

Three new species of *Ardeicola* Clay, 1935 (Mallophaga, Ischnocera: Philopteridae)

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With 24 Text-figures

SYNOPSIS

Descriptions are given of three new species of Mallophaga, one from *Euxenura galeata* from Argentine, one from *Mycteria americana* from British Guiana, and the third from *Melanophoyx ardesiaca* from Botswana (formerly Bechuanaland).

I. INTRODUCTION

IN this paper, one of a series dealing with the genus *Ardeicola* Clay, 1935, three new species are described. The abbreviations used in describing the length and position of setae are those given in Hajela & Tandan (1967), with the following additions: elg, elongated; sc, sternocentral; sl, sternolateral; tc, tergo-central; tl, tergolateral. Measurements have been corrected to two decimal places.

II. Genus *Ardeicola* Clay, 1935

Ardeicola hopkinsi sp. n. (figs. 1-6)

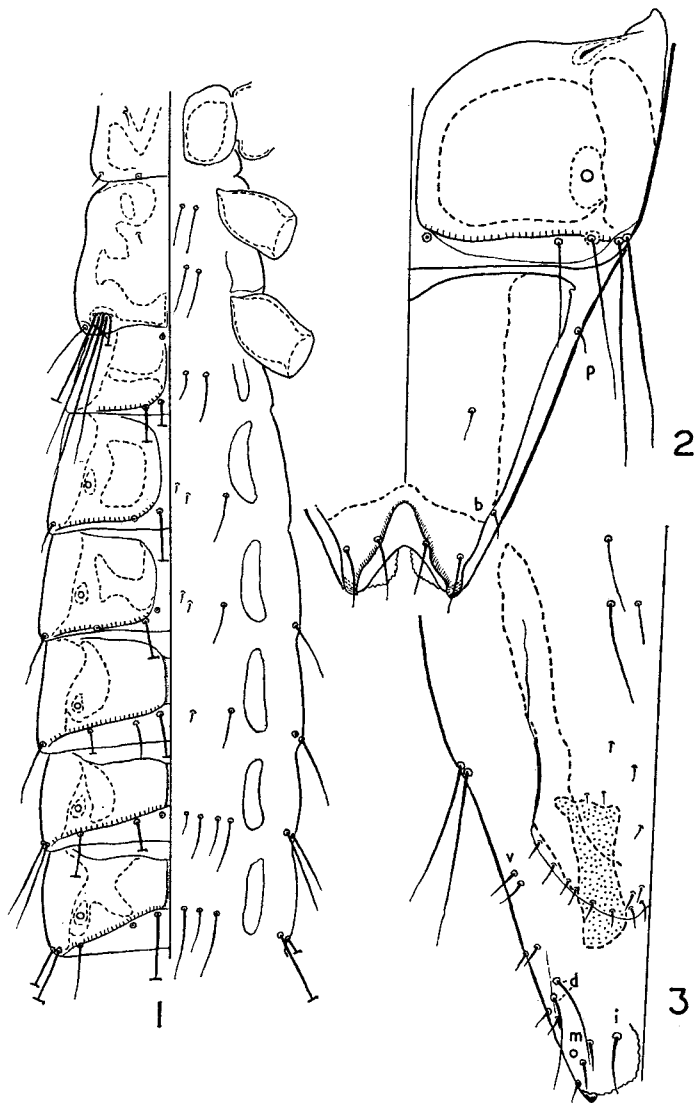
Host: *Euxenura galeata* (Molina)

This is a distinctive species. Its greatest resemblance is to *Ardeicola fissomaculatus* (Giebel, 1874) and to a new species of *Ardeicola* (Tandan & Kumar, in press), respectively from *Leptoptilos crumeniferus* and *L. javanicus*. It is readily distinguished from these by the shape and proportions of the head and terminalia, tergal and sternal chaetotaxy, and characters of the genital region.

Colour of mounted specimens brown.

Head and thorax (figs. 1, 4).—Head widest at about level of marginal temporal setae 2. No definite incassations in pre-antennal region, as are present in *A.* sp. (see above). Pre-antennal considerably longer than postantennal region, an uncommon condition in *Ardeicola* from Ciconiidae. Dorsal anterior plate wider than long; centrally unpigmented; in male, about two-thirds of posterior portion well pigmented, in female, only the posterior half less intensely so; an anterior lateral thickening associated with it (arrow in fig. 4). Prominent thickenings on ventral anterior plate. Gular plate moderately sclerotised almost uniformly all over. Important head setae as follows:—Anterior dorsal slightly posterior to anterior ventral 1 and 2, and well removed from the pre-antennal suture. Dorsal submarginal behind tip of pre-marginal carina, but less so in female. Anterior dorsal (broken in female) and dorsal submarginal lg; postnodal, pre-conal and mandibular ml; preantennal sp; ocular sh to ml, definitely on edge of temporal margin. Marginal temporal 4 ml and 2 sh, rest sp. Post-temporal sh in male, slightly shorter and thinner in female. Others ml to lg. Pro- and pteronotum as in figure 1; on pronotum 1 + 1 sp anterior and 2 + 2 posterior setae, outer sp, inner ml. No prosternal setae. Pterothorax wider than long. On pteronotum 1 + 1 sp anterior, and 7 + 7 characteristically arranged posterior setae; 5 + 5 lg, with contiguous alveoli, 1 + 1 sp, and 1 + 1 trichobothrium-like. On meso- and metasternum: in male 2 + 2 on both, and in female 2 - 4 and 3 - 4 lg setae respectively.

