

## New species of *Ardeicola* Clay, 1935 (Mallophaga: Ischnocera).

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### SYNOPSIS

Descriptions are given for both sexes of two new species of *Ardeicola*, one from an Australian and the other from an Indian ibis.

### INTRODUCTION

CONTINUATION of the study of *Ardeicola* from the Threskiornithidae (Ciconiiformes) has shown that the species parasitic on *Pseudibis papillosa*, the Black Ibis of India, and on *Carphibis spinicollis*, the Straw-necked Ibis of Australia, are new.

### Family Philopteridae

#### Genus *Ardeicola* Clay, 1935

#### *Ardeicola australis* sp.n. (figs. 1-9)

Host: *Carphibis spinicollis* (Jameson)

Colour of mounted specimens brown; a well sclerotised species. Only slight sexual dimorphism in length, which shows no overlap in the 2 sexes.

#### Male

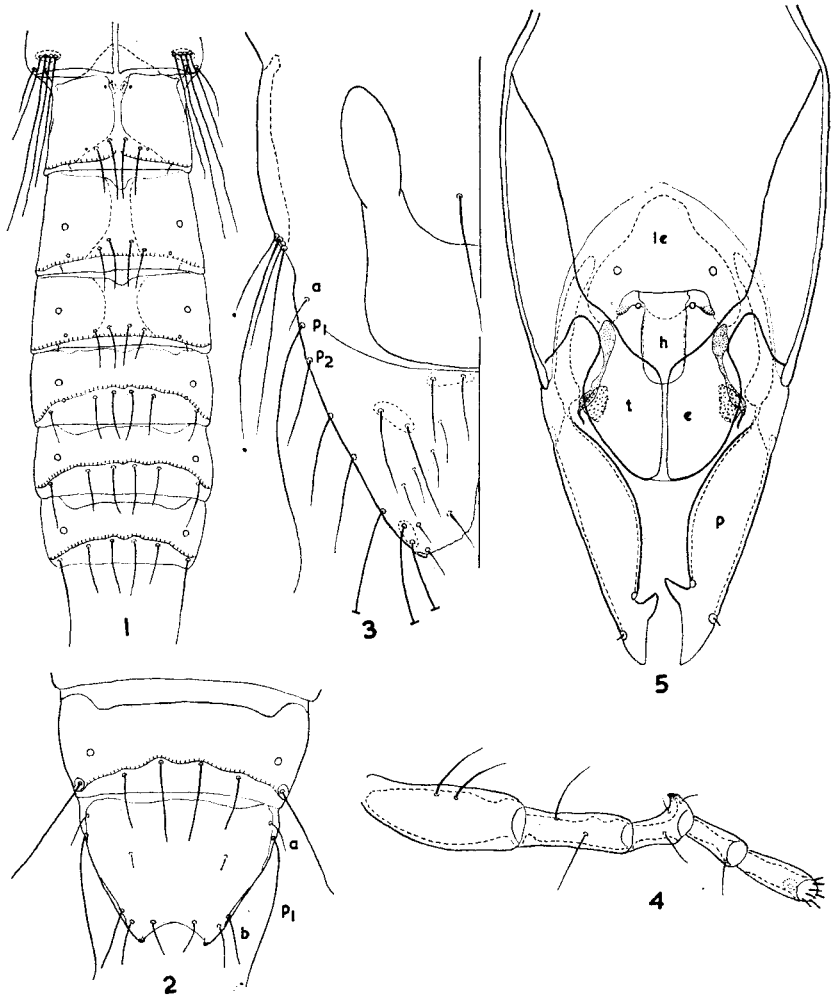
Head widest across temples; dorsal anterior plate very slightly wider than long; prominent thickenings on ventral anterior plates. Antenna as shown in figure 4. Anterior dorsal and dorsal submarginal setae moderately long; postnodal, preconal and mandibular setae short; preantennal and ocular setae spiniform, the latter on or near edge of temporal margin; fourth marginal temporal seta moderately long to long, and the remaining 5 marginal temporal setae minute (significantly finer than in the named taxa (p.73)); post-temporal seta short to moderately long; other head setae short to moderately long. Names of various head setae after Clay (1951).

