

CULICOIDES GULBENKIANI, A NEW SPECIES OF CULICOIDES (DIPTERA CERATOPOGONIDAE) IN SOUTH AFRICA

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INTRODUCTION

The description of *Culicoides gulbenkiani* † is based on 15 females captured in a light trap, at Onderstepoort, within forty-two days (from 20th March, 1958, to 30th April, 1958); and on three females and one male from the Onderstepoort Laboratory collection identified by De Meillon in April 1956 as *Culicoides milnei* Austen.

The careful study of these specimens show them to be a new species and not a variation of *milnei*.

Unfortunately amongst the thousands of *Culicoides* captured in light traps daily no other males of this species were found.

CULICOIDES GULBENKIANI SP. NOV.

Female

A medium-sided, rather dark brownish species, with greyish wings. Length of body 1.8 mm.; length of wing from "arculus" 1.275 mm.; greatest breadth of wing 0.584 mm. Head and mouth parts dark brown. Eyes bare, separated by the width of two facets. Pharynx length 67.5 μ .; width at level of median part 34.5 μ .; width at level of the base of "cornua" 42.5 μ .; "cornua" length 21 μ . Palpi dark brown, the two last segments slightly lighter; third segment of the palpi short and slightly swollen at the level of the sensory pit, which is not deep. Measurements of third segment 50.4 \times 21 μ . The relative lengths of the segments of the palpi are: II, 16; III, 16.8; IV, 11.3; V, 11. Antennae: Tori dark brown; flagellar segments light brown, being, however, darker from the 11th to the 15th. The relative proportions of the segments, are as follows:—

Segment.....	3	4	5	6	7	8	9	10	11	12	13	14	15
Length.....	9	9	10	10	11	11	11	14	17	17	17	18	30
Width.....	10	8	7	7	6	6	6	6	5	5	5	5	6

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† The species is named in honour of the Foundation Calouste Gulbenkian which made my stay at Onderstepoort possible.

Thorax.—Mesonotum yellow gold, uniformly coloured, without dots or stripes, the anterior and lateral borders dark brown, the same coloration is also seen at the level of the mesonotal pits; small bristles present arranged in longitudinal parallel rows; scutellum with the same colour as the mesonotum, except in the central part which shows a brownish colour. It bears four bristles, two central and one on each side of the scutellum; the two central ones are the largest. Postscutellum dark brown, as also the pleurae. Abdomen very dark brown to black, showing some irregularly arranged bristles. Halteres: Yellowish or rather fuscous, with the tip lighter in colour and whitish. Legs: Light brown. Femur darker greyish brown; tibiae and tarsi yellowish. Articulations light, yellowish, but without definite annulations; claws simple. The apex of hind tibiae bears five bristles, of which the first is the longest, and the others in decreasing order. The average lengths are:—

Bristle.....	1st	2nd	3rd	4th	5th
Length.....	71·1 μ	47·1 μ	42·3 μ	40·5 μ	37·2 μ

The relative lengths of the tarsal segments, excluding the claws, are:—

Segment.....	1st	2nd	3rd	4th	5th
1st pair.....	64	27	19	12	14
2nd pair.....	75	33	21	11	16
3rd pair.....	73	41	22	15	18

Wing.—Practically without macrotrichia, except one row along the anterior edge and, in a few specimens, at the end of the upper branch of the fourth vein. Wings relatively light, in colour. The two radial cells are complete, the first one very narrow and elongate and the second one oval.

A line running from the end of the costa to the posterior border, meets it at a point a short distance from the end of the inferior branch of the fifth vein. It shows dark and pale spots and a fringe along the posterior edge. The first dark spot, which has as its posterior limit the veins that limit the radial cells, begins in the middle of the first radial cell and ends at the end of second radial cell. The tip of the costa has a slightly yellowish coloration. From the tip of the costa to the end of the upper branch of the fourth vein, i.e. the apical cell, there are three pale spots as is seen in Figure 3. The pale spot which covers the anterior median cell also shows three pale ill-defined spots; the spot on the posterior median cell is also ill-defined. The cubital cell is occupied by a pale spot, relatively large, which, however, does not reach the veins that limit the cell. The anal cell shows pale spots, large, and with ill-defined limits, which give it a light colour. Spermatheca: three in number, well pigmented. The two largest ones are oval to globular in shape, measuring $51 \times 45\mu$ and $48 \times 36\mu$; the duct is chitinised for 4μ . The third spermatheca is rudimentary, elongate and measuring $15 \times 7.5\mu$.

