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DEGEERIELLINE ISCHNOCERA (INSECTA : PHTHIRAPTERA) OF THE PITTIDAE (AVES)

K. Somadder and B. K. Tandan

Department of Zoology, University of Lucknow, Lucknow, U.P., 226007, India

ABSTRACT. This paper deals with the species of *Picicola*, a member of the *Degeeriella*-complex, parasitic on birds (pittas) of the family Pittidae (order Passeriformes). It contains a redescription of one known species, descriptions of 8 new species and a key to the described species.

According to the Check-List of Mallophaga (Hopkins & Clay, 1952), *Lipeurus quadripustulatus* Piaget (=*Esthiopterum quadripustulosus* Harrison) is the only *Degeeriella*-like Ischnocera known from any member of the family Pittidae (Passeriformes). Assigned to *Picicola* by Hopkins & Clay (1952), this species is not listed in Eichler's (1942) "Mallophagen-Synopsis. IV Genus *Picicola*." Besides *P. quadripustulosus* (Harrison), fifteen other *Degeeriella*-like species, twelve valid, three invalid, are placed in the Check-List. Of the valid twelve, seven come from the Picidae and five from six different families (Tyrannidae, Dicruridae, Cractidae. Ptilinorhynchidae, Mimidae and Laniidae) of Passeriformes. Since *P. quadripustulosus* resembles those Degeerielline Ischnocera available from several members of the Pittidae, all the recognized species from this avian family can be included in a distinct species group of *Picicola*.

Figures in parentheses denote the number of specimens examined for chaetotaxy or measured; while the measurements in millimetres have been corrected to two decimal places, $\bar{x}$ denotes the mean. The chaetotaxy in the figures agrees with the specimens from which these were drawn and broken or missing setae, shown by broken lines, have been usually completed from the other side of the same specimen or from another specimen.

The following abbreviations have been used to designate the depositories for the material on which this study is based : BMNH, British Museum (Natural History); USNM, U. S. National Museum; EC, Dr. K. C. Emerson collection; REC, Robert E. Elbel collection.

THE PICICOLA QUADRIPUSTULOSUS SPECIES GROUP

Degeerielline Ischnocera with general characters of the body as shown in Fig. 2. Frons medially pointed; preantennal region of head with subparallel sides. The ends of the preantennal suture just reach to but do not interrupt the inner margin of the marginal carina, the latter being continuous like its outer margin. Ventral carina medially interrupted. Position of anterior head setae as in Fig. 9; anterior seta 1 and anterior ventral seta 3 considerably posterior to ventral setae 1 and 2. Marginal temporal seta 2 usually, 4 always very long.

Pronotum entire without anterior but with 1+1 long postero-lateral setae. Postnotum and pterosternal plate absent. On the pteronotum also only marginal setae present; the spiniform seta inner relative to the thoracic trichobothrium; other marginal setae 4−4 in number, arranged on each side in two groups of two (Fig. 2). Metasternal setae form a more or less straight row.

Tergal thickening of abdominal segments II-VII as lateral plates; in the male of VIII as lateral tergites, of IX+X as a transversely continuous plate and tergum XI unhardened. In the female thickening of VIII as a transversely continuous plate and of IX-XI as a single large plate. Sternal thickening (not seen in *emersoni* and *magnus*) of II-VI as median plates, followed by the median subgenital plate.

Chaetotaxy. Tergal setae: In both sexes, 1+1 abdominal trichobothria on tergum VIII and 1+1 post-spiracular setae on terga III-VII, with contiguous sensillum on III-V (Figs. 2, 7). The 2 central setae on terga III-VII close to each other, but each well apart from the lateral seta of its side (Fig. 2). In the male on tergum IX+X, in the female on IX-XI, 1+1 thick and very long setae (b, in Figs. 18, 24) (anterior relative to seta pd), off the tergite in the male, on it in the female, having the cuticle around it unsclerotised. Sternal setae: Sternum VIII with 2 central setae; in the female these are close to and not readily identifiable from the row of setae on sternum VII. In the male posterior to these 1+1 very long setae (e in Fig. 18). Margin of vulva with central setae also, slightly anterior to the marginal row of setae (Fig. 24). No seta in the genital region of both sexes homologous to seta f of which 1+1 are present in both sexes of *Picicola roberti* (see Somadder & Tandan, 1975) and in the female sex only of *Cuculicola*. Pleural setae (Figs. 2, 18, 24): II, III absent; IV, V 1+1 (lateral or l); VI, VII 2−2 (1−1 lateral, thin long to very long and 1+1 dorsal, or d, thick very long); VIII 3+3 (1+1 lateral which is now ventral, 1+1 dorsal which is now lateral and 1+1 ventral, or v, added inner to the lateral (or first) seta). Anteriorly on IX+X in the male and IX−XI in the female 1+1 thick, very long, lateral (ad) and 1+1 thin, medium to long, dorsal (ad2) setae. (This pair of setae occurs in several Ischnoceran genera.) Posterior to these the following setae occur in the female: 1+1 lateral (pd), 1+1 ventral (pl) and 2+2 ventral (pv) rather stout (Figs. 18, 24). In the corresponding position in the male setae are absent or each side 0−1, total 1−2, may be present ventrally, anterior relative to seta b.

Anal setae 3+3 (Figs. 18, 25). Male: all dorsal; anterior and middle short, posterior minute, with anterior longest. Female: all ventral; anterior minute, middle and posterior short, posterior longest.

Male genitalia of the slightly modified *Degeeriella fulva* type (see Clay, 1958: pl. 8, Fig. 3).

Specific Characters of quadripustulosus Species Group

Picicola from different, even not closely related members of the family Pittidae, has been found to differ relatively slightly from each other, hence

even small but constant differences are of taxonomic significance. The available sample of a population has been accorded specific status if it differs from all other samples in some or all of the following characters in combination : (1) Pigmentation pattern of the abdominal dorsum. (2) Shape of the frons and lateral spots in the neck region (present or absent). (3) Pteronotum (divided or entire). (4) Shape of posterior margin of the female terminalia. (5) Details of the components of the male external genitalia. (6) Length of certain head setae. (7) In both sexes : the number of setae on terga II—VIII, on sterna II—VII and of pv setae as also the proportions of the latter. (8) In the male the number of bl setae on tergum IX+X, setae on bulge of the last abdominal segment referred to as terminal setae. (9) In the female the number of short setae in the genital region, of setae on the vulva in the marginal row and antero-centrally, as also the proportions of the marginal setae.

This arrangement is in order of the importance of the characters.

Species Descriptions

The following characters, common to all the described species, are being enumerated separately because they have little or no importance in delimiting species.

Female longer, there being no overlap in the length of the two sexes (Fig. 1).

Head and thorax : Portion of head anterior to anterior dorsal setae more than 0.11 mm long (Fig. 14). Marginal carina medially notched. Dorsal cuticle inner to marginal and temporal carinae and anterior to preantennal suture sculptured. Temporal carina absent. Gular plate characteristic (Fig. 19). Conus well developed, slightly smaller in the male than in the female, its tip usually extending beyond the distal end of antennal segment I. Hypopharynx normal.

Position of important setae as follows (Fig. 9) : Dorsal submarginal seta well on dorsal surface, anterior ventral seta 3 posterior relative to it. Anterior seta 3 dorsal and usually almost or directly anterior to ventral submarginal seta 1. Anterior ventral seta 1 posterior to ventral seta 2. Ventral submarginals on marginal carina. Ocular seta on cornea, short to very long. The following setae are of more or less constant length : anterior dorsal and dorsal submarginal medium to long; preconal short; postnodal short to medium; preantennal spiniform; post-temporal minute to short; marginal temporal setae 1, 3, 5 and 6 spiniform. Anterior setae 1, 2 medium to long, 3 short to medium; all three anterior ventrals and mandibular long. The same seta may be slightly longer in the female. Mesosternal setae 1+1 long (range 2—3).

(Marginal temporal seta 3 shows an anterior shift, as occurs in certain species of *Cuculicola* (see Somadder & Tandan, in press). In *C. hardayali* this seta becomes anterior to marginal temporal seta 2 but the alveoli of the two setae always remain contiguous. In *Picicola* from Pittidae the anterior shift of marginal temporal 3 is even greater, with its alveolus becoming considerably anterior to that of marginal temporal 2 (Fig. 12)).

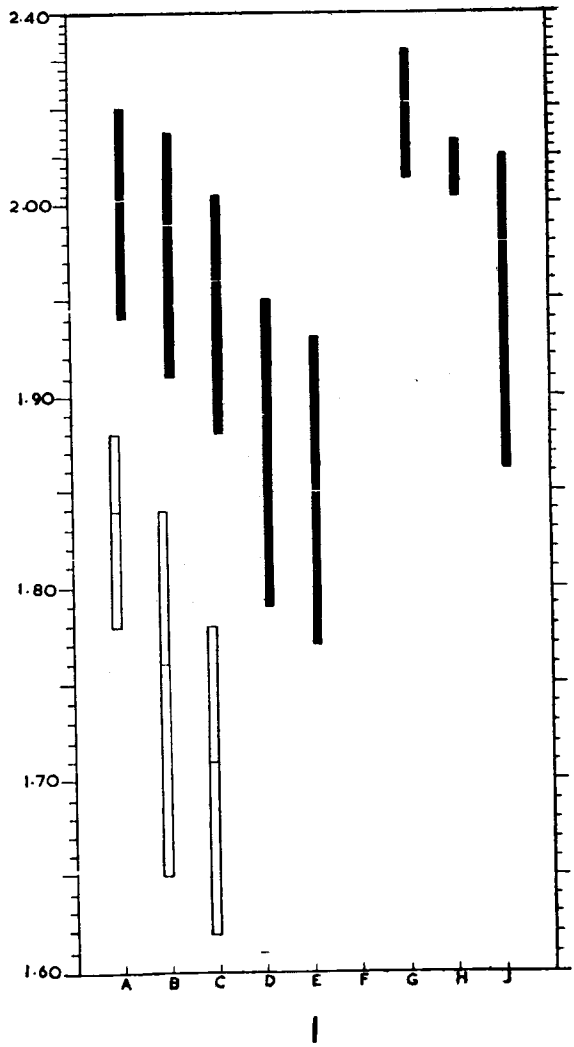


Fig. 1. Dimorphism in length in millimetres of males (left-hand side column in white) and females (right-hand side column in black) of *Picicola* species of *quadripustulosus* species group; line across each column represents the average length. (A) *quadripustulosus*; (B) *australis*; (C) *malaya*; (D) *emersoni*; (E) *angolensis* ; (F) *usheri*; (G) *magnus*; (H) *obscurus*; (J) *meinertzhageni*. All from the type host.

Abdomen. Tergal setae: tergum II with 2 antero-central setae (Fig. 2). One medium to long seta present each side on the terminalia inner to seta b, always in the male, less frequently in the female (b1, in Figs. 18-31).

Male external genitalia rather long and narrow. Inner margin of the paramere continuous with the inner margin of basal apodeme of its side. The mesosomal sclerites comprise a dorsal endomeral plate with anteriorly diverging arms, ventral endomere and the somewhat posterior penial complex. The

latter consists of a median penis, lateral penial arms bearing basal sensilla and a median penial sclerite which is a median prolongation of the basal apodeme, either joined to or free of the penis. No transverse sclerites present between the basal apodeme and mesosome.

In order to make the specific descriptions complete, certain setae having no taxonomic value have also been included. These show individual variation in number, proportions and position and have been referred to for convenience as seta a and e1.

