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TERMITE FAUNA OF ORISSA STATE, EASTERN INDIA

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(With 3 Text-figures and 2 Tables)

Introduction

Silvestri (1923) reported 10 species of termites from a small island of Barkuda in the Chilka lake, Orissa, while Annandale in the same year gave a detailed account of the nesting habits of these insects from this island. There was no further addition to our knowledge of the termites of Orissa state till the publication of the catalogue by Snyder (1949) wherein ten species were reported from this state. Subsequently Roonwal and Sen-Sarma (1955), Mathur and Chhotani (1969), and Thakur (1976) have reported ten more species.

This present work deals with the termite material, collected over the past few years, by various survey parties of the Zoological Survey of India, from Orissa state, India. The entire material consists of 20 species distributed over 10 genera and 2 families. Of these eight species are new records for the state and one is new to science. In all, 31 species are now known from this state, a list of which and the keys for their identification are provided here.

Abbreviations used

The following abbreviations are used : coll., Collected by : Im., Imago ; K., King ; Q., Queen ; S., Soldier ; W., Worker.

List of Species and key for Identification

(A) LIST OF SPECIES KNOWN FROM ORISSA STATE

Family Kalotermitidae

1. *Bifiditermes pintoi* (Kemner)
2. *Cryptotermes dudleyi* Banks

Family RHINOTERMITIDAE

3. *Heterotermes balwanti* Mathur & Chhotani
4. *Coptotermes heimi* (Wasmann)
5. *Coptotermes travians* Haviland

Family TERMITIDAE

6. *Speculitermes cyclops* Wasmann
7. *Speculitermes sinhalensis* Roonwal & Sen-Sarma
8. *Eurytermes assmuthi assmuthi* Wasmann
9. *Eurytermes assmuthi modestior* Silvestri
10. *Angulitermes ramanii* sp. nov.
11. *Dicuspiditermes obtusus* (Silvestri)
12. *Microcerotermes annandalei* Silvestri
13. *Microcerotermes beesoni* Snyder
14. *Macrotermes estherae* (Desneux)
15. *Odontotermes assmuthi* Holmgren
16. *Odontotermes bellahunisensis* Holmgren & Holmgren
17. *Odontotermes brunneus* (Hagen)
18. *Odontotermes ceylonicus* (Wasmann)
19. *Odontotermes feae* (Wasmann)
20. *Odontotermes guptai* Roonwal & Bose
21. *Odontotermes horni* (Wasmann)
22. *Odontotermes indicus* Thakur
23. *Odontotermes microdentatus* Roonwal & Sen-Sarma
24. *Odontotermes obesus* (Rambur)
25. *Odontotermes orissae* (Snyder)
26. *Odontotermes redemanni* (Wasmann)
27. *Odontotermes wallonensis* (Wasmann)
28. *Euscaiotermes primus* Silvestri, Silvestri (1923) described this species as *Odontotermes* (*Euscaiotermes*) *primus* Silvestri
29. *Microtermes obesi* Holmgren
30. *Nasutitermes fletcheri* (Holmgren & Holmgren)
31. *Trinervitermes biformis* (Wasmann)

(B) KEY FOR THE IDENTIFICATION OF TERMITES OF ORISSA BASED ON SOLDIER CASTE

1 (4)	Head without fontanelle and frontal gland ...	Family KALOTERMITIDAE
2 (3)	Head capsule long and not phragmotic; mandibles comparatively long ...	Genus **Bifiditermes** Krishna
	[Anterior broader part of postmentum bilobed and covering about half its total length] ...	*B. pintoi* (Kemner)
3 (2)	Head capsule short and phragmotic; mandibles comparatively short ...	Genus **Cryptotermes** Banks
	[Head-length to base of mandibles 1.60-1.80 mm, width of head 0.90-1.35 mm; mandibles with prominent dentition] ...	*C. dudleyi* Banks
4 (1)	Head with fontanelle and frontal gland	
5 (10)	Pronotum flat ...	Family RHINOTERMITIDAE
6 (7)	Head-capsule rectangular, fontanelle small, situated on dorsum of head ...	Genus **Heterotermes** Froggatt
	[Small species; head-length 1.03-1.25 mm, head-width 0.66-0.88 mm] ...	*H. balwanti* Mathur & Chhotani
7 (6)	Head oval, fontanelle large, situated just behind clypeus ...	Genus **Coptotermes** Wasmann
8 (9)	Minimum width of postmentum greater (0.25-0.34 mm), contraction index 0.63-0.76 ...	*C. heimi* (Wasmann)
9 (8)	Minimum width of postmentum smaller (0.20-0.29 mm), contraction index 0.57-0.69	*C. travians* Haviland
10 (5)	Pronotum saddle-shaped ...	Family TERMITIDAE
11 (14)	Mandibles degenerate, head produced into rostrum	
12 (13)	Soldiers dimorphic ...	Genus **Trinervitermes** Holmgren
	[Head width 1.30-1.36 mm; number of antennal segments 13] ...	*T. biformis* Wasmann
13 (12)	Soldiers monomorphic ...	Genus **Nasutitermes** Dudley
	[Head-length with rostrum 1.25-1.36 mm, head-width 0.78-0.83 mm; number of antennal segments 12] ...	*N. fletcheri* (Holmgren & Holmgren)
14 (11)	Mandibles well developed; head not produced into rostrum	
15 (48)	Mandibles symmetrical	
16 (19)	Mandibles serrated, without any prominent teeth ...	Genus **Microcerotermes** Silvestri

