

Redescription of two species of Mallophaga (Insecta)  
parasites on *Sagittarius serpentarius* (Miller) (Aves)

by

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Two species of Mallophaga, namely *Falcolipeurus secretarius* (Giebel) (Menoponidae) and *Neocolpocephalum cucullare* (Giebel) (Philopteridae) are redescribed from specimens collected on a secretary bird (*Sagittarius serpentarius*) in Spain.

INTRODUCTION

The Secretary Bird, *Sagittarius serpentarius* (Miller) is a bird endemic to Africa. Living in semi-arid savannas, grass plains and subdeserts south of the Sahara, it ranges from Senegal east to Somalia, and south to the Cape Province of South Africa, and is much more common in South and East African highlands.

This bird is the only species and genus in the family Sagittariidae. Considered to be an aberrant Falconiform due to its terrestrial hunting habits, it is possibly related to Gruiformes birds and this may have an influence on the characteristics of its parasitic Mallophaga, which show some noticeable morphological variations in comparison with other species of Mallophaga, parasite on Falconiformes.

Two species of Mallophaga have been cited as parasites of *Sagittarius serpentarius*: *Neocolpocephalum cucullare* (Giebel) and *Falcolipeurus secretarius* (Giebel). Both species were described from two specimens collected by Nitzsch from *Gypogeranus* (= *Sagittarius*) *serpentarius* (locality not specified) in February, 1837. Subsequently, the insects were named by their author as *Colpocephalum cucullare* and *Lipeurus secretarius*. The former species belongs to the family Menoponidae, suborder Amblycera, the latter species to the family Philopteridae, suborder Ischnocera.

Reviewing the literature on both species, we found a brief description of them by Piaget (1880) (on specimens collected from *Gypogeranus* (= *Sagittarius*) *serpentarius* housed in the zoo of Rotterdam), and some taxonomic data for *C. cucullare* given by Price and Beer (1963). Other references to these species are listed below.

Since little was hitherto known about these species we find necessary to redescribe both species on the basis of new material taken from the type host.

#### MATERIAL AND METHODS

Specimens were collected from a single *Sagittarius serpentarius* specimen from the Barcelona Zoo (Spain), and stored in 70% ethanol until they were slide-mounted. This process included the following steps: (1) clearance of the material by immersion in a 30% potassium hydroxide hot solution; (2) neutralization with acetic acid; (3) dehydration by passing the material through 40%, 70% and 90% ethanol; (4) mounting in Hoyer's liquid; (5) drying of the preparations at 50–55 degrees centigrade for some weeks.

All specimens are deposited in the Collection of Museo Nacional Ciencias Naturales (M.N.C.N.) of Madrid (Spain).

A morphometric study of several parameters in each species was carried out by means of a WILD MMS-235 digital micrometer. Abbreviations are as follows:

H.L. = head length.

C.I. = cephalic index (H.W./H.L.).

Pr.W. = prothorax width.

Pt.W. = pterothorax width.

A.W. = abdomen width.

G.L. = genitalia length.

H.W. = head width.

Pr.L. = prothorax length.

Pt.L. = pterothorax length.

A.L. = abdomen length.

T.L. = total length.

P.L. = parameres length.

Measurement are in mm; range and arithmetic mean are given for each parameter.

*Neocolpocephalum cucullare* (Giebel). (Figs 1–10).

**Colpocephalum cucullare** Giebel, 1874: 263.

**Colpocephalum major** Piaget, 1880: 519 (as a variety of *C. caudatum* Giebel).

*Neocolpocephalum cucullare* (Giebel): Eichler and Zlotorzycza 1971: 28.

Type host: *Gypogeranus serpentarius* (= *Sagittarius serpentarius*) (Miller).

**Description.** This species is characterised by possessing three nodes, or cephalic plates, intensely pigmented, and by the presence of rows of pectinate ctenidial setae on the ventral side of the 3rd femur and on the abdominal sternite III. General morphology and cephalic chaetotaxy are similar in both sexes; there is, however, a marked sexual dimorphism in the abdomen, which will be described separately.

