

MALLOPHAGA FROM BIRDS OF THE INDIAN SUBREGION
PART VII (1). *ARDEICOLA HARDAYALI*, SP. N.
[ISCHNOCERA, PHILOPTERIDAE]
FROM *LEPTOPTILOS JAVANICUS*

BY

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Synopsis

A new species, *Ardeicola hardayali*, is described. It has been compared with the closely related taxon *A. fissomaculatus*, the differences between the two taxa enumerated, and important characters of the latter also given.

Introduction

This is a continuation of the study of *Ardeicola* undertaken primarily for devising a key for its species. In this paper, a new species is described from the Lesser Adjutant of India (family *Ciconiidae*).

Names to head setae have been given according to the terminology proposed by CLAY (1951). Length of important setae has been abbreviated as follows: m, minute; sp, spiniform; sh, short; ml, moderately long; lg, long; elg, elongated.

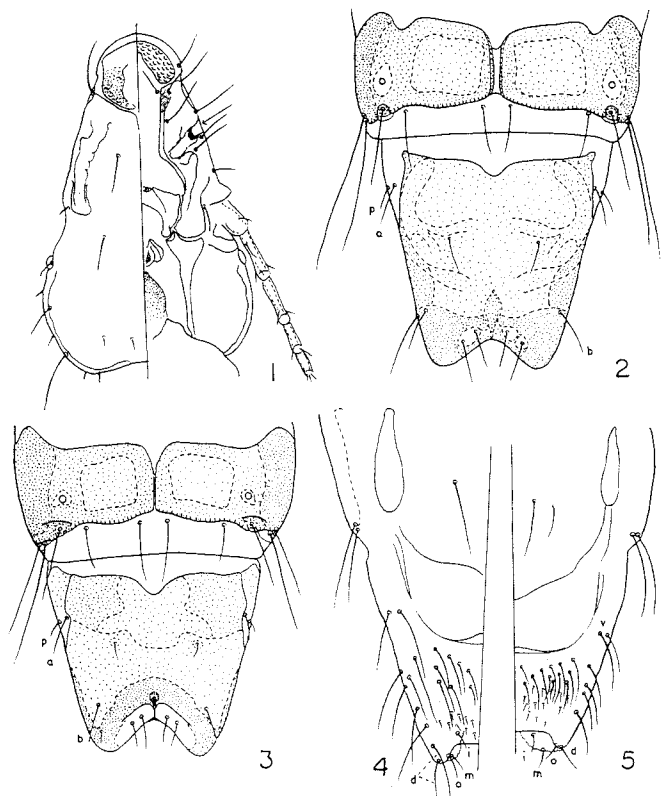
In species of *Ardeicola*, usually the two central tergal and sternal setae differ strikingly from the lateral setae. Hence following KÉLER (1938: 419), the terms tergo-central, tergo-lateral, sterno-central and sterno-lateral, abbreviated respectively as tc, tl, sc and sl, have been used. Further, the characteristic postero-lateral seta in the pocket of the integument of tergum VIII (CLAY, 1954) is referred to as the trichobothrium, or tr, (see KÉLER, 1956). The three anal setae have been referred to as inner (i), middle (m) and outer (o) setae, the inner being towards the midline.

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GENUS ARDEICOLA CLAY, 1935

Ardeicola hardayali, sp. n.

(Figs. 1, 2, 4, 6, 7, 9, 11-16, 20, 22).

Host: *Leptoptilos javanicus* (HORSFIELD).

Figs. 1-5. (1) *Ardeicola hardayali*, sp. n., female (allotype), dorsal and ventral: all 6 marginal temporal setae shown on left side. (2, 3) Male abdominal segments VIII-XI. (2) *A. hardayali* sp. n., holotype. (3) *A. fissionaculatus*. (4, 5) Male genital region, of one side only. (4) *A. hardayali* sp. n. (5) *A. fissionaculatus*. Anal setae: i, inner; m, middle; o, outer.

