

ON A COLLECTION OF TERMITES (INSECTA : ISOPTERA)  
FROM KERALA (INDIA) WITH A NEW SPECIES OF  
AND KEYS TO THE INDIAN SPECIES OF  
*ANGULITERMES* SJÖSTEDT

By

S. C. VERMA

*Zoological Survey of India, Northern Regional Station, Dehra Dun.*

(With 3 Tables and 2 Text-figures)

INTRODUCTION

This paper is based on a collection received from the Kerala Forest Research Institute, Peechi and made by Drs. K. S. Nair and R. V. Varma, from the 13 localities (Table 1) during 1977-1980. Eighteen species belonging to eight genera under two families (Rhinotermitidae and Termitidae) are reported from the collection, the most common genus being *Odontotermes* Holmgren, with eleven species. Thakur (1981) has revised the Indian *Odontotermes* and has treated *O. guptai* Roonwal & Bose, *O. kushwahai* Roonwal & Bose and *O. vaishno* Bose, as synonyms of *O. bellahunisensis* Holmgren & Holmgren, *O. wallonensis* (Wasmann) and *O. obesus* (Rambur), respectively but these have been taken as valid species in this paper. The following four species are

TABLE 1. Termite collecting localities from Kerala

Locality	Latitude (N)	Longitude (E)	Altitude (meters)
1. Begur	11°45'	76°15'	803
2. Kalikuvu	11°10'	76°20'	120
3. Kondazhi	10°42'	76°27'	208
4. Konni	9°20'	76°30'	181
5. Mannamangalam	10°33'	76°27'	108
6. Nilambur	11°20'	76°20'	150
7. Peechi	10°33'	76°27'	108
8. Potta	10°42'	76°27'	208
9. Thachamala	11°5'	76°45'	588
10. Thuva	11°5'	76°45'	588
11. Trichur	10°30'	76°14'	105
12. Varavur	10°42'	76°12'	177
13. Vazhacha	10°18'	76°27'	447

first records from Kerala : *Odontotermes guptai* Roonwal & Bose, *Odontotermes indicus* Thakur ; *Odontotermes kushwahi* Roonwal & Bose, and *Odontotermes wallonensis* (Wasmann). A new species, *Angulitermes keralai*, is described and a key to Indian species of *Angulitermes* is given. Two vials contain workers and soldiers minor only of the genera *Macrotermes* and *Trinervitermes*, and such they could not be identified up to specific level.

Measurements are given for those species which were not earlier reported from Kerala State.

The following are the abbreviations used in this paper : Dist., District ; Im., Imago ; S., Soldier ; Sev., Several ; Syn., Synonym ; Type-loc., Type-locality ; W., Worker.

#### SYSTEMATIC ACCOUNT

##### Family : RHINOTERMITIDAE

##### 1. *Coptotermes heimi* (Wasmann)

(Syn. *Coptotermes parvulus* Holmgren)

1902. *Arrhinotermes heimi* Wasmann, *Zool. Jb.*, 17 (1), p. 104, Im. *Type-Loc.* : India : Wallon.

*Material* : A vial with 10S. & 5W., Peechi, K. S. S. Nair coll., 17.8.79. A vial with 2S. & 1W., Potta, K. S. S. Nair coll., 11.7.80. A vial with 3S. & 2W. ; Trichur, K. S. S. Nair coll. 10.2.80.

*Distribution* : Widely distributed in Pakistan and India. Also recorded from Bhutan and Bangladesh. Present records : India Kerala (Peechi, Potta and Trichur).

##### Family : TERMITIDAE

##### 2. *Microcerotermes fletcheri* Holmgren & Holmgren

1917. *Microcerotermes fletcheri* Holmgren & Holmgren, *Mem. Dep. Agric. India ent. Ser.* 5 (3), pp. 170-171. S. & W. *Type-loc.* : South India : Babubuddin Hills (Karnataka).

*Material* : A vial with 4S. & 2W., Varavur, K. S. S. Nair coll., 1.3.79. A vial with 5S. & 5W., Konni, Mathew coll., 5.7.79. (mixed with *Nasutitermes brunneus* Snyder).

*Distribution* : Recorded from India only from Karnataka, Uttar Pradesh, Tamil Nadu and Kerala States. Present record : India : Kerala (Varavur and Konni).

3. *Angulitermes keralai* n. sp.

