▼ Journal of Research (Science), Bahauddin Zakariya University, Multan, Pakistan.
Vol. 17, No. 3, July 2006, pp. 207-218 ISSN 1021-1012

MORPHOMETRIC ANALYSIS OF POPULATION SAMPLES OF SOLDIER CASTE OF *ODONTOTERMES PARVIDENS* HOLMGREN AND HOLMGREN (ISOPTERA: TERMITIDAE, MACROTERMITINAE)

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Abstract
In order to study morphometric Variations in *Odontotermes parvidens* Holmgren and Holmgren, samples from fifteen different nests were statistically analyzed for mean, standard deviation, standard error, coefficient of variability and confidence interval (95%) and analysis of variance (Model II ANOVA), The mean values of the different population samples were compared with the help of student 't' test according to Minitab version and Sokal and Rohlf [1973]. In the study of external characters, measurements form a very important component particularly for identification of species. However, the reliability of the measurements depends on the extent of variability which the structures show within and between colonies.
For each individual soldier the following nine parameters were measured: i) Length of head to side base of ii) Width of head at side base of mandibles iii) Width of head at the posterolateral ends of antennal carinae iv) Maximum width of Head v)). Length of Left mandible vi) Tooth of left mandible from tip vii) Length of Pronotum viii) Width of Pronotum) ix) Length of Postmentum(x) Width of postmentum.
This study was carried out in the department of zoology, university of the punjab, Lahore, Pakistan.

Keywords: Morphometric variability, *Odontotermes parvidens,* soldier, termite.

INTRODUCTION
Odontotermes parvidens Holmgren and Holmgren is widely distributed in Pakistan, Bangladesh, India and Bhutan [Chhotani 1997].It attacks dead bark of trees and logs of several species of wood [Roonwal 1970a]. In Pakistan, it has been found inhabiting submountaneous areas at the height of about 5000 ft. above sea level [Akhtar 1975]. As the species exists in various forms, relationship amongst the population samples are described in this report for the

first time. To understand variation in morphological features of *Odontotermes parvidens,* Population samples from different localities were statistically analyzed, which will facilitate its identification and comparison with other related species. Thakur [1981] has treated *Odontotermes parvidens* as junior synonym of *Odototermes distans.* Bose [1984] and Chhotani [1997] treat it as separate, valid species, to which the present also agrees.

Only a few studies on Morphometric variation in termites have been made [Ahmad 1949, Roonwal 1970b, Chhotani and Das 1979, Chhotani 1981, Akhtar and Anwar 1991, Akhtar and Ahmad 1991, Coronel and Porcel 2002].

The morphometric analysis of *O. parvidens* Holmgren and Holmgren presented in this paper will provide a standard of comparison for specimens from different localities of the range of that species and other species of the genus. The photographs of the specimens have also been prepared to present exact morphological appearance of various taxonomic characters. Another aim of this study is to determine whether different populations can be differentiated statistically or not by measurements and indices calculated for the imago and soldier caste. Internest and intranest comparisons were also made for this species.

The objective of this work is to contribute to a better taxonomic knowledge of this species by means of the study of the intracolonial and intercolonial variations in the soldier caste.

MATERIALS AND METHODS

The present study is based on the preserved material available in the collection of Prof. Dr. Muzaffar Ahmad, presently in the custody of Prof. Dr. M. Saeed Akhtar. Specimens from the samples were picked up at random and measured under stereoscopic binocular microscope with built in magnification changer. Measurements were taken with the aid of calibrated ocular micrometer.

Taxonomic terms and measurements used in the present study are as explained by Emerson [1945 1952], Ahmad [1965] and Akhtar [1975]. Population samples of the species collected from the geographic range of the species have been compared according to Manhattan District [Mayr and Ashlock 1991] to highlight similarities and differences of the population samples. For Manhattan District data matrix, the character states of each character were coded on the basis of frequency distribution of specimens of the pooled data. Character size range pertaining to maximum number of individuals were coded as 1; less than said range as zero; more than said range as 2.

RESULTS

Odontotermes parvidens Holmgren and Holmgren

Odontotermes/O. (Odontotermes) parvidens: [Ahmad 1958, Roonwal and Chhotani 1962, Mathur and Thapa 1965, Akhtar 1975, Bose 1984].

Odontotermes parvidens: [Roonwal and Chhotani 1962, Chatterjee and Thakur 1967, Chhotani 1997] (consider *Termes (Termes) almorensis* Snyder and *O. microdens* Holmgren Nom. nud as junior synonym of *O. parvidens*).

SOLDIER

(see Fig. 1; Tables 1 - 3)

The soldier of *O. parvidens* Holmgren and Holmgren is characterized by uniformly colored antennae; Head capsule large, subrectangularly oval, converging anteriorly. Mandibles strong, half as long as or a little longer than half head length. Left mandible with a minute, laterally directed tooth at base of mandible-third. Postmentum subrectangular.