17 (18)	Pronotum with well developed notch at anterior margin. Head-length 1.63-1.66 mm, head-width 0.95-1.00 mm ...	*M. annandalei* Silvestri
18 (17)	Pronotum without or with a weak median notch at anterior margin Head-length 1.25-1.30 mm, head-width 0.80-0.82 mm, head-index (width/length) 0.58-0.61 ...	*M. beesoni* Snyder
19 (16)	Mandibles not serrated, with or without teeth or crenulations	
20 (21)	Left mandible with a prominent notch at middle ...	*Euscaiotermes primus* Silvestri
21 (20)	Left mandible without any notch	
22 (23)	Mandibles thin, without any teeth or crenulations. Soldiers smaller than workers ...	Genus **Microtermes** Wasmann
	[Mandibles weakly hooked ; labrum lanceolate, broader at tip] ...	*M. obesi* Holmgren
23 (22)	Mandibles thick and stout ; left with teeth or crenulations	
24 (27)	Left mandible with two widely separated teeth ; labrum triangular. ...	Genus **Eurytermes** Wasmann
25 (26)	Larger species (head 2.0 mm long and 1.30 mm wide) ; mandibles 0.83-0.87 mm long ...	*E. assmuthi assmuthi* Wasmann
26 (25)	Smaller species (head 1.70 mm long and 1.08 mm wide) ; mandibles 0.78 mm long ...	*E. assmuthi modestior* Silvestri
27 (24)	Left mandible with a single variably placed tooth or crenulations in basal half	
28 (29)	Labrum with a hyaline tip ; left mandible with crenulations in basal half ...	Genus **Macrotermes** Holmgren
	[Soldier major : head-length 4.15-4.20 mm, head-width 4.10-4.25 mm] ...	*M. estherae* (Desneux)
29 (28)	Labrum without a hyaline tip ; left mandible with a variably placed tooth ...	Genus **Odontotermes** Holmgren
30 (31)	Mandibles very straight, tooth on left mandible minute ...	*O. microdentatus* Roonwal & Sen-Sarma
31 (30)	Mandibles curved or sabre-shaped, tooth on left mandible prominent	
32 (41)	Head oval to subrectangularly oval ; antennae darker distally	
33 (36)	Mandibles short, index left mandible-length/head-length 0.52-0.57	
34 (35)	Anterior margin of pronotum rounded and posterior margin with a weak median depression ...	*O. guptai* Roonwal & Bose

35 (34)	Anterior margin of pronotum triangular and posterior margin straight ...	*O. bellahunisensis* Holmgren & Holmgren
36 (33)	Mandibles long, index left mandible-length/ head-length 0.60-0.70	
37 (38)	Left mandibular tooth forwardly placed, index tooth distance from tip/mandible length 0.30-0.37 ...	*O. redemanni*/*O. obesus* (Wasmann) (Rambur)
38 (37)	Left mandibular tooth backwardly placed, index tooth distance from tip/mandible length 0.39-0.46	
39 (40)	Mandibles strongly incurved in front from middle ; left mandibular tooth index 0.39-0.42 ; larger species ...	*O. brunneus* (Hagen)
40 (39)	Mandibles comparatively less so incurved from distal third ; left mandibular tooth index 0.41-0.46 ; smaller species ...	*O. wallonensis* (Wasmann)
41 (32)	Head capsule subrectangular ; antennae uniformly coloured	
42 (43)	Tooth on left mandible distinctly acute, making an angle of 60° ...	*O. indicus* Thakur
43 (42)	Tooth on left mandible laterally directed, making an angle of 90°	
44 (45)	Smaller species. Head-length 1.55-2.20 mm ; head sides subparallel. ...	*O. ceylonicus* (Wasmann)
45 (44)	Larger species. Head-length 2.30-2.60 mm ; head sides weakly convex, or converging in front	
46 (47)	Head-capsule parallel sided, somewhat convex medially ...	*O. horni* (Wasmann)
47 (46)	Head capsule converging anteriorly ...	*O. feae* (Wasmann)
48 (15)	Mandibles asymmetrical or rod-like	
49 (50)	Head with frontal protuberance ; mandibles rod-like ...	Genus **Angulitermes** Sjöstedt
	[Frontal gland large ; head-length 1.18-1.20 mm, mandible-length 1.18-1.25 mm ; labrum anteriorly deeply incurved] ...	*A. ramanii* sp. nov.
50 (49)	Head without frontal protuberance ; mandibles strongly asymmetrical, left mandible strongly twisted in the middle. ...	Genus **Dicuspiditermes** Krishna
	[Labrum deeply concave with two antero-lateral processes ; head 2.00 mm long ; antero-lateral corners of head rounded] ...	*D. obtusus* Silvestri

Systematic Account

Family Rhinotermitidae

Genus **Coptotermes** Wasmann

1. **Coptotermes heimi** (Wasmann)

Material (S., W.) and distribution : Rambha, coll : *O. B. Chhotani*, July, 1961 ; Puri and Gopalpur, coll. *G. Ramakrishna*, Feb. 1962 ; Champajuhran forest, Rairakkol, Hathisalpara, coll, *P. K. Maiti*, Dec. 1971 ; Jharsuguda, coll. *P. K. Maiti*, Jan. 1972 ; Chandbali, coll. *S. Biswas*, Feb. 1972 ; Champagarh, coll. *J. K. Sen*, Feb. 1972. Earlier records : India : Barkuda Island, Chilka Lake and almost throughout India.

Remarks : This species is noted for its destruction of wood and wooden articles and is reported from all over India. From Orissa this species has been collected from the dead trunk of *Casuarina equisetifolia*, cocoanut and banyan trees.