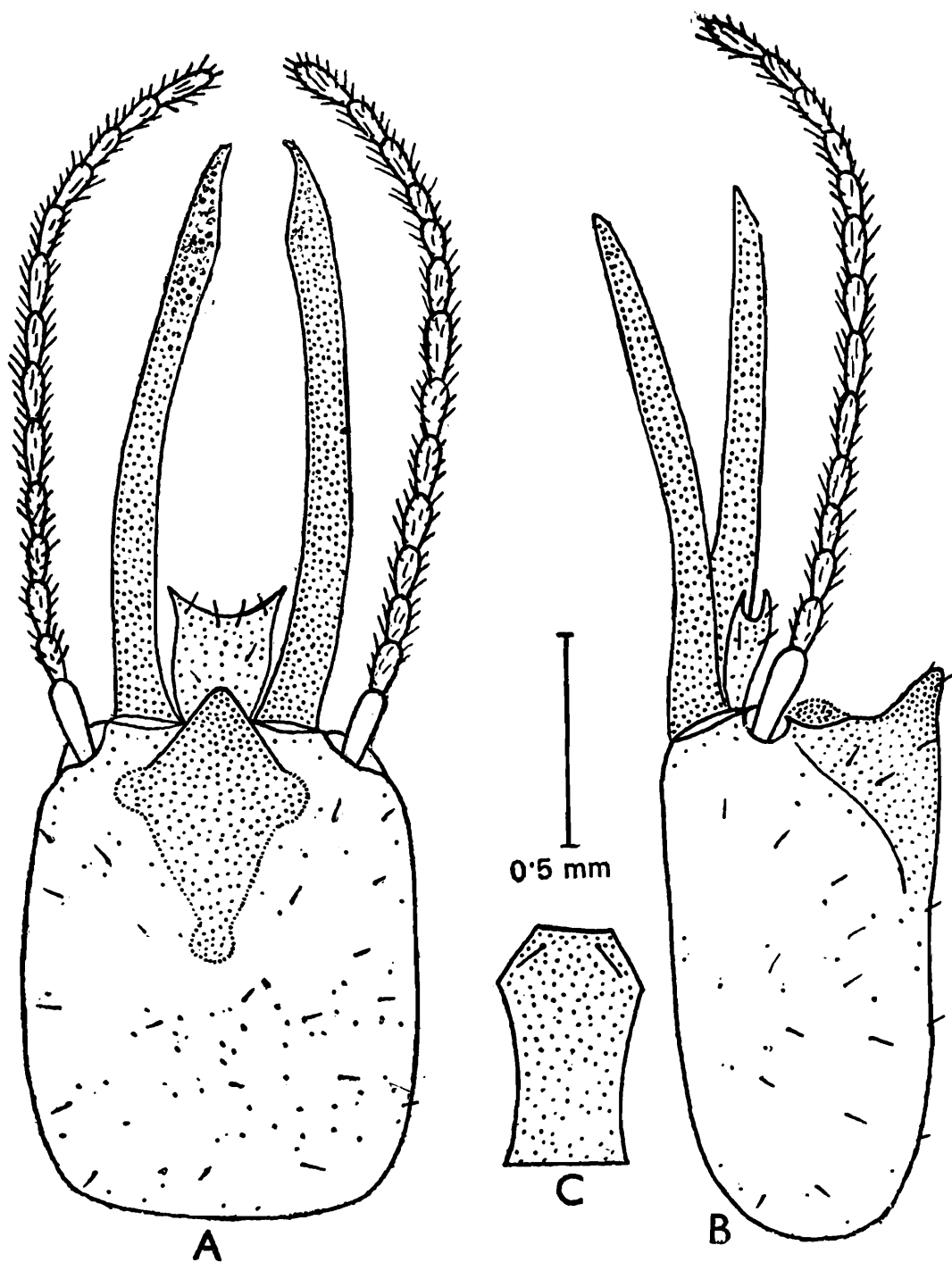
*Material* : A vial with 3S. & 1W., Kondazhi (Kerala), K.S.S. Nair & W. A. Sands coll., 2.3.1979.

*Description* :

1. IMAGO : Unknown.

2. SOLDIER (Text-fig, 1, Table 2) :

Head capsule yellowish ; antennae, labrum and legs pale yellow ; rest of the body parts whitish yellow. Head and labrum fairly and



Text-fig. 1. *Angulitermes keralai* n. sp. Holotype. Soldier. (A) Head, in dorsal view (B) Head, in side view (C) Postmentum *in situ*.

body moderately pilose. Total body-length including mandibles c. 3.55-3.75.