MATERIAL EXAMINED

Bangladesh

B i) Barisal (latitude 22°40'N, longitude 90°23'E): soldiers and workers, collected by N.K. Malik, from stump, 16.1.1970, determined by M.S. Akhtar, vial No. 536E.

ii) Barisal, soldier and workers, collected by N.K. Malik, in a log, 18.1.1970, determined by M.S. Akhtar, vial No. 546 E.

D Dariadighi forest (latitude 21°15'N, longitude 92°05'E), soldiers and workers, collected by M.S. Akhtar from ex-log, 15.4.1968; vial No. 240-A.

F i) Dinajpur (latitude 25°34'N, longitude 88°35'E), soldiers and workers, collected by N.K. Malik, 23.12.1969, from cow dung, determined by M.S. Akhtar, vial No. 386-E.

ii) Dinajpur, soldiers and workers, collected by N.K. Malik, from a tree bark, 22.12.1969, determined by M.S. Akhtar, vial No. 366-E.

G Teknof (latitude 22°07'N, longitude 91°54'E), soldiers and workers, collected by M.S. Akhtar from ex-log, 27.4.1970, vial No. 796-A.

I i) Titalya (latitude 26°30'N, longitude 88°20'E), soldiers and workers, collected by N.K. Malik, in a mound, 30.12.1969, determined by M.S. Akhtar, vial No. 454-E.

ii) Titalya, soldiers and workers, collected by N.K. Malik, in a stump, 29.12.1969, determined by M.S. Akhtar, vial No. 451-E.

O. East Bengal, Chaumahani (latitude 22°56'N, longitude 91°07'E), soldiers and workers, in prone log, collected by Fletcher, 6.11.1911, determined by Silvestri.

Pakistan

C Rawalpindi (latitude 33°40'N, longitude 73°15'E), soldiers and workers, collected by M.S. Akhtar from ex-log, 18.7.1968; vial No. 311-A.

E. Chatter Bagh (latitude 33°55'N, longitude 73°25'E), soldiers and workers, collected by M.S. Akhtar, from ex-lokat tree, 17.7.1968, vial No. 287-A.

J. Abbottabad (latitude 34°10'N, longitude 73°13'E), soldiers and workers, determined by M.B. Sheikh, ex-Pinus, 18.9.1956.

K. Parachinar (latitude 33°54'N, longitude 72°33'E), soldiers and workers, collected by M.S. Akhtar from ex-sirkanda, 22.9.1969.

L. Azad Kashmir, Trimula (latitude 63°12'N, longitude 28°44'E), soldiers and workers, collected by Figer Ahmad, in cutting of a building, 27.19.

N. Balakot (latitude 34°32'N, longitude 73°26'E), soldiers and workers, collected by M. Arshad, 14.7.1968, determined by M.S. Akhtar, vial No. 438.