Abdomen (fig. 1).—Interpretation of abdominal segments as in *Ardeicola dennelli* (Hajela & Tandan, 1967). Segment III slightly longer than II. In male, tergal thickening as definite lateral tergites, those of V-VIII being joined by intense central (secondary) sclerotisation (figs. 1, 5). Lateral tergites of II narrowly, of III and IV well separated medially. Thickening of terminal tergum, IX-XI, apparently extends to posterior margin, but sclerotisation around posterior setae relatively feeble (fig. 5). In female tergal thickening II-VII as lateral tergites; of II separated by a wider gap than in male; of III-VIII fairly wide apart, and the distance between them decreasing progressively



FIGS. 1-3.—*Ardeicola hopkinsi* sp. n. (1) Male, thorax and abdominal segments II-VII, dorsal and ventral. (2) Female, abdominal segments VIII-XI; seta *a* absent on right side. (3) Female, genital region of one side only; supra-vulval sclerite stippled, and subgenital plate shown by broken lines. Anal setae: *i*, inner; *m*, middle; *o*, outer.

posteriorly. Secondary sclerotisation (in one female only) along inner margin of lateral tergites III-VIII, on VI-VIII that of the two sides merges medially. Tergal thickening IX-XI pigmented characteristically, and falls short of the lateral segmental margins; its anterior margin slightly depressed medially (fig. 2). Sternal thickening II-VIII as narrow, elongated lateral plates, but that of II not evident in male. In both sexes, lateral sternites VIII continuous with subgenital plates. Genital regions and chaetotaxy as shown in figures 3, 6. In male, posterior to subgenital plates 30 ml to lg and 17 sp or sh setae present. (The external genitalia of the male holotype, inside the abdomen,

are greatly twisted; even so their diagnostic nature is evident. Since the species can be identified by the non-sexual characters alone, the holotype was not dissected in order to restore the genitalia to normality.)

Body measurements of types given in Table I.

TABLE I.—Measurements (in mm.) of *Ardeicola hopkinsi* mounted in Canada balsam

		Holotype ♂	Allotype ♀	Paratype ♀
Head	Length	0.98	0.98	1.01
		0.57*	0.57	0.58
		0.41†	0.41	0.43
	Breadth	0.58	0.60	0.61
Prothorax	Length	0.25	0.25	0.24
	Breadth	0.46	0.46	0.44
Pterothorax	Length	0.48	0.50	0.51
	Breadth	0.62	0.71	0.64
Abdomen	Length	2.56	3.15	2.90
	Breadth	0.72	0.89	0.75
Total length		4.27	4.88	4.66
Head index		0.59	0.61	0.60

*Length of preantennal region.

†Length of postantennal region.

Abdominal chaetotaxy

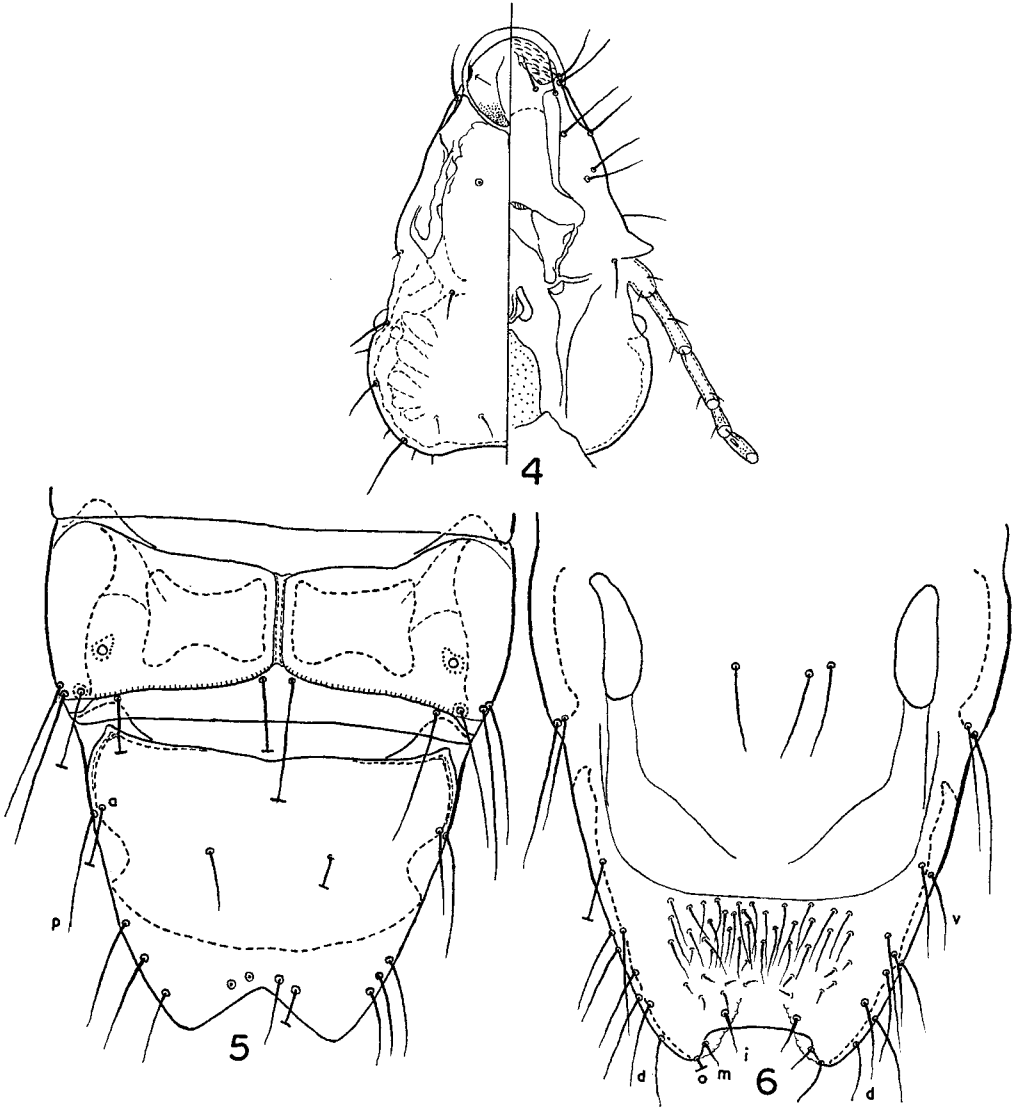
Some setae on the body were broken, and in the figures these have been shown incompletely; others were represented by their alveoli, which alone have been shown.