For convenience, it may be pointed out that the first three species *quadripustulosus*, *australis* and *malaya* can be separated from the remaining species, with the exception of *emersoni*, by the chaetotaxy of terga III-VII which normally have 2 central + 2 lateral setae, the total number exceeding 17 (range 18-22). In the female of *emersoni* (the single available male not being fit for study) the number of setae on terga III-VII is 15-17 (3); this difference is due to fewer setae on terga III-V (7-9 (3)), the corresponding number in *quadripustulosus*, *australis* and *malaya* being respectively 12 (7), 12-13 (9) and 10-12 (6). In contrast, in both sexes of *angolensis* and the females of *usheri*, *magnus* and *obscurus* (as their males are not known) terga III-VII lack lateral setae, normally having 2 central ones only of which the total number is less than 11 (range 10-11). In *meinertzhageni* terga III-VII have 2 central setae, with VII having 1-2 lateral ones also, the total not exceeding 12.

1. Picicola quadripustulosus (Harrison, 1916) (Figs. 2, 9, 24, 32, 33)

Type host: *Pitta maxima* Muller & Schlegel.

Lipeurus quadripustulatus Piaget, 1888, *Tijdschr. Ent.*, **31** : 156, pl. 3, Fig. 9. Host *Hydrornis maximus*.

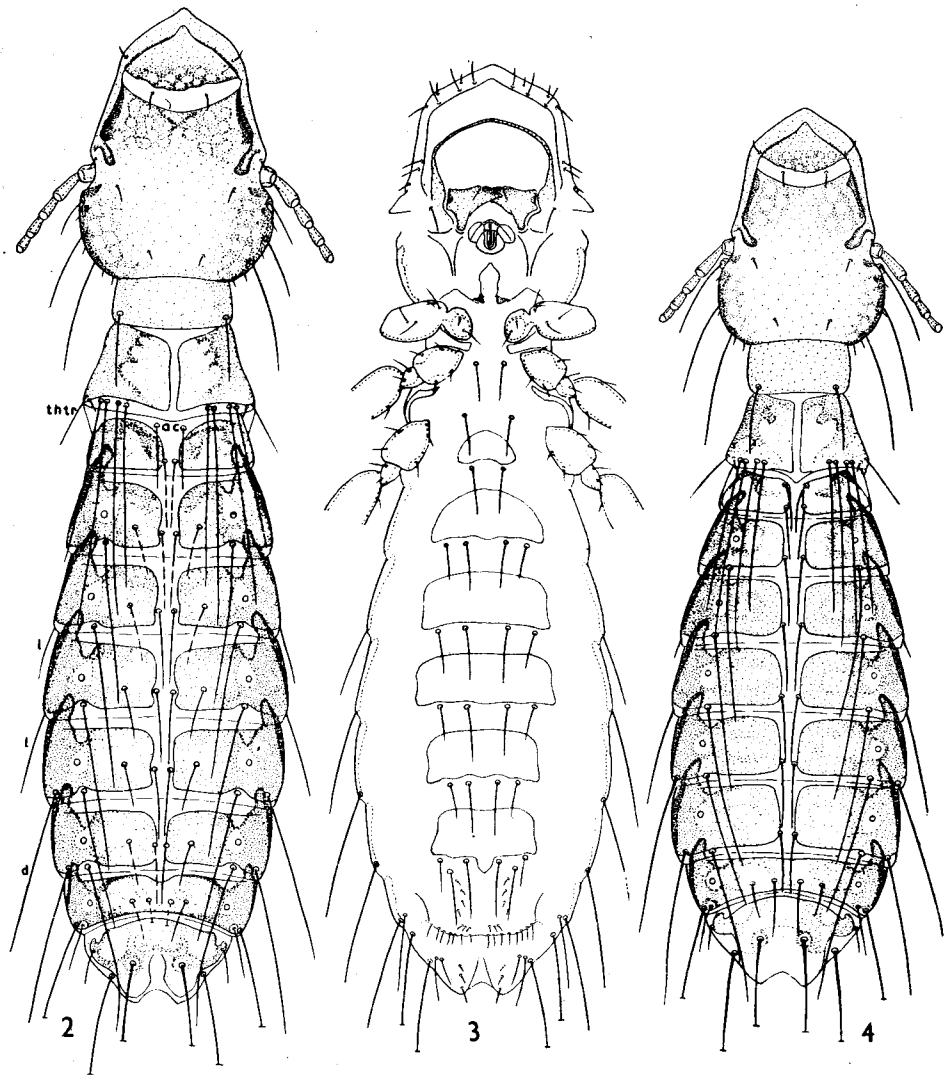
Esthiopterum quadripustulosus Harrison, 1916, *Parasitology*, **9** : 141. *Nomen novum* for *Lipeurus quadripustulatus* Piaget, 1888 (*nec* Burmeister, 1838).

Lipeurus kelloggi Bagnall & Hall, 1930, *Vasculum*, **16** : 55. Nomen novum for *Lipeurus quadripustulatus* Piaget, 1888.

Esthiopterum quadripustulosus Harrison, 1916 : Hopkins & Clay, *A Check list of the genera and species of Mallophaga*, 1952 : 294.

The following description is based on specimens from *Pitta maxima* mounted on two slides, no. 15732, in the BMNH collection and compared with the original Piaget specimens of *Lipeurus quadripustulatus*, from *Hydrornis maxima* mounted on slide no. 913 in BMNH.

Male and *female* : General characters and chaetotaxy as in Figs. 2, 9, 24. Abdominal dorsum almost uniformly sclerotised but the intensity of pigmentation is slightly greater laterally than centrally. Head with median point of the frons rather well developed, there being noticeable curvature each side of the point. Dorsal cuticle anterior to preantennal suture slightly and that inner to marginal carina well sculptured. Dorsal preantennal suture well curved. Gular plate and pigmented spots each side of it, in the neck region, distinct. Ocular seta and marginal temporal seta 2 long. Pteronotum divided



Figs. 2-4. *Picicola* spp. Females, entire: 2, *quadripustulosus*, dorsal; ac, antero-central: ab tr and th tr, abdominal and thoracic trichobothrium; 3, *australis*, ventral; 4, *angolensis*, dorsal.

medially. In the female anterior margin of tergite VIII noticeably depressed medially and posterior margin of segment IX-XI considerably emarginate (Fig. 24). Male external genitalia as in Figs. 32, 33. Basal apodeme 0.308-0.330 mm, $\bar{x}$ 0.324 (4), long; dorsal endomere in the form of a shallow cup; ventral endomere also cup-shaped, its posterior margin with a median bulge. Penial arms somewhat triangular in shape, not joined to the median penial sclerite, with 2+2 basal sensilla visible in two males only out of five. Almost half of the apical portion of the penis covered by the dorsal endomere.

Thoracic chaetotaxy: Marginal pteronotal setae: male (5), normal (4) 1+4 (1); female (6), normal. Metasternal setae : male, 2—4 (4); female, 3—4, (6).

Abdominal chaetotaxy : Tergal setae : male (5); II 2 anterocentral. Marginal; II 2 central; III-VII 2 central + 2 lateral; total of III-VII 20 (4); VIII 2 central + 2 lateral (3), 2+3 (1); IX+X seta a absent; b1 1+1 (4) medium to long; terminal setae, total 19-20 (4). Female (6) (Fig. 2); II 2 antero-central (5). Marginal; II 2 central + 0 lateral (4), 2+1 (1); III-VII number and total as in the male; VIII 2 central + 2 lateral, the 2 central setae being broken their length relative to that of the lateral ones can not be determined; IX-XI setae a and b1 absent. Pleural setae : male (5); IV 0.064-0.08 mm, $\bar{x}$ 0.068 (5 setae) long, its tip falling slightly short of the spiracle of V; V long to very long, its tip reaching to posterior margin of VI; VIII normal; setae ad and ad2 normal (4), ad2 medium to just long; seta pv 1+0 (1) long, 0 (3). Female (6); IV 0.064-0.102 mm, $\bar{x}$ 0.087 (9 setae), slightly longer than in the male; V length as in the male; VIII normal; setae ad and ad2 normal; seta pv 2+2, long. Sternal setae: male (5); II 2 central (1), 2 central + 1 lateral (2); III 2+2 (3), 2+1 (1); IV 2+2 (4), 2+1 (1); V, VI 2+2; total of II-VI 17-19 (3); VII 2 central + 2 lateral (4), 2+0 (1); seta el 0+1 very long (2). Female (6); II 2 central + 2 lateral (1), 2+0 (4); III-VI 2+2; total of II-VI 18-20 (6); VII 4-5, 2 central and 2-3 lateral; short setae in genital region, each side 2-3, total 5-6; vulval marginal, anterior and central 5-6, posterior and marginal 11-16, $\bar{x}$ 14.16 (6) short to medium (Fig. 24).

Measurements in millimetres of 4-5 males and 6 females: Length : total, ♂ 1.78-1.88, $\bar{x}$ 1.84 (4); $\bar{x}$ ♀ 1.94-2.20, $\bar{x}$ 2.01. Head, total, ♂ 0.52-055, $\bar{x}$ 0.53; ♀ 0.55-0.59, $\bar{x}$ 0.56; anterior to anterior dorsal setae (h in Fig. 14), ♂ 0.163-0.173, $\bar{x}$ 0.167; ♀ 0.160-0.176. $\bar{x}$ 0.168. Abdomen, ♂ 0.99-1.02, $\bar{x}$ 1.00 (4); ♀ 1.11-1.29, $\bar{x}$ 1.16. *Breadth* : Head, at level of anterior seta 1, ♂ 0.259-0.272, $\bar{x}$ 0.265; ♀ 0.266-0.291, $\bar{x}$ 0.279; at level of preantennal setae, ♂ 0.33-0.35, $\bar{x}$ 0.34; ♀ 0.35-0.38, $\bar{x}$ 0.36; across temples, ♂ 0.38-0.39, $\bar{x}$ 0.385; ♀ 0.39-0.43, $\bar{x}$ 0.40. Prothorax, ♂ 0.23-0.24, $\bar{x}$ 0.238; ♀ 0.24-0.29, $\bar{x}$ 0.26. Pterothorax, ♂ 0.31-0.33, $\bar{x}$ 0.32; ♀ 0.34-0.38, $\bar{x}$ 0.35. Abdomen, ♂ 0.44-0.46, $\bar{x}$ 0.45; ♀ 0.48-0.53, $\bar{x}$ 0.50. Head index, ♂ 0.70-0.74, $\bar{x}$ 0.73; ♀ 0.69-0.72, $\bar{x}$ 0.71.

Lectotype ♀ of *Lipeurus quadripustulatus* Piaget by present designation, slide no. 913, BMNH, from *Hydrornis maxima.*

From skin of *Pitta maxima* Müller & Schlegel. 5 ♂♂ (1 dissected), 6 ♀♀, INDONESIA: Halmahera Is. and 1 ♀ from NEW GUINEA: no other data, R. Meinertzhagen, 15732, 16658 (BMNH).

Status of specimens from two other species of *Pitta*

The available material from *Pitta sordida* and *P. steerei* resembles *quadripustulosus* from the type host (or s. str.) in general habitus, including the shape of the head and terminalia, the abdominal chaetotaxy and in male external genitalia. However some differences from *quadripustulosus* s. str. have also been observed, which are enumerated below.