Pronotum undivided medially, on each side with 1 minute anterior and 2 posterior setae, the outer of which is shorter; no prosternal setae. Pterothorax usually longer than wide; pternotum anteriorly continuous, but posteriorly divided medially; pterosternum apparently unhardened. Pteronotum normally bears on each side 1 minute anterior (delineable with difficulty) and 6 posterior setae, latter arranged as shown in figure 1; one is trichobothrium-like, and the longest of the 4 setae with contiguous alveoli extends up to the suture between III and IV. Meso- and meta-sternum with 4 and 2 long setae respectively.

Interpretation of abdominal segments as in *Ardeicola dennelli* sp.n. (see p. 75). General characters of abdomen and shape of tergal thickenings as shown in figures 1, 2. The anal lobes do not extend beyond terga IX-XI. Sternal thickening II not evident; of III-VIII as faint, lateral ovoidal plates, that of VIII being continuous with the subgenital plate. Genital opening ventral in position (fig. 3). External genitalia as shown in figure 5.

*Abdominal chaetotaxy* (Length and position of important setae abbreviated thus: sp, spiniform; m, minute; sh, short; ml, moderately long; lg, long; at, anterior; pt, posterior).—Tergal (figs. 1, 2): II, at tergo-central 2 (m) and pt tergal 4; III-VII, pt tergal 4; VIII, 1 (tr), 4, 1 (alveolus of trichobothrium (tr) on tergite); IX-XI, at tergal 2 (m) and pt tergal 4 (sh to ml); seta *a*, 1 + 1 (sh, on tergite); *b*, 1 + 1 (sh, on tergite or at its edge). Post-spiracular setae, without contiguous sensilli, on II-VII, normally 1 + 1; m on II-IV, sh to ml on V, ml to lg on VI and elongated on VII. Pleural, each side and total, respectively. II, 0-1, 1-2 (sp, sh or ml); III, 1-2, 3-4 (1-2 sh, 2 ml); IV, 1-2 (dorsal, lg) + 1 (ventral, stouter and longer), 2-3 + 2; V, 1 (dorsal, lg) + 2 (ventral, ml to lg), 2 + 4; VI-VIII, 2 (dorsal, 1 ml, 1 lg) + 2 (ventral, 1 ml, 1 lg), 4 + 4; seta *p*<sub>1</sub>, 1 + 1 (lg); *p*<sub>2</sub>, 1 + 1 (ml); marginal and submarginal setae, 2-3, 5-6 (ml, resemble *p*<sub>2</sub>). Sternal: II, 4 (lg); III, 4 (2 sh, 2 lg); IV, V, 2 (lg); VI, 6 (2 sh, 4 lg); VII, 6-7 (2-3 sh, 4 lg); VIII, 2 (lg); anal setae, 3 + 3 (2 ml, 4 sh). Chaetotaxy of genital region as in figure 3, in which the constant setae have been indicated.

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FIGS. 1-5.—*Ardeicola australis* sp. n., male. (1) Abdominal segments II-VII, dorsal view (note the post-spiracular setae). (2) Abdominal segments VIII-XI, dorsal view. (3) Terminalia, ventral view; although dorsal, seta *a* has been shown; alveoli of constant setae encircled by dotted lines (margin of genital opening missed inadvertently). (4) Antenna. (5) External genitalia, posterior sclerotised parts; *e*, endomere; *h*, hypomere; *le*, lower endomere; *p*, paramere; *t*, telomere.

#### Female

General characters of head (fig. 8) and thorax as in male, but measurements slightly larger; head appreciably wider across temples than in preantennal region, antennae simple, setae as in male but slightly shorter and finer—the post-temporal being minute. Anterior pro- and pteronotal setae not delineable. Variation in pteronotal setae from norm (4, 1, 1) is 4-5, 1, 1. Meso- and metasternum with 4-6 and 2-3 long setae respectively.

Interpretation of the 8 apparent abdominal segments as in male. General characters of abdomen and relative lengths of segments as in figures 6, 7. Segment III usually very slightly longer than II. Tergite of composite IX-XI falls considerably short of lateral margins and is characteristically pigmented (fig. 7). Sternal thickening II-VIII lateral, elongated, lightly pigmented plates, that of II being much narrower; lateral sternites VIII extend into subgenital plate. Post-vulval sclerites characteristic, spermathecal duct opening anterior to these (fig. 9).