Male holotype (figs. 1, 5, 6).—Tergal: II, 2 anterior tc (broken); II–VII, 1 tl + 2 tc + 1 tl posterior; VIII, 1 tr + 1 tl + 2 tc + 1 tl + 1 tr (tr on tergite); although broken, tc on all segments apparently longer than tl; IX–XI, 1 + 1 anterior lg, and 1 tl + 2 tc + 1 tl posterior (only 1 complete tc, lg); seta *a*, 1 + 1 lg on tergite; posterior to *a* 3 + 3 dorsal setae, of which all or one may be homologous to seta *b* of other species from Ciconiidae. Post-spiracular setae present on terga III or IV–VII, 1 + 1, all broken, without apparent contiguous sensilli. Pleural: II, 0; III, 1 + 1; IV, 2 + 2; V, 3 + 3; VI–VIII, 4 + 4; seta *p*, 1 + 1 lg; seta *v*, 1 + 2 lg; marginal and submarginal setae, 5 + 5 lg. Sternal: II, 1 sl + 2 sc + 1 sl (all lg, sl longer and stouter than sc); III–V, 1 sl lg + 2 sc m + 1 sl lg; on III, IV 2 m anterior to sc also present; VI, 3 + 4; VII, 4 + 3 ml to lg on both; VIII, 1 + 2 lg; seta *d* on lateral edge of genital opening, 2 + 2 ml to lg, their position diagnostic. Anal setae, 3 + 3 sh to ml, middle and outer close to each other.

Female (figs. 2, 3).—Allotype given first, followed by paratype where the two differ. Tergal: II, 2 anterior tc ml; posterior on II–VIII, and tr, as in male; IX–XI, 1 + 1 anterior sh, and 1 tl + 1 tc + 1 tl and 1 + 2 + 1 ml to lg posterior; seta *a*, 1 + 0 and 1 + 1 sp off tergite; seta *b*, 0 + 1 and 1 + 1 sh to ml off tergite or near its edge. Post-spiracular setae on terga III–VII, 1 + 1; on III broken; on IV ml; on V ml to lg; on VI, VII lg. Pleural: except on IV and VI, count as in male; IV, 2 + 3 and 1 + 1; VI, 4 + 4 and 3 + 4; seta *p*, 1 + 1 sp; seta *v*, 2 + 3 sp and 3 + 2 sp to lg; marginal and submarginal setae 5 + 5 and 8 + 8. Sternal: II, 2 sl + 2 sc + 2 sl (all lg, sc and sl almost equal); III, 1 sl lg + 2 sc m + 1 sl lg, and 1 sh + 2 lg + 1 ml; IV, 1 lg + 2 m + 1 lg, and 0 + 2 ml + 0; V, 1 lg + 2 m + 1 lg, and 1 sh + 2 lg + 0; VI, 4 + 4 sh to lg; VII, 3 + 3 lg to elg; VIII, 1 + 1 lg to elg; between VII and VIII 4 + 4 sh to ml setae also present, and 2–3 m near sc on III, V, also present; seta *d* in genital region, 2 + 2 lg; sp setae on or near margin of vulva 18 and 19, respectively 7 and 5 median, 11 and 14 lateral; 7 and 8 m or sh anterior setae in genital region on subgenital plates. Anal setae, 3 + 3; 2 inner ml characteristic, 4 sp or sh; inner anterior relative to middle anal seta.

Holotype ♂ and *paratype* (*allotype*) ♀, ARGENTINE: from *Euxenura galeata*, slide no. 4815a, Meinertzhagen collection, British Museum (Nat. Hist). *Paratype*, 1 ♀ from same host individual.

The species is named in honour of Mr. G. H. E. Hopkins, the eminent ectoparasitologist.



FIGS. 4-6.—*Ardeicola hopkinsi* sp. n.: (4) female, head, dorsal and ventral (all 6 marginal temporal setae shown on left side); (5) male, abdominal segments VIII-XI; (6) male, genital region. Anal setae: *i*, inner, *m*, middle; *o*, outer.

***Ardeicola leucosoma* sp. n. (figs. 7-9, 12-14)**

Host: *Mycteria americana* Linnaeus

Colour of mounted specimens pale; evidently a feebly sclerotised species. No overlap in length of sexes (Table II).

Head and thorax (figs. 7, 9).—Head widest at about level of marginal temporal setae 2. Faint incassations present in pre-antennal region, as in *A. sp.* Tandan & Kumar. Dorsal anterior plate wider than long, almost unpigmented. Apical region of gular plate sclerotised feebly. Prominent thickenings on ventral anterior plate. Important head setae as follows:— Anterior dorsal, ml to lg, posterior relative to anterior ventral 1 and 2, well removed from pre-antennal suture. Dorsal submarginal, lg, on or near edge, and well behind tip, of pre-marginal carina. Postnodal ml to lg in male, sh in female; preconal sh to ml; mandibular ml; pre-antennal sp; ocular sh to ml, on edge of temporal margin. Marginal temporal 4 lg in male, ml to lg in female; 2 ml in male, sh in female;

TABLE II.—Measurements (in mm.) of 7 males and 6 females (of type series) of *Ardeicola leucosoma* mounted in Canada balsam

		Male			Female		
		Range	Mean	Holotype	Range	Mean	Allotype
Head	Length	0.71-0.80	0.77	0.79	0.83-0.90	0.87	0.83
		0.37-0.41*	0.40	0.41	0.41-0.44	0.43	0.44
		0.30-0.41†	0.37	0.38	0.41-0.48	0.44	0.39
	Breadth	0.48-0.54	0.51	0.50	0.54-0.59	0.57	0.54
Prothorax	Length	0.17-0.21	0.18	0.18	0.18-0.22	0.21	0.18
	Breadth	0.36-0.40	0.37	0.39	0.39-0.43	0.40	0.39
Pterothorax	Length	0.35-0.41	0.36	0.36	0.40-0.43	0.41	0.41
	Breadth	0.54-0.57	0.55	0.55	0.62-0.65	0.64	0.62
Abdomen	Length	1.66-1.74	1.70	1.67	2.28-2.42	2.35	2.35
	Breadth	0.54-0.58	0.56	0.57	0.73-0.86	0.80	0.76
Total length		2.90-3.06	3.01	3.00	3.78-3.96	3.84	3.78
Head index		0.61-0.70	0.65	0.63	0.63-0.66	0.64	0.65

* Length of preantennal region.
 † Length of postantennal region.

rest spiniform. Post-temporal sh to ml in male almost reaching posterior temporal margin; sh in female falls considerably short of this margin. Others ml to lg. Distal hook on antennal segment III as in figure 8. Pronotum divided narrowly medially; pteronotum divided likewise, but distinct posteriorly only. On pronotum 1 + 1 anterior setae, sh in male, m in female, and 2 + 2 posterior setae, outer sp, inner ml to lg in male but sh to ml in female. No prosternal setae. Pterothorax wider than sp. Its chaetotaxy normal (as in *A. hopkinsi*); range of the 5 + 5 setae with contiguous alveoli 4 - 6 (total 9 - 11) in male and 4 - 5 (total 9 - 10) in female. On both meso- and metasternum 1 + 1 lg setae, mesosternal slightly longer.