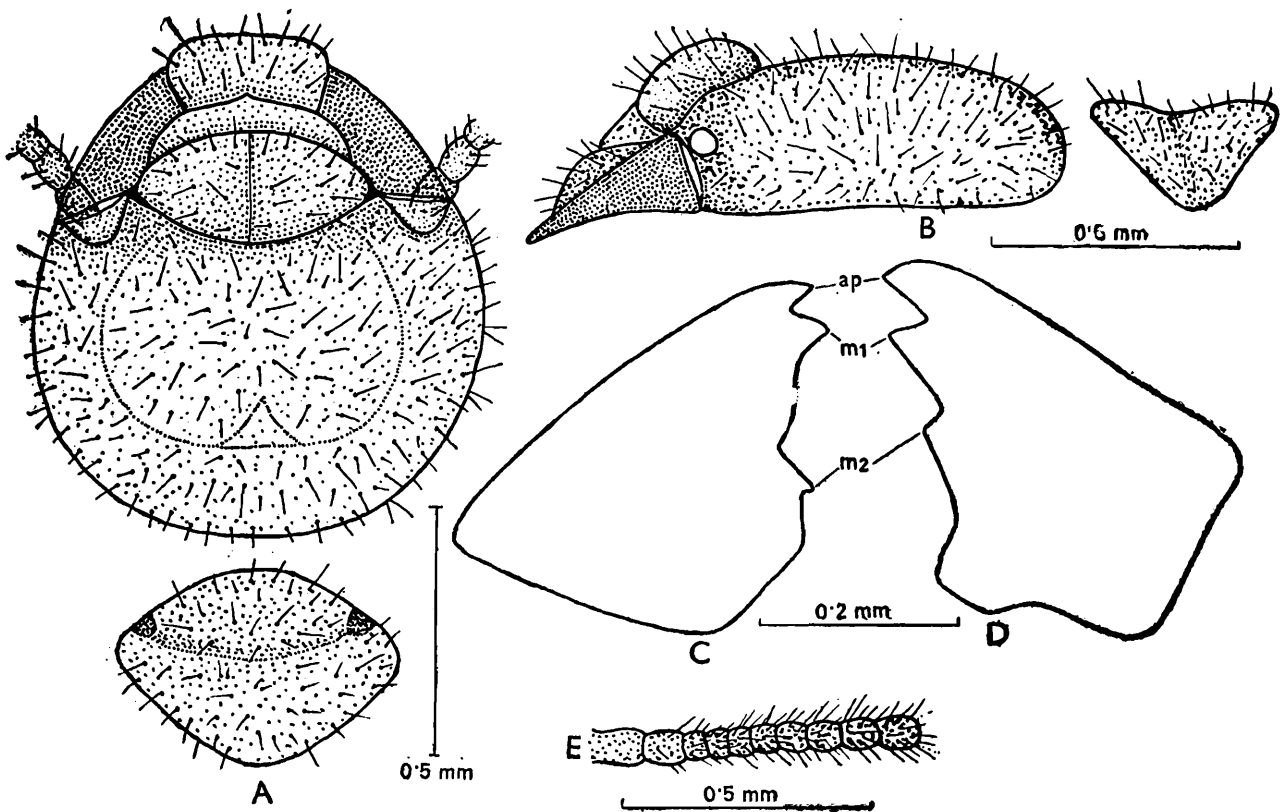
Head-capsule subrectangular ; longer than broad ; sides subparallel, slightly convex in middle ; posterior margin rounded ; frontal projection long, pointed and projected anteriorly from head (length 0.22 mm). Fontanelle lying below the frontal projection ; light brownish ; sparsely hairy. Antennae 14 segmented ; pilose ; segment 1 longest ; 2 cylindrical ; 3 longer than 2 ; 4 shortest ; 5-8 gradually increasing in length ; 9-14 gradually decreasing in length ; last conical, subequal to penultimate. Postclypeus yellowish, short and swollen. Anteclypeus white, apilose. Labrum yellowish ; sides convex and converging posteriorly ; anterior margin deeply concave ; anterolateral corners pointed. Mandibles snapping type ; long and slender, pointed and

TABLE 2. Body measurements (in mm) of Soldier of (3 exs.) *Angulitermes keralai* sp. n.

Body parts	Holotype	Range
1. Total body length with mandibles.	3.75	3.55-3.75
2. Length of head with mandibles	2.14	2.08-2.14
3. Length of head to lateral base of mandibles.	1.03	1.00-1.03
4. Length of head upto frontal projection.	1.25	1.22-1.25
5. Length of frontal projection	0.22	0.22
6. Max. width of head.	0.83	0.80-0.83
7. Max. height of head.	0.58	0.58
8. Head index I (Width/Length side base of mandibles).	0.81	0.80-0.83
9. Head index II (Height/Length to side base of mandibles).	0.56	0.56-0.58
10. Head index III (Height/Width).	0.700	0.700-0.725
11. Head index IV (Length upto frontal projection /Length to side base of mandibles)	1.21	1.21-1.22
12. Max. length of labrum upto middle of anterior margin.	0.22	0.22-0.25
13. Max. width of labrum.	0.28	0.25-0.28
14. Length of mandibles		
(a) Left mandible	1.11	1.08-1.11
(b) Right mandible.	1.11	1.08-1.11
15. Head mandibular Index (Left Mandible Length/Head length to side base of Mandibles).	1.08	1.08-1.11
16. Min. (Midian) length of postmentum.	0.42	0.42
17. Max. width of postmentum.	0.28	0.25-0.28
18. Min. width of postmentum.	0.22	0.19-0.22
19. Max. length of pronotum.	0.14	0.14
20. Max. width of pronotum.	0.42	0.42

weakly incurved at distal tips ; longer than head-length to lateral base of mandibles (index left mandible-length/head-length to lateral base of mandibles 1.08-1.11). Postmentum clubshaped, widest near the apical third ; moderately contracted in basal region (Postmentum contraction index i. e., minimum width/maximum width 0.76-0.79) ; anterior margin sub-straight ; posterior margin slightly substraight.

Pronotum saddle-shaped ; anterior margin convex ; posterior margin moderately convex ; both margins without median notch. Mesonotum broader than pronotum ; posterior margin substraight. Metanotum subequal to mesonotum ; posterior margin substraight. Legs short, slender and pilose ; tarsi 4-segmented ; tibial spur formula 3 : 2 : 2.



Text-fig. 2. *Angulitermes keralai* n. sp. Paramorphotype worker. (A) Head and pronotum, in dorsal view. (B) Ditto, in side view (C) Left mandible (D) Right mandible. (E) Antennae (broken)  
*ap.*, apical tooth ; *m*<sub>1</sub>, *m*<sub>2</sub>, 1st and 2nd marginal tooth.

Abdomen whitish yellow, sparsely hairy ; cerci 2-segmented (length 0.056 mm.) ; styli short, unsegmented.

### 3. WORKER (Text-fig. 2, Table 3) :

Head capsule yellowish white to pale yellow ; central glandular portion whitish ; mandibles brownish yellow with dark brown inner margins ; postclypeus of same colour as head capsule ; labrum semi-transparent, whitish yellow ; antennae, thorax, legs and abdomen

paler than head-capsule. Head-capsule sparsely and body moderately pilose. Total body-length c. 3.30 mm.

