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MALLOPHAGA INDICA-VI

NOTES ON *GONIOCOTES* (MALLOPHAGA : PHILOPTERIDAE) FOUND ON *PAVO CRISTATUS*, WITH DESCRIPTION OF A NEW SPECIES

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ABSTRACT. In addition to the two known species of *Goniocotes* on *Pavo cristatus* Linnaeus, namely, *G. parviceps* (Piaget) and *G. rectangulatus* Nitzsch, a third species *G. mayuri*, sp. nov., is described in this paper. The new species is believed to be sympatric and phylogenetically older than *G. parviceps*. The diagnostic characters to distinguish *parviceps* and *mayuri* are given with notes on *rectangulatus*.

Hopkins and Clay (1952) listed three species of *Goniocotes* Burmeister on the peafowl (*Pavo cristatus* Linnaeus) *viz.*, *G. parviceps* (Piaget), *G. rectangulatus* Nitzsch and *G. yngarejsuf* Eichler, with a note that the last named species was probably a synonym of *G. parviceps*. Emerson and Elbel (1957) remarked that *parviceps* and *rectangulatus* are two closely related atypical members of *Goniocotes*, often included in the related *Goniodes* Nitzsch. The two species exhibit sexual dimorphism in the cephalic characters, the male indicating an affinity to *Goniodes* and the female to *Goniocotes*. Hence Emerson and Elbel retained the species in *Goniocotes*, pending further study. They did not examine the type of *G. yngarejsuf*, but concluded from the description and illustrations that it is conspecific with *parviceps*.

Our present studies reveal that, in addition to *parviceps* and *rectangulatus*, another species is found on *Pavo cristatus*; it is described here as new. Since the new species is sympatric with *parviceps*, it is desirable to discuss *parviceps* and *rectangulatus* before describing the new species.

1. **Goniocotes parviceps** (Piaget) (Figs. 1-4)

Goniodes parviceps Piaget, 1880, *Les Pediculines*, p. 277, pl. xxiii fig. 2 ; Thompson, 1938, *Ann. Mag. Nat. Hist.*, (11) **1** : 494 ; Blagoveshtchensky, 1940, *Fauna SSSR Inst. Zool. Akad. Nauk, SSSR*, (*N. S.*) **27** : 60, fig. 34 ; Séguy, 1944, *Faune de France*, **43** : 171, figs. 244-246.

Gonotyles parviceps (Piaget) : Kéler, 1939, *Nova Acta Leopoldina*, (N. F.) **8** (5) : 211.

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Goniocotes yngarejsuf Eichler, 1950, *Doriana*, **1** : 4 ; figs. 3 and 4.

Goniocotes parviceps (Piaget) : Hopkins and Clay, 1952, Check-List of Genera and Species of Mallophaga : 150 ; Emerson and Elbel, 1957, *Proc. Ent. Soc. Washington*, **59** (5) : 235, figs, 9 and 10 ; Emerson, 1964, Check-List of the Mallophaga of North America (North of Mexico), Part I. Suborder Ischnocera : 60.

Piaget (1880) described the species from specimens collected on *Pavo cristatus*. Briefly, his diagnosis was as follows : Head quadrangular in male and triangular in female ; antennae sexually dimorphic, segment I in male enlarged, equal to II and III, provided with a triangular appendix, bearing a fine seta at its tip, II slightly bulged at its base and the rest as in *Goniodes falcicornis* (now *G. pavonis*); temples in male parallel-sided and angles obtuse. Prothorax posteriorly convex with divergent posterior angles unlike *rectangulatus*. 'Metathorax' very large, angles round, and extended over abdomen and with two lateral setae. Abdomen identical in both sexes, elongate; tergites in the form of plates, large. Male genitalia large, slightly constricted at the level of the attachment of parameres with basal plate, the former pointed; valvulae convex.

Séguy (1944) broadly followed Piaget (1880). Thompson (1938) stated that Piaget's collection in the British Museum contains two males and two females on two slides. Though he did not redescribe the species, Kéler included it in his key as *Gonotyles parviceps* (Piaget).

The authors were able to examine specimens collected on the type-host and from *Pavo muticus*. Specimens from the type-host were collected in Nepal and India; the latter being provided by Dr Theresa Clay, British Museum (Natural History), London.