*Abdominal chaetotaxy*.—Tergal: disposition and setal count as in male, but anterior tergo-central setae on II minute or even absent, only their alveoli being present, and anterior tergal on IX-XI smaller; setae *a* and *b*, 1 + 1 (sh, on tergite or at its edge). Post-spiracular setae on II-VII, normally 1 + 1; *m* on II-IV, *m* to *sh* on V, *sh* to *ml* on VI and elongated on VII. Pleural, each side and total respectively (figs. 6, 9): II, 0 (an important character); III, 2, 4 (2 *sh* to *ml*, 2 *lg*); IV, 1-2 (dorsal, thinner, *lg*) + 2-5 (ventral, very *lg*, characteristic and usually inwardly directed), 2-3 + 5-9; V, 1

(dorsal, thicker, longer) + 2-3 (ventral, thinner, lg), 2 + 4-5; VI-VIII, 4, 8 (4 ml, 4 lg, arrangement as in male); seta  $p_1$ , 1 + 1 (lg);  $p_2$ , absent; marginal and submarginal setae, 4-6, 8-10 (sp). Sternal: II, 4 (lg); III, 2 + 2 (2 sh to ml, 2 lg, adjoining the sternites and disposition characteristic), 2-4 m to sh setae may be present anteriorly; IV, 0 (rarely 1-2, sh); V, 2 (lg); VI, 6-7 (2-3 sh, 4 lg); VII, 6 (2 sh, 4 lg); VIII, 2 (lg); occasionally 1-2 sh setae also present on VII and VIII. Seta  $d$ , 1-2 + 2 (2 sh to ml, 1-2 lg); anal setae, 3 + 3 (1 sh, 1 sp, 1 ml). Spiniform setae on or near margin of vulva, 19-23 (6-8 median, 5-8 lateral); in addition, 6-7 minute setae occur anteriorly in the genital region.

In both sexes the long, dorsal pleural seta on V-VIII is distinctive and  $p_1$  resembles it in position and proportions; this supports the possibility of  $p_1$  being the pleural seta of IX.

Measurements are given in Table I.

TABLE I.—*Ardeicola australis* sp.n. Measurements (mm.) 8 ♂, 6 ♀ in *Canada balsam*

		Male		Holotype	Female		Allotype
		Range	Mean		Range	Mean	
Head	Length	0.61-0.63	0.62	0.63	0.67-0.70	0.68	0.70
	Breadth*	0.33-0.36 0.35-0.37	0.34 0.36	0.36 0.37	0.36-0.37 0.38-0.41	0.36 0.40	0.37 0.41
Prothorax	Length	0.17-0.20	0.18	0.18	0.18-0.20	0.19	0.20
	Breadth	0.28-0.30	0.29	0.30	0.30-0.34	0.32	0.34
Pterothorax	Length	0.37-0.41	0.39	0.40	0.41-0.46	0.43	0.46
	Breadth	0.35-0.41	0.37	0.41	0.41-0.47	0.43	0.47
Abdomen	Length	1.44-1.61	1.52	1.61	2.01-2.14	2.06	2.10
	Breadth	0.37-0.41	0.39	0.41	0.45-0.53	0.49	0.53
	Total length	2.58-2.93	2.72	2.83	3.30-3.48	3.37	3.46
	Head index	0.57-0.59	0.58	0.59	0.57-0.59	0.58	0.59

\* Upper line, breadth of preantennal region; lower line, breadth across temples.

*Holotype* ♂, *allotype* ♀, AUSTRALIA: Canberra, from *Carphibis spinicollis*, iii. 1957 (R. Mykytowycz), slide B.M. 1957-210, in Division of Entomology Museum, C.S.I.R.O., Canberra.