Male

Wing length from "arculus" 1.240 mm.; the greatest width of wing 0.480 mm. General coloration as in female. Palpi:— third segment of the palpi not very swollen. It was impossible to measure the third segment in the only specimen available. Antennae:— the relative lengths and widths of the four last segments are as follows:—

Segment.....	12th	13th	14th	15th
Length.....	13.0	34.5	29.5	38.5
Width.....	5.2	5.0	5.5	6.0

Thorax.—As the only male specimen is mounted on a slide, the thorax, scutellum, postscutellum, abdomen, pleurae and the halteres could not be described.

Legs.—The bristles at the apex of the hind tibiae are the same as in the female, the first one being the largest. However, in the males this character has not the same importance that it has in the females. The measurements are as follows:—

Bristle.....	1st	2nd	3rd	4th	5th
Length.....	60 μ	42 μ	39 μ	30 μ	27 μ

The relative lengths of the tarsal segments excluding the claws, are:—

Segment.....	1st	2nd	3rd	4th	5th
1st pair.....	68	30	23	14	15
2nd pair.....	77	37	23	14	15
3rd pair.....	73	45	25	14	16

Wing.—Length 1.240 mm., width 0.480 mm. Dark and pale spots with the same arrangement as in the female and as represented in the figure.

Terminalia.—Ninth segment: sternite excavated; tergite trapezoid in shape with posterior angles rounded and without fingerlike process; lobe-like processes well-developed covered by small spines; side-piece more or less of the same width throughout, slightly tapering distally, covered with small hairs and bearing also strong bristles. Claspers with some minute hairs and a few bristles in basal portion. Aedoeagus (99 \times 75 μ) Y-shaped, with narrow and chitinised arms, pigmentation weaker near trunk. This shows a spinelike prolongation anteriorly, similar to that of *C. pallidipennis* Carter, Ingram and Macfie and of *C. grahami* Aust.

TABLE I.

	<i>Culicoides gulbenkianii</i> Female (Author's Measurements)	<i>C. milnei</i> Female (Fiedler's Measurements)	<i>C. milnei</i> Female (Author's Measurements)
Wing:			
Length from the "arculus".....	1.275 mm.	1.600 mm.	1.520 mm.
Width at the end of the costa....	0.584 mm.	0.500 mm.	0.650 mm.
Pharynx:			
Length.....	67.5 μ	—	75.0 μ
Width in middle.....	34.5 μ	—	33.0 μ
Width at base of "cornua".....	42.5 μ	—	36.6 μ
"Cornua" length.....	21.0 μ	—	37.5 μ
Palpi:			
Length of third segment.....	50.4 μ	104.0 μ	97.2 μ
Width of third segment.....	21.0 μ	26.0 μ	27.3 μ
Relative lengths of segments....	II, 16; III, 168; IV, 11.3 V, 11	—	II, 20.6; III, 32.6; IV, 13; V, 14.8
Antennae:			
Relative length and width of four last segments	17 \times 17.5 \times 18 \times 30 5 \times 5 \times 5 \times 6	22.5 \times 26 \times 29.5 \times 44 6 \times 5.5 \times 5.5 \times 6	21.2 \times 24.2 \times 28.1 \times 36.6 5.3 \times 6 \times 6.2 \times 5.8
Measurements of four last seg- ments.....	51 \times 15 μ ; 52.5 \times 15 μ ; 54 \times 15 μ ; 90 \times 18 μ	—	63.6 \times 15.9 μ ; 72.6 \times 18 μ ; 84.3 \times 18.6 μ ; 109.8 \times 17.4 μ
Legs:			
Length of bristles at apex of hind tibiae	1st 71.1 μ ; 2nd 47.1 μ ; 3rd 42.3 μ ; 4th 40.5 μ ; 5th 37.2 μ	1st —; 2nd 80; 3rd —; 4th —; 5th 42 μ	1st 57.9 μ ; 2nd 88.8 μ ; 4th 51 μ ; 5th 42 μ
Relative lengths of tarsal seg- ments from first to fifth, ex- cluding the claws	Fore leg—64; 27; 19; 12; 14. Mid. leg—75; 33; 21; 11; 16. Hind leg—73; 41; 22; 15; 18.	—	77; 35; 23.6; 15.3; 18.3. 98.6; 39; 24.3; 15; 17.6. 93; 47.3; 27.6; 17.6; 19.6.
Genital armature:			
The longest spermatheca.....	51 \times 45 μ	55 \times 49 μ	49 \times 42 μ
The medium spermatheca.....	48 \times 36 μ	48 \times 40 μ	45 \times 36 μ
The smallest spermatheca.....	15 \times 7.5 μ	20 \times 14 μ	15 \times 9 μ
Portion of chitinized duct.....	4 μ	4-6 μ	4 μ