Specimens from *P. sordida* : (1) Both sexes are slightly shorter in length

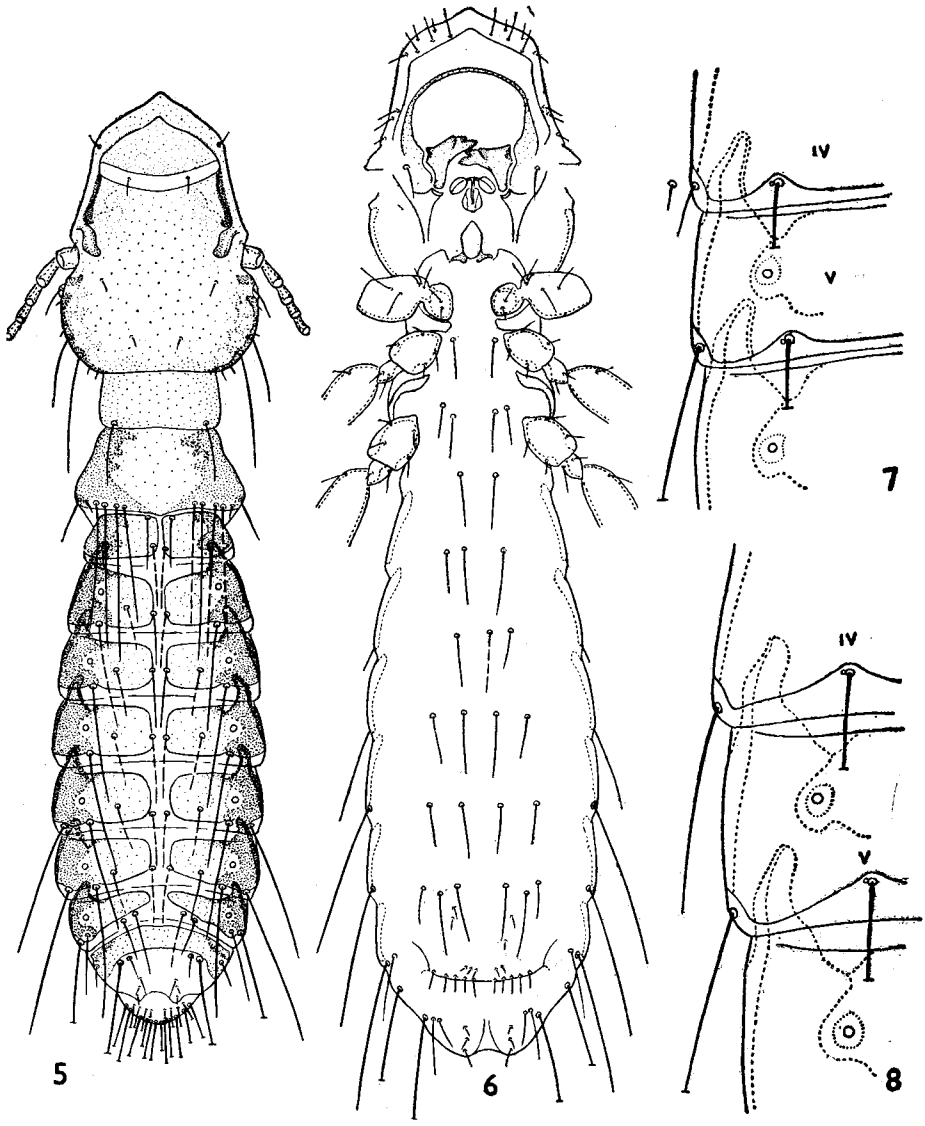


Fig. 5-8. *Picicola* spp. **5, 6,** *malaya*, entire, male dorsal (5) and female ventral (6); **7, 8,** abdominal segments IV, V of female showing the length of pleural seta IV (note the sensillum contiguous with the alveolus of post-spiracular seta IV and V). **7,** *malaya*; **8,** *australis*.

(♂ 1.71 mm (1), ♀ 1.89-2.03 mm, $\bar{x}$ 1.97 (6)). (2) Head at level of anterior setae 1 is wider in the male (0.271, 0.274 mm); in the female the range overlaps but the mean breadth is smaller (0.267-0.274 mm, $\bar{x}$ 0·270 (6)). Sculpturing of dorsal cuticle in the preantennal region is less intense. (3) Pleural seta, IV is slightly shorter in both sexes (♂ 0.058 mm (1 seta); ♀ 0.064-0.096 mm, $\bar{x}$ 0.077 (5 setae)). (4) In the male external genitalia the basal apodeme is slightly longer (0.349 mm (1)), the dorsal endomere is slightly depressed medially and a significantly smaller portion of the penial tip is covered by the dorsal endomere. (5) Setae on the terminal bulge (14 (1)) in the male are smaller in number. (6) In the female the anterior margin of tergite VIII is slightly more depressed and vulval marginal setae (8-15, $\bar{x}$ 10.83 (6)) are smaller in number.

Specimens from *P. steerei* (the only available male from this host is teneral, having poorly differentiated sclerities) : (1) Both sexes are slightly shorter in length (♂1.74 mm (1), ♀ 1.93-2.06 mm, $\bar{x}$ 1.99 (4)). (2) In the female there is a distinct pigmentation pattern on the inner side of lateral tergites II and III; in *quadripustulosus* these tergites are uniformly pigmented medially. (3) Anterior part of the head somewhat differs in shape; in the only available male the head is wider at level of anterior setae 1 and in the female the range overlaps but the mean is greater (0.288-0.293 mm, $\bar{x}$ 0.291 (4)). (4) Dorsal cuticle inner to marginal carina and anterior to preantennal suture is more extensively sculptured in the female (this character is not visible in the male). (5) In the male external genitalia the dorsal endomeral arms are slightly longer, the ventral endomere is apparently of somewhat larger proportions and only the tip of the penis is covered by the dorsal endomere. These differences, while indicative of a slight divergence of *Picicola* living on *P. sordida* and *P. steerei* from *quadripustulosus* s. str., are not sufficient for effecting their taxonomic separation from the latter. Further, the study of the male sex is incomplete, not being based on an adequate number of specimens. It has therefore been decided to accord to the specimens from *P. sordida* and *P. steerei* the status of *P. quadripustulosus* s. lat.

The data of this material are given below.

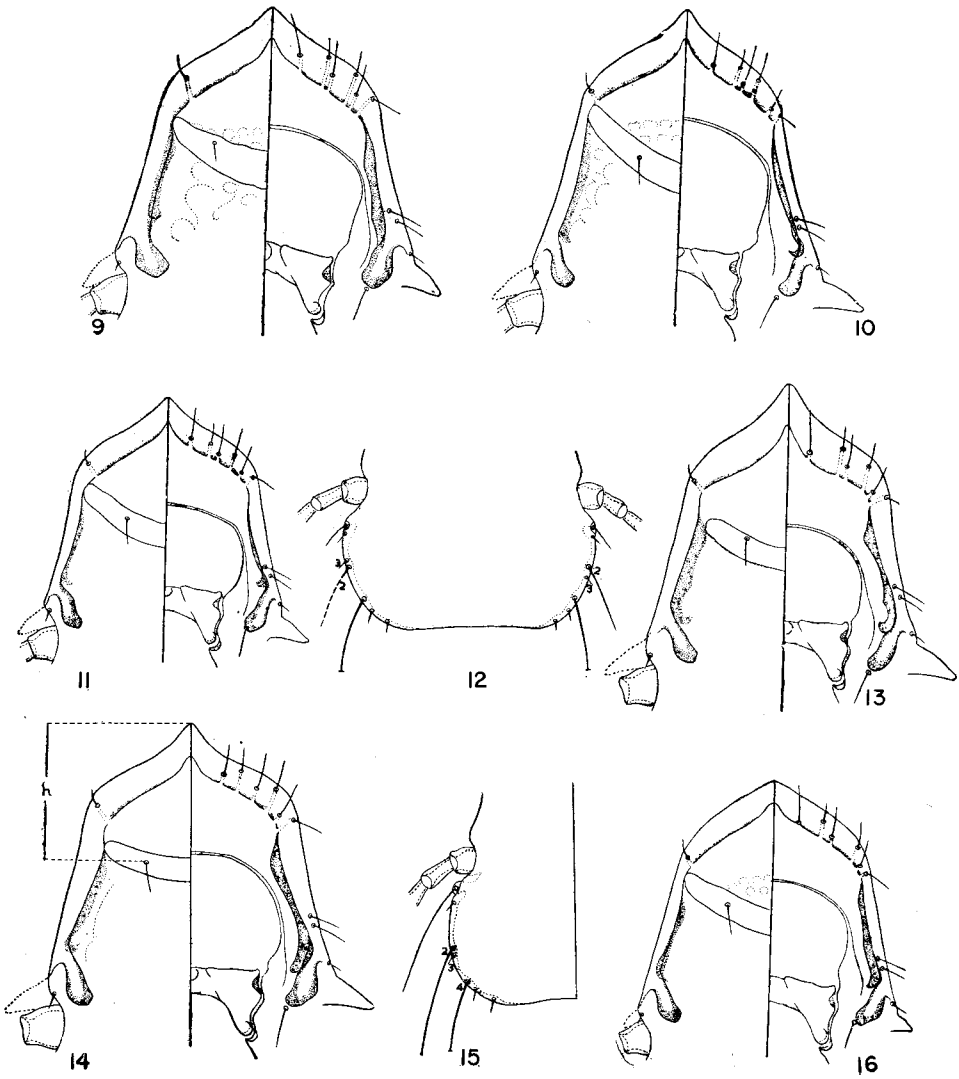
1 ♂, 6 ♀♀ from skin of *Pitta sordida* (P.L.S. Müller), no other data 'R. Meinertzhagen, 16219 (BMNH).

1 teneral ♂, 4 ♀♀ from skin of *Pitta steerei* (Sharpe), PHILIPPINE Is. : no other data, R. Meinertzhagen, 16221 (BMNH).

2. Picicola australis, sp. nov. (Figs. 3, 8, 17, 18, 25, 36-38)

Type host : *Pitta versicolor* Swainson

Diagnosis : This species resembles *quadripustulosus* from which it can be separated in the male by the details of the external genitalia and shape of the head; the only character by which the females of the two species can be separated is the shape of the head.



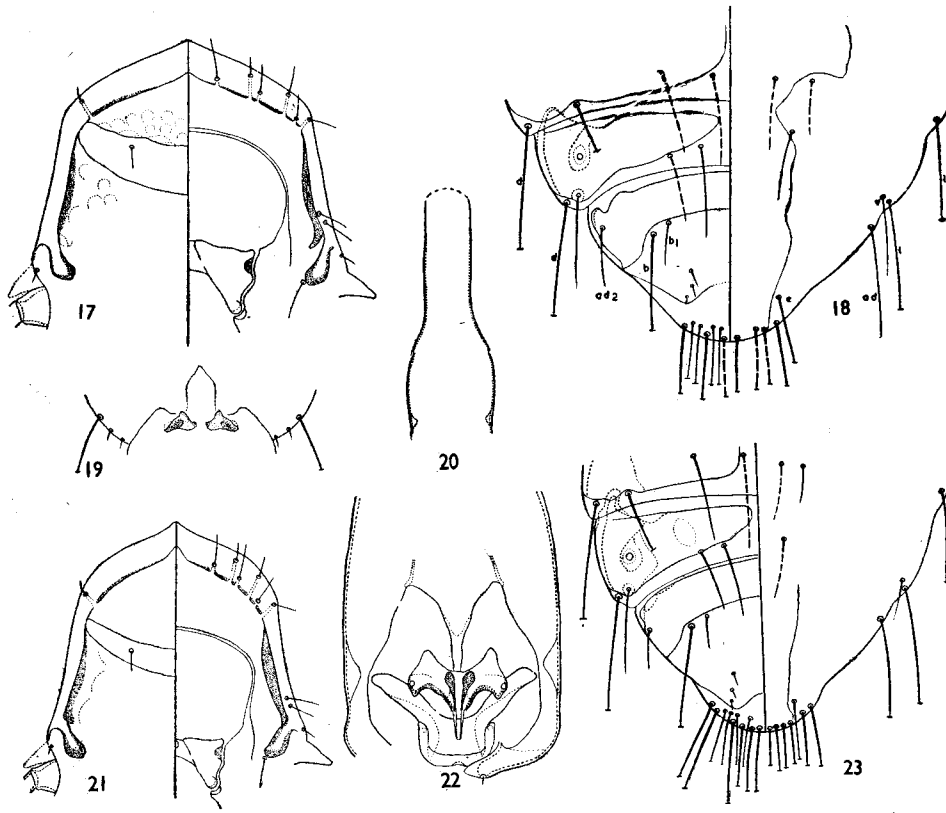
Figs. **9-16.** *Picicola* spp. Head, mainly dorsal and ventral. **9**, *quadripustulosus*, female; **10**, *magnus*, female; **11**, *emersoni*, male; **12**, *usheri*, female, dorsal, showing length of ocular seta and variation in position of marginal temporal seta 3 on left-hand side; **14**, *obscurus*, female; **15**, **16**, *angolensis*, female, dorsal (15) showing length of ocular seta.