Abdomen (fig. 9).—Interpretation of abdominal segments as in *A. dennelli* (Hajela & Tandan, 1967); relative lengths of segments II, III, as in *A. hopkinsi*. In male tergal thickening II-V as lateral tergites, of II narrowly, of III-V widely separated medially and latter joined by central (secondary) sclerotisation; VI-VIII apparently continuous across, due probably to intense central sclerotisation. Thickening of terminal composite tergum, IX-XI, pigmented posteriorly (fig. 12); inner margins of anal lobes not covered by tergum XI. In female tergal thickening II-VIII as lateral tergites; of II as in male; of III-VIII more widely separated medially. Central sclerotisation apparently absent or too feeble. Tergite of terminal composite tergum, IX-XI, falls considerably short of lateral segmental margins; its anterior margin slightly depressed medially, and it is pigmented posterolaterally only (fig. 14). Sternal thickening not apparent. Subgenital plate and genital region of the two sexes shown in figures 12, 14. Post-vulval sclerites long, narrow; opening of spermathecal duct somewhat anterior to vulval margin, and strengthened by a curved sclerite anteriorly. Male external genitalia shown in figure 13; mesosome long, narrow, and hook on inner margin of paramere variable in proportions.

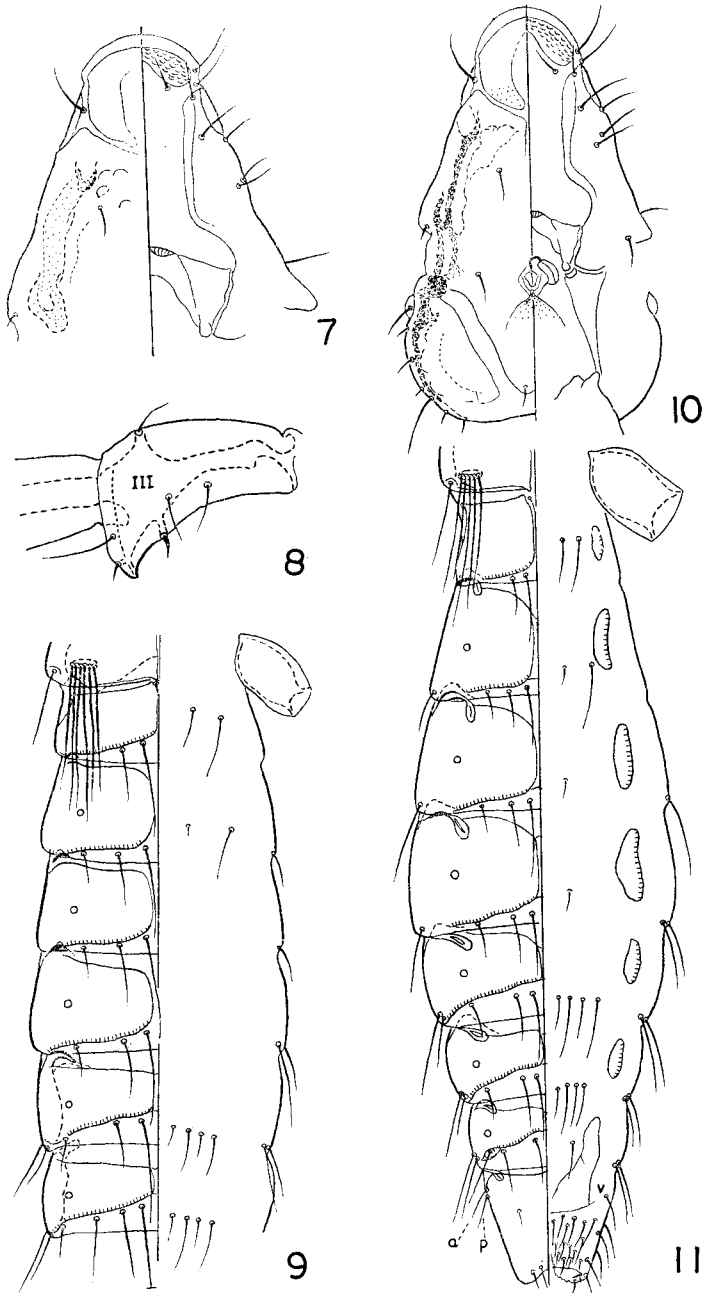
Body measurements of type given in Table II.

Abdominal chaetotaxy (setal count of 7 males and 6 females).

Male.—Tergal (figs. 9, 12): II, 2 tc sh anterior; II-VII, 1 tl + 2 tc + 1 tl posterior (2 tl on one side on II in one specimen, on VII in another) (2 tc longer than 2-3 tl); VIII, 1 tr + 1 tl + 2 tc + 1 tl + 1 tr (tr on tergite) (tc slightly longer than tl); IX-XI, 1 + 1 anterior ml to almost lg, and 1 tl + 2 tc + 1 tl posterior all ml (tc very slightly longer than tl); seta *a*, 1 + 1 ml to lg off tergite or on its edge; seta *b*, 1 + 1 ml (0 + 1 in 1) on or edge of tergite. Post-spiracular setae, without contiguous sensilla, on terga III-VII, 1 + 1; on III sh; on IV sh to ml; on V ml to lg; on VI, VII lg. Pleural: II, 0; III, 1 + 1; IV, 1 + 1 (2 + 1 in 1); V, 1-4 (total 2-7); VI, VII, 4 + 4 (3 + 4 on VI in one, on VII in another); VIII, 4 + 4 (4 + 5 in 1); seta *p*, 1 + 1 lg; seta *v*, 1 + 3 lg total (2-6); marginal and submarginal setae, 2-4 lg (total 4-7). Sternal: II, 1 sl lg + 2 sc m, sp or 1 sh 1 ml + 1 sl; III, 1 sl lg + 2 sc m to sp + 1 sl; IV, V, apparently absent; VI, 7-8 ml to lg (7.57) (7); VII 6-7 ml to lg (6.43) (7); VIII, 1 + 1 lg; seta *d* in genital region, 2 + 2 ml. Anal setae, 3 + 3, their relative position as in figure 12.

