EXTERNAL MORPHOLOGY OF THE TERMITE, *ODONTOTERMES OBESUS* (RAMBUR) (ISOPTERA : TERMITIDAE). PART 3. CHAETOTAXY OF THE SOLDIER, WORKER AND ALATE CASTES

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(With 13 Tables, 25 Text-figures, and 5 Plates)

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I—Introduction

The chaetotaxy (*i.e.*, the arrangement and distribution of the bristle-like hairs or chaetae on the various external body-parts) has been extensively studied in some insect groups, *e.g.*, Diptera adults by Osten-Sacken (1884), Williston (1908), Walton (1909); Lepidoptera larvae by Hinton (1946), Singh (1953), etc., and has been found to be of considerable use in taxonomic differentiation between species of higher groups. No such study has so far been made for the Isoptera. As a first step, the chaetotaxy in the common mound-building termite, *Odontotermes obesus* (Rambur) (Isoptera : Termitidae), was studied. For the general external morphology of this species, see Kushwaha (1955; 1959, 1960*a*, *b*).

Acknowledgments.—My sincere thanks are due to Dr. M. L. Roonwal, formerly Chief Research Officer (Forest Entomologist), Forest Research Institute, Dehra Dun, and presently Director, Zoological Survey of India, Calcutta, for his guidance and supervision during the progress of the work and for laboratory facilities. I am also very grateful to the Additional Chief Secretary, Government of Rajasthan for according me Government permission to continue my research work besides my teaching duties. I am highly indebted to Dr. S. Venkatachary, Professor of Botany, Maharana Bhupal College, Udaipur, for the assistance he kindly rendered in the photomicrographs besides other valuable suggestions. My thanks are also due to Shri Balwant Singh, Research Assistant (I), Dehra Dun, and my colleague Shri B. K. Kaul at S. K. N. Agricultural Institute, Jobner, for kind suggestions.

II—Material and Methods

The material for the study of the soldiers, workers, and alates was collected from mounds in the areas of New Forest and Jhajra Forest near Dehra Dun (U.P.), *ca.* 600 metres above sea level.

Twenty-five specimens of each caste were studied, except in the case of the soldier labrum where 40 specimens were examined as this structure showed greater variability than the other body-parts. It was observed that the arrangement of bristles resembles each other closely in the case of workers and alates in the head region and in the case of soldier and worker in the thoracic and abdominal regions. Careful observations have been made under high magnification in locating the bristles since they easily fall off leaving only their scars behind. In case any scar was observed it was taken into consideration, according to its size, to represent a bristle of comparable size in that area. In order to be more exact in relative size and location of the various bristles, photomicrographs were taken in almost all cases.

III—Head

(a) *General*

In the study of chaetotaxy of the head only those parts which depict prominent constancy of arrangement of bristles have been discussed. Mainly the large and differentiated bristles have been discussed but some smaller ones which show characteristic location have also been considered.

A nomenclature comprising of Arabic numerals has been used for the labral bristles, but in most other cases the bristles have been named according to their location on a body-part. In the study of bilateral arrangement, which was commonly observed in the case of these large bristles, individual aberrations have been observed in some cases.

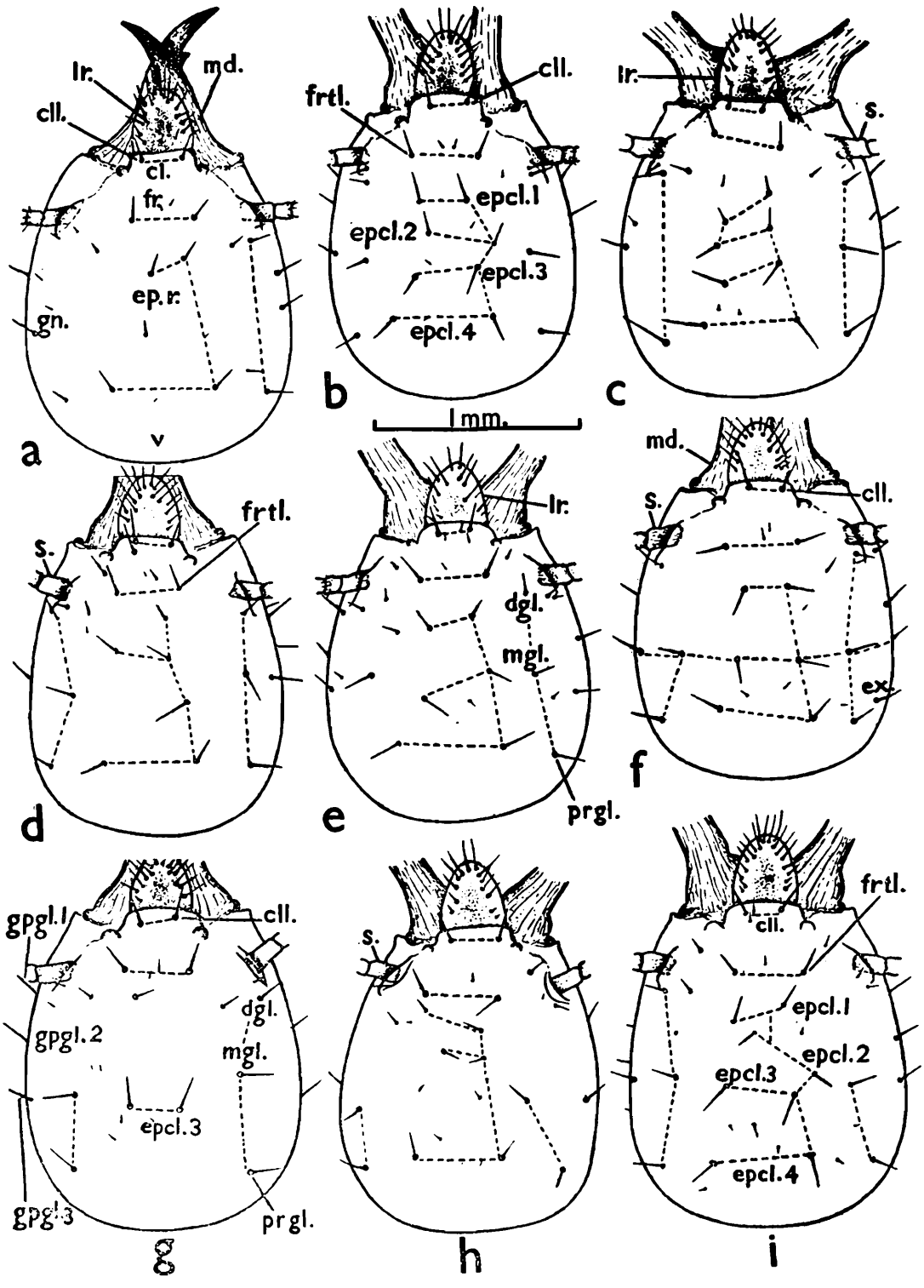
(b) *Chaetotaxy of the head-capsule*

1. *Soldier* (Text-figs. 1*a-i* ; 2*a-f*).—In general the soldier head-capsule or cranium is sparsely bristled. In absence of the various sutures demarcating the definite cranial areas the location of the various bristles in these has been approximately considered and named correspondingly. The percentage of their occurrence has been calculated (Table 1) on the basis of 25 specimens to show their frequency. In border cases where their location may correspond to two or more cranial areas, the nomenclature has been adapted to suit convenient description in order to avoid confusion.

TABLE 1.—*Percentage of individuals of soldier caste of* Odontotermes obesus (*Rambur*), *showing the different larger cranial bristles on the basis of* 25 *specimens examined.*

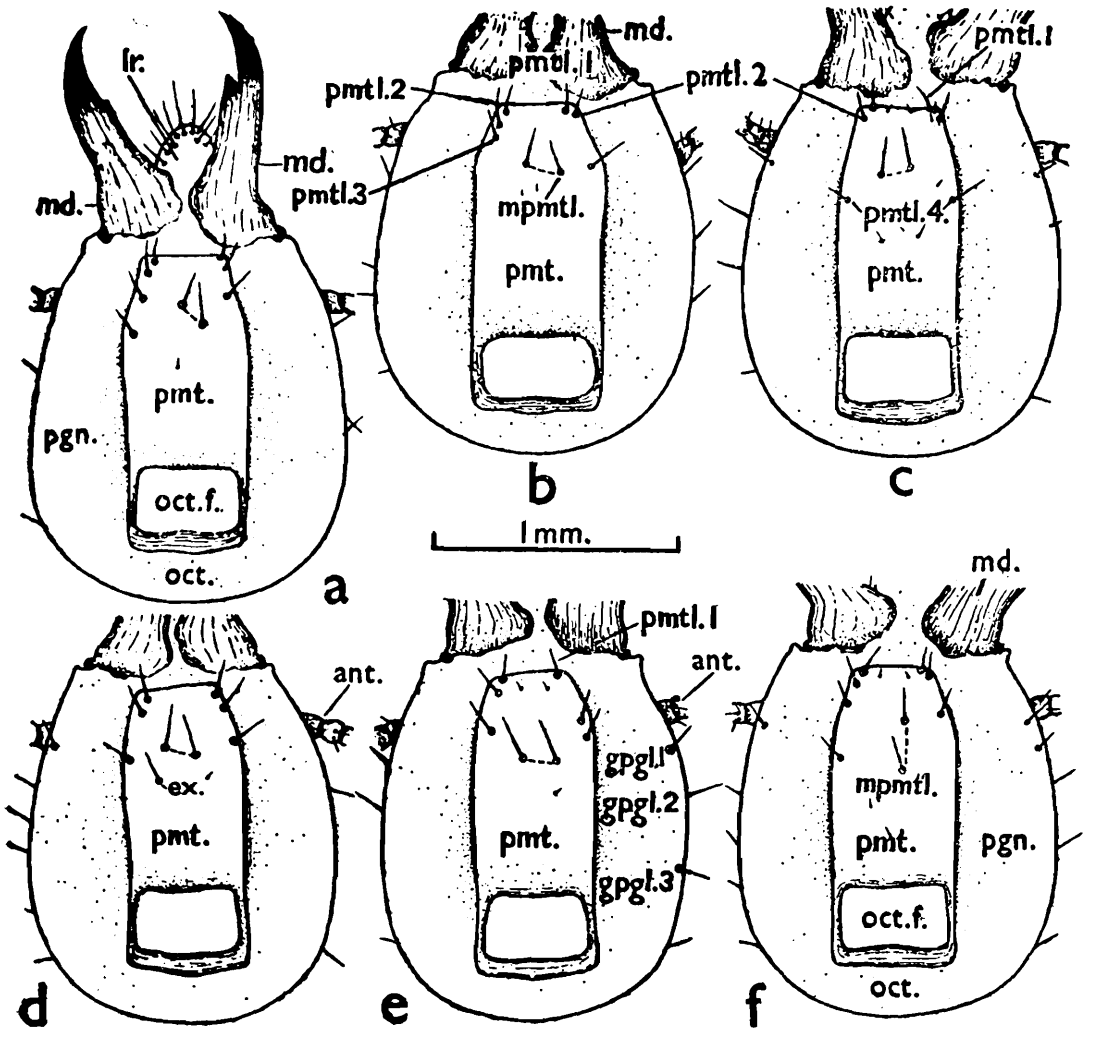
Nomenclature of bristles.	Abbreviations used.	Per cent. of individuals with bilateral symmetry.	Per cent. of individuals with asymmetry.		Per cent. of individuals with both the bristles absent.
			Only left bristle present.	Only right bristle present.	
clypeal	*cll.*	100	—	—	—
frontal	*frtl.*	100	—	—	—
epicranial 1	*epcl.* 1	92	—	8	—
epicranial 2	*epcl.* 2	16	—	—	
epicranial 3	*epcl.* 3	88	4	8	—
epicranial 4	*epcl.* 4	96	—	—	4
medio-genal	*mgl.*	96	—	—	4
proximo-genal	*prgl.*	88	—	8	4
geno-postgenal 1	*gpgl.* 1	56	12	16	16
geno-postgenal 2	*gpgl.* 2	76	—	16	8
geno-postgenal 3	*gpgl.* 3	76	12	12	—

Note.—In case any bristle was of comparatively much smaller size than normal it was counted towards asymmetry.



TEXT-FIG. 1.—*Odontotermes obesus* (Rambur), soldier caste.

(*a*). Dorsal view of the cranium, showing only a few symmetrical pairs of large bristles. (*b*). Ditto, showing nearly all the symmetrical pairs of large bristles. (*c*). Ditto, showing all the symmetrical pairs medially but some lateral bristles missing. (*d*). Ditto, showing asymmetry in respect to some medial as well as lateral pairs of large bristles. (*e*). Ditto, showing asymmetry in respect of some lateral pairs including *prgl.* and total absence of the pair *epcl.* 2 medially. (*f*). Ditto, showing nearly all the pairs except *epcl.* 2. An *exrta bristle* (*ex.*) adjacently outwards to the right *prgl.* has been observed in this specimen alone. Also note the transverse row formed by the paired bristles, namely, *epcl.* 3, *mgl.* and *gpgl.* 3, and another row posteriorly by *epcl.* 4 and *prgl.* (*g*). Ditto, showing more symmetry in respect of lateral pairs of bristles. Of the 4 pairs of epicranial bristles only *epcl.* 3 is located symmetrically, the *epcl.* 2 and *epcl.* 4 being entirely absent. (*h*). Ditto, showing comparatively an asymmetrical location of the various bristles mf the different pairs. (*i*). Ditto, showing asymmetrical location of the *epcl.* 2, oost of the other pairs being located more symmetrically.



TEXT-FIG. 2.—*Odontotermes obesus* (Rambur), soldier caste.

(*a*). Ventral view of the cranium, showing lateral postmental (*pmtl.*) and medio-postmental (*mpmtl.*) bristles, the left bristle of the fourth postmental pair (*pmtl.* 4) being absent. (*b*). Ditto, showing asymmetrical location of the bristles of the third postmental pair (*pmtl.* 3), whereas the fourth pair (*pmtl.* 4) being entirely missing. (*c*). Ditto, showing the third pair of postmental bristles (*pmtl.* 3) missing, whereas the fourth pair (*pmtl.* 4) shows bilateral symmetry which has been rarely observed. (*d*). Ditto, showing the fourth pair of postmental bristles missing and an *extra bristle* (*ex.*) located posterior to *mpmtl.*, pair. (*e*). Ditto, showing the fourth pair of postmental bristles (*pmtl.* 4) missing and the individual bristles of the second postmental pair (*pmtl.* 2) located somewhat asymmetrically. The geno-postgenal bristles (*gpgl.*) are also shown approximately in their usual location. (*f*). Ditto, showing the left bristle of the fourth postmental pair (*pmtl.* 4) missing and the medio-postmental pair showing an asymmetrical location of its bristles.

Except the vertex, all the dorsal cranial areas *i.e.*, clypeus, frons and epicranial area medially and the genae laterally show some conspicuously elongated bristles arranged more or less in symmetrical pairs in addition to some smaller ones occurring here and there.

A symmetrical pair of large *clypeal bristles* (*cll.*), located about the median transverse line separating the *anteclypeus* (*acl.*) from the *postclypeus* (*pcl.*), was present in all the 25 individuals examined (Table 2). In a line between these, or posteriorly on the postclypeus, are a few more bristles, singly or paired, mostly distributed irregularly. There is no bristle on the anteclypeus.

TABLE 2.—*Percentage of individuals showing various proportions of different labral bristles (both smaller and larger) and clypeal bristles (largest anterior-most pair) in the soldier caste of* Odontotermes obesus *(Rambur). Based on* 40 *specimens.*

For explanations, also see "Abbreviations used in Text-figures and Tables" *infra.*

Nomenclature of bristles starting from apical end.	Percentage of individuals having complete set of left bristle.	Percentage of individuals having complete set of right bristle.	Percentage of individuals showing bilateral symmetry in regard to different bristles.
ap.	100	100	100
1	100	100	100
2	97·5	100	97·5
3	95	100	95
4	97·5	97·5	95
5	87·5	90	77·5
6	75	87·5	62·5
7	82·5	95	77·5
8	80	85	67·5
9	60	75	47·5
10	47·5	35	27·5
11	17·5	12·5	10
12	5	2·5	2·5
cll.	100	100	100
G (4-5)	10 per cent.		12·5 per cent.
G (3-4)	2·5 per cent.		

The *frons* (*fr.*) similarly shows a single pair, with bilaterally symmetrical bristles in 100% individuals, more or less in line with the two *antennal foveolae* (*ant. f.*) and called the *frontal bristles* (*frtl.*).

The *epicranial region* (*ep.*) has four pairs of larger bristles named from anterior region posteriorly as *epicranial 1* (*epcl. 1*), *epicranial 2* (*epcl. 2*), *epicranial 3* (*epcl. 3*) and *epicranial 4* (*epcl. 4*) with 92%, 16%, 88% and 96% bilateral symmetry. Evidently, the *second pair* (*epcl. 2*) has been observed only rarely with its individual bristles relatively asymmetrical in their location. Of all these epicranial pairs, the individual bristles of the *fourth pair* (*epcl. 4*) are located the widest apart.

The *vertex* (*v.*) is naked, showing no bristles.

The *genae* (*gn.*) show medially a pair of bristles. Each bristle is located more or less symmetrically on either side of the *third epicranial pair* (*epcl. 3*) outwards and called the *medio-genal pair* (*mgl.*), showing 96% bilateral symmetry. Another pair of bristles has been observed proximally on the genae at the rounded postero-lateral corners of the cranium dorsally. Each of these bristles is located on either side more or less at the level of the *fourth epicranial pair* (*epcl. 4*) and called the *proximo-genal pair* (*prgl.*) with 88% bilateral symmetry.