Male and *female :* Characters as in *quadripustulosus* have been omitted here. General characters and chaetotaxy as in Figs. 3, 8, 17, 18, 25); both sexes are slightly smaller but stouter than those of *quadripustulosus*. Anteriorly the head differs in shape from that of *quadripustulosus*, because the portion anterior to anterior dorsal setae is considerably shorter and the mean breadth at level of anterior setae 1 is greater, although the range overlaps. Median point of frons less well developed among all the species, including *quadri-*

pustulosus, the curvature of the margin each side of the point being slight. Dorsal cuticle inner to marginal carina slightly, that anterior to preantennal suture extensively sculptured. Dorsal preantennal suture slightly curved, its proportions being relatively greater than in other species. Ocular seta usually long, marginal temporal seta 2 long to very long, but both somewhat shorter than in *quadripustulosus*. In the female anterior margin of tergite VIII with a prominent and much deeper median depression than in that form (Fig. 25). Male external genitalia as in Figs. 36-38; basal apodeme longer (0.320-0.361 mm, $\bar{x}$ 0.339 (10)) than in *quadripustulosus*; the dorsal and ventral endomeres differ slightly in proportions but the penial complex does so considerably because the anterior margin of each lateral penial arm is joined to the median penial sclerite (whereas in *quadripustulosus* this margin joins the penis); basal sensilla on each penial arm 2+2, seen in 10 out of 15 males. Less than one-half of the apical portion of the penis covered by the dorsal endomere.

Thoracic chaetotaxy : Marginal pteronotal setae : male (14), normal (8) 4+5 (5), 5+5 (1); female (10), normal (6), 5+5 (3), 6+1 (1). Metasternal setae : male (8), female (10), 2-4.

Abdominal chaetotaxy. Tergal setae : male (15); II 2 antero-central (7). Marginal; II 2 central +0 lateral (3), 2+1 (3), 2+2 (1); III-VIII as in *quadripustulosus*; total of III-VII 20 (10); IX+X seta a, 1+0 (5) long, 0 (10); seta b1 1+1 (11), 1+0 (3), 0 (1) long; terminal setae, total 12-17, $\bar{x}$ 14.6 (15) long (Fig. 18). Female (10); II 2 antero-central (7). Marginal; II 2 central +0 lateral (6), 2+1 (2) 2+2 (2); III-VIII as in *quadripustulosus* but on V 2+3 also (1); total of III-VII 20-21 (7); the 2 central setae on VIII are usually considerably longer than the 2 lateral setae; IX-XI setae a and b1 absent. This is the only species from the Pittidae having 1-2 tergolateral setae on tergum II, besides the 2 central setae, in both sexes. Pleural setae : male (15); III 0+1 in 1 out of 14; IV 0.080—0.134 mm, $\bar{x}$ 0.099 (11 setae) long, its tip usually extending beyond the spiracle of V; V very long, its tip extending beyond the posterior margin of VI; VIII normal (13), 4+3 (1) as an extra seta V present on one side; seta ad normal; ad2 normal (14), 0+1 (1) long; seta pv absent. Female (10); IV 0.007-0.160 mm, $\bar{x}$ 0.094 (15 setae) long (Fig. 8), the tip of the longest seta reaching to the posterior margin of V; V length as in the male; VIII normal (9), 3+4 (1) as an extra seta v present on one side; setae ad and ad2 normal, ad2 long; seta pv 2+2 (9), 1+2 (1) medium to long. In both sexes pleural seta IV is much longer than in *quadripustulosus*. (One out of 10 females has 0+1 seta inner to seta ad2 on IX-XI; this might be either an additional ad2 seta or the homologue of seta referred to as a. In one female out of six of *quadripustulosus* s. lat. from *P. sordida* also an identical seta is present on one side.) Sternal setae: male (15); II 2 central +0 lateral (4), 2+1 (1), 2+2 (6); III 2+2 (7), 2+1 (4) 2+0 (2); IV 2+2 (12), 2+1 (1); V 2+2 (13), 2+1 (1), 2+0 (1); VI 2+2 (13), 2+1 (2); total of II-VI 16-20, $\bar{x}$ 18.16 (6); VII 2 central+2 lateral (12), 2+1 (2), 2+0 (1); seta e1 absent. Female (10) (Fig. 3); II 2 central+0 lateral (5), 2+2 (2); III 2+2 (7), 2+0 (1); IV 2+2 (7), 2+1 (2); V 2+2 (9), 2+1 (1); VI 2+2 (9), 2+3 (1); total of II-VI 17-20, $\bar{x}$ 18.42 (7); VII 3-4, of these 2 are central



Figs. **17-23**. *Picicola* spp. **17**, *australis*, female head, dorsal and ventral; **18**, *australis*, male terminalia, dorsal and ventral; **19-23**, *malaya*; **19**, female, neck sclerites; **20**, basal apodeme; **21**, male head, dorsal and ventral; **22**, male, posterior sclerites of genitalia (the paramere of left-hand side being damaged has been omitted); **23**, male terminalia, dorsal and ventral.

and 1-2 lateral; short setae in genital region, each side 2-6, total 4-10, $\bar{x}$ 6.9 (10); vulval marginal, anterior and central 5-6, posterior and marginal 13-17, $\bar{x}$ 15.5 (10) (Fig. 25).

Measurements in millimeters of 8 males and 10 females : Length : total, ♂ 1.65-1.84, $\bar{x}$ 1.76; ♀ 1.91-2.15, $\bar{x}$ 1.99; Head, total, ♂ 0.49-0.53, $\bar{x}$ 0.51; ♀ 0.53-0.55, $\bar{x}$ 0.54; anterior to anterior dorsal setae, ♂ 0.122-0.141, $\bar{x}$ 0.129; ♀ 0.128-0.144, $\bar{x}$ 0.135. Abdomen, ♂ 0.91-1.04, $\bar{x}$ 0.99; ♀ 1.13-1.29, $\bar{x}$ 1.19. *Breadth :* Head, at level of anterior seta 1, ♂ 0.266-0.304, $\bar{x}$ 0.281; ♀ 0.275-0.304, $\bar{x}$ 0.290; at level of preantennal setae, ♂ 0.34-0.36, $\bar{x}$ 0.35; ♀ 0.36-0.40, $\bar{x}$ 0.38; across temples, ♂ 0.38-0.40, $\bar{x}$ 0.39; ♀ 0.40-0.43, $\bar{x}$ 0.42. Prothorax, ♂ 0.23-0.0.26, $\bar{x}$ 0.24; ♀ 0.26-0.27. Pterothorax, ♂ 0.35-0.38, $\bar{x}$ 0.36; ♀ 0.36-0.40, $\bar{x}$ 0.38. Abdomen ♂ 0.49-0.53, $\bar{x}$ 0.50; ♀ 0.53-0.60, $\bar{x}$ 0.56. Head index, ♂ 0.74-0.77, $\bar{x}$ 0.75; ♀ 0.75-0.79, $\bar{x}$ 0.77.

Holotype ♂, slide no. 16653a, from skin of *Pitta versicolor* Swainson, N. AUSTRALIA : no other data, R. Meinertzhagen (BMNH). *Paratypes* 14 ♂♂ (2

dissected, 1 teneral), 32 ♀♀ (1 teneral) with data as given for holotype (BMNH).

3. Picicola malaya, sp. nov. (Figs. 5-7, 19-23, 26)

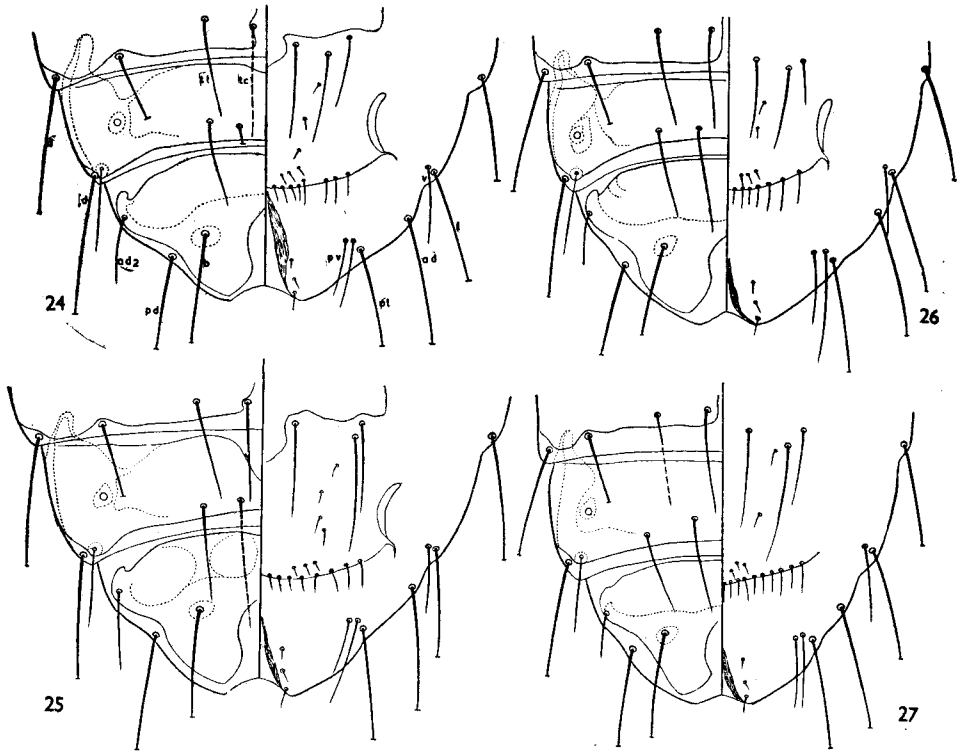
Type host : *Pitta brachyura* (Linn.)

Diagnosis : This species is distinguished from *quadripustulosus* and *australis* in both sexes by the shape of the head and by the pigmentation pattern of the abdomen; additionally in the male by the details of external genitalia.