The following features are characteristic of *G. parviceps :*

Male : Head with the pre-antennal region slightly wider than the post-antennal. Segment I (Fig.1) enlarged as in *Goniodes*, bearing a triangular tubercle, to the apex of which is attached a distinctive seta, II long, III postaxially prolonged distally, IV smallest and V slightly larger than IV. Anterior marginal carina narrow, and the marginal temporal carina conspicuously wide. Spiniform setae on temple margin robust. Prothorax (Fig. 2) posterolaterally prolonged or 'winged', bearing a stout seta, posterior margin nearly sinuate. Pterothorax with two long and a spiniform seta at the posterolateral angle, two setae on the posterior margin and another pair of median setae; two mesosternal setae present. Abdominal tergite I (Fig. 3) not anterolaterally prolonged into thorax; sternites indistinct, except for the anterior ones. Tergite VIII with two short marginal setae on either side; last tergite with eight long setae. Male genitalia asymmetrical, as figured by Emerson and Elbel (1957)

Female : Head broadly triangular, with filiform antennae. Chaetotaxy of thorax and abdomen, except for terminal segments, as in male. Tergite VIII

with two long marginal setae on either side ; last tergite with six long and four short setae. Margin of vulva with three spiniform (two in *rectangulatus*) setae on each side and about 47 short setae in a row (fig. 4).

Material examined : INDIA : Delhi, from *Pavo cristatus*, xi.1912, Coll. R.N. Meinertzhagen, Slide No. 3122, British Museum (Natural History) London. NEPAL : Tamispur, Nawalpur, Parasi District, 15.ii.1968, Coll. No. NP-313, Coll. Robert E. Lewis, Iowa State University, Ames, Iowa ; from *Pavo muticus imperator*. THAILAND : Kho Mountain, Nakhon Phanom, Nakae, Kanluang, 11.vii.1954, Coll. No. 3912, Coll. Robert E. Elbel ; Trang, Siam (no other data) in the collection of K.C. Emerson ; Ban Pha Kang, Nan Sa, 8. xii. 1961, Coll. No. V-139, Coll. Kitti Thonglongva.

TABLE I. MEASUREMENTS (MM) OF *GONIOCOTES PARVICEPS*

	Male		*Female*	
	Length	*Width*	*Length*	*Width*
Head	0.46-0.47		0.53	
Pre-antennal*		0.46-0.49		0.53
Temporal		0.45-0.49		0.73
Prothorax	0.22-0.25	0.43-0.50	0.21	0.49
Pterothorax	0.32-0.35	0.67-0.69	0.25	0.71
Abdomen	1.12-1.15	1.00-1.04	1.19	1.08
Genitalia	0.70-0.71			
Total	1.81-1.89		1 88	

Remarks : The material examined includes two new distributional records, *viz.*, India and Nepal, with two additional records from Thailand by one of us (K.C.E.) and Mr. Thonglongva. Piaget (1880) obtained his specimens from *P. cristatus* from Amsterdam and Rotterdam Zoological gardens. Eichler (1950) obtained his specimens from the type-host of Indian origin, in the Hamburg Zoo.

2. **Goniocotes retangulatus** Nitzsch

Goniocotes rectangulatus Nitzsch, 1866, In Giebel, *Z. ges. Naturwiss.*, **28** : 389 ; Giebel, 1874, *Insecta Epizoa :* 185 ; (?) Piaget, 1880, *Les Pediculines*, 230, pl. xix fig. 5 ; (?) Thompson, 1938, *Ann. Mag. Nat. Hist.*, (11) **1** : 496 ; Kéler, 1939, *Nova. Acta.*

*Including coni

Leopoldina, (N. F.) **8** (51) : 146, fig. 80 ; Blagoveshtchensky, 1940 ; *Fauna SSSR Inst. Zool. Akad. Nauk. SSSR*, (N. S.), **27** : 65, fig. 40 ; Séguy, 1944, *Faune de France*, **43** : 180 ; Ansari, 1947, *Proc. Nate. Inst. Sci. India*, **13** (6) : 297 ; Hopkins and Clay, 1952, Checklist of Genera and Species of Mallophaga : 149.

Kéler (1939) figured and redescribed the species, based on two complete and one incomplete female specimens in the Halle Museum. He stated that Piaget (1880) reported the species from *Pavo spicifer* (*P. muticus*), Kellogg and Paine (1914) from *Pavo* (*cristatus*) *nigripennis* from India, and Osborn (1891) and other veterinary workers in America. Kellogg and Paine (1914) reported the species as 'one ♂ from *Pavo nigripennis* (no history, India)', but this slide is not at present available in the collections of the Zoological Survey of India, from which it was originally reported. It is likely that this slide might have been lost in the R. Varuna floods at Benares in 1943.

Kéler (1939) characterized the species with broad head, anterior part remarkably flat on the sides and parabolic ; temples round. Prothorax with straight sides. Piaget (1880), however, stated that the temporal borders are divergent in female and subparallel in male ; antennae not showing any significant differences in the two sexes. Prothorax does not offer any characters of taxonomic importance with straight sides. 'Metathorax' large, rounded on the sides and extends over the oval abdomen. The latter non-setose, save the lateral setae. Piaget (1880) and Séguy (1944) reported the sizes of the male as 0.8 mm and female 1.5 mm respectively, while Kéler (1939) stated the female examples in Halle Museum as 1.351 and 1.424 mm respectively.

