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## ISCHNOCERA (MALLOPHAGA) INFESTING PARROTS (PSITTA-CIFORMES). III. NOTES ON SOME SPECIES OF THE GENUS *PARAGONIOCOTES* CUMMINGS, 1916, WITH DESCRIPTION OF A NEW SPECIES

LINDOLPHO R. GUIMARÃES

### ABSTRACT

The genus *Paragoniocotes* is characterized, and a brief history of the development of its knowledge given. *Avipediculus Eichler, 1952* and *Mausolus Eichler, 1952* are considered its synonyms. *P. cummingsi Guimarães, 1947*, and *P. tritergum tritergum Carriker, 1947*, both found on *Amazona aestiva aestiva* are synonymized with *P. s. semicingulatus (Piaget, 1890)*, originally reported from *Strepsilas collaris (probably Arenaria interpres)*, evidently in error. *P. quadritergum tibialis Carriker, 1947* is considered a synonym of *P. grandis Guimarães, 1947*, both found on *Amazona f. farinosa*. *P. rauli Carriker, 1950*, found on *Ara rubrogenys* is considered a synonym of *P. fasciatus (Piaget, 1880)*, reported originally from *Nymphicus novaehollandiae (now Nymphicus hollandicus)*, also an error. Both sexes of *P. meridionalis, sp. n.*, from *Cyanoliseus patagonus*, are described. *Nirmus ligulatus Neumann, 1890*, included in *Paragoniocotes* by Hopkins and Clay, is here treated as a species inquirenda.

In 1916 Cummings erected the genus *Paragoniocotes*, describing only one species, *gribocephalus*. He declared, however, that he knew several others, of which only *Goniocotes fasciatus* Piaget had been described; he did not designate the type-species. In that same year Harrison selected *gribocephalus* as the type-species (1916: 23), and included in *Paragoniocotes* two other species (l.c., p. 128); *abnormis* (Kellog, 1908), and *fasciatus* (Piaget, 1880). Guimarães (July 1940) described another species, *neivai*. In the same year (December) Carriker created the genus *Dimorphia* (in 1944 changed to *Epipsittacus*, as *Dimorphia* was preoccupied), for a new species related to the *Paragoniocotes*-group, and redescribed the latter genus on the basis that Cummings' original description was inadequate, and because he had several undescribed species at hand.

From Carriker's characterization of *Paragoniocotes* and its comparison with *Dimorphia*, the two nominal genera differed as follows: *Paragoniocotes* had the antennae subequal; a heavy, curved spine-like process arising from each side of the frontal margin of the head [coni] bent backwards and inwards under the first antennal segment,

and a pair of groups of three long, curved spines on the posterior margin of the last segment of the female; in *Dimorphia*, the heavy, curved spine-like process of the head was present only in the females, as the males had *trabeculae*, and the groups of spines were located on the dorsal surface of the female's abdomen.

In 1943 Stafford described as *Paragoniocotes* the new species *venezolanus*, which presented typically *Dimorphia*-like *coni*.

In November 1947 Carriker dealt again with the genus, describing new taxa (species and subspecies) showing the characters attributed by him to typical representatives of *Paragoniocotes*, again characterizing the genus. At this time, however, he no longer stated that the spines of the last abdominal segment of the females were located on the posterior border of the segment, but near to it; *Dimorphia* (now *Epipsittacus*) would have those spines not on the dorsal surface of the segment, but ventrally and close to the anterior margin.

A few months before (July 1947) Guimarães had described several new species and redescribed three previously known species. Guimarães organized the species in four groups, which overlapped morphologically; the species of *Epipsittacus* (*Dimorphia*) represented one of those groups, which was consequently included in *Paragoniocotes*.