Male and *female :* General characters and chaetotaxy as in Figs. 5, 6; both sexes are slightly smaller than those of *quadripustulosus* and *australis* (Fig. 1). Abdominal dorsum with a characteristic pigmentation pattern; the tergites are dark brown laterally, light brown centrally, there being sharp contrast between the two areas. Head at level of anterior setae 1 narrower than in *quadripustulosus* and *australis* but as the length of its anterior portion, and of the median point of the frons, is intermediate between these two forms, the shape of the anterior portion is strikingly different (Fig. 21). Dorsal cuticle only inner to marginal carina sculptured, that too feebly. Gular plate faint but lateral pigmented spots each side of it, in the neck region, distinct (Fig. 19). Ocular seta medium to long, marginal temporal seta 2 long. Pteronotum entire. In the female anterior margin of segment IX-XI moderately emarginate (Fig. 26). Male genitalia as in Figs. 21, 22; basal apodeme slightly shorter (0.287-0.315 mm, $\bar{x}$ 0.299 (3)) than in *quadripustulosus* and *australis* and so are the dorsal endomeral arms; ventral endomere posteriorly slightly depressed medially. Anterior margin of each penial arm joined slightly obliquely to the median penial sclerite (in *australis* this margin is usually joined much more obliquely). Basal sensilla on each penial arm 1+1 in 2 out of 3 males. One-half or more of the apical portion of the penis covered by the dorsal endomere.

Thoracic chaetotaxy : Marginal pteronotal setae : male (3), normal (1), 3+4 (1), 3+3 (1); female (6), normal. Metasternal setae : male, 3/4 (3); female 4-5 (6).

Abdominal chaetotaxy : Tergal setae : male (3) (Fig. 5); II 2 antero-central (2). Marginal; II 2 central (3); III 2 central+2 lateral (2), 2+1 (1); IV-VIII 2+2; total of III-VII 19-20 (2); IX+X seta a 1+0 (1) very long, 0 (2); b1 1+1 short to medium; terminal setae, total 15-20, $\bar{x}$ 18.33 (3) (Fig. 23). Female (6); II 2 antero-central. Marginal; II 2 central; III-VIII 2 central+2 lateral but 2+1 also on III (3), V (2), VI and VII (1 each); total of III-VII 18-20; the 2 central setae on VIII are slightly longer than the 2 lateral setae; IX-XI seta a 1+0 (3) medium to long, 0 (3); b1 absent. Pleural setae : male (3); IV 0.022-0.032 mm, $\bar{x}$ 0.028 (4 setae) long, its tip just crossing the posterior margin of IV; V long, its tip slightly falling short of the posterior margin of VI; VIII normal (2), 2+3 (1) as seta v absent on one side; seta ad normal; ad2 normal (2), 0+1 (1) medium to long; seta pv 1+1 (1), 1+0 (1), 0 (1). Female (6); IV 0.026-0.045 mm, $\bar{x}$ 0.035 (10 setae) (Fig. 7) and V slightly longer than in the male; VIII normal (5), 2+3 (1) as seta v absent on one side; setae ad and ad2 as in the male; seta pv 2+2 (5), 2+3 (1) long. Sternal setae : male (3); II 2



Figs. **24-27.** *Picicola* spp. Female terminalia, dorsal and ventral. **24**, *quadripustulosus*; tc; tergocentral; tl, tergolateral. **25**, *australis*; **26**, *malaya*. 27, Emerson

central + 0 lateral (2), 2+1 (1); III-VI 2+2 but on III 2+1 (1); total of II-VI 18 (2); VII 2 central + 2 lateral; seta el absent. Female (6) (Fig. 6); II 2 central + 0 lateral (4), 2+2 (2); III 2+0 (2), (2), 2+1 (3); IV 2+0 (1), 2+1 (3), 2+2 (1); V 2+0 (1), 2+1 (2), 2+2 (3); VI 2+2; total of II-VI 15-17 (5); VII 4-6, of these 2 are central and 2-4 lateral; short setae in genital region, each side 2-3, total 4+6; vulval marginal, anterior and central 5-8, $\bar{x}$ 6 (6); posterior and marginal 10-13, $\bar{x}$ 12 (6) short to medium (Fig. 26), the mean being smaller than in *quadripustulosus* and *australis*.

Measurements in millimetres of 3 males and 6 females : Length : total, ♂ 1.62-1.78, $\bar{x}$ 1.71; ♀ 1.88-2.02, $\bar{x}$ 1.96. Head, total, ♂ 0.49-0.51, $\bar{x}$ 0.50; ♀ 0.52-0.55, $\bar{x}$ 0.53; anterior to anterior dorsal setae, ♂ 0.141-0.160, $\bar{x}$ 0.150; ♀ 0.150-0.163, $\bar{x}$ 0.155. Abdomen, ♂ 0.90-1.03, $\bar{x}$ 0.96; ♀ 1.08-1.20, $\bar{x}$ 1.15. *Breadth :* Head, at level of anterior seta 1, ♂ 0.243-0.256, $\bar{x}$ 0.248; ♀ 0.265-0.275, $\bar{x}$ 0.270; at level of preantennal setae, ♂ 0.31-0.33, $\bar{x}$ 0.32; ♀ 0.33-0.36, $\bar{x}$ 0.35; across temples, ♂ 0.36-0.38, $\bar{x}$ 0.37; ♀ 0.39-0.40, $\bar{x}$ 0.395. Prothorax, ♂ 0.23-0.24, $\bar{x}$ 0.236; ♀ 0.24-0.27, $\bar{x}$ 0.26. Pterothorax, ♂ 0.33-0.36, $\bar{x}$ 0.34; ♀ 0.34-0.36, $\bar{x}$

0.35. Abdomen, ♂ 0.39-0.46, $\bar{x}$ 0.42; ♀ 0.43-0.47, $\bar{x}$ 0.45. Head index, ♂ 0.73-0.77, $\bar{x}$ 0.75; ♀ 0.70-0.76, $\bar{x}$ 0.74.

Holotype ♂, slide no. M-00149a, from *Pitta brachyura* (Linn.), MALAYA : R Panjang, 7.vii.1961 (collector unknown) (USNM), *Paratypes :* 2♂♂, 6♀♀, slides nos. M-00149, M-00193 and M-00197, all from the same host and locality as holotype, 7.vii and 9, 22.vi.1961 (collector unknown) (EC, USNM).

4. Picicola emersoni, sp. nov. (Figs. 11, 27, 34, 35)

Type host : *Pitta phayrei* (Blyth)

Diagnosis : This species resembles *malaya* most closely and can be distinguished therefrom by (1) its smaller size, (2) the general shape of the head, (3) fewer setae on terga III-VII and on the vulval margin in the female and (4) details of external genitalia in the male. From the five following species, of which four are known from the female sex only, it can be distinguished by characters 2 and 3 above and the greater number of setae on terga III-VII.

Male and *female :* The characters in which it resembles *malaya* have been omitted. Despite being overtreated with alkali, the entire dorsum of the available specimens retains the remnants of a pigmentation pattern. Since the dorsum is slightly but perceptibly darker laterally and the pleural thickening are similar to those of *malaya*, possibly the natural pigmentation pattern of this species is similar to that of the latter form. Both sexes smaller and slender than those of *malaya* (Fig. 1). Head breadth at level of anterior setae 1 considerably narrower than in that form (Fig. 11); median point of frons slightly more developed and so is the curvature each side of it. No lateral pigmented spots apparent in the neck region. Ocular seta almost long in the male, long to very long in the female. In the female the posterior margin of segment IX-XI medially slightly less depressed than in *malaya* (Fig. 27). Male external genitalia (Figs. 34, 35) being depigmented may not have been delineated accurately; basal apodeme slightly narrower posteriorly and dorsal and ventral endomeres rather wider than in *malaya*; penial arms not apparent.

Thoracic chaetotaxy. Marginal pteronotal setae : male (1), normal; female (4), normal (3), 3+4 (1). Metasternal setae : male, 2(1); female, 2-4 (4).

Abdominal chaetotaxy. Tergal setae : male (1); II 2 antero-central. Marginal; II 2 central; III-VI ?; VII, VIII 2 central + 2 lateral; IX+X seta a absent; b1 1+0 medium; terminal setae, total 15. Female (4); II 2 antero-central (1). Marginal; II 2 central (1); III 2 central + 0 lateral (2), 2+1 (1); IV 2+0 (3), 2+1 (1); V 2+2 (2), 2+1 (1); VI-VIII 2+2; total of III-VII 15-17 (3) being intermediate between that in the three preceding and the five following species; IX-XI setae a and b1 absent. Pleural setae : male (1) : IV 0.016 mm (1 seta) long, slightly shorter than in *malaya*; V long, its tip extending slightly beyond the spiracle of VI; VIII normal; setae ad and ad2 normal, ad 2 just long; seta pv absent. Female (4); IV 0.019-0.038 mm, $\bar{x}$ 0.031 (7 setae) and V slightly longer than in the male; VIII normal (3), 3+2 (1) as seta v absent on one side; seta ad normal; ad2 normal (3), 1+0 (1) medium to long; seta pv 2+2. Sternal

setae : male (1); II-VI?; VII 2 central + 1 lateral; seta e1 absent. Female (4); II 2 central (3); III 2 central + 2 lateral; IV, V 2+2 (3); VI 2+2; total of II-VI 18 (1); VII 2 central + 2 lateral; short setae in genital region each side 1—4, total 4—6; vulval marginal, anterior and central 5—6, posterior and marginal 16—19, $\bar{x}$ 17 (4) (Fig. 27), slightly greater in number than in *malaya*.

Measurements in millimetres of 1 male and 4 females : Length : total, ♂ 1.61; ♀ 1.79-1.95, $\bar{x}$ 1.89. Head, total, ♂ 0.47; ♀ 0.49-0.50, $\bar{x}$ 0.495; anterior to anterior dorsal setae, ♂ 0.147; ♀ 0.154-0.160, $\bar{x}$ 0.156. Abdomen, ♂ 0.91; ♀ 0.99-1.18, x 1.13. *Breadth :* Head, at level of anterior seta 1, ♂ 0.227; ♀ 0.221-0.230, $\bar{x}$ 0.226; at level of preantennal setae, ♂ 0.29; ♀ 0.30-0.31, $\bar{x}$ 0.305; across temples, ♂ 0.32; ♀ 0.33-0.35, $\bar{x}$ 0.34. Prothorax, ♂ 0.21; ♀ 0.21-0.23, $\bar{x}$ 0.22. Pterothorax, ♂ 0.29; ♀ 0.28-0.30, $\bar{x}$ 0.29. Abdomen, ♂ 0.40; ♀ 0.42-0.44, $\bar{x}$ 0.43. Head index, ♂ 0.68; ♀ 0.67-0.70, $\bar{x}$ 0.68.

Holotype ♀, slide no. RE 4466a (RT-B-31102), from *Pitta phyarei* (Blyth), THAILAND : Thali, Ban Muang Khai, Loei Province, 13.i.1955, R.E. Elbel, (USNM). *Paratypes* 3 ♀♀ and 1 ♂ with data as given for holotype (EC, REC).

The species is named in honour of Dr. K.C. Emerson, the eminent worker on ectoparasitic lice.

5. Picicola angolensis, sp. nov. (Figs. 4, 15, 16, 39, 40)

Type host : *Pitta a. angolensis* Vieillot

Male and *female :* General characters and chaetotaxy as in Fig. 4. Abdominal dorsum almost uniformly pigmented, the intensity being only slightly greater laterally than centrally (somewhat as in *quadripustulosus* and *australis*). Median point of the frons poorly developed, curvature of the margin each side of the point slight (Fig. 16). Although in both these characters there is a resemblance with *australis*, yet the shape of the head anteriorly is different and distinctive because it is longer anterior to the anterior dorsal setae and narrower at the level of anterior setae 1. Dorsal cuticle anterior to preantennal suture quite extensively but faintly sculptured and that inner to marginal carina somewhat less so. Gular plate distinct, there being no lateral pigmented spots in the neck region. Tip of conus usually falls short of or just reaches to the distal end of antennal segment I. Ocular seta and marginal temporal seta 2 very long (Fig. 15). Pteronotum divided. In the female anterior margin of tergite VIII without a median depression; posterior margin of segment IX-XI considerably emarginate. Male external genitalia as in Figs. 39, 40; basal apodeme 0.316-0.336 mm, $\bar{x}$ 0.326 (3) long. Dorsal endomere with stout endomeral arms, ventral endomere with a posterior projection. Penial complex distinctive; only 1+1 (3) basal sensilla on each penial arm; tip of penis not covered by dorsal endomere.

