

MORPHOMETRIC ANALYSIS OF *ODONTOTERMES ASSAMENSIS* HOLMGREN, WITH A NOTE ON ITS TAXONOMIC STATUS

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Abstract: Morphometric analysis of *O. assamensis* Holmgren, is discussed in detail. *Odontotermes assamensis* differs from *O. obesus* in tooth of left mandible from tip, which is more anteriorly located in *O. assamensis*.

Key words: Odontotermes, termites, morphometric study

INTRODUCTION

Odontotermes (Cyclotermes) assamensis was described by Holmgren in 1913 from Assam. Ahmad (1958) and Roonwal and Chhotani (1962) considered *O. assamensis* as a valid species. Later on, Krishna (1965), without giving morphometric variations in different species of the genus *Odontotermes*, considered *O. assamensis* as junior synonym of *O. obesus* (Rambur). As a result Roonwal (1970) and Akhtar (1975) also treated it as a junior synonym of *O. obesus*.

Maiti (1983) reported that *O. obesus* described from Bangladesh by Akhtar (1975) is *O. redemanni*. But at the same time Maiti (1975) points out, *O. redemanni* is a highly variable species and the inter-colonial variations are a source of confusion.

As great confusion prevailed regarding exact identification and differentiation of *O. obesus*, *O. redemanni* and *O. assamensis*, material collected by the senior author from different localities of Bangladesh was examined. Since there is great variation in different species of the genus *Odontotermes*, we do not accept the *O. assamensis* is a junior synonym of any known species. Therefore, its morphometric variations are given in detail and its taxonomic status is discussed.

MATERIALS AND METHODS

The termite colonies used in the present studies were procured from collection of the senior author and Prof. Dr. Muzaffer Ahmad. The collection is lodged in the Department of Zoology, University of the Punjab, Lahore. Taxonomic terms and measurements used are as explained by Krishna (1961), Ahmad (1965), Akhtar (1975).

For each individual soldier ten parameters were measured and data was statistically analysed for various statistical constants, according to Sokal and Rohlf (1973). Abbreviations used in the text are as follow: A, B, C, D, E, F represent samples of *O. assamensis* from Seripur, Rajshahi, Barisal, Chandpur, Noakhali and Rasulpur, respectively. Samples A¹, B¹ and C¹ of *O. obesus* are from Rajshahi, Singra and Dinajpur, respectively. Mean, standard deviation and coefficient of variability are indicated as X, S.D. and C.V.

RESULTS

Morphometric Analysis Of Odontotermes assamensis

Length of head to side base of mandibles

The length of head to side base of mandibles varied from 1.19 - 1.52mm. There was significant variance component in the six populations listed in Table-1 for length of head to side base of mandibles (F.49.04; df. 5:65; $P < 0.05$). The coefficient of variability of the six populations varied from 1.003 to 6.83. Population B from Scripur was not significantly different from population E from Noakhali (T-value=0.05; df.18; $P > 0.05$).

Width of head at side base of mandible

The width of head to side base of mandibles varied from 0.63 - 0.87mm. There was significant variance component in the six populations for this parameter (F. 15.61; df. 5:65; $P < 0.05$). The coefficient of variability of the six populations varied from 2.31 to 4.22, indicating consistency of samples. Population B from Rajshahi showed significant differences ($P < 0.05$).

Width of head at posterolateral ends of antennal carinae

The width of head at posterolateral ends of antennal carinae varied from 0.90 - 1.14mm, and there was significant variance component (F. 21.99; df. 5:65; $P < 0.05$). The coefficient of variability of the six populations varied from 2.44 to 5.68. Comparison of six populations based on t-test are listed in Table-1.

Maximum width of head

The maximum width of head varied from 1.07 - 1.31mm, and there was significant variance component (F.32; df. 5:65; $P < 0.05$). The coefficient of variability of the six populations varied from 1.32 to 5.45. The following populations had non-significant differences among them (A-B), (A-C), (B-D), (B-E), (C-D), (C-E), (C-F) (D-E). The remaining populations showed significant variation regarding this character.