Three years afterwards (1950) Carriker described another series of species, accepting, "although with mental reservation", the synonymy of *Epipsittacus* with *Paragoniocotes*. Only three species-groups were considered by him, as he merged groups B and D of Guimarães into one. He declared at the occasion that *P. neivai* (Group B) had the first tergite entire in the male, with the 6th and 7th broken medially; this was an error, as, the same with all other species of this group, *neivai* has all tergites entire. As to the generic groupings, he said: "Since I cannot see how it is possible to give a concise generic characterization of such a heterogeneous group of species as this, I shall not attempt to do so, merely accepting that as given by Guimarães, inadequate though it may be. Two characters are present in all females of the genus that I have seen, viz.: All tergites except the apical are widely broken medially, and the presence on each side of the apical abdominal segment (ventrally) of three heavy, curving spines (in two known species two long and one short spines). As for the males, there is not a single generic character mentioned under any of the groups which is constant throughout the genus".

In 1952, apparently based solely on Cummings' paper, where it was said that *fasciatus* was a *Paragoniocotes* without the two larve recurved frontal processes [*coni*], and apparently without seeing any material of the genus, Eichler erected the genera *Avipediculus*, for *Goniocotes fasciatus* Piaget, and *Mausolus*, for *P. grandis*, species belonging to Carriker's Group C, and found on parrots of the genus *Amazona*. Eichler also suggested that species of Guimarães' Group D might be segregated in another genus.

In the same year Hopkins & Clay included in *Paragoniocotes* a total of 48 species (Carriker's subspecies being treated as full species).

As can be seen from the foregoing history, *Paragoniocotes* is a highly heterogeneous group of species, which may be distributed through three or four subgroups. At first, it may seem unnatural to include species like *nanus*, *gripecephalus*, *mirabilis*, *fulvofasciatus*, or *mirmoides* in the same genus. For the moment, however, I see no other alternative. The generic concept has to be enlarged to include all the

species considered by Hopkins & Clay. The value of the groupings and their meaning in relation to the hosts will be discussed in the near future.

#### Paragoniocotes Cummings, 1916

*Paragoniocotes* Cummings, 1916: 101; Carriker, 1940: 292; Conci, 1942: 41; Guimarães, 1947: 245; Carriker, 1947: 89.

*Dimorphia* Carriker, 1940: 294.

*Epipsittacus* Carriker, 1944: 233 (n. nom. for *Dimorphia* Carriker nec Malloch).

*Avipediculus* Eichler, 1952: 75, *syn. n.*

*Mausolus* Eichler, 1952: 77, *syn. n.*

Both sexes with a faint dorsal pre-antennal suture present, reaching the sides of head, not interrupting, however, the marginal carina; dorsal anterior plate undifferentiated, always wider than long. Pre-antennal region very variable in shape; it may be very short, with flattened outline as in *nanus*, or rounded as in *mirabilis*, widely rounded as in *aratingae*, semicircular as in *fulvofasciatum* or as a truncated cone as in *grandis*. Temporal margin rounded with a long seta (4th). Antennae similar, or dimorphic in the sexes; when dimorphic the first segment of male larger and stouter than the other, and the 3rd or the 5th may present verrucose processes. The conii may be similar or different in both sexes; in some species (typical *Paragoniocotes*) they appear in both sexes as a pair of conspicuous hooks, curving upon the first antennal segment; in other species the conii are also similar in both sexes but they are triangular, not very conspicuous and projecting obliquely on the first antennal segment or parallel to it (*Mausolus*); in typical "*Dimorphia*" they are different in both sexes: in the female the conii are as in typical *Paragoniocotes*, that is, as a pair of conspicuous hooks, but in the male they are triangular, projecting laterally, with the base relatively wide; however, in this group the conii show a lot of variability, as in *nevai* and *anomalous*, in which the conii of female are small, triangular and very little conspicuous or as in the species now described whose conii in both sexes are very small.

Prothorax small, with a median seta on each side of the posterior margin, near the posterior corner.

Pterothorax wider than long, with 4 to 8 setae on posterior margin, on each side of the midline.

Abdomen globular (*nanus*) to elongate (*fulvofasciatum*). Male tergites interrupted or not in the middle, sometimes only some tergites are interrupted; in the female they are always interrupted, with the exception of the two last ones, which are entire; in both sexes the tergites are duller at the posterior and lateral margins.