**Head.** About 1.5 × as wide as long, (a slightly more in the female; C.I.: male = 1.60; female = 1.53). Anterior or clypeal margin slightly curved, almost flat. Lateral margins with ocular notches weakly marked; well developed temporal lobes and occipital region deeply concave. Antennae (Fig. 4) with the second segment bearing a small latero-apical apophysis; fifth segment oval, wider than the second, with setiform sensilla on the apical area and two plate like sensillae on its middle region. Three nodes or cephalic plates on each side, intensely pigmented in blackish brown colour, with their

periphery more sclerotised and more intensely pigmented; the nodes of the first pair, at a preantennal level, have a very small diameter and are free; nodes of second (preocular) and third (occipital) pairs have similar size, and they are connected with the preocular and occipital carinae on each side, as well as both occipital nodes. These carinae are slightly less pigmented than the nodes.

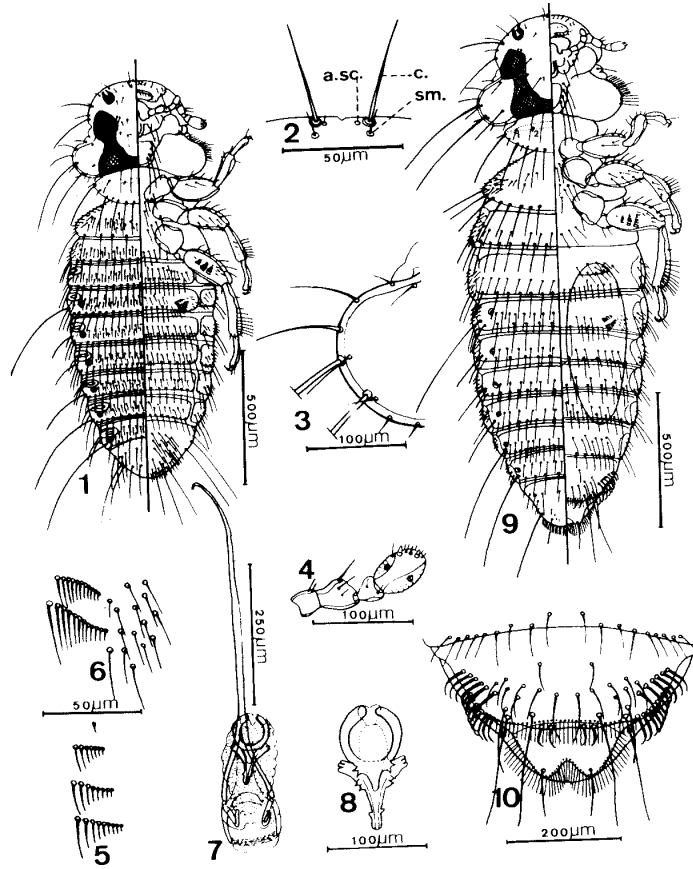
Dorsal chaetotaxy characterised by the almost absent development of the anterior subcentral seta (a.sc.) reduced to an almost dot-like stem, while central (c.) and first submarginal (s.m.) setae are markedly longer (Fig. 2). The relative development of marginal-temporal setae is also characteristic (Fig. 3): the first two have a medium length; 3rd and 4th are very long, surpassing the pterothoracic angle, and joined by a submarginal seta implanted near their base; 5th and 6th are very short and spine-like. Subcentral temporal seta well developed and almost at the same level as the 4th marginal one. Ocular setae very short. The remaining cephalic chaetotaxy has no relevant features other than the great development of the preocular marginal seta, and reduced development of the four occipital setae (their tips scarcely surpass the middle region of prothorax).