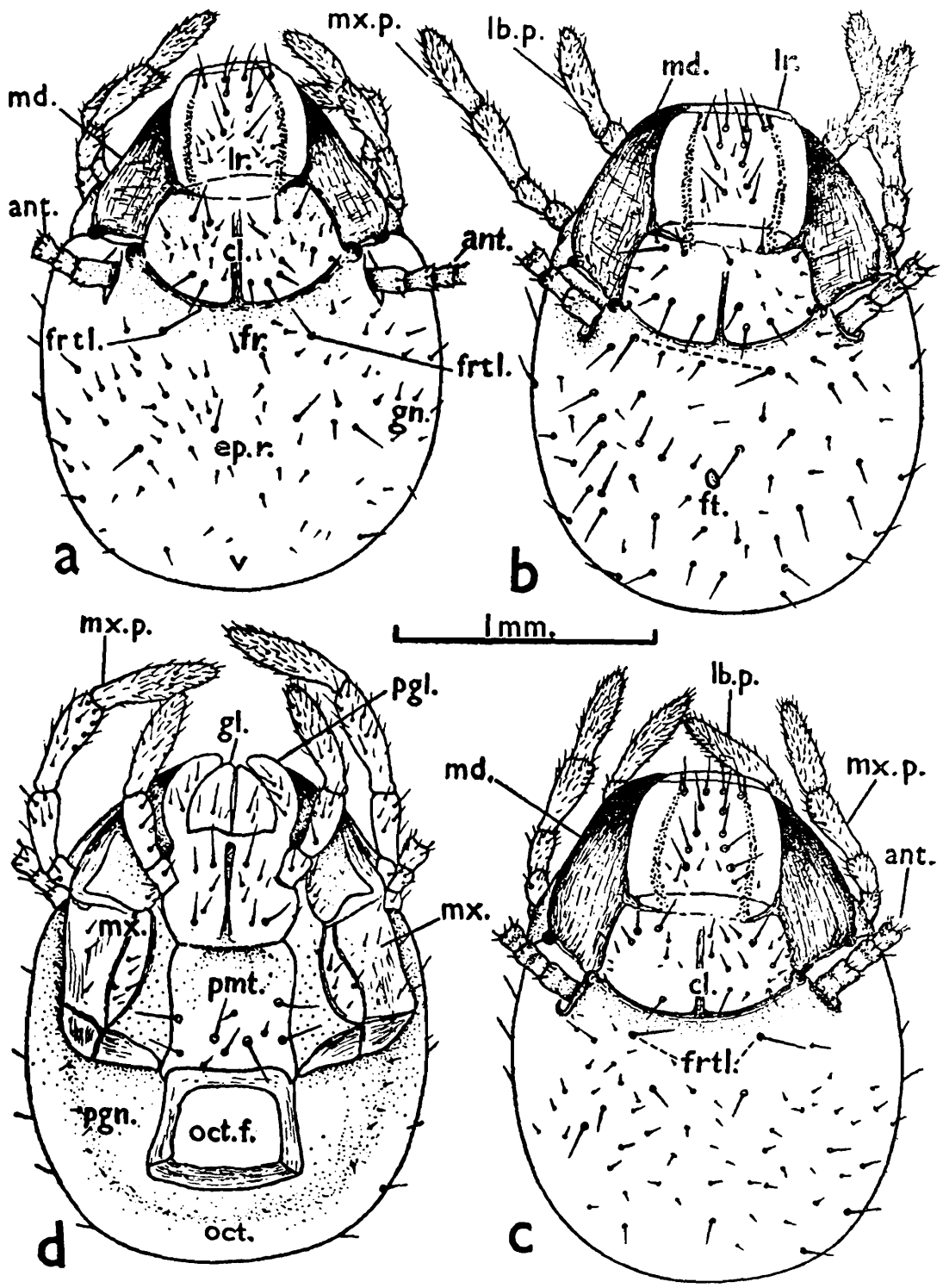
Occasionally, a few smaller bristles have been observed near the antennal foveolae or other regions dorsally.

Ventrally the labium and the postgenae show some regular symmetrical pairs, whereas the occiput and postocciput are almost naked. The labial bristles show a comparatively more regular and symmetrical occurrence than the postgenal bristles and would be discussed under the chaetotaxy of head-appendages.

The postgenal bristles are located more or less at the extreme lateral margins of the postgenae confluent with the genae dorsally and thus named as *geno-postgenal bristles,* numbered from anterior cranial margin posteriorly. The *first geno-postgenal bristle* (*gpgl. 1*) is located

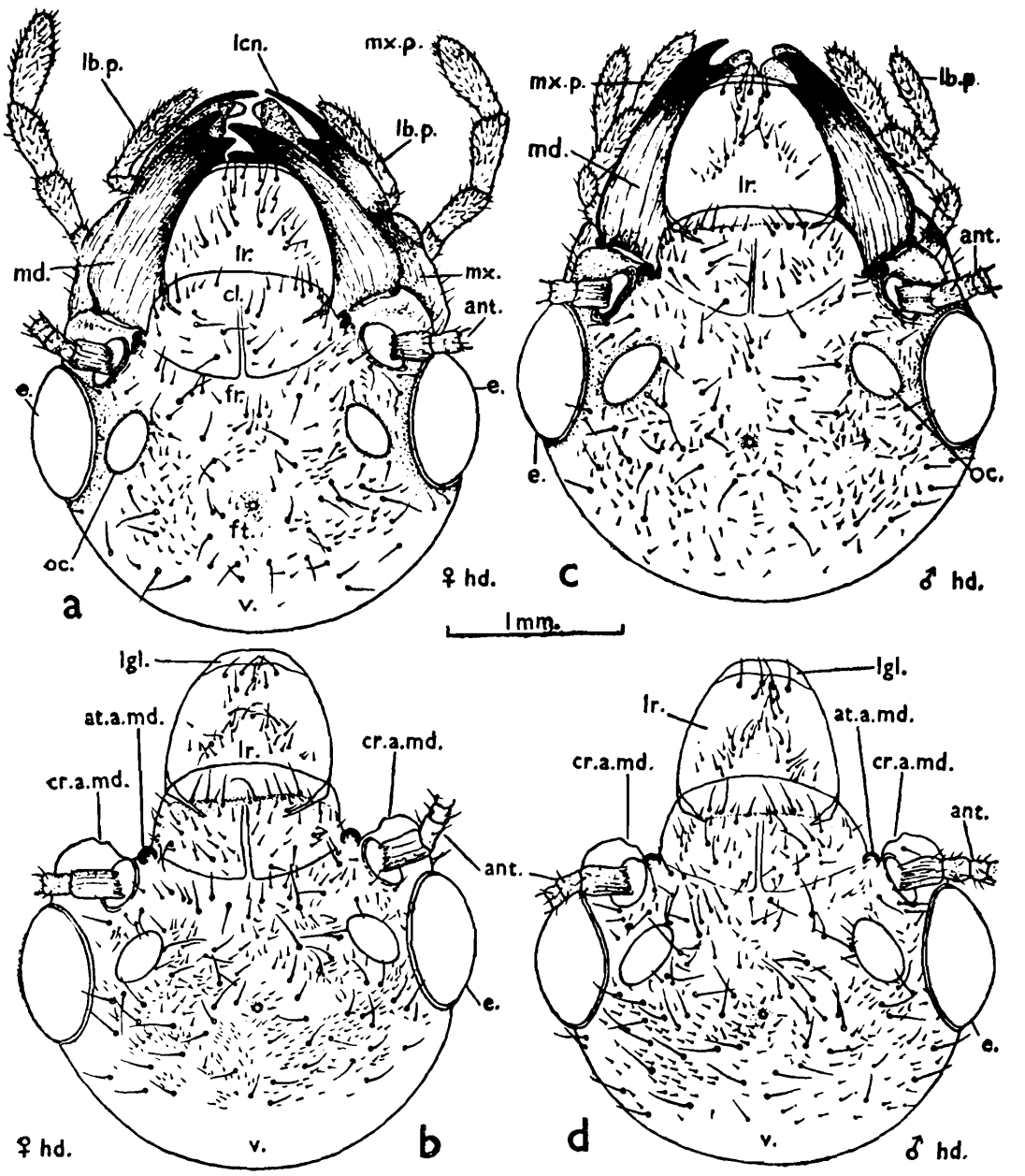
laterally in line with the antennal foveola outwards, showing 56 per cent. bilateral symmetry. *Geno-postgenal 2* (*gpgl. 2*) and *geno-postgenal 3* (*gpgl. 3*) with 76 per cent. bilateral symmetry each are located posterioral —one behind the other approximately at equal interval ; the latter being situated somewhere at the medio-lateral margin of the cranium appoximately in transverse row with the *epicranial 3* and *medio-genal pair* of bristles.

Occasionally, there may occur some additional bristle ventrally her and there as observed dorsally.



TEXT-FIG. 3.—*Odontotermes obesus* (Rambur), worker caste.

(*a*). Dorsal view of the cranium, showing only a few large bristles including the frontal pair which are located symmetrically. (*b*). Ditto, showing many large bristles distributed irregularly except the frontal pair. (*c*). Ditto, showing a few large bristles distributed irregularly except the frontal pair. (*d*). Ventral view of the cranium, showing practically no bristles on occiput and postgenae.

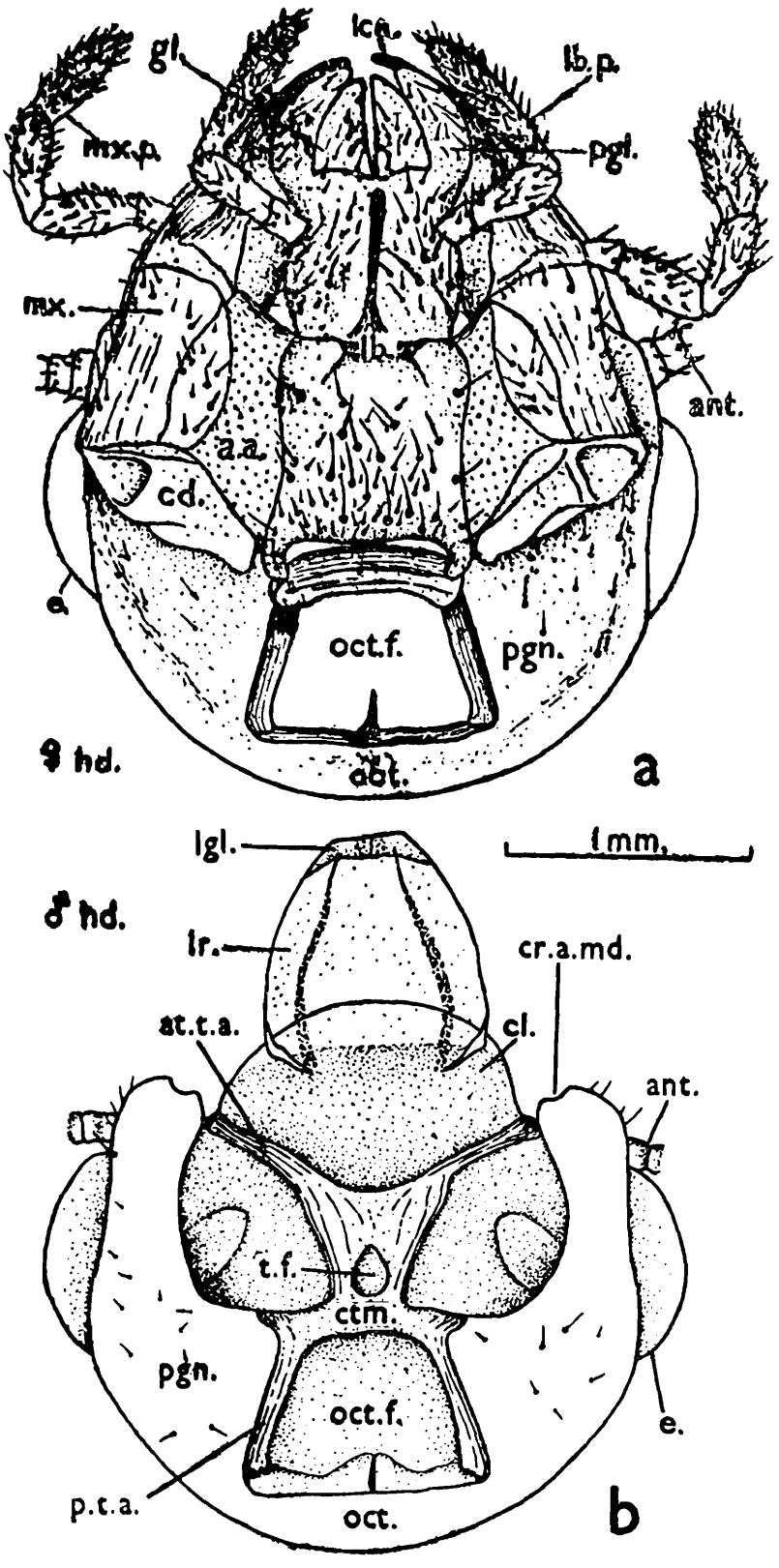


TEXT-FIG. 4.—*Odontotermes obesus* (Rambur), alate caste.

(*a* and *b*). Dorsal views of the female cranium, showing irregular and hirsute growth of the bristles. (*c* and *d*). Dorsal views of the male cranium, ditto. (Diagrams *b* and *d* have been drawn from permanent preparations mounted in cavity slides, whereas *a* and *c* from unmounted specimens under clove oil.)

2. *Worker and alate* (Text-figs. *3a-d*; *4a-d*; *5a*, *b*).—The worker and the alate resemble each other considerably. Dorsally they show an irregular and denser growth of larger and smaller bristles as compared to the soldier. Further, the alates show denser growth as compared to the workers which show a variable density particularly of larger bristles, *i.e.*, some individuals show only a few of these, whereas others are liberally provided.

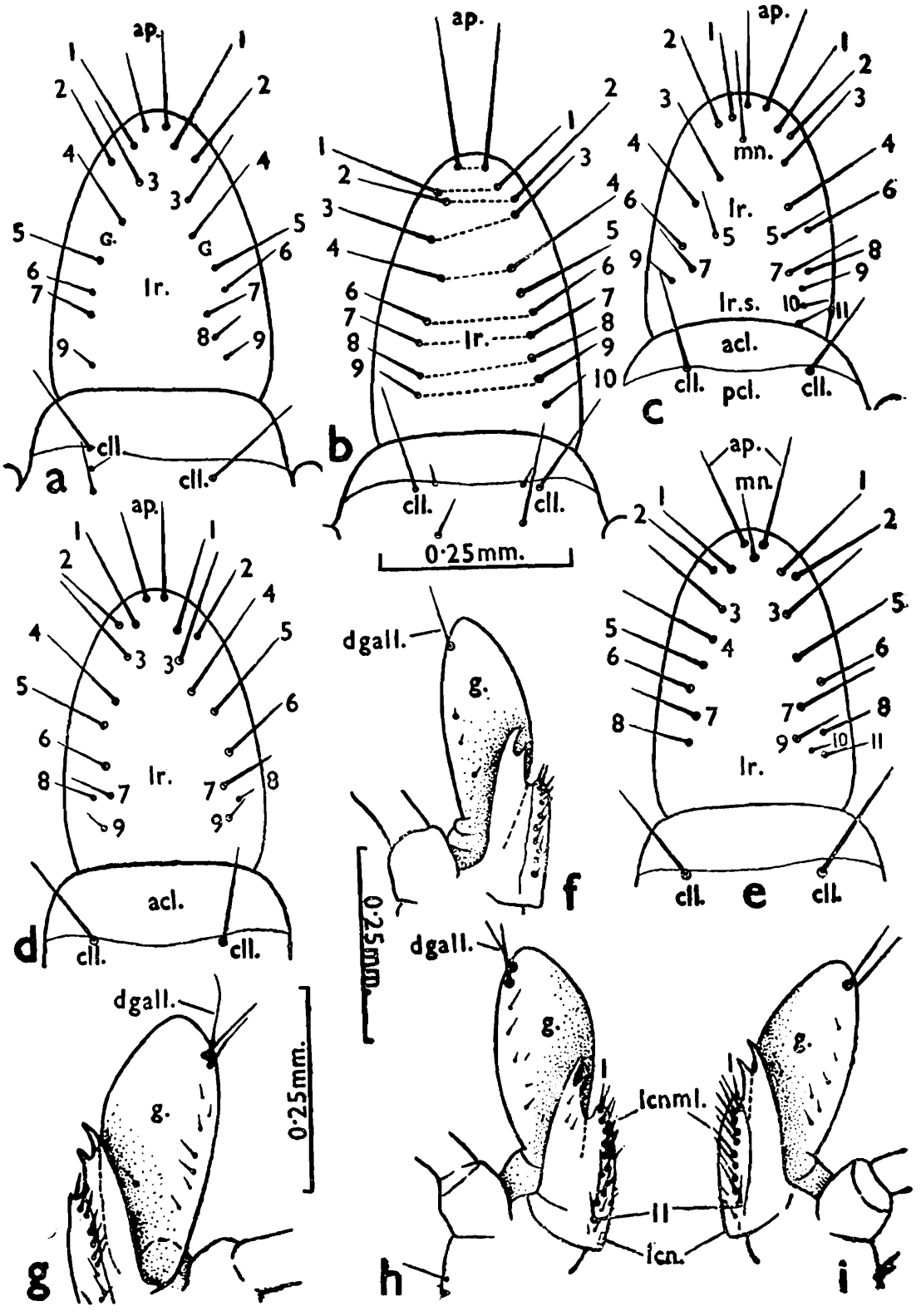
The *clypeal pair* (*cll.*), as was observed in the soldier, is also present in both the worker and the alate in similar locations with 96 per cent. and 48 per cent. bilateral symmetry, respectively (Table 4). The *frontal pair* (*frtl.*)., on the other hand, has been more distinctly observed in the worker than the alate; the worker showing 92 per cent. bilateral symmetry. This pair, in the alates, is generally confused amongst other larger bristles.



TEXT-FIG. 5.—*Odontotermes obesus* (Rambur), alate caste.

(*a*). Ventral view of the female cranium, showing no large bristles on ventral cranial areas. (*b*). Ventral view of the male cranium, ditto. (Diagram *a* has been drawn from a specimen under clove oil and *b* drawn from permanent preparation in cavity slide.)

Ventrally, the *occiput* (*oct.*) and the *postgenae*(*pgn.*) are almost naked in both the castes as observed in the soldier. The labium is bristled in either case, being denser in the alate, and the characteristic bristles of the same would be discussed under head-appendages.



