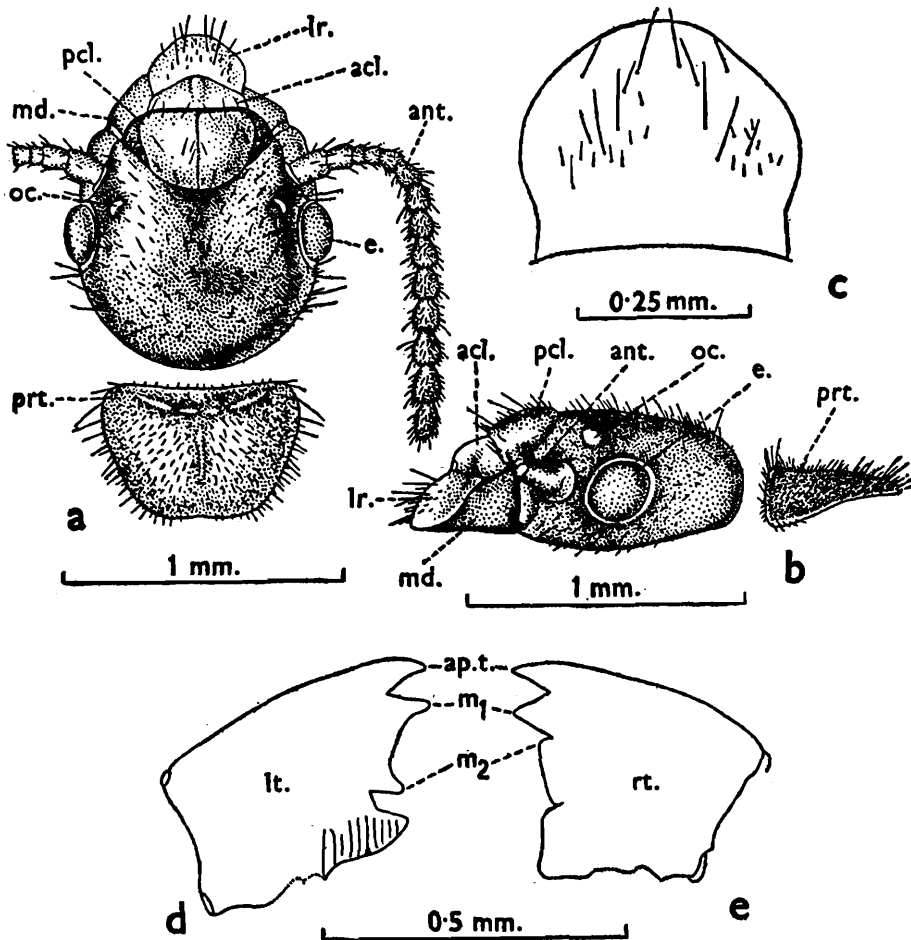
(b) *Description.*—

1a. IMAGO ♀ (Table 6 ; and Text-figs. 11 and 12.) :

General : Head-capsule deep yellowish brown ; postclypeus and pronotum pale brownish yellow ; antenna and rest of thorax paler ; mandibles yellowish brown, with dark brown teeth ; anteclypeus, legs and

abdomen pale yellowish ; wings pale yellowish brown, veins darker ; abdominal tergites pale brown. Head fairly, and body densely, pilose. Total length up to tip of labrum, without wings *ca.* 5.7-6.8 mm. ; with wings 9.1-10.6 mm.

Head : Subspherical, a little broader than long (maximum width with eyes, 0.90-0.97 mm. ; length to lateral base of mandibles 0.80-0.88 mm.) ; slightly converging in front ; rounded posteriorly ; frons weakly sloping in front. *Fontanelle* : Distinct, rounded, situated about the middle of head-dorsum. *Eyes* : Two, lateral, sub-spherical eyes, one on either side ; maximum diameter 0.25-0.26 mm. *Ocelli* : Two, lateral, prominent, translucent, subspherical ocelli, one on either side ; maximum diameter 0.06-0.09 mm. ; minimum diameter 0.05-0.07 mm. ; separated from eye by a distance subequal to its maximum diameter (eye-ocellus distance 0.08-0.10 mm.). *Antennae* : With 14 segments ; segment 1 longest, cylindrical ; 2 shorter than 1 ; 3 shortest, about half

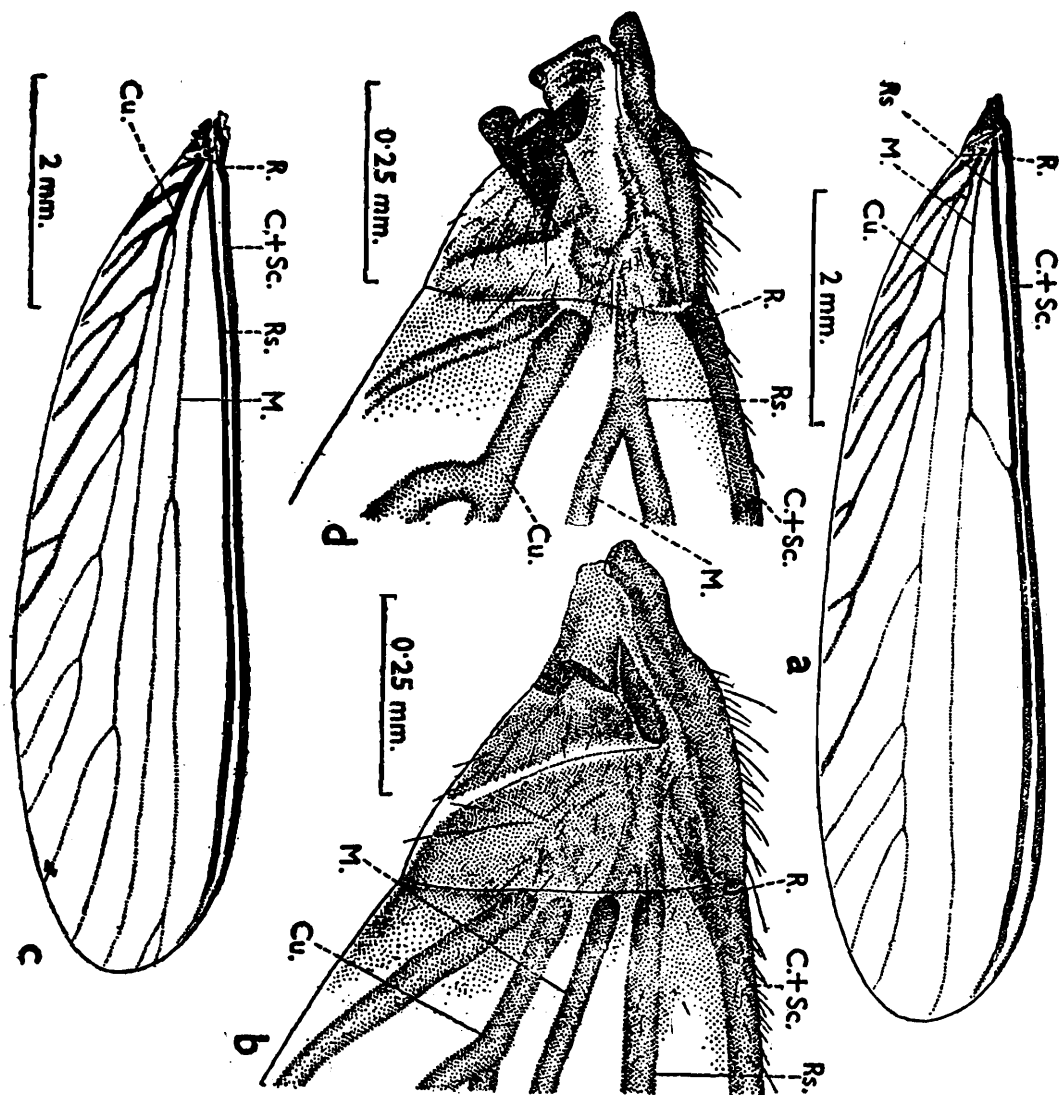


TEXT-FIG. 11.—*Microcerotermes nicobarensis* n. sp. Image (paramorphotype), from the South Andamans.