**Thorax.** Prothorax with marked angles and posterior margin strongly convex. Marginal prothoracic setae 1, 3 and 5 are short and spine-like, while 2 and 4 are longer than the six central postero-marginal setae; those latter are shorter in the female than in the male, especially the two central ones. There are two setae on each side of the pronotum: the outer one (1) is slightly longer than the spine-like marginal setae; the inner one (2) is very short, almost imperceptible. Metathorax with marked angles. Posterior margin almost straight in the male and slightly incurved in the female. Metathorax is, proportionally, much more developed in the female. Lateral margins with a row of spine-like setae; the density of these setae increases on the postero-marginal area, especially in the female. The original row splits into two irregular rows extending towards the dorsal middle area; in this region, setae are abundant in the male (30) but fewer in the female (12–14) and absent from the central area of the latter. Posterior margin with 10 long setae in the male and 16 in the female; marginal seta 2 not differentiated from the rest. Ctenidia on the 3rd femur preceded by one spine-like seta, and bearing 6–7, 8–10 and 7–9 spine-like setae per ctenidium (Fig. 5).

**Abdomen of male** with subequal segments I–VIII. Tergites with well chitinized and continuous plates. Sternites with well differentiated plates. A wide sternocentral and two narrow lateral ones, the latter being longer than wide. Pleural plates on segments II to VIII well chitinized, with pyriform oval shape, more developed in VII and VIII, and at a level immediately anterior to the spiracles.

Tergites chaetotaxy with two slightly irregular rows of short anterior tergal setae (more irregular in the first than in the following segments), and a row of tergomarginal setae (these setae longer than the former; specially the ones on tergites I and II, whose apexes reach, or almost, the base of the marginal setae on the following segment). Number per tergite: I, 18, 18, 17; II, 20, 20, 20; III, 24, 24, 22; IV, 22, 20, 22; V, 20, 20, 22; VI, 20, 20, 20; VII, 20, 18, 18; VIII, 12, 14, 8. Postspiracular setae very long on III, VII and VIII; short on IV and V; and medium size on VI. Last segment with an anterior row of 12 setae, and a posterior row of 4, and 2 marginal setae in the middle area more developed in diameter and length than the others.

Sternal chaetotaxy reduced, on central plates, to a row of anterior setae (very irregular on II and III) and a row of marginal setae with similar development to the central ones. Two ctenidia on each side of the central plate of sternite III; 11–12



Figs 1-10. *Neocolpocephalum cucullare* (Giebel): 1. Male. 2. Anterior setae. 3. Margino-temporal setae. 4. Antennae. 5. Ctenidia on the 3rd femur. 6. Ctenidia and slender setae on sternite III. 7. Male genitalia. 8. Sclerite of genital sac. 9. Female. 10. Last abdominal segments of the female.

spine-like setae in the first one, and 11-13 in the second; laterally accompanied by a group of 12-15 slender setae similar in length to the ones in the combs (Fig. 6). Last sternite bearing a group of numerous central setae (similar in length to the setae on the other sternites) and two groups of 3 long and strong marginal setae, first seta in anterior marginal group thinner and shorter.

Genitalia (Figs. 7-8) with basal plate very long and narrow, shaped like an inverted "Y", and extending as far as segment I of the abdomen. Narrow parameres, almost parallel; acicular and flexible endomeres, a bit longer than parameres. Sclerite of genital sac (Fig. 8) with a pair of tooth-like latero-subterminal projections, penis shorter and narrow, with three denticles on its basal angles.

**Abdomen of female** with segment II longer than I and III; triangular pleurites feebly sclerotised; tergal plates with lateral zones slightly separated, abdominal apex less acute than in the male.

Chaetotaxy notably reduced when compared to the male. Anterior tergal setae in a single row, 12-14 setae per segment, very short and slender. Tergomarginal setae nearly double in length; 12-16 setae on segments I to VII, 8 on VIII. Last tergite as in Fig. 10. Postspiracular setae very long on III, VII and VIII; short and subequal on IV to VI. Sternal setae: I, with a curved central row of 6-7 setae; II, with two anterior groups of 12-14 setae and a row of 18-20 marginal ones; III, similar to the male's, with a medially interrupted row of 6-7 setae; two ctenidia and a group of short, slender setae, and a row of 14-17 marginal setae (the two central ones notably longer than the others); IV, with 12 median and 12-14 marginal setae; V, with 10-12 and 12-14; VI, 12-14; VII, 14-16 and 14-16; VIII, and IX, as in Fig 10, with two oblique rows of 6-7 setae, and 8 robust and hooked setae on each angle of vulva. This latter flat, with a continuous row of slender, spine-like setae along its edge, and four stronger and hooked setae divided into two groups of two on its medial area. Anus "W" shaped, edged by a continuous row of thin, subequal, spine-like setae, and with a strong submarginal seta on each lobe. The rest of chaetotaxy as in Fig. 10.