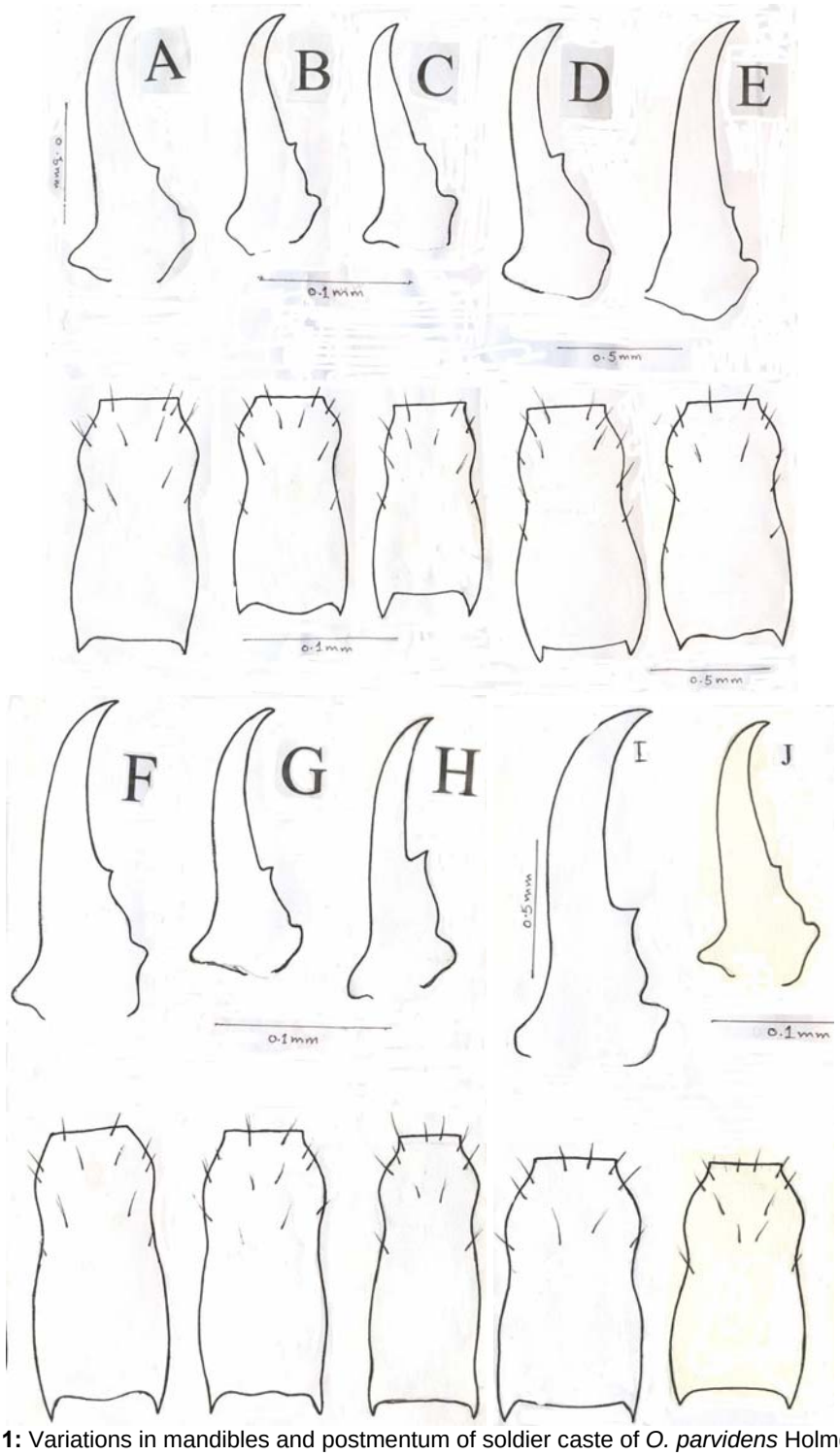

Fig. 1: Variations in mandibles and postmentum of soldier caste of *O. parvidens* Holmgren and Holmgren from localities A to O.

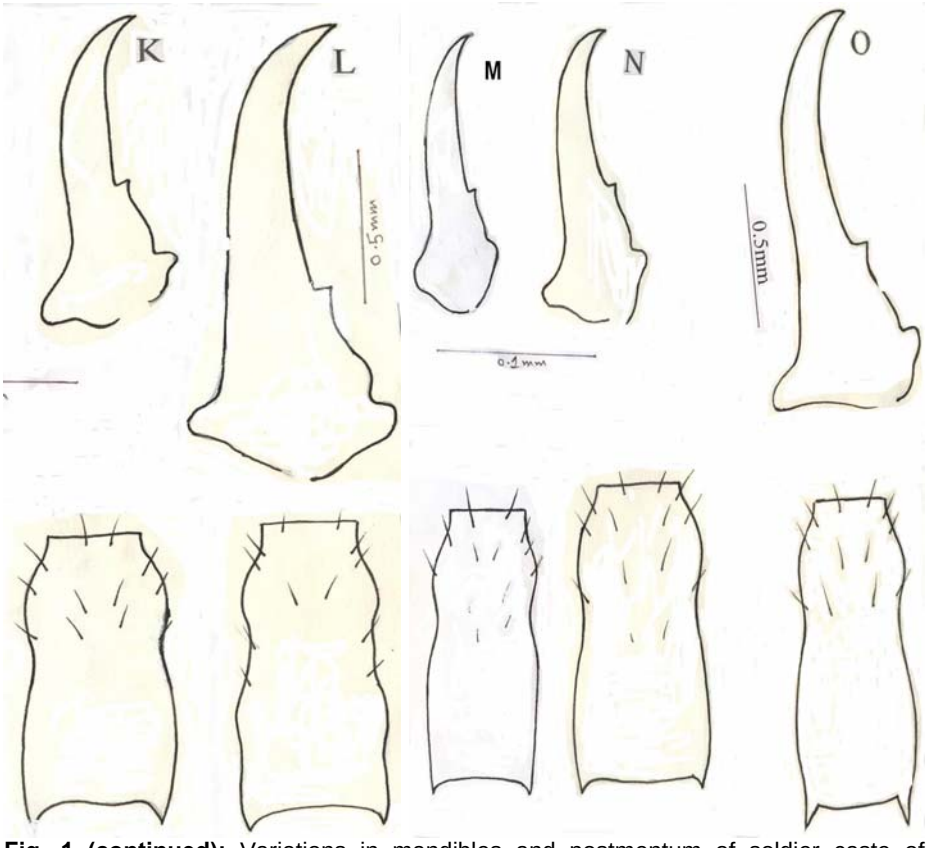

Fig. 1 (continued): Variations in mandibles and postmentum of soldier caste of *O. parvidens* Holmgren and Holmgren from localities A to O.