(a) Head and pronotum, in dorsal view. (b) Ditto, in lateral view. (c) Labrum, in dorsal view. (d) and (e) Left and right mandibles respectively, in dorsal view.

acl., anteclypeus ; *ant.*, antenna ; *ap.t.*, apical tooth of mandible ; *e.*, eye ; *lr.*, labrum ; *lt.*, left ; *m₁*, *m₂*, 1st and 2nd mandibular teeth respectively ; *md.*, mandible ; *oc.*, ocellus ; *pcl.*, postclypeus ; *prt.*, pronotum ; *rt.*, right.

of 2 ; 4 onward progressively increasing in length to the penultimate one; the last (14) ovate, club-shaped, subequal to and narrower than the penultimate one. *Clypeus*: Anteclypeus narrow, hyaline, apilose; medially projected to a broad tip. Postclypeus swollen, sparsely hairy, twice as broad as long; posterior margin greatly rounded and well demarcated from frons; divided into right and left halves by a median vertical suture. *Labrum*: Subsquamish, with broadly rounded tip; several long, bristle-like hairs as well as short hairs present on body. *Mandibles*: Of typically *Microcerotermes*-type. Right mandible with an apical and 2 marginal teeth; apical large, finger-like; 1st marginal triangular, subequal to apical; 2nd short, blunt and situated close to 1st. Left mandible also with an apical and 2 marginal teeth; apical and 1st marginal as in right mandible; 2nd marginal short, blunt and widely separated from 1st.



TEXT-FIG. 12.—*Microcerotermes nicobarensis* n. sp. Imago, from the South Andamans.

(a) Right forewing, in dorsal view. (b) Scale and part of right forewing, in dorsal view. (c) Right hindwing, in dorsal view. (d) Scale and part of right hindwing, in dorsal view.

C.+Sc., Costa-subcosta; Cu., Cubitus; M., Median; R., Radius; Rs., Radial sector.

TABLE 6.—*Body-measurements (in mm.), etc. of Microcerotermes nicobarensis n.sp. (Roonwal & Bose). Caste : Imago.*

Body-parts	Range (5 examples)
1. Total body-length with wings (and excluding antennae), <i>ca.</i> ..	9.1—10.6
2. Total body-length without wings (and excluding antennae), <i>ca.</i>	5.7 ¹ —6.8
3. Length of head to lateral base of mandibles.	0.80—0.88
4. Maximum width of head with eyes	0.90—0.97
5. Maximum height of head	0.48—0.49
6. Maximum length of postclypeus	0.23—0.27
7. Maximum width of postclypeus	0.50—0.53
8. Maximum length of labrum	0.18—0.23
9. Maximum width of labrum	0.33—0.40
10. Maximum diameter of eye with ocular sclerite	0.25—0.26
11. Minimum diameter of eye with ocular sclerite	0.22—0.23
12. Maximum diameter of lateral ocellus	0.06—0.09
13. Minimum diameter of lateral ocellus	0.05—0.07
14. Minimum eye-ocellus distance	0.08—0.10
15. Minimum eye-antennal distance	0.04—0.05
16. Minimum ocellus-antennal distance	0.09—0.10
17. Maximum length of pronotum	0.45—0.46
18. Maximum width of pronotum	0.60—0.68
19. Length of forewing with scale	7.30—7.70
20. Length of forewing scale	0.35—0.40
21. Length of hindwing with scale	6.80—7.00.
22. Length of hindwing scale	0.33—0.38
23. No. of antennal segments	14

Thorax: Pronotum : Very weakly saddle-shaped, subtrapezoidal, broader than long ; anterior margin substraight, without a median notch ; sides converging posteriorly ; posterior margin with a weak median notch. *Mesonotum* and *metanotum* : With deeply notched posterior margins. *Legs* : Thin, moderately long, fairly densely pilose ; apical tibial spur formula 3 : 2 : 2. *Wings* : Long, hairy, punctate. *Forewings* : Longer than hindwings ; scale also longer than that of hindwing. Costa-subcosta fused, thickened, chitinized, hairy and bordering the anterior margin. Radius rudimentary, visible upto just a little outside the scale where it joins the costa-subcosta. Radial sector almost as thick as costa-subcosta, running parallel to latter all along entire wing-length and meeting it at distal margin. Median relatively thin and less chitinized, arising jointly with radial sector and separating from the latter just before leaving the scale. Cubitus also poorly chitinized ; with 15-16 branches to posterior border of wing ; proximal branches heavily, and distal ones very poorly, chitinized. *Hindwing* : Costa-subcosta radius and radial sector as in forewing. Median arising from radial sector outside the scale and bifurcating near middle of wing. Cubitus with 14 branches to posterior margin of wing.

Abdomen : Elongate, fairly densely pilose. Cerci 2-jointed, *ca.* 0.1 mm. long. Styli absent.

1b. IMAGO ♂ : Similar to ♀.

2. SOLDIER (Table 7 ; Text-fig. 13 ; and Pl. 14, Fig. 7) :

General : Head-capsule and postclypeus light to deep golden brown, labrum, anteclypeus, antennae, thorax, and legs pale golden yellow ; mandibles dark reddish brown ; abdomen pale yellowish. Head and thorax lightly pilose ; abdomen and legs somewhat more pilose. Total length without antennae *ca.* 6.2-6.3 mm.

Head : Subrectangular, much longer than broad (length to base of mandibles 1.70-1.76 mm. ; width 0.98-1.08 mm.) ; anterior corners angular, posterior margin rounded. *Fontanelle* : Indistinct. *Eyes* : absent. *ocelli* : Absent. *Antennae* : With 13 segments ; segment 1 and 2 sparsely, and the remainder moderately, pilose ; segment 1 longest, cylindrical ; 2 shorter than 1, and longer than 3 ; 3 shortest ; 4 subequal to 2 ; 5 onward progressively increasing in size to the penultimate one ; last (13) thinner, ovate, and longer than 12. *Clypeus* : Anteclypeus narrow, apilose, with a broad median tip. Postclypeus separated from frons by a deep semicircular demarcation ; much broader than long ; with a few long and short hairs. *Labrum* : Subpentagonal, with a median tip in front and a few long hairs on body. *Mandibles* : Sabre-shaped thick and stout ; outer margin convex, inner margin finely serrated and with only one large denticle at the basal third. *Postmentum* : Vase-shaped, widest at about one-third of its length from anterior margin and with a waist in the posterior one-third ; anterior margin weakly convex ; posterior margin weakly concave and with a median bulge.

Thorax : Saddle-shaped ; with many long hairs on margins and a few shorter hairs on body ; broader than long ; anterior margin with a

TABLE 7.—*Body-measurements (in mm.), etc. of Microcerotermes nicobarensis n. sp. (Roonwal & Bose). Caste : Soldier.*

Body parts	Range (3 examples)	Holotype
1. Total body length (including mandibles), <i>ca.</i>	6.2 — 6.3	6.2
2. Length of head with mandibles	2.60—2.70	2.70
3. Length of head to lateral base of mandibles	1.70—1.76	1.75
4. Maximum width of head	0.98—1.08	1.05
5. Maximum height of head	0.85—0.88	0.88
6. Length of mandibles	0.90—0.95	0.95
7. Head Index I (Width/Length*)	0.58—0.61	0.60
8. Head Index II (Height/Width)	0.81—0.87	0.84
9. Head Index III (Height/Length*)	0.50	0.50
10. Maximum length of labrum	0.25—0.28	0.25
11. Maximum width of labrum	0.33—0.34	0.33
12. Median length of postmentum	1.00—1.08	1.08
13. Maximum width of postmentum	0.33—0.35	0.35
14. Width of postmentum at waist	0.20—0.23	0.20
15. Width of postmentum at anterior margin ..	0.23—0.25	0.23
16. Maximum width of pronotum	0.62—0.63	0.63
17. Maximum length of pronotum	0.38—0.40	0.40
18. Maximum width of mesonotum	0.60—0.68	0.60
19. Maximum width of metanotum	0.75	0.75
20. No. of antennal segments	13	13