TABLE 1. Measurements of *Neocolpocephalum cucullare* (mm)

Parameter*	Males (1)	Females (2)	
		Range	Mean
H.L.	0,30	0,35-0,35	(0,35)
H.W. preocular	0,36	0,38-0,39	(0,385)
temporal	0,48	0,53-0,55	(0,54)
Pr.L.	0,13	0,14-0,14	(0,14)
Pr.W.	0,33	0,36-0,36	(0,36)
Pt.L.	0,15	0,16-0,20	(0,18)
Pt.W.	0,42	0,51-0,51	(0,51)
A.L.	0,88	1,08-1,29	(1,18)
A.W.	0,55	0,64-0,64	(0,64)
T.L.	1,51	1,73-1,98	(1,85)
G.L.	0,68		
C.I.	1,60	1,51-1,56	(1,53)

\*See text for explanation of abbreviations.

MATERIAL EXAMINED: 1 male and 2 females collected from a specimen of *Sagittarius serpentarius* from the Zoo of Barcelona (SPAIN), III-1989; Gállego leg.

Comments. - This species, described as *Colpocephalum cucullare* has been reported in several localities: Pretoria (Howard, 1912, as *Liotheum caudatum* (Gieb.)); Coll. South African Museum, Cape Town (Waterston, 1914); Mozambique (Tendeiro, 1951, 1958); Kenya (Price and Beer, 1963).

Following the criterion of Eichler and Zlotorzycza (1971) we include this species in the genus *Neocolpocephalum*, nomen novum given by Ewing (1933) for *Ferrisia*, described by Uchida (1926). This genus includes Colpocephalinae, parasites on Falconiformes, which are characterized as follows: females with fusiform abdomen, while this region is, in the males, slender and oval-elongated; narrow, short and lobed pleural plates in the males, while they are poorly developed and not always clearly visible in the females; presence of 4 (2+2) hooked setae on the middle area of the vulval edge of females.

*N. cucullare* belongs to the 'turbinatum group', which is considered 'sensu lato' by Price and Beer (1963) as constituted by species which show certain common characters but showing variability related with the different hosts. *N. cucullare* shows some differences with respect to the general features of the species in the group: medio-dorsal setae on the head are short to medium in length; occipital setae not very long; 10 prothoracic marginal setae in the male, 16 in the female, all of them with a similar length. These morphological differences seem to prove the close relation between parasite and host; being the latter, in this case, an 'abnormal' Falconiform related to Gruiformes birds.

*Falcolipeurus secretarius* (Giebel). (Figs 11-17).

**Lipeurus secretarius** Giebel, 1874: 213.

**Esthiopterum secretarium** (Giebel): Harrison, 1916: 141.

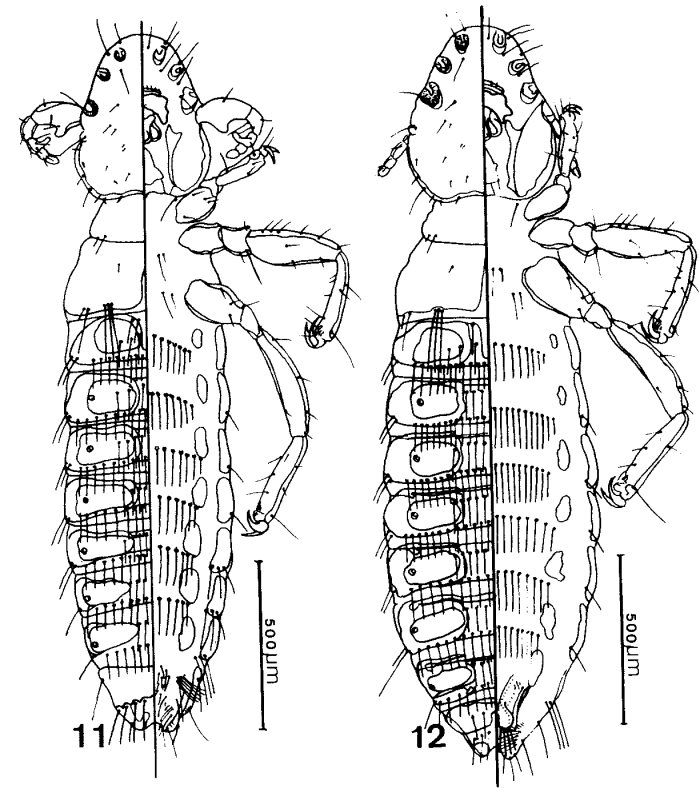
*Falcolipeurus secretarius* (Giebel): Bedford, 1931: 291