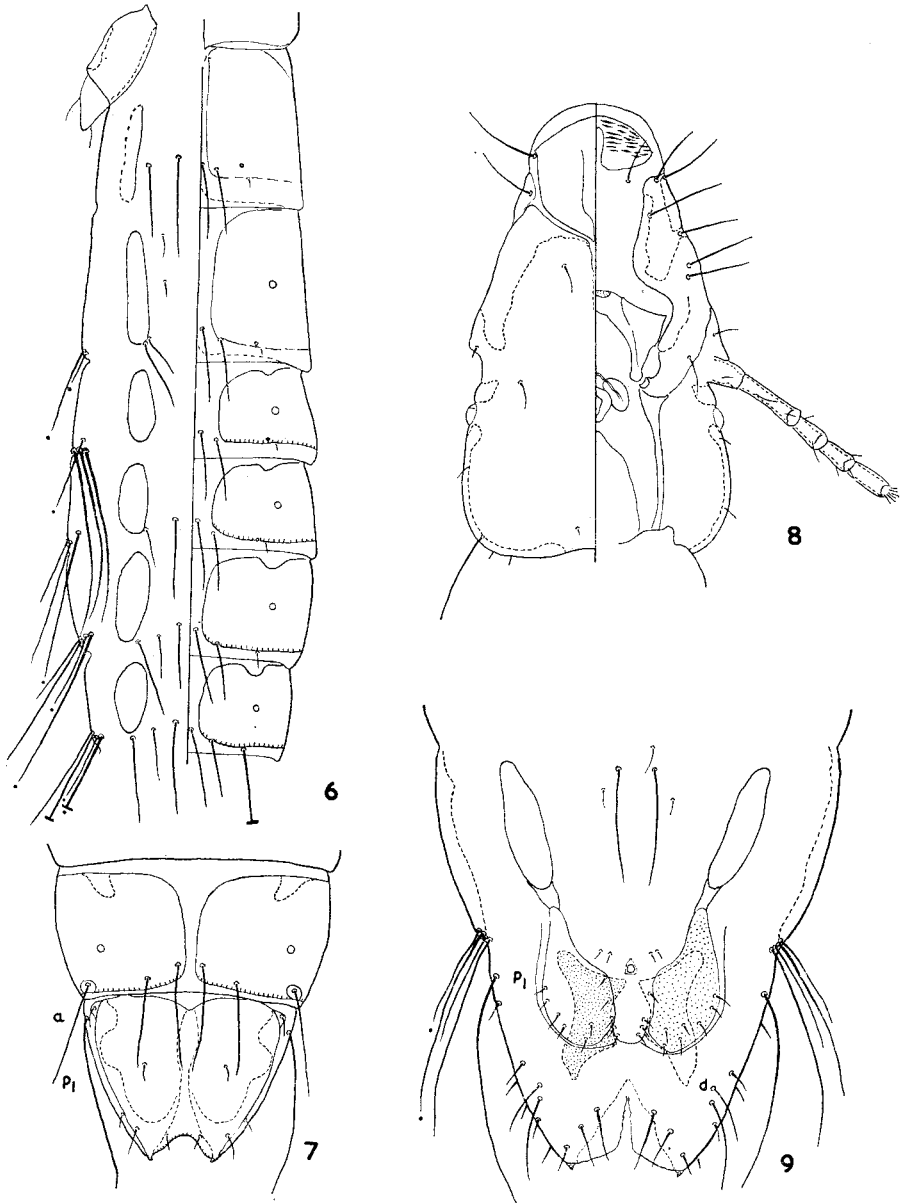
*Paratypes*: 31 ♂, 67 ♀, AUSTRALIA: N.S.W., Lake Cowal, from the type host species, 22. i. 1964 (J. L. McKean), in the British Museum (Natural History) (Meinertzhagen and Harrison collections) and in the Division of Entomology Museum, C.S.I.R.O., Canberra.

*Discussion*.—Although *Ardeicola australis* resembles *A. geronticum* Brinck, 1955 (specimens from *Geronticus eremita*, and not the type host *G. calvus*), *A. dennelli* sp. n., and possibly *A. cruris* Carriker, 1960 and *A. capitatus* (Piaget, 1885) also, its precise affinities are obscure. The presence of post-spiracular setae on terga II-VII, those on VII being elongated, at once distinguishes *A. australis* from the mentioned taxa. Further, the male can be separated by the curved inner margin of the paramere, and the female by the 5-9 characteristic pleural setae on IV.