Head-capsule suboval ; wider than long ; widest near the base of antennae. Left antenna broken ; right antenna with only 10 segments present ; segment 1 longest ; 2 distinctly longer than 3 ; 3 shortest ; 4-10 progressively increasing in length. Postclypeus swollen, with few hairs ; length almost half its width ; median dividing line distinct. Anteclypeus trapezoid ; whitish ; translucent ; anterior margin projected in middle. Labrum whitish yellow ; moderately hairy ; anterior margin substraight ; wider than long. Left mandible with an apical and two marginal teeth ; right mandibles also with an apical and two marginal teeth.

Pronotum weakly saddle-shaped, wider than long ; anterior margin convex ; posterior margin substraight ; both margins without median notch. Mesonotum wider than pronotum ; posterior margin substraight ; more hairy than pronotum. Metanotum wider than mesonotum ; posterior margin substraight ; pilosity as in mesonotum. Legs short, slender and pilose ; tarsi 4-segmented ; tibial spurs 3 : 2 : 2.

TABLE 3. Body measurements (in mm) of worker of (1 ex.) *Angulitermes keralai* sp. n.

Body parts	Size
1. Total body length (excluding antennae)	3.30
2. Length of head to tip of labrum	0.94
3. Length of head to lateral base of mandibles	0.61
4. Max. width of head	0.80
5. Max. height of head	0.31
6. Max. length of post-clypeus	0.19
7. Max. width of post-clypeus	0.36
8. Max. length of labrum	0.19
9. Max. width of labrum	0.28
10. Max. length of pronotum	0.28
11. Max. width of pronotum	0.53

Abdomen oblong, hairy ; cerci short, hairy and 2-segmented ; styli short, unsegmented.

TYPE-SPECIMENS : *Holotype* : A soldier from above material, deposited in the National Zoological Collection, Zoological Survey of India (ZSI), Calcutta.

*Paratypes* : (i) A soldier and a paramorphotype worker, in vial, in Z. S. I., Calcutta (ii) A soldier, in vial, at Northern Regional Station, Zoological Survey of India, Dehra Dun.

COMPARISON : SOLDIER : In shape of frontal projection, *A. keralai* n. sp. come close to *A. quadriceps* Harris from Israel and *A. frontalis* (Silvestri) from South Africa, but however it definitely differs from them by its smaller size (Head length with mandibles 2.08-2.14 vs. 2.32 in *A. quadriceps* and 2.85-2.90 in *A. frontalis*; Mandibles length 1.08-1.11 vs. 1.23 in *A. quadriceps* and 1.40-1.62 in *A. frontalis*). It is differ from neighbouring South Indian species viz. *A. acutus* Mathur & Sen-Sarma; *A. fletcheri* (Holmgren & Holmgren) and *A. obtusus* (Holmgren & Holmgren) by its smaller size in all respect. None of the Indian species have frontal projection as long, pointed and upturned anteriorly from head as in *A. keralai* n. sp.

#### DISTRIBUTION AND KEYS OF *Angulitermes* SPECIES FROM INDIAN REGION

(A) *Distribution* : Roonwal & Chhotani (1971) in their paper reported 10 species of *Angulitermes* from the Indian Region. Later on five species have been added to this region. Akhtar (1974) described *A. punjabensis* from Pakistan (Punjab : Choa Saiden Shah) and Akhter (1975) *A. emersoni* from Bangladesh (Danadighi and Shishak forest); Roonwal & Verma (1977) have reported *A. jodhpurensis* from India (Rajasthan : Jodhpur); Sen-Sarma & Thakur (1979) described *A. mishrai* from India (Tripura : Zoolchara, Ambasa, Tiliamura); and presently *A. keralai* is described here (above) from India (Kerala : Kondazhi).

Thus 15 species of *Angulitermes* Sjöstedt are known from Indian Region as follows :

1. *acutus* Mathur & Sen-Sarma—India.
2. *akhorisainensis* Chatterjee & Thakur—India.
3. *dehraensis* (Gardner)—India ; Pakistan ; Afganistan.
4. *emersoni* Akhtar—Bangladesh.
5. *fletcheri* (Holmgren & Holmgren)—India.
6. *hussaini* Ahmad—Pakistan.
7. *jodhpurensis* Roonwal & Verma—India.
8. *kashmirensis* Roonwal & Chhotani—India.
9. *keralai* Verma—India.
10. *mishrai* Sen-Sarma & Thakur—India.
11. *obtusus* (Holmgren & Holmgren) —India.
12. *paanensis* Krishna—Burma.

13. *punjabensis* Akhter—Pakistan.
14. *resimus* Krishna—Burma.
15. *tilaki* Roonwal & Chhotani—India.

(B) KEYS TO *Angulitermes* OF INDIAN REGION

(a) IMAGO

Out of 15 species of *Angulitermes*, known from Indian Region, imagoes are known only in four species. The type of all species except *A. emersoni* have been examined by me. (Measurements given in key are in millimeter).

- |    |  |     |   |
|----|--|-----|---|
| 1. | Ocellus nearer to eyes, separated by a distance of less than short diameter of ocellus. ...  | ... | 2 |
|    | Ocellus separated from eyes by a distance equal to its short diameter. ...   | ... | 3 |
| 2. | Larger species (Head-length to base of mandibles 0.68-0.80; Head-width with eyse 0.95-1.00; Pronotum-length 0.47-0.53, width 0.89-0.95). Minimum eye-ocellus distance 0.036-0.045. |     |   |

1. *A. jodhpurensis* Roonwal & Verma

Smaller species (Head-length to base of mandibles 0.57-0.60; Head-width with eyes 0.78-0.81; Pronotum-length 0.43-0.45, width 0.65-0.71). Minimum eye-ocellus distance 0.05.