Female.—Tergal (fig. 14): II, 2 tc m to sh anterior; II-VII, 1 tl + 2 tc + 1 tl posterior all lg (tc fairly longer than tl); VIII, 1 tr + 1 tl + 2 tc + 1 tl + 1 tr (range of tl 2-3 (tc usually longer than tl)); IX-XI, 1 + 1 anterior sh to ml relatively close to lateral margin of tergite, and 1 tl + 2 tc + 1 tl posterior all ml (tl on or off tergite, tc very slightly longer than tl); seta *a*, 1 + 1 anterior sh to ml, near edge of tergite; seta *b*, 1 + 1 sh off tergite. Post-spiracular setae on terga III-VII, 1 + 1; on III sh to ml; on IV-VI ml to lg; on VII lg. Pleural: II, 0; III, 1 + 1; IV, 4 + 4 (4 + 3 in 1); V,

4 + 4 (5 + 4 in 1); VI, 4 + 4 (4 + 5 and 4 + 1 in 1 each); VII, VIII, 4 + 4; seta *p*, 1 + 1 sp; seta *v*, 1-2 sp (total 2-4); marginal and submarginal setae, 4-6 sp (total 10-12). Sternal: II, III, 1 sl lg + 2 sc sh + 1 sl (sc on II wide apart, on III closer); IV, V, apparently absent (rarely 1-2 m or sh sc on V); VI, 6-9 lg (7-50) (6); VII, 6 ml to lg; VIII, 1 + 1 lg; between VII, VIII 2-4 (total 5-7) sh to ml setae also present; seta *d* in genital region, 2 + 2 ml to lg. Anal setae, 3 + 3, their relative



FIGS. 7-11.—*Ardeicola* spp. (7-9) *A. leucosoma* sp. n.: (7) female preantennal region of head, dorsal and ventral; (8) male, distal hook on antennal segment III; (9) male, abdominal segments II-VII, dorsal and ventral (posterior margin of pteronotum, also shown, bears 6 setae with contiguous alveoli on left side). (10, 11) *A. loculator*: (10) male, head, dorsal and ventral; note the temporal carina (all 6 marginal temporal setae shown on left side); (11) male, abdomen, dorsal and ventral.

position as in figure 14. Sp setae on or near margin of vulva, 14-16 (5-7 median, 3-6 (total 8-11) lateral); besides these 2-5 sp setae present on subgenital plates.

Holotype ♂ and *paratype* (*allotype*) ♀, BRITISH GUIANA: Good Hope, Rupunini, from *Mycteria americana*, 13.ii.1961 (*T. Clay*), slide no. 705, British Museum (Nat. Hist.). *Paratypes*: 6 ♂ and 5 ♀ from the same host individual.

Notes and remarks.—*Mycteria americana* (Wood Ibis) also harbours another species of *Ardeicola*, *A. loculator* (Giebel, 1874). Twelve males of the latter were examined; no female was available. Its important characters are given below together with those in which it differs from *A. leucosoma*.

Figures 10, 11, 15. Mounted specimens golden yellow; evidently a well sclerotised species. Incrassations in pre-antennal region more intense. Dorsal anterior plate slightly wider than long. Temporal carinae present. Postnodal seta ml, ocular seta on cornea but near edge of temporal margin. Marginal temporal seta 4 ml to lg, and 2 sh to ml. Post-temporal sh falls much short of posterior temporal margin. On pronotum no outer spiniform setae posteriorly, only 1 + 1 ml to almost lg setae. Range of posterior setae on pteronotum with contiguous alveoli 4-5 (total 9-10). In one male 2 metasternal setae on one side with contiguous alveoli. Post-spiracular setae on III relatively close to tergal seta of its side. Tergal thickening II-VIII as distinct lateral tergites, but joined by central (secondary) sclerotisation. Tergite IX-XI almost uniformly pigmented all over. Sternal thickening II not evident; of III-VIII as distinct narrow lateral plates; of VIII continuous with the subgenital plate. The body measurements (Tables II, III), shape of head (figs. 7, 10) and abdomen (figs. 9, 11) and of external genitalia (figs. 13 and 15) differ significantly from those of *A. leucosoma*.

TABLE III.—*Measurements (in mm.) of 12 males of Ardeicola loculator mounted in Canada balsam*

		Range	Mean
Head	Length	0.87-0.93	0.90
		0.43-0.48*	0.46
		0.41-0.46†	0.44
Prothorax	Breadth	0.53-0.55	0.54
Prothorax	Length	0.17-0.19	0.18
		Breadth	0.37-0.42
Pterothorax	Length	0.39-0.42	0.40
		Breadth	0.53-0.58
Abdomen	Length	2.21-2.35	2.28
		Breadth	0.66-0.80
Total length		3.67-3.89	3.76
Head index		0.58-0.63	0.60