*Ardeicola dennelli* sp. n. (figs. 10-17)

Host: *Pseudibis papillosa* (Temminck)

This species closely resembles *A. geronticum* Brinck, 1955 (from *Geronticus eremita*, and not from the type host, *G. calvus*) from which it can be distinguished as follows.—In both sexes by the shape of the head and anterior dorsal plate and the shorter fourth marginal temporal seta. In the male by the shorter anterior dorsal, postnodal and posttemporal setae and proportions of the posterior sclerites of the



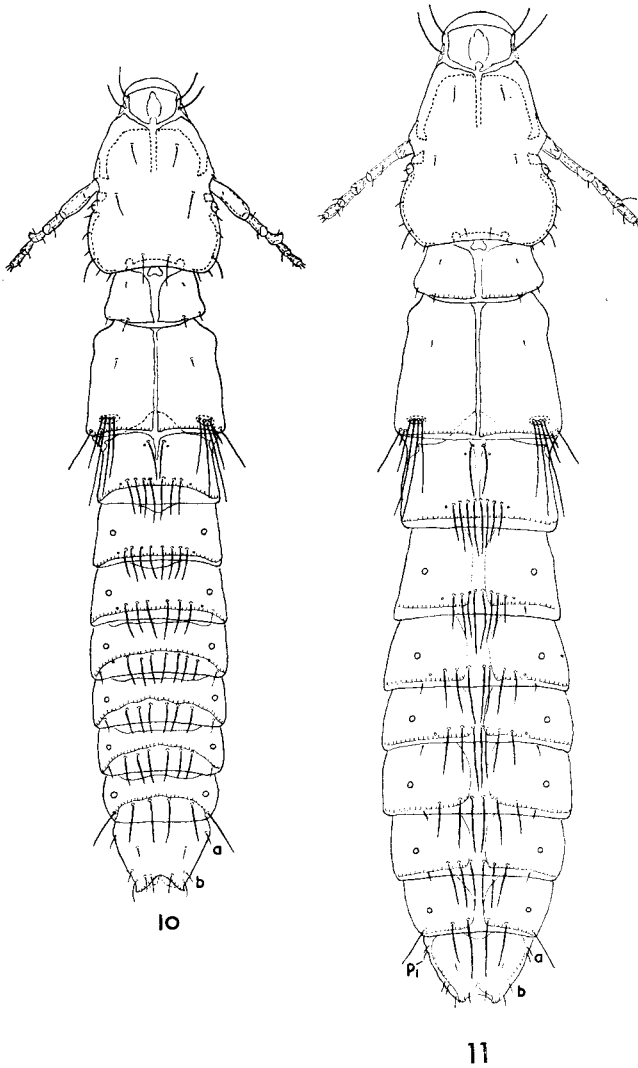
FIGS. 6-9.—*Ardeicola australis* sp.n., female. (6) Abdominal segments II-VII; note the post-spiracular setae and the arrangement and proportions of pleural setae; the dorsal pleural setae are indicated by a dot near their tip. (7) Abdominal segments VIII-XI, dorsal view. (8) Head; marginal temporal setae 5 and 6, ventral in position, are shown on dorsal side. (9) Terminalia, ventral view; subgenital plate of left-hand side and post-vulval sclerite of right-hand side stippled.

external genitalia. In the female by the shape of the post-vulval sclerites and proportions of the terminalia.

Alkali-treated specimens brown, apparently a well sclerotised species. No overlap in length of the sexes.

#### Male

General characters as in figure 10. Head widest across temples; dorsal anterior plate wider than long. First antennal segment stoutest, third produced into a well sclerotised point. Anterior



FIGS. 10-11.—*Ardeicola dennelli* sp. n., dorsal view. (10) Male holotype. (11) Female allotype. Drawn to same scale.

dorsal, postnodal, preconal and mandibular setae short; preantennal and ocular setae spiniform; fourth marginal temporal seta short, the remaining 5 spiniform; post-temporal seta moderately long, usually extending to or beyond the anterior pronotal seta; other head setae moderately long.

