

Falcolipeurus josephi, a New American Mallophagan from Caracaras of the Genus *Polyborus*, and a Key to Allied Species (Ischnocera: Philopteridae)¹

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ABSTRACT

This new species, described from two species of caracaras, differs strikingly from the three other known species of the *assessor* group of *Falcolipeurus*. A key to this group is given. *Lipeurus polybori* Rudow, 1869

(=*L. polybori* Rudow, 1870) is discussed; this seems an unidentifiable species, probably of the genus *Anaticola*, whose natural host is not a caracara.

A revision of the genus *Falcolipeurus* Bedford, 1931, based mainly on material obtained on loan from the British Museum (Natural History), is nearing completion. The study reveals that the known species of the genus (see Hopkins and Clay 1952, 1953) are divisible into three species groups; and, furthermore, that the populations parasitizing the caracaras *Polyborus plancus brasiliensis* (Gmelin) and *Polyborus c. cheriway* (Jacquin) are conspecific and belong to the *assessor* group. This species differs strikingly from the other species of the group; and, being of interest, its account is presented in advance.

But before describing the form, it is incumbent to discuss *Lipeurus polybori* Rudow, 1869, a taxon already dealt with and disposed of by Clay and Hopkins (1955). Ferdinand Rudow (1869) described this as *Lipeurus polybori*, later (1870) amending the name to *L. polybori*, from material from *Polyborus tharus* Molina, =*Polyborus p. plancus* (J. F. Miller), provided by the Hamburg Museum. He first (1869: 35) compared this species with *Lipeurus punctulatus* and later (1870: 127) with *L. tadornae*, species now referred to the genus *Anaticola*—an action of decisive significance in determining the status of *L. polybori*. Taschenberg (1882: 110) said that there were no specimens from *Polyborus tharus* in the Hamburg collection examined, later, by him, but that he saw a drawing of *L. polybori* which showed that it did not belong to the "sexguttati" (= *Falcolipeurus*) division of *Lipeurus*. Clay and Hopkins (1955) have stated that the collection of Mallophaga recently found in the Hamburg Museum seems to be, at least in part, the material used by Rudow for his original descriptions. One male and one female *Falcolipeurus*, which have been mounted by them, are represented in this collection, but they find that the male is certainly not, and the female probably not, the same species that is usually found on *Polyborus*.

Furthermore, these specimens have no specific name label; and as, in view of Taschenberg's statements, there is no evidence that Rudow ever saw these particular specimens, Clay and Hopkins justifiably concluded that these *Falcolipeurus* were most

probably later additions to the collection. Dr. Clay, in correspondence, points out that Rudow (1870: 127) stated that he saw only a female, while the specimens now in the Hamburg Museum comprise a male and a female which were originally in one tube. This is an additional reason for presuming that they are not the Rudow type material.

All these points, taken together, leave little doubt that Rudow conferred the name *Lipeurus polybori*, not to the natural, elongate ischnoceran (or *Falcolipeurus*) of *Polyborus plancus*, but to some straggler *Anaticola* which has not been identified (Hopkins and Clay 1952: 33). Eichler (1942) also included *L. polybori* in *Falcolipeurus* with reservations. Due to the doubtful status of *Lipeurus polybori* Rudow, 1869, Clay and Hopkins (1955) proposed to apply to the International Commission on Zoological Nomenclature to place this name of the Official Index of Rejected and Invalid Specific Names in Zoology.

Genus *Falcolipeurus* Bedford, 1931

Falcolipeurus josephi, new species

Type host: *Polyborus plancus brasiliensis* (Gmelin)
(Figs. 1-5)

Color of specimens in 90% alcohol light brown or tan; pigmentation pattern of dorsum characteristic. Slight sexual dimorphism in length, marked in antennae.