Genus **Heterotermes** Froggatt

2. **Heterotermes balwanti** Mathur & Chhotani

Material (S., W.) and distribution : Barkuda Island, Puri and Rambha ; coll. *O. B. Chhotani*, July, 1961. Earlier records : India : Balukhand Forest Range near Puri ; Goa.

Remarks : This is not a very common species. It is recorded from dead trunk of *Casuarina* and banyan trees and twigs lying on ground.

Family Termitidae

Genus **Speculitermes** Wasmann

3. **Speculitermes cyclops** Wasmann

Material (W.) and distribution : Joshipur, coll. *J. K. Sen*, Nov. 1972. Earlier records : India : Assam ; Madhya Pradesh ; Maharashtra ; Rajasthan ; Uttar Pradesh.

Remarks : This species dwells in soil and is a non-wood-destroying termite. In Orissa, it has been collected from loose soil. This constitutes a new record of this species from Orissa state.

4. **Speculitermes sinhalensis** Roonwal & Sen-Sarma

Material (W.) and distribution : Kathpal, coll. *R. L. Chowdhury*, Nov. 1976. Earlier records : Sri Lanka. India : Madhya Pradesh ; Tamil Nadu.

Remarks : This is also a soil inhabiting termite from Orissa. It has been collected from loose soil. This is a new record for this state.

Genus **Microcerotermes** Silvestri

5. **Microcerotermes annandalei** Silvestri

Material (*S.*, *W.*) *and distribution* : Chahala, coll. *S. Ali*, Feb., 1951 ; Barkuda Island, coll. *O. B. Chhotani*, July, 1961 ; Chhatrapur, coll. *G. Ramakrishna*, Nov. 1962. Earlier records : Barkuda Island.

Remarks : This termite is very much restricted in distribution. It nests in wooden stumps, logs, etc. but does not pose a serious problem. From Orissa it has been collected from the dead trunk of *Casaurina equisetifolia*, stumps of felled trees and twigs.

6. **Microcerotermes beesoni** Snyder

Material (S., *W.*) *and distribution* : Champajuran Forest, Haldi nulla, Bonaigarh and Rairakhol, coll. *P. K. Maiti*, Dec. 1971. Earlier records : India : Haryana ; Madhya Pradesh : Punjab and Uttar Pradesh. Pakistan.

Remarks : This species attacks wood in the open and builds nests therein. In Orissa it has also been collected from dead trunk of *Casuarina equisetifolia*. This is a new record for the state.

7. **Angulitermes ramanii** sp. nov.

(Text-fig. 1 ; Table 1)

Material : (S.) Barkuda Island, Chilka Lake, Orissa ; coll. *O. B. Chhotani*, 8. vii. 1961 ex. mound (mixed with *Microtermes obesi* Holmg.)

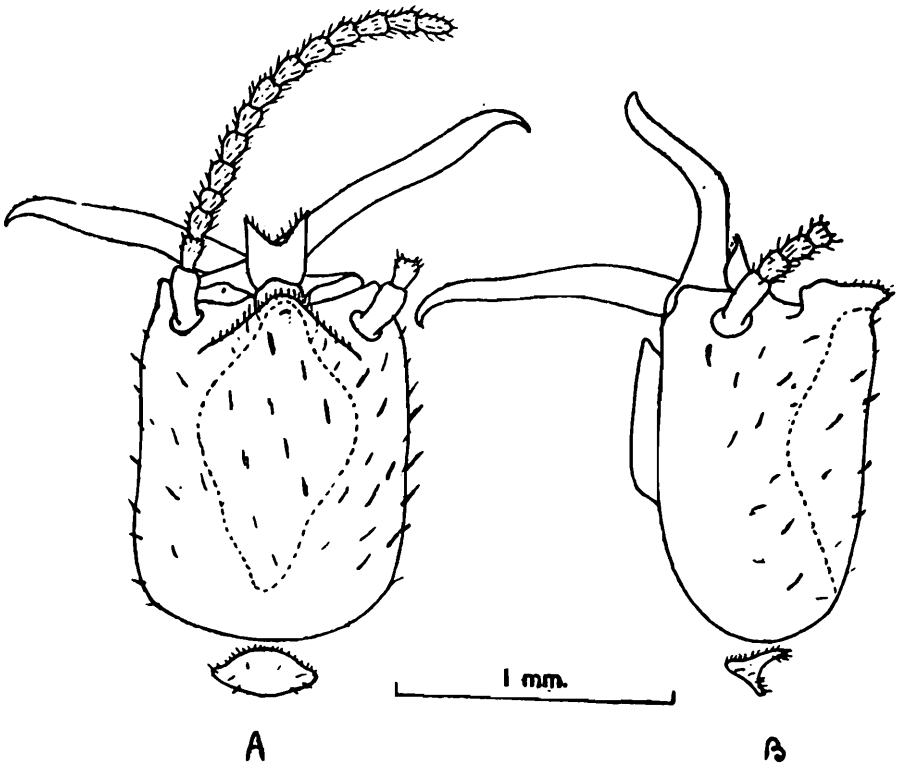
Description : 1. *Imago*.—Unknown

2. *Soldier* (Text-fig. 1 : Table 1).—Head light brown, mandibles dark reddish brown, antennae, labrum, legs and body pale yellow. Head and body moderately pilose. Total body-length 4.21-4.75 mm.

Head-capsule subrectangular, a little wider anteriorly ; longer than wide (head-length to base of mandibles 1.18-1.20 mm, head-width 0.88—0.91 mm) ; frontal projection bluntly conical, extends beyond base of mandibles. Fontanelle lying just below frontal projection and covered with hairs ; frontal gland large extending to about three fourths of head. Eyes and ocelli absent. Antennae 14-segmented, pilose ; segment 1 largest, cylindrical ; 2 less than half of 1, subequal to 3 ; 4 shortest ; from 5 gradually increasing in length and club-shaped, last (14th) oval, subequal to penultimate. Anteclypeus medially protruding, subsquarish.