India

A. Bangal: Tista Div. (latitude 24°00'N, longitude 90°00'E), soldiers and workers, 6.5.1912, determined by T.E. Snyder.

H. Assam, 5000 ft, soldiers and workers, collected by Fletcher, 8.5.1914.

M. India: U.P., Balrampur, soldiers and workers, collected by G. Emerson, January. 1928.

DISCUSSION

Internest comparisons revealed that there were significant differences among samples collected from different localities for the parameters: Length of head to Side base of Mandible (F., 8.99; d.f., 12:75; P<0.05); Width of head at side base of Mandible (F., 8.90; d.f., 12:75; P<0.05); Width of head at the posterolateral ends of antennal carinae (F., 10.96; d.f., 12:75; P<0.05); Maximum width of head (F., 17.14; d.f., 12:75; P<0.05); Length of left mandible (F., 14.97; d.f., 12:75; P<0.05); Tooth of left mandible from tip (F., 26.84; d.f., 12.75; P<0.05) ; Length of Pronotum (F., 18.99; d.f., 12:75; P<0.05) ; Width of Pronotum (F., 22.98; d.f., 12:75; P<0.05); Length of Postmentum (F., 16.62; d.f., 12:75; P<0.05); Width of Postmentum (F., 36.98; d.f., 12:75; P<0.05) as shown in Table 1.

Table 1: Internest morphometric variations in taxonomic parameters of the soldier caste of *O. parvidens* Holmgren and Holmgren. Samples followed by similar letters indicate non-significant differences in mean values by 't'-test (P>0.05).

Nest Sample	N	O.R	$\overline{X}$	S.D.	S.E.	95% C.I	C.V
Length of head to side base of mandibles							
A[a]	4	2.24-2.50	2.3950	0.1173	0.0587	2.2083-2.5817	4.89
B[b]	9	1.90-2.11	2.0100	0.0695	0.0232	1.9566-2.0634	3.45
C[ac]	10	1.96-2.42	2.2330	0.1477	0.0467	2.1273-2.3387	6.61
D	6	2.37-2.46	2.4517	0.0739	0.0302	2.3741-2.5292	3.01
E[e]	10	2.01-2.19	2.1230	0.0640	0.0202	2.0772-2.1688	3.01
F[cef]	10	2.01-2.49	2.1980	0.1416	0.0448	2.0966-2.994	6.44
G[cefg]	10	2.00-2.30	2.1350	0.0956	0.0302	2.0666-2.2034	4.47
H[cfh]	8	2.15-2.40	2.2562	0.0863	0.0305	2.1840-2.3285	3.82
I[cfghi]	9	2.00-2.15	2.1933	0.0778	0.0259	2.1335-2.2531	3.54
J[bcefgi]	2	2.05-2.12	2.0850	0.0495	0.0350	1.6403-2.5297	2.37
K[bcefgj]	3	2.00-2.15	2.0500	0.0866	0.0500	1.8349-2.2651	4.22
L[bcefgij]	4	2.00-2.27	2.0975	0.1187	0.0594	1.9086-2.2864	5.65
M[acfh]	3	2.15-2.40	2.2900	0.1277	0.0737	1.9728-2.6072	5.57
N	1	2.25	2.25	-	-	-	-
O	1	2.38	2.38	-	-	-	-
						F., 8.90; d.f., 12:75; P<0.05	
Width of head at sidebase of mandibles							
A[a]	4	1.03-1.18	1.1375	0.0723	0.0361	1.0225-1.2525	6.35
B	9	1.00-1.08	1.0511	0.0302	0.0101	1.0279-1.0743	2.87
C[ac]	10	1.05-1.21	1.1510	0.0597	0.0189	1.1083-1.1937	5.18
D[acd]	6	1.13-1.26	1.1800	0.0469	0.0191	1.308-1.2292	3.97
E[acde]	10	1.05-1.23	1.1290	0.0482	0.0152	1.0945-1.1635	4.26
F[acdef]	10	1.13-1.18	1.15300	0.01703	0.00539	1.14081-1.1652	1.47
G[acefg]	10	1.10-1.22	1.1220	0.0358	0.0113	1.0964-1.1476	3.19
H[dh]	8	1.15-1.30	1.2250	0.0463	0.0164	1.1863-1.2637	3.77
I[acefgi]	9	1.00-1.17	1.1167	0.0581	0.0194	1.0720-1.1613	5.20
J[acdef]	2	1.15-1.20	1.1750	0.0354	0.0250	0.8573-1.4927	3.01
K[acdefgi]	3	1.12-1.17	1.1300	0.0361	0.0208	1.0404-1.2196	3.19
L[h]	4	1.25-1.27	1.25500	0.01000	0.00500	1.23900-1.2709	0.79
M	3	1.30-1.35	1.3333	0.0289	0.0167	1.2616-1.40561	2.16
N	1	1.20	1.20	-	-	-	-
O	1	1.25	1.25	-	-	-	-
						F., 8.99; d.f., 12:75; P<0.05	
Width of head at the posterolateral ends of antennal carinae							
A[a]	4	1.49-1.60	1.5525	0.0465	0.0232	1.4786-1.6264	2.99
B[b]	9	1.35-1.44	1.3922	0.0438	0.0146	1.3583-1.4259	3.14
C[c]	10	1.41-1.55	1.4670	0.0538	0.0170	1.4285-1.5055	3.66
D[ad]	6	1.47-1.70	1.5583	0.0811	0.03331	1.4722-1.6435	5.20
E[e]	10	1.35-1.49	1.4340	0.0502	0.0159	1.3981-1.4699	4.05
F[cef]	10	1.37-1.55	1.4610	0.0580	0.0183	1.4195-1.5025	3.96
G[beg]	10	1.30-1.52	1.4130	0.0756	0.0239	1.3589-1.4671	5.35
H[cef]	8	1.40-1.55	1.4500	0.0598	0.0211	1.4000-1.5000	4.12
I[bg]	9	1.35-1.45	1.4044	0.0364	0.0121	1.3764-1.4325	2.59
J	2	1.35-1.37	1.3600	0.0141	0.0100	0.2329-1.4871	1.03
K[ad]	3	1.50-1.65	1.5733	0.0751	0.0433	1.3869-1.7598	4.77
L[alk]	4	1.52	1.52000	0.00000	0.00000	1.5200-1.5200	-
M[cef]	3	1.45-1.47	1.45667	0.01155	0.00667	1.4280-1.4853	0.79
N	1	1.50	1.50	-	-	-	-
O	1	1.44	1.44	-	-	-	-
						F., 10.96; d.f., 12:75; P<0.05	
Maximum width of head							
A[a]	4	1.89-2.06	1.9625	0.0709	0.0354	1.8497-2.0753	3.61
B[b]	9	1.58-1.83	1.6956	0.1014	0.0338	1.6176-1.7735	5.98
C[c]	10	1.73-1.95	1.8460	0.0735	0.0232	1.7934-1.8986	3.98
D[d]	6	2.00-2.19	2.0750	0.0764	0.0312	1.9948-2.1552	3.68
E[be]	10	1.70-1.85	1.7720	0.0567	0.0179	1.7314-1.8126	3.19