Pronotum divided medially, bearing 1 minute anterior and 2 short posterior setae. Pterothorax wider than long; pteronotum interrupted medially. Pterosternum apparently unsclerotised. Pteronotum on each side with 1 minute anterior and 6 (4, 1, 1, range 4-5, 1, 1) posterior setae; arrangement and length of the six setae as in figure 1; one of these is trichobothrium-like. Mesosternal setae 4, and metasternal setae 3-4 long.

Abdomen with 8 apparent segments; apparent I has been interpreted as I and II fused, but designated as II, and the last (or apparent VIII) as IX-XI fused. General characters and shape of tergal thickenings as in figure 10. Anal lobes may extend slightly beyond posterior margin of terga IX-XI. Sternal thickening II not delineable; III-VIII faint, lateral ovoidal plates. Genital opening ventral; subgenital plate and chaetotaxy of genital region as in figure 16; certain setae are constant and have been indicated in the figure. External genitalia as in figure 17.

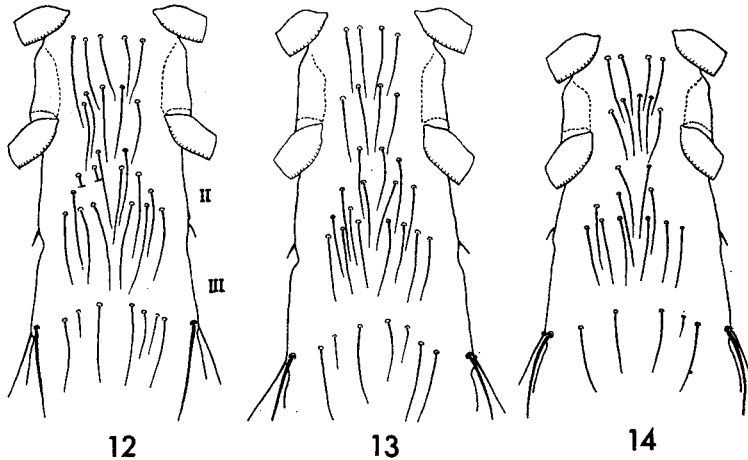
*Abdominal chaetotaxy.*—Tergal (fig. 10): all terga with 1 row of posterior setae and terga II and IX-XI also with anterior tergal setae; II, 2 (as long as posterior tergal setae) and 6-9; III, 6-8; IV, 5-8; V, 6-7; VI, 5-7; VII, 4-6; VIII, 1, 4 (range 3-5), 1 (tr) (alveolus of trichobothrium, tr, on tergal plate); IX-XI, 2 (m to sh) and 4-5 (sh); seta *a*, 1 + 1 (sh, on tergite, rarely absent on one side); *b*,

1 + 1 (sh to ml, well on tergite, occasionally an identical seta may be present anteriorly on one side). Post-spiracular setae on terga IV-VII, 1 + 1 (sh) in 14 out of 21 specimens; variation in 7 specimens: IV, 0 + 1 (4); IV, V, 0 + 0 (1); IV and VII 0 + 1 (2). Pleural, each side and total respectively: II, 1, 2 (sp); III, 2, 4 (ml); IV, 2-3, 4-5 (ml); V, 3, 6 (2 ml, 4 lg); VI, VII, 4, 8 (2 sh, 6 lg); VIII, 4, 8 (lg); seta  $p_1$ , 1 + 1 (sh to ml);  $p_2$ , 1 + 1 (ml to lg); marginal and submarginal setae, 5-6 (lg or 2 may be sh). Sternal: II, 3-4 (lg); III, 3-4 (1-2 ml, 2 lg); IV, V, 2 (lg); VI, VII, 6 (2 sh to ml, 4 lg); VIII, 2 (lg). Anal setae 3 + 3 (range 5-6).

Position of setae  $a$  and  $p_2$  is constant, but that of  $p_1$  varies and may be close to  $a$  or to  $p_2$ .

### Female

General characters of head and thorax (fig. 11) as in male but measurements slightly larger, antennae simple, setae as in male but slightly shorter and finer, the post-temporal being much shorter and never extending into the prothorax. Anterior pro- and pteronotal setae delineable with difficulty. Variation from norm (4, 1, 1) in posterior pteronotal setae 2-5, 1, 1.



FIGS. 12-14.—*Ardeicola dennelli* sp. n. Setae on pterosternum and sternae II, III of female; pleural setae also shown. Note arrangement on sternum II and the characteristic inner, ventral pleural seta on III.