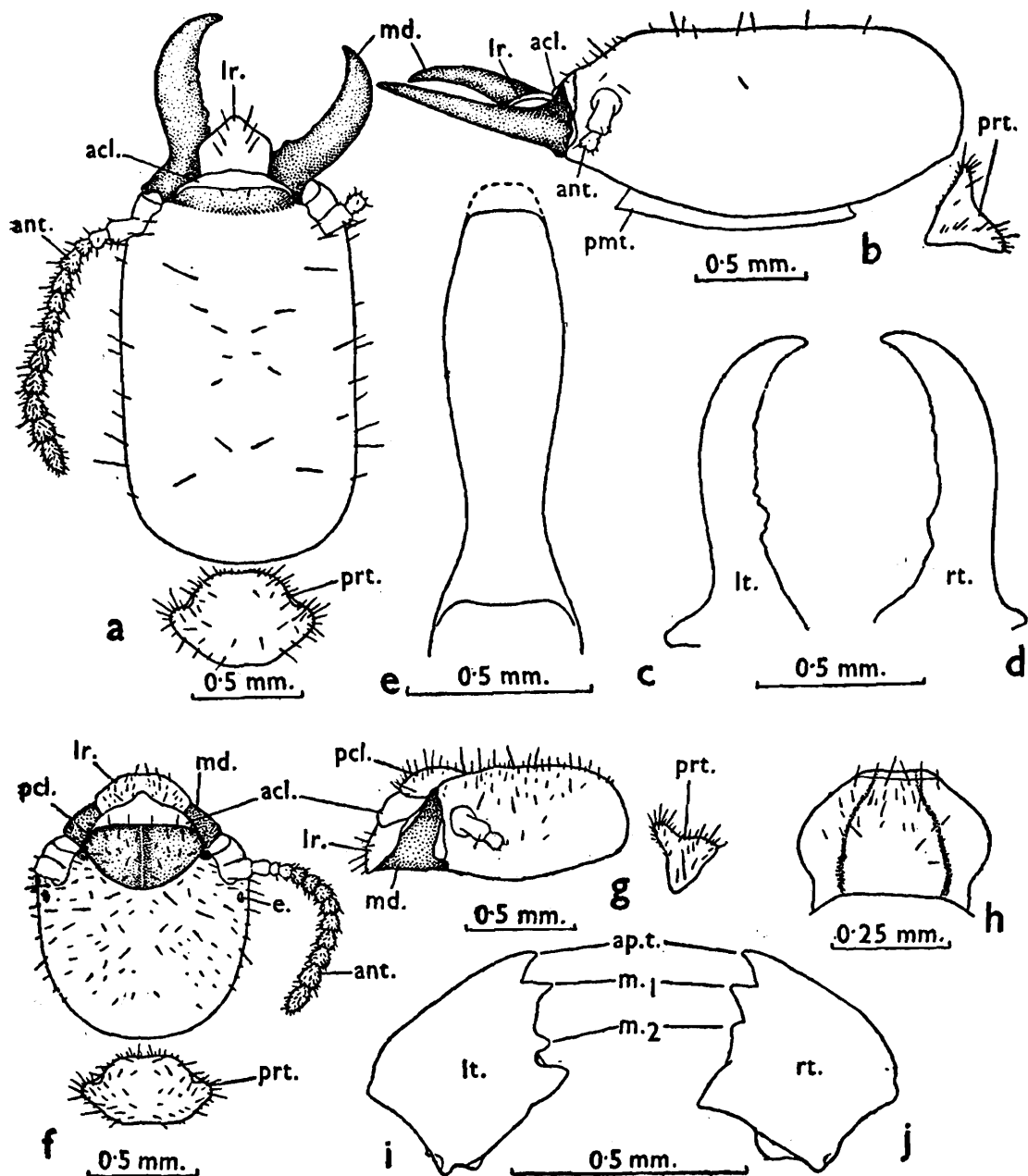
very weak or no median notch ; anterior angles broadly rounded ; sides strongly converging posteriorly ; posterior margin substraight, without a median notch. *Mesonotum* : Oval, broader than long, a little broader than pronotum. *Metanotum* : Much broader than long ; broader than mesonotum. *Legs* : Long and pilose ; apical tibial spur formula 3 : 2 : 2.

*Length to lateral base of mandibles.

Abdomen: Oval, elongate. Cerci 2-jointed, *ca.* 0.06 mm. long. Styli 1-jointed, *ca.* 0.02mm. long.

WORKER MAJOR (Text-fig. 13) :

General : Head capsule, postclypeus, labrum, antennae and mandibles yellowish ; mandibular teeth reddish brown ; thorax, legs and abdomen



TEXT-FIG. 13.—*Microcerotermes nicobarensis* n. sp. Soldier (holotype) (a-e) and Worker major (f-j), from the Car Nicobar Is.

(a) Head and pronotum, in dorsal view. (b) Head and pronotum, in lateral view. (c) and (d) Left and right mandibles respectively. (e) Postmentum. (f) Head and pronotum, in dorsal view. (g) Ditto, in lateral view. (h) Labrum, in dorsal view. (i) and (j) Left and right mandibles respectively.

acl., anteclypeus ; *ant.*, antenna ; *ap.t.*, apical tooth of mandible ; *e.*, eye-spot ; *lr.*, labrum ; *lt.*, left ; *m₁*, *m₂*, 1st and 2nd mandibular teeth respectively ; *md.*, mandible ; *pcl.*, postclypeus ; *prt.*, pronotum ; *rt.*, right.

pale yellow. Head and body moderately pilose. Total length without-antennae *ca.* 4.5-5.3 mm..

Head: Subsuarish, broadest anteriorly; sides converging posteriorly to a round posterior margin. *Fontanelle*: Indistinct. *Eyes*: Present as two small brown patches, one on either side, a little below the base of antennae. *Ocelli*: Absent. *Clypeus*: Anteclypeus hyaline, apilose; anterior margin projected into a median tip. Postclypeus swollen, pilose; separated from frons by a semicircular demarcation and divided into right and left halves by a median vertical line; width almost twice the length. *Labrum*: Broader than long, and bulged in middle; with a few long and short hairs on body. *Antennae*: With 13 segments; segment 1 longest, cylindrical; 2 smaller than 1, twice 3 and subequal to or somewhat longer than 4; 3 shortest; 5-12 progressively increasing in size; 13 club-shaped, ovate and slightly longer than 12. *Mandibles*: Of typically *Microcerotermes*-type. Teeth as in imago.

Thorax: *Pronotum*: Saddle-shaped; anterior margin weakly notched medially. *Mesonotum*: Subequal to or slightly broader than pronotum. *Metanotum*: Much broader than mesonotum. *Legs*: Long, thin, pilose; apical tibial spur formula 3 : 2 : 2.

Abdomen: Fairly elongate, pilose. *Cerci* 2-jointed, *ca.* 0.06 mm. long. *Styli* 1-jointed, *ca.* 0.05 mm. long.

5. WORKER MINOR.—Like the worker major but smaller.

Body-measurments (in mm.) of Worker Major and Minor of Microcerotermes nicobarensis n. sp. (4 examples each).

	Workers Major	Workers Minor
1. Total body-length excluding antennae, <i>ca.</i>	4.5—5.3	4.2—4.6
2. Length of head to lateral base of mandibles	0.90—0.98	0.73—0.78
3. Maximum width of head	0.93—0.95	0.80—0.83
4. Maximum height of head	0.48—0.50	0.43—0.45
5. Maximum length of pronotum	0.33—0.34	0.23—0.26
6. Maximum width of pronotum	0.60—0.63	0.45—0.50

(c) *Type specimens*.—*Holotype*: A soldier in a vial, Z.S.I. Reg. No. 3566/H8, from "Material (ii)" above. Field Coll. No. 959, Arong village, Car Nicobar Is., coll. K.K. Tiwari, 31. iii. 1959, ex. "mounds on coconut tree", deposited in Z.S.I. *Morphotype*: A ♀ imago and 2 workers (1 major, 1 minor), in a vial, Z.S.I. Reg. No. 3567/H8, from hojotype lot, deposited in Z.S.I. *Paratypes and paramorphotypes*: (i) A

paratype soldier, a paramorphotype imago ♂ and 2 paramorphotype workers (1 major, 1 minor), in a vial, Z.S.I. Reg. No. 3568/H8, from holotype lot, deposited in Z.S.I. (ii) A paratype soldier, a paramorphotype imago ♀ and 4 paramorphotype workers (2 major, 2 minor), in a vial, Z.S.I. Reg. No. 3569/H8, from "Material (i)" above. Field Coll. No. 622, Ross Is., South Andamans, coll. K. K. Tiwari, 14.iii.1959; deposited in Z.S.I. (iii) A paramorphotype imago ♀ and 2 paramorphotype workers (1 major, 1 minor) from holotype lot; deposited in F.R.I., Dehra Dun. (iv) A paramorphotype imago ♀ and 2 paramorphotype workers (1 major, 1 minor), from holotype lot; deposited with Prof. A.E. Emerson, U.S.A.

(d) *Type-locality and Geographical distribution.*—*Type-locality* : Arong village, Car Nicobar Is.

Geographical distribution : Andamans : South Andamans (Ross Is., Nicobars : Car Nicobar Is. (Arong village).