Female abdominal chaetotaxy quite simple: tergite I with 2 tergo-central setae on each side of the midline, one anterior — probably remaining from the true first tergite — and another posterior to the tergal plate (exception in *nirmoides*, which has only one), and tergites II to VII with one; tergites II to VI with one tergo-lateral seta (*nirmoides* III to VI); one seta on lateroposterior corner of tergites II to IV (*nirmoides* III and IV), 2 on segments V and VI, and 2 + sensillum on the segment VII; 2, but on the anterior corner, on the segment

VIII (not in *nirmoides*); posterior margin of VIII tergite with 2 long setae and a short one between them, on each side of the segment. Ventrally there are 5 rows with a variable number of setae; on each side of the vulva there is a group of three strong and medium-sized setae; another seta, thinner and much longer, is found between each group of three setae and the lateral margin of the abdomen. Genital plate and posterior margin of vulva showing some variation in the outline; this margin is rounded or pointed, and always fringed with short setae and spine-like setae, at least partially; sometimes the posterior end of genital plate is fused with a more intense sclerotization that runs parallel to the margin of the vulva.

Male with abdominal chaetotaxy of the seven anterior segments as in the female, but tergo-central setae increasing in number towards the apex of abdomen.

The male genitalia has as general characteristic the great development of the endomeres and concomitant atrophy of the parameres. With the exception of three species, *mirabilis*, *fulvofasciatum* and *nirmoides*, it keeps the same general structure although showing differences in the shape of its several pieces.

Type-species: *Paragoniocotes gripocephalus* Cummings, 1914.

#### **Paragoniocotes s. semicingulatus** (Piaget, 1890)

*Nirmus semicingulatus* Piaget, 1890: 231, pl. 8, fig. 8; Kellogg, 1908: 29. *Degeeriella semicingulata*; Harrison, 1916: 123.

*Paragoniocotes cummingsi* Guimarães, 1947: 268, figs. 10, 11 (*n. syn.*).

*Paragoniocotes tritergum tritergum* Carriker, 1947: 12, figs. 29-31 (*n. syn.*).

*Paragoniocotes semicingulatus*; Hopkins & Clay, 1952: 264.

In 1968, Dr. Clay compared syntypes of *semicingulatus*, paratypes of *cummingsi* and syntypes of *tritergum* and was kind to advise me (*in litt.*) that there was little doubt that they belonged to the same species, in spite of not so good condition of the specimens of *semicingulatus* and *tritergum*. *P. semicingulatus* was described from specimens found on *Strepsilas collaris* (probably *Arenaria interpres* — Charadriidae) evidently an error; the other two were collected on *Amazona ae. aestiva*. Establishing the synonymy above we reach the conclusion that the true host of *P. s. semicingulatus* is really *Amazona ae. aestiva*, and that the two other subspecies, *bolivianum* and *tucumananae* described by Carriker, become subspecies of *semicingulatus*.

#### **Paragoniocotes g. grandis** Guimarães, 1947

*Paragoniocotes grandis* Guimarães, 1947: 272, figs. 12, 13; Hopkins & Clay 1952: 263.

*Paragoniocotes quadrilaterum tibialis* Carriker, 1947: 17, figs. 40-41 (*n. syn.*).

*Paragoniocotes tibialis*; Hopkins & Clay, 1952: 265.

*Mausolus grandis* (Guimarães); Eichler, 1952: 67.

It is quite probable the subspecies *tibialis* may be a synonym of *grandis*, since the two have the same type-host, *Amazona f. farinosa* (Boddaert), and the same general facies. The only difference found between *grandis* and *tibialis*, as figured by Carriker, is the absence of a small acute projection at the posterior end of the mesosome of *tibialis*. Such a projection, however, is not always so conspicuous as figured either by Guimarães for *grandis* or by Carriker for *q. quadritergum*.

Differences among the several forms of this group are so subtle that only a study of all the forms may clear their status. Some of the differences are, without any doubt, due to technique procedures (for instance, the width of the male abdomen of *P. q. quadritergum*). Anyway, subspecies of *quadratergum* described by Carriker must be considered subspecies of *grandis*. Of course this does not mean that I accept as good all the forms without a previous study of them.