Length of left mandible

The length of left mandible varied from 0.72 - 0.98mm, and there was a significant variance component (F. 11.80; df. 5:62; $P < 0.05$). The coefficient of variability varied from 2.88 to 6.34. There were non-significant variations amongst populations (A-B), (B-C), (B-D), (C-E) and (D-F). The remaining populations varied significantly from each other.

Length of Postmentum

The length of postmentum varied from 0.61 - 1.05mm, and there was slightly significant variance component (F. 3.39; df. 5:65; $P < 0.05$). However, the coefficient of variability in the six populations varied from 1.91 to 12.5.

Maximum width of postmentum

The maximum width of postmentum varied from 0.41 - 0.58mm, with variance component (F. 15.35; df. 5:65; $P < 0.05$). The coefficient of variability varied from 2.5

to 6.44.

Length of pronotum

The length of of pronotum varied from 0.41 - 0.65mm, with variance component (F. 16.71; df. 5:65; P < 0.05). The coefficient of variability varied from 1.77 to 10.51.

Width of pronotum

The width of pronotum varied for 0.82 - 1.09mm, and there was significant variance component (F. 27.20; df. 5:65; P < 0.05). The coefficient of variability varied from 1.73 to 5.35.

Table-1: Morphometric variations in taxonomic parameters of the soldiercaste of *O. assamensis*. Samples followed similar letters indicate non-significant differences in mean values by T-test.

Sample	N	Range	X	S.D.	C.V.
Length of head at side base of mandible					
A	9	1.31 - 1.35	1.33	0.013	1.003
b ^a	10	1.29 - 1.46	1.37	0.054	3.950
C	10	1.27 - 1.33	1.29	0.088	6.830
D	10	1.40 - 1.52	1.47	0.034	2.330
E ^a	10	1.34 - 1.46	1.39	0.041	2.960
F	22	1.19 - 1.31	1.25	0.039	3.130
(F. 49.04; df. 5:65 P < 0.05)					
Width of head at side base of mandibles					
A ^{abc}	9	0.72 - 0.82	0.75	0.023	3.055
B	10	0.74 - 0.84	0.78	0.033	4.220
C ^{ade}	10	0.72 - 0.80	0.75	0.029	3.880
D ^{bc}	10	0.80 - 0.86	0.82	0.019	2.310
E ^d	10	0.72 - 0.80	0.74	0.026	3.430
F ^c	22	0.63 - 0.80	0.72	0.033	3.360
(f. 15.61; df. 5:65; P < 0.05)					
Width of head at posterolateral end of antennal carinae					
A ^{ab}	9	0.96 - 1.09	1.03	0.034	3.26
B ^{acd}	10	0.98 - 1.11	1.06	0.038	3.62
C ^{be}	10	0.92 - 1.09	0.99	0.056	5.68
D ^f	10	1.04 - 1.14	1.10	0.027	2.44
E ^c	10	1.05 - 1.13	1.09	0.033	3.07
F ^{def}	10	0.90 - 1.11	0.96	0.49	5.10
(f. 21.99; df. 5:65; P < 0.05)					
Maximum width of head					
A ^{ab}	9	1.12 - 1.31	1.22	0.035	2.88
B ^{acde}	10	1.14 - 1.28	1.22	0.046	3.72
C ^{bcfgh}	10	1.09 - 1.31	1.21	0.066	5.45
D ^{dh}	10	1.24 - 1.29	1.27	0.016	1.32
E ^{egi}	10	1.21 - 1.29	1.26	0.035	2.77
F ^h	22	1.07 - 1.23	1.16	0.045	3.85
(F. 11.32; df. 5:65 P < 0.05)					

length of left mandible					
A ^a	9	0.90 - 0.96	0.93	0.21	2.25
B ^{bcd}	10	0.85 - 0.91	0.88	0.020	2.26
C ^{efg}	10	0.82 - 0.92	0.87	0.029	3.28
D ^{ai}	10	0.88 - 0.93	0.90	0.014	1.56
E ^{cfh}	10	0.72 - 0.94	0.84	0.064	7.62
F ^{dghi}	22	0.82 - 0.92	0.87	0.048	5.48