Thoracic chaetotaxy : Marginal pteronotal setae : male (3) and female (9) normal. Metasternal setae : male, 3 (3); female, 3-4 (9).

Abdominal chaetotaxy : Tergal setae : male (3); II 2 antero-central. Marginal; II, VII 2 central (2); III-VI 2 central (3); total of III-VII 10 (2); VIII

2 central+2 lateral (1; IX+X seta a absent; b1 1+2 (1) medium; terminal setae, total 11 (1). Female (9) (Fig. 4); II 2 antero-central (4). Marginal; II 2 central; III-VI 2 central; VII 2 central (8), 2 central+1 lateral (1); total of III-VII 10-11 (9); VIII 2 central+2 lateral, the 2 central setae are considerably longer than the 2 lateral setae; IX-XI seta a 0 (8), 1+0 (1) long; b1 normally absent, 1+0 (1) medium. Pleural setae : male (3); IV 0.028-0.032 mm, $\bar{x}$ 0.030 (3 setae) long, its tip slightly crossing the posterior margin of IV; V very long, its tip slightly falling short of the spiracle of VII; VIII normal (1); setae ad and ad2 normal (1), ad2 short; seta pv absent. Female (9); IV 0.028-0.048 mm, $\bar{x}$ 0.035 (15 setae) and V as in the male; VIII normal (3), 3+2 (5), 2+2 (1) as seta v absent on one or both sides; setae ad and ad2 as in the male; seta pv 2+2 (7), 1+2 (1), 0+2 (1) long. (One out of 9 females has 0+1 seta inner to seta ad2, on IX-XI, which might be either an additional ad2 or the homologue of seta referred to as a.) Sternal setae : male (3); II 2 central; III 2 central+2 lateral (1), 2+1, (1), 2+0 (1); IV, V 2+2 (2), 2+0 (1); VI 2+2 (1), 2+0 (1); total of II-VI 18 (1); VII 2 central+2 lateral (2), 2+0 (1); seta e1 0+1 (1). Female (9); II 2 central; III 2 central+2 lateral (3), 2+1 (2), 2+0 (2); IV 2+2 (5), 2+1 (1), 2+0 (2); V, VI 2+2 (7), 2+1 (2); total of II-VI 15-19, $\bar{x}$ 16.42 (7); VII 2 central+2 lateral; short setae in genital region, each side 2-4, total 4-7, $\bar{x}$ 5.33 (9); vulval marginal, anterior and central 4-6, posterior and marginal 14-20, $\bar{x}$ 17.4 (9) short to long, being slightly longer than in four preceding species.

Measurements in millimetres of 3 males and 9 females : *Length* : total, ♂ 1.64 (1); ♀ 1.77-1.93, $\bar{x}$ 1.85. Head, total, ♂ 0.47-0.48, $\bar{x}$ 0.476; ♀ 0.49-0.52, $\bar{x}$ 0.51; anterior to anterior dorsal setae, ♂ 0.134-0.131, $\bar{x}$ 0.139; ♀ 0.134-0.154, $\bar{x}$ 0.144. Abdomen, ♂ 0.91 (1); ♀ 1.00-1.14, $\bar{x}$ 1.10. *Breadth* : Head, at level of anterior seta 1, ♂ 0.224—0.227, $\bar{x}$ 0.225 ; ♀ 0.230—0.253, $\bar{x}$ 0.238; at level of preantennal setae, ♂ 0.29-0.30, $\bar{x}$ 0.293; ♀ 0.30-0.33, $\bar{x}$ 0.31; across temples, ♂ 0.34-0.35, $\bar{x}$ 0.343; ♀ 0.35-0.39, $\bar{x}$ 0.36. Prothorax, ♂ 0.22-0.24, $\bar{x}$ 0.23; ♀ 0.23-0.26, $\bar{x}$ 0.24. Pterothorax, ♂ 0.30-0.31, $\bar{x}$ 0.306; ♀ 0.34-0.35, $\bar{x}$ 0.342. Abdomen, ♂ 0.43; ♀ 0.42-0.52, $\bar{x}$ 0.47. Head index, ♂ 0.72-0.78, $\bar{x}$ 0.74; ♀ 0.68-0.76, $\bar{x}$ 0.71.

Holotype ♂, slide no. 16654a, from skin of *Pitta a. angolensis* Vieillot, CONGO : no other data, R. Meinertzhagen (BMNH). *Paratypes* 2 ♂♂ (dissected), 9 ♀♀, with data as given for holotype (BMNH).

6. Picicola usheri, sp. nov. (Figs. 12, 28)

Type host : *Pitta grantina usheri* Gould

Diagnosis : This species, known from one female only, is closely related to *angolensis* being distinguished therefrom by the pigmentation pattern, presence of only 2 central setae on tergum VIII and shorter ocular seta. Characters which distinguish it from *magnus*, *obscurus* and *meinertzhageni* are given under those species.

Female : Pigmentation pattern of abdominal dorsum characteristic; the colour is less intense than in *angolensis* (as also in *malaya*), the faint contours

of lateral tergites II-VII being the most important difference. Distinct lateral pigmented spots in neck region, unlike *angolensis*, but conus as in that form. Head setae shorter than in *angolensis*; ocular seta short, marginal temporal seta 2 long (Fig. 12). Pteronotum entire.

Chaetotaxy of one female : Thoracic. Marginal pteronotal setae : normal. Metasternal setae : 4. Abdominal : Setae on terga II-VII, sterna II-VI, as also postspiracular seta and pleural setae, especially pleural V, are significantly shorter and finer than in *angolensis*. Tergal setae : II-VII as in *angolensis*; VIII 2 central only; this being the only *Picicola* female from the Pittidae having 2 setae on this tergum (Fig. 28); IX-XI setae a and b1 absent. Pleural setae : IV as in *angolensis*; V long, its tip falling short of posterior margin of VI; VIII 2+3 as seta v absent on one side; setae ad and ad2 normal, ad2 long; seta pv 2+2. Sternal setae : II, III 2 central; IV-VI 2 central+2 lateral; total of II-VI 16; VII 2 central only; short setae in genital region, total 10 (*angolensis* has 4-7); vulval marginal, anterior and central 7, posterior and marginal 14.

Measurements in millimetres of holotype, female : Length : total, 1.86. Head, total, 0.51; anterior to anterior dorsal setae, 0.146. Abdomen, 1.11. *Breadth :* Head, at level of anterior setae 1. 0.230; at level of preantennal setae, 0.31; across temples, 0.35. Prothorax, 0.22. Pterothorax, 0.29. Abdomen, 0.47. Head index, 0.68.

Holotype ♀, slide no. 16655, from skin of *Pitta grantina usheri* Gould, NORTH BORNEO : no other data, R. Meinertzhagen (BMNH).

7. Picicola magnus, sp. nov. (Figs. 10, 29)

Type host *: Pitta o. oatesi* (Hume)

Diagnosis : This species, known from females only, differs from the female of *angolensis* and *usheri* in the shape of the head and posterior margin of segment IX-XI and in its generally larger size. Characters which distinguish it from *obscurus* and *meinertzhageni* are given under those forms.

Female : While overtreatment with alkali has bleached the specimens, whatever remains of the pigmentation pattern suggests that it might have been similar to that of *meinertzhageni*. This is the longest form among those dealt with here (Fig. 1). The frons is somewhat as in *qudripustulosus* but as the median point is more pronounced and the head is narrower at level of anterior setae 1, the shape of the anterior portion of the head is different (Fig. 10). Preantennal suture deeply curved. Gular plate faint, as also are the lateral pigmented spots each side of it. Ocular seta and marginal temporal seta 2 long. Pteronotum apparently entire. Anterior margin of tergite VIII without a median depression; posterior margin of segment IX-XI only slightly depressed medially (Fig. 29).

Chaetotaxy of 4 females. Thoracic. Marginal pteronotal setae : normal (2), 3+4 (1), 4+2 (1). Metasternal setae : 2—4.

Abdominal. Tergal setae : II-VI as in *angolensis*; VII 2 central+1 lateral (3), 2+0 (1); total of III-VII 10-11 (2); VIII 2+2 (2), 2+1 (1), the 2 central setae are slightly longer than the 1-2 lateral setae; IX-XI seta a 0 (2), 1+0 (2)

medium; bl absent. Pleural setae: IV 0.019-0.051 mm, $\bar{x}$ 0.034 (11 setae) long, its tip just crossing the posterior margin of IV; V very long, its tip extending slightly beyond the posterior margin of VI; VIII normal (0), 4+4 (2), 3+4 (1), 4+? (1) as an extra seta v present on one or both sides; setae ad and ad2 normal, ad2 short to medium; seta pv 2+2 (1), 3+2 (2), 0+3 (1) short to almost long. Sternal setae: II 2 central; III 2 central + 2 lateral (3), 2+1 (1); IV, V 2+2 (2), 2+1 (2);VI 2+2 (2), 2+1 (1), 2+3 (1); total of II-VI 14-18, $\bar{x}$ 17 (4); VII 2-7, of these 2 are central and 0-5 lateral; short setae in genital region, each side 3-4, total 6-8; vulval marginal, anterior and central 6-7, posterior and marginal 18-20, $\bar{x}$ 18.65 (3) short (Fig.29).

Measurements in millimetres of 4 females: Length : total, 2.05-2.32, $\bar{x}$ 2.21, Head, total, 0.56-0.62, $\bar{x}$ 0.59; anterior to anterior dorsal setae, 0.160-0.179, $\bar{x}$ 0.173. Abdomen, 1.22-1.43. $\bar{x}$ 1.33. *Breadth* : Head, at level of anterior seta 1, 0.250-0.259, $\bar{x}$ 0.255; at level of preantennal setae, 0.35-0.37, $\bar{x}$ 0.36; across temples, 0.38-0.42, $\bar{x}$ 0.41. Prothorax, 0.25-0.29, $\bar{x}$ 0.27. Pterothorax, 0.38-0.40, $\bar{x}$ 0.39. Abdomen, 0.51-0.62, $\bar{x}$ 0.55. Head index, 0.67-0.70, $\bar{x}$ 0.68.