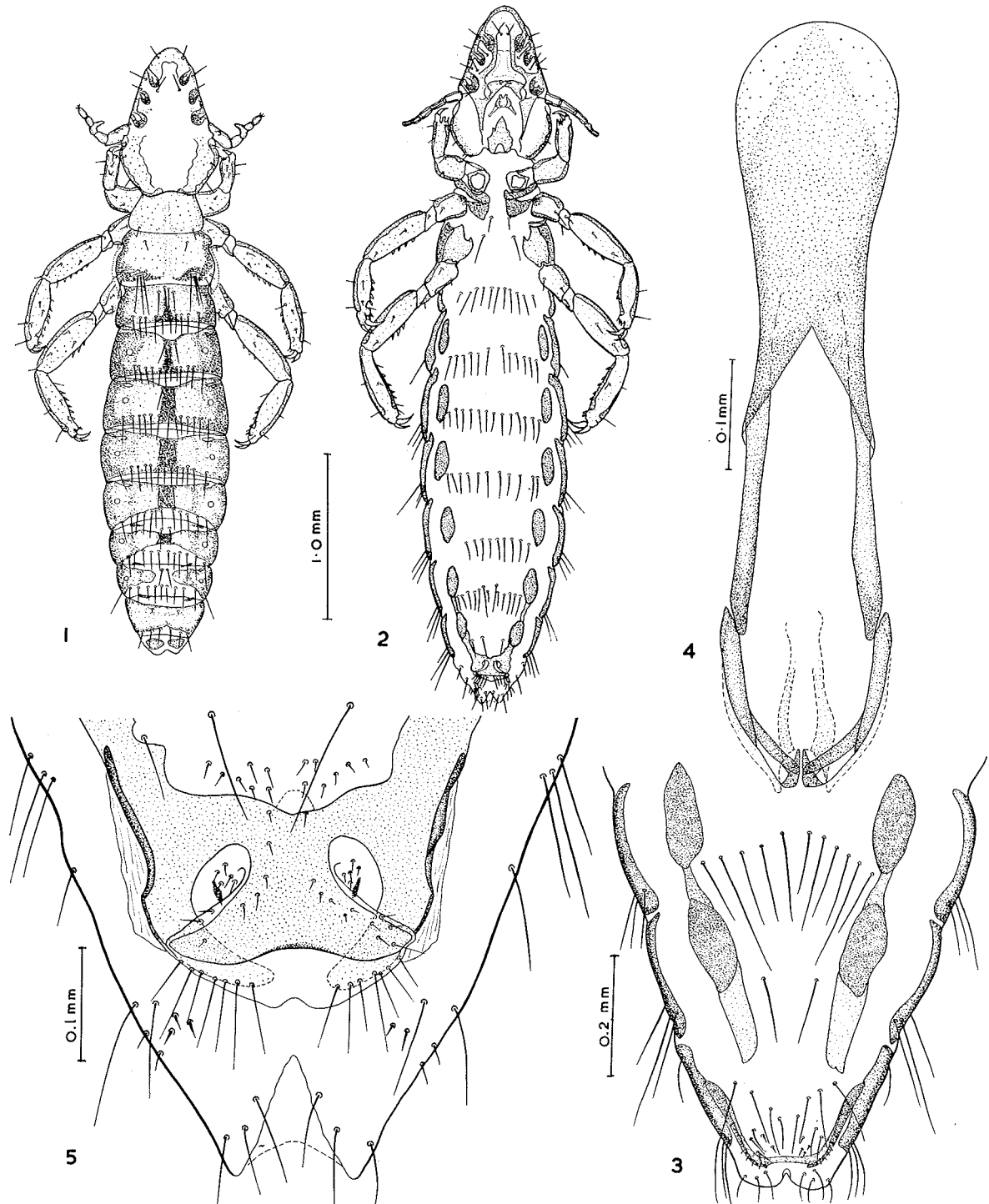
MALE (figs. 1, 3, 4).—The part of anterior margin of head between first pair of incassations prolonged and bluntly rounded; preantennal region longer than postantennal region. First pair of incassations larger than second pair, but incassations less prominent than preantennal nodi. Ocular setae of medium length; of the six marginal temporal setae each side, the first and second are of medium length but still spinelike, the third, fifth, and sixth short and spinelike, the fourth almost as long as ocular setae. Dorsal protuberance on the first, enlarged, antennal segment feebly developed; hook arising from inner margin of third antennal segment relatively short.

Prothoracic chaetotaxy not typical of the genus, there being only one seta of medium length each side of posterior margin of pronotum. Pterothoracic sternal plate absent, but pterothoracic chaetotaxy typical of the genus.