Colour of mounted specimens brown; the mean length of male less than that of female, with some overlap in range (Table I).

Head and Thorax (figs. 1, 6). — Head widest across marginal temporal setae 2, and not at level of preantennal setae. A lateral endocarina each side in the preantennal region (shown by arrow in fig. 1), somewhat like the incrustations in the same region of the head of *Falcolipeurus*.

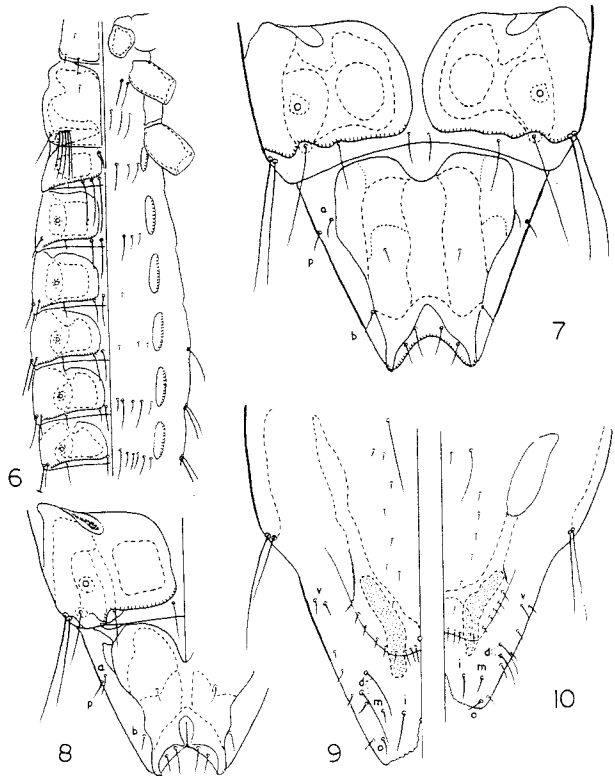
Dorsal anterior plate slightly wider than long, laterally feebly pigmented, almost unpigmented centrally; prominent thickenings on ventral anterior plate. Important head setae as follows: Anterior dorsal more posterior to preantennal suture than it is in *Ardeicola* from *Threskiornithidae*. CLAY (1951: 185) has already remarked upon the variation in the position of this seta in different species of *Ardeicola*. Dorsal submarginal at tip of premarginal carina in male, subapical in female. Anterior dorsal, dorsal submarginal and postnodal lg; a second m anterior dorsal also present; preconal ml; mandibular sh to ml; preantennal sp; ocular sh, on cornea but close to temporal margin. Marginal temporal 4 ml to lg, 2 sp or sh and remaining four sp. Posttemporal sh in male, slightly shorter in female. Others ml to lg. Pro- and ptero-notum apparently divided medially. On pronotum 1+1 sh anterior, and 2+2 posterior setae, outer sp, inner ml. No prosternal setae. Pterothorax wider than long. On pteronotum 1+1 anterior sp, and 7+7 posterior setae; latter arranged characteristically, 5+5 lg (range in male 9-10, in female 8-10) and have contiguous alveoli, 1+1 sh and 1+1 lg trichobothrium-like. On meso- and meta-sternum normally 2+2 lg setae; in female inner seta on metasternum ml to lg; in male 2 or 3 on both and in female 3 on meso- and 5 or 6 on meta-sternum also present.

Abdomen. Interpretation of abdominal segments as in *A. dennelli* (see HAJEJA & TANDAN, 1967). Segment III slightly longer than II in male, more so in female. Tergal thickenings II-VIII as lateral tergites (fig. 6), but different in shape in the 2 sexes. In male lateral tergites V-VIII joined by central (secondary) sclerotization, but no central sclerotization in female. In male thickening of terminal composite tergum (fig. 2) extends to end of the segment, but is less sclerotized posteriorly. This thickening, or tergite IX-XI, surrounds the 4 posterior tergal setae, but there is much individual variation (figs. 11-13). Tergal thickening IX-XI in female (fig. 7) falls considerably short of lateral segmental margins, its anterior margin deeply concave medially, and it is pigmented characteristically, being less sclerotized medially posteriorly. Sternal thickenings II-VIII as narrow, elongated, feebly pigmented, lateral plates, but of II not apparent in male; of VIII continuous with the sub-genital plate of its side. The sub-genital plate, chaetotaxy of genital region and external genitalia as in figs. 4, 9, 20, 22; post-vulval sclerites long, narrow, slightly variable in shape.