Holotype ♀, slide no. RE 4867a, from *Pitta o. oatesi* (Hume), THAILAND: Dan Sai, Kok Sathon, Phu Lomlo Mt., Loei Province, 3.iii.1955, R. E. Elbel (USNM). *Paratypes :* 3 ♀♀ with data as given for holotype (EC, REC),

8. Picicola obscurus, sp. nov. (Figs. 14, 31)

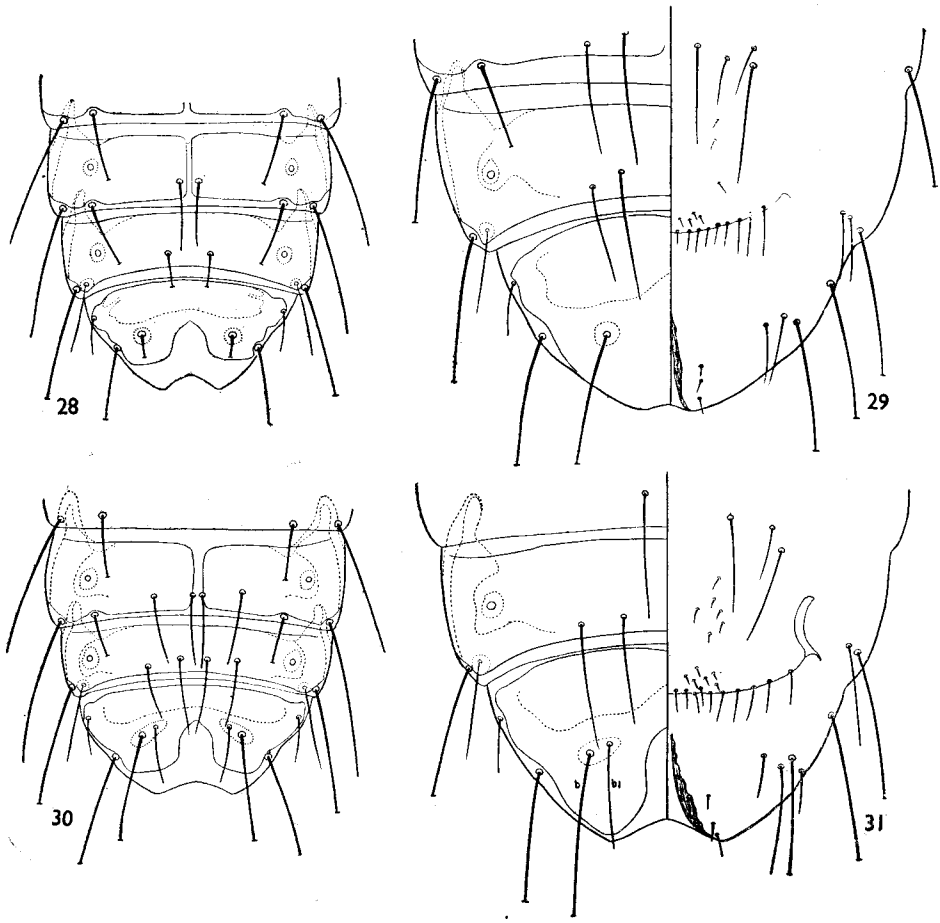
Type host: *Anthocichla phayrei obscura* Delacour

Diagnosis : This species is also known from females only. It can be separated from the females of *magnus* by (1) the shape of the head and (2) of the posterior margin of segment IX-XI and (3) by the presence of seta bl. From the female of *meinertzhageni* by character (1) above and by the presence of only 2 setae on tergum VII; from those of *angolensis* and *usheri* by character (1) in combination with the pigmentation pattern of the body and body measurements.

Female : Characters in which it resembles *magnus* have been omitted here. Even though the specimens are slightly overtreated with alkali, the pigmentation pattern of abdominal dorsum seems to resemble that of *meinertzhageni*, the next species. Frons as in *magnus* but as the head is wider at level of anterior setae 1, the shape of its anterior portion differs (Fig. 14, compare with 10). Ocular seta probably short to medium (broken in 2 out of 4), marginal temporal seta 2 long. Pteronotum divided. Posterior margin of segment IX-XI considerably emarginate.

Chaetotaxy of 4 females. Thoracic. Marginal pteronotal setae: normal (1), 5+4 (3). Metasternal setae: 2—3.

Abdominal : Tergal setae : II-VI as in *angolensis*; VII 2 central; total of III-VII 10 (4); VIII 2 central + 2 lateral; the 2 central setae are slightly shorter than the 2 lateral ones (only in this species the tergocentral are shorter than the tergolateral setae); IX-XI seta a absent; bl 1+1 long (Fig. 31). Pleural setae: IV 0.045-0.080 mm, $\bar{x}$ 0.058 (4 setae) long, its tip extending slightly



Figs. **28-31**. *Picicola* spp. Female terminalia. **28**, *usheri*, dorsal, abdominal segments VII-XI; **29**, *magnus*, dorsal and ventral; **30**, *meinertzhageni*, dorsal, abdominal segments VII-XI of a specimen from *Pitta g. guajana*; 31, *obscurus*, dorsal and ventral.

beyond the posterior margin of IV; V long to very long, its tip reaches to the posterior margin of VI; VIII normal (3), 3+2 (1) as seta v absent on one side; seta ad normal; ad2 normal (2), 0 (2) short to medium; seta pv 2+2 (2), 2+3 (1), 3+3 (1) short to medium. Sternal setae; II 2 central (1); III 2 central + 2 lateral (1), 2+1 (1); IV, V 2+2 (3), 2+1 (1); VI 2+2 (2), 2+3 (2); total of II-VI 19 (1); VII 4-5, of these 2 are central and 2-3 lateral; short setae in genital region, each side 3-6, 6-11, $\bar{x}$ 8.2 (4); vulval marginal, anterior and central 9-14, $\bar{x}$ 11.2 (4), posterior and marginal 17-24, $\bar{x}$ 21 (4) short to medium (the former number more than in *angolensis*, *usheri* and *magnus* in range, the latter do so only in the mean (Fig. 31).

Measurements in millimetres of 4 females: Length: total, 2.01-2.13, $\bar{x}$ 2.06. Head, total, 0.57-0.56, $\bar{x}$ 0.58; anterior to anterior dorsal setae, 0.166-0.179, $\bar{x}$

0.173. Abdomen, 1.13-1.27, $\bar{x}$ 1.21. *Breadth:* Head, at level of anterior seta 1, 0.266-0.272, $\bar{x}$ 0.262; at level of preantennal setae, 0.34-0.36, $\bar{x}$ 0.35; across temples, 0.38-0.40, $\bar{x}$ 0.39. Prothorax, 0.24-026, $\bar{x}$ 0.25. Pterothorax, 0.34-0.39, $\bar{x}$ 0.36. Abdomen, 0.51-0.53, $\bar{x}$ 0.52. Head index, 0.65-0-76, $\bar{x}$ 0.67.

Holotype ♀, slide no. 16656a, from skin of *Anthocichla phayrei obscura* Delacour, no other data, R. Meinertzhagen (BMNH). *Paratypes :* 3 ♀♀ with data as given for holotype (BMNH)

9. Picicola meinertzhageni, sp. nov. (Figs. 13, 30)

Type host : *Pitta guajana affinis* (Horsfield)

Diagnosis : This species is also known from females only. Characters which distinguish it from *obscurus* are given under that form; those which do so from *magnus* are the (1) shape of the head, (2) presence of seta bl and (3) body measurements. Characters (1) and (2), in combination with the pigmentation pattern of the abdominal dorsum, distinguish it from *angolensis* and *usheri.*

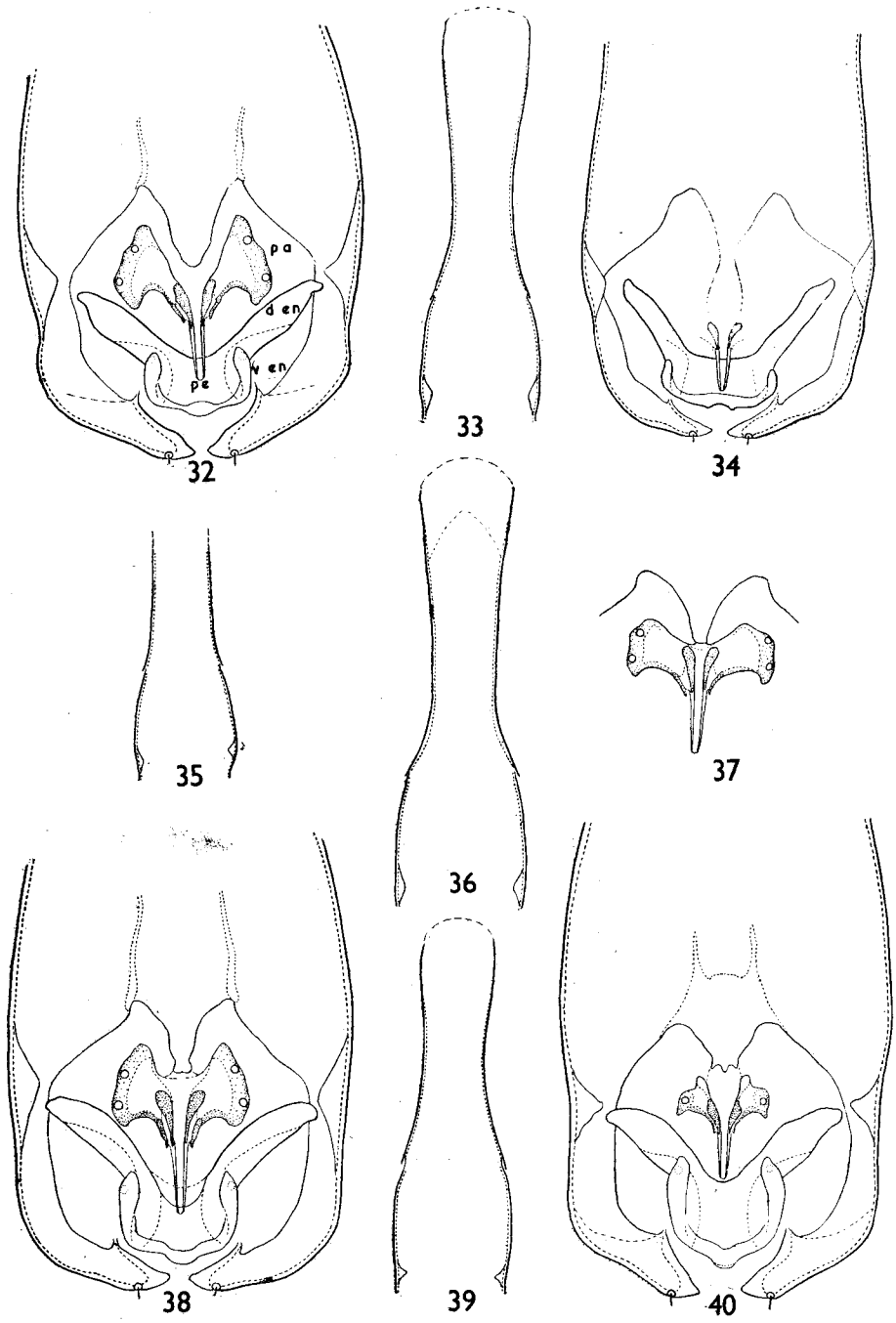
Female : Abdominal dorsum characteristically pigmented; lateral tergites II-VIII darker literally than centrally, those of V-VIII being considerably more heavily sclerotised and pigmented than those of II-IV. Abdomen slender than that of *magnus* and *obscurus*, the head being so from that of *obscurus* only (Fig. 13). Gular plate and lateral pigmented spots each side of it disinct. Ocular seta in both females 0+1 and broken (apparently short to medium); marginal temporal seta 2 long (1) and broken on one and spiniform on other side (1). Pteronotum apparently divided. Anterior margin of tergite VIII uninterrupted, being as in *magnus*; posterior margin of segment IX-XI considerably emarginate.

Chaetotaxy of 2 females. Thoracic. Marginal pteronotal setae: normal. Metasternal setae: not visible.