Shape and general characters of abdomen as

¹ Accepted for publication July 23, 1962.

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FIGS. 1-5.—*Falcolipeurus josephi*, n. sp., from *Polyborus plancus brasiliensis*. FIG. 1.—Male, dorsal view. FIG. 2.—Female, ventral view. FIG. 3.—Male terminalia, ventral view; all anal setae ventral in position. FIG. 4.—Male external genitalia. FIG. 5.—Female terminalia, ventral view.

shown in figure 1. Segment II (actually I+II) and its tergal thickening shorter than III. Tergites II to V apparently continuous across the segment, II involving almost the entire tergum, leaving only a

narrow unsclerotized strip posteriorly; III to V also involving the greater area of the tergum but with an additional narrow, unsclerotized strip anteriorly. Anterior margin of tergite II with a

median notch, tergites III to V with a median emargination; posterior margin of tergites II and III more or less straight, that of IV and V slightly curved. Tergite VI also apparently continuous across segment; its anterior margin like that of V, with or without the median emargination, but posteriorly greatly curved, so that there is a narrow, unsclerotized strip anteriorly, much as on V, but a relatively wide strip posteriorly. Thickening of segment VII variable, either continuous across the segment or as lateral plates having somewhat straight anterior and curved posterior margins; anterior and posterior unsclerotized strips both wider than on VI. Thickening of segment VIII as lateral tergites; posterior unsclerotized strip even wider than on VII. Thickening of IX+X continuous across the segment, with almost straight anterior and slightly curved posterior margins, involving almost the entire terga; that of XI as large, lateral, somewhat triangular plates with apices directed inwards, involving the greater area of the tergum. Tergal plate II darker centrally, but posteriorly only; III to VI much darker centrally, the intensity of darkening increasing progressively towards the posterior segments; VII also dark centrally but less so than VI, the central sclerotization sometimes merging with, sometimes distinct from the lateral sclerotized areas. Tergum VIII unsclerotized centrally; tergite IX+X slightly lighter in color centrally than laterally; tergum XI unsclerotized centrally. On any of segments III to V, or even VI, an

indistinct, longitudinal thickening may be present on one or both sides; this may be the beginning of differentiation of the continuous tergal plate into lateral tergites. Three pairs of narrow, transverse intertergal thickenings present between segments VI to IX+X.

Sternal thickenings as follows: absent on segment II; as lateral, ovoid plates on segments III to VII; each lateral sternite VII continuous posteriorly through a narrow sclerite with an elongated plate or genital plate; genital plates widely separated, pointed or rounded posteriorly, their anterior part more heavily sclerotized than the posterior portion. Lateral plates associated with segments VIII and IX (Hopkins 1941; 293) fused posteriorly with one another and falling short of posterior margin of tergum XI.

Abdominal chaetotaxy as shown in table 1, its important features being: the presence of only two rows of tergal setae on segment II (=I+II, fused), an anterior row of fewer setae belonging to I and a posterior row of numerous setae belonging to II; absence of pleural setae on II; and two short, spinelike anterior tergo-central setae on tergite IX+X. Alveoli of setae of posterior tergal row placed as follows: segments II to V with alveoli of all setae on tergal plate; VI either with alveoli of all setae off the tergite or with alveoli of one outermost seta, each side, on the tergite; VII and VIII with alveoli of all setae off the tergite; IX+X with alveoli of four median setae off and that of one

Table 1.—Thoracic and abdominal chaetotaxy of *Falcolipeurus josephi*, n. sp., from two species of *Polyborus*.