#### ***Paragoniocotes fasciatus* (Piaget, 1880)**

(Figs. 1 to 7)

*Goniocotes fasciatus* Piaget, 1880: 236, pl. 19, figs. 11, 11a, 11b, 11c, (*Nymphicus Novae-Hollandiae*); Kellogg, 1908: 33.

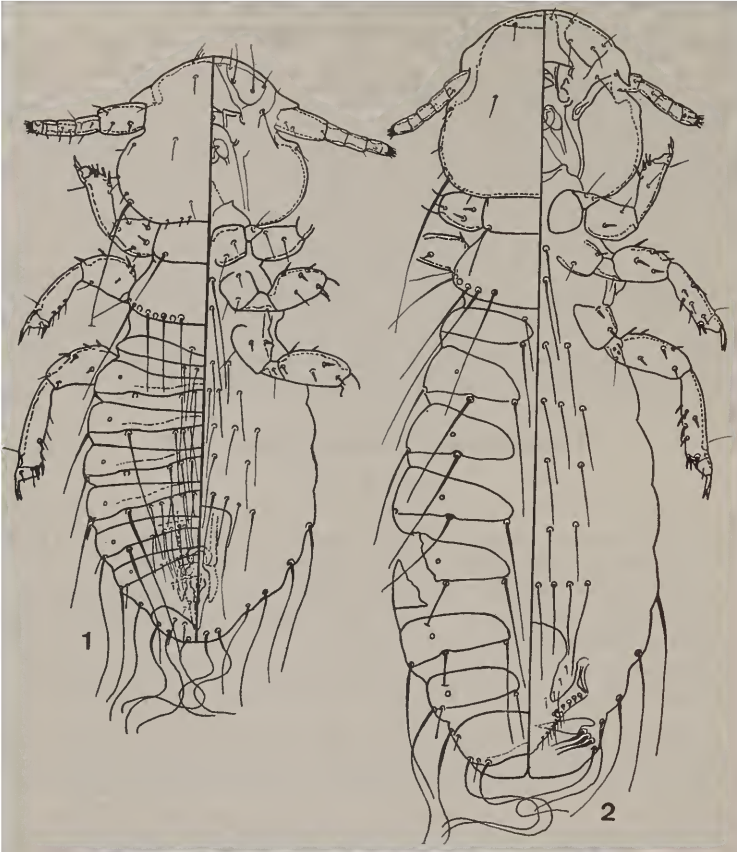
*Paragoniocotes fasciatus*; Harrison, 1916: 128 (*Callopsittacus novae-hollandiae*); Hopkins & Clay, 1952: 263 (*Nymphicus hollandicus*).

*Avipediculus fasciatus*; Eichler, 1952: 75.

*Paragoniocotes rauli* Carriker, 1950: 4, figs. 1-4 (*Ara rubrogenys*); Hopkins & Clay, 1952, 264 (*Ara rubrogenys*). *Syn. n.*