(F.5.38; df. 5:65; P < 0.05)

Tooth of left mandible from tip					
A ^a	9	0.24 - 0.28	0.26	0.010	4.03
B ^{abd}	10	0.23 - 0.27	0.255	0.013	6.34
C ^{bdf}	10	0.21 - 0.24	0.227	0.009	3.94
C ^g	10	0.24 - 0.26	0.240	0.007	2.88
E ^d	10	0.20 - 0.26	0.221	0.081	8.22
F ^{fg}	22	0.22 - 0.26	0.238	0.0145	6.07

(F.11.80; df. 5:62; 5:62 P < 0.05)

Length of postmentum					
A ^a	9	0.78 - 0.88	0.81	0.033	4.07
B ^{bcd}	10	0.74 - 0.82	0.78	0.026	3.29
C ^{bgh}	10	0.70 - 0.82	0.78	0.035	4.49
D ^a	10	0.78 - 0.82	0.81	0.015	1.91
E ^{efgi}	10	0.74 - 0.80	0.77	0.023	2.99
F ^{dghi}	22	0.61 - 1.03	0.73	0.920	12.05

(F.3.39; df. 5:65; P < 0.05)

Width of postmentum					
A ^{ab}	9	0.49 - 0.57	0.52	0.021	4.07
B ^{cd}	10	0.51 - 0.58	0.54	0.018	3.36
C ^{ace}	10	0.47 - 0.55	0.52	0.024	4.64
D ^d	10	0.53 - 0.57	0.54	0.014	2.58
E ^{be}	10	0.51 - 0.57	0.53	0.016	3.04
F	22	0.41 - 0.51	0.48	0.031	6.44

(F. 15.35; df. 5:65; P < 0.05)

Length of pronotum					
A ^{ab}	9	0.53 - 0.55	0.53	0.009	1.17
B ^c	10	0.51 - 0.60	0.56	0.027	4.87
C ^{ad}	10	0.45 - 0.57	0.52	0.035	6.75
D	10	0.53 - 0.64	0.62	0.019	3.13
E ^c	10	0.55 - 0.61	0.57	0.020	3.50
F ^{db}	22	0.41 - 0.59	0.50	0.053	10.57

(F. 16.71; df. 5:65; P < 0.05)

With of pronotum					
A ^{abc}	9	0.90 - 0.96	0.92	0.020	2.21
B ^{de}	10	0.86 - 1.03	0.96	0.052	5.37
C ^{af}	10	0.86 - 0.95	0.91	0.027	2.99
D ^d	10	0.99 - 1.06	1.02	0.025	2.48
E ^{bef}	10	0.90 - 0.96	0.93	0.016	1.73
F ^c	22	0.82 - 0.94	0.88	0.035	4.00

(F. 27.20; df. 5:65; P < 0.5)

Table-2: Summary of measurements (in mm) of different parameters of the soldier caste of *Odontotermes obesus* drawn from three localities and their statistical constants.