2. *A. emersoni* Akhtar

3. Larger species (Body-length with wings 11-11.50, without wings 6-6.90; Head width with eyes 0.90-0.95). Eyes separated from the lower margin of head by half their short diameter. Postclypeus divided more prominently. Cubitus with 10-11 number of veins.

3. *A. akhorisainensis* Chatterjee & Thakur

Smaller species (Body-length with wings 10-10.5, without wings 5.5; Head-width with eyes 0.80-0.90). Eyes separated from lower margin of head by less than half their short diameter. Postclypeus divided less prominently. Cubitus with 10-14 number of veins.



4. *A. dehraensis* (Gardner)

## (b) SOLDIER

(Key to soldier caste is partly based after Roonwal &amp; Chhotani, 1971)

- |   |     |   |
|---|-----|---|
| 1. Frontal projection of head long (length 0.22-0.26).  | ... | 2 |
| Frontal projection of head short (length 0.10-0.17).  | ... | 4 |
| 2. Frontal projection of head sharply pointed and strongly projected anteriorly (Head-length with frontal projection 1.22-1.25 Head-length to lateral base of mandibles 1.00-1.03 ; length of frontal projection 0.22 ; Head-width 0.80-0.83 ; Mandibles length 1.08-1.11 ; Postmentum max. width 0.25-0.28 ; Pronotum-width 0.42. Anterior margin of pronotum is deeply concave. Lateral sides of head substraight). |     |   |

1. *A. keralai* n. sp.

- |   |     |   |
|---|-----|---|
| Frontal projection on head not sharply pointed and projected anteriorly (subconical).   | ... | 3 |
| 3. Head shorter (Head-length to lateral base of mandibles 1.11-1.32) ; Pronotum wider (Max. width 0.58-0.63) and frontal projection longer (length 0.26). |     |   |

2. *A. jodhpurensis* Roonwal & Verma

Head longer (Head-length to lateral base of mandibles 1.37) ; Pronotum narrower (Max. width 0.53) and frontal projection smaller (length 0.23). ...

3. *A. fletcheri* (Holmgren & Holmgren)

- |  |     |   |
|--|-----|---|
| 4. Frontal projection of head inclined posteriorly.  | ... | 5 |
| Frontal projection of head not inclined posteriorly.   | ... | 6 |
| 5. Anterior margin of frontal projection slightly concave. Smaller species (Head-length to lateral base of mandibles 0.84-0.98 ; Head-width 0.75-0.79 ; Mandible-length 1.00-1.06 ; Postmentum maximum-width 0.24-0.25 ; Pronotum-width 0.35-0.40). Anterior margin of labrum deeply concave. Lateral sides of head not depressed in middle. |     |   |

#### 4. *A. emersoni* Akhtar

Anterior margin of frontal projection slightly convex. Larger species (Head-length to lateral base of mandibles 1.13; Head-width 1.05; Mandible-length 1.42; Postmentum maximum-width 0.30; Pronotum-width 0.49). Anterior margin of labrum shallowly concave. Lateral sides of head depressed in middle.

#### 5. *A. punjabensis* Akhtar

6. Margin of frontal projection rounded in shape. (Head-length to lateral base of mandibles 0.90-1.00; Head-width 0.68-0.78; Mandible-length 0.93-1.00; Postmentum max. width 0.25-0.23; Pronotum-width 0.30-0.38. Anterior margin of labrum deeply concave. Lateral side of head shallowly depressed in middle).

#### 6. *A. mishrai* Sen-Sarma & Thakur

- Margin of frontal projection not rounded but blunt or pointed in shape. ... 7
7. Smaller species (Head-length to side base of mandibles 0.87-1.00; Max. head-width 0.80-0.84). ... 8
- Larger species (Head-length to side base of mandibles 1.13-1.40; Max. head-width 0.90-1.05). ... 9
8. Head wider anteriorly and sparsely hairy. Frontal projection narrower and indented medially at anterior margin. Third antennal segment longer than second.

#### 7. *A. hussaini* Ahmad

Head wider posteriorly and fairly densely hairy. Frontal projection broader and even at anterior margin. Third antennal segment subequal to second.

#### 8. *A. paanensis* Krishna

9. Labrum broader (index maximum-width/maximum length 0.97), and strongly narrowed posteriorly; anterior margin broadly and shallowly concave.

9. **A. acutus** Mathur & Sen-Sarma

- Labrum narrower (index maximum width/maximum length 0.66-0.88), and weakly narrowed posteriorly ; anterior margin narrowly and deeply concave. ... 10
10. Mandibles shorter (length 1.27-1.30). ... 11  
 Mandibles longer (length 1.34-1.47). ... 12
11. Head capsule uniformly wide ; frontal projection with an acute apex and sharply truncated in front. ...

10. **A. obtusus** (Holmgren & Holmgren)

Head capsule wide in front and narrowed posteriorly ; frontal projection with a round apex and roundly truncated in front. ...