Postclypeus reduced, notched. Mandibles long, slender, rod-like, bow-shaped in profile ; a little longer than head-length to mandible-

base ; left mandible broad near apex on inner margin, apex drawn out to a beak ; right mandible thin, with apex drawn out to a short beak. Labrum : subrectangular (length 0.23—0.26 mm ; width 0.23 mm) ; anterior margin deeply concave ; lateral processes pointed. Postmentum subrectangular, with slight constriction near base. Pronotum saddle-shaped, much broader than long, narrower than head ; anterior lobe



Text-fig. 1. *ulitermes* sp. nov. Soldier. (A) Head and pronotum dorsal view, (B) Head and pronotum, side view.

upturned, with weak median notch. Legs thin, pilose ; apical tibial spurs 3 : 2 : 2. Abdomen oval, pilose ; cerci 2-jointed, 0.09 mm long ; styli absent.

3. *Worker* : Unknown

Type-specimens : Holotype S. (Z. S. I., Reg. No. 2370/H11) and one paratype S. (Z. S. I. Reg. No. 2371/H11) in two vials, vide material above, deposited in National Zoological Collections, Zoological Survey of India, Calcutta.

Type-locality and Distribution : India : Orissa, Barkuda Island, Chilka lake (Type-locality), known only from the type-locality.

Affinities : The soldier of *Angulitermes ramanii* sp. nov. is close to that of *Angulitermes obtusus* Holmgren & Holmgren but is separable

by the following characters :—(i) Size larger (head length 1.18-1.20 mm. vs. 1.12-1.14 mm in *obtusus*). (ii) Mandibles shorter, length 1.25 mm, stouter and curved on outer margin vs. longer, length 1.27-1.30 mm and not so curved. (iii) Frontal gland large, covering three fourth of head vs. smaller, covering only about half of head. (iv) Frontal protuberance more acute. (v) Labrum deeply incurved anteriorly vs. shallowly incurved in *obtusus*.

TABLE 1. Measurements (in mm) etc. of soldier of *Angulitermes ramanii* sp. nov.

Body parts	Range (2 exs)	Holotype
1. Total body-length (excluding antennae) ...	4.20-4.75	4.20
2. Length of head to lateral base of mandibles ...	1.18-1.20	1.20
3. Length of head to frontal projection ...	1.28-1.33	1.33
4. Length of protuberance ...	0.13-0.15	0.15
5. Maximum width of head ...	0.88-0.91	0.88
6. Maximum height of head ...	0.70-0.73	0.70
7. Head Index (Width/Length) ...	0.74-0.75	0.74
8. Head Index (Height/Width) ...	0.79-0.80	0.79
9. Head Index (Height/Length) ...	0.58-0.60	0.58
10. Maximum length of labrum ...	0.23-0.26	0.26
11. Maximum width of labrum ...	0.23	0.23
12. Length of mandibles (from upper base of condyle to tip)		
(a) Left mandible ...	1.25	1.25
(b) Right mandible ...	1.18-1.23	1.18
13. Head-mandibular length Index (left-mandible-length/Head-Length) ...	1.04-1.05	1.04
14. Minimum median length of postmentum ...	0.50	0.50
15. Maximum width of postmentum ...	0.31-0.32	0.32
16. Width of postmentum at waist ...	0.26-0.28	0.26
17. Maximum length of pronotum ...	0.19-0.20	0.20
18. Maximum width of pronotum ...	0.48-0.50	0.48

Genus **Macrotermes** Holmgren

8. **Macrotermes estherae** (Desneux)

Material *(Im, S., W.) and distribution* : Barkuda Island and Rambha, coll. *O. B. Chhotani*, July, 1961. Earlier records : India : Peninsular India.

Remarks : This species attacks wood in the open but generally it is subterranean in habit. In Orissa, it was collected from small heaps of loose soil while returning from foraging expeditions to the nest in the evening. This is a new record for the state.

Genus **Odontotermes** Holmgren

9. **Odontotermes assmuthi** Holmgren

Material (S., W.) and distribution : Barkuda Island, coll. *O. B. Chhotani*, July 1961 ; Ghatgaon, coll. *J. K. Sen*, Nov. 1972 ; Bisoi, coll. *S. K. Gupta*, March, 1973 ; Lulung, coll. *D. P. Sanyal*, Dec. 1975. Earlier records : Recorded from all over India. Also Pakistan and Bangla Desh.

Remarks : It is generally a non-mound building subterranean termite. It attacks logs in the open and is a pest of sugarcane. In Orissa this species was collected from rotten logs of unidentified plants.

10. **Odontotermes bellahunisensis** Holmgren & Holmgren

Material (S., W.) and distribution : Chahala, coll. *A. K. Mondal*, Jan. 1971 ; Lulung, Ghatgaon, coll. *D. P. Sanyal & A. K. Sarkar*, Dec. 1975. Earlier records : India : Karnataka, Rajasthan and Tamil Nadu.

Remarks : This is also a non-mound building termite and attacks dead woods. In Orissa the species has been collected from the rotten logs of unidentified trees.

11. **Odontotermes brunneus** (Hagen)

Material (S., W.) and distribution : Biswanathpur, coll. *A. K. Mondal*, July, 1974. Earlier records : Andhra Pradesh, Bihar, Karnataka, Maharashtra, Rajasthan, Tamil Nadu and West Bengal.