Sample	N	Range	X	S.D.	C.V.
Length of head to side base of mandible					
A	10	1.38 - 1.40	1.43	0.018	1.29
B	20	1.29 - 1.44	1.37	0.041	3.03
C	30	1.29 - 1.59	1.44	0.85	5.96
Width of head at side base of mandibles					
A	10	0.82 - 0.84	0.81	0.011	1.39
B	20	0.78 - 0.83	0.80	0.018	2.26
C	30	0.80 - 0.32	0.84	0.340	4.04
Width of head at posterolateral ends of antennal carinae					
A	10	1.07 - 1.12	1.09	0.014	1.32
B	20	1.01 - 1.11	1.06	0.013	2.91
C	30	1.03 - 1.21	1.11	0.040	3.59
Maximum width of head					
A	10	1.19 - 1.26	1.22	0.021	1.75
B	20	1.15 - 1.26	1.19	0.037	3.08
C	30	1.17 - 1.39	1.27	0.050	4.21
Length of left mandible					
A	10	0.95 - 0.98	0.97	0.010	1.03
B	20	0.80 - 0.98	0.91	0.039	4.28
C	30	0.90 - 1.03	0.94	0.036	3.71
Tooth of left mandible from tip					
A	10	0.33 - 0.39	0.36	0.017	4.78
B	20	0.30 - 0.35	0.31	0.017	5.34
C	30	0.31 - 0.37	0.33	0.018	5.04
Length of Postmentum					
A	10	0.86 - 0.88	0.87	0.009	1.09
B	20	0.76 - 0.86	0.80	0.230	2.86
C	30	0.72 - 0.96	0.85	0.070	8.21
Width of postmentum					
A	10	0.53 - 0.57	0.54	0.012	2.18
B	20	0.53 - 0.57	0.54	0.011	2.09
C	30	0.47 - 0.58	0.52	0.032	6.06
Length of pronotum					
A	10	0.54 - 0.58	0.56	0.013	2.24
B	20	0.51 - 0.57	0.54	0.018	3.24
C	30	0.51 - 0.59	0.56	0.019	3.33
Width of pronotum					
A	10	0.88 - 0.96	0.93	0.022	2.36
B	20	0.80 - 0.94	0.87	0.038	4.32
C	30	0.80 - 1.13	0.98	0.077	7.87

Comparison

For the sake of comparison, morphometric values of the samples A, B and C of *O. obesus* from Bangladesh are given in Table-2. The table clearly indicates that there is overlapping of measurements for most of the parameters, except for the tooth of left mandible from tip. Although majority of the samples have been taken from different localities of Bangladesh, samples B of *O. assamensis* and sample A' of *O. obesus* are from the same locality i.e., Rajshahi, And, both the samples shows differences in the location of tooth of left mandible from tip. Frequency distribution graphs (safely deposited in the library, of the Department of Zoology, University of the Punjab, Lahore in a thesis) for most of the parameters of the pooled data of *O. assamensis* and *O. obesus* were Unimodal, except for the tooth of left mandible from tip, where it was bimodal (fig.1). We do not think that the same species living in the same area would be maintaining distinctly different populations for tooth of left mandible from tip. The coefficient of variability of the pooled data of *O. assamensis* and *O. obesus* for this parameter was 18.20, clearly indicating that the data pertains to two species.