Host:	Dorsal setae			Sternal setae			Pleural setae		
	<i>Polyborus plancus brasiliensis</i>	<i>Polyborus c. cheriway</i>		<i>Polyborus plancus brasiliensis</i>	<i>Polyborus c. cheriway</i>		<i>Polyborus plancus brasiliensis</i>	<i>Polyborus c. cheriway</i>	
<i>Males:</i>	<i>Holotype</i> ^a	<i>1 paratype</i>	<i>3 paratypes</i>	<i>Holotype</i> ^b	<i>1 paratype</i>	<i>3 paratypes</i>	<i>Holotype</i> ^b	<i>1 paratype</i>	<i>3 paratypes</i>
Prothorax ^c	1,1 (2)	1,1 (2)	1,1 (2)	—	—	—	—	—	—
Pterothorax ^d	1,1 (2)	1,1 (2)	1,1 (2)	1,1 (2)	0,1 (1)	0-1 (0-2)	—	—	—
"	5,5 (10)	5,5 (10)	5,5 (10)	1,1 (2)	1,1 (2)	1,1 (2)	—	—	—
Abdomen ^e									
" II	4; 10	3; 12	3-4; 11-12	10	8	6-7	0,0 (0)	0,0 (0)	0,0 (0)
" III	2; 13	2; 12	2; 12-14	11	15	11-13	1,1 (2)	0,1 (1)	1,1 (2)
" IV	2; 13	2; 14	2; 13	8?	10	10-13	3,2 (5)	1,2 (3)	1-2 (2-4)
" V	2; 13	2; 17	2; 13	12	13	10-11	3,3 (6)	?3 (?)	1-3 (4-6)
" VI	2; 12	2; 11	2; 11-12	10	11	10	3,3 (6)	?3 (?)	3,3 (6)
" VII	2; 12	2; 13	1-2; (8-10)	11	11	9	3,3 (6)	5,3 (8)	2-3 (5-6)
" VIII	2; 1,9,1	3; 1,9,1	2; 1,7-8,1	2	2	2	3,3 (6)	3,3 (6)	3,3 (6)
" IX+X	2; —	2; —	2; —	—	—	—	1,1 (2)	—	1,1 (2)
"	— 6	— 6	— 6	—	—	—	3,3 (6)	—	3-4 (6-7)
<i>Females:</i>	<i>Allotype</i>	<i>3 paratypes</i>	<i>8 paratypes</i>	<i>Allotype</i> ^f	<i>3 paratypes</i>	<i>8 paratypes</i>	<i>Allotype</i>	<i>3 paratypes</i>	<i>8 paratypes</i>
Prothorax ^c	1,1 (2)	1-2 (2-3)	1-2 (2-3)	—	—	—	—	—	—
Pterothorax ^d	1,1 (2)	1,1 (2)	1,1 (2)	1,1 (2)	1,1 (2)	0-1 (1-2)	—	—	—
"	5,4 (9)	5,5 (10)	5,5 (10)	1,1 (2)	1,1 (2)	1,1 (2)	—	—	—
Abdomen ^e									
" II	5; 13	4; 11-14	3-4; 11-12	11	10-11	7-11	0,0 (0)	0,1 (1)	0,0 (0)
" III	2; 13	2; 12-14	2; 12-14	12	11-13	9-13	1,1 (2)	1,1 (2)	0-1 (1-2)
" IV	2; 13	1-2; 12-13	2; 11-14	14	12-14	10-13	3,3 (6)	1-3 (2-6)	1-3 (2-5)
" V	2; 13	2; 13	2; 12-14	?	11-13	9-12	3,3 (6)	2-3 (4-6)	2-3 (5-6)
" VI	2; 10	2; 12-13	2; 10-12	?	10-12	8-11	3,3 (6)	2-3 (5-6)	2-4 (4-7)
" VII	2; 11	2; 9-11	2; 9-11	13	10-11	9-12	3,2 (5)	2-3 (4-6)	2-3 (4-6)
" VIII	2; 1,8,1	2; 1,7-9,1	2; 1,7-8,1	3	2	2	3,3 (6)	3,3 (6)	2-3 (5-6)
" IX-XI	3; —	2; —	1-3; —	—	—	—	1,1 (2)	1,1 (2)	1,1 (2)
"	— 6	— 6	— 6	—	—	—	1,1 (2)	1,1 (2)	1,1 (2)

^a See figure 1.

^b See figure 3.

^c For the prothorax and the pterothorax (and also for the pleural setae on the abdominal segments), the number of setae on each side of the body is given, followed (in parentheses) by the respective totals.

^d The setae on the pterothorax are in two rows; the anterior row is enumerated on the first line, the posterior row on the second line. In all except one of the specimens seen there were five dorsal setae on each side of the body in the posterior row, arranged 1+1+3. In the allotype, however, one side of the body has 1+1+3, the other 2+1+1.