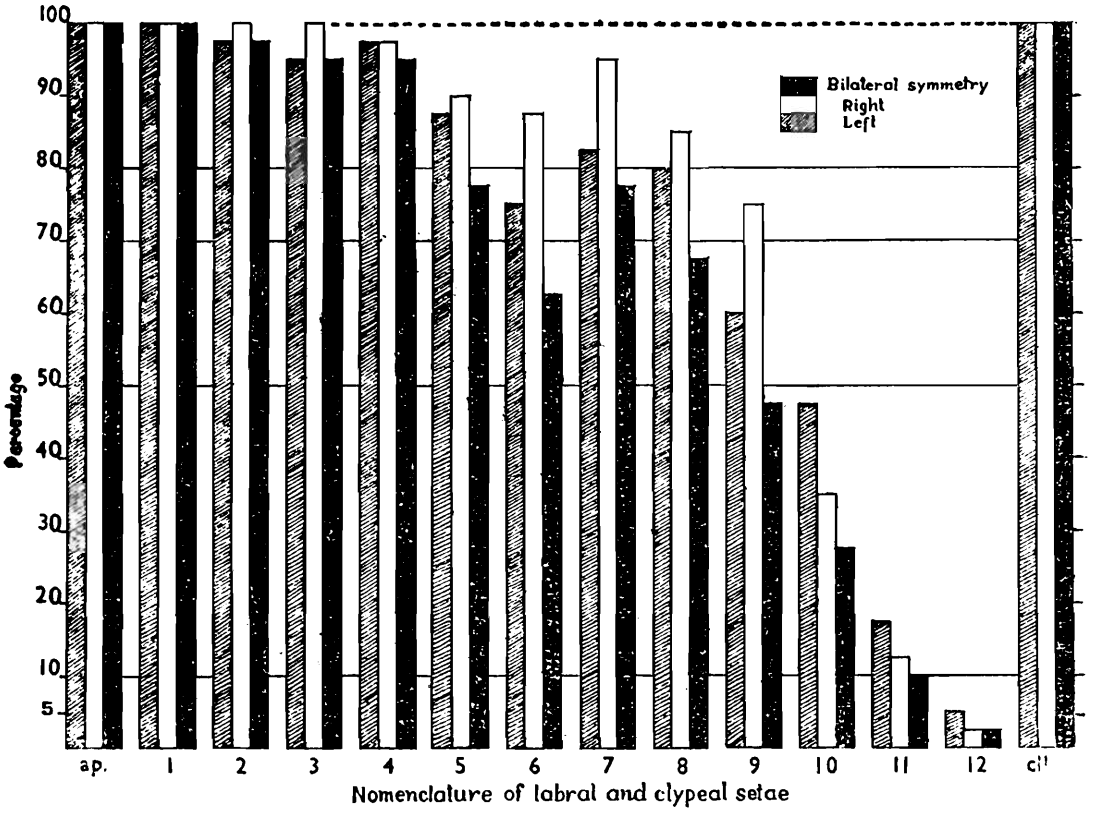
TEXT-FIG. 6.—*Odontotermes obesus* (Rambur), soldier caste.

(*a*). Labrum, together with clypeal region, showing a bilaterally symmetrical gap between 4th and 5th pair of bristles; left 8th bristle missing. Clypeus, showing the anterior bilaterally symmetrical pair of clypeal bristles besides other rear asymmetrical bristles posteriorly. (*b*). Ditto, left 5th and 10th bristle missing. (*c*). Ditto, median bristle present, left 8th, 10th and 11th bristles missing. (*d*). Ditto, showing bilaterally symmetrical condition of bristles. (*e*). Ditto, median bristle present; right 4th bristle and left 9th, 10th, and 11th bristles missing. (*f*). Left lacinia and galea. Galea showing only one distogaleal bristle. (*g*). Right lacinia and galea. Galea showing three distogaleal bristles. (*h* and *i*). Left and right lacinia and galea, respectively, each lacinia showing 11 lacino-marginal bristles and each galea showing a pair of distogaleal bristles.

(c) *Chaetotaxy of the head-appendages*

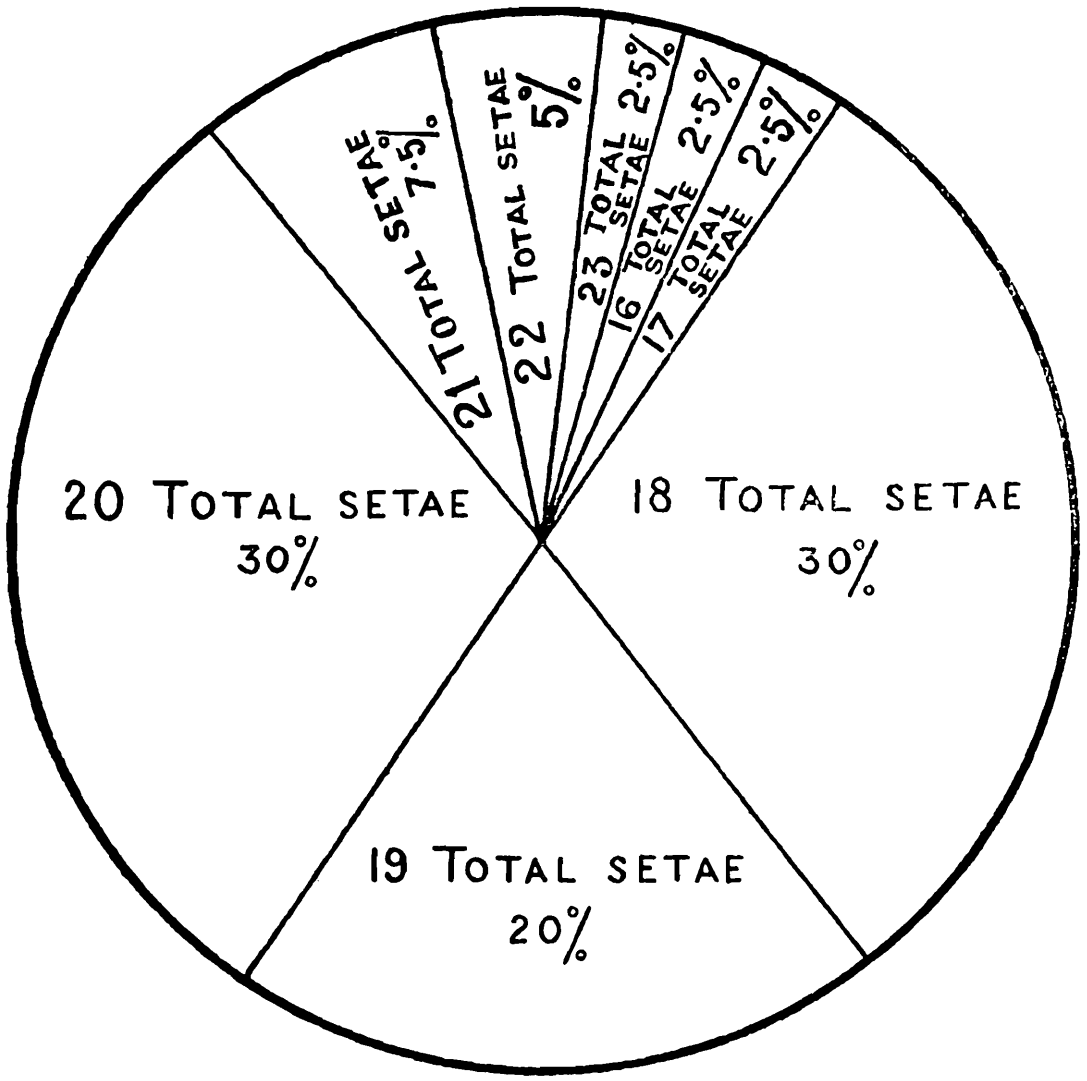
The head-appendages showing characteristic arrangement of bristles include the labrum, the scape of antenna, the lacinia and the galea of the maxilla, and the labium.

The characteristic bristles on the labrum, antenna, lacinia and labium have been discussed in the case of all the three castes. The galea, on the other hand, has been observed to show characteristic bristles in the soldier caste only.



TEXT-FIG. 7.—*Odontotermes obesus* (Rambur), soldier caste.

Bar diagram, showing the percentage of individuals with different labral and clypeal bristles on left and right sides, together with the bilaterally symmetrical condition.



TEXT-FIG. 8.—*Odontotermes obesus* (Rambur), soldier caste.

Circle diagram, showing proportional percentage of the varying total number (16-23) of labral bristles.

1. *Labrum.*—

(i) *Soldier* (Text-figs. 6*a-e* ; 7 and 8).—The bristles in the soldier show a bilaterally symmetrical arrangement. The anteriormost pair of bristles are the *apical pair of bristles* (*ap.*) and are generally proclinate, *i.e.*, directed forward. Sometimes there occurs a *median bristle* (*mn.*) mostly just behind and between the apical pair. Other bilaterally marginal bristles rear to the apical pair have been numbered 1, 2, 3, etc. The bristles are generally divaricate or divergent, *i.e.*, inclined outwards from the median line. Because of their limited number and a comparatively more orderly arrangement, both the larger and the smaller bristles have been considered in this case.

Occasionally, a conspicuous and bilaterally symmetrical gap has been observed on either side and might probably be due to the displacement of certain bristles more anteriorly or posteriorly, though it could as well be interpreted to indicate absence of a symmetrical pair of bristles. The percentage of individuals showing such a gap has been indicated in Table 2 to the extent of 12·5 per cent. and denoted as G (n-n^1), where G represents the gap and n and n^1 being the nomenclature of the bristles between which the gap exists.

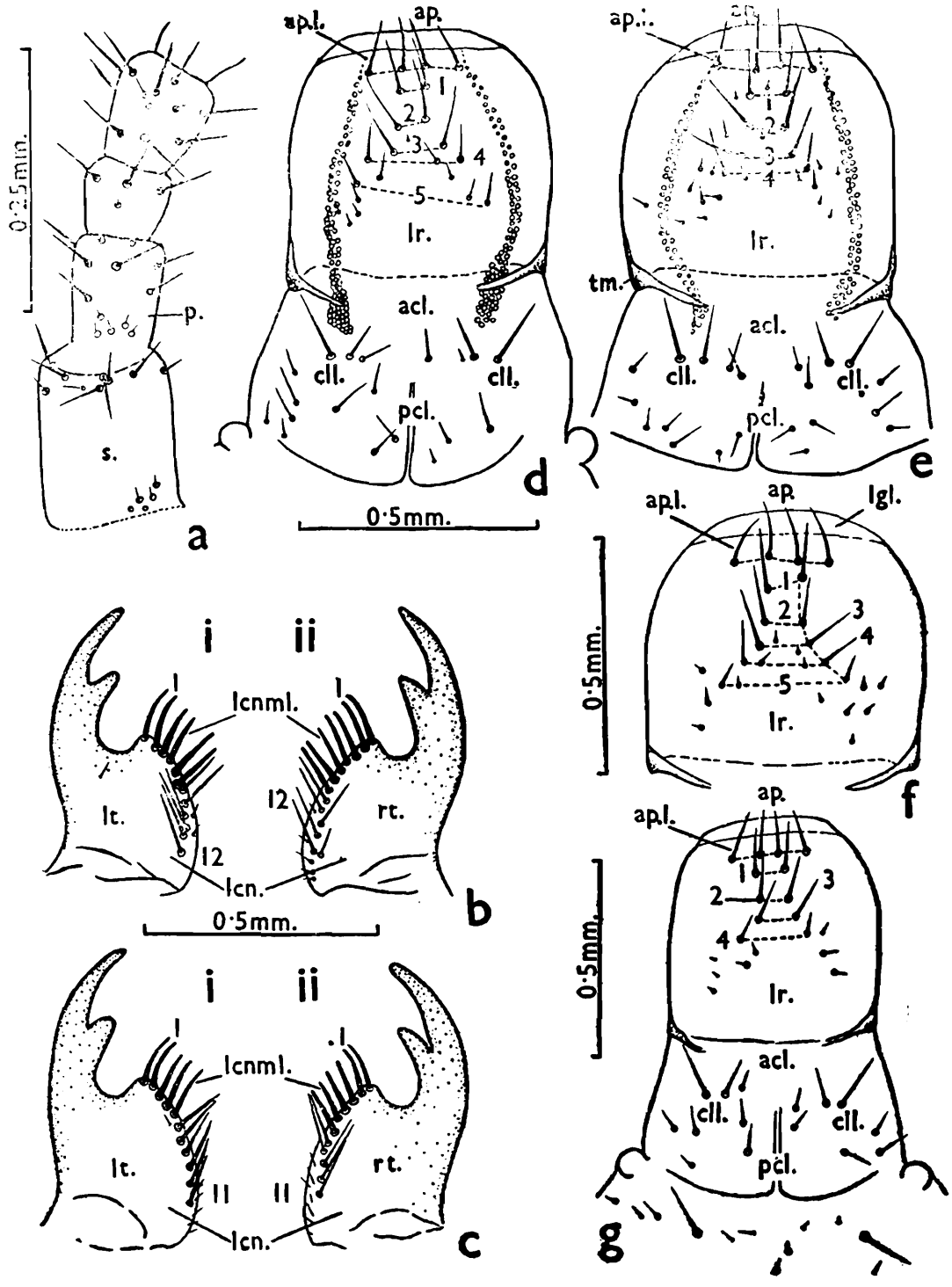
The first five anterior pairs of bristles, including the apical pair, indicate more or less an absolute bilateral symmetry (95-100 per cent.) and may probably provide an important characteristic feature. The symmetry becomes progressively irregular posteriorly and a few of the posteriormost bristles, namely, Nos. 11 and 12, seem to be distributed without any apparent arrangement (Table 2).

There are 7 or 8 to 12 bristles on either side, with a total number of bristles on the whole labrum varying from 16 to 23. A total number of 18 and 20 bristles have been observed in 30 per cent. individuals and 19 bristles in 20 per cent. individuals ; other cases of the total count of bristles on the labrum being rather insignificant (Table 3).

TABLE 3.—*Percentage of individuals of soldier caste of* Odontotermes obesus (*Rambur*), *showing total labral bristles varying from* 16-23. *Based on* 40 *specimens.*

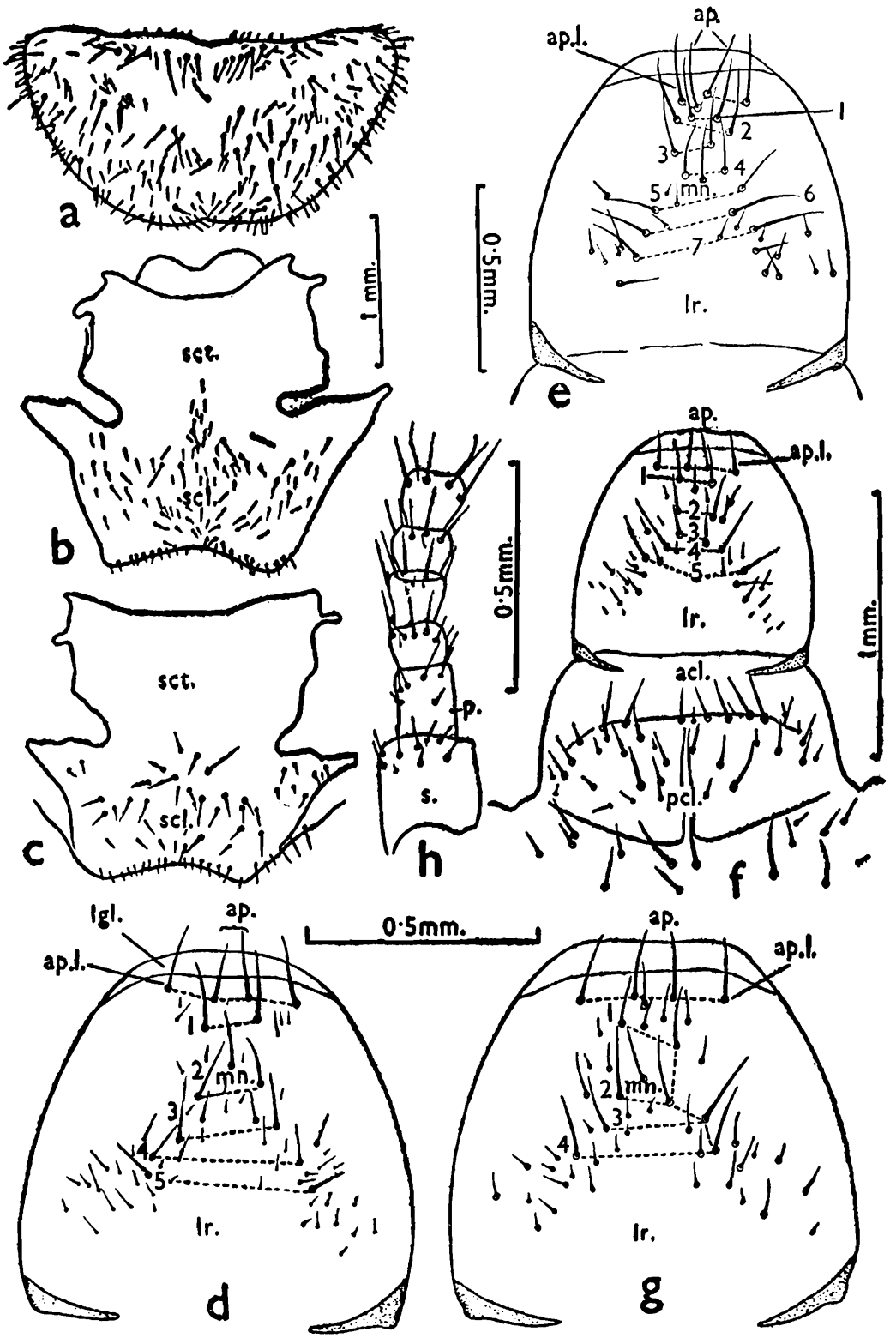
For explanations, also see "Abbreviations used in Text-figures and Tables", *infra.*

Serial No. of individual.	Total No. of bristles on left half.	Median bristle (*mn.*).	Total No. of bristles on right half.	Total No. of bristles on labrum.	Percentage of individuals.
1	8	—	8	16	—2·5
2	7	—	10	17	—2·5
3	8	—	10	18	
4	8	—	10	18	
5	8	—	10	18	
6	8	—	10	18	
7	9	—	9	18	
8	9	—	9	18	
9	9	—	9	18	—30
10	9	—	9	18	
11	9	—	9	18	
12	9	—	9	18	
13	9	—	9	18	
14	10	—	8	18	
15	8	—	11	19	
16	9	—	10	19	
17	9	—	10	19	
18	9	—	10	19	
19	10	—	9	19	—20
20	10	—	9	19	
21	10	—	9	19	
22	10	—	9	19	
23	9	—	11	20	
24	9	—	11	20	
25	10	—	10	20	
26	10	—	10	20	
27	10	—	10	20	
28	10	—	10	20	
29	10	—	10	20	—30
30	10	—	10	20	
31	10	—	10	20	
32	11	—	9	20	
33	11	—	9	20	
34	11	—	9	20	
35	9	1	11	21	
36	10	—	11	21	—7·5
37	10	—	11	21	
38	10	—	12	22	
39	11	—	11	22	—5
40	12	—	11	23	—2·5



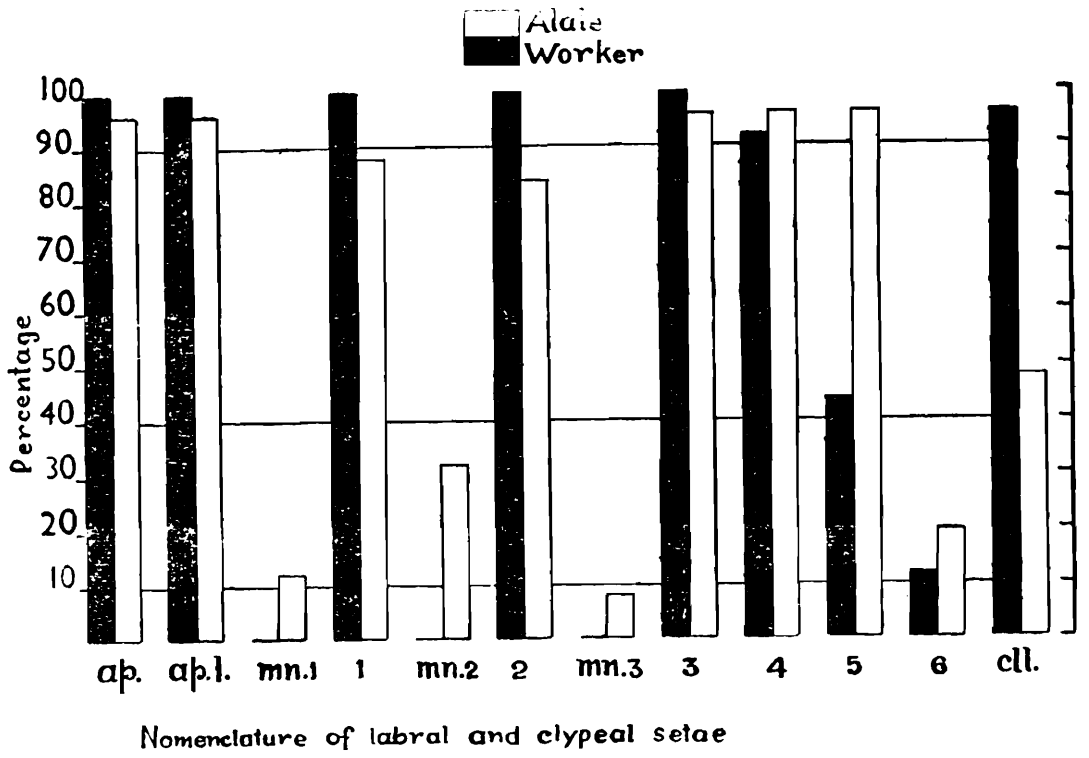
TEXT-FIG. 9.—*Odontotermes obesus* (Rambur), worker caste.