TABLE 2.

	<i>Callicoides gulbenkiani</i> Male (Author's Measurements)	<i>C. milnei</i> Male (Colaco's Measurements)	<i>C. milnei</i> Male (Author's Measurements)
Wing: Length from the "arculus" . . . Width at the end of the costa . . .	1.240 mm. 0.480 mm.	1.390 mm. 0.530 mm.	1.360 mm. 0.520 mm.
Pharynx	—	—	—
Palpi: Length of third segment Width of third segment Relative lengths of segments	— — —	— — —	62.4 μ 18.6 μ II, 14; III, 20.8; IV, 8; V, 10.
Antennae: Relative lengths and widths of four last segments Measurements of four last seg- ments	$\frac{13}{5.2} \times \frac{34.5}{5} \times \frac{29.5}{5.5} \times \frac{38.5}{6}$ $39 \times 15.6\mu$; $103.5 \times 15\mu$; $88.5 \times 16.5\mu$; $115.5 \times 18\mu$	$20 \times \frac{45}{7} \times \frac{45}{10} \times \frac{52}{9}$	$19.2 \times \frac{37.7}{7.1} \times \frac{39}{6} \times \frac{47.7}{7.5}$ $57.6 \times 21.3\mu$; $113.1 \times 18\mu$; $117 \times 18.6\mu$; $143.1 \times 22.5\mu$
Legs: Lengths of bristles at apex of hind tibiae Relative lengths of tarsal seg- ments from first to fifth, ex- cluding the claws	1st, 60 μ ; 2nd, 42 μ ; 3rd, 39 μ ; 4th, 30 μ ; 5th, 27 μ . Fore leg—68; 30; 23; 14; 15. Mid. leg—77; 37; 23; 14; 15. Hind leg—73; 45; 25; 14; 16.	— — — —	1st, 67.5 μ ; 2nd, 85.5 μ ; 3rd, 55.5 μ ; 4th, 48 μ ; 5th, 37.5 μ 75.5; 34; 22.5; 14; 17. 92; 41; 23; 12; 17. 89; 49; 27; 15; 17.
Terminalia: Aedeagus: length width Harpes: the greatest width Side-piece: length width	0.099 mm. 0.075 mm. 18 μ 0.108 mm. 51 μ	0.132 mm. 0.07 mm. — — —	0.117 mm. 0.069 mm. 9 μ 0.112 mm. 75 μ

Harpes.—In the only specimen available the basal portion of the parameres as also the distal, are perceptible only with difficulty. They appear as slightly chitinised processes, broad in the median portion, quickly tapering and becoming filamentous. The greatest width is 18 μ .

There are a number of characteristics which distinguish *Culicoides gulbenkiani* from *Culicoides milnei*.

In tables 1 and 2 are given the average measurements of the more important characters which distinguish the two species. The measurements for *C. milnei* Austen, are compared with those of Fiedler for the females, and with those of Colaco for the males. Comparing Fiedler's measurements with those of the author some differences appear, most probably due to personal error and, perhaps, also due to the small number of specimens examined. The difference between Colaco's measurements and those of the author is smaller.