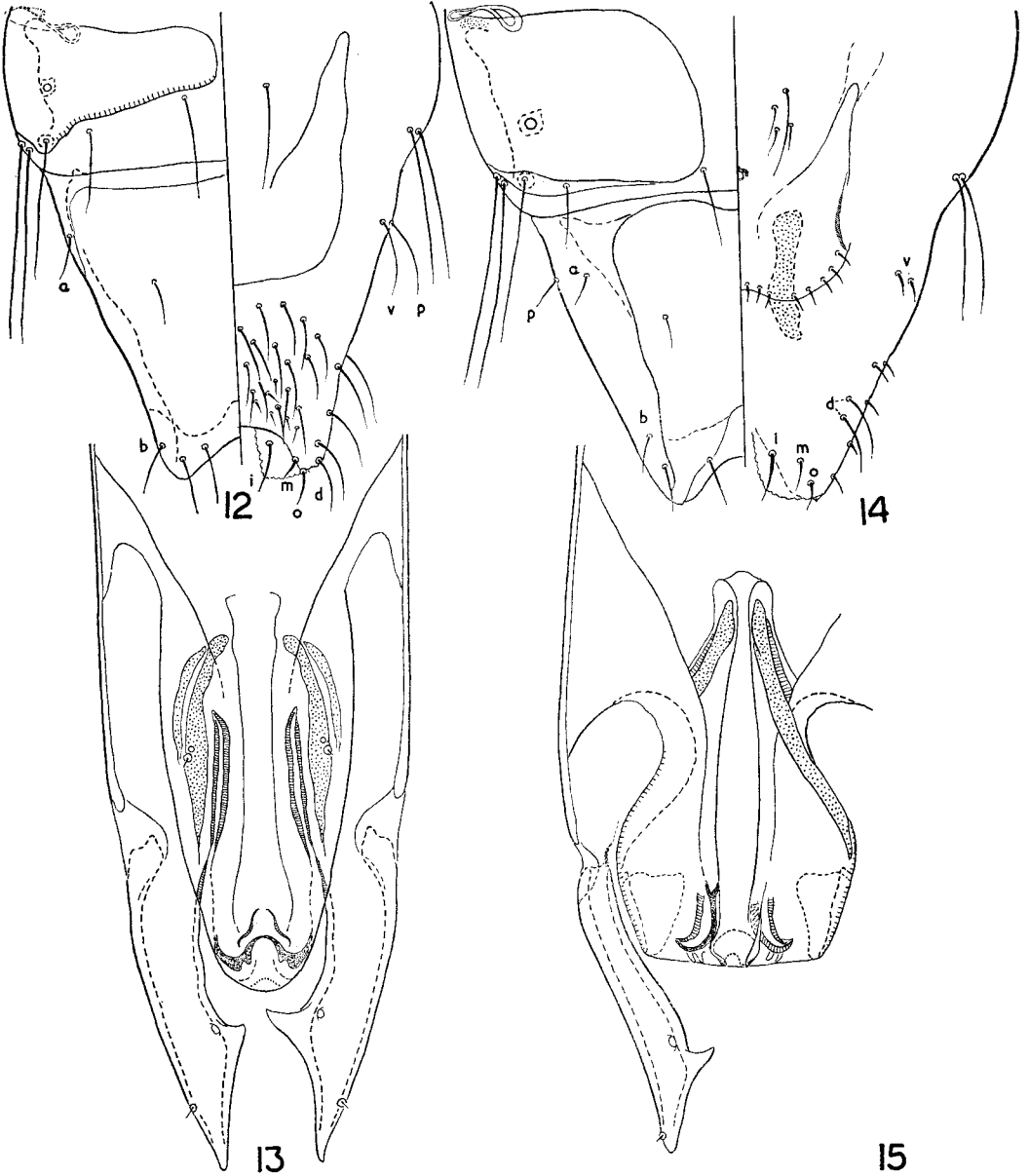
* Length of preantennal region.

† Length of postantennal region.

Abdominal chaetotaxy.—Tergal: II, tc anterior; II-VII, 1 tl + 2 tc + 1 tl posterior; tc on II-VI not as long as in *A. leucosoma*, and do not extend as much posteriorly; VIII, 1 tr + 1 tl + 2 tc + 1 tl + 1 tr (in one specimen 1 tl seta, in another 2 tl setae, present between tc and outer tl, on one side only) (tc equal to or longer, rarely shorter, than tl), tr usually on edge of lateral tergite; IX-XI, 1 + 1 anterior sh to ml; seta *a*, 1 + 1, off or on edge of tergite. Post-spiracular setae on terga III-VII, 1 + 1 (not apparent on one side on IV in one specimen, V in another); on III sh to ml; on IV ml; on V-VII ml to almost lg. Pleural: IV, 2 + 2; V, 3 + 3; variation from norm on VIII, 3 + 2 in 1; seta *p*, 0 + 1 also in 1; seta *v*, 1-2 lg (total 3-4); marginal and submarginal setae, 2-4 lg (total 5-6). Sternal: II, 1 sl + 2 sc + 1 sl (all lg, sl longer than sc); III, 1 sl ml to lg + 2 sc m or sh + 1 sl lg (0 + 1 m + 1 ml in 1) (sc relatively more apart than on other segments); IV, V, 0 + 2 sh + 0 (on IV 1 + 2 + 1 all lg in 1 and 0 + 2 + 1 ml in 2); VI, 6-8 (7.31) (12); VII, 7-8 (6.91) (12).
Setae not mentioned above, as in *A. leucosoma* sp. n.

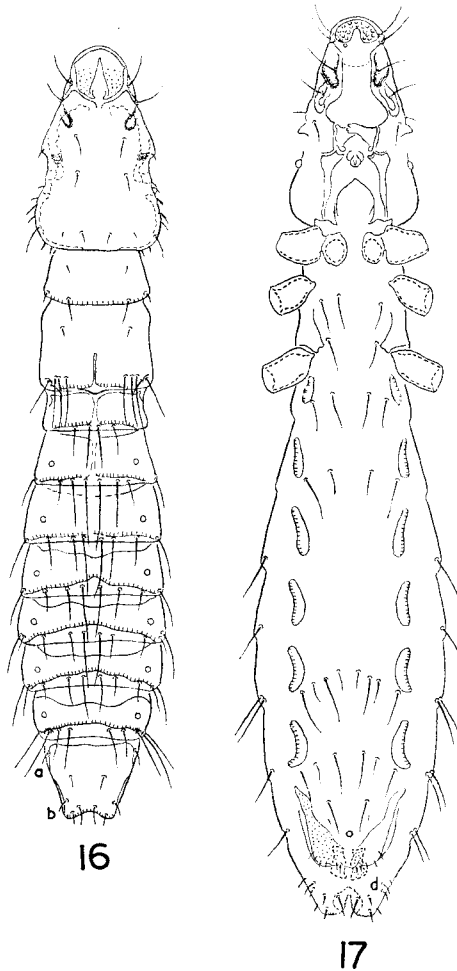
The occurrence of two congeneric species on one host is not uncommon in the Ischnocera or indeed in the Mallophaga (*see* Clay, 1949, 1957). In the present instance, what is of special interest is the difference in the degree of sclerotisation of *A. leucosoma* and *A. loculator*.