(*a*). Proximal end of antenna. Scape showing a number of bristles distally. (*bi*, *bii*) Left and right lacinia, respectively with 12 lacino-marginal bristles. (*ci*, *cii*). Ditto, with 11 lacino-marginal bristles. (*d*). Labrum together with clypeal region. Labrum, showing five pairs of large bristles in addition to apical and apical-lateral pairs. Clypeus, showing a symmetrical pair of large clypeal bristles besides many other smaller ones scattered irregularly.(*e*). Ditto, labrum with only four pairs of large bristles in addition to other usual apical, apical-lateral and clypeal bristles. (*f*). Labrum, showing five pairs of large bristles in addition to apical and apical-lateral pairs. (*g*). Labrum, clypeus and part of frons. Arrangement of longer bristles same as in (*e*). Larger pair of bristles on frons not showing any constancy.



TEXT-FIG. 10.—*Odontotermes obesus* (Rambur), alate caste.

(*a*, *b*, *c*). Pro-, meso and metanotum showing no regular arrangement of bristles. (*d*). Labrum, showing five pairs of large bristles besides apical and apical-lateral pairs, and median bristle 2 between 1st and 2nd pair of bristles. (*e*). Ditto, showing 7 pairs of larger bristles more or less asymmetrically located. A median bristle, unusually present between the 4th and 5th pairs of bristles. (*f*). Labrum, clypeus and part of frons. Labrum, showing 5 symmetrical pairs of bristles in addition to apical and apical-lateral pairs. Clypeus and frons showing no symmetrical arrangement of bristles. (*g*). Labrum, showing 4 symmetrical pairs of larger bristles in addition to apical and apical-lateral pairs. (*h*). Proximal part of right antenna with scape showing a number of bristles distally.



TEXT-FIG. 11.—*Odontotermes obesus* (Rambur), alate and worker caste.

Bar diagram, showing the relative percentage of individuals of alate and worker with different labral and clypeal bristles.

(ii) *Worker and alate* (Text-figs. 9*d-g* ; 10*d-g* and 11).—The alates and workers show a considerable similarity among themselves. The large and small bristles are more or less intermixed, but the larger ones gradually increase in size, particularly in the worker towards the apex. The bristles are denser in the alate than in the worker and are distributed in both the castes in a specific inverted V-shaped area, the two arms of the V converging from the posterolateral corners to the apex of the labrum.

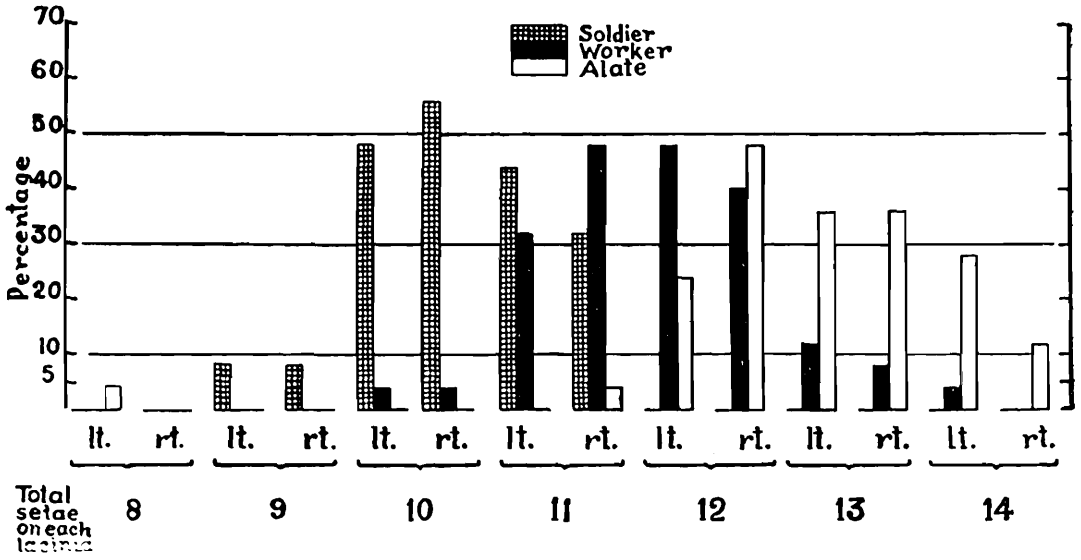
There are two pairs of " apical " bristles—an inner pair, the true *apical bristles* (*ap.*) and an outer pair, the *apical lateral bristles* (*ap. l.*)—in both the worker and the alate. The apical bristles show a significant symmetry, *i.e.*, 100 per cent. and 96 per cent. in workers and alates respectively. In addition, they are followed by other larger symmetrical pairs labelled 1,2,3, etc. posteriorly ; here 92–100 per cent. symmetry has been observed upto the 4th pair in the worker and 84-96 per cent. upto the 5th pair in alate (Table 4), but the individual

TABLE 4.—*Percentage of individuals, showing bilateral symmetry in respect to different larger bristles in addition to median bristles* (*mn. 1, mn. 2, mn. 3*) *on the labrum and the paired clypeal bristles* (*cll.*) *of the worker and alate castes of* Odontotermes obesus (*Rambur*). *Based on 25 specimens examined.*

For explanations, also see "Abbreviations used in Text-figures and Tables" *infra.*

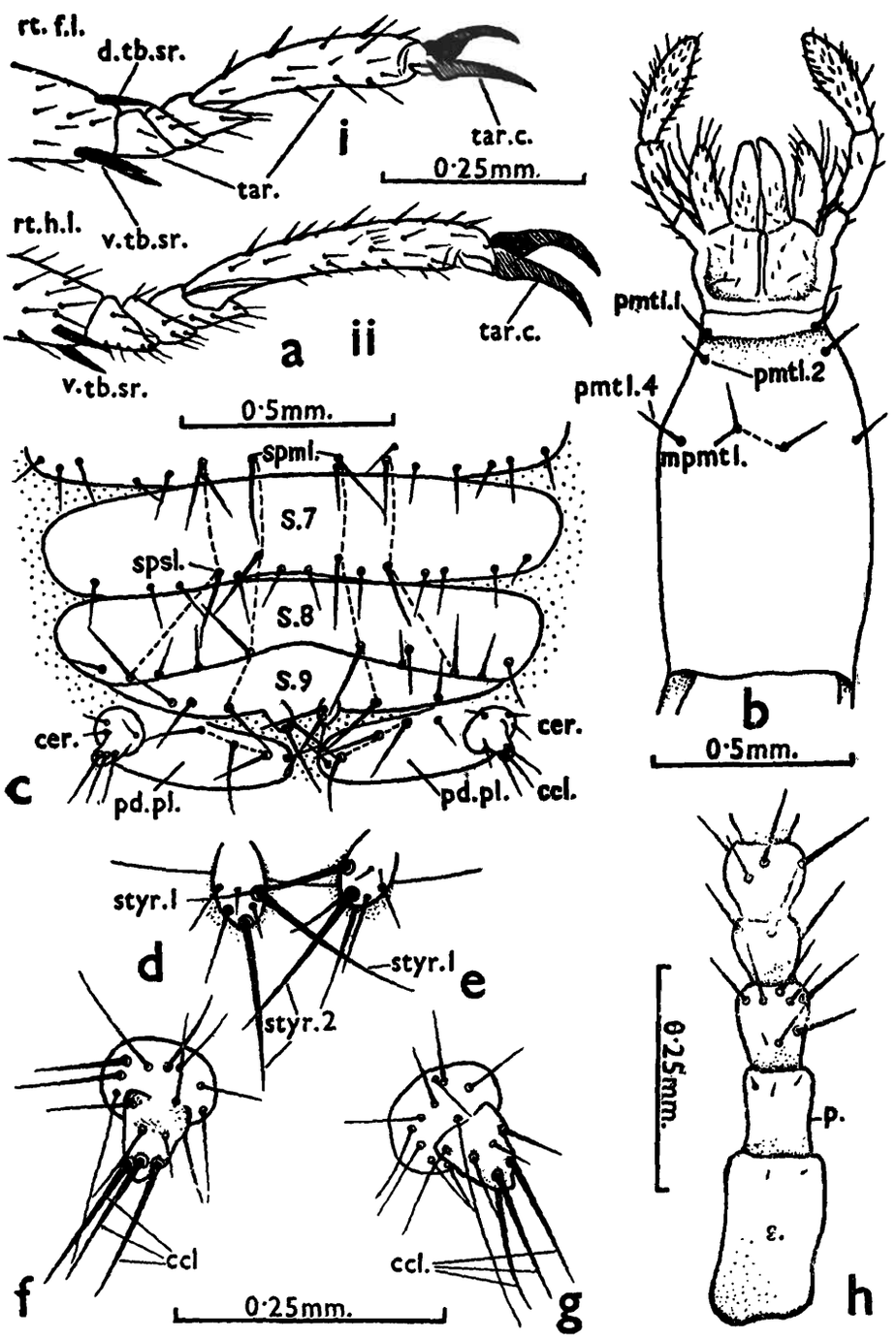
	Nomenclature of bristles											
Caste	*ap.*	*ap. l.*	*mn. 1*	1	*mn. 2*	2	*mn. 3*	3	4	5	6	*cll.*
Worker	100	100	—	100	—	100	—	100	92	44	12	96
Alate	96	96	12	88	32	84	8	96	96	96	20	48

bristle of each pair is more symmetrically located in the worker than in the alates. There also occurs sometimes in the alates a prominent *median bristle 1* (*mn. 1*) between the *apical* (*ap.*) and No. 1 pair observed to the extent of 12 per cent., *mn. 2* between Nos. 1 and 2 pairs of bristles and *mn. 3* between Nos. 2 and 3 pairs of bristles upto 8 per cent. (Table 4).



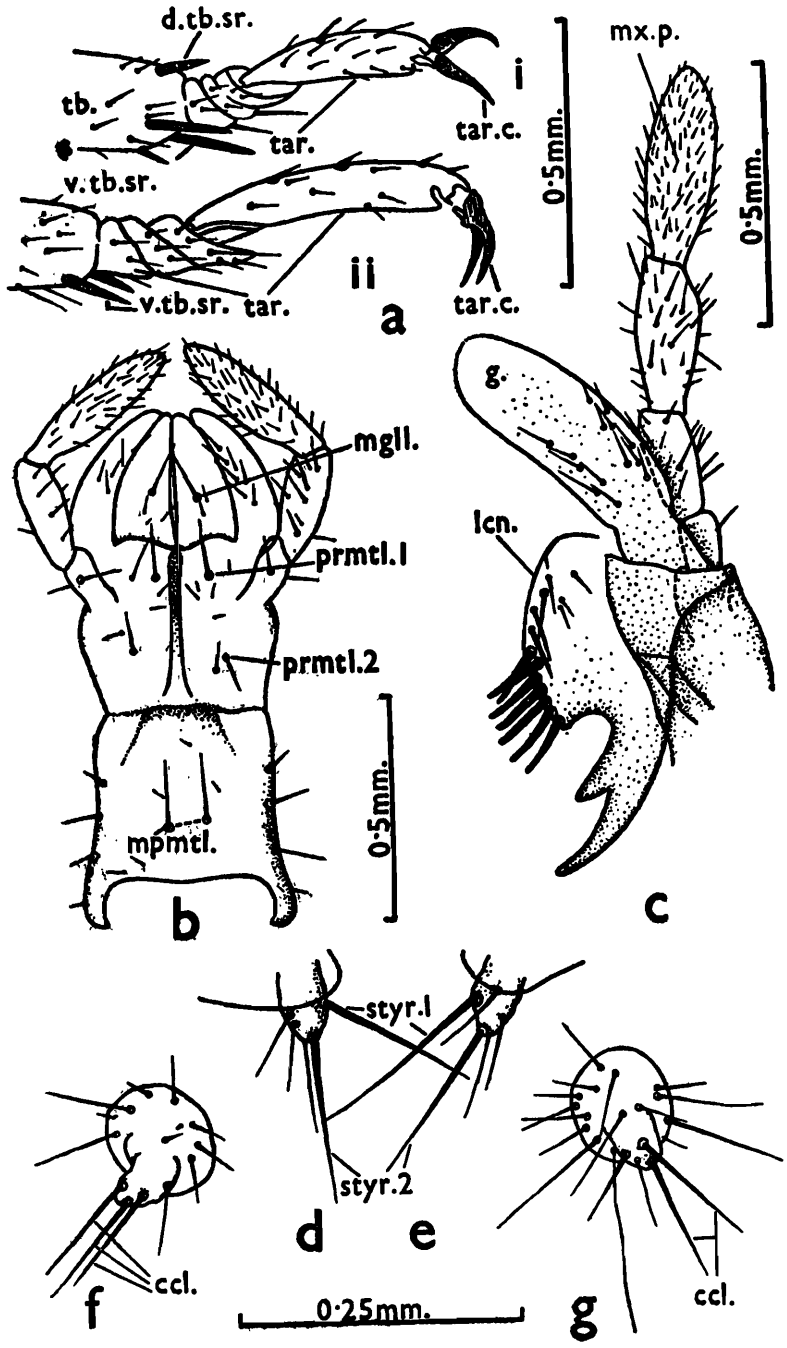
TEXT-FIG. 12.—*Odontotermes obesus* (Rambur), soldier, worker and alate.

Bar diagram, showing the relative percentage of individuals of the three castes with the full complement of the lacino-marginal bristles on left and right lacinia separately.



TEXT-FIG. 13.—*Odontotermes obesus* (Rambur), soldier caste.

(*ai*, *aii*). Distal portion of right fore-leg and hind-leg, respectively. The distal end of tibia in the fore-leg showing a dorsal tibial spur in addition to a pair of ventral tibial spurs, the hind-tibia showing only a pair of ventral spurs. (*b*). Labium, showing only a few large bristles on pre- and postmentum. (*c*). Ventral abdominal tip, showing sternites 6 (only partly seen) to 10. Smaller bristles have not been shown. Note the row of sterno-postero-medial and sterno-postero-sublateral bristles, joined by dotted lines. (*d*, *e*). Left and right subanal styles, respectively, showing a pair of large bristles on each—the inner bristle being stylar 1 and the outer bristle stylar 2. (*f*, *g*). Left and right anal cerci, respectively, showing three large cercal bristles. (*h*). Right antenna, showing no prominent bristles on scape.



TEXT-FIG. 14.—*Odontotermes obesus* (Rambur), worker caste.

(*ai*, *aii*). Distal portion of right fore-leg and hind-leg. The distal end of tibia in the fore-leg showing a dorsal tibial spur in addition to a pair of ventral spurs ; the hind-tibia showing only a pair of ventral spurs. (*b*). Labium, showing large paired bristles : medio-glossal, premental 1, premental 2, and 5 postmental pairs. (*c*). Maxilla, showing general distribution of bristles on right lacinia, galea and maxillary palp (*d*, *e*). Left and right subanal styles, respectively, showing a pair of large bristles on each—the inner bristles being stylar 1 and the outer stylar 2. (*f*, *g*). Left and right anal cerci, respectively, left showing three and right showing only two cercai bristles.

2. *Antenna.*—

Soldier, worker and alate (Text-figs. 9*a* ; 10*h* ; and 13*h*).—In the soldier, the first segment or *scape* (*s.*) of the antenna is more or less naked with a few microscopic bristles, whereas it is conspicuously bristled anteriorly in the case of worker and alate.

3. *Galea.*—

Soldier (Text-figs. 6*f-i*).—Apically on the galea at its outer disto-lateral margin is present a bilaterally symmetrical pair of conspicuously elongated and superposed bristles called *disto-galeal bristles* (*dgall.*) closely set together and observed in 92 per cent. individuals (25 counts). Of the remainder, 4 per cent. had only one bristle on the left galea and the other 4 per cent. had 3 such bristles on the right galea ; the opposite galea of these specimens showed the usual paired condition of the disto-galeal bristles.