A study of Tables 1 and 2 reveals the following:—

	<i>Culicoides gulbenkiani</i>	<i>Culicoides milnei</i> , Austen
Wing.....	Shorter.....	Longer
Pharynx.....	Narrower ⁽¹⁾	Broader
	Slightly shorter.....	Longer
	Slightly broader.....	Narrower
Palpi.....	"Cornua" shorter.....	"Cornua" longer
	Third segment shorter, almost one half slightly narrower, II and III segments bigger than IV and V	Almost the double of the <i>C. gulbenkiani</i> broader, II and III segments much bigger than IV and V.
Antennae.....	The last four segments are shorter than in <i>C. milnei</i> ; they are more or less of the same width, but slightly narrower than in <i>C. milnei</i>	Last four segments are bigger than in <i>C. gulbenkiani</i> , more or less of the same width, but slightly broader than in <i>C. gulbenkiani</i> .
Legs.....	Five bristles at apex of hind tibiae, of which the first is the longest	Five bristles at the apex of hind tibiae, of which the second is the longest.
	Tarsal segments do not keep the same proportion in both, and they are shorter in <i>C. gulbenkiani</i>	Tarsal segments do not keep the same proportion in both, and they are longer than in <i>C. gulbenkiani</i>
Spermatheca...	They have the same shape in both, occur in equal number, show the same degree of chitinization, duct pigmented to the same extent, but in <i>C. gulbenkiani</i> they are slightly larger ⁽²⁾	They are slightly smaller.
Terminalia....	9th tergite trapezoidal.....	9th tergite with posterior angles more rounded.
	Side-piece narrower than in <i>C. milnei</i> and keeps more or less the same width throughout. Aedoeagus Y-shaped, but the stem shows a spine-like process anteriorly. Harpes broader than in <i>C. milnei</i>	Side-piece broader and tapering suddenly to distal portion. Aedoeagus Y-shaped with very long stem which is bent ventrally at its distal extremity. Harpes narrow, the basal portion footlike in shape.

(1) Compared with Fiedler's measurements it would be broader.

(2) Compared with Fiedler's measurements they would be smaller.

Besides the differences in comparative measurements:—

- (a) *C. milnei* Austen is a larger and darker species.
- (b) The thorax of *C. gulbenkiani* shows a uniform yellow gold coloration on the mesonotum, small hairs arranged in parallel longitudinal lines, and the scutellum the same colour as the mesonotum, except in the central field which is brown. *C. milnei* shows the mesonotum ornamented as in Figure 1; small hairs irregularly arranged and scutellum dark brown. ⁽¹⁾
- (c) In *C. milnei* the legs are dark brown with ill-defined yellow bands on the proximal and the distal parts of the segments, except on the tarsus. In *C. gulbenkiani* the femurs are brown-greyish and the tibiae and tarsus are yellowish.
- (d) In connection with the antennae, palpi and bristles at the apex of the hind tibiae, Fiedler states: "The three external characters of the female, the distal segments of the antennae, the palps and the row of long bristles at the apices of the tibiae, are introduced in addition to the ornamentation of the wing and of the thorax and the genital appendices. These novel characters prove to be absolutely constant for the different species and provide additional, thoroughly reliable criteria which serve to give finality in determination which previously used characters have failed to provide."
- (e) The wings provide good characters for the differentiation of the two species. Besides the differences in dimensions, *C. milnei* shows appreciable macrotrichia, particularly in the apical, anterior and posterior median ⁽²⁾, cubital and anal cells, in addition to those that are seen on the limiting veins of the radial cells, and on the upper branch of the fourth vein.

In *C. gulbenkiani* the macrotrichia are scanty and observed only as a single row on the anterior margin of the wing, distal portion of the upper branch of the fourth vein and a few in the apical portion of the fourth vein and a few in the apical portion of the anterior median cell.

The first dark spot in *C. milnei* ends in the middle of the second radial cell, but in *Culicoides gulbenkiani* reaches the vein which limits this cell anteriorly. Hence it follows that the yellow spot, clear in *C. milnei*, is limited in *C. gulbenkiani* to that vein and is less intense in colour.

C. gulbenkiani shows a pale spot in the distal portion of the apical cell; this is not seen in *C. milnei*.

The two rounded pale spots at the anterior median cell, as also the two of the posterior median cell, in *C. milnei* show a characteristic arrangement occupying the angles of a trapezium having the smaller base directed to the "arculus" of the wing.

⁽¹⁾ Colaco describing male *C. milnei* Austen states that the scutellum is dark brown. In the specimens that the author studied, the scutellum is identical in colour with the light portion of the mesonotum.