Remarks : This species usually builds mounds and attacks wood lying in the open. Here this species was collected from rotten logs of unidentified plants. This species is a new record for the state.

12. **Odontotermes ceylonicus** (Wasmann)

Material (S., W.) and distribution : Rairakhol, coll. *P. K. Maiti*, Dec. 1971 ; Kotabangi, coll. *K. V. Surya Rao*, Jan. 1972 ; Lathore, coll. *D. P. Sanyal*, Nov. 1972 ; Ghatgaon, coll. *D. P. Sanyal & A. K. Sarkar*, Dec. 1975. Earlier records : India : Southern India.

Remarks : This species is very much restricted in distribution. In Orissa it has been collected from soil and forms first record of this species from the state.

13. **Odontotermes feae** (Wasmann)

Material *(Q., K. S. W.) and distribution* : Barkuda Island, coll. *N. Annandale*, June, 1920, and *O. B. Chhotani*, July, 1961 ; Badrama, coll. *D. P. Sanyal*, June, 1972. Earlier records : India : Andhra Pradesh, Kerala, Rajasthan, Tamil Nadu, Tripura, West Bengal.

Remarks : This is a serious pest of timbers. It attacks woods of different trees. In Orissa also this species was collected from rotten logs.

14. **Odontotermes horni** (Wasmann)

Material *(S., W.) and distribution* : Sambalpur, Bolangir, Rairakhol, and Sundergarh, coll. *P. K. Maiti*, Dec. 1971-Jan. 1972 ; Badrama, coll. *K. Rai*, Sept. 1972 ; Ghatgaon, Joshipur and Tikripara, coll. *J. K. Sen* ; Nov. 1972 ; Posighat, Baiganpal, coll. *S. K. Gupta*, March 1973 ; Sonepur, coll. *S. Biswas*, Jan. 1975 ; Dhenkikote and Lulung, coll. *D. P. Sanyal & A. K. Sarkar*, Dec. 1975. Earlier records : Southern and Eastern India.

Remarks : This is a subterranean species, builds nests underground, attacks wood and does a lot of damage. In Orissa the species has been collected mainly from rotten logs. This species also forms a new record for the state.

15. **Odontotermes microdentatus** Roonwal & Sen-Sarma

Material *(S., W.) and distribution* : Chahala, coll. *A. K. Mondal*, Jan. 1971. Earlier record : India : Bihar ; Himachal Pradesh ; Madhya Pradesh ; Uttar Pradesh.

Remarks : This termite builds mounds but also attacks wood when comes in contact with it. In Orissa it has been collected from a mound.

16. **Odontotermes obesus** (Rambur)

Material *(K., Q., S., W.,) and distribution* : Satpura, coll. *B. S. Lamba*, Dec. 1960 ; Rambha, coll. *O. B. Chhotani*, July, 1961 ; Mahanadi estuary, coll. *N. V. Subba Rao*, March, 1964 ; Barkuda Island, coll. *K. N. Nair*, Feb. 1969 : Chandipur, and Puri, coll. *V. K. Premkumar*, Jan.-Feb. 1972 ; Sonapalli, Subàlia Kangra, Balijuri and Grandarail, coll., *P. K. Maiti*, Dec. 1971-Jan. 1972 ; Attgarh, coll. *S. K. Mitra*, August, 1972 ; Badrama, Deogarh, Panposh, Harishankar Hill and Lathore, coll. *D. P. Sanyal*, May-June, 1972 ; Tikrapara, Nimapatha and Balugaon,

coll. *Y. Chaturvedi*, Sept.-Oct. 1972 ; Padmapore, Joshipur, coll. *J. K. Sen*, Nov. 1972 ; Angul, coll. *K. Rai*, Sept. 1972 ; Khantapara, coll. *B. C. Saha*, Sept. 1974 ; Puranokot, Denkanol and Denkikote, coll. *D. P. Sanyal & A. K. Sarkar*, Dec. 1975-Jan. 1976 ; Pudamani, Kathpal, Rangamati, Taptipuri, Dighapahandi, and Lulung, coll. *R. L. Chowdhury*, Feb.-March, 1976. Earlier records : Throughout India, Pakistan and Bangla Desh.

Remarks : This is the most widely distributed and abundant species of termites. It builds mounds and is a serious pest of crops and forestry. From Orissa it has been collected from both mounds and from dead woods.

17. **Odontotermes wallonensis** (Wasmann)

Material (S., W.) and distribution : Sambalpur, and Rourkela, coll. *P. K. Maiti*, Dec. 1971 ; Bandigarh, coll. *S. Biswas*, Jan. 1975. Earlier records : India : Madhya Pradesh ; Maharashtra ; Gujarat ; Rajasthan ; Karnataka ; Tamil Nadu ; Uttar Pradesh.

Remarks : This is a mound-building termite and often attacks wood. From Orissa the species has been collected from woods and mounds.

Genus **Microtermes** Wasmann

18. **Microtermes obesi** Holmgren

Material (S., W.) and distribution : Rambha and Barkuda Island, coll. *O. B. Chhotani*, July, 1961 ; Panposh, Graundarail and Sambalpur, coll. *P. K. Maiti*, Dec. 1971-Jan. 1972. Earlier records : Throughout India. Also Pakistan, Bangla Desh, Burma and Thailand.

Remarks : Usually this species forms subterranean nests but sometimes attacks wood and crop plants also and causes heavy damages. From Orissa it was collected from dead wood and nesting in mounds of *O. feae* and *O. obesus*.