Abdominal chaetotaxy. — Setae counted in 10 males and 12 females. Counting on certain segments of some specimens failed; number in which it succeeded, the average and number from which it was determined,

follow the setal count in brackets; no number denotes counting succeeded in all segments of all specimens. Many setae were broken; but as the same seta was complete in some other specimen, the length of all setae could be determined from the series.

Male. Tergal. II, anterior tc 2 sh to ml, and posterior 4-7 (5.33) (9); III, 3-7 (5.00) (9); IV, 3-4 (3.80) (10); V, 4-5 (4.10) (10); VI, 3-4 (3.80) (10); VII, 2-4 (3.20) (10); VIII, 1 tr + 1 tl + 2 tc + 1 tl + 1 tr (9) (in 1,



FIGS. 6-10. (6) *Ardeicola hardayali* sp. n., male, thorax and abdominal segments II-VII, dorsal and ventral. (7, 8) Female, abdominal segments VIII-XI. (7) *A. hardayali* sp. n. (8) *A. fissomaculatus*. (9, 10) Female, genital region of one side only: supra-vulval sclerite stippled, subgenital plate shown by broken lines. (9) *A. hardayali* sp. n. (10) *A. fissomaculatus*. Anal setae; i, inner; m, middle; o, outer.

1 tr + 2 tl + 4 tc + 2 tl + 1 tr), tr primarily in a notch of the lateral tergite, but apparently surrounded by it secondarily, tc usually longer than tl, but equal also (in holotype, however, tc shorter than tl); IX-XI, anterior 1+1 sh, and posterior 1 tl + 2 tc + 1 tl all ml; seta a, 1+1 sh to ml (0+1 in 1) off tergite, and seta b, 1+1 ml (1+0 in 1) on tergite (fig. 2). Post-spiracular setae, apparently without contiguous sensilli, present on terga II-VII, 1+1; on II sh to ml (may be absent on one side); on III-VII ml to lg; the antero-posterior increase in their length is slight. Pleural. II, 0; III, 1+1; IV, 2+2 (9) (range 4-5); V, 3+3 (6) (range 5-7); VI, 4+4 (7) (range 6-8); VII, 4+4; VIII, 4+4 (6) (range 7-8); seta p, 1+1 sh fine; seta v, 1-3 lg (total 3-5); marginal and submarginal setae, 2-3 lg (total 4-6). Sternal (figs. 14, 15). II, 1 or 2 sl + 2 sc + 1 sl (all lg but sc slightly longer than sl); III, 1 sl + 2 sc ml + 1 sl sh to ml (range 1 or 2 + 2 + 1 or 2, total 5-6); IV, V, 0 or 1 sl + 2 sc + 0 or 1 sl all m (range on IV, 0-2 + 2 + 0-2); VI, 9-11 ml to lg (9.60) (10); VII, 8-13 ml to lg (10.40) (10); VIII, 2 lg; seta d on lateral edge of genital opening, 2+2 lg. Anal setae, 3+3 sh, middle and outer close to each other (fig. 4).