4. *Lacinia.*—

Soldier, worker and alate (Text-figs. 6*h*, *i* ; 9*b*, *c* ; 12 and 18*a*, *b*).—The lacinia is fringed throughout its inner margin with robust bristles called the *lacino-marginal bristles* (*lcnml.*), besides some minor ones not considered here. The total number of large bristles on each lacinia varies from 9-12 in the soldier, 10-14 in the worker and 8-14 in the alate (25 counts in each case). The more commonly observed numbers are 10 or 11 bristles (with 24 per cent. and 16 per cent. bilateral symmetry respectively) in the soldier, 11 or 12 bristles (with 16 per cent. bilateral symmetry in each case) in the worker and 12 or 13 bristles (with 16 per cent. bilateral symmetry in each case) in the alate (Tables 5 and 6).

TABLE 5.—*Total lacino-marginal bristles on left and right lacinia together with percentage of bilateral symmetry in respect to their total number, in the soldier, worker and alate of* Odontotermes obesus (*Rambur*). *Based on 25 specimens each.*

	Soldier			Worker			Alate		
Serial No.	Total No. of bristles.		Per cent. bilateral symmetry.	Total No. of bristles.		Per cent. bilateral symmetry.	Total No. of bristles.		Per cent. bilateral symmetry.
	Left lacinia.	Right lacinia.		Left lacinia.	Right lacinia.		Left lacinia.	Right lacinia.	
1	9	10		10	11		8	12	
2	9	10		11	11		11	12	
3	10	9		11	11		11	13	
4	10	10		11	11	16	12	11	
5	10	10		11	11		12	12	
6	10	10		11	12		12	12	
7	10	10	24	11	12		12	12	16
8	10	10		11	12		12	12	
9	10	10		11	13		12	13	
10	10	11		12	10		13	12	
11	10	11		12	11		13	12	
12	10	11		12	11		13	12	
13	10	11		12	11		13	13	
14	10	12		12	11		13	13	
15	11	10		12	11		13	13	16
16	11	9		12	11		13	13	
17	11	10		12	11		13	14	
18	11	10		12	12		13	14	
19	11	10		12	12		14	12	
20	11	10		12	12	16	14	12	
21	11	10		12	12		14	12	
22	11	11		13	12		14	13	
23	11	11		13	12		14	13	
24	11	11	16	13	12		14	13	
25	11	11		1	13		14	14	4

TABLE 6.—*Percentage of individuals showing a variable number of bristles on left and right lacinia of soldier, worker and alate of* Odontotermes obesus (*Rambur*). *Based on* 25 *specimens each.*

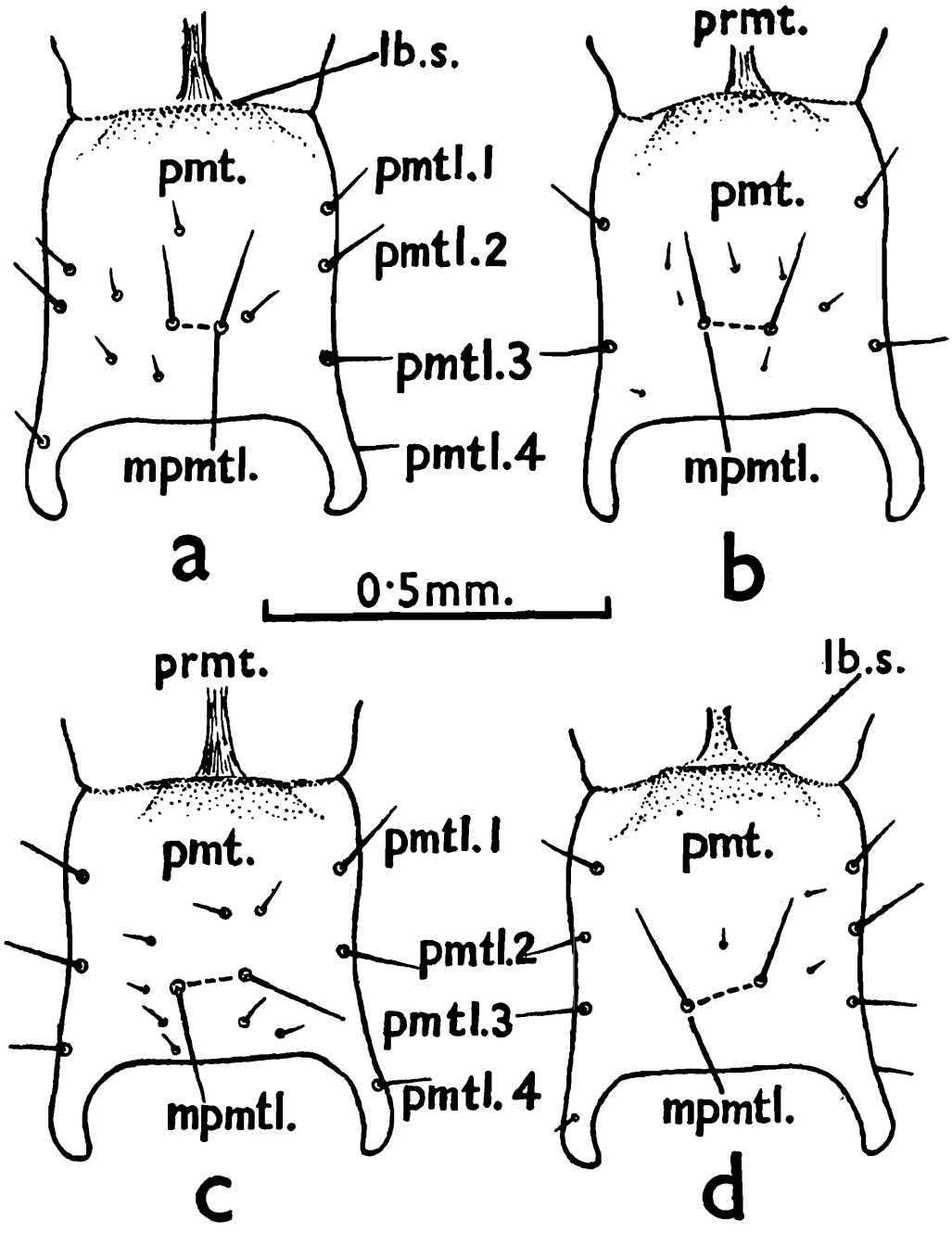
Total No. of bristles.	Solider		Worker		Alate	
	Per cent. of individuals with bristles on		Per cent. of individuals with bristles on		Per cent. of individuals with bristles on	
	Left lacinia.	Right lacinia.	Left lacinia.	Right lacinia.	Left lacinia.	Right lacinia.
8	—	—	—	—	4	—
9	8	8	—	—	—	—
10	48	56	4	4	—	—
11	44	32	32	48	8	4
12	—	4	48	40	24	48
13	—	—	12	8	36	36
14	—	—	4	—	28	12

5. *Labium.*—

Soldier, worker and alate (Text-figs. 2*a-f* ; 13*b* ; 15*a-d* ; 16*a-d* ; 17*a-f* ; and 18*c*).—The labium in the alate caste is more densely bristled, particularly in the pre- and postmental regions, as compared to that of the soldier and the worker castes. A few large bristles have been observed with regular and characteristic location, in all the three castes, besides other bristles distributed more or less irregularly. The workers show such characteristic bristles on the glossae, prementum and postmentum, whereas the soldiers and the alates have been observed to show only on the postmentum.

In general, 3 or 4 postmental bristles are located latero-marginally on either side in all the three castes. In soldier these bristles are located only in the distal half of the postmentum but in the other two castes the bristles are distributed throughout the lateral margins. Of these, the anteriormost bristles have shown more significant frequency and bilateral symmetry in their location and size in all the castes. These bristles have been called the *postmental bristles* (*pmtl.*) and numbered serially from anterior end posteriorly. In addition, a conspicuous medial pair has been observed only in the soldier and the worker castes and named as the *medio-postmental pair* (*mpmtl.*).

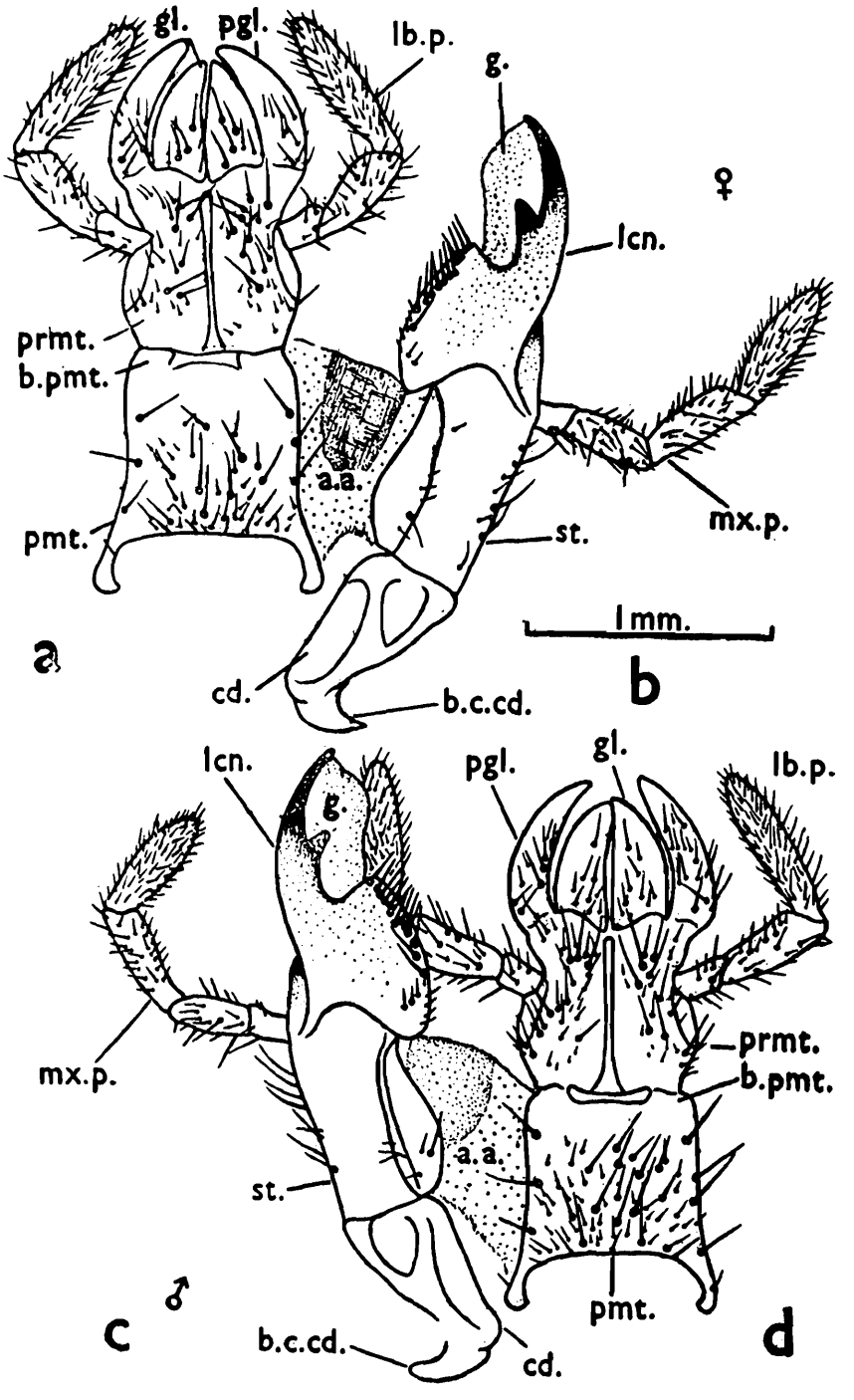
In the soldier caste 4 *postmental bristles* (*pmtl.*) have been observed latero-marginally on either side in the distal half of the postmentum. Of these, the first three occur more commonly than the fourth. They have been numbered serially from anterior end as *postmental 1* (*pmtl. 1*), *postmental 2* (*pmtl. 2*), *postmental 3* (*pmtl. 3*) and *postmental 4* (*pmtl. 4*) showing 92 per cent., 76 per cent., 72 per cent. and 16 per cent. bilateral symmetry, respectively. The *medio-postmental pair* (*mpmtl.*) is located medially, approximately between the third and the fourth postmental pair, showing 96 per cent. bilateral symmetry (Table 7).



TEXT-FIG. 15.—*Odontotermes obesus* (Rambur), worker caste.

Diagrams showing variations in location of the characteristic postmental bristles located lateromarginally and medially.

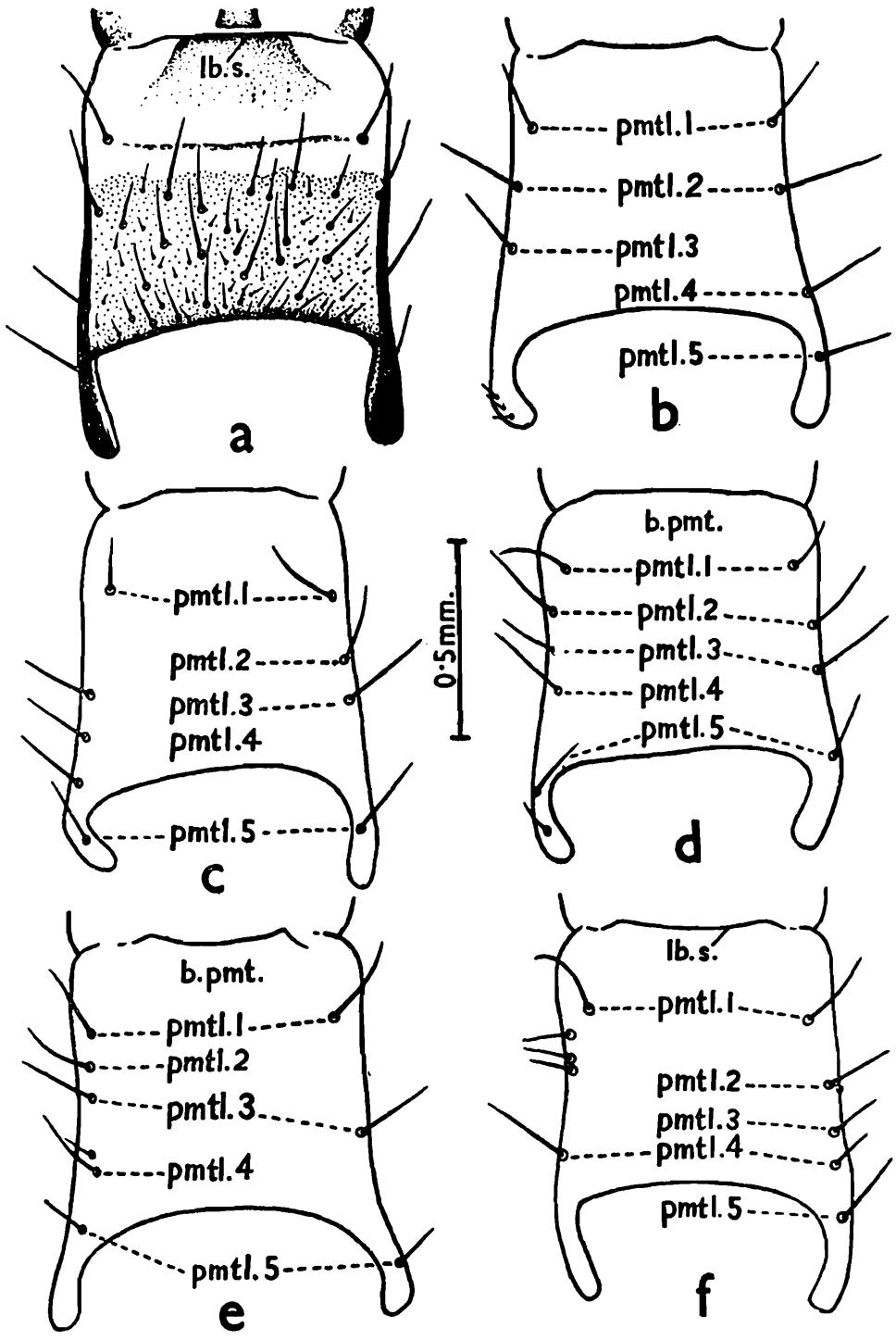
(*a*). Ventral view of the postmentum, showing more or less normal arrangement of the four postmental bristles at its left margin. Its right margin shows *pmtl.* 1 missing and *pmtl.* 3 located asymmetrically. (*b*). Ditto, showing only *pmtl.* 1 and *pmtl.* 3 in symmetrical pairs. (*c*). Ditto, showing only *pmtl.* 1, *pmtl.* 2 and *pmtl.* 4 in symmetrical pairs. (*d*). Ditto, all the four pairs located more or less symmetrically, *mpmtl* pair located symmetrically in all the cases.



TEXT-FIG. 16.—*Odontotermes obesus* (Rambur), alate caste.

Diagrams showing no sexual differentiation in the arrangement of the bristles on the labium and maxilla of the two sexes.