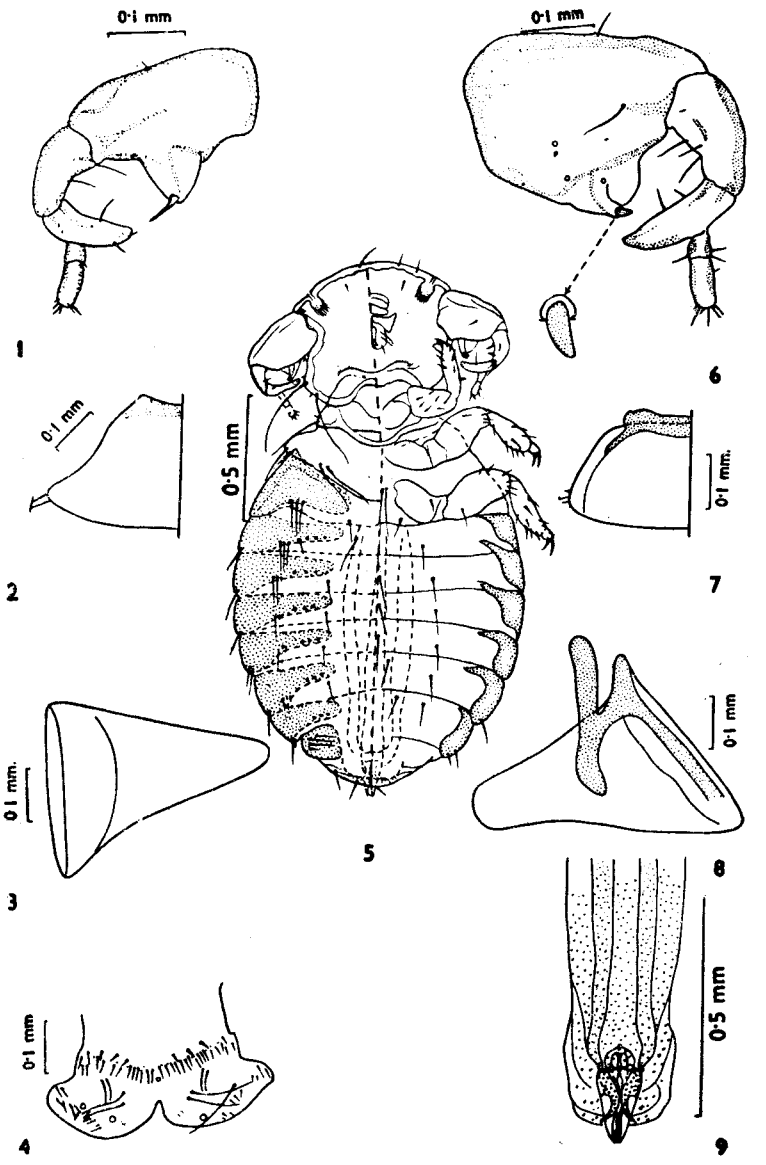
Specimens of *G. rectangulatus* are not available for study. Since Thompson (1938) stated that 2 ♂♂, 7 ♀♀ of this species are available in Piaget's collection in the British Museum, one of us (K.V.L.) requested Dr. Theresa Clay to kindly examine the material, particularly for the male genitalia. Dr. Clay (in *litt.*) informs us that "The specimens labelled with this name in the Piaget collections are mixed lot and of little interest ; Piaget did not know what Nitzsch's species was like". Blagoveshtchensky (1940) and Ansari (1947) also reported the species, the latter from Hoshiarpur (India).

In view of Dr. Clay's considered opinion, the only authentic description and figure available to us for comparison is that of Kéler (1939) ; the specimens on which they were based are, however, lost.

3. **Goniocotes mayuri,** sp. nov. (Figs. 5-9)

Goniocotes rectangulatus Nitzsch : Emerson and Elbel, 1957, *Proc. Ent. Soc. Washington*, 59 (5) : 241, fig. 11 (figure only) ; Emerson, 1964, Checklist of the Mallophaga of (North of Mexico). Part 1. Suborder Ischnocera : 60 (error).

Male : Head quadrate (Fig. 5), anterior marginal carina narrow ; antennae (Fig. 6) large. Segment I very large, with a triangular appendage bearing a small



Figs. 1-4. *Goniocotes parviceps* (Piaget) : 1, male antenna ; 2, dorsal half of prothorax ; 3, abdominal tergite I ; 4, chaetotaxy of the female genital region and terminal abdominal sternite.