Female. — Tergal. II, anterior tc 2 sh to ml, and posterior 4-7 (5.18) (11); III, 4-6 (4.41) (12); IV, 3-6 (3.66) (12); V, 4-5 (3.82) (12); VI, 3-5 (4.00) (12); VII, 3-4 (3.50) (12); VIII, 1 tr + 1 tl + 2 tc + 1 tl + 1 tr (range of tl 2-3, as 2 may occur on one side), tr in a notch of the lateral tergite, tc equal to, slightly longer or shorter than outer tl; IX-XI, anterior 1+1 sh, and posterior 1 tl + 2 tc + 1 tl sh to ml; seta a, 1+1 sh (0+1 in 1) off tergite, close to or removed from its margin, and seta b, 1+1 sh off tergite (fig. 7). Post-spiracular setae as in male, but may be slightly shorter on the same tergum. Pleural. II, 0; III, 1+1; IV, 2+2 (9) (range 4-6); V, 3-3 (7) (range 5-8); VI, 4+4 (10) (range 7-8); VII, 4+4; VIII, 4+4 (10) (range 6-8); seta p, 1+1 sp (0+1 in 1), usually posterior to a or anterior also; seta v, 1-3 sp (total 3-5); marginal and submarginal setae, 4-6 sp (total 8-10). Sternal (fig. 16). II, 5-6 (2 sc slightly longer than 3-4 sl); III, 4-7 (2 sc ml to lg, 2-5 sl sh to ml) (in 1, 3 sc + 4 sl); IV, 1 sl + 2 sc sh + 1 sl m (sl absent or 2 on one side also); V, as on IV, but sl absent or 2 on one or both sides; VI, 9-11 ml to lg (10.00) (12); VII, 11-16 ml to lg (12.33) (12); VIII, 2 lg, near these 1-2 m to sh may be also present; seta d in genital region, 2+2 lg; sp setae on or near margin of vulva 17-28 stet (5-9 central, 5-10 each side total 11-19); besides 5-10 m setae occur anteriorly in the genital region. Anal setae, 3-3 (2 inner ml characteristic, 4 sp or sh); inner seta posterior relative to the middle one (fig. 9).

Body measurements of types and paratypes are given in Table I.

Holotype male, allotype female, slide no. 4818 a, Meinertzhagen collection, British Museum (Nat. Hist.) collections, from *Leptoptilos javanicus* (HORSFIELD), from India. Paratypes, 9 males (1 dissected) and 11 females from the same host individual.

The species is named in honour of Dr. HAR DAYAL SRIVASTAVA, F. N. I., the eminent Indian Helminthologist.

TABLE I

Measurements in mm, corrected to two decimal places, of two species of *Ardeicola* mounted in Canada balsam; (a) *A. hardayali*, sp. n. (b) *A. fissomaculatus*.