Type host: *Gypogeranus serpentarius* = (*Sagittarius serpentarius*) (Miller)

**Description.** Large Lipeuridae, elongated, characterised by possessing six cephalic endocarinae which gives on it an unmistakable appearance. Noticeable sexual dimorphism, clearly shown in the shape of the antennae and in the shape and sclerotisation of the abdomen, it is wide and fusiform in the females, narrow and with subparallel edges in the male. This region, because of its differences in morphology and chaetotaxy, will be described separately for each sex.

**Head.** Longer than wide (C.L.: males = 0,81; females = 0,88), with the clypeal region smoothly sharpening, bearing three approximately oval endocarinae on each side: first pair slightly pigmented; second pair more pigmented and pyriform; third pair bigger, heavily sclerotised and opened apically.

Dorsal cephalic chaetotaxy: 3 marginal and 2 medio-dorsal setae on each side: the anterior long seta situated at the level of the second carina; the posterior short, situated at the level of the third endocarina. Ocular seta of medium length, not superior, or scarcely, to that of preantennal marginal and medio-dorsal setae. Five small dorso-temporal setae, almost spine-like, the first two ones very close to each other; the third is submarginal. Five spine-like margino-temporal setae, the third being of medium length.



Figs 11-12. *Falcolipeurus secretarius* (Giebel): 11. Male. 12. Female.

Ventral cephalic chaetotaxy: 2 marginal setae, approximately at the level of the first two endocarinae; 1 submarginal beside and behind the first marginal one; 4 subventral setae. All of them with medium length and subequal.

Antennae of male with a fusiform first segment bearing a very large inner apophysis, and longer than second and third segments together, third segment with a incurved latero-terminal apophysis, almost as long as the segment itself. Antennae of female filiform, first, second and third segments subequal in length and longer than the last two segments.

**Thorax.** *Prothorax* with subparallel lateral margins. Posterior edge slightly convex, 2 setae near each angle, the outer one in each pair being spine-like. *Pterothorax* with slightly divergent margins and straight posterior edge; 1 spine-like submedial dorsal seta on each side; 2 setae near each of the postero-external angles, the outer one spine-like, the inner one long; two groups of three long setae implanted near the posterior edge and equidistant from the mid-line and from the postero-external angle. Ventrally, 1 medium sized seta at the level of the coxa I, and 1 medium sized and 1 spine-like seta at the level of coxae II and III. Sternal plates missing.