F[acf]	10	1.83-2.06	1.9230	0.0926	0.0293	1.8567-1.9893	4.81
G[bg]	10	1.58-1.75	1.6690	0.0472	0.0149	1.6352-1.7028	2.82
H[begh]	8	1.58-1.87	1.7300	0.0938	0.0332	1.6516-1.8084	5.42
I[behi]	9	1.70-1.81	1.7533	0.0374	0.0125	1.7246-1.7821	2.13
J[bceghij]	2	1.60-1.81	1.705	0.148	0.105	0.371-0.039	8.68
K[acdfk]	3	1.85-2.06	1.9400	0.1082	0.0624	1.6713-2.2087	5.57
L[bcehik]	4	1.70-1.83	1.7725	0.0591	0.0295	1.6785-1.8665	3.33
M[acfk]	3	1.91-2.01	1.9433	0.0577	0.0333	1.7999-2.0868	2.96
N	1	1.81	1.81	-	-	-	-
O	1	1.80	1.80	-	-	-	-
						F., 17.14; d.f., 12:75; P<0.05	
			Length of left mandible				
A[a]	4	1.35-1.45	1.4675	0.0818	0.0409	1.3373-1.5977	5.57
B[b]	9	1.21-1.31	1.2689	0.0333	0.0111	1.2433-1.2945	2.62
C[c]	10	1.21-1.44	1.3690	0.0652	0.0206	1.3223-1.4157	4.76
D[ad]	6	1.41-1.49	1.4600	0.0346	0.0141	1.4236-1.4964	2.36
E[be]	10	1.23-1.35	1.2930	0.0435	0.0137	1.2619-1.3241	3.36
F[acf]	10	1.34-1.49	1.4040	0.0425	0.0134	1.3736-1.4344	3.02
G[cg]	10	1.34-1.44	1.33400	0.02836	0.00897	1.3137-1.3542	2.12
H[ad]	8	1.45-1.50	1.48125	0.02588	0.00915	1.4596-1.5029	1.74
I[cfgi]	9	1.30-1.45	1.3667	0.0559	0.0186	1.3237-1.4096	4.09
J[acefgij]	2	1.32-1.35	1.3350	0.0212	0.0150	1.1444-1.5256	1.58
K[cegijk]	3	1.30-1.37	1.3233	0.0404	0.0233	1.2229-1.4237	3.05
L[cfgijkl]	4	1.35-1.37	1.36500	0.01000	0.00500	1.3491-1.3809	0.73
M[acfgijlk]	3	1.30-1.42	1.3633	0.0603	0.0348	1.2136-1.5131	4.42
N	1	1.40	1.40	-	-	-	-
O	1	1.35	1.35	-	-	-	-
						F., 14.97; d.f., 12:75; P<0.05	
			Tooth of left mandible from tip				
A[a]	4	0.79-0.90	0.8475	0.0450	0.0225	0.7759-0.9191	5.30
B[b]	9	0.72-0.79	0.73778	0.02587	0.00862	0.71788-0.75767	3.50
C[ac]	10	0.74-0.90	0.8390	0.0511	0.0162	0.8024-0.8756	6.09
D[bd]	6	0.72-0.77	0.74	0.022360	0.0091287	0.72-0.76	3.02
E[bde]	10	0.72-0.79	0.76500	0.02415	0.00764	0.74772-0.78228	3.15
F[acf]	10	0.77-0.87	0.8120	0.0377	0.0119	0.7851-0.8389	4.64
G	10	0.67	0.67000	0.00000	0.00000	0.67000-0.67000	-
H[acfh]	8	0.80-0.90	0.8438	0.0320	0.0113	0.8170-0.8705	3.79
I[cfh]	9	0.80-0.82	0.80444	0.00882	0.00294	0.79766-0.81123	1.09
J[bcde]	2	0.75-0.77	0.7600	0.0141	0.0100	0.6329-0.8871	1.85
K[cfh]	3	0.82-0.87	0.8433	0.252	0.0145	0.7808-0.9058	2.98
L	4	0.87	0.87000	0.00000	0.00000	0.87000-0.87000	-
M[aeh]	3	0.75-0.82	0.7967	0.0404	0.0233	0.6963-0.8971	5.07
N	1	0.85	0.85	-	-	-	-
O	1	0.74	0.74	-	-	-	-
						F., 26.84; d.f., 12:75; P<0.05	
			Length of pronotum				
A[a]	4	0.72-0.77	0.7425	0.0206	0.0103	0.7097-0.7753	2.77
B	9	0.61-0.67	0.63333	0.02000	0.00640	0.61651-0.64549	3.20
C[c]	10	0.64-0.77	0.6910	0.0370	0.0117	0.6646-0.7174	5.35
D[acd]	6	0.69-0.74	0.71667	0.02251	0.00919	0.69304-0.74030	3.14
E[e]	10	0.64-0.69	0.66700	0.02058	0.00651	0.65228-0.68172	3.08
F[cef]	10	0.64-0.72	0.68600	0.02716	0.00859	0.66656-0.70544	3.95
G[cef]	10	0.62-0.72	0.6800	0.0422	0.0133	0.7102	6.20
H	8	0.80-0.95	0.8313	0.0530	0.0187	0.7869-0.8756	6.37
I[adi]	9	0.67-0.75	0.7256	0.0340	0.0113	0.6995-0.7517	4.68
J[di]	2	0.72	0.72000	0.00000	0.00000	0.72000-0.72000	-
K[adi]	3	0.72-0.75	0.7300	0.01730	0.0100	0.6870-0.7730	2.36
L[l]	4	0.75-0.77	0.76000	0.01155	0.00577	0.74163-0.77837	1.51
M[l]	3	0.75-0.80	0.7667	0.0289	0.0167	0.6950-0.8384	3.76
N	1	0.80	0.80	-	-	-	-
O	1	0.83	0.83	-	-	-	-
						F., 18.99., d. f., 12.75., P< 0.05	