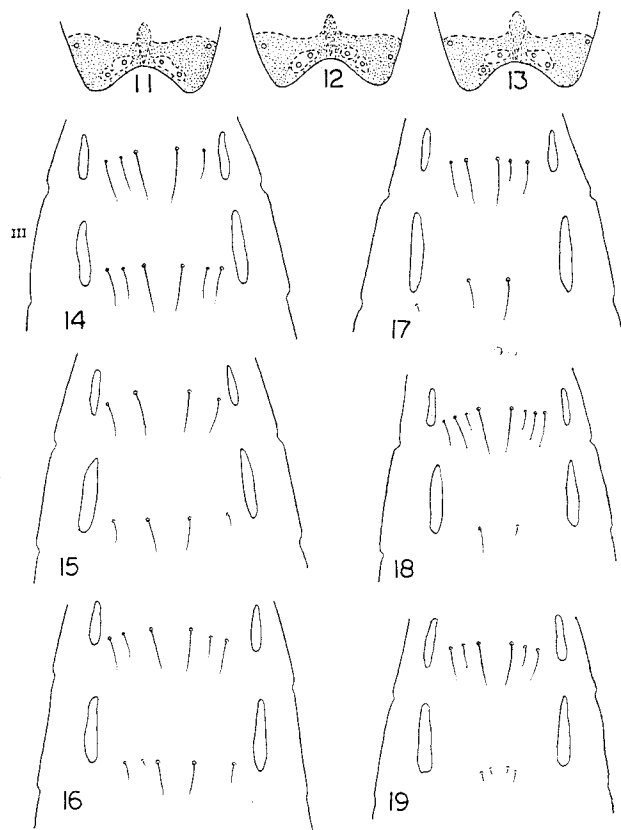
	Male				Female		
		RANGE	MEAN	Holotype	RANGE	MEAN	Allotype
HEAD	Length	(a) 0.94-1.01	0.95 (11)	0.97	0.97-1.05	1.01 (12)	1.01
		(b) 1.06-1.16	1.11 (5)		1.05-1.15	1.08 (4)	
		*(a) 0.46-0.53	0.50 (5)	0.51	0.48-0.53	0.51 (5)	0.53
	Breadth across temples	†(a) 0.44-0.50	0.47 (5)	0.46	0.47-0.51	0.48 (5)	0.48
		*(b) 0.54-0.58	0.57 (5)		0.55-0.59	0.57 (4)	
		†(b) 0.53-0.55	0.54 (5)		0.50-0.57	0.54 (4)	
	(a) 0.58-0.62	0.60 (11)	0.61	0.60-0.68	0.62 (12)	0.63	
	(b) 0.70-0.73	0.71 (5)		0.68-0.73	0.71 (4)		
PROTHORAX	Length	(a) 0.19-0.22	0.20 (11)	0.22	0.19-0.25	0.22 (12)	0.21
	Breadth	(b) 0.28-0.35	0.30 (5)		0.28-0.33	0.30 (4)	
PTEROTHORAX	Length	(a) 0.41-0.47	0.46 (11)	0.44	0.43-0.48	0.47 (12)	0.48
		(b) 0.54-0.57	0.55 (5)		0.53-0.57	0.54 (4)	
	Breadth	(a) 0.39-0.44	0.41 (11)	0.40	0.43-0.50	0.46 (12)	0.47
		(b) 0.54-0.57	0.55 (5)		0.53-0.57	0.56 (4)	
ABDOMEN	Length	(a) 0.57-0.66	0.63 (11)	0.64	0.61-0.70	0.66 (12)	0.66
		(b) 0.77-0.94	0.86 (5)		0.83-0.86	0.84 (4)	
	Breadth	(a) 2.21-2.63	2.49 (10)	2.49	2.35-2.82	2.70 (12)	2.64
		(b) 3.18-3.32	3.24 (5)		3.17-3.32	3.22 (4)	
Total length	(a) 0.65-0.82	0.78 (11)	0.76	0.76-0.90	0.86 (12)	0.90	
	(b) 1.05-1.19	1.12 (5)		1.02-1.23	1.09 (4)		
Head index	(a) 3.78-4.23	4.09 (10)	4.08	4.01-4.61	4.38 (12)	4.43	
	(b) 5.09-5.37	5.21 (4)		5.03-5.35	5.16 (4)		
Head index	(a) 0.61-0.64	0.62 (11)	0.63	0.60-0.67	0.62 (12)	0.63	
	(b) 0.61-0.66	0.63 (5)		0.63-0.68	0.65 (4)		

Number of specimens from which mean determined given in parenthesis. * Length of preantennal region. † Length of postantennal region.

Taxonomic discussion and notes

Ardeicola hardayali sp. n. is very closely related to *A. fissomaculatus* (GIEBEL, 1874) from *Leptoptilos crumeniferus*. HOPKINS (1941: 40) has convincingly established that it was GIEBEL (1874) who first described *Lipeurus fissomaculatus* from *Mycteria crumenifera* (= *Leptoptilos crumeniferus*), the Marabou Stork. As GIEBEL's types are lost, he designated as neotype a male and as neallotype a female, and both were presented to the Halle collection. Important characters of *A. fissomaculatus*, and also others which distinguish it from *A. hardayali*, sp. n., are given below.