General characters and relative lengths of abdominal segments as in figure 11; interpretation of the 8 apparent segments as in male; composite IX-XI as in figure 11 and slightly emarginate posteriorly; tergite IX-XI continuous across, but posteriorly indented and laterally falls short of margin. Sternal thickening II not delineable; III-VII as lateral ovoidal plates, faint; lateral sternites VIII also present, and continuous posteriorly with the subgenital plate (fig. 15). Post-vulval sclerites somewhat triangular and opening of spermathecal duct anterior to these.

**Abdominal chaetotaxy.**—Tergal (disposition as in male) (fig. 11): II, 2 (as long as posterior tergal setae) and 6-8; III, 8-10; IV, 6-9; V, 6-8; VI, 5-7; VII, 4-6; VIII, 1 (tr), 4-5, 1; IX-XI, 2 (m) and 4-5 (sh) (in one specimen 2 short setae were present between the 2 rows); seta  $a$ , 1 + 1 (sh, near edge of tergite);  $b$ , 1 + 1 (range 2-3) (sh, off the tergite). Post-spiracular setae on terga IV-VII, 1 + 1 in 18 out of 21 specimens; variation in 3 specimens: III, 0 + 1 (1); IV, 0 + 1 (2); on IV-VI m, and on VII sh. Pleural, each side and total, respectively: II, 1, 2 (sp); III, 2, 4 (2 ml and 2 lg, stout and characteristic); IV, 3-5, 6-9 (2 lg, stout, rest ml); V, 3-4, 6-7 (2 ml, rest lg); VI, 3-4, 7-8 (2 sh, rest ml to lg); VII, 4, 8 (2 sh, 2 ml, 4 lg); VIII, 3-4, 4-8 (4 lg, rest ml); seta  $p_1$ , 1 + 1 (sh to ml);  $p_2$ , absent; marginal and submarginal setae, 8-11 (sp). Sternal: II, 11-16 (arrangement characteristic, figs. 12-14); III, 5-10 and 1-3 m; IV, V, 2; VI, 4-6; VII, 7-10; VIII, 2 (lg); setae  $d$ , 2 + 2 (2 sh, 2 lg). Anal setae 3 + 3 (4 sh, 2 lg). (The last marginal seta each side is invariably close to the outermost anal seta and may be an additional seta; if so, anal setae may be 4 + 4, as is the condition in the female of *A. meinertzhageni* (Hajela, 1967)). Spiniform setae on or near margin of vulva, 16-22 (fig. 15), of these 5-7 median and 5-9 lateral; in addition 5-9 minute to spiniform setae occur anteriorly in the genital region.

Setae  $a$  and  $p_1$  are either close together or slightly apart.

In both sexes setae  $a$  and  $p_1$  are near the intersegmental suture between VIII and IX-XI.