			Width of pronotum				
A[a]	4	1.41-1.54	1.4950	0.0614	0.0307	1.3973-1.5927	4.10
B	9	1.21-1.31	1.2467	0.0482	0.0161	1.2096-1.2837	3.86
C[c]	10	1.21-1.47	1.4000	0.0706	0.0223	1.3495-1.4505	5.04
D[ad]	6	1.49-1.52	1.4700	0.0469	0.0191	1.4208-1.5192	3.19
E[e]	10	1.26-1.34	1.30100	0.02470	0.00781	1.28333-1.31867	1.89
F[cf]	10	1.29-1.49	1.3970	0.0576	0.0182	1.3558-1.4382	4.12
G	10	1.12-1.25	1.1920	0.0492	0.0155	1.1568-1.2272	4.12
H[cfh]	8	1.30-1.50	1.4250	0.0655	0.0231	1.3703-1.4797	4.59
I[ei]	9	1.27-1.37	1.3300	0.0367	0.0122	1.3017-1.3583	2.75
J[ei]	2	1.30-1.32	1.3100	0.0141	0.0100	1.1829-1.4371	1.07
K[cfh]	3	1.37-1.42	1.3867	0.0289	0.0167	1.3150-1.4584	2.08
L[ei]	4	1.32-1.35	1.33500	0.01732	0.00866	1.30744-1.36256	1.29
M[ad]	3	1.45-1.50	1.4733	0.0252	0.0145	1.4108-1.5358	1.71
N	1	1.30	1.30	-	-	-	-
O	1	1.32	1.32	-	-	-	-
						F., 22.98., d. f., 12.75., P< 0.05	
			Length of postmentum				
A[a]	4	1.47-1.57	1.5200	0.0476	0.0238	1.4442-1.5958	3.13
B[b]	9	1.23-1.35	1.2889	0.0443	0.0148	1.2548-1.3229	3.43
C[bc]	10	1.21-1.39	1.3120	0.0683	0.0216	1.2631-1.3609	5.20
D[ad]	6	1.41-1.54	1.5150	0.0521	0.0213	1.4604-1.5696	3.43
E[bce]	10	1.29-1.39	1.3150	0.0344	0.0109	1.2904-1.3396	2.61
F[f]	10	1.39-1.52	1.4310	0.0431	0.0136	1.4002-1.4618	3.01
G[fg]	10	1.37-1.50	1.4090	0.0572	0.0181	1.3680-1.4500	4.05
H[adfgh]	8	1.40-1.55	1.4562	0.0563	0.0218	1.3966-1.5034	3.97
I[fghi]	9	1.35-1.45	1.4233	0.0384	0.0128	1.3938-1.4529	2.69
J[bcegj]	2	1.30-1.37	1.3350	0.0495	0.0350	0.8903-1.7797	3.70
K[ad]	3	1.50	1.50000	0.00000	0.00000	1.5000-1.5000	-
L[gj]	4	1.35-1.40	1.3675	0.0236	0.0118	1.3299-1.4051	1.72
M[adfghi]	3	1.37-1.50	1.4567	0.0751	0.0433	1.2702-1.6431	5.15
N	1	1.35	1.35	-	-	-	-
O	1	1.48	1.48	-	-	-	-
						F., 16.62., d. f., 12.75., P< 0.05	
			Width of postmentum				
A[a]	4	0.69-0.77	0.7100	0.0400	0.0200	0.6464-0.7736	5.63
B[b]	9	0.61-0.64	0.63333	0.01323	0.00441	0.62316-0.64350	2.08
C[ac]	10	0.64-0.77	0.7080	0.0368	0.0116	0.6817-0.7343	5.19
D[acd]	6	0.67-0.74	0.6967	0.0280	0.0115	0.6672-0.7261	4.01
E[b]	10	0.61-0.69	0.64400	0.03062	0.00968	0.62209-0.66591	4.75
F[acd]	10	0.67-0.74	0.69900	0.02558	0.00809	0.68069-0.71731	3.65
G	10	0.50-0.60	0.55800	0.02573	0.00814	0.53959-0.57641	4.61
H[h]	8	0.60-0.65	0.60625	0.01768	0.00625	0.59147-0.62103	2.91
I	9	0.75	0.75000	0.00000	0.00000	0.75000-0.75000	-
J[abcd]	2	0.62-0.72	0.6700	0.0707	0.0500	0.0347-1.3053	1.05
K[acd]	3	0.67-0.70	0.6900	0.0173	0.0100	0.6470-0.7330	2.50
L[h]	4	0.60-0.62	0.61000	0.01155	0.00577	0.59163-0.62837	1.89
M	3	0.75	0.75000	0.00000	0.00000	0.74000-0.75000	-
N	1	0.70	0.70	-	-	-	-
O	1	0.74	0.74	-	-	-	-
						F., 36.98, d. f., 12.75., P< 0.05	