11. **A. tilaki** Roonwal & Chhotani

12. Head-length with frontal projection slightly more than head-length to side base of mandibles (Index head-length up to frontal projection/head-length to side base of mandibles more than 1). ... 13  
 Head-length with frontal projection slightly less than head-length to side base of mandibles (Index 0.97-0.98). ... 14
13. Head fairly pilose ; frontal projection rounded and not turned upward apically. ...

12. **A. dehraensis** (Gardner)

Head sparsely pilose, with only a few bristles ; frontal projection conical and turned upward apically.

13. **A. resimus** Krishna

14. Head shorter (head-length to side base of mandibles 1.20-1.30). Mandibles longer compared to head-length (index left mandible-length/head-length to side base of mandibles 1.14-1.23). Labrum shallowly incurved at anterior margin (index median length/maximum length 0.72-0.75) and broader (index maximum-width/maximum-length 0.85-0.88).

14. *A. kashmirensis* Roonwal & Chhotani

Head longer (head-length to side base of mandibles 1.35-1.40). Mandibles shorter compared to head-length (index left mandible-length/head-length to side base of mandibles 1.0-1.04). Labrum deeply incurved at anterior margin (index median length/maximum length 0.68) and narrower (index maximum width/maximum length 0.80).

15. *A. akhorisainensis* Chatterjee & Thakur4. *Odontotermes anamallensis* Holmgren & Holmgren

1917. *Odontotermes (Odontotermes) anamallensis* Holmgren & Holmgren, *Mem. Dep. Agric. India ent. Ser.*, 5 (3), pp. 157-158. S. & W. *Type-loc.* : South India : Anamalai Hills.

*Material* : A vial with 2S. & 5W., Varavur, R. V. Varma coll., 20.1.79. A vial with 4S. & 5W., Varavur, K. S. S. Nair coll., 1.3.79.

*Distribution* : Recorded from India from the Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, and Madhya Pradesh States. Present record : Kerala (Varavur).

5. *Odontotermes ceylonicus* (Wasmann)

1902. *Termes (Termes) ceylonicus* Wasmann, *Zool. Jb.* 17 (1), p. 113, S. & W. *Type-loc.* : Srilanka : Nalanda.

1913. *Odontotermes (Odontotermes) ceylonicus* Holmgren, *K. svenska Vetenskakad Handl.*, 50 (2), pp. 124-125. Im.

*Material* : A vial with 2S. & 10 W., Thuva, R. V. Varma coll., 28.2.80. A vial with 2S. & 1W., Potta, R. V. Varma coll., 14.3.80. A vial with 2S. & 10W., Peechi, R. V. Varma coll., 17.3.80.

*Distributions* : Widely distributed in Srilanka. From India recorded from Kerala State only. Present records : Kerala (Thuva, Peechi and Potta).

6. *Odontotermes feae* (Wasmann)

1896. *Termes feae* Wasmann, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 16 (36), pp. 625-626. S. & W. *Type-loc.* Burma : Carin Cheba.

*Material* : A vial with 10S. & 10W. ; Varavur, K. S. S. Nair coll., 1.3.79. A vial with 3S. & 4 W. ; Kondazhi, K. S. S. Nair coll., 2.3.79.

*Distributions* : Widely distributed in India ; Bangla Desh ; Nepal ; Burma ; Bhutan and Thailand. Present records : Kerala (Varavur and Kondazhi).

7. *Odontotermes guptai* Roonwal & Bose(Syn : *O. lokanandii* Chatterjee & Thakur)

1960. *Odontotermes bellahunisensis guptai* Roonwal & Bose, *J. Bombay nat. Hist. Soc.*, **58** (3), pp. 588-593. S. & W. *Type-loc.* India : Rajasthan : Near Gudha Village (Nagaur Dist.)
1967. *Odontotermes lokanandii* Chatterjee & Thakur, *Indian Forest Rec. N. S. (ent.)*, **2** (1), pp. 38-41. S. & W. *Type-loc.* : India : Jammu : Residence Plot No. 6 near river Tavi.
1977. *Odontotermes lokanandii* Akhtar, *Biologia, Lahore*, **23** (2), pp. 175-177. Im. Locality : Pakistan : Lahore.
1977. *Odontotermes guptai*, Chhotani, *Rec. Zool. Surv. India*, **72**, p. 377 (New Synonymy).

*Material* : 19 vials with sev. S. & W., from Kondazhi, Mannamangalam, Nilambur, Peechi, Potta, Thachamala, Varavur, K. S. S. Nair and R. V. Varma coll., 1977-1980.

*Measurements* : Body measurements in mm. of 20 soldiers from Kerala).

1. Total body length with mandibles	...	4-5
2. Head length with mandibles	...	1.65-1.80
3. Head-length without mandibles	...	1.05-1.20
4. Max. width of head	...	0.70-1.0
5. Max. height of head	...	0.60-0.65
6. Max. length of mandibles	...	0.58-0.65
7. Distance of tooth from apex on left mandibles	...	0.18-0.20
8. Labrum (length × width)	...	0.25-0.28 × 0.23-0.28
9. Min. (Median) length of postmentum	...	0.55-0.60
10. Max. width of postmentum	...	0.45-0.50
11. Max. length of pronotum	...	0.48-0.55
12. Max. width of pronotum	...	0.76-0.85
13. No. of antennal segments	...	15

*Distribution* : Widely distributed in India, Pakistan and Bangladesh. Present records : Kerala (Kondazhi, Mannamangalam, Nilambur, Peechi, Potta, Thachamala and Varavur). This is the first record from Kerala State.