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

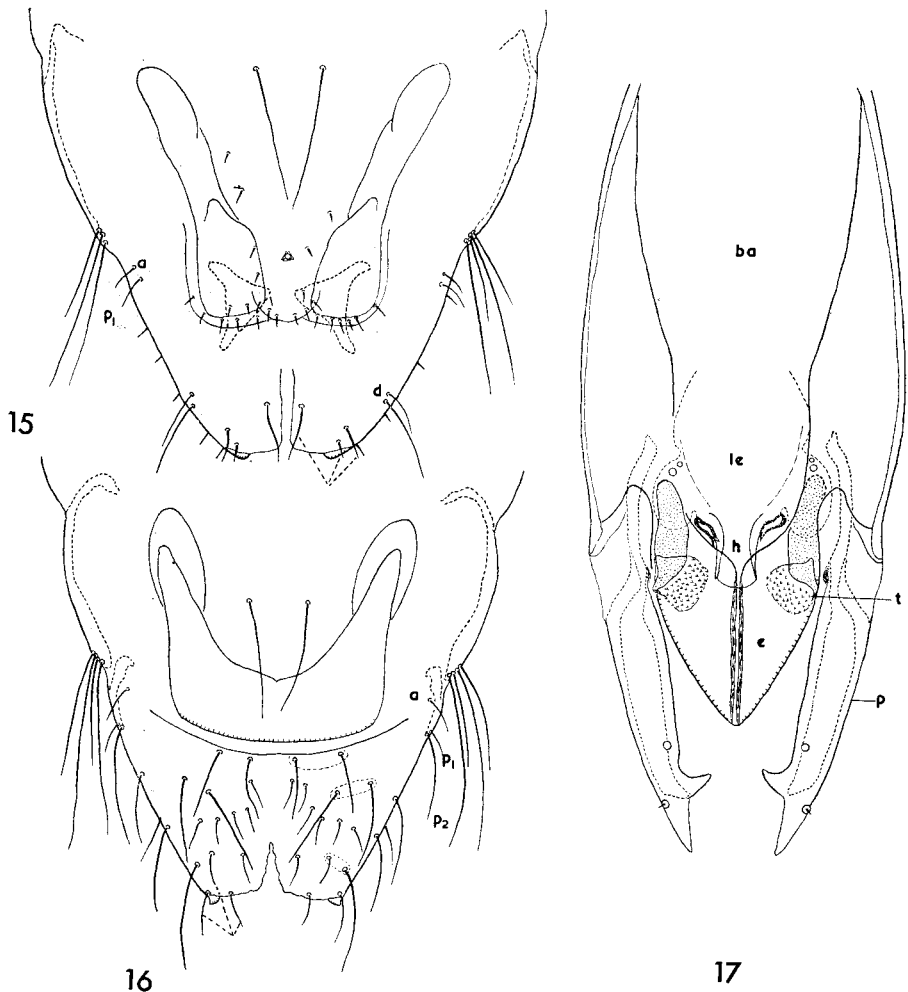
**Holotype** ♂, **allotype** ♀, INDIA: Lucknow, from *Pseudibis papillosa* (Temminck), 18.xi.52, slide no. 699 in British Museum (N.H.).

TABLE II.—*Ardeicola dennelli* sp. n. Measurements (mm.) 9 ♂, 9 ♀ in *Canada balsam*

	Male		Female	
	Length	Breadth	Length	Breadth
Head	Range	0.36-0.38*	0.67-0.73	0.40-0.42*
	Mean	0.38	0.73	0.42
Prothorax	Range	0.38-0.40†		0.44-0.48†
	Mean	0.39		0.41*
Pterothorax	Range	0.368*	0.69	
	Mean	0.388†		0.46†
Abdomen	Range	0.32-0.33	0.18-0.19	0.36-0.38
	Mean	0.325	0.18	0.37
Total length	Range	0.42-0.47	0.39-0.41	0.50-0.56
	Mean	0.45	0.41	0.53
Head index	Range	0.45	0.399	0.53
	Mean	0.44-0.48	1.87-2.08	0.56-0.71
Preantennal	Range	1.49	1.85	0.59
	Mean	1.50	1.97	0.64
Postantennal	Range	2.61-2.69	3.14-3.40	
	Mean	2.65	3.25	
Head index	Range	0.62-0.64	0.65-0.68	
	Mean	0.627	0.66	0.65

\* Preantennal

† Postantennal



FIGS. 15-17.—*Ardeicola dennelli* sp. n. (15, 16) Ventral view of terminalia. (15) Female, post-vulval sclerites shown by dotted lines. (16) Male; alveoli of constant setae encircled by dotted lines, broken lines indicate the three anal setae; although dorsal, seta *a* is shown to indicate its relationship with *p*<sub>1</sub> in female (15) and *p*<sub>1</sub> and *p*<sub>2</sub> in male (16). (17) External genitalia, posterior sclerotised area: parameres slightly parted at tips; *ba*, basal apodeme; *e*, endomere; *h*, hypomere; *le*, lower endomere; *p*, paramere; *t*, telomere (see Clay, 1956).

*Paratypes*: 149 ♂, 165 ♀ from the type host from N. India.

The species is named in honour of Professor R. Dennell, Zoological Laboratories, University of Manchester, teacher of one of us (B.K.T.).

We are most grateful to Dr. Theresa Clay, British Museum (Natural History), for the loan of material and for reading the manuscript, and to Professor M. B. Lal for his unceasing interest in our work.

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