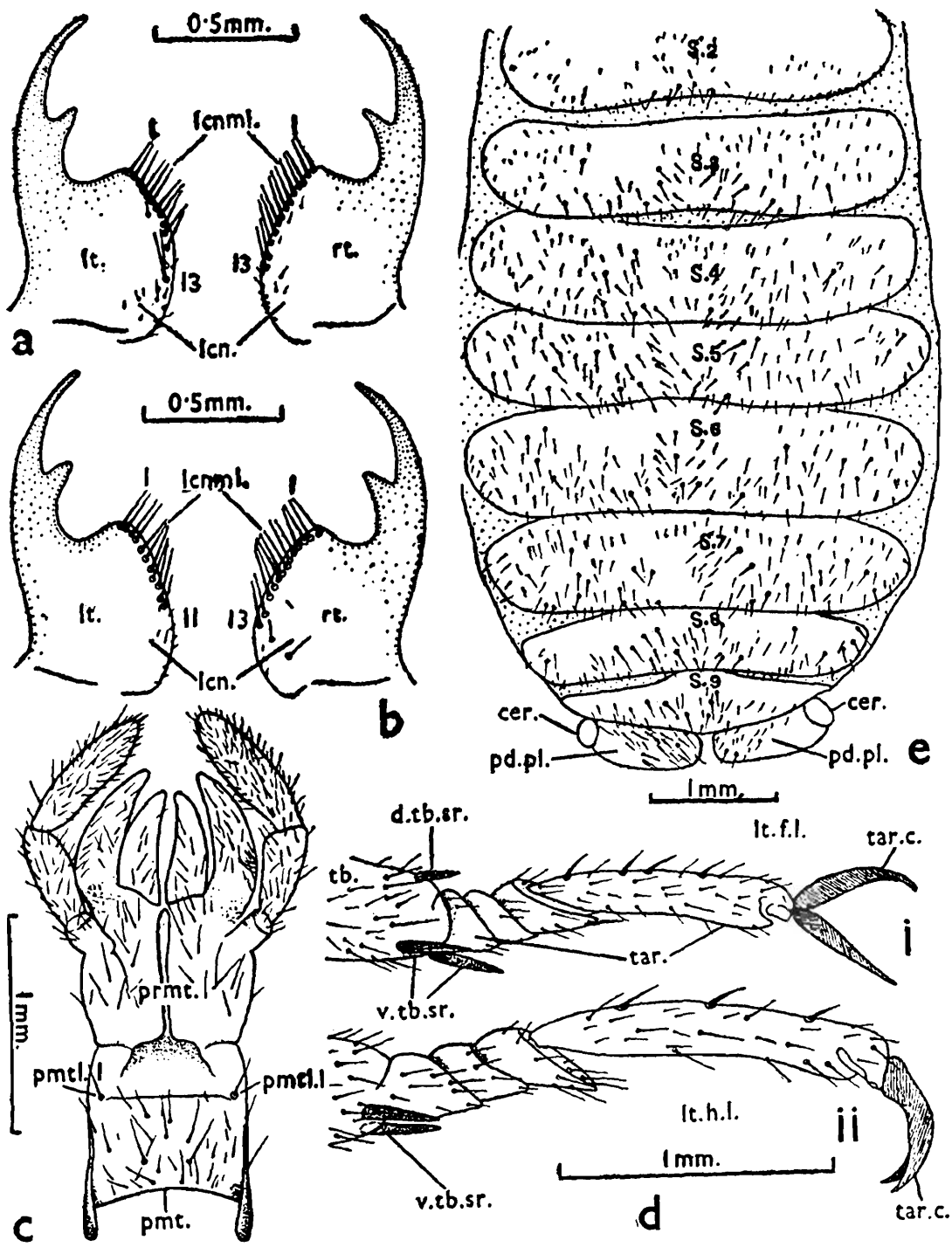
(*a* and *b*). Ventral view of the labium and maxilla, respectively, of the female. (*c* and *d*). Ventral veiw of the labium and maxilla, respectively, of the male.



TEXT-FIG. 17.—*Odontotermes obesus* (Rambur), alate caste.

Diagrams showing variations in arrangement of the characteristic postmental bristles located lateromarginally.

(*a*). Ventral view of the postmentum, showing bilateral symmetry in respect of *pmtl.* 1, *pmtl.* 2, *pmtl.* 3 or *pmtl.* 4 (?) and *pmtl.* 5, together with other bristles distributed irregularly on the whole posterior surface. (*b*). Ventral view of the postmentum, showing only the lateral bristles. Only *pmtl.* 1 and *pmtl.* 2 showing bilateral symmetry. (*c*). Ditto, only *pmtl.* 1 and *pmtl.* 5 showing bilateral symmetry; the remainder located asymmetrically. (*d*). Ditto, only *pmtl.* 1, *pmtl.* 2, *pmtl.* 3 and *pmtl.* 5 showing bilateral symmetry. (*e*). Ditto, only *pmtl.* 1, *pmtl.* 3 and *pmtl.* 5 located symmetrically. (*f*). Ditto, only *pmtl.* 1 located symmetrically. *pmtl.* 4 also showing bilateral symmetry, but left bristle is comparatively much smaller.



TEXT-FIG. 18.—*Odontotermes obesus* (Rambur), alate caste.

(*a*). Left and right lacinia, showing 13 symmetrically arranged lacino-margina bristles. (*b*). Ditto, left lacinia with only 11, and right lacinia with 13 lacino-marginal bristles. (*c*). Labium, showing regular pairs of lateral postmental bristles. (*di*, *dii*). Distal portion of left fore-leg and hind-leg, respectively. The distal end of tibia in the fore-leg showing a dorsal tibial spur in addition to a pair of ventral tibial spurs ; the hind-tibia showing only a pair of ventral spurs. (*e*). Abdominal sternites 2-10, showing a thick growth of smaller bristles distributed irregularly.

TABLE 7.—*Percentage of bilateral symmetry of larger labial bristles in the soldier, worker and alate caste of* Odontotermes obesus (*Rambur*). *Based on 25 specimens each.*

Castes.	% of individuals showing bilateral symmetry of *medio-glossal bristles* (*mgll.*).	% of individuals showing bilateral symmetry of *premental bristles* (*prmtl.*).		% of individuals showing bilateral symmetry of *postmental bristles* (*pmtl.*).					
		prmtl. 1	*prmtl. 2*	*pmtl. 1*	*pmtl. 2*	*pmtl. 3*	*pmtl. 4*	*pmtl. 5*	*mpmtl.*
Soldier	—	—	—	92	76	72	16	—	96
Worker	88	100	44	92	92	84	12	—	100
Alate	—	—	—	100	80	68	20	24	—

The workers have shown a conspicuous medial bristle on each glossa, two pairs of bristles on prementum, and 4 pairs on postmentum. The glossal bristles called the *medio-glossal* (*mgll.*) have shown 88 per cent. bilateral symmetry. The remaining 12 per cent. have also shown similar bristles, but not distinctly differentiated from other bristles on that part. The premental pairs of bristles include an anterior pair called the *premental 1* (*prmtl. 1*) showing 100 per cent. bilateral symmetry, and a posterior pair called the *premental 2* (*prmtl. 2*) with 44 per cent. bilateral symmetry. The lateral postmental pairs are the *postmental 1* (*pmtl. 1*), *postmental 2* (*pmtl. 2*), *postmental 3* (*pmtl. 3*) and *postmental 4* (*pmtl. 4*) with 92 per cent., 92 per cent., 84 per cent. and 12 per cent. bilateral symmetry, respectively. The *medio-postmental pair* (*mpmtl.*) has been observed with 100 per cent. bilateral symmetry (Table 7).

Of the various characteristic labial bristles discussed in the soldier and the worker castes, the *medio-postmental pair* is the most conspicuously located showing a very significant frequency of occurrence (*vide supra*).

The alate caste has shown much closer similarity with the worker caste in arrangement of the latero-marginal bristles on the postmentum. There are five pairs of these which are similarly called *postmental 1* (*pmtl. 1*), *postmental 2* (*pmtl. 2*), *postmental 3* (*pmtl. 3*), *postmental 4* (*pmtl. 4*) and *postmental 5* (*pmtl. 5*), observed more or less in the same relative position as in the worker, showing 100 per cent., 80 per cent., 68 per cent., 20 per cent. and 24 per cent. bilateral symmetry, respectively (Table 7).

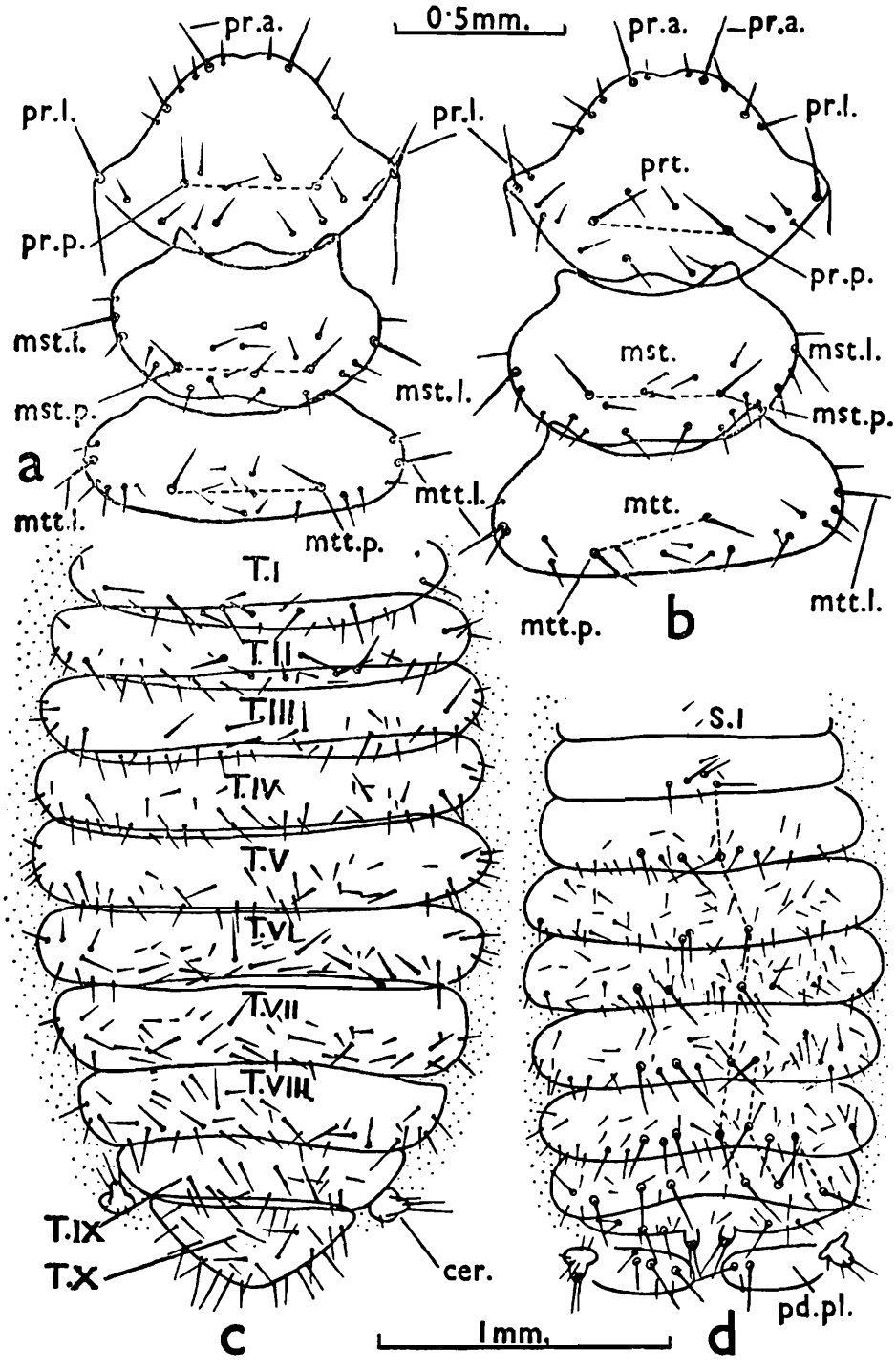
IV—CHAETOTAXY OF THE THORAX

(a) *Thoracic sclerites*

Soldier, worker and alate (Text-figs. 10*a-c* ; 19*a*, *b* ; 20*a*, *b* ; and 21).—The alates are hirsute, showing a thick growth of bristles distributed irregularly. The soldier and the worker, on the other hand, closely resemble each other, showing more or less a bilaterally symmetrical arrangement of the larger bristles on the thoracic tergites besides smaller ones distributed irregularly. The sternites lack such prominent larger bristles.

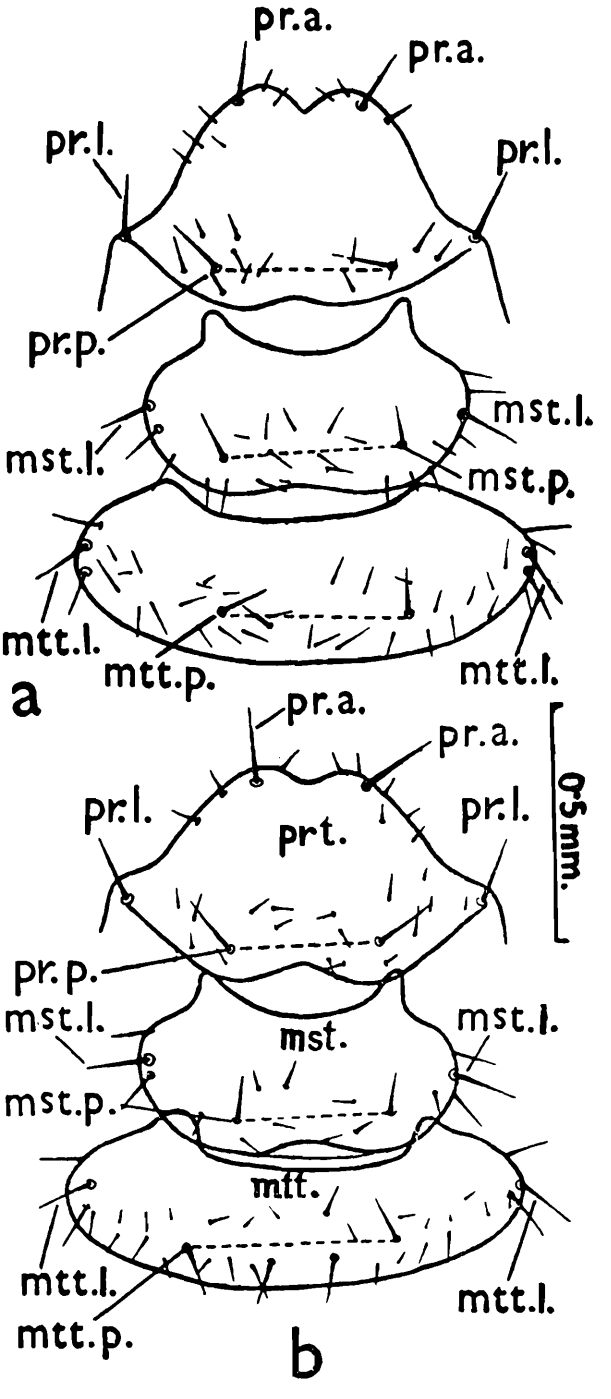
25 specimens were examined in each case to find the percentage of bilateral symmetry of the larger bristles. The nomenclature used is based on the location of bristles in the different regions of the tergites.

In the soldier there are three pairs of large bilaterally symmetrical pronotal bristles and two pairs of similar mesonotal and metanotal bristles each. The pronotal pairs are located anteriorly, laterally and posteriorly, and called the *pronoto-anterior* (*pr.a.*), the *pronoto-lateral* (*pr.l.*) and the *pronoto-posterior* (*pr.p.*). They were observed in 100 per cent., 96 per cent., and 100 per cent. individuals, respectively (Table 8). The mesonotal and metanotal pairs are located only laterally and posteriorly and are accordingly called the *mesonoto-lateral* (*mst.l.*), *mesonoto-posterior* (*mst.p.*), *metanoto-lateral* (*mtt.l.*), and *metanoto-posterior* (*mtt.p.*). Of the mesonotal pairs, each pair was observed in



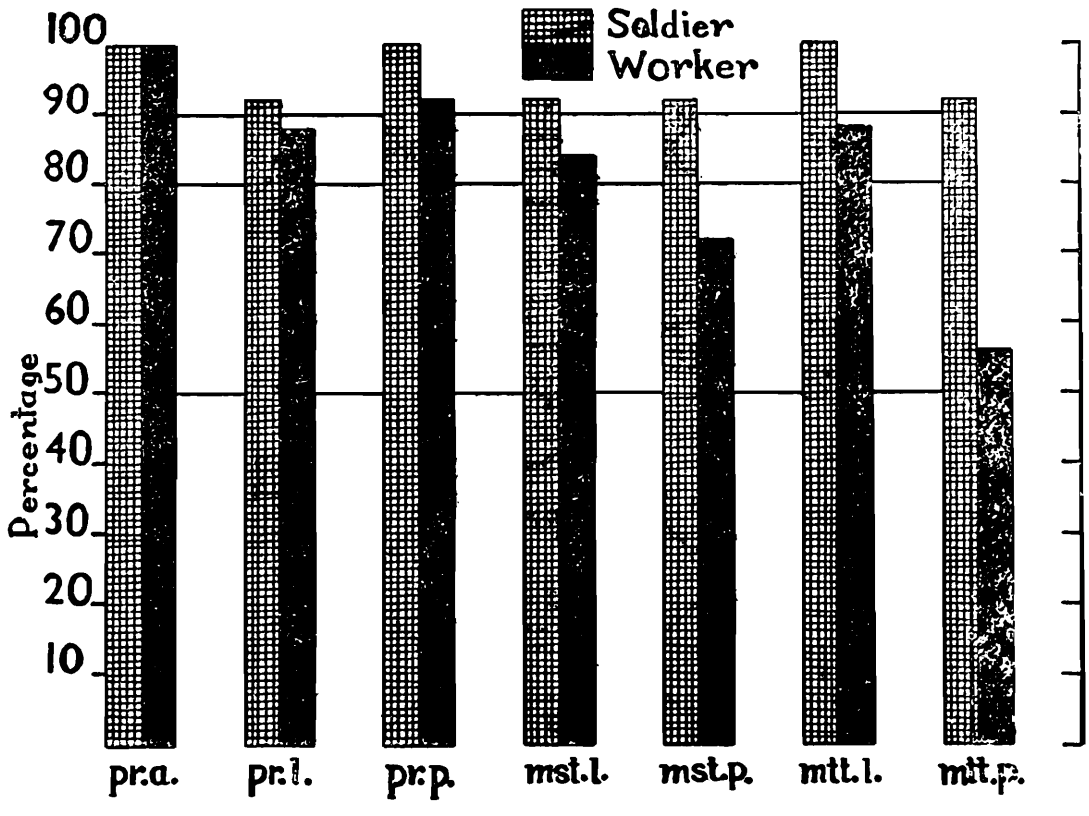
TEXT-FIG. 19.—*Odontotermes obesus* (Rambur), soldier caste.

(*a*, *b*). Three thoracic tergites ; the pronotum showing three pairs of large symmetrical bristles, *i.e.*, pronoto-anterior, pronoto-lateral and pronoto-posterior ; the meso- and metanotum showing only two pairs each , *i.e.*, mesonoto- or metanoto-lateral and mesonoto- or metanoto-posterior. (*c*). Abdominal tergites I-X, showing irregular distribution of bristles. (*d*). Abdominal sternites 1-10, showing a row of larger sterno-posteromedial, sterno-postero sublateral and a few other lateral bristles ; first two rows of bristles on the left joined by dotted lines.



TEXT-FIG. 20.—*Odontotermes obesus* (Rambur), worker caste.