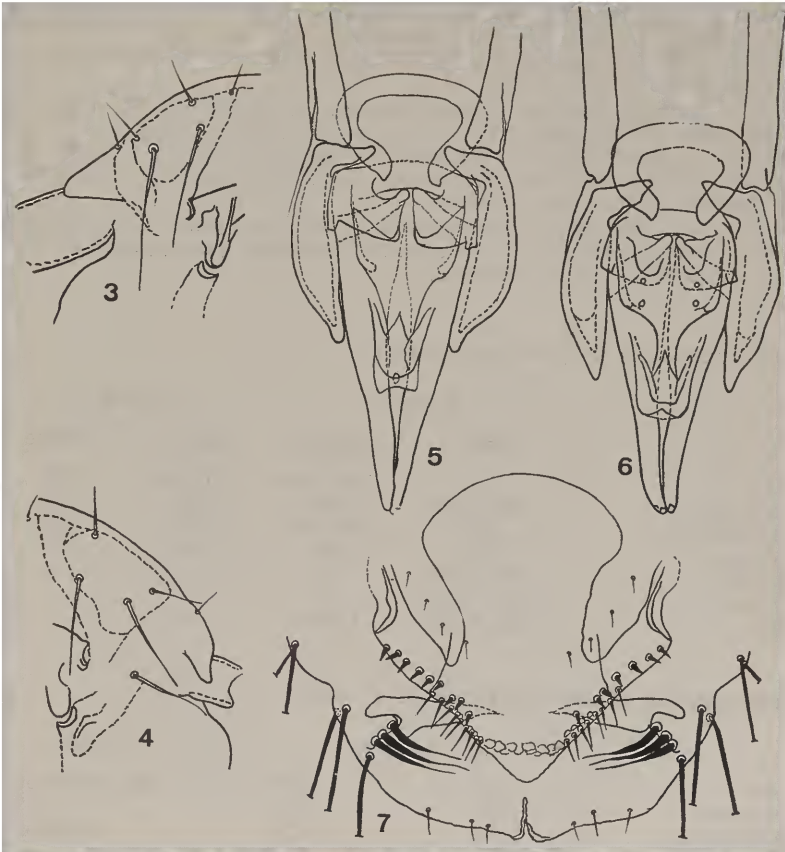
Referring to his species Piaget said "C'est jusqu'ici le seul exemple de *Goniocotes* infestant d'autres oiseaux que les gallinacées", and to confirm the true identity of the host "et qu'il ne s'agit pas ici d'individus égarés, c'est ce que prouve le fait que j'ai trouvé notre espèce sur un *Nymphicus* vivant du Jardin Zoologique et sur une peau au muséum de Leide".

If indeed Piaget's species had had a *Nymphicus* as its true host it would be the first example of a *Paragoniocotes* parasitizing a parrot outside of the New World. Through the kindness of Dr. Clay, I had the opportunity of examining a couple of syntypes of *fasciatus* from Piaget's Collection belonging to the British Museum (Natural History) and to verify that, in fact, they are a *Paragoniocotes* of the same type generally found on parrots of the genus *Ara*, and very close, if not the same, as *P. rauli* Carriker, from *Ara rubrogenys*. Dr. K. C. Emerson was kind enough to sent me for study 5 paratypes (2♂ and 3♀) of *P. rauli*, included, together with the types, in the collection of the United States National Museum. Although the condition of the paratypes of *rauli* is not as good as that of the specimens of *P. fasciatus* the comparison between them leaves only a few doubts, on the possibility of *rauli* being a synonym of *fasciatus*. It is true there are some small differences in the male genitalia, chiefly in the structure of the mesosome (figs. 5 and 6). But even so I do not believe it right to consider them as different taxa, since the mesosome is a complex structure composed of so weak pieces that the common treatment for mounting



*Paragoniocotes fasciatus*: 1, male; 2, female.

the specimen may provoke modification in their shape and relative position. In the present case the differences are: the shape of the median calyciform structure of mesosome, the "foot" of which is more abruptly narrowed in Piaget's specimen; the latero-posterior angles of the more anterior transverse structure of mesosome which are more or less conspicuous (as two small projections) in one of Carriker's specimens; and the presence of a very nitid bar, also transverse, at the base of the endomeres in one of Carriker's specimens. Such a bar is less delimited in Piaget's specimens. The shape of the calyciform structure and the clearness of the transverse bar of another paratype of Carriker's species is intermediate between the specimens figured. The question of the host of *fasciatus* must also be considered. Without any doubt the specimens collected by Piaget on *Nymphicus hollandicus* in the Zoological Garden of Rotterdam and on a skin in The Leiden Museum, is the result of contamination of those parrots by the true host



*Paragoniocotes fasciatus*: 3, part of the head, showing a conus of male; 4, part of the head, showing a conus of female; 5, male genitalia (paratype of *P. rauli*); 6, male genitalia (lectotype of *P. fasciatus*); 7, ventral view of posterior extremity of abdomen of female.

of *P. fasciatus* which must be a parrot of the genus *Ara*. The identity of *P. fasciatus* (Piaget) and *P. rauli* Carriker compels me to consider *Ara rubrogenys* Lafresnaye — host of Carriker's specimens — as the type-host of *P. fasciatus*. In spite of being a very rare macaw with an apparently very restricted distribution, (Bond & Schauensee)<sup>1</sup>, it was represented, in 1864 and 1874, in the collections of the Leiden

1. The few specimens of *Ara rubrogenys* existing in several Museums had no locality data, or were merely labelled as from "Bolivia". Only in 1937 Carriker collected a specimen (the type-host of *P. rauli*) in Ele-ele, Dpto. of Cochabamba, Bolivia.