Genus **Nasutitermes** Dudley

19. **Nasutitermes fletcheri** (Holmgren & Holmgren)

Material (S., W.) and distribution : Puri, coll. *A. K. Mondal*, July, 1973. Earlier records : India : Peninsular India.

Remarks ; This species generally builds nests in dead wood in the open area. From Orissa also this species has been collected from dead wood. This species is a new record for the state.

Genus **Trinervitermes** Holmgren

20. **Trinervitermes biformis** (Wasmann)

Material (S., W.) and distribution : Barkuda island, coll. *O. B. Chhotani*, July, 1961. Earlier records : India : Andhra Pradesh ; Karnataka ; Madhya Pradesh ; Maharashtra ; Rajasthan ; Tamil Nadu.

Remarks : This species generally forms subterranean nests but sometimes also builds small mounds. In Orissa it has been collected from diffuse soil under stones. This species also forms a new record for the state.

Distribution of Termites in Orissa

(Text-figs. 2 and 3 ; Table 2)

The state of Orissa has an area of about 1,55,782 sq km and physiographically it is of heterogenous character. It's geological formations vary from the oldest rocks of the earth crust in the stable land-mass of the Indian peninsula to the deltaic alluvium or littoral deposits and ridges of wind blown sand on the seaboard.

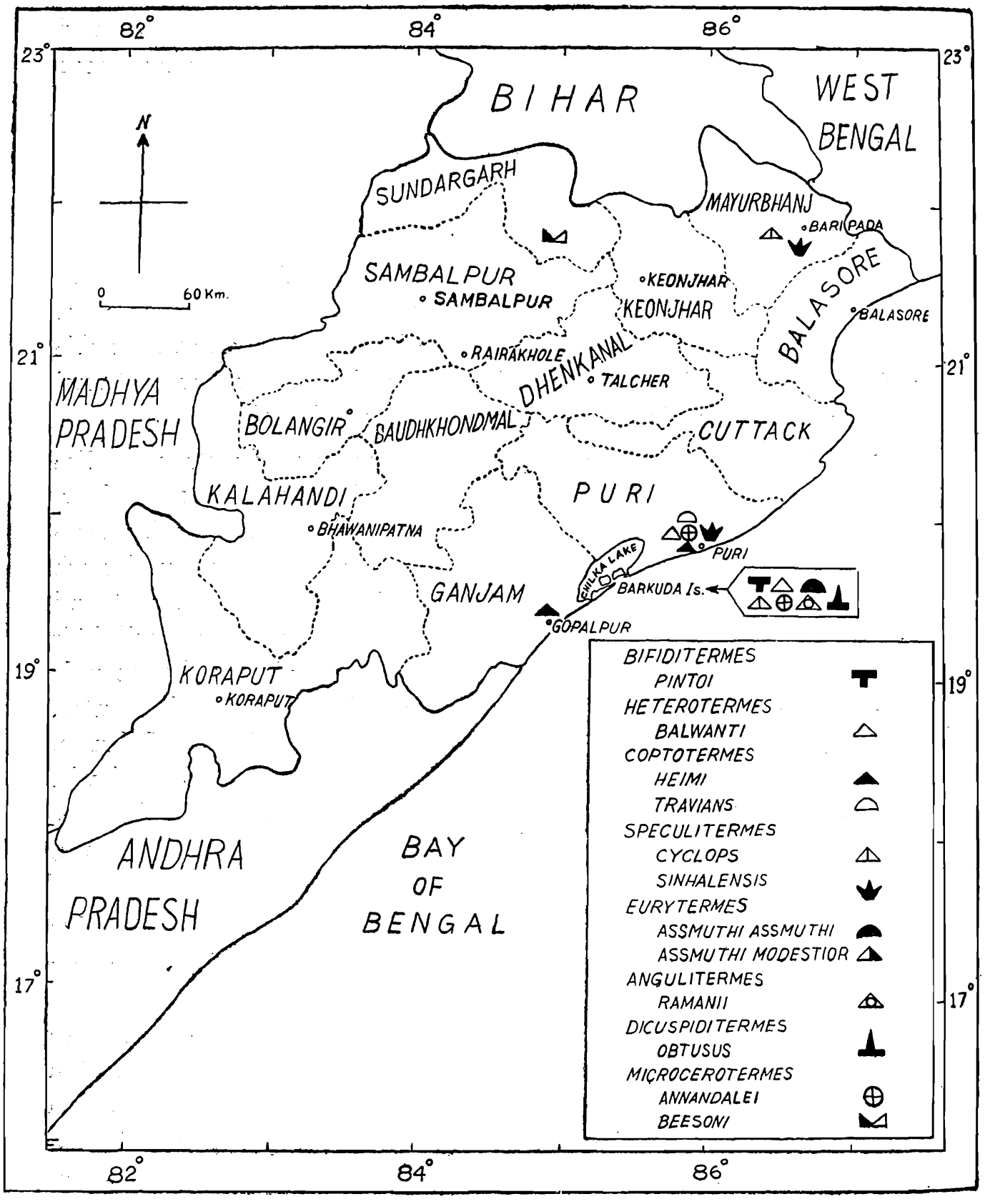
Broadly the state can be divided into four natural divisions, (i) The Northern plateau ; (ii) the Eastern ghat ; (iii) the central tract ; and (iv) the coastal plains. The Northern plateau is an extension of the Chotanagpur plateau covering the Mayurbhanj, Keonjhar and Eastern Sundergarh areas. The upper parts of the rivers Subarnarekha, Baitarini and Brahmani lie in this area and its central portion has many small hills and forests. The Eastern ghat forms an uneven plateau that extends over Koraput, parts of Kalahandi, Baudhkhondmals and Ganjam districts. The Central tract covers the districts of Sambalpur, Bolangir, Dhenkanol and parts of Kalahandi, Sundergarh and Baudhkhondmals. The rivers Mahanadi, Brahmani and Baitarini and their tributaries flow through the area. The landscape consists of succession of plateau, hills, uplands and valleys. The coastal plains cover the districts of Balasore, Cuttack, Puri and parts of Ganjam. This fertile area runs parallel to the coast and contains the river deltas formed of alluvium and silt.