⁽²⁾ Colaco states that there are no macrotrichia between M_2 and C_1 which disagrees with what is seen in the author's specimens.

In *C. gulbenkiani* the equivalent spots are long, with ill-defined limits, spreading along the cells that bear them. As was stated in the description of the wing of *C. gulbenkiani*, a line from the end of the costa running to the posterior margin, meets this at a point near the end of the inferior branch of the fifth vein. In *C. milnei*, the same line crosses the posterior margin of the wing, more or less in the middle of the space between the termination of the inferior and the upper branches of the fifth vein.

- (f) Each of these differences, which have been discussed is more marked in the females than in the males. In the latter the terminalia are markedly different. The dissimilar conformation of the aedoeagus, harpes, outline of the ninth tergite and the width of the side-piece in the two species is striking.

A careful study of the figures of the terminalia gives a better picture of the difference in the two species than would a differential description (see Fig. 2 and 4).

The terminalia of the males of *C. gulbenkiani*, *C. pallidipernis* Carter, Ingram and MacFie and *C. grahami* Austen are strikingly similar.

The main characters which permit of differentiation between them, are:—

In *C. pallidipernis*, the ninth tergite is more square in shape, it does not show the central cleft in the posterior margin and it is less hairy; the harpes are much smaller and more strongly swollen at the base; the aedoeagus, the ventral wall is less developed and the spine-like process between the limbs is smaller and blunter. Besides these elements of the terminalia, each one of the other characteristics e.g. wings, antennae, palps, mesonotal ornamentation and bristles at the apex of the hind tibiae are totally different in *C. pallidipernis* and *C. gulbenkiani*.

In *C. grahami* Austen, the ninth tergite is more slender posteriorly, with posterior angles more rounded, the central cleft is more marked and less hairy; the harpes are narrower in the basal portion; the aedoeagus has the spine-like process between the limbs more developed and more pointed. In general, however, the terminalia of *C. grahami* and *C. gulbenkiani* are very similar.

Besides the characters given by the terminalia, the two species can be distinguished by the measurements of the body, by the length and width of the wings, which are notably smaller in *C. grahami*.

	Female	Male
Length of body.....	0·9 to 1·2 mm.	1·0 mm.
Length of wing.....	1·0 mm.	0·9 mm.
Greatest breadth of wing.....	0·4 mm.	0·3 mm.

In *C. grahami* the wings appear dark with pale spots as contrasted with the reversed appearance in *C. gulbenkiani*. There are, however, some specimens of *C. grahami* in which the pale spots are more numerous than those figured by Austen, where Carter, Ingram and Macfie state in their description of this species:—

“In our specimens the pale spots on the wings are more numerous than shown in Austen’s figure, but the additional ones are well-defined. The latter are situated along the middle line of the wing, notably at the base and on each side of the termination of the lower ramus of the fourth vein.”

Concerning the hairy covering of the wings the same authors state:—

“The decumbent hairs are not entirely confined to the upper portion of the distal extremity of the wings and are present, though extremely scanty, along the apical and posterior margins.”

As important differential characteristics between the two species, must be considered: *C. grahami* females; the eyes contiguous dorsally for a variable distance, the scutellum bears three bristles, a central one and one on each side; in the male they are reduced to a central one; tibiae in both sexes show a characteristic ring-like band; spermatheca are two in number or, occasionally three, measuring approximately 40μ in diameter.