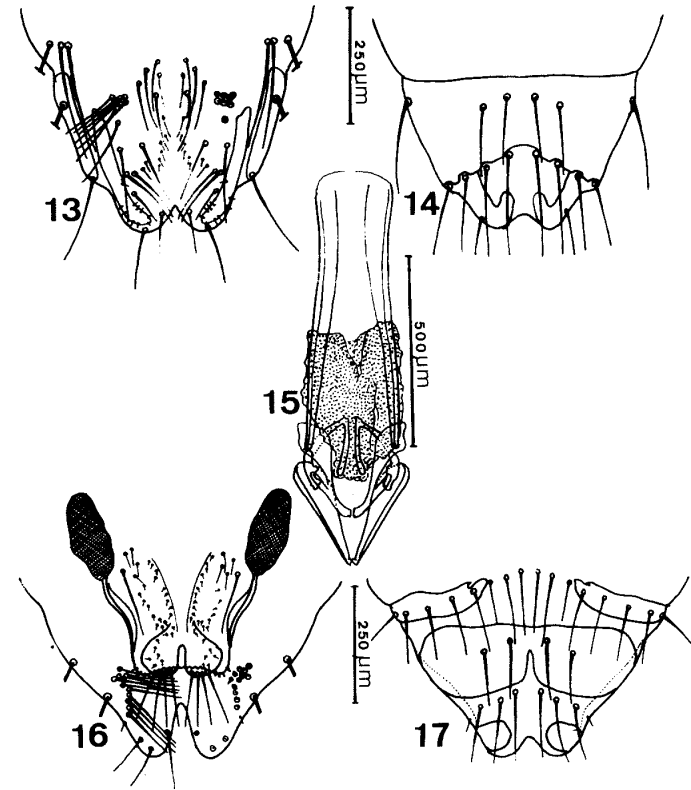
**Abdomen of male.** (Figs 11, 13, 14). Well developed paratergal plates in every segment, with the marginal areas more sclerotised and pigmented than the internal ones; these plates are approximately rectangular in tergites I–V, and are joined by a tergal band, this band is pigmented, and narrowed by a very deep notch almost reaching its base in segment I; they are continuous and widened from segments II to V. In segments VI–VIII, plates are subtriangular and thickened only in the external and superior margins. Plate in VIII covers the whole tergite; its posterior edge is concave, and reaches the marginal zones of the last segment in the form of a sclerotised area that incurves like a “V” in the apical lobes of the abdomen. Pleural plates are narrow, with their anterior edges not reaching the preceding segment; lateral edges parallel; breadth increases from segments I to V, and decreases in the following, VI to IX. Sternal plates small, more or less oval, and slightly increasing in size up to segment VI; plate on VII a bit smaller and deeply inserted in the preceding plate.

Tergal chaetotaxy: three rows of setae (4, 6 and 15–17) in I; two rows (7–8 and 16–18) in II–IV; two rows (6–8 and 15–17) in V; two rows (5 and 15) in VI; two rows (4 and 12) in VII; two rows (4 and 6–8) in VIII. Sternal chaetotaxy with a single row of setae: I, 13–15; II and III, 15–18; IV, 14; V and VI, 12–13; VII, 9–10. Pleural setae: I, 2+0; II–IV, 2+1; V and VI, 2+3; VII, 1+3.

Genital region (Fig. 13) with a complex chaetotaxy, unusual, the two “clusters” of setae (7–8 per group) implanted near the internal basal zone of the last sternites.

Genitalia (Fig 15) with basal plate extending up to the posterior edge of segment V; preputial sac approximately covering one half of the basal plate, and without penis sclerites; parameres of medium length, thickened at the base and convergent at the apex, with an internal subapical denticle; endomeres separated in the middle, longer than the endomeral base and with wing-shaped lateral appendages; hypomere present, slightly chitinized and with a widened apical end.

**Abdomen of female.** Subrectangular paratergal plates on segments I–VII; these plates joined by a chitinized tergal band. The band is deeply notched in I, and has a subequal width in all the segments, its anterior chitinized edge bearing a marked transverse groove in segments III to VII. Anterior margin of segment VII clearly split by the groove; paratergal plates on this tergite show, as seen from behind, some short, independent plates which are equal in width; they seem to correspond to the posterior edge of the paratergal plates because, as in the preceding ones, the setae from the posterior row of the tergite are implanted on them (Figs 12 and 17). The plate is continuous in tergite VIII, without a differentiated margin and bearing a deep notch medially on its posterior edge; in segment IX, they are reduced to two small latero-terminal chitinized areas (Fig. 17). Pleural plates with similar width in segments I–VII, and very narrow in VIII and IX. Sternal plates as in the male, but smaller and with more irregular margins in the last ones.



Figs 13–17. *Falcolispeurus secretarius* (Giebel): 13–14. Genital region of male, ventral and dorsal views. 15. Male genitalia. 16–17. Genital region of the female, ventral and dorsal views.