(e) *Comparisons.*—1. IMAGO.—The imago of *Microcerotermes nicobarensis* n. sp. is close to that of *M. heimi* Wasm. but differs from it as follows :—(i) Head-size a little larger (length without mandibles 0.80-0.88 mm. vs. 0.75-0.82 mm.; width 0.90-0.97 mm. vs. 0.85-0.92 mm.). (ii) Head-capsule deep yellowish brown to brown vs. light brown. (iii) Eyes larger (maximum diameter 0.25-0.26 vs. 0.19-0.21 mm.; minimum diameter 0.22-0.23 vs. 0.16-0.17 mm.). (iv) Eye-ocellus distance slightly greater than (vs. equal to) maximum diameter of ocellus (0.08-0.10 and 0.06-0.09 mm. vs. 0.08-0.10 and 0.07-0.10 mm. respectively).

2. SOLDIER.—The soldiers of *Microcerotermes nicobarensis* n. sp. are close to *M. fletcheri* Holmgren, *M. annandalei* Silvestri and *M. bugnioni* Holmgren, but differs from these as follows :—

(1) *From M. fletcheri* : (i) Mandibles longer, slightly more convex and slender (vs. shorter, more straight and stouter). (ii) Head wider (maximum width 1.05-1.10 vs. 0.95 mm.).

(2) *From M. annandalei* : (i) Smaller (head-length to lateral base of mandibles 1.70-1.76 vs. 1.83-1.90 mm.) (ii) Labrum pentagonal and pointed (vs. tongue-shaped). (iii) Mandibles more convex and uniformly broad to about its distal one-fourth (vs. more straight and broader towards base and thinner towards apex.).

(3) *From M. bugnioni* : Head larger (length with mandibles 2.60-2.70 vs. 2.25 mm., without mandibles 1.70-1.76 vs. 1.63 mm.; maximum width 1.05-1.10 vs. 0.92 mm.). (ii) Mandibles longer (0.90-0.95 vs. 0.62 mm.). (iii) Labrum wider than long (vs. as long as wide).

(f) *Biological Remarks.*—The collector's field labels say that the material was obtained from "mounds on cocoanut tree" Presumably he obtained it from the large subglobular carton nests at the base of cocoanut trees; these nests are characteristic of the genus *Microcerotermes* and, when covered by soil as they often look like "mounds".

Subfamily (ii) *Macrotermitinae*Genus (6) *Odontotermes* Holmgren12. *Odontotermes latigula* (Snyder)

(Pl. 12, Figs. 1-3 and 5 ; and Pl. 13, Fig. 8)

1934. *Termes (Cyclotermes) latigula* T. E. Snyder, *Indian For. Rec. (Ent.)* Delhi, 20 (11), pp. 9, 10. S. Type-locality : North Andaman Is.

(a) *Material*.—26 vials, S. and W., the Andamans and the Nicobars, as follows :—Lot (A) : 4 vials, South Andamans, coll. O. Paiva, March-April, 1911, as follows (all *det.* Silvestri as “*Odontotermes redemanni* Wasm.”): (i) 30.iii.1911, ex. “*Mangifera indica*”; no other details. (ii) Ross Is., 30.ix.1911, ex. “mango tree” (iii) Garacharama, 2.iv.1911. (iv) Garacharama, 3.iv.1911.

Lot (B) : 4 vials, South Andamans, coll. N. Annandale, November-December, 1923, as follows (all *det.* Silvestri as “*Odontotermes obesus* Ramb.”): (v) Coll. Sta. No. 1, base to summit of Mt. Harriet, 29.xi.1923 (10 to 11 a.m.), Z.S.I. Reg. No. 7379/H2, ex. “gallery on jungle path”. (vi) Coll. Sta. No. 31, summit of Mt. Harriet, 1190 ft., 30.xi.1923, Z.S.I. Reg. No. 7380/H2, ex. “earthen gallery” (vii) Mt. Harriet, 500 ft., xii. 1923, Z.S.I. Reg. No. 7342/H2, ex. “under stones and wood”. (viii) Coll. Sta. No. 51, thick jungle, north side of Mt. Harriet, 500-1000 ft., xii. 1923, Z.S.I. Reg. No. 7381/H2, ex. “dead log on floor of jungle”.

Lot (C) : (ix) 1 vial, Coll. Sta. No. B10, Hope Town, Ranighat, South Andamans, coll. R.B.S. Sewell, 27.viii.1928.

Lot (D) : 13 vials, Andamans and Nicobars, coll. K. K. Tiwari, January to April 1959, thus : (x) Fd. Coll. No. x, Coll. Sta. No. 1, Aberdeen Bay near Port Blair, South Andamans, 12.i.1959, ex. “rotten log of wood” (xi) Fd. Coll. No. 17, Coll. Sta. No. 3, Wright Myo, South Andamans, 13.i.1959, ex. “below stone”. (xii) Fd. Coll. No. 143, Coll. Sta. No. 6, Long Is. Middle Andamans, 23.i.1959, ex. “bark of a tree”. (xiii) Fd. Coll. No. 260, Coll. Sta. No. 11, Port Cornwallis, North Andamans, 31.i.1959, ex “log of wood”. (xiv) Fd. Coll. No. 286, Coll. Sta. No. 12, Diglipur, North Andamans, 2.ii.1959. (xv) Fd. Coll. No. 306, Coll. Sta. No. 13, Interview Is., North Andamans, 7.ii.1959. ex. “decaying log of wood” (xvi) Fd. Coll. No. 323, Coll. Sta. No. 13, Interview Is., North Andamans, 8.ii.1959, ex. “decaying timber” (xvii) Fd. Coll. No. 401, Coll. Sta. No. 15, Chouldhari, South Andamans, 26.ii.1959, ex. “decaying log of wood” (xviii) Fd. Coll. No. 553, Coll. Sta. No. 17, Port Blair, South Andamans, 8.iii.1959, ex. “loose mud under a thorny bush”. (xix) Fd. Coll. No. 649, Coll. Sta. No. 23, Collinpur, South Andamans, 15.iii.1959, ex. “rotting log of wood” (xx) Fd. Coll. No. 655, Coll. Sta. No. 24, Herbertabad, South Andamans, 15.iii.1959. (xxi) Fd. Coll. No. 733, Coll. Sta. No. 25, Malacca village, Car Nicobar (Nicobars), 23.iii.1959, ex “rotten log of wood”. (xxii) Fd. Coll. No. 1045, Coll. Sta. No. 25, Malacca village, Car Nicobar (Nicobars), 8.iv.1959.

Lot (E) : 4 vials, Little Andamans, coll. A. Daniel, February-March, 1961, thus : (xxiii) Fd. Coll. No. 473, Coll. Sta. No. 5, Gaje, 25.ii.1961

ex. "pillar of Onge hut" (xxiv) Fd. Coll. No. 587, Coll. Sta. No. 6, Ongebera, Kwateneabo, 28.ii.1961, ex. "tree" (xxv) Fd. Coll. No. 615, Coll. Sta. No. 2, near Dugong Creek, Tokoibuea, 1.iii.1961, ex. "dead tree" (xxvi) Fd. Coll. No. 616, Coll. Sta. No. 2, near nullah (streamlet) at Tokoibuea, 1.iii.1961, ex. "trees"

(b) *Measurements (in mm.) of Soldiers (30 examples).*

1. Total body-length without antennae, ca.	..	..	..	..	4.8—5.6
2. Length of head with mandibles	..	.	..	..	2.23—2.40
3. Length of head to lateral base of mandibles	..	..	..	..	1.25—1.38
4. Maximum width of head	..	..	..	..	1.15—1.30
5. Maximum length of pronotum	..	..	..	..	0.55—0.58
6. Maximum width of pronotum	..	..	..	..	0.83—0.93
7. No. of antennal segments	..	..	..	..	17

(c) *Geographical Distribution.*—*Andamans*: North Andamans (Port Cornwallis and Interview Is.) and Middle Andamans (Long Is.); South Andamans (Aberdeen Bay, Port Blair, Mt. Harriet, Wright Myo, Collinpur, Herbertabad, Chouldhari, Hope Town, Garacharama and Ross Is.); and Little Andamans (Dugong Creek, Gaje, Kwateneabo and Tokoibuea). *Nicobars*: Car Nicobar (Malacca village). *Elsewhere*: Burma (South Shan States, *vide* Roonwal and Pant, 1953, p. 55).