8. *Odontotermes indicus* Thakur

1981. *Odontotermes indicus* Thakur, *Indian Forest Rec. N. S. ent.*, **14** (2), pp. 70-75. Im., S. & W. *Type-loc.* : India : Bombay.

*Material* : A vial with 5S. & 5W., Potta, Padmnabhan coll., 30.10.70.

*Measurements, etc.* : Body measurements in mm. of 1 soldier from Kerala).

1. Total body length with mandibles	...	6.5
2. Head length with mandible	...	3.74
3. Head length without mandibles	...	2.36
4. Max. width of head	...	1.97
5. Max. height of head	...	1.39
6. Max. length of mandibles	...	1.39
7. Distance of tooth from apex on left mandibles	...	0.72
8. Labrum (length × width)	...	0.33 × 0.33
9. Min. (median) length of postmentum	...	1.58
10. Max. width of postmentum	...	0.83
11. Max. length of pronotum	...	0.83
12. Max. width of pronotum	...	1.58
13. No. of antennal segments	...	17

*Distributions* : Recorded from the following States of India : Goa, Madhya Pradesh, Karnataka, Tamil Nadu, and Maharashtra. Present records : Kerala (Vazhachal and Potta). This is the first record from Kerala.

9. *Odontotermes kushwahi* Roonwal & Bose

1964. *Odontotermes brunneus kushwahi* Roonwal & Bose, *Zoologica, Studtg.* **113**, pp. 33-36. S. & W. *Type-loc.* India : Rajasthan : Bhupalasagar (Udaipur District).

1977. *Odontotermes kushwahi*, Roonwal & Verma, *Rec. Zool. Surv. India*, **72**, p. 451.

*Material* : A vial with 4S. & 5W., Kondazhi, K. S. S. Nair coll., 2.3.79.

*Measurements* : (Body measurements in mm. of one soldier from Kerala : Kondazhi).

1. Total body length with mandibles	...	5.96
2. Head-length with mandibles	...	2.80

3. Head-length without mandibles	...	1.72
4. Max. width of head	...	1.34
5. Max. length of mandible	...	1.08
6. Distance of tooth from apex on left mandibles		0.44
7. Labrum (length $\times$ width)	...	0.40 $\times$ 0.35
8. Min. (median) length of postmentum	...	1.05
9. Max. width of postmentum	...	0.58
10. Max. length of pronotum	...	0.68
11. Max. width of pronotum	...	1.08
12. No. of antennal segments	...	17

*Distributions* : Distributed in Rajasthan, Gujarat, Tamil Nadu, and Maharashtra States of India. Present record : Kerala (Kondazhi). This is the first record from this state.

#### 10. *Odontotermes obesus* (Rambur)

1842. *Termes obesus* Rambur, *Hist. natur. Insects Neuropters*, p. 304 Im. *Type-loc.* : India : Bombay.

*Material* : A vial with 10S. & 3W. ; Potta, K. S. S. Nair coll., 24.7.1979.

*Distributions* : Widely distributed in India, Pakistan, Bangladesh, Burma and Bhutan. Present record : Kerala (Potta).

#### 11. *Odontotermes redemanni* (Wasmann)

1893. *Termes redemanni* Wasmann, *Wien. ent. Ztg.*, 12 (7), p. 239. Winged, Queen, S. & W. *Type-loc.* : Srilanka : Comombo.

*Material* : 3 vials with sev. S. & W. ; Kondazhi, K. S. S. Nair coll., 2.3.79. A vial with 6S. & 2W., Peechi, R. V. Varma coll., 29.9.79.

*Distribution* : Distributed in India from Maharashtra, Karnataka, Andhra Pradesh, Kerala, Tamil Nadu, Madhya Pradesh, Uttar Pradesh, Rajasthan, West Bengal, and Bihar States.. Present records : India : Kerala : (Kondazhi and Peechi).

#### 12. *Odontotermes roonwali* Bose

1975. *Odontotermes roonwali* Bose, *Oriental Insects*, 9 (2), pp. 157-161. S. & W. *Type-loc.* : India : Kerala, Nilambur (Malabar).

*Material* : A vial with 4S. & 4W., Varavur, K.S.S. Nair coll., 1.3.79. Two vials with 8S. & 1OW., Kondazhi, K. S. S. Nair coll.,

2.3.79. A vial with 5S. & 5W., Thuva, R. V. Varma coll., 28.2.80.  
A vial with 5S. & 5W., Peechi, K. S. S. Nair coll., 5.3.80.

*Distributions* : From India : Kerala, Tamil Nadu and Karnataka States. Present records : Kerala (Varavur, Kondazhi, Thuva and Peechi).

### 13. *Odontotermes vaishno* Bose

1975. *Odontotermes vaishno* Bose, *Oriental Insects*, 9 (2), pp. 161-164. S. & W. *Type-loc.*, ; India : Kerala (Kannoth Forest Range, Wynaad Div., Malabar).

*Material* : A vial with 4S. & 4W., Varavur. K. S. S. coll., 1.3.79.

*Distributions* : From India recorded from Kerala and Karnataka States. Present record : India : Kerala (Varavur).

### 14. *Odontotermes wallonensis* (Wasmann)

1902. *Termes obesus* sub sp. *wallonensis* Wasmann, *Zool. Jb.* 17 (1), p. 106. Im., S. *Type-loc.* : Wallon : Sangamnor (Ahmadnagar Dist.).

*Material* : A vial with 3S. & 2W., Kondazhi, R. V. Varma coll., 28.7.79.