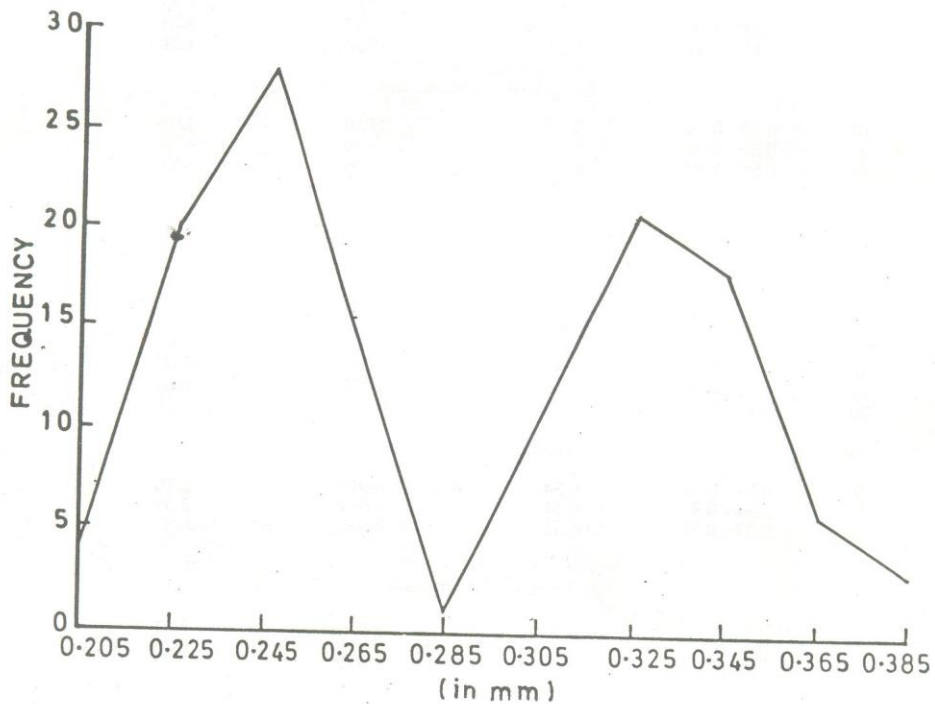


Fig. 1. Bimodal frequency distribution of tooth of left mandible from tip. *Odontotermes assamensis* (0.20-0.28 mm); *odontotermes obesus* (0.30-0.385 mm).

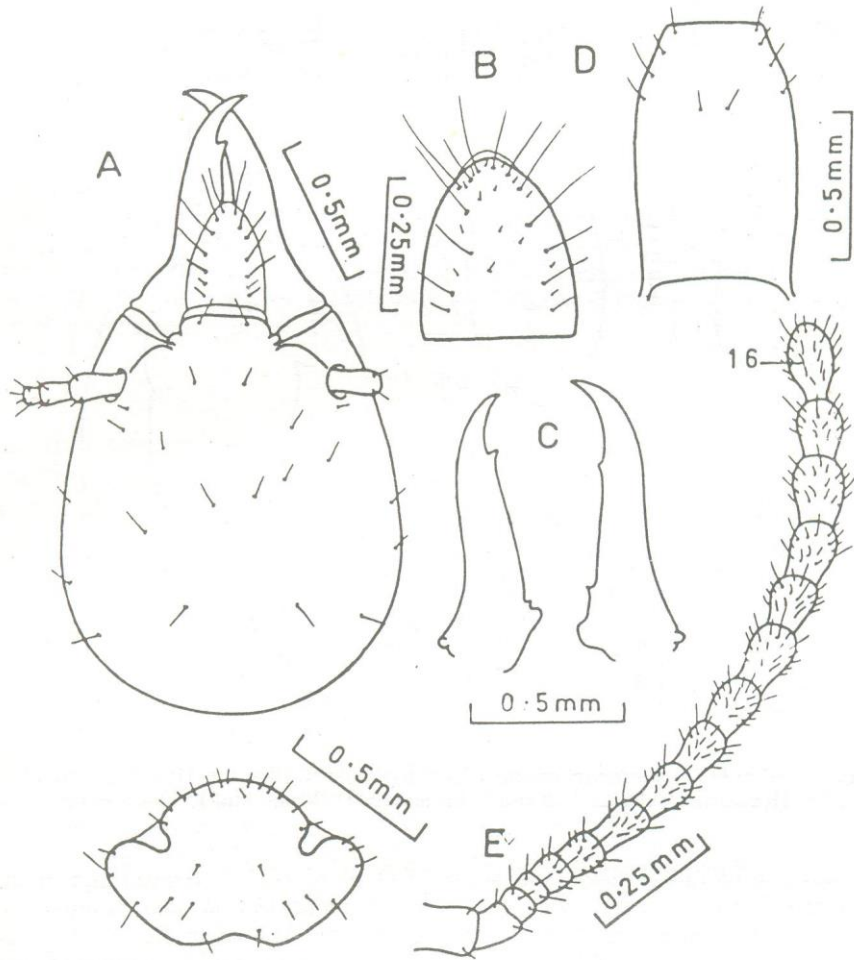


Fig. 2. Soldier of *Odontotermes assamensis* Holmgren from Seripur. A. Head and pronotum from above, B. Labrum from above, C. Mandible, D. Postmentum from below.