Abdominal. Tergal setae: II, III not visible; IV, V 2 central; VI 2 central + 0 lateral (1), 2+2 (1); VII 2+2 (1), 2+1 (1); VIII 2+2 (1), 2+3 (1), the 2 central setae are slightly longer than the 2−3 lateral setae; IX-XI seta a absent; bl 1+1 (1), 0+1 (1) long (Fig. 30). Pleural setae: IV spiniform to short, its tip reaching to the posterior margin of IV; V long, its tip falling slightly short of the posterior margin of VI; VIII and seta ad normal; ad2 normal (1), 1+0 (1) short to medium; seta pv 2+2 (1), 2+1 (1) short to long. Sternal setae: II?; III, IV 2 central + 1 lateral (1); V, VI 2+2 (1), 2+3 (1); VII 2 central + 2 lateral; short setae in genital region 7 (1); vulval marginal, anterior and central 9 (1), posterior and marginal 17 (1), 21 (1) short to medium.

Measurements in millimetres of 2 females: Length : total, 1.86, 2.10. Head, total, 0.51; anterior to anterior dorsal setae, 0.160, 0.190. Abdomen, 1.07, 1.24. *Breadth :* head, at level of anterior seta 1,0245, 0.262; at level of preantennal setae, 0.30, 0.32; across temples, 0.34, 0.38. Prothorax, 0.23, 0.24. Pterothorax, 0.33, 0.36. Abdomen, 0.43, 0.47. Head index. 0.63, 0.66.

Holotype ♀, slide no. 16223a, from skin of *Pitta guajana affinis* (Horsfield), JAVA: no other data, R. Meinertzhagen (BMNH). *Paratype* 1 ♀ with data as given for holotype (BMNH).



Figs. 32-40. *Picicola* spp. Male external genitalia. **32, 33,** *quadripustulosus*; posterior sclerites **(32)**; d en and v en, dorsal and ventral endomere; pa, penial arm; pe, penis; basal apodeme **(33)**. **34, 35,** *emersoni*, posterior sclerites **(34)**, basal apodeme **(35)**; **36,** *australis*, basal apodeme; **37, 38,** *australis*, posterior sclerites; **39, 40,** *angolensis*, basal apodeme **(39)**, posterior sclerites **(40)**.

The species is named in honour of the late Col. R. Meinertzhagen, the eminent Ornithologist, for creating a matchless collection of bird lice.

Status of *Picicola* from *Pitta g. guajana*

One *Picicola* female available from this bird resembles *meinertzhageni* from the type host in (1) the pigmentation pattern of the abdominal dorsum, (2) the shape of the frons and the relative position of the anterior head setae, (3) the shape of the posterior margin of segment IX-XI, (4) the chaetotaxy of terga IV-VIII and (5) in the booy measurements. However, two differences have also been observed: the abdomen is slightly narrower (0.44 mm) and the vulval marginal setae are smaller in number, 16. As these are slight differences and inadequate to separate the female from *meinertzhageni* s. str., the single specimen from this pitta has been considered to be conspecific with that form.

The data of this specimen, excluded from the type series of *meinertzhageni*, are as follows:

1 ♀, slide no. 16224, from skin of *Pitta. g. guajana*, P. L. S. Müller, JAVA; no other data, R. Meinertzhagen (BMNH).

DISCUSSION

The question arises whether the group of species parasitic on the Pittidae merits generic status within the *Degeeriella*-complex as defined by Clay (1958; 123). This comprises biting lice of similar habitus parasitic on several orders of related and unrelated birds and the following genera have been included by Clay (1958), albeit with slight reservations: *Degeeriella* Neumann (=*Kélerinirmus* Eichler), *Acutifrons* Guimaraes, *Austrophilopterus* Ewing, *Capraiella* Conci, *Cotingacola* Carriker, *Cuculicola* Clay & Meinertzhagen, *Lagopoecus* Waterston (=*Colinicola* Carriker), *Picicola* Clay & Meinertzhagen (=*Tyrannicola* Carriker), *Trogoninirmus* Eichler, *Upupicola* Clay & Meinertzhagen, a group of undescribed species from the Bucerotidae, and an undescribed species* from the Magapodidae, probably an aberrant *Lagopoecus*. *Buceronirmus* Hopkins and *Hopkinsiella* Clay & Meinertzhagen should also perhaps be included here. Possible derivatives from this group include *Syrrhaptoecus* Waterston, *Tinamotaecola* Carriker, some of the Ischnocera from the Bucerotidae and also possibly *Penenirmus*."

Two genera described since 1958 also deserve inclusion in it : *Trogoniella* from the genus *Apaloderma* of Trogons (Tendeiro, 1959) and *Megagodiella* from the Megapodiidae (Emerson & Price, 1972).

With the exception of three all the taxa of the *Degeeriella*-complex parasitise hosts belonging to orders not related to the Pittidae; there is, therefore, the possibility of the species from the Pittidae being phylogenetically closer to these three. The three taxa are : *Cotingacola* and *Tyrannicola* from the Cotingidae and Tyrannidae respectively which, like the Pittidae, belong to the superfamily Tyrannoidea of Passeriformes, and *Picicola* from Picidae of Piciformes, phylogenetically not far removed from Passeriformes (Wetmore, 1951). *Picicola* was proposed by Clay & Meinertzhagen (1938) for three new species of degeerialline

* Described as *Megapodiella*, see below.

lice from members of the Picidae and *Cotingacola* and *Tyrannicola* by Carriker (1956a, 1956b), the former, as a genus, but the latter as a subgenus under *Picicola*.

Three characters were considered for the generic separation of the species from the Pittidae, all being similar in this (*quadripustulosus*) group of species. The characters are : (1) the preantennal suture (absent or present); (2) the position of thoracic spiniform seta (outer or inner) relative to the thoracic trichobothrium; (3) the nature of the tergal plates (divided or entire).

The preantennal suture, generally absent in the species from the Picidae, is present in *Picicola roberti* Sommadder & Tandan, 1975 from *Picus chlorolophus*, in which character it resembles the Pittidae-infesting species. As far as the other two characters are concerned, in the *thripias* species group of four species of *Picicola*, the thoracic spiniform seta being outer to the thoracic trichobothrium and the tergal plates entire, both are different from the Pittidae forms. In the *candidus* group of three species, of *Picicola*, the position of the thoracic spiniform seta relative to the thoracic trichobothrium varies in different species and the nature of the tergal plates differs in the two sexes of the same species. In the *snodgrassi* group, of the nominate form and *mississippiensis*, the two characters are as in the species from Pittidae. *P. roberti* also belongs to the *snodgrassi* group, but as it has a preantennal suture its resembles with the Pittidae forms is in all these three characters.

As far as *Cotingacola* and *Tyrannicola* are concerned, their descriptions (Carriker 1956a, 1956b) proved inadequate for determining the extent of their resemblances with and differences from the Pittidae. However, as far as the three characters which were compared with the nine *Picicola* species are concerned, the resemblance of *Cotingacola* with the species under discussion is in all the three, but of *Tyrannicola* in two characters only, as in this subgenus the tergal plates are entire.

Hence it has not been found possible to find characters separating the species group parasitic on the Pittidae from all those placed in *Picicola* by Hopkins & Clay (1952) and by Dalgleish (1969).

In these circumstances the inclusion of the species from the Pittidae in a species group of *Picicola* seems the most satisfactory course, at least until the inter-relationships and generic separation within the *Degeeriella*-complex have been resolved.

KEY TO *PICICOLA* SPECIES OF *QADRIPUSTULOSUS* SPECIES GROUP

Being given in the text, the measurements have been omitted from the couplets.

1. Each of the terga III-VI normally with 3-4 setae (total more than 12 but in *emersoni* more than 10) (Fig. 2) 2

   Each of the terga III-VI with 2 setae (total 8) (Fig. 4) 5

2. Pleural seta IV more than 0.062 mm long, its tip extending beyond the spiracle of V (Fig. 8) 3

   Pleural seta IV less than 0.048 mm long, its tip falling well short of the spiracle of V (Fig. 7) 4

3. Anterior portion of head relatively narrower and longer; penial complex characteristic (Figs. 9, 32) . . . . . **quadripustulosus** (Harrison)

   Anterior portion of head relatively wider and shorter; penial complex characteristic (Figs. 17, 37) . . . . . **australis**, sp. nov.

4. Head relatively wider anteriorly; vulval marginal setae 10-13, $\bar{x}$ 12 (Figs. 21, 26) . . . . . **malaya**, sp. nov.

   Head relatively narrower anteriorly; vulval marginal setae 16-19, $\bar{x}$ 17 (Figs. 11, 27) . . . . . **emersoni**, sp. nov.

5. Head relativey shorter anteriorly, curvature each side of the median point slight; conus smaller, its tip falling short of the distal end of antennal segment I (Fig 16) . . . **6**

   Head relatively longer anteriorly, curvature each side of the median point pronounced; conus bigger, its tip extending beyond the distal end of antennal segment I (Figs. 10, 13, 14) **7**

6. Ocular seta and marginal temporal seta 2 very long; pigmentation pattern of abdominal dorsum characteristic (Figs. 4, 15) . . . . . **angolensis**, sp. nov.

   Ocular seta short, marginal temporal seta 2 long; pigmentation pattern of abdominal dorsum characteristic (Fig. 12). Male not known . . . . . **usheri**, sp. nov.

7. Female : posterior margin of segment IX-XI slightly depressed; seta b1 absent (Fig. 29) Male not known . . . . . **magnus**, sp. nov.

   Female : posterior margin of segment IX-XI considerably emarginate; seta b1 present (Figs. 30, 31). Male not known **8**

8. Female : tergum VII with 2 setae (Fig. 31). Male not known . . . **obscurus**, sp. nov.
   Female : tergum VII with 4 setae (Fig. 30). Male not known . **meinertzhageni**, sp. nov.

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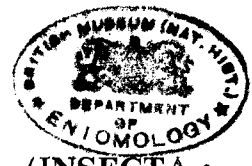

DEGEERIELLINE ISCHNOCERA (INSECTA : PHTHIRAPTERA) OF THE PITTIDAE (AVES)

BY K. SOMADDER & B.K. TANDAN

Oriental Insects 11 : 113-138

Erratum

Page	Line from top	To read
114	29	.....lateral (or first) seta).
115	29	.....posterior to anterior ventral seta 2.
	43	.....temporal 2 (Fig. 12).
116	3	.....(bl, in Figs. 18, 31).
119	18	; seta e 1 0+1 (2) very long, 0 (2).
	26	; ♀ 1.11—1.29, ...
121	30	, to accord to the available specimens.....
123	32	IV 0.070—0.160 mm, ...
124	10	; ♀ 0.40—0.43, ...
	11	; ♀ 0.26—0.29, $\bar{x}$ 0.27.
125	18	.....anterior margin of tergite VIII without a median depression ; posterior margin of segment IX-XI moderately.....
	27	.....male, 3-4 (3) ;
126 (Legend to Figures)		.....26, *malaya* ; 37, *emersoni*. ? 27
129	1	; bl 1+2 (1).....
	6	; IV 0.028—0.032.....
	25	, ♂ 0.134—0.141,.....
	29	; ♀ 0.35—0.39, ...
130	18	.....of anterior seta 1, 0.230 ;.....
132	7	.....each side 3-6, total 6-11,.....
	12	.....total, 0.57-0.59,.....
133	2	....., $\bar{x}$ 0.269 ; at level.....
	3	. Pterothorax
	38	total, 0.51, 0.59 ;.....
	39	anterior seta 1, 0.245, 0.262 ;.....
135	7	. (4) the chaetotaxy.....
	15	, Java : .....
	last line	.....degeerielline
	foot note	.....*Megapodiella*,.....
136	10	.....from *Picus*.....
	20	.....its resemblance with.....
	24	.....differences from the species from the Pittidae.....
	30	.....group parasitic.....