(*a*, *b*). Three thoracic tergites ; the pronotum showing three pairs of large symmetrical bristles, *i.e.*, pronoto-anterior, pronoto-lateral and pronoto-posterior ; the meso- and metanotum showing only two pairs each, *i.e.*, mesonoto- or metanoto-lateral and mesonoto- or metanoto-posterior.



TEXT-FIG. 21.—*Odontotermes obesus* (Rambur), soldier and worker castes.

Bar diagram, showing the relative percentage of individuals of soldiers and workers with different pronotal, mesonotal and metanotal bristles.

96 per cent. individuals. Of the metanotal pairs, the lateral pair was observed in 100 per cent. and the posterior pair in 96 per cent. individuals (Table 8).

TABLE 8.—*Percentage of bilateral symmentry of the larger dorsal thoracic bristles in the soilder and worker of* Odontotermes obesus (*Rambur*). *Based on 25 specimens examined.*

Castes.	Pronotum.			Mesonotum.		Metanotum.	
	Pronoto-anterior (pr. a.).	*Pronoto-lateral (pr. l.).*	*Pronoto-posterior (pr. p.).*	*Mesonoto-lateral (mst. l.).*	*Mesonoto-posterior (mst. p.).*	*Metanoto-lateral (mtt. l.).*	*Metanoto-posterior (mtt. p.).*
Soldier	100	96	100	96	96	100	96
Worker . .	100	88	92	84	76	88	56

The worker also shows the above mentioned pairs of bristles. The *pronoto-anterior*, the *pronoto-lateral*, and the *pronoto-posterior* were observed in 100 per cent., 88 per cent and 92 per cent. individuals, respectively ; the *mesonoto-lateral*, the *mesonoto-posterior* in 84 per cent. and 76 per cent. individuals, respectively : and the *metanoto-lateral* and *metanoto-posterior* in 88 per cent. and 56 per cent. individuals, respectively (Table 8).

(b) *Legs*

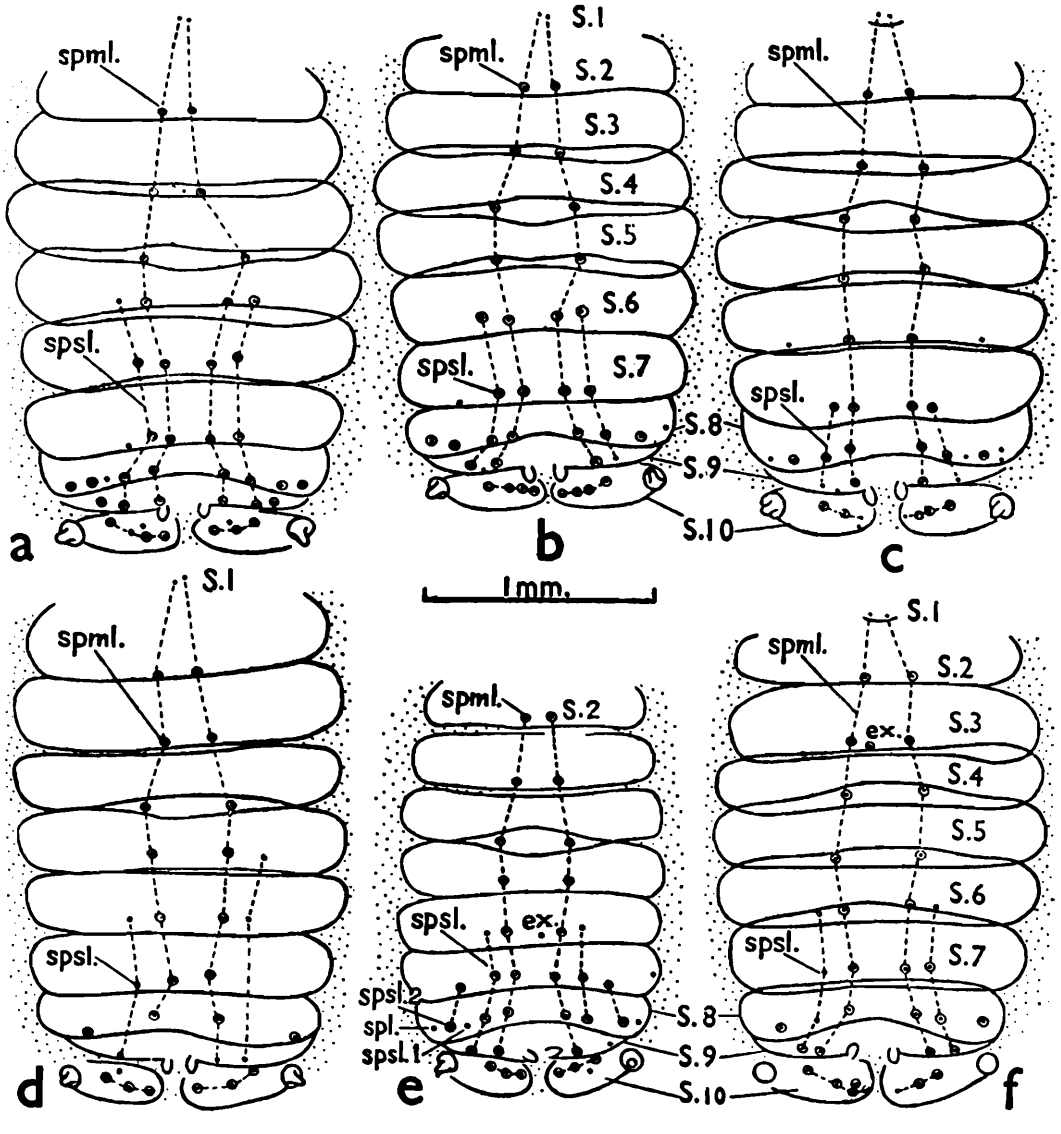
Soldier, worker and alate (Text-figs. 13*a* ; 14*a* : and 18*d*).—The legs in all the three castes are more or less thickly bristled in the distal segments. All the three pairs, *i.e.*, pro-, meso-, and metathoracic legs, at the distal end of their tibiae and provided ventrally with a pair of thick and robustly built spines, called the *ventral-tibial spurs* (*v. tb. sr.*). In addition to the said spurs, the fore-legs are, in all the three castes, provided with a single, more or less similar spur dorsally called the *dorsal tibial spur* (*d. tb. sr.*). The above condition was found in all the 25 specimens examined for each caste.

V—Chaetotaxy of the Abdomen

(a) *Abdominal sclerites*

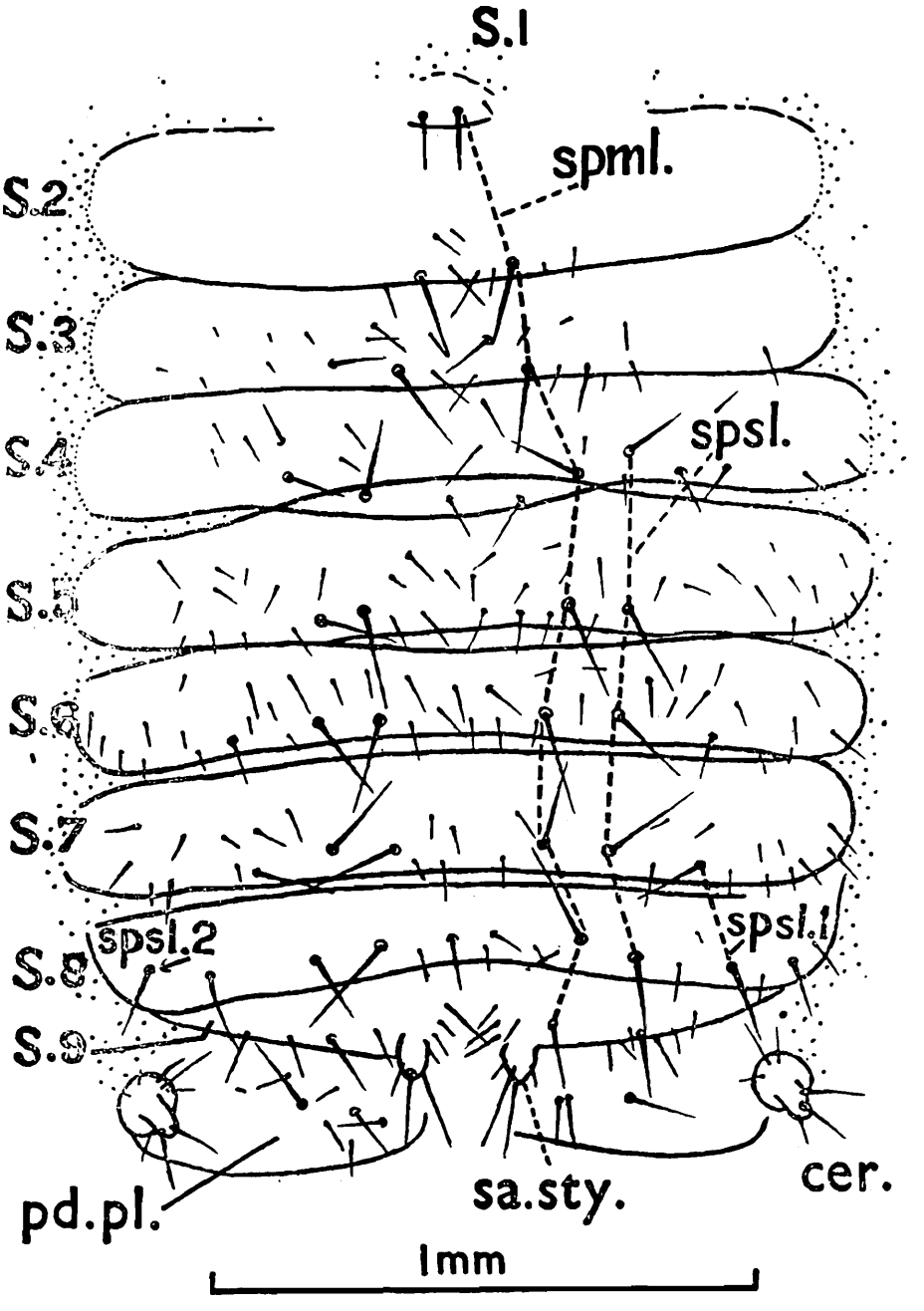
Soldier, worker and alate (Text-figs. 13*c* ; 18*e* ; 19*c*, *d* ; 22*a-f* ; 23 ; 24*a-f* and 25*a*).—The abdominal sternites of the soldiers and the workers present a similar and more or less a regular pattern of arrangement of the larger bristles, the alates showing only the smaller bristles which are distributed irregularly. Considering the entire abdomen ventrally, most of the larger bristles seem to be arranged in bilateral longitudinal rows extending from the anterior to the posterior sternites. It was further observed that these larger bristles are located in the posterior half of each sternite rather at the posterior margin in most cases.

Starting from the medial region outwards to the lateral margins of the individual sternites, the larger bristles have been mamed as *sterno-posteromedial* (*spml.*), *sterno-posterosublateral* (*spsl.*), *sterno-posterosublateral 1* (*spls. 1*). *sterno-posterosublaterel 2* (*spsl. 2*), and *sterno-posterolateral* (*spl.*). Considering their constant position and size on individual sternite, the first atrophied sternite shows a pair of comparatively much smaller bristles set very close together forming the first anterior pair of the row of the sterno-posteromedial bristles ; there are a few more extra bristles of the same size round about occurring irregularly. The sterno-posteromedial bristles in the following sternites posteriorly get wider apart gradually, those on the 4th and 5th sternites being generally the widest apart. These bristles show an absolute regularity from the 1st sternite to the 8th in the worker and from the 2nd to 8th sternite in the soldier (Tables 9 and 10). The 1st sternite of the soldier and the last two sternites, *i.e.*, 9th and 10th (podical plates), of both the soldier and the worker do not show such a constant position and distribution, only 60 per cent. to 75 per cent. individuals showing this constancy. Occasionally (5-10 per cent. individuals a few larger *extra bristles* (*e.x.*) were observed in variable positions.



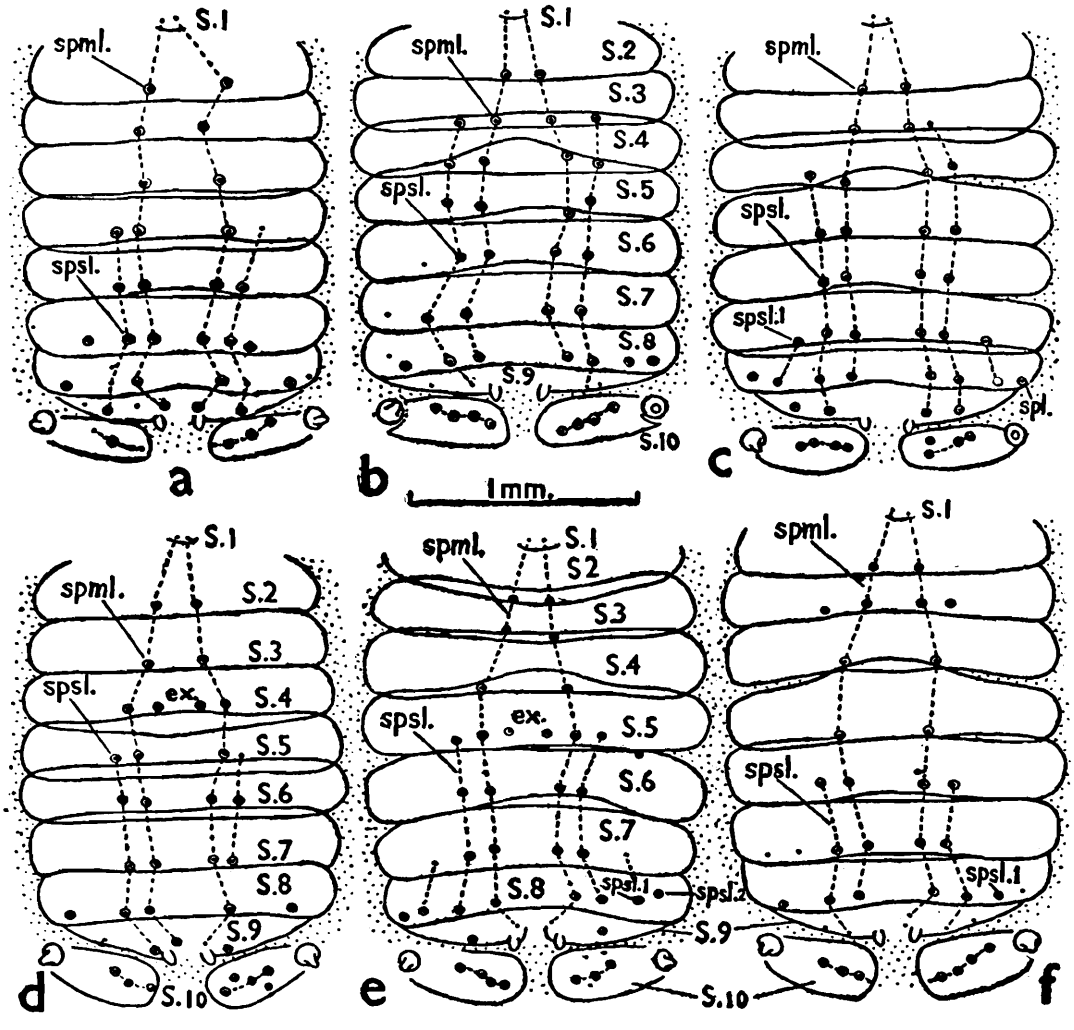
TEXT-FIG. 22.—*Odontotermes obesus* (Rambur), soldier caste.

(*a-f*). Abdominal sternites 1-10, showing rows of scars of sterno-posteromedial bristles; sterno-posterosublateral bristles joined by dotted lines and other bristles, *e.g.*, extra inner, sterno-posterosublateral 1 and 2 and sterno-posterolateral on posterior sternites mostly as such.



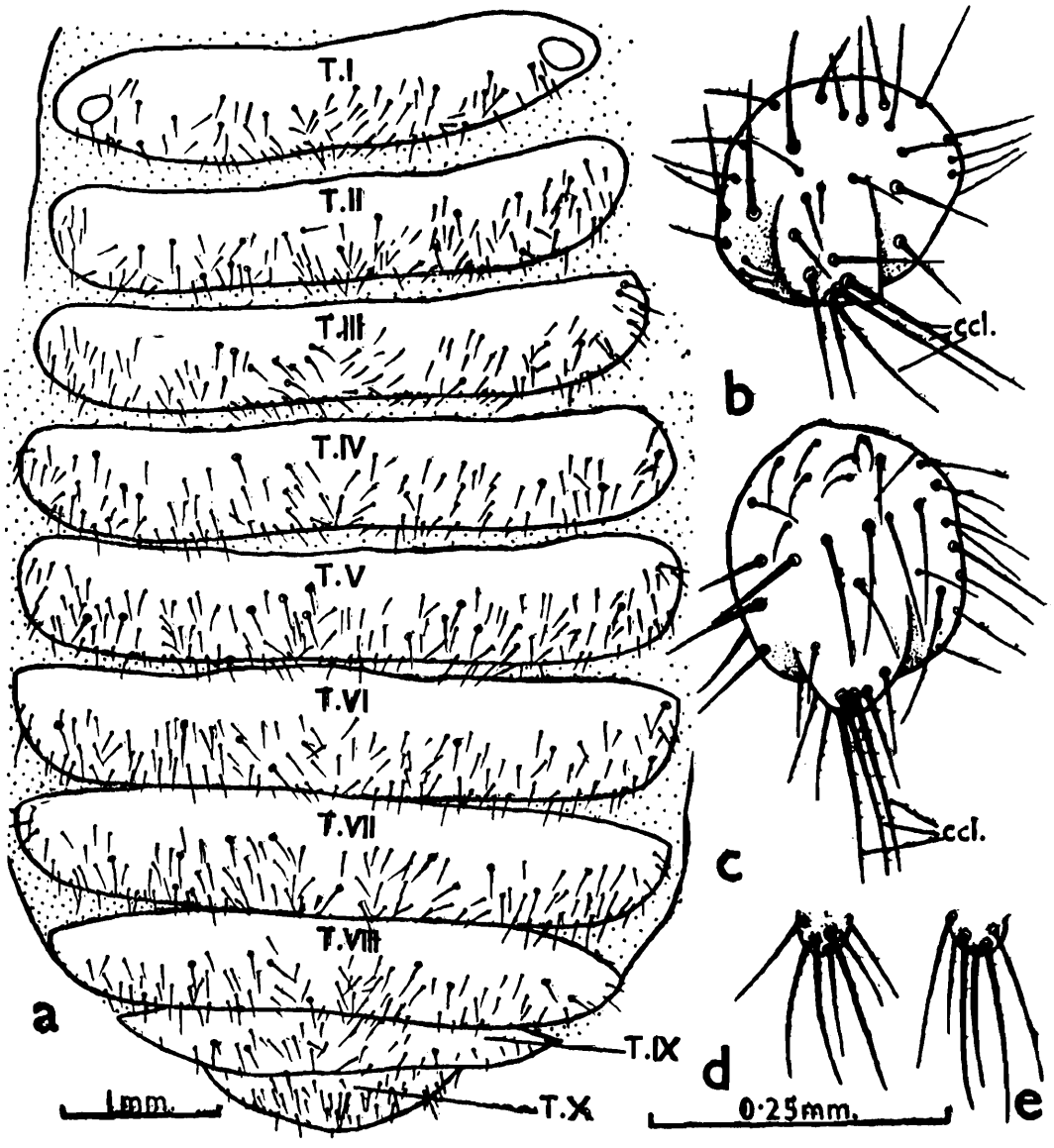
TEXT-FIG. 23.—*Odontotermes obesus* (Rambur), worker caste.