(d) *Biological Remarks.*—This is a widely distributed species in the Andamans and the Nicobars, and so far this is the only species of *Odontotermes* recorded from there. It is differentiated from all other *Odontotermes* of the "obesus" group by its very wide and swollen postmentum. It seems to be the species whose mounds from the Andamans were described by Annandale (1924, p. 27) as a small (about 90 cm. high and 90 cm. in basal diameter) formless mass of earth, nearly solid and with only a few narrow passages. Annandale's specimens were identified by Silvestri as "*Odontotermes obesus* (Ramb.)." but this is an error, and we find the specimens to be *O. latigula* (*vide* Material above, Lot B). (In this connection, also see Roonwal, 1962.) The present collections have been obtained from various situations, e.g. "earthen galleries" in jungle path, on ground under stones and wood, in rotten logs, under bark of trees, and in the wooden pillar of a hut.

Subfamily (iii) *Nasutitermitinae*

Genus (7) *Nasutitermes* Banks*

13. *Nasutitermes krishna* n. sp.

(Table 8 ; and Text-figs. 14 and 15)

(a) *Material*.—5 vials, S. and W., Andaman Islands, as follows :—
Lot (A) : (i) Fd. Coll. No. 306, Coll. Sta. No. 13, Interview Is., North Andamans. coll. K. K. Tiwari, 7.ii.1959, ex. “decaying log of wood”.
Lot (B) : 4 vials, Little Andaman Is., coll. A. Daniel, thus: (ii) Fd. Coll. No. 163, Coll. Sta. No. 2, near Entizebera, 16 km. west of Tokoibuea, 15.ii.1961, ex. “dead tree” (iii) Fd. Coll. No. 272, Coll. Sta. No. 3, Kwate-tu-Kwage, 18.ii.1961, ex. “dead tree”. (iv) Fd. Coll. No. 438, Coll. Sta. No. 4, forest 1 km. north of Benyabobera, 16 km. west of Ingoie, 23.ii.1961, ex. “dead tree”. (v) Fd. Coll. No. 580, Coll. Sta. No. 6, Ingitekudda forest, north of Nachugea, 28.ii.1961, ex. “dead tree”

(b) *Description*.

1. IMAGO.—Unknown.

2. SOLDIER (Table 8 ; and Text-fig. 14).

General : Head-capsule and antennae brownish yellow ; rostrum reddish brown ; mandibles yellowish ; pronotum, mesonotum, metanotum, legs and abdominal tergites, pale brownish yellow. Head with several short and 2 pairs (one distal and one proximal) of long bristle-like hairs ; thorax with many short hairs ; abdomen with several short and a few long bristle-like hairs. Total length with rostrum (but without antennae) ca. 3.4-3.7 mm.

Head : Nearly pear-shaped, with anterior end prolonged into a rostrum ; posterior margin rounded ; maximum width subequal to, or a little more than, the length (head-length without rostrum 0.93-1.00 mm. maximum width 0.98-1.10 mm.) ; widest near middle of head-capsule. *Rostrum* : Subcylindrical and slender ; gradually narrowing distally and ending in a conical truncated apex with a cluster of short hairs on tip ; shorter than head (rostrum-length 0.55-0.68 mm. ; head-length 0.93-1.00 mm.). *Fontanelle* : Gland and tube distinct. *Eyes and ocelli* : Absent. *Antennae* : With 12 segments ; segments 1 and 2 sparsely, and the remainder fairly densely, pilose ; segment 1 long, cylindrical ; 2 shorter than 1 and longer than 3 ; 3 shortest ; 4 slightly longer than 3 ; 5-11 subequal and pyriform ; apical (12) ovate, club-shaped, subequal to 11. *Mandibles* : Vestigial and small ; each with a spine-like apical process in middle of outer margin ; inner or molar margin rounded. *Postmentum* : Pentagonal, short, much broader than long.

* *Nasutitermes* Banks 1920 replaces *Nasutitermes* Dudley 1890, *vide* discussion in Prasad & Sen-Sarma (1959, p. 2).

TABLE 8.—*Body-measurements (in-mm.) of Nasutitermes krishna n. sp. (Roonwal & Bose). Caste : Soldier.*

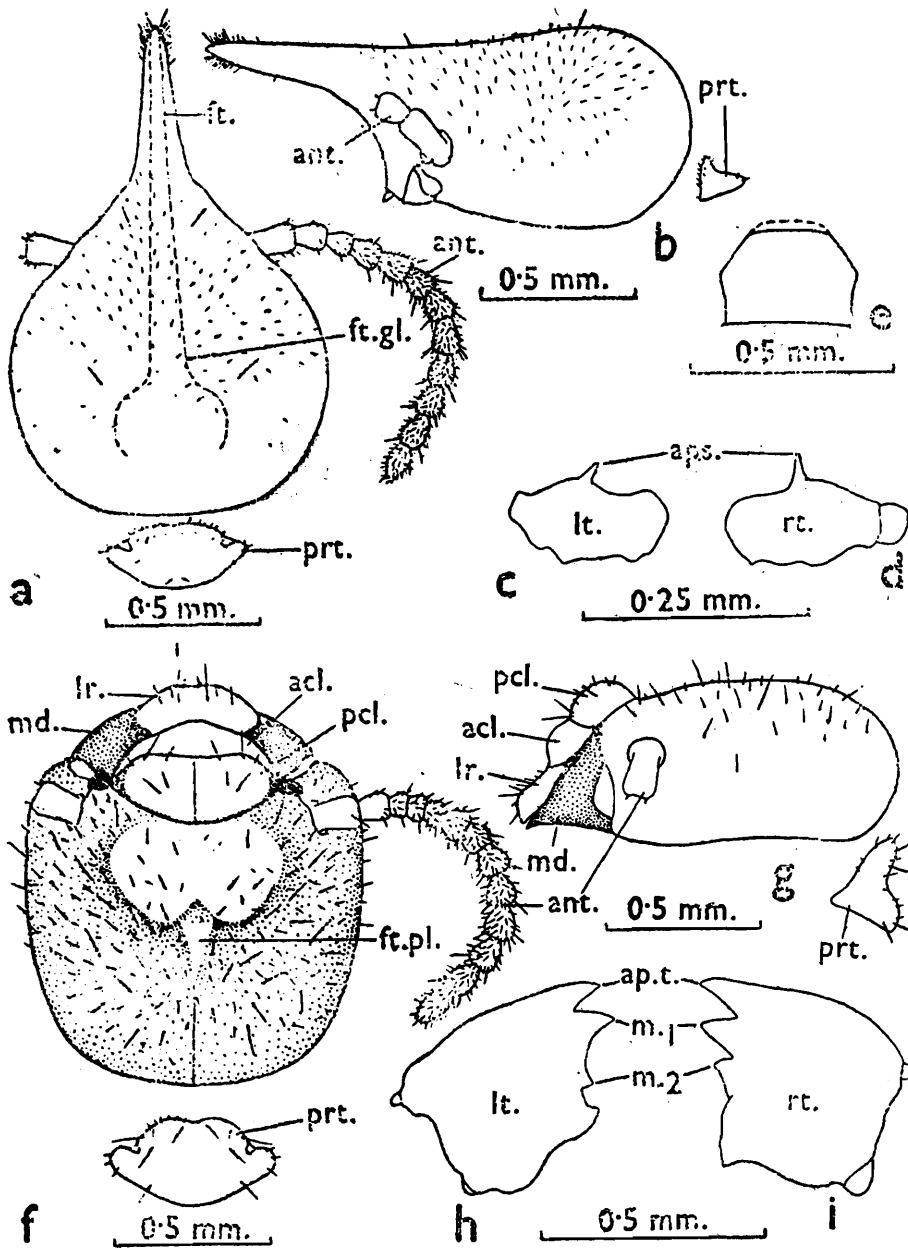
Body-parts	Range (10 examples)	Holotype
1. Total body-length without antennae, ca. ..	3.4—3.7	3.46
2. Length of head with rostrum ..	1.55—1.60	1.60
3. Length of head upto base of rostrum ..	0.93—1.00	0.95
4. Length of rostrum	0.55—0.68	0.65
5. Maximum width of head	0.98—1.10	1.05
6. Maximum height of head ..	0.60—0.68	0.68
7. Head Index I (Width/Length to base of rostrum)	1.03—1.14	1.10
8. Head Index II (Height/Length to base of rostrum)	0.67—0.72	0.72
9. Head Index III (Height/Width)	0.58—0.65	0.64
10. Head-Rostrum Index (Length of rostrum/ Length of head to base of rostrum) ..	0.60—0.76	0.68
11. Posterior bulge of head	0.26—0.30	0.28
12. Head production Index I (Head bulge/Length of head to base of rostrum) ..	0.25—0.30	0.29
13. Head production Index II (Head bulge/Width of head)	0.24—0.30	0.26
14. Median length of postmentum ..	0.25—0.30	0.25
15. Maximum width of postmentum	0.30—0.33	0.30
16. Minimum width of postmentum	0.25—0.28	0.25
17. Postmentum Index (Maximum width/ Maximum length)	1.07—1.32	1.20
18. Maximum length of pronotum	0.16—0.18	0.18
19. Maximum width of pronotum ..	0.43—0.48	0.45
20. Pronotum-Head Index (Pronotum-width/ Head-width)	0.43—0.47	0.43
21. Maximum width of mesonotum	0.33—0.38	0.33
22. Maximum width of metanotum ..	0.48—0.50	0.50
23. Length of hind-tibia	0.90—0.98	0.90