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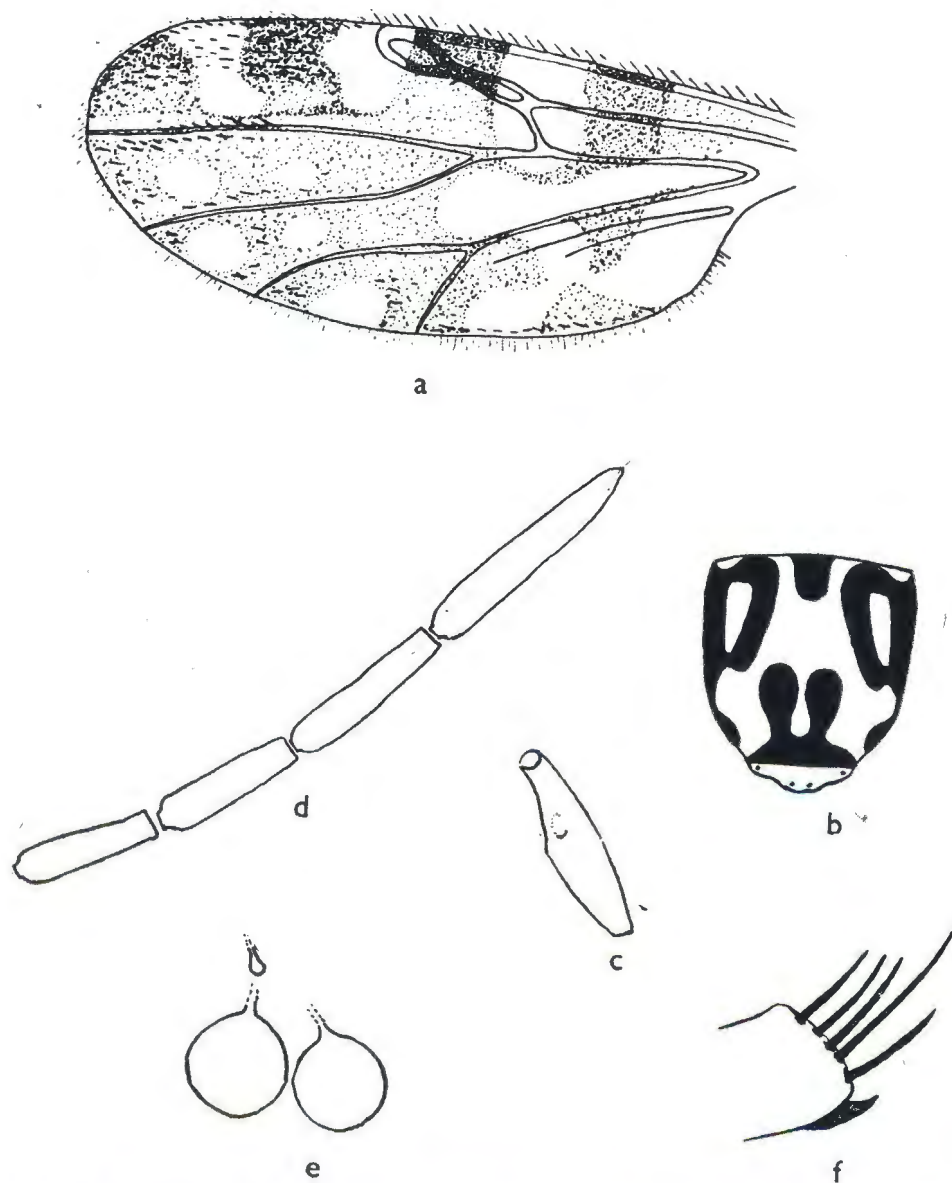


FIG. 1.—*Culicoides milnei* Austen. a—wing; b—thorax; c—third segment of the palp; d—last four segments of the antennae; e—spermathecae; f—bristles at the apex of the third tibiae.