1. *A. fissomaculatus* is larger in size, shows considerable overlap in length of the 2 sexes, the mean length of male being slightly greater (Table I). 2. Marginal temporal seta 2 ml. Setae on mesosternum 2+2 in both sexes, on metasternum 2-5 in male and 3-5 in female. 3. In male tergal thickenings VI and VII are either lateral tergites joined by

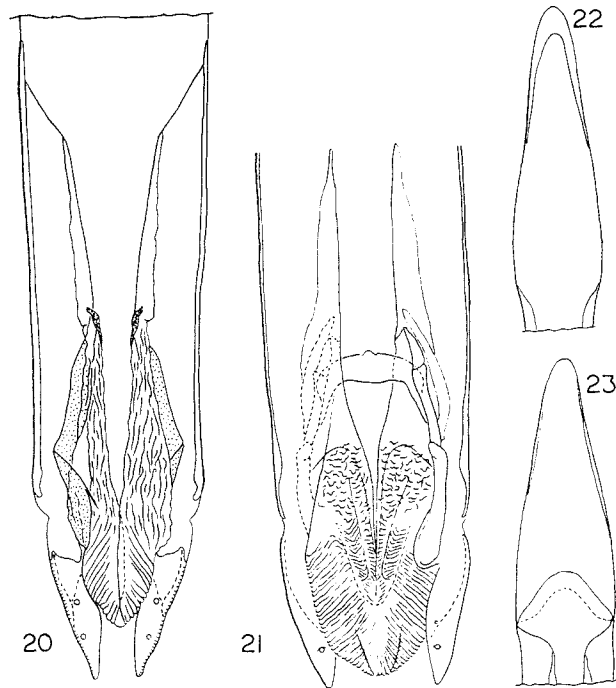


FIGS. 11-19. (11-13) *Ardeicola hardayali* sp. n., male, posterior margin of tergum IX-XI showing variation in sclerotization around posterior tergal setae; latter shown by their alveoli only. (14-19) *A. hardayali* sp. n. (14, 15) Male. (16) Female. (17-19) *A. fissomaculatus*. (17) Male. (18, 19) Female.

equally intense central sclerotization or apparently continuous across. Terminal tergum (or IX-XI) well sclerotized, but a narrow posterior strip is feebly sclerotized laterally and unsclerotized medially (fig. 3). Posterior margin of tergite IX-XI produced characteristically centrally and joins the margin of tergum XI. The 4 posterior tergal setae are set in the unsclerotized portion of the tergum (fig. 3). If in *A. fissomaculatus* the posterior marginal strip of the terminal tergum was completely unsclerotized and broader, and the anterior sclerite shorter, the former would then have been interpreted as tergum XI and the latter as tergite IX+X, as has been done in *A. epiphanes* (KELLOGG & PAINE, 1911), *A. theristicus* (PESSÓA & GUIMARÃES, 1935) and *A. emersoni* HAJELA & TANDAN, 1968. Not being so the thickening has been referred to as tergite IX-XI, and the strip left undesignated; however designating these respectively as tergite IX+X and tergum XI is also justifiable. This species represents an intermediate stage in the differentiation of tergum XI through gradual loss of sclerotization, beginning at the posterior margin of the terminal composite tergum. Almost all stages of such differentiation are represented in *Ardeicola* from *Threskiornithidae*. 4. On sternum II, lateral setae 2-4 in male, and 4-6 in female; 2 central always longer than at least 2 lateral setae. On sternum III no lateral setae in male (fig. 17) (rarely an m seta may occur on one side); in female either no apparent setae or m, sh or ml central setae (figs. 18, 19). Average number of sternal setae on VII in male, and on VI and VII in female, greater. In male on VIII 4-6 sternal setae (fig. 5). Fewer spiniform setae on margin of vulva (fig. 10). 5. Shape and proportions of external male genitalia (compare figs. 20, 22 with 21, 23). 6. Shape and proportions of head and terminalia, whence the same structures differ in shape and position (e. g., anal setae in male and seta d in both sexes) (compare figs. 2, 4, 7, 9 with 3, 5, 8, 10 respectively).

Abdominal chaetotaxy. — Setal count of 5 males (1 dissected) and 4 females.