Abdominal sternites 1-10, showing general distribution of bristles. The large bristles of one side joined by dotted lines to show the rows of sterno-posteromedial, sterno-posterosublateral and sterno-posterosublateral 1 bristles.



TEXT-FIG. 24.—*Odontotermes obesus* (Rambur), worker caste.

(*a-f*). Abdominal sternites 1-10, showing rows of scars of sterno-posteromedial and sterno-posterosublateral bristles, joined by dotted lines ; and other bristles, *e.g.*, extra-inner, sterno-posterosublateral 1 and 2, and sterno-posterolateral, on posterior sternites, shown mostly as scars.



TEXT-FIG. 25.—*Odontotermes obesus* (Rambur), alate caste.

(*a*). Abdominal tergites I-X, showing irregularly distributed bristles. (*b*, *c*). Left and right anal cerci, respectively, without any characteristic cercal bristles. (*d*, *e*). Left and right subanal styles, respectively, without any characteristic bristles.

TABLE 9.—*Percentage of individuals, showing arrangement of the different larger bristles on the abdominal sternites of the soldier caste of* Odontotermes obesus (*Rambur*), *Based on 20 specimens. lt.*, left ; *rt.*, right.

Sternites	Sterno-postero-medial (*spml.*)		Sterno-postero-sublateral (*spsl.*)		Sterno-postero-sublateral 1 (*spsl. 1*)		Sterno-postero-sublateral 2 (*spsl. 2*)		Sterno-postero-lateral (*spl.*)		Extra (*ex.*)			
											Outer*		Inner*	
	lt.	*rt.*	*lt.*	*rt.*	*lt.*	*rt.*	*lt.*	*rt.*	*lt.*	*rt.*	*lt.*	*rt.*	Single	Paired
S. 1	70	70	..	..	..	..	..	..	..	..	..	..	..	..
S. 2	100	100	..	..		..	..	..	..	..	5	—	10	—
S. 3	100	100	..	..		..	..	..	..	..	—	5	—	5
S. 4	100	100	—	5		..	..	..		..	..	..	..	..
S. 5	100	100	40	45		..	..	..	..		—	—	—	5
S. 6	100	100	90	90	—	10	—	—	10	5	..	..	..	..
S. 7	100	100	100	95	40	50	5	10	10	5	..	..	..	..
S. 8	100	100	85	90	50	50	80	80	65	60	10	—	..	..
S. 9	70	75	65	71	45	50	—	—	10	10	..	..	..	..

* Outer and inner in respect to the bilateral rows of bristles.

TABLE 10.—*Percentage of individuals, showing the arrangement of the different larger bristles on the abdominal sternites of the worker caste of* Odontotermes obesus (*Rambur*). *Based on 20 specimens, lt.*, left ; *rt.*, right

Sternites	Sterno-postero-medial (*spml.*)		Sterno-postero-sublateral (*spsl.*)		Sterno-postero-sublateral 1 (*spsl. 1*)		Sterno-postero-sublateral 2 (*spsl. 2*)		Sterno-postero-lateral (*spl.*)		Extra (*ex.*) Outer*		Extra (*ex.*) Inner*	
	lt.	*rt.*	*lt.*	*rt.*	*lt.*	*rt.*	*lt.*	*rt.*	*lt.*	*rt.*	*lt.*	*rt.*	Single	Paired
S. 1	100	100			..	..	..	..	..				5	—
S. 2	100	100		..	..	..		..	..	..			5	—
S. 3	100	100	25	25	..	..	..	..	..	..			—	5
S. 4	100	100	20	25	..		..	..		..			—	10
S. 5	100	100	95	85	..	..							15	15
S. 6	100	100	95	100	5	10			...					..
S. 7	100	100	100	100	60	45	30	15	10	20	..	..	..	..
S. 8	100	100	90	100	100	100	5	5	65	50	—	—	5	5
S. 9	70	60	90	100	40	60	—	10	—	..	..			..

* Outer and inner in respect to the bilateral rows of bristles.

The next outer row laterally consists of the *sterno-posterosublateral bristles* (*spsl.*) which, in the soldier, was observed from the 5th sternite and in the worker from the 3rd sternite posteriorly, in a somewhat variable percentage of individuals (Tables 9 and 10).

The other sublateral and lateral bristles were observed generally from the 7th sternite posteriorly in both the soldier and the worker, though not very regularly. In the 8th sternite they are comparatively better developed. In the 9th sternite they are frequently absent, and the *sterno-posteromedial bristles* here are closer together in the worker than in the soldier.

The 10th sternite (podical plates) shows 3 or 4 bristles very closely set together in a somewhat transverse row on either side. The number, however, varies frequently.

The bristles on the abdominal tergites are distributed irregularly in all the three castes, showing no characteristic arrangement whatsoever.

(b) *Abdominal appendages*

1. *Anal cerci.*—

Soldier and worker (Text-figs. 13*f*, *g* ; 14*f*, *g* ; and 25*b*, *c*).—In both the soldier and the worker caste, the *anal cerci* (*cer.*) bear three robust bristles distally, called the *cercal bristles* (*ccl.*), and a few comparatively minor ones. A few individuals show only 2 robust bristles instead. The bilateral symmetry noted in respect of the 3 robust bristles is 84 per cent. in the soldier and 72 per cent. in the worker (Table 11). The alates also possess such larger bristles but show no such distinction and constancy.

TABLE 11—*Percentage of individuals, showing bilateral symmetry in respect of the large bristles on anal cerci* (*ccl.*) *in the soldier and the worker of* Odontotermes obesus (*Rambur*). *Based on 25 specimens.*

Caste	Left anal cercus		Right anal cercus		Percentage of bilateral symmetry in respect of the 3 large bristles (*ccl.*)	Percentage of bilateral symmetry in respect of the 2 large bristles (*ccl.*)
	Percentage of individuals with 3 large bristles	Percentage of individuals with 2 large bristles	Percentage of individuals with 3 large bristles	Percentage of individuals with 2 large bristles		
Soldier	92	8	88	12	84	4
Worker	92	8	80	20	72	—

2. *Subanal styles.*—

Soldier and worker (Text-figs, 13*d*, *e* ; 14*d*, *e*, and 25*d*, *e*).—The *subanal styles* (*sa. sty.*) in both the soldier and the worker comprise a pair of conspicuously elongated and thick bristles on each style, and a few other smaller bristles. Of the former, one bristle is distinctly located towards the inner margin and called the *stylar bristle 1* (*styr. 1*), whereas the other is located more or less apically and called the *stylar bristle 2* (*styr. 2*). Both the stylar bristles show 96 per cent. bilateral symmetry (Table 12) in both the castes ; in the remaining 4 per cent. cases only the *stylar bristle 1* is present. The alates neither show such constant number nor can these bristles be distinctly differentiated from the other bristles present.

TABLE 12.—*Percentage of individuals, showing bilateral symmetry in respect of the larger bristles on subanal styles, called stylar bristles (styr.), in the soldier and worker of* Odontotermes obesus (*Rambur*). *Based on 25 specimens.*

Caste	Left subanal style		Right subanal style		Percentage of bilateral symmetry in respect to 2 large bristles (*styr.*)	Percentage of bilateral symmetry in respect to 1 large bristle (*styr.*)
	Percentage of individuals with 2 large bristles	Percentage of individuals with 1 large bristle	Percentage of individuals with 2 large bristles	Percentage of individuals with 1 large bristle		
Soldier	**100**	—	**96**	**4**	**96**	—
Worker	**100**	—	**96**	**4**	**96**	—

TABLE 13.—*Summary of the characteristic bristles observed in more than 80 per cent. of the individuals of the three castes of* Odontotermes obesus (*Rambur*) (*Isoptera : Termitidae*).

Body regions and appendages	Nomenclature of the bristles	Abbreviations used for bristles	Frequency percentage of bilateral symmetry		
			Soldier	Worker	Alate
I—HEAD-CAPSULE					
Dorsal view					
Clypeus	Clypeal	*cll.*	100	96	—
Frons	Frontal	*frtl.*	100	92	—
Epicranial region	Epicranial 1	*epcl. 1*	92	—	—
	Epicranial 3	*epcl. 3*	88	—	—
	Epicranial 4	*epcl. 4*	96	—	—
Genae	Medio-genal	*mgl.*	96	—	—
	Proximo-genal	*prgl.*	88	—	—
II—HEAD-APPENDAGES					
Labrum	Apical	*ap.*	100	100	96
	Apical lateral	*ap. l.*	—	100	96
	1	1	100	100	88
	2	2	97·5	100	84
	3	3	95	100	96
	4	4	95	92	96
	5	5	—	—	96
Galea	Disto-galeal	*dgall.*	92	—	—
Glossa	Medio-glossal	*mgll.*	—	88	—
Prementum	Premental 1	*prmtl. 1*	—	100	—
Postmentum	Postmental 1	*pmtl. 1*	92	92	100
	Postmental 2	*pmtl. 2*	—	92	80
	Postmental 3	*pmtl. 3*	—	84	—
	Medio-postmental	*mpmtl.*	96	100	—
III—THORAX					
Prothorax	Pronoto-anterior	*pr. a.*	100	100	—
	Pronoto-lateral	*pr. l.*	96	88	—
	Pronoto-posterior	*pr. p.*	100	92	—
Mesothorax	Mesonoto-lateral	*mst. l.*	96	84	—
	Mesonoto-posterior	*mst. p.*	96	—	—
Metathorax	Metanoto-lateral	*mtt. l.*	100	88	—
	Metanoto-posterior	*mtt. p.*	96	—	—
IV—LEGS					
Fore-leg	Dorsal tibial spur	*d. tb. sr.*	100	100	100
Fore-leg, Middle-leg, Hind-leg	Ventral tibial spurs	*v. tb. sr.*	100	100	100
V—ABDOMEN					
Sternite 1	Sterno-posteromedial	*spml.*	—	100	—
Sternite 2	Ditto	*spml.*	100	100	—
Sternite 3	Ditto	*spml.*	100	100	—
Sternite 4	Ditto	*spml.*	100	100	—
Sternite 5	Ditto	*spml.*	100	100	—
	Sterno-posterosublateral	*spsl.*	—	80	—
Sternite 6	Sterno-posteromedial	*spml.*	100	100	—
	Sterno-posterosublateral	*spsl.*	80	95	—
Sternite 7	Sterno-posteromedial	*spml.*	100	100	—
	Sterno-posterosublateral	*spsl.*	95	100	—
Sternite 8	Sterno-posteromedial	*spml.*	100	100	—
	Sterno-posterosublateral	*spsl.*	80	90	—
	Sterno-posterosublateral 1	*spsl. 1*	—	100	—
Sternite 9	Sterno-posterosublateral	*spsl.*	—	90	—
VI—CERCI	Cercal (3 setae)	*ccl.*	84	—	—
VII—SUBANAL STYLES	Stylar 1	*styr. 1*	100	100	—
	Stylar 2	*styr. 2*	96	96	—

VI—SUMMARY

1. The chaetotaxy of the soldier, the worker and the alate castes of *Odontotermes obesus* (Rambur), was studied from the material collected from areas around Dehra Dun (U.P.).

2. The soldier and the worker closely resemble each other and present a considerably regular and symmetrical arrangement of bristles. The alate caste shows some symmetrical and regular bristles only on head-appendages.

3. The nomenclature of the bristles is based mostly on their location on the particular body-part except in the case of the labral setae where a connotation in Arabic numerals has been adopted.

4. In the head, the larger bristles on the cranium and some head-appendages, *e.g.*, labrum, lacinia and labium have been described to show characteristic arrangement in the case of all the three castes. The bristles on the galea have been described in the soldier caste only.

5. The first segment or scape of the antenna is naked in the soldier, while in the worker and the alate it is bristled.

6. In the thorax only the tergites, and in the abdomen only the sternites, of the soldier and the worker castes have been described ; they show a characteristic and regular arrangement of the larger bristles. Alates do not show such a characteristic or regular arrangement.

7. All the three castes show a pair of ventral tibial spurs distally on the fore-, middle-, and hind-legs in addition to a dorsal tibial spur on the fore-leg alone.

8. The anal cerci and the subanal styles show some characteristic large and robust bristles in the soldier and the worker castes, besides other smaller and less differentiated bristles. The alates show no such differentiation between large and small bristles.

VII—REFERENCES

HINTON, H. E. 1946.—On the homology and nomenclature of the bristles of Lepidopterous larvae, with some notes on the phylogeny of the Lepidoptera.—*Trans. R. ent. Soc. Lond.*, London, 97, pp. 1-37.

KUSHWAHA, K. S. 1955.—External morphology of the soldier of *Odontotermes obesus* (Rambur).—*Curr. Sci.*, Bangalore, **24**, pp. 203-204.

KUSHWAHA, K. S. 1959,—A preliminary account of external morphology of the worker and alate of *Odontotermes obesus* (Rambur).—*Curr. Sci.*, Bangalore, **28**, pp. 298-299.

KUSHWAHA, K. S. 1960*a*.—External morphology of the termite *Odontotermes obesus* (Rambur) (Isoptera : Termitidae). Part Soldier.—*Rec. Indian Mus.*, Delhi, **55** [1957], pp.209-227.

KUSHWAHA, K. S. 1960*b*.—External morphology of the termite *Odontotermes obesus* (Rambur) (Isoptera : Termitidae). Part 2. Alate and worker.—*Rec. Indian Mus.*, Delhi, **55** [1957], pp. 229 250.,

OSTEN-SACKEN, C. R. 1884.—An essay of Comparative Chaetotaxy, or the arrangement of characteristic bristles of Diptera.—*Trans. ent. Soc. Lond.*, London, pp. 497-517.

SINGH, B. 1953.—Immature stages of Indian Lepidoptera.—*Indian For. Rec.* (*Ent.*), Delhi, **8**(7), pp. 67-158, 10 pls.

WALTON, W R. 1909.—An illustrated glossary of chaetotaxy and anatomical terms used in describing Diptera.—*Ent. News*, Philadelphia, **20**, pp. 307-319, 4 pls.

WILLISTON, S. W. 1908.—Chaetotaxy. In : *Manual of North American Diptera*. Ed. 2, pp. liv+167, New Haven (Hathaway).

VIII—ABBREVIATIONS USED IN TEXT-FIGURES AND TABLES

a.a., articulating area between maxilla and labium.
acl., anteclypeus.
ant., antenna.
ap., apical bristles of labrum.
ap. l., apical lateral bristles of labrum.
at. a. md., anterior articulation of mandible.
b. c. cd., basal condyl of cardo.
at. t. a., anterior tentorial arm.
b. pmt., blade of postmentum.
ccl., cercal bristle.
cd., cardo.
cer., cercus.
cl., clypeus.
cll., clypeal bristle.
cr. a. md., cranial articulation of mandible.
ctm., corporotentorium.
dgall., disto-galeal bristle.
d. tb. sr., dorsal tibial spur.
e., eye.
epcl. 1, *epcl. 2*, *epcl. 3*, *epcl. 4*, epicranial bristles 1, 2, 3, 4, respectively.
ep. r., epicranial region.
ex., extra bristle.
fr., frons.
frtl., frontal bristle.
ft., fontanelle.
G., Gap between labral bristles.
g., galea.
gl., glossa.
gn., gena.
gpgl. 1, *gpgl. 2*, *gpgl. 3*, geno-postgenal bristles 1, 2, 3, respectively.
hd. head.
lb. labium.
lb. p., labial palp.
lb. s., labial suture.
lcn., lacinia.
lgl., lingula (hyaline tip of labrum).
lr., labrum.
lr. s., labral suture.
lt. f. l., left fore-leg.
lt. h. l., left hind-leg.
mgl., medio-genal bristle.
md., mandible.
mgll., medio-glossal bristle.
mn., median bristle.
mn. 1, *mn. 2*, *mn. 3*, median bristles 1, 2, 3, respectively.
mpmtl., medio-postmental bristle.
mst., mesonotum.
mst. l., mesonoto-lateral bristle.

mst. p., mesonoto-posterior bristle.
mtt., metanotum.
mtt. l., metanoto-lateral bristle.
mtt. p., metanoto-posterior bristle.
mx., maxilla.
mx. p., maxillary palp.
oc., ocellus.
oct., occiput.
oct. f., occipital foramen.
p., pedicel.
pcl., postclypeus.
pd. pl., podical plate.
pgl., paraglossa.
pgn., postgena.
pmt., postmentum.
pmtl. 1, *pmtl. 2*, *pmtl. 3*, *pmtl. 4*, *pmtl. 5*, postmental bristles, 1,2,3,4,5, respectively,
poct., postocciput.
prgl., proximo-genal bristle.
prmtl. 1, *prmtl. 2*, premental bristles 1 and 2, respectively.
pr. a., pronoto-anterior bristle.
pr. l., pronoto-lateral bristle.
pr. p., pronoto-posterior bristle.
prt., pronotum.
p. t. a. posterior tentorial arm.
rt. f.l., right fore-leg.
rt. h. l., right hind-leg.
s., scape.
sa. sty., subanal style.
scl., scutellum.
sct., scutum.
st., stipes.
styr. 1., stylar bristle 1.
styr. 2., stylar bristle 2.
su. g., sutural groove of stipes.
T. I., T. II., tergum first, second, etc.
tar., tarsus.
tar. c., tarsal claw.
tb., tibia.
t. f., tentorial foramen.
v., vertex.
v. tb. sr., ventral tibial spur.
♀, female.
♂, male.