Thorax : Pronotum : Saddle-shaped, weakly hairy, with a few small hairs on body and on margins ; broader than long (width ca. $2\frac{1}{2}$ times the length ; index Length/Width 0.40-0.44) ; much narrower than head-capsule (index Pronotum-width/Head-width 0.43-0.47) ; anterior margin rounded, with a weak median notch ; sides converging posteriorly to a narrow subconvex posterior margin. *Mesonotum* : Oval ; broader than long ; narrower than pronotum ; with very minute hairs on margins and on body. *Metanotum* : Oval, much broader than long ; with very minute hairs on margins and on body. *Legs* : Thin and long ; pilose ; apical tibial spur formula 2 : 2 : 2.

Abdomen.—Elongate ; sparsely hairy with a pair of long hairs on lateral margins and another such pair towards middle line of each posterior tergite ; remaining segments fairly densely covered with minute hairs ; sternites also covered with many long and short hairs. *Cerci* 2-jointed ca. 0.08 mm. long. *Styli* absent.

3. WORKER MAJOR (Text-fig. 14) :

General : Head-capsule and labrum, yellow to reddish yellow ; postclypeus, thorax and antennae yellowish ; anteclypeus, legs and abdomen pale creamish yellow. Head and body moderately pilose. Total length excluding antennae *ca.* 3.8-4.9 mm.



TEXT-FIG. 14.—*Nasutitermes krishna* n. sp. from the Little Andamans. (a-e). Soldier (paratype). (f-i). Worker major (paramorphotype).

(a) Head and pronotum, in dorsal view. (b) Ditto, in lateral view. (c) and (d) Left and right mandibles respectively. (e) Postmentum. (f) Head and pronotum, in dorsal view. (g) Ditto, in side view. (h) and (i) Left and right mandibles, respectively.

acl., anteclypeus ; *ant.*, antenna ; *aps.*, apical spine of mandible ; *ap.t.*, apical tooth of mandible ; *ft.*, fontanelle tube ; *ft. gl.*, fontanelle gland ; *ft. pl.*, fontanelle plate ; *lr.*, labrum ; *lt.*, left ; *m₁*, *m₂*, 1st and 2nd mandibular teeth respectively ; *md.*, mandible ; *pcl.*, postclypeus ; *prt.*, pronotum ; *rt.*, right.

Head : Subrectangularly oval ; a little broader than long (length to lateral base of mandibles 0.90-0.93 mm. ; maximum width 1.00-1.08 mm.), widest anteriorly. **Fontanelle** : Fontanelle Plate triangular, long, whitish, translucent ; situated almost in middle of head-capsule. **Antennae** : With 13 segments ; segments 1 and 2 sparsely, and the remainder fairly densely, pilose ; segment 1 longest, cylindrical ; 2 shorter than 1 and $1\frac{1}{2}$ times 3 ; 3 shortest ; 4-12 gradually increasing in size ; apical (13) ovate, club-shaped, subequal to 12. **Clypeus** : Anteclypeus subtrapezoidal, narrow, hyaline and apilose ; anterior margin projecting in middle. Postclypeus swollen, sparsely pilose, anterior margin concave ; divided into right and left halves by a median vertical suture. **Labrum** : Broader than long ; broadest anteriorly ; anterior margin rounded. **Mandibles** : Of typically *Nasutitermes*-type. Right mandible with an apical and 2 marginal teeth ; apical finger-like ; 1st marginal subequal to apical ; 2nd short and blunt and lying close to 1st. Left mandible also with an apical and 2 marginal teeth ; apical finger-like ; 1st marginal similar and subequal to apical ; 2nd short and widely separated from 1st.

Thorax : Pilose, with many long and short hairs on margins and on body. **Pronotum** : Saddle-shaped, much narrower than head (maximum width 0.53-0.58 mm. vs. 1.00-1.10 mm.) ; broader than long (maximum length 0.23-0.28 mm. ; width 0.53-0.58 mm.) ; anterior margin strongly upturned and with a deep median notch ; posterior margin substraight and without a median notch. **Mesonotum** : Oval, broader than long, narrower than pronotum ; sparsely pilose. **Metanotum** : Oval, broader than pronotum, sparsely pilose. **Legs** : Thin and long ; pilose ; apical tibial spur formula 2 : 2 : 2.

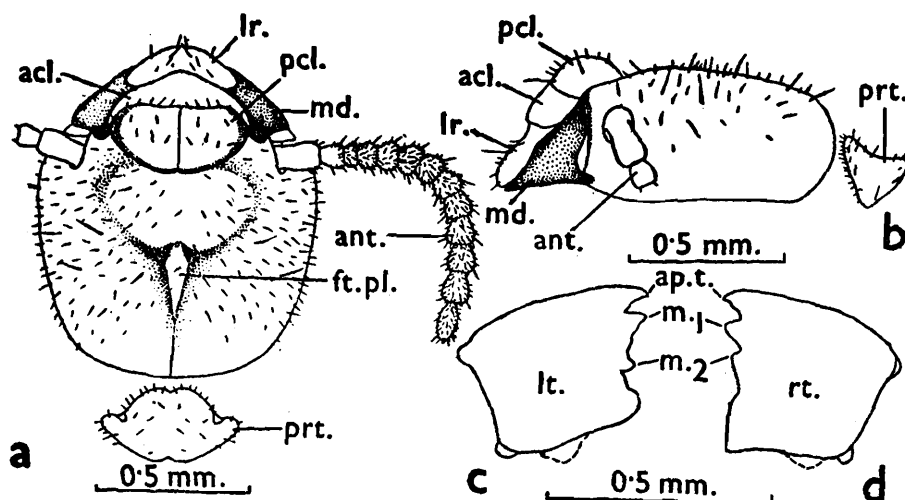
Abdomen : Elongate, hairy. Cerci 2-segmented, ca. 0.08 mm. long. Styli absent.

4. WORKER MINOR (Text-fig. 15).

Like worker major, but smaller.

Measurements (in mm.) of workers major and minor of Nasutitermes krishna n. sp. (7 examples each).

	Workers major	Workers minor
1. Total body-length without antennae, ca.	3.8-4.9	3.0-4.1
2. Length of head to lateral base of mandibles	0.90-0.93	0.70-0.83
3. Maximum width of head	1.00-1.10	0.80-0.93
4. Maximum height of head	0.50-0.60	0.40-0.48
5. Maximum length of pronotum	0.23-0.28	0.15-0.23
6. Maximum width of pronotum	0.53-0.58	0.40-0.48



TEXT-FIG. 15.—*Nasutitermes krishna* n. sp. Worker minor (paramorphotype), from the Little Andamans.

(a) Head and pronotum, in dorsal view. (b) Ditto, in lateral view. (c) and (d) Left and right mandibles respectively.

acl., anteclypeus ; *ant.*, antenna ; *ap.t.*, apical tooth of mandible ; *ft.pl.*, fontaneile plate ; *lr.*, labrum ; *lt.*, left ; *m₁*, *m₂*, 1st and 2nd mandibular teeth respectively ; *md.*, mandible ; *pcl.*, postclypeus ; *prt.*, pronotum ; *rt.*, right.

(c) *Type-specimens*.—*Holotype*: A soldier in a vial, Z.S.I. Reg. No. 3570/H8, Fd. Coll. No. 272, Kwate-tu-Kwage, Little Andamans, coll. A. Daniel, 18.ii.1961, deposited in Z.S.I. *Morphotypes*: 2 workers (1 major, 1 minor) in a vial, Z.S.I. Reg. No. 3571/H8, same data as for holotype ; deposited in Z.S.I. *Paratypes (soldiers) and paramorphotypes (workers)*: From the holotype lot ; deposited as follows : 10 S. and 15 W. (10 major, 5 minor) in Z.S.I., Z.S.I. Reg. No. 3572/H8. (ii) 2 S. and 2 W. (1 major, 1 minor) in F.R.I., Dehra Dun. (iii) 2 S. and 2 W. (1 major, 1 minor) in I.A.R.I., New Delhi. (iv) 2 S. and 2 W. (1 major, 1 minor) with Prof. A.E. Emerson, U.S.A.