The length of left mandible varied from 1.21-1.50 mm (Table 1). The tooth of left mandible from tip, varied from 0.67-0.90 mm in the pooled data and most of the samples showed overlapping. Highest tooth distance was recorded for sample from Azad Kashmir: Trimula (L) ($\overline{X}$ = 0.87) and the lowest value was for sample from Bangladesh: Teknof (G) ($\overline{X}$ = 0.67).For the pooled data, highest value of coefficient of variability (C.V. = 9.56) was recorded for width of postmentum.

Length of postmentum is less variable character (C.V. = 4.69) for this species (Table 2). Specimens determined by Snyder and collected from Bengal (A) were the largest. Cluster analysis reveals that specimens from locality G (Bangladesh: Teknof) are distantly related to specimens from locality K Pakistan: Parachinar) and I (Bangladesh: Titalya) (Fig. 2).

Table 2: Statistics for various parameters used in this study for *O. parvidens* Holmgren and Holmgren, all localities combined.

Parameters	N	O.R.	$\overline{X}$	S.D.	S.E.	95% C.I.	C.V.
Length of head to side base of Mandibles	89	1.90-2.50	2.19	0.146628309	0.015542569	2.15-2.22	6.69
Width of head at side base of Mandibles	89	1.00-1.35	1.15	0.077889566	0.008256277	1.13-1.16	6.77
Width of head at the posterolateral ends of antennal carinae	89	1.30-1.70	1.54	0.093311902	0.009835938	1.52-1.55	6.05
Maximum width of head	89	1.58-2.19	1.81	0.133517852	0.014152864	1.78-1.83	7.37
Length of left Mandible	89	1.21-1.50	1.36	0.077447931	0.008209264	1.34-1.37	5.69
Tooth of left mandible from tip	89	0.67-0.90	0.78	0.063936434	0.006777248	0.77-0.79	8.19
Length of pronotum	89	0.61-0.95	0.71	0.059173706	0.0062724	0.70-0.72	8.33
Width of pronotum	89	1.12-1.54	1.35	0.099344779	0.010530525	1.33-1.37	7.35
Length of postmentum	89	1.21-1.57	1.41	0.066181587	0.007015234	1.40-1.42	4.69
Width of postmentum	89	0.50-0.77	0.66	0.062141069	0.00669239	0.65-0.67	9.56

Table 3: Similarity Matrix: Manhattan distance rearranged by similarity Taxa.