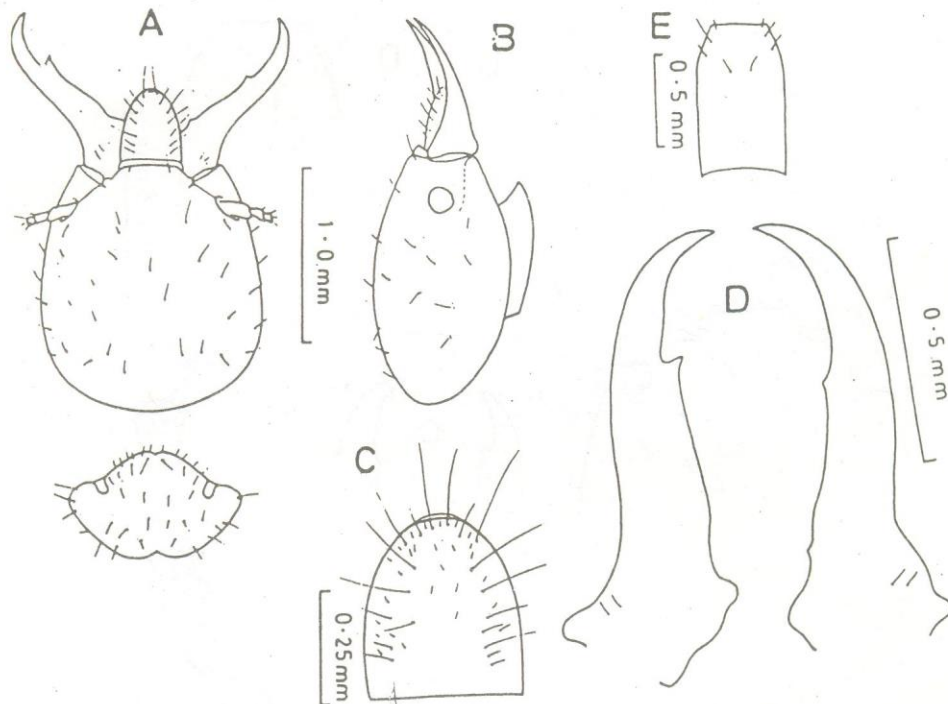


Fig. 3. Soldier of *Odontotermes obesus* (Rambur) from Rajshahi A. Head and pronotum from above, B. Head from side, C. Labrum from above, D. Mandible, E. Postmentum from below.

Based on this consideration, taxonomic status of *O. assamensis* is revived and should be considered a valid species. For the sake of identification and comparison, Illustrations of the soldier caste of the two species are shown in Fig. 2, 3. In *O. assamensis*, tooth of left mandible from tip is distinctly more anteriorly located than that of *O. obesus*.

DISCUSSION

Same species of the genus *Odontotermes* are so closely related and at the same time so variable that their correct identification is a tedious job. Krishna (1965) surveyed Burma for termites and, besides other species, collected *Odontotermes obesus*. He reported that *O. obesus* is a highly variable species, and therefore,

considered *O. orissae*, *O. assamensis*, *O. banglaorensis* as synonym of *O. obesus*.

Chhotani (1977) and Bose (1984) also pointed out the inability in telling apart *O. obesus* from *O. redemanni*.

Keeping in view intercolonial variations in soldiers, a large number of colonies of *O. obesus*, *O. assamensis* and the *O. redemanni* were examined. The statistical data reveals that out of the ten parameters discussed in the present report, only one parameter is quite distinct.

This last parameter is the tooth of left mandible from tip and the coefficient of variability of the pooled data of *O. assamensis* and *O. obesus* was 18.20. This indicates that data pertains to two species. Consequently taxonomic status of *O. assamensis* is revived with the remark the *O. assamensis* and *O. obesus* are sibling species, difficult to separate on the basis of morphological characters, except for the tooth of left mandible from tip.

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