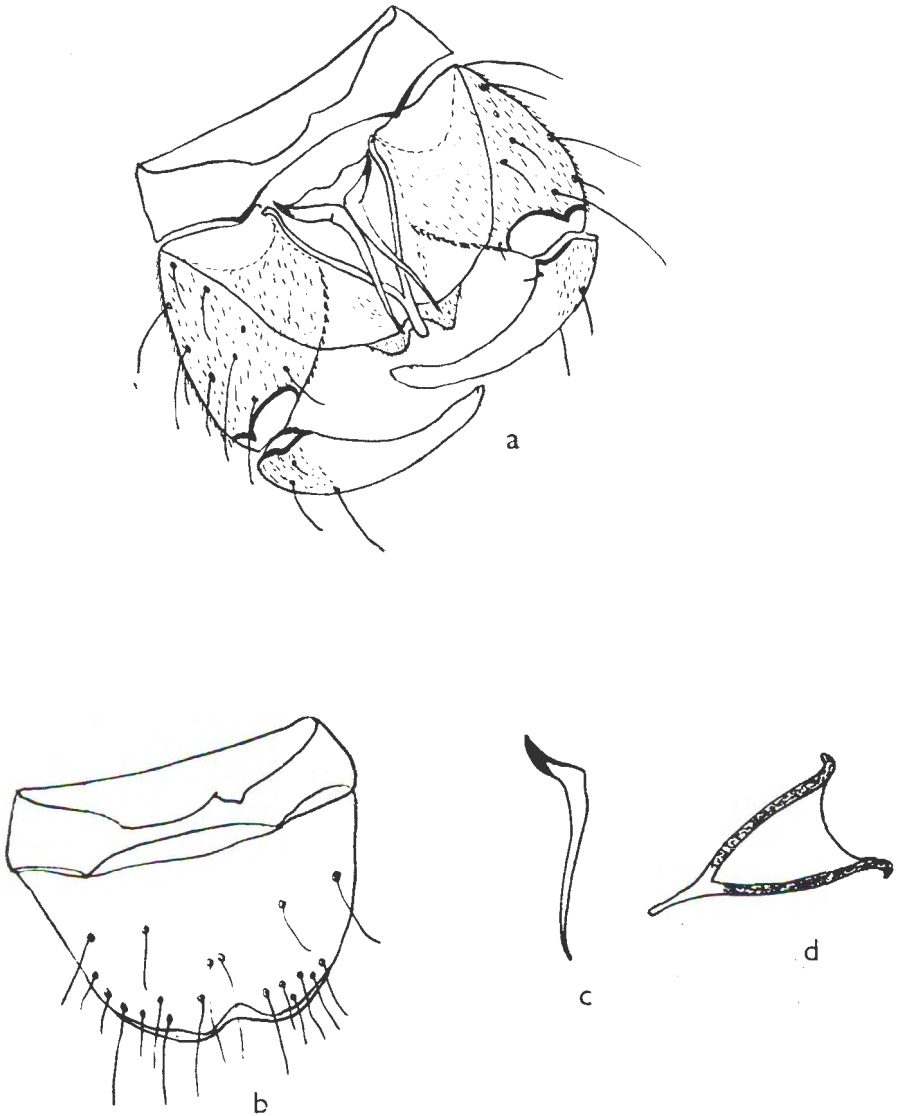


FIG. 2.—*Culicoides milnei* Austen. a—male hypopygium dorsal view; b—ninth tergite; c—paramere; d—acdoeagus.