Sympatric species are found on other members of the Ciconiiformes: *Eudocimus albus* and *E. ruber* harbour two quite distinct species of *Ardeicola*, those on the former being *A. robusta* Tuff and *A. elongata* Carriker (see Tuff, 1967). Examples are found in other host orders: two distinct species of the same genus, *Quadriceps hemichrous* (Nitzsch) and *Q. semifissus* (Nitzsch), are parasitic on *Himantopus himantopus* (Charadriiformes), and two species of *Degeeriella*, belonging to two distinct species groups, are found on *Aquila* (Falconiformes) (see Clay, 1958). These pairs of sympatric species are sclerotised to a more or less equal degree, unlike *A. leucosoma* and *A.*



FIGS. 12-15.—*Ardeicola* spp. (12-14) *A. leucosoma* sp. n.: (12) male, terminalia, dorsal and ventral; (13) male, posterior components of external genitalia; (14) female, terminalia, dorsal and ventral, supra-vulval sclerite stippled (note sclerite anterior to opening of spermathecal duct). (15) *A. loculator*, male, posterior components of external genitalia; shown incompletely on right side, but ventral sclerites of mesosome shown complete on right side. Anal setae: *i*, inner; *m*, middle; *o*, outer.

loculator. It is the extent of sclerotisation that imparts to the cuticle of the insect its characteristic pigmentation pattern. In the Mallophaga, especially Ischnocera, the pigmentation pattern is known to be related to the specific ecological niche occupied by the parasite on the body of the host. It is such that the louse merges with the plumage of that niche, and this phenomenon may have survival value for the insect (Clay, 1957). Hence, the difference in the pigmentation pattern, due to differing degrees of sclerotisation, raises the question whether the ecological niche of *A. leucosoma* and *A. loculator* on the wing feathers of *Mycteria americana* overlaps or is different, *i.e.*, the species show allopatry.



FIGS. 16, 17.—*Ardeicola buttikeri* sp. n.: (16) male, dorsal. (17) female, ventral. Drawn to same scale.

***Ardeicola buttikeri* sp. n. (figs. 16–24)**

Host : *Melanophoyx ardesiaca* (Wagler)

The pigmentation pattern, especially of the dorsal surface, is a more important taxonomic character for *Ardeicola* from Ardeidae than for those from Ciconiidae or Threskiornithidae. *A. buttikeri* sp. n. differs from all other species from Ardeidae in its pigmentation pattern, in its external genitalia, shape of head and terminalia, and in the proportions of the body setae.

Pigmentation pattern of the head, thorax, and abdomen, especially the tergites, is diagnostic. Mounted specimens light brown in colour. General characters of both sexes as in figures 16, 17.

Head and thorax.—Head widest at about level of marginal temporal setae 3. Characteristic endocarinae present in the pre-antennal region, somewhat like the incassations in the same region of *Falcolipeurus*. Dorsal anterior plate slightly longer than wide, its pigmentation characteristic. In male, pre-antennal suture apparently continuous across the head, in the (single) female not so, as posterior margin of dorsal anterior plate joins the dorsal carina. Prominent thickenings on ventral anterior plate. Gular plate well sclerotised, but less so centro-posteriorly, and heavily in region of its articulation with the neck. Neck sclerite not apparent. Antennae as in figures 18–21; either no or poorly developed distal hook on antennal segment III of male, and this end appears as shown in figures 19, 20. Important head setae as follows:—Anterior dorsal well removed from pre-antennal suture, as in *Ardeicola* from Ciconiidae; this seta, dorsal submarginal and postnodal lg in male, ml in female; preconal sh; pre-antennal sp; mandibular ml; ocular sp, on edge of temporal margin. Marginal temporal 4 ml to lg, 2 sp or sh, rest sp. Post-temporal sh in male, shorter in female. Others ml to lg. Pronotum apparently entire. Pteronotum apparently entire anteriorly but divided medio-posteriorly. On pronotum 1 + 1 anterior, sh in male and sp in female, and 2 + 2 posterior, outer sh or sp and inner ml, setae. Pterothorax slightly wider than long, its dorsal posterior margin curved in middle characteristically. On pteronotum 1 + 1 anterior sp and 5 + 5 posterior setae; latter arranged characteristically, 3 + 3 lg (range 5–6 in male) and their alveoli apart; behind these 1 + 1 sh and 1 + 1 trichobothrium-like setae. On meso- and metasternum 2 lg setae in male, but 2 + 1 and 2 respectively in female. Many of the described setae significantly shorter in female.

Abdomen.—Interpretation of abdominal segments as in *A. dennelli* (Hajela & Tandan, 1967). Segment III slightly longer than II. Tergal thickening of II completely or partially divided narrowly medially; the true nature of tergites III, IV not determinable precisely in alkali treated specimens, as these are feebly sclerotised centrally and because of the lack of sharp contours the thickening appears continuous across segment; thickening of V–VIII as lateral tergites in female, but continuous in male, either primarily or due to intense central (secondary) sclerotisation. In male thickening of terminal composite tergum, tergite IX–XI, less sclerotised along posterior margin; in female it falls slightly short of lateral segmental margins and is pigmented characteristically (figs. 16, 24). The 4 posterior tergal setae present on tergite IX–XI. Sternal thickening II–VIII as distinct narrow elongated plates; of II not apparent in male; of V–VII curved, more so posteriorly; of VIII continuous posteriorly with subgenital plate. Male genital region, its chaetotaxy, external genitalia, and female genital region as in figures 22, 23, 17; post-vulval sclerites faint, and opening of spermathecal duct anterior to these. An inner strip of each anal lobe exposed in male; in female the lobe projects slightly beyond tergum XI.

Body measurements of types given in Table IV.

TABLE IV.—Measurements (in mm.) of *Ardeicola buttikeri* mounted in Canada balsam