Chaetotaxy similar to that in the male, but with more setae. Tergal setae: I, 4, 6 and 16–20; II, 7–8 and 21–23; III, 7–8 and 21–25; IV, 7–8 and 20–22; V, 6–8 and 16–18; VI, 5–7 and 15–18; VII, 4–6 and 16–17; VIII, 4; IX, 6. Sternal setae: I, 13–19; II, 19–24; III, 20–21; IV, 16–19; V, 15–17; VI, 12–15. Pleural setae: I, 2+0; II–VI, 2+1 (one of them longer on VI); VII, 1+3.

Genital region chaetotaxy as in Fig. 16. Vulva with slightly denticulated fringe; 4–5 small spine-like setae near each its angles; 4 long setae, subequal in length, not

TABLE 2. Measurements of *Falcolipeurus secretarius* (mm)

Parameter*	Males (2)		Females (4)	
	Range	Mean	Range	Mean
H.L.	0,95-0,96	0,955	0,91-1,02	0,98
H.W.	0,76-0,80	0,78	0,82-0,88	0,86
Pr.L.	0,31-0,36	0,33	0,33-0,36	0,34
Pr.W.	0,61-0,64	0,62	0,60-0,72	0,67
Pt.L.	0,40-0,40	0,40	0,38-0,43	0,40
Pt.W.	0,92-0,98	0,95	0,92-1,09	1,02
A.L.	2,48-2,61	2,54	2,61-3,04	2,73
A.A.	0,87-0,96	0,91	1,13-1,30	1,22
T.L.	4,04-4,26	4,15	4,17-4,39	4,29
G.L.	1,04-1,09	1,06		
P.L.	0,30-0,31	0,305		
C.I.	0,80-0,83	0,81	0,86-0,90	0,88

\*See text for explanation of abbreviations.

surpassing the base of the anal ones, on each of the lobes of the bilobate sclerite on its medial region. Clusters of paragenital setae, with 11-12 setae per group and 1 small spine-like seta; the latter separates the grouped anterior setae from the four last ones, whose bases are arranged along a longitudinal row.

MATERIAL EXAMINED: 2 males, 4 females and 2 nymphs, collected from a specimen of *Sagittarius serpentarius* from the Zoo of Barcelona (Spain), III. 1979, Gállego leg.

*Comments.* This species is reported as *Lipeurus secretarius* by Piaget (1880) from the Zoo of Rotterdam and by Waterston (1914) from the South African Museum Cape Town. Afterwards another authors recorded it as *Falcolipeurus secretarius*: Eichler (1942); Hopkins and Clay (1952); Tendeiro (1951, 1958, 1959) from Mozambique, Zlotorzycska (1963) from Hamburg Zoological Museum.

Bedford (1931) described the genus *Falcolipeurus* with *F. secretarius* as its type-species and compared the latter to two closely related African species of the genus *Falcolipeurus*: *F. lineatus* Bedford and *F. africanus* Bedford, both found on hosts from Transvaal (*Terathopius ecaudatus* Daud. and *Pseudogyps africanus* Erl., respectively). Some morphological differences are found when comparing the material studied in this paper to the drawings of *F. secretarius* by Bedford (1931). In these drawings, the genital cluster of the female bears 10 setae plus 3 very long and strong setae implanted at the inferior end of the bilobed sclerite placed on the edge of the vulva; in all the specimens examined in the present study, the number of setae in the cluster varies between 11 and 12, and there are 4 long setae at the end of the bilobated sclerite (Fig. 16). There are also differences concerning the chaetotaxy of the sternal sclerites placed on the posterior end of the male genitalia (Fig. 13).

Dimensions given for the type-species are, in general, smaller than those found on the studied material; and the C.I. as well as the Corporeal Index (T.L./A.W.) reveal differences in the shape of the specimens:

	males	females
C.I. (studied material)	0,81	0,88
C.I. (type-species)	0,82	0,81
Corporeal Index (studied material)	4,56	3,51
Corporeal Index (type-species)	4,11	3,53

These data show that the head of the females from our material is wider than the type-species head, while the maximum width (A.W.) of the males is considerably less than the one in the type-species described by Bedford (1931).

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