(d) *Type-locality and Geographical Distribution*.—*Type-locality*: Little Andaman Is., Coll. Sta. No. 3, Kwate-tu-Kwage.

Geographical Distribution: Andamans: North Andamans (Interview Is.). Little Andamans (Kwate-tu-Kwage, the type-locality ; and Tokoibuea, Benyabobera and Ingitekudda).

(e) *Comparison*.—*Nasutitermes krishna* n. sp. appears to be close to *N. emersoni* Snyder but differs from it as follows : SOLIDER : (i) Head light yellow to orange (*vs.* brown to castaneous brown). (ii) Head in profile slightly concave (*vs.* slightly convex). (iii) Nasus conical but not with convexical sides (*vs.* with slightly convexical sides). (iv) Segment 3 of antenna smaller than 2 or 4 (*vs.* larger). (v) Anterior abdominal tergites with no long hairs (*vs.* a few such hairs).

(f) *Biological Remarks*.—The species appears to attack dead wood, and was obtained from “dead trees”

14. *Nasutitermes matangensis matangensisformis* (Holmgren)

(Pl. 13, Fig. 9)

1913. *Eutermes* (*E.*) *matangensisformis* N. Holmgren, *K. Sv. Vet. Akad.-Handl.*, Stockholm, 50(2), p. 185, *Im.*, *S.* and *W.* Type-localities : Sarawak (Borneo) and Nankauri Is. (Nicobars). Restricted to Sarawak by Prashad & Sen-Sarma (1959, p. 53).

1956. *Nasutitermes matangensis matangensisformis* (Holmg.), M. L. Roonwal and P. K. Sen-Sarma, *Indian J. agric. Sci.*, New Delhi, 26 (2), pp. 27-29.

(a) *Material*.—7 vials, one *Im.* several *S.* and *W.*, Andamans and Nicobars, as follows :—

Lot (A) : 2 vials, Car Nicobar Is. (Nicobars), coll. *K. K. Tiwari*, March-April, 1959, thus : (i) *Fd.* Coll. No. 768, Coll. Sta. No. 25, Tamalu village, 24.iii.1959, ex. "a rotten cocoanut tree" (ii) *Fd.* Coll. No. 1005, one *Im.*, one *S.* and several *W.*, Coll. Sta. No. 32, Sawi village, 5. iv. 1959.

Lot (B) : 5 vials, Little Andaman Is., coll. *A. Daniel*, February, 1961, thus : (iii) *Fd.* Coll. No. 162, Coll. Sta. No. 2, Entizebera, 16 km. west of Tokoibuea, 15.ii.1961, ex. "dead log" (iv) *Fd.* Coll. No. 215, Coll. Sta. No. 2, Bedeabdulu, 19. km. south of Tokoibuea, 16.ii.1961, ex. "dead log" (v) *Fd.* Coll. No. 313, Coll. Sta. No. 3, Tailanda, 24 km. north of Kwate-tu-Kwage, 19.ii.1961, ex. "dead log" (vi) *Fd.* Coll. No. 314, Coll. Sta. No. 3, Tailanda, 23 km. north of Kwate-tu-Kwage, 19.ii.1961. ex. "dead wood" (vii) *Fd.* Coll. No. 472, Coll. Sta. No. 5, Gaje, near Onge hut, 25.ii.1961, ex. "dead tree"

(b) *Measurements* (in mm.).—

Imago (1 example)

1. Total body length with wings (but without antennae), <i>ca.</i>	..	13.2
2. Body-length without wings and antennae	.. ..	8.2
3. Length of head to tip of labrum	..	1.55
4. Length of head to lateral base of mandibles	..	1.10
5. Maximum width of head	.. ..	1.40
6. Maximum diameter of eye	.. ..	0.50
7. Maximum diameter of ocellus	.. ..	0.18
8. Minimum eye-ocellus distance	.. ..	0.025
9. Maximum length of pronotum	..	0.75
10. Maximum width of pronotum	.. ..	0.18
11. No. of antennal segments	.. ..	15

Soldiers (11 examples)

1. Total body-length (without antennae), <i>ca.</i>	.. ..	3.4—4.0
2. Length of head with rostrum	.. ..	1.43—1.68
3. Length of head to base of rostrum	..	0.83—1.08
4. Maximum width of head	..	0.88—1.08
5. Maximum length of pronotum	.. ..	0.18—0.25
6. Maximum width of pronotum	.. ..	0.43—0.55
7. No. of antennal segments	.. ..	13

(c) *Geographical Distribution*.—*Andamans* : Little Andamans (Bede-abdulu, Entizebera, Gaje and Tailanda). *Nicobars* : Nankauri Is. (Holmgren, 1913), Camorta Is. (Roonwal & Sen-Sarma, 1956) and Car Nicobar Is. (Tamalu and Sawi, present record). *Elsewhere* : Malay Peninsula and Indonesia (Java, Sumatra and Borneo).

(d) *Biological Remarks*.—The species was obtained from “dead logs”.

IV—ZOOGEOGRAPHY OF THE ANDAMAN AND NICOBAR TERMITES* (Table 9)

1. *General remarks*

The following considerations have to be kept in mind while discussing the zoogeography of the termite fauna of the Andaman and Nicobar Islands :—(i) As discussed below, these islands first arose from the ocean bed in the Mesozoic period about 110 million years ago and have since then undergone several periods of *partial* submergence and elevation. (ii) They lie in the middle of the oriental region, having affinities with India, Burma and Indonesia. (iii) The Nicobar chain of islands has so far been scantily worked out from the point of view of termite fauna ; any conclusions arrived at for that area must, therefore, be tentative.

2. *Geological history of the Andamans and Nicobars*

The geology of the Andaman and Nicobar Islands has been studied by several workers, notably Oldham (1885), Tipper (1911), Gee (1926) and, in recent years, by Karunakaran (1962), the last named author having given a useful review on which, and on personal discussions with him, the following summary is based.

The arcuate chain of islands which comprise the Andamans and the Nicobars can be separated into two concentric areas—an outer (western) non-volcanic arc comprising the major islands of the Andamans and the Nicobars, and an inner (eastern) volcanic arc jutting above the sea as the conical volcanoes of the Narcondam and the Barren Islands. According to Karunakaran, rock formation on the Andamans and the Nicobars can be classified as follows :—

1. *Quaternary Era* : Recent and subrecent (0.01 million years ago) : Aluvium, raised beaches, reef limestone.

2. *Tertiary Era* : (a) Miocene-Pliocene (12-25 million years ago) : Clays of Nicobar group. Interview Island stage (limestone and sandstone). (b) Oligocene (40 million years ago). (c) Eocene (60 million years ago) : Archipelago series (clays ; Port Blair series, e.g., grits, sandstones, shales and conglomerates).

3. *Mesozoic Era* : Cretaceous (110 million years ago) : Ultrabasic rocks.

Ultrabasic and basic rocks are found over fairly large areas on the islands, and associated with them are the oldest sedimentary rocks, viz., some limestones or marble cherts (which contain minute Radiolaria) and quartzites. All the other rocks are marine sediments of the Tertiary and Recent ages.

* For a preliminary account, see Roonwal & Bose, 1965, *Bull. syst. Zool* Calcutta, 1 (1), pp. 3-4.

The deposition of the oldest sediments, which contain fossil Radiolaria, probably took place over 100 million years ago. This was followed, at the beginning of the Tertiary Era (about 60 million years ago), by upheavals when intense crumpling of these sedimentary basins accompanied by uplifts (up to about 5 km.) took place. The uplift was probably accompanied by volcanic activity. These compressions and upheavals, resulting in the formation of land-masses out of the ocean basin, were followed by a period of quiet during which erosion took place. A second period of mountain-building, folding and faulting now took place up to the Miocene time (about 25 million years ago), and was succeeded by a period of submergence so that shallow water deposits were formed over the older rocks. The quiet Miocene period (12-25 million years ago) was followed by one of folding and elevation of this island group again into a land-mass.

After this Miocene period, geological history has been one of periodic fluctuations in level-elevation followed by submergence. Thus, during the Pliocene and Pleistocene periods (1-10 million years ago) some shelly sands were deposited in the Ritchies Archipelago areas which were subsequently elevated and tilted. This was followed by minor upheavals and submergence. Finally, in the Recent period there has been further submergence, resulting in drowned valleys as indicated by the deeply indented coastline and the existence of island-studded bays.