^e In enumerating the dorsal setae on the abdominal segments, the number in the anterior row is followed by the number in the posterior row. The sternal setae on the abdominal segments are in a single row. The pleural setae are enumerated in the manner described in footnote c above.

^f See figures 2 and 5, respectively, for the sternal and pleural chaetotaxy of the allotype.

outermost seta, each side, on the tergite. All three anal setae, each side, ventral in position.

Genital opening ventral; male external genitalia comprising an anterior, well developed, basal apodeme, a posterior sclerotized area, and the preputial sac. Anterior half of basal apodeme well and almost uniformly sclerotized, posterior half medianly membranous and laterally heavily sclerotized and barlike; an elongated intermediate sclerite is articulated to the posterior end of this barlike thickening, each continuing posteriorly as the paramere. The two intermediate sclerites and the parameres converge towards one another so that the inner margins of the parameres, in their posterior halves only, become parallel and applied to one another; another distinct sclerite, here termed the endomere, runs along the inner margin of each paramere. In the normal, resting state of the genitalia the tips of the parameres are upturned and retracted.

Due to the small size of the genitalia, the relationships of the preputial sac with other sclerites and the mode of its formation are not clearly understood. It appears, however, that the median, membranous part of the basal apodeme, between the barlike lateral arms, extends almost to the tips of the parameres, then, after turning dorsally, extends anteriorly to form, or become continuous with, the ventral wall of the preputial sac. The ventral wall is thickened to form a pair of narrow, elongated sclerites. The dorsal wall of the preputial sac appears to be formed by the membranous portion lying between the intermediate sclerites. The walls of the preputial sac bear clusters of minute spines (microtrichia); the sac opens posteriorly by a semicircular opening formed principally by its ventral wall.

FEMALE (figs. 2, 5).—General characters of head (except antennae) and of pro- and pterothorax as in male, but with larger measurements. Besides the seta each side of posterior margin of pronotum as in male, there may be occasionally an outer, short, spinelike seta on one side only.

Shape and general character of abdomen as shown in figure 2. Tergal thickenings of segments II to V as in male; VI to VIII resembling that of V. Segments IX+X not separated from XI by a dorsal suture, the latter being fused with the former; thickening of fused segments IX-XI not separated transversely, but forming an undivided plate whose outer margins anteriorly fall slightly short of the lateral segmental margins; its anterior margin with a shallow, its posterior margin with a much deeper median notch. As in the male, an indistinct, longitudinal thickening may be present on all or some of segments III to VIII, on one or both sides, which may be the beginning of differentiation of the continuous tergite into lateral plates. Tergite II darker centrally than in male; III to VII much darker centrally than laterally; VIII lighter centrally than laterally; IX-XI almost uniformly pigmented. Sternal thickening absent on segment II; III to VII as in male; each lateral sternite VII continuous pos-

teriorly through a narrow sclerite with an elongated plate or genital plate. Sternites posterior to genital opening absent.

Abdominal chaetotaxy is given in table 2; it shows the same features as in the male. However, in 1 specimen out of 12, one pleural seta was present on one side only of segment II. Tergite IX-XI with two short, anterior, tergo-central setae and a posterior row of six, of which two are elongate and four are short and spinelike. Alveoli of setae of posterior tergal row on the tergal plate in all segments.

Genital opening underlain by a median, somewhat triangular flap, termed the median genital flap, an extension of the sternum, measuring 0.027 to 0.237 mm. across; general sclerotization of the flap not extending anteriorly, but turning laterally each side and merging with inner margin of lateral genital plate; the flap with 4 to 8 setae on each side (total, 10 to 15). Dorsal wall of genital chamber with clusters of minute spines which appear as denticles, and with a pair of small, obliquely placed, supra-valvular sclerites; ventral wall bearing continuous rows of minute spines.

Measurements in millimeters and C.I. of types are given in table 2.