Male. — Tergal. II, anterior tc 2 sh to ml, and posterior 2-4 (3.50) (4); III, 3-4 (3.75) (4); IV, 4-5 (4.22) (4); V, 4-5 (4.22) (4); VI, 4; VII, 3-4 (3.80) (5); VIII, 1 tr + 1 tl + 2 tc + 1 tl + 1 tr, tr on tergite IX-XI, anterior 2 ml, and posterior 1 tl + 2 tc + 1 tl ml to lg; seta a, 1+1 lg off tergite or near its edge, and seta b, 1+1 or 2+2 ml to lg well on tergite. Post-spiracular setae, apparently without contiguous sensilli, present on terga II-VII, 1+1; on II-IV ml; on V-VII lg; of II relatively longer than of III. Pleural. II, 0; III, 1+1; IV, 2+2 (4) (range 3-4); V, 3-3 (2) (range 6-8); VI, 4-4; VII, VIII, 4-4 (4) (range 7-8); seta p, 1+1 sh fine; seta v, 2-3 lg (total 4-5); marginal and submarginal setae, 1-5 lg (total 3-8). One marginal, usually on turned edge of tergite, is dorso-lateral, but may be dorsal also, well on tergite IX-XI, and anterior to b or if b are 2 in number (on one side) then between these. Sternal (fig. 17). II, 4-6 lg (2 sc lg longer than 2-4 ml to lg sl); III, 0 sl + 2 sc ml to lg + 0 sl (0+2 + 1 m in 1); IV, 0 + 2 m to sh + 0 (1 sc only in 1); V



FIGS. 20-23. External male genitalia of *Ardeicola* species. (20, 22, *A. harhayali* sp. n. posterior sclerotized area and basal apodeme respectively. (21, 23) *A. fissomaculatus*, same parts respectively.

0 or 1 + 2 + 0 all m to sh; VI, 9-12 ml to lg (10.40) (5); VII, 10-12 ml to lg (11.60) (5); VIII, 2-3 lg (total 4-6); seta d, 2-2 ml. Anal setae, 3+3 sh, middle and outer well apart.

Female. — Tergal. II, anterior tc 2 sh to ml, and posterior 3-4 (3.50) (4); III, 3-4 (3.66) (3); IV, V, 4; VI, 4-5 (4.22) (4); VII, 4; VIII, 1 tr + 1 tl + 2 tc + 1 tl + 1 tr; IX-XI, anterior 2 sh to ml and posterior 1 tl + 2 tc + 1 tl (all ml to slightly longer than tl), between these two rows an odd seta may occur on one side; seta a, 1+1 sh usually well away from margin of tergite, and seta b, 1+1 sh off tergite. Post-spiracular setae as in male. Pleural. II, 0; III, 1+1 (3) (range 2-3); IV, 2-2 (1) (range

4-6); V, 3+3 (1) (range 6-8); VI, VII, 4+4; VIII, 4+4 (3) (range 7-8); seta p, 1+1 sp usually posterior to a or anterior also; seta v, 1-2 sp (total 2-4) (near by a long seta present on one side in 1); marginal and submarginal setae, 3-5 sp (total 6-9). Sternal (figs. 18, 19). II, 6-8 (2 sc lg longer than 4-6 ml to lg sl); III, apparently absent or 0 + 2 + 0 or 1 all m (additional m may be present anterior to sc or elsewhere); IV, V, 0 + 2 m + 0; VI, 9-14 ml to lg (11.75) (4); VII, 12-16 ml to lg (14.75) (4); VIII, 2 lg (near by 1 sp or sh may be present); seta d, 2+2 lg; sp setae on or near margin of vulva, 17-19 (5-6 central, 5-7 each side total 12-13); besides 7 m setae present anteriorly in the genital region. Anal setae, 3 + 3 (2 ml characteristic, 4 sp or sh); inner usually posterior to middle anal seta, or both at same level.

Body measurements are given in Table I.

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