Thus, these islands, which were first raised in the Mesozoic period (about 100 million years ago), have since then undergone several periods of submergence and elevation up to the Pleistocene (about one million years ago), and finally some submergence in the Recent period. These considerations are of importance in the study of the terrestrial fauna which is not likely to survive periods of total submergence. But the submergences in these islands appear to have been *partial*. Evidences of partial submergence in recent times are to be seen in the form of marine shell-beds at about six metres above the present sea-level. The total absence of shell-beds in the higher ridges of the islands suggests that such submergences were only partial and ranged only within a few metres. That submergences in the older geological periods were also partial is shown by the fact that the ultrabasic rocks near the peaks, such as Saddle Hill (North Andamans), *ca.* 600 metres, have no marine deposits. Such marine deposits are to be found at much lower elevations only, a few metres above the sea-level along the flanks of the higher ridges as well as in the outlying islands like those of the Ritchies Archipelago which have a low elevation.

3. Discussion on composition of termite fauna

The 17 termite species known from these islands are phylogenetically distributed as follows :—

Family Kalotermitidae	.. ..	3 (or 17.6 %)
Family Rhinotermitidae	.. ..	8 (or 47.1 %)
Family Termitidae	.. ..	6 (or 35.3 %)

Thus, the Rhinotermitidae is the best represented family and the Kalotermitidae the poorest. Among the Rhinotermitidae, only three genera namely, *Coptotermes*, *Prorhinotermes* and *Schedorhinotermes*, occur, and of these the last mentioned is the dominant one, with four species. Among the Kalotermitidae, which is the most primitive of the three families, the two species of *Cryptotermes* are widely distributed, mainly by introduction. Their "absence" from the Nicobars is almost certainly due to inadequate surveys. *Neotermes andamanensis* is a rare species. It is highly likely that with intensive surveys in the forests, and a careful examination of tree trunks, some more Kalotermitidae species will be found. Among the Termitidae, which is the most highly evolved family among termites, the occurrence of only a single species of the genus *Odontotermes* is noteworthy since this genus is highly successful in the humid tropics. The species, however, is perhaps the most commonly met with termite on these islands. The nasute termites (Nasutitermitinae) are represented by 2 genera and 3 species, namely *Nasutitermes krishna* n. sp., *N. matangensis matangensisformis* and *Hospitalitermes blairi*.

Of the 17 species found, 10 (or 58·8 per cent) are endemic to these islands and are not found elsewhere (Table 9). These are : *Neotermes andamanensis*, *Prorhinotermes shiva*, *Schedorhinotermes eleanoreae* n. sp., *S. longirostris*, *S. tiwarii*, *Microcerotermes danieli* n. sp., *M. nicobarensis* n. sp., *Odontotermes latigula*, *Nasutitermes krishna* n. sp. and *Hospitalitermes blairi*. One species (or 5·9 per cent), namely, *Prorhinotermes flavus* (Fam. Rhinotermitidae) is common with the Indian Region only. Six species (or 35·3 per cent) are common with the Oriental Region as a whole—these are : *Cryptotermes dudleyi*, *Crypt. havilandi* (Kalotermitidae), *Coptotermes heimi*, *Copt. travians*, *Schedorhinotermes medioobscurus* (Rhinotermitidae) and *Nasutitermes matangensis matangensisformis* (Termitidae). The two species of *Cryptotermes* are very widely distributed due to introductions.

Thus, there is a strong element (nearly 59 per cent) of endemic fauna in these islands, and in the remaining portion the oriental element is prominent. This is to be expected, judging from the geological history of these islands which first arose from the ocean bed in the Mesozoic era. Although in their subsequent history the islands underwent several periods of submergence and elevation, the submergences were only *partial* and, therefore, did not completely blot out the terrestrial fauna, including termites. Such fauna must have survived in the considerable areas left above the submergence level, and could easily invade the freshly elevated areas after each period of submergence. Since the islands are separated from the mainland by a vast stretch of the ocean, and contacts with the outside world by natural means, such as driftwood, etc., must have been of rare occurrence, the original termite fauna should be regarded as having survived without any appreciable dilution by introduced species, and any evolution which took place must have occurred on the islands themselves. This accounts for the high percentage of endemism. In the last few thousand years, however, with the coming in of man on the scene, the islands were no longer isolated, and a few widespread wood-inhabiting species, such as *Cryptotermes* spp., *Coptotermes* spp., and probably also *Schedorhinotermes* spp., are perhaps to be regarded as relatively recent introductions.

TABLE 9.—Geographical distribution of the termite species of the Andaman and Nicobar Islands in various regions of the world.

+ , present ; — , absent.

Species	Andamans	Nicobars	Other parts of "Indian Region"*	Other parts of Oriental Region	Africa (including Madagascar)	Europe	Australia and Oceania	Nearctic (N. and Middle America)	Neotropical (South America)
1	2	3	4	5	6	7	8	9	10
Fam. 1. KALOTERMITIDAE									
1. <i>Neotermes andamanensis</i> (Snyd.)	+	—	—	—	—	—	—	—	—
2. <i>Cryptotermes dudleyi</i> Bks.	+	—	+	+	+	—	+	+	+
3. <i>Cryptotermes havilandi</i> (Sjöst.)	+	—	+	+	+	—	—	—	+
Fam. 2. RHINOTERMITIDAE									
4. <i>Coptotermes heimi</i> (Wasm.)	+	—	+	+	—	—	—	—	—
5. <i>Coptotermes travians</i> (Hav.)	+	+	+	+	—	—	—	—	—
6. <i>Prorhinotermes flavus</i> (Bug. & Pop.)	+	—	+	—	—	—	—	—	—

7. <i>Prorhinotermes shiva</i> (Roon. & Th.)	+	-	-	-	-	-	-	-	-	
8. <i>Schedorhinotermes eleanorae</i> n. sp.	+	-	-	-	-	-	-	-	-	
9. <i>Schedorhinotermes longirostris</i> (Br.)	-	+	-	-	-	-	-	-	-	
10. <i>Schedorhinotermes medioobscurus</i> (Holmg.)	+	-	-	+	-	-	-	-	-	
11. <i>Schedorhinotermes tiwarii</i> (Roon. & Th.)	+	-	-	-	-	-	-	-	-	
Fam. 3. TERMITIDAE										
12. <i>Microcerotermes danieli</i> n. sp.	+	-	-	-	-	-	-	-	-	
13. <i>Microcerotermes nicobarensis</i> n. sp.	+	+	-	-	-	-	-	-	-	
14. <i>Odontotermes latigula</i> (Snyd.)	+	+	-	-	-	-	-	-	-	
15. <i>Nasutitermes krishna</i> n. sp.	+	-	-	-	-	-	-	-	-	
16. <i>Nasutitermes matangensis matangensis-formis</i> (Holmg.)	+	+	-	+	-	-	-	-	-	
17. <i>Hospitalitermes blairi</i> Roon. & Sen-Sarma.	+	-	-	-	-	-	-	-	-	

*India, E. and W. Pakistan, Burma and Ceylon.

V—SUMMARY

1. Until the present study was made, only 7 species of termites were known from the Andaman and Nicobar groups of islands. This study, which is based on the material from a number of collections, both recent and old, present in the Zoological Survey of India, Calcutta, raises the number of termites known from these islands to 17 of which 4 species are new to science and 5 are new distributional records from these islands. The major part of the collections are from the Andamans.

2. A list of the 17 species, the castes known and the geographical distribution are given.

3. A key for the identification of the genera and species is provided.

4. Fourteen species present in the collections studied are considered here, and their body-measurements, and in several cases, their illustrations, are given. The four new species described here are : *Schedorhino-termes eleanorae* n. sp., *Microcerotermes danieli* n. sp., *Microcerotermes nicobarensis* n. sp. and *Nasutitermes krishna* n. sp.

5. The zoogeography of the Andaman and Nicobar termites is discussed. Of the three families represented, the Rhinotermitidae is dominant (with 8 species or 47·1 per cent of the total), the representation of the other families being : Termitidae 6 species (or 35·3 per cent) and Kalotermitidae 3 species (or 17·6 per cent).

6. Ten (58·8 per cent) out of the 17 species present on these islands are endemic and have not been found elsewhere. Thus, the proportion of endemism is high. One species (or 5·9 per cent) is common with the Indian Region only and 6 (or 35·3 per cent) are common with the Oriental Region only. The distribution is also discussed in relation to the age of the islands and the introduction of widely-spread species by artificial agencies.

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