MATERIAL EXAMINED.—Holotype male and allotype female from *Polyborus plancus brasiliensis* (Gmelin), from São Paulo, Brazil; L. R. Guimarães collection, Slide No. 1337. Paratypes: 1♂ (dissected) and 5♀ from same caracaras, as above, Slide No. 1337. 3♂ (dissected) and 5♀ (dissected) from *Polyborus c. cheriway* (Jacquin, 1784), from British Guiana; British Museum (Natural History) collection, Slide No. 1961-188. 3♀ from *Polyborus cheriway* (Jacquin), from Florida, Meinertzhagen collection, Slide No. 20279.

The species is named *josephi* to honor Dr. M. T. Joseph, M.Sc. (Travancore), Ph.D. (Fordham), of the Indian Agricultural Research Institute, New Delhi, whose life came to a tragic end on January 6, 1960—a date to be remembered by all Indian scientists.

DISCUSSION

The species comprising the *assessor* group are *Falcolipeurus assessor* (Giebel, 1874), *F. marginalis* (Osborn, 1902), *F. quadriguttatus* (Giebel, 1874),

Table 2.—Measurements in millimeters of *Falcolipeurus josephi*, new species.

	Male holotype		Female allotype	
	Length	Breadth	Length	Breadth
Head	0.84	0.54	0.92	0.60
Prothorax	0.23	0.47	0.25	0.54
Pterothorax	0.31	0.58	0.40	0.65
Abdomen	2.17	0.74	2.82	0.93
Total	3.55		4.37	
C.I.		0.64		0.65
Genital flap				0.22