Museum (H. Schlegel, *Muséum d'Histoire Naturelle des Pays-Bas*. 5me. Libraison. *Psittaci*: 1864 Royal 8vo. pp. 166; and *Revue de la collection des Perroquets (Psittaci) faisant partie du Musée des Pays Bas. Leide*, 1874, pp. 1-84)<sup>2</sup>.

The syntype male of *Paragoniocotes fasciatus* (Piaget) mounted on the slide 43 of Piaget's Collection, in the British Museum (Natural History), is here selected as Lectotype, and the syntype female, also mounted on slide, becomes accordingly, a Paralectotype. Both specimens are figured in the present paper.

The measurements of paratypes of *P. rauli* are, practically, identical to those of the Lectotype of *P. fasciatus*. The female paratypes of *P. rauli* have no condition to be measured.

Measurements of *P. fasciatus*, in mm

	Length		Width	
	Male	Female	Male	Female
Head	.340	.360/.400	.390/.400	.420
Prothorax	.080/.090	.080	.230	.240
Pterothorax	.130	.140/.150	.330	.370
Abdomen	.660	.990	.490	.570
Paramere	.080/.090	—	—	—
Endomere	.130/.140	—	—	—
Total	1.200/1.210	1.590	—	—

Measurements of male paratypes of *P. rauli*

	Length		Width
Head	.350	.360	.380/.390(both)
Prothorax	.080	.090	—
Pterothorax	.110	.120	.340(both)
Abdomen	.660	.660	—
Paramere	.080/.090	.080	—
Endomere	.140/.150	.140/.150	—
Total	1.210	1.230	—

***Paragoniocotes meridionalis*, sp. n.**

(Figs. 8 to 14)

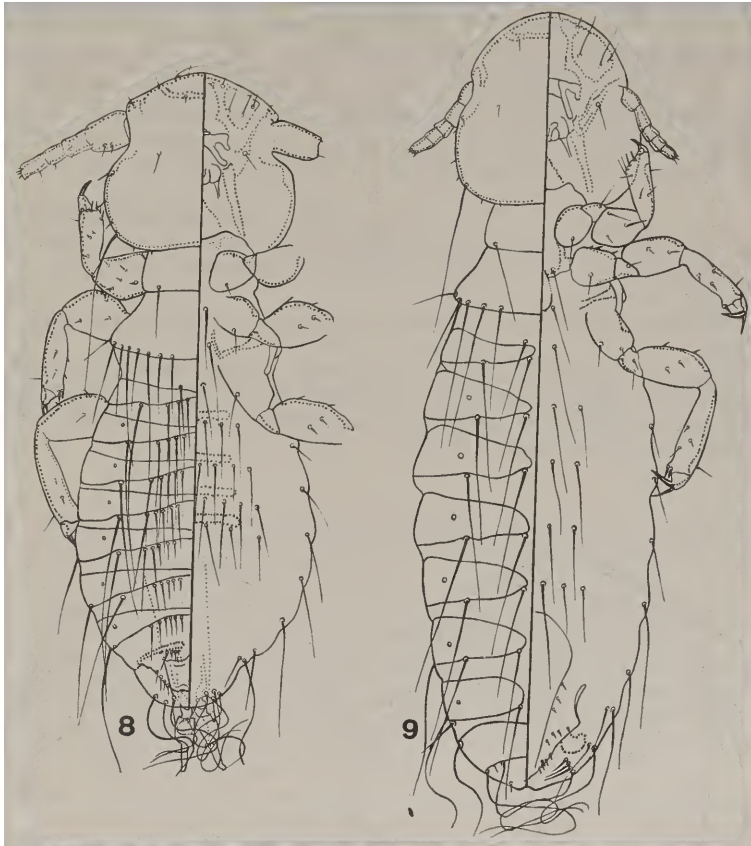
Type-host: *Cyanoliseus patagonus* (Vieillot)

Specimens examined 1♂, 2♀ collected on the type-host.