*Measurements, etc.* : (Body measurements in mm. of 1 soldier from Kerala).

1. Total body length with mandibles	...	5.3
2. Head length with mandibles	...	2.70
3. Head length without mandibles	...	1.63
4. Max. width of head	...	1.27
5. Max. length of mandibles	...	1.05
6. Distance of tooth from apex on left mandibles		0.44
7. Labrum (length × width)	...	0.40 × 0.37
8. Postmentum (Median length × width)	...	1.16 × 0.58
9. Pronotum (length × width)	...	0.61 × 0.95
10. Antennal segments	...	17

*Distributions* : From India : Andhra Pradesh, Bihar, Gujarat, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh, Madhya Pradesh and Karnataka States. Present record : Kerala (Kondazhi). This is a new record from Kerala.

### 15. *Microtermes obesi* Holmgren

1918. *Microtermes obesi* Holmgren, *K. svenska Vetensk Akad. Handl.*, 50 (2), p. 150. Im., *Type-loc.* : India : Khandala near Bombay.

*Material* : A vial with 2S. & 4W., Begur, Sudheer coll., 17.8.79.



A vial with 4S. & 5W., Peechi, R. V. Varma coll., 29.9.79. A vial with 4S. & 10W., Kalikavu, Sudheer coll., 6.11. 79.

*Distribution* : This species is common throughout India, Pakistan, Bangladesh, Burma, Srilanka and Thailand. Present record : India : Kerala (Begur, Peechi and Kalikavu).

#### 16. *Macrotermes* sp.

*Material* : A vial with 2W., Varavur, K. S. S. Nair coll., 1.3.79.

*Remarks* : These 2 workers are mixed with *Odontotermes roonwali* Bose, could not be identified up to specific level.

#### 17. *Nasutitermes brunneus* Snyder

1933. *Nasutitermes* (*Nasutitermes*) *fletcheri* Snyder (nec. Holmgren), *Proc. U. S. natn. Mus.*, Washington, 82 (16), pp. 10-11, pl. 1.

1934. *Nasutitermes* (*Nasutitermes*) *brunneus* Snyder, *Indian Forest Rec.*, 20 (11), p. 11.  
*Type-loc.* : India : Anamalai Hills (Madras State).

*Material* : A vial with sev. S. & W., Varavur, K. S. S. Nair coll., 1.3.79. A vial with 3S. & 3W., Konni, Mathew coll., 5.7.79.

*Distributions* : India : Kerala, Karnataka and Tamil Nadu States. Present record : India : Kerala (Konni and Varavur).

#### 18. *Trinervitermes* sp.

*Material* : A vial with 6 minor S., Varavur, K. S. S. Nair coll., 1.3.79.

*Remarks* : These 6 minor soldiers were mixed with *Nasutitermes brunneus* Snyder, could not be identified up to specific level.

#### SUMMARY

Eighteen species of termites of two families (Rhinotermitidae and Termitidae) are reported from Kerala. Four species viz. *Odontotermes guptai* Roonwal & Bose ; *O. indicus* Thakur ; *O. kushwahi* Roonwal & Bose and *O. wallonensis* (Wasmann) are reported for the first time from Kerala.

One new species, *Angulitermes keralai* is described from soldier and worker caste from Kondazhi, Kerala.

A key, based on imago and soldier characters is provided for identifications of 15 known species of *Angulitermes* from the Indian Region.

## ACKNOWLEDGEMENTS

I am thankful to Dr. B. Tikader, Director, Zoological Survey of India, Calcutta for encouragement in termite work. I am grateful to Dr. B. S. Lamba, Deputy Director, Zoological Survey of India, Dehra Dun, for facilities and encouragements in my termite work. I am also grateful to Dr. M. L. Roonwal, Zoological Survey of India, Jodhpur and Dr. O. B. Chhotani, Superintending Zoologist, Zoological Survey of India, Calcutta, for useful suggestions, finally thanks are also due to Drs. K. S. S. Nair and R. V. Varma of Kerala Forest Research Institute, Kerala, for placing this material for my study.

## REFERENCES

- AKHTAR, M. S. 1974. New termites from Pakistan. *Biologia, Lahore*, **20** (1) : 23-61.
- AKHTAR, M. S. 1975. Taxonomy and zoogeography of the termites (Isoptera) of Bangladesh. *Bull. Dep. Zool. Panjab Univ. (N. S.)*, **7** : 1-199.
- ROONWAL, M. L. AND CHHOTANI, O. B. 1971. Two new termites of genus *Angulitermes* Sjöstedt (Isoptera : Termitidae) from India, with a key to species of Indian region. *Rec. zool. Surv. India*, **63** (1-4) : 209-222.
- ROONWAL, M. L. AND VERMA, S. C. 1977. A new species of *Angulitermes* (Isoptera : Termitidae : Termitinae) from the Indian Desert, with some observations on its biology. *Entomologist's mon. Mag.*, **112** : 5-12.
- SEN-SARMA, P. K. AND THAKUR, M. L. 1979. Termite of Tripura (Insecta : Isoptera). *Indian Forest Rec. N. S. (ent.)*, **13** (1) : 1-67.
- THAKUR, M. L. 1981. Revision of the termite genus *Odontotermes* Holmgren (Isoptera : Termitidae : Macrotermitinae) from India. *Indian Forest Rec. N. S. (ent.)*, **14** (2) : 1-182.