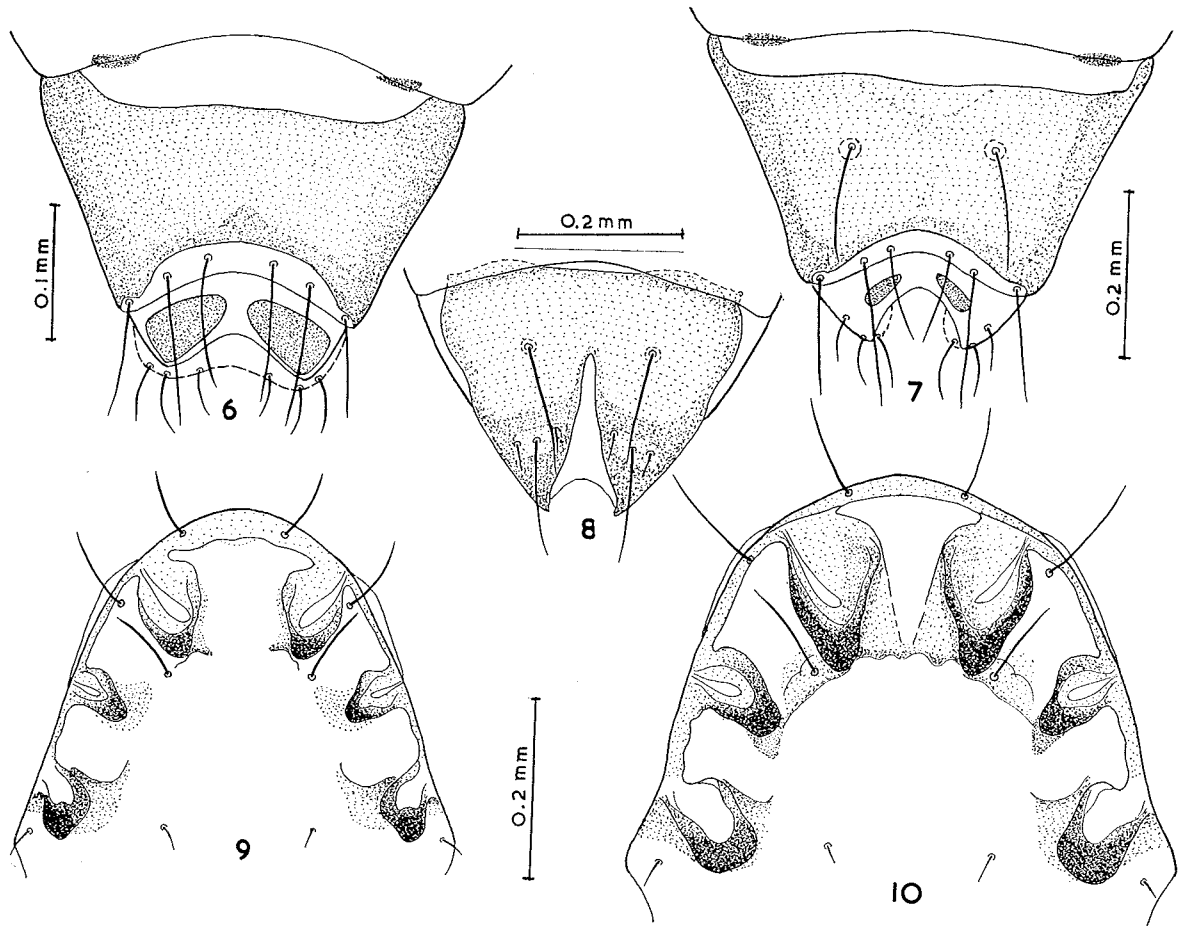


FIG. 6.—Dorsal view of male abdominal segments IX-X and XI of *Falcolipeurus quadriguttatus* (Giebel) from *Rostrhamus sociabilis*; all three anal setae on each side marginal in position. FIG. 7.—Same, of *F. assessor* from *Vultur gryphus*; one of the three anal setae on each side is dorsal and two are marginal in position. FIG. 8.—Dorsal view of female abdominal segments IX-XI of *F. marginalis* (Osborn) from *Cathartes aura*. FIG. 9.—Dorsal view of preantennal region of head of *F. marginalis*. FIG. 10.—Same, of *F. assessor*.

and *F. josephi*, new species. These four Nearctic and Neotropical species do not form a homogeneous group, but they have certain characters in common which makes it convenient to treat them as one group. *F. assessor* and *F. marginalis*, parasitic on American vultures (suborder Cathartae), resemble one another in several characters as well, and hence are probably closely related. In each of the other species, *F. quadriguttatus* and *F. josephi*, parasitic, respectively, on the South American snail kite, *Rostrhamus sociabilis*, and on caracaras of the genus *Polyborus* (both hosts being of the suborder Falcones), these other characters are distinctive and suggest no relationship between them. Furthermore, these characters in *F. quadriguttatus* and *F. josephi* are quite different from the corresponding ones of *F. assessor* and *F. marginalis*, and the hosts of the one pair are far removed from those of the other pair. These facts, together, indicate that neither *F. quadriguttatus* nor *F. josephi* is related to *F. assessor* or *F. marginalis*.

Falcolipeurus josephi can be readily distinguished from the other species, in both sexes, by the tergal thickenings of abdominal segments II to VI, as these are continuous across the segments and are characteristically pigmented. Other distinguishing characters are the two short, spinelike, anterior tergoventral setae on tergite IX+X in the male and IX-XI in the female; characters of the male antennae; the nature of tergite IX-XI in the female; and the details of the external genitalia in both sexes.

KEY TO *Falcolipeurus* SPECIES OF THE
assessor GROUP

1. Tergite IX+X in male, IX-XI in female, without anterior tergoventral setae (fig. 6).....*quadriguttatus* (Giebel)
2. Tergite IX+X in male, IX-XI in female, with two anterior tergoventral setae (figs. 1, 7, 8).....
2. The two anterior tergoventral setae on tergite IX+X in male, and IX-XI in female, short and spinelike (fig. 1).....*josephi* new species
- The two anterior tergoventral setae on tergite

- IX+X in male, IX-XI in female, elongated (figs. 7, 8)..... 3
3. First pair of incassations on head relatively small (fig. 9); male less than 3.60 mm., female less than 3.80 mm. long..... *marginalis* (Osborn)
- First pair of incassations on head relatively large (fig. 10); male more than 3.80 mm., female more than 4.00 mm. long..... *assessor* (Giebel)

ACKNOWLEDGMENTS

Our best thanks are due to Dr. Theresa Clay, British Museum (Natural History), and Dr. L. R. Guimarães for kindly allowing us to examine the *Falcolipeurus* material; and to Professor M. B. Lal, Department of Zoology, University of Lucknow, for his unceasing interest in our work.

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Reprinted from the
ANNALS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA
Volume 56, Number 5, pp. 634-639 September, 1963