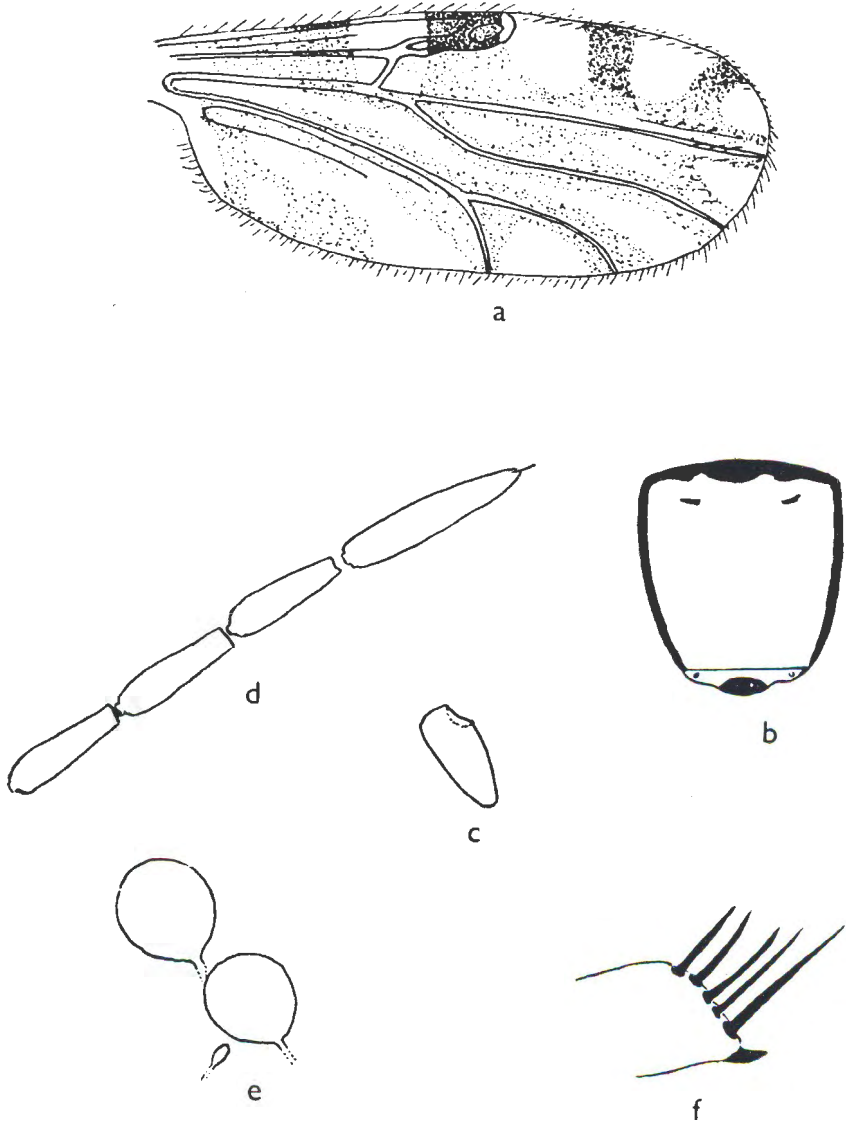


FIG. 3.—*Culicoides gulbenkiani* n. sp. a—wing; b—thorax; c—third segment of the palp; d—last four segments of the antennae; e—spermathecae; f—bristles at the apex of the hind tibiae.

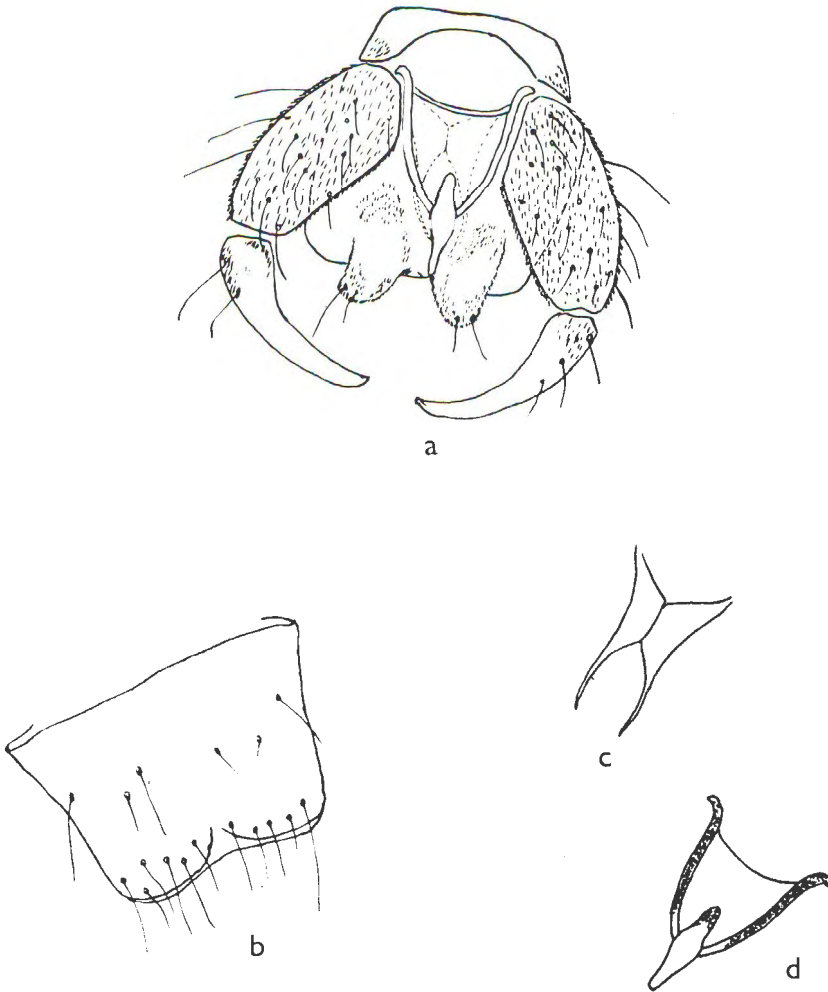


FIG. 4.—*Culicoides gulbenkiani* n. sp. a—male hypopygium, ventral view; b—ninth tergite; c—paramere; d—aedoeagus.