Fig. 5-9. *Goniocotes mayuri*, sp. nov. : 5. male (entire) ; 6, male antenna ; 7, dorsal half of prothorax ; 8, abdominal tergite I ; 9, male genitalia.

lanceolate seta at its tip (a normal seta in *parviceps*), other segments as in *parviceps*. Temples slightly compressed anteriorly, temporal carina narrow (conspicuously wide in *parviceps*), spiniform temporal setae very thin (strongly sclerotized and stout in *parviceps*). Prothorax (Fig. 7) nearly rectangular, the sides straight, posterolateral angles not produced (winged in *parviceps*), posterior margin nearly truncate. Pterothorax as in *parviceps*. Abdomen as in Fig. 5. Anterolateral margin of tergite I (Fig. 8) sharply projecting into thorax unlike in *parviceps* (Fig. 3). Tergite VIII with three medium-sized and one short setae on the lateral margins. Terminal abdominal tergite with six long setae. Terminal sternite with 20-25 marginal setae. Genitalia (Fig. 9) symmetrical (asymmetrical in *parviceps*).

Female : Usually larger than *parviceps*. Chaetotaxy and general shape same as in *parviceps*, except for terminal abdominal segment. Terminal tergite with four long and four short setae. Margin of vulva as in *parviceps*. Internal vulval chamber prominent and circular (not prominent in *parviceps*).

Holotype ♂, Ex. *Pavo cristatus*, U.K.: Yorks, ii.1925, Slide No. 2928, British Museum (Natural History), London, Coll. R.N. Meinertzhagen. *Paratypes* ♂♂, Ex. *Pavo cristatus*, INDIA : Delhi, xi.1899, Slide No. 4452, British Museum (Nat. History), London, Coll. R.N. Meinertzhagen (male genitalia mounted separately on the same slide). Assam : Jamduar, Goalpara District, 24.iii.1957, Coll. B.K. Tikader (Z.S.I.). NEPAL : Tamispur, Navalpur, Parasi District, 15.ii. 1968, Coll. No. NP-313, in the collection of Robert E. Lewis, Iowa State University, Ames, Iowa.

No females have been designated as paratypes, because of our uncertainity of their identification (*vide* remarks).

TABLE II. MEASUREMENTS (MM) OF *GONIOCOTES MAYURI*, SP. NOV.

	Male		*Female*	
	Length	*Width*	*Length*	*Width*
Head	0.55-0.56		0.48-0.56	
Pre-antennal*		0.60-0.64		0.46-0.57
Temples		0.56-0.59		0.62-0.76
Prothorax	0.22-0.25	0.43-0.46	0.18-0.24	0.38-0.50
Pterothorax	0.29-0.31	0.69-0.74	0.25-0.31	0.60-0.73
Abdomen	1.37-1.46	1.12-1.16	0.98-1.23	0.91-1.08
Genitalia	0.91-1.27			
Total	2.1-2.13		1.67-1.90	

* Including coni

Remarks : G. mayuri, sp. nov. (from *mayur* Sanskrit for the common peafowl) seems to be sympatric* with *G. parviceps* (Piaget), and most closely related to that species. In the male, these characters of *mayuri* are distinctive : temporal margin slightly constricted, marginal temporal carina narrow, small and thin temporal marginal setae, antennal appendage with lanceolate seta, nearly rectangular prothoracic margins, abdominal tergite I strongly projecting into thorax anterolaterally, tergite VIII with four setae, terminal abdominal tergite with six long setae, and symmetrical genitalia. We are not certain that the females can be separated, however, these characters appear to be distinctive for *mayuri :* usually larger size, terminal abdominal tergite with eight setae, and a prominent internal circular-shaped vulval chamber. Our reasons for concluding that the females we identify as *mayuri* are from those collections which do not contain *parviceps* males as in the Thailand collections. Therefore, we have assumed that in the collection which contains males of both *parviceps* and *mayuri*, that the females with the characters given above are *mayuri*. Since there is a possibility of error in our conclusions, no females are designated as paratypes.

On enquiry by one of us (K.V.L.) as to her opinion on *G. mayuri*, Dr. Theresa Clay (in *litt.*) informed us that "I have always considered this species to be *rectangulatus*, but on looking at Kéler's figure of one of the syntype females [Kéler, 1939. *Nova Acta Leopoldina* (N.F.) 8 (51) : 146] it seems that the shape and size of the head, the width of the marginal carina and the setae of the female genital region differ". Kéler (1939) figured only two spiniform setae on the margin of the vulva as against 3-4 in *mayuri* and *parviceps*. On the basis of the symmetrical nature of the male genitalia, narrow cephalic carinae, lanceolate small seta, *mayuri* seems to be phylogenetically older than *parviceps* with asymmetrical genitalia, wider cephalic carinae and fine long antennal seta.

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*Dr Clay (1949) suggested that one of the sympatric species shows variation to a smaller or greater extent in the antenna among Ischnocera. It is interesting to note that in *mayuri* the antennal appendage carries a lanceolate seta while in *parviceps* a long and fine seta.

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