The pattern of distribution of termite species from these areas also varies according to the topography of the area. From the distribution pattern of the various species in different natural divisions, we find that the Kalotermitidae is restricted to the coastal tract. The Rhinotermitidae is represented by only one species i. e., *Coptotermes heimi* (Wasmann) in the Northern plateau and Eastern ghat and by three species viz., *Coptotermes heimi* (Wasmann), *Coptotermes travians* Haviland

TABLE 2. Distribution of termites in the four natural divisions of the state of Orissa.

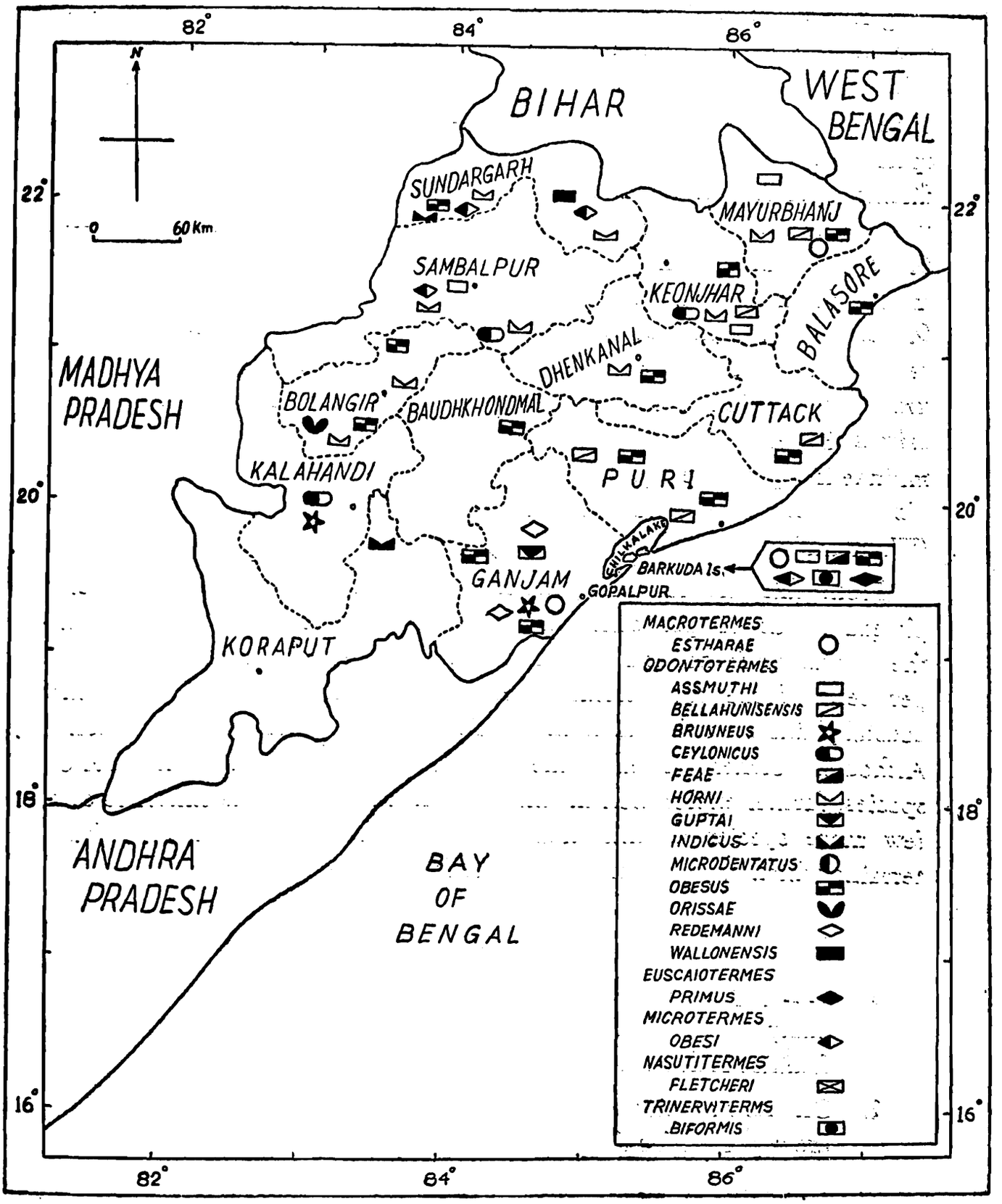
Northern plateau	*Eastern ghat*	*Central tract*	*Coastal plains*
Family KALOTERMITIDAE	Family KALOTERMITIDAE	Family KALOTERMITIDAE	Family KALOTERMITIDAE
Nil	Nil	Nil	*Bifiditermes pintoi* (Kemner)
			Cryptotermes dudleyi Banks
Family RHINOTERMITIDAE	Family RHINOTERMITIDAE	Family RHINOTERMITIDAE	Family RHINOTERMITIDAE
Coptotermes heimi (Wasmann)	*Coptotermes heimi* (Wasmann)	Nil	*Heterotermes balwanti* Mathur & Chhotani
			Coptotermes heimi (Wasmann)
			Coptotermes travians Haviland
Family TERMITIDAE	Family TERMITIDAE	Family TERMITIDAE	Family TERMITIDAE
Speculitermes cyclops Wasmann	*Macrotermes estherae* (Desneux)	*Odontotermes feae* (Wasmann)	*Eurytermes assmuthi assmuthi* Wasmann
Speculitermes sinhalensis Roonwal	*Odontotermes brunneus* (Desneux)	*Odontotermes horni* (Wasmann)	*Eurytermes assmuthi modestior* Silvestri
			Angulitermes ramanii sp. nov.
Microcerotermes beesoni Snyder	*Odontotermes ceylonicus* (Wasmann)	*Odontotermes obesus* (Rambur)	*Dicuspiditermes obtusus* (Silvestri)
Odontotermes assmuthi Holmgren	*Odontotermes indicus* Thakur	*Odontotermes wallonensis* (Wasmann)	*Microcerotermes annandalei* Silvestri
			Microcerotermes beesoni Snyder
Odontotermes bellahunisensis Holmgren & Holmgren	*Odontotermes obesus* (Rambur)	*Microtermes obesi* Holmgren	*Macrotermes estharae* (Desneux)
			Odontotermes assmuthi Holmgren
Odontotermes ceylonicus (Wasmann)	*Odontotermes orissae* Snyder		*Odontotermes bellahunisensis* Holmgren & Holmgren
			Odontotermes feae (Wasmann)
Odontotermes microdentatus Roonwal & Sen-Sarma	*Odontotermes redemanni* (Wasmann)		*Odontotermes guptai* Roonwal & Bose
Odontotermes obesus (Rambur)	*Microtermes obesi* Holmgren		*Odontotermes obesus* (Rambur)
Odontotermes wallonensis (Wasmann)			*Odontotermes redemanni* (Wasmann)
Odontotermes indicus Thakur			*Euscaiotermes primus* Silvestri
Microtermes obesi Holmgren			*Microtermes obesi* Holmgren
			Nasutitermes fletcheri (Holmgren & Holmgren)
			Trinervitermes biformis (Wasmann)