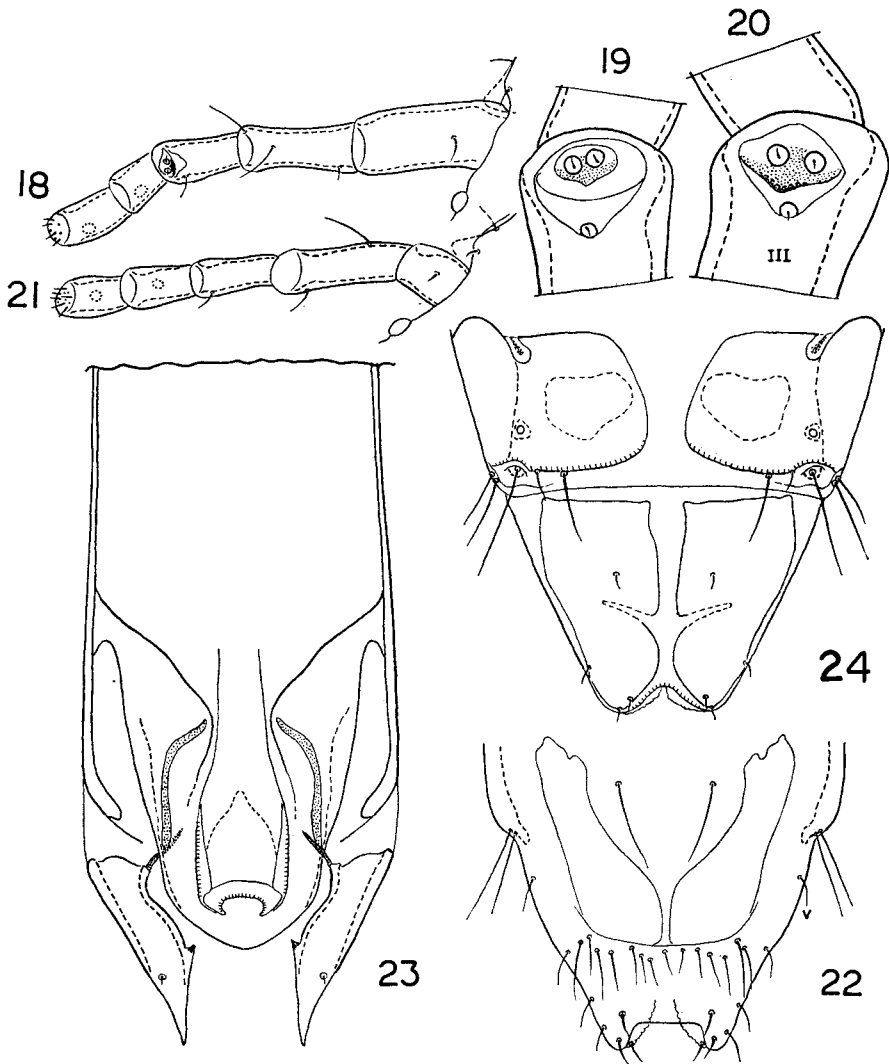
		Holotype ♂	Paratype ♂	Allotype ♀
Head . . .	Length	0.62	0.61	0.64
		0.34*	0.32	0.35
		0.28†	0.29	0.29
	Breadth	0.36	0.365	0.39
Prothorax . . .	Length	0.14	0.145	0.14
	Breadth	0.27	0.28	0.30
Pterothorax . . .	Length	0.29	0.28	0.29
	Breadth	0.33	0.325	0.36
Abdomen . . .	Length	1.30	1.31	1.70
	Breadth	0.41	0.40	0.54
Total length . . .		2.35	2.345	2.77
Head index . . .		0.575	0.58	0.61

* Length of preantennal region.

† Length of postantennal region.

Abdominal chaetotaxy

Male.—Holotype given first, followed by paratype where the two differ. Tergal: II, anterior tc 0; II–VII, posterior 1 tl + 2 tc + 1 tl; VIII, 1 tr + 1 tl + 2 tc + 1 or 2 tl + 1 tr (tr probably on tergite) (on II–VIII tc much longer than tl); IX–XI, 1 + 1 anterior sh, and 1 tl + 2 tc + 1 tl posterior ml, tc slightly longer than tl; seta *a*, 1 + 1 sh on edge of tergite, and *b*, 1 + 1 sh to ml well on tergite or near its edge. Post-spiracular setae on terga III–VII, 1 + 1 ml to lg, without



FIGS. 18-24.—*Ardeicola buttikeri* sp. n.: (18) male antenna; (19, 20) receptors on reduced distal hook of antennal segment III of male; (21) female antenna; (22) male, ventral view of genital region; (23) posterior sclerotised area of male external genitalia; (24) female, abdominal segments VIII-XI.

apparent contiguous sensilla. Pleural: II, 0; III, 1 + 1; IV, V, 3 + 3; VI, 4 + 4, 3 + 4; VII, 3 + 4, 4 + 4; VIII, 4 + 4; seta *p*, 0 + 0; seta *v*, 1 + 1 ml, 0 + 0; marginal and submarginal setae, 2 + 2, 1 + 1 ml. Sternal: II, 1 sl + 2 sc + 1 sl (sl lg, sc lg to elg); III, 0 or 1 sl + 2 sc + 1 sl (sl lg, sc ml to lg); IV, apparently absent; V, 0 sl + 2 sc lg + 0 sl; VI, 6, 8 ml to lg; VII, 6 (2 sl + 2 sc + 2 sl, sl lg, sc lg to elg); VIII, 2 lg; seta *d* in genital region, 2 + 2 sh to ml (position different from that in *Ardeicola* from Threskiornithidae). Anal setae, 3 + 3 sh, their relative position as in figure 22.

Female allotype.—Tergal: II-VII as in male, but length and proportions of setae different; VIII, 1 tr + 1 tl + 2 tc + 1 tl + 1 tr (tr as in male); IX-XI, 1 + 1 anterior sh, and 1 tl + 2 tc + 1 tl posterior sh; seta *a*, 0 + 0, and seta *b*, 1 + 1 sh on edge of tergite. Post-spiracular setae almost as in male, but on III, 0 + 1. Pleural: II, III, V as in male; IV, 3 + 2; VI-VIII, 3 + 4; seta *p*, 1 + 1 sp; seta *v*, 0 + 0; marginal and submarginal setae, 2 + 2 sp. Sternal: II, 1 sl + 2 sc + 1 sl (all lg, sc slightly longer than sl); III, 1 sl + 2 sc + 1 sl (sl lg, sc ml); IV, V, apparently absent; VI, VII, 2 sl + 2 sc + 2 sl (sl ml to lg, sc lg, total on VI 8 as 2 sh present between the 2 sc); seta *d* in genital region, 2 + 2 sh to ml; setae on or near margin of vulva, 6 + 4 + 6 sp; 2 or more minute setae present anteriorly on subgenital plate. Anal setae, 3 + 3, inner and middle setae at about same level (fig. 17).

In the male, the gap separating the two tergo-central setae increases progressively from V-VII, because of a slight outward shift of the tergo-central towards the tergo-lateral seta of its side. In both sexes, on VIII, the central setae, and on IX-XI the posterior tergo-central setae, become lateral, having come very close to the lateral setae; the two central setae on VIII-XI are therefore wide apart, that of each side being close to the lateral seta of its side (figs. 16, 24).

Holotype ♂ and *paratype* (*allotype*) ♀, BOTSWANA (formerly BECHUANALAND): Boro Mann, from *Melanophox ardesiaca* (Black Heron), 2.iii.1950 (*W. Buttiker*), slide no. 683, British Museum (Nat. Hist.). *Paratype*, 1 ♂ from the same host individual.

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