Male (figs. 8, 10, 11, 12) — Head wider than long; preantennal region much shorter than the postantennal, with the anterior margin

2. These citations have been kindly confirmed (in litt.) by Dr. Teresa Clay.





*Paragoniocotes meridionalis*, sp. n.: 8, male; 9, female.

slightly angulous. Coni reduced to a small triangular process projecting on the anterior margin of the first antennal segment. First antennal segment developed, a little longer than the next two together; segments III and IV with a small lappet-like projection on distal posterior margin.

Pterothorax with 7 setae of different length on each side of posterior margin.

Abdomen ovate, longer than the head and thorax together; tergites entire (perhaps with the exception of the VIII) and thinner medially. Tergocentral setae distributed on each side of the abdomen as follows: segment I with 1 seta anteriorly to tergal band and 3 setae posteriorly; II with 4; III to VII with 5, and VIII with 4; some setae of segment V and all of segments VI to VIII smaller than the preceding ones. One tergolateral seta on segments I to VI. Apical segment with 3-4

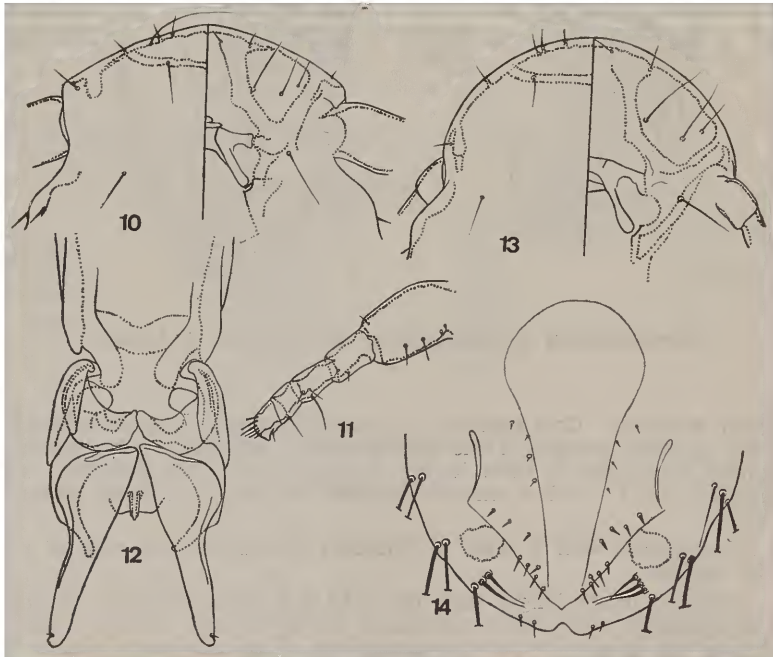
small setae bordering the anterior margin of tergal plate and 3 long ones on posterior margin of the plate or near it. Sternal plate with indistinct outline at least on segments II to V. Five rows of setae on sternal face, distributed on each side of the median line in the following way: 1 on segment I; 2-3 on II; 3-4 on III; 4-5 on IV, and 3 on V; terminal segment with 6 setae near the posterior margin.

Male genitalia, although keeping the same general shape of the other species of the genus, differs in several details as can be seen in fig. 12.

Female (figs. 9, 13, 14). Preantennal region longer than in the male and outlined in a perfect arch. Coni also small, but with the sharp point turned to the side, and not backwards as in the male. Antennae filliform.

Pterothorax with only 5 setae of different lengths on the posterior margin.

Abdomen ellipsoidal and, as in the other species of the genus, with tergal bands of the first seven segments interrupted on the midline. The tergo-central setae are present on segments I to VII; the tergo-lateral ones on segments I to VI.



*Paragoniocotes meridionalis*, sp. n.: 10, anterior part of male head; 11, male antenna; 12, male genitalia; 13, anterior part of female head; 14, ventral view of posterior extremity of female abdomen.