and *Heterotermes balwanti* Mathur & Chhotani in the coastal plains. In the Eastern ghat and central tract, the subfamily Apicotermitinae is absent and is represented in the Northern plateau by two species viz., *Speculitermes cyclops* Wasmann and *Speculitermes sinhalensis* Roonwal & Sen-Sarma and in the coastal plains by two subspecies i. e.,



Text-fig. 2. Map showing the distribution of termites in Orissa.

Eurytermes assmuthi assmuthi Wasmann and ***Eurytermes assmuthi modestior*** Silvestri. The subfamily Termitinae is absent in the Eastern ghat and central tract, in the Northern plateau it is known by only one species, *Microcerotermes beesoni* Snyder but in the coastal plain by four species i. e., *Microcerotermes annandalei* Silvestri, *Microcerotermes*



Text-fig. 3. Map showing the distribution of termites in Orissa.

beesoni Snyder, *Dicuspiditermes obtusus* (Silvestri) and *Angulitermes ramanii* sp. nov. The Macrotermitinae is less prominent in the central tract, being represented by *Odontotermes feae* (Wasmann), *Odontotermes horni* (Wasmann), *Odontotermes obesus* (Rambur), *Odontotermes wallonensis* (Wasmann) and *Microtermes obesi* Holmgren. In the Eastern ghat it is represented by *Macrotermes estharae* (Desneux), *Odontotermes brunneus* (Hagen), *Odontotermes ceylonicus* (Wasmann), *Odontotermes indicus* Thakur, *Odontotermes obesus* (Rambur), *Odontotermes orissae* Snyder, *Odontotermes redemanni* (Wasmann) and *Microtermes obesi* Holmgren. In Northern plateau and coastal plain, this subfamily is well represented by several species of common occurence in both regions besides a few other distinct species. The common species to both these regions are *Odontotermes assmuthi* Holmgren, *O. bellahunisensis* Holmgren & Holmgren, *O. obesus* (Rambur) and *Microtermes obesi* Holmgren. Besides these, in the Northern plateau the species *Odontotermes ceylonicus* (Wasmann), *O. horni* (Wasmann), *O. microdentatus* Roonwal & Sen-Sarma, *O. wallonensis* (Wasmann), *O. indicus* Thakur and in the coastal plains *Macrotermes estherae* (Desneux), *Odontotermes feae* (Wasmann), *Euscaiotermes primus* Silvestri, *O. redemanni* are present. The subfamily Nasutitermitinae is represented in the coastal plains by only two species i. e., *Nasutitermes fletcheri* (Holmgren & Holmgren) and *Trinervitermes biformis* (Wasmann).

From this distribution pattern it is seen that in the Northern plateau about 42 per cent, in the Eastern ghat about 29 per cent, in the central tract about 16 per cent and in the coastal plains about 68 per cent of the total termite species are represented. As such, the coastal plains are richer in termite fauna than the other natural divisions. Although Northern plateau comes next to coastal plains in number of species, further exploration in this region may reveal the existence of a few more species as this area is covered by forests and low hilly terrains which suggests an ideal abode for termites.

Summary

1. This paper deals with the termite fauna of the Orissa state. As many as 31 species are now known and these belong to the families Kalotermitidae, Rhinotermitidae and Termitidae.
2. One new species, *Angulitermes ramanii* is described and eight are reported for the first time from the state.
3. The distribution of termites in the various natural divisions of the state is discussed. The species *Odontotermes obesus* (Rambur) has been found to be very extensively distributed throughout.

4. A key to the identification of all the species has been provided ; it is based on soldier's characters.

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