	B	E	J	G	I	C	L	F	K	M	H	D	A
B	X	3	4	5	9	10	11	12	12	15	16	16	17
E	3	X	5	4	6	7	8	9	9	12	13	13	14
J	4	5	X	7	7	10	9	12	10	11	14	12	15
G	5	4	7	X	6	11	10	9	9	12	13	13	14
I	9	6	7	6	X	7	6	5	5	8	9	9	8
C	10	7	10	11	7	X	7	4	4	9	10	10	7
L	11	8	9	10	6	7	X	9	7	8	5	11	10
F	12	9	12	9	5	4	9	X	4	7	8	6	5
K	12	9	10	9	5	4	7	4	X	7	8	8	5
M	16	13	12	13	7	8	7	6	6	X	4	4	5
H	16	13	14	13	9	10	5	8	8	5	X	6	5
D	16	13	12	13	9	10	11	6	8	3	6	X	3
A	17	14	15	14	8	7	10	15	5	6	5	3	X

CLUSTER ANALYSIS

On the basis of Manhattan distance, population sample from locality A (Bengal) and D (Bangladesh: Dariadighi) form primary cluster at value of 3, C (Pakistan: Rawalpindi) and F (Bangladesh: Dinajpur) form the second primary cluster at value of 4, B (Bangladesh: Barisal) and E (Pakistan: Chatter Bagh) form third primary cluster at value of 3, H (India: Assam) and L (Azad Kashmir) form fourth primary cluster at value of 5, K (Pakistan: Parachinar) and I (Bangladesh: Titalya)

form fifth primary cluster at value of 5 (Table 3). Sample from locality M (India: Balrampur) form the secondary cluster with AD at value of 4.5, samples from locality J (Pakistan: Abbottabad) forms another secondary cluster with BE at value of 4.5. Samples from locality G (Bangladesh: Teknof) form third secondary cluster with KI at value of 7.5. Pairs ADM and HL are joined to form tertiary cluster at value of 7.5, CF joins ADMHL at value of 7.8. Pairs BEJ and KIG are joined at value of 7.55. The last separate clusters ADMHLCF and BEJKIG are joined at an average value of 10.2 (Fig. 2).

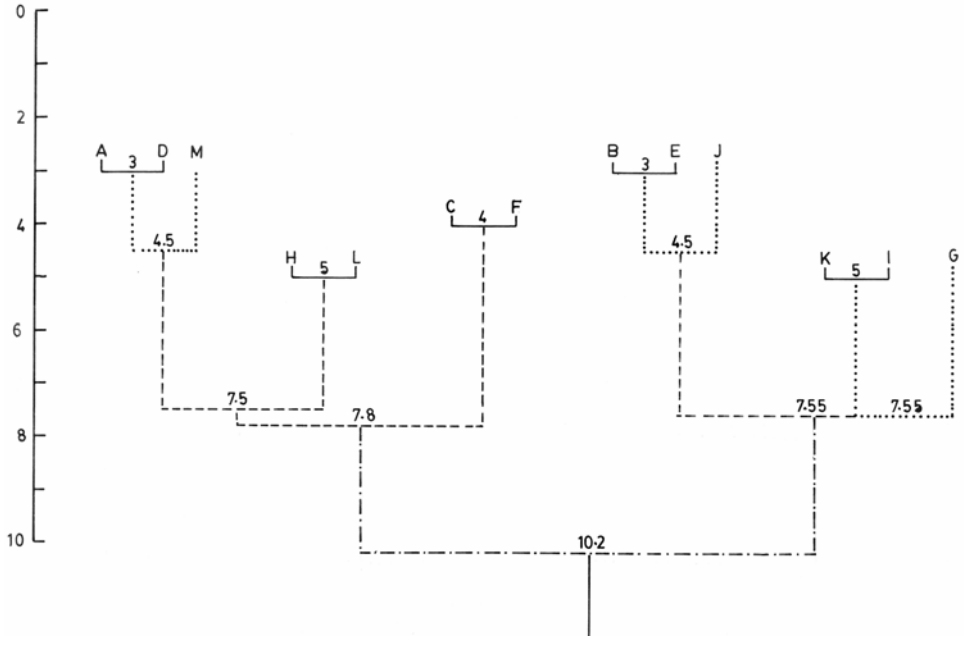

Fig. 2: Phenogram Manhattan distance of the soldier samples of O. parvidens Holmgren and Holmgren primary clusters are indicated by solid lines. Secondary clusters by dotted lines, tertiary clusters by dashed lines and quartnary clusters are indicated by solid-dotted lines. The scale on the left is a distance meter.

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