Genital plate cuneiform, long, with the anterior margin semi-circular.

Vulva tapering posteriorly and having, on each side, 5 short setae and 3-4 spine-like setae. The 3 subapical spine-like setae, found on either side of the vulva, are slender, and the more anterior one is shorter than the others. The allotype shows only 2 of these setae on one side.

Measurements of type, in mm

	Length		Width	
	Male	Female	Male	Female
Total	1.170	1.450	—	—
Head	.320	.350	.360	.350
Prothorax	.080	.080	.220	.220
Pterothorax	.120	.130	.310	.320
Abdomen	.650	.880	.440	.470

Types: HOLOTYPE male, ALLOTYPE female and PARATYPE female, from *Cyanoliseus patagonus* (Vieillot), in the Institut Royal des Sciences Naturelles de Belgique.

Taxonomic discussion: This new species differs from all other species of the genus by the shape of the conic, by the tergo-lateral setae, which begin on abdominal segment I, and by the shape of male genitalia. Without any doubt the female is similar to *P. anomalus*, but the head is more rounded, both in the pre-antennal and the temporal margins, the conic are smaller, the laterotergal setae begin on abdominal segment I and the genital plate is longer.

*Note.* According to Peters (1937) *Cyanoliseus patagonus* is divided in three subspecies: the typical one, *andinus* and *byroni*. The first two are found in Argentina and the latter in Chile. Dr. J. Cooreman, from the Institut Royal des Sciences Naturelles de Belgique, informed (*in litt.*) that the host specimen of the new species had probably come from Argentina.

### *Species inquirenda*

#### ***Nirmus ligulatus* Neumann, 1890**

*Nirmus ligulatus* Neumann, 1890: 60.

This species was included by Hopkins & Clay (1952) in the genus *Paragoniocotes*. It is, indeed possible that such a position is right, since Neumann's original description, based only on the female, presents some characters that do not exclude the possibility of its allocation in this genus. Thus the preantennal region is a "cône tronquée", with "trabécules [conic] courtes", "une très longue soie" on the temporal margin, "métathorax... pourvu à son bord postérieur de six longues

soies de chaque coté" and "abdomen ovale allongé; les 7 premiers segments avec deux taches triangulaires, plus foncées en dehors qu'en dedans". Of course the above characters are not decisive to include the species in the genus *Paragoniocotes*; furthermore, there is no reference to the cluster of three strong setae on either side of the genitalia. Unfortunately, as happened to almost all specimens of Ischnoceran Mallophaga studied by Neumann, the specimen described was lost, not allowing, accordingly, a direct comparison with any species of *Paragoniocotes*.

As to the host there is also some doubt. Neumann says that his material was collected by Dr. Trouessart, at the Muséum de Paris, from a *Chrysotis brasiliensis* (now *Amazona brasiliensis*), Rio Negro.

Thanks to my colleague Dr. Hélio Camargo, I have at hand a letter from Dr. F. Roux, Muséum National d'Histoire Naturelle, that sheds the necessary light on the question of the host. Dr. Roux says that the Muséum has only one specimen of *Amazona brasiliensis*, recorded in 1818, on the label of which there is no indication other than "Brazil" as the locality. However, examining other specimens of *Amazona* from Brazil, Dr. Roux verified that "un seul a pour localité d'origine le Rio Negro (exactement Barra do Rio Negro). Il s'agit d'un *A. autumnalis diadema* (Spix), ♂ récolté en février 1847. Serait-ce l'oiseau sur lequel Trouessart avait trouvé le Mallophage décrit par Neumann? Ce n'est pas impossible: sur l'étiquette on lit *Chrysotis brasiliensis* et c'est bien postérieurement à l'époque de Trouessart que l'erreur de détermination fut rectifiée".

So, it is quite probable that the specimen described by Neumann as *Nirmus ligulatus* had been found on *Amazona autumnalis diadema* and not on *Amazona brasiliensis*; only specimens of Ischnocera found on the former parrot fitting Neumann's description may be identified as *Nirmus ligulatus*. At present it is not possible to be sure that it is a *Paragoniocotes*.

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