

AFROTROPICAL *CULICOIDES*: *SYNHELEA* KIEFFER, 1925, RESURRECTED AS SUBGENUS TO EMBRACE 10 SPECIES (DIPTERA: CERATOPOGONIDAE)

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ABSTRACT

MEISWINKEL, R. & DYCE, A. L., 1989. Afrotropical *Culicoides*: *Synhelea* Kieffer, 1925, resurrected as subgenus to embrace 10 species (Diptera: Ceratopogonidae). *Onderstepoort Journal of Veterinary Research*, 56, 147-163 (1989).

Synhelea Kieffer, 1925, is resurrected from synonymy to embrace 10 species of Afrotropical *Culicoides*. *C. tropicalis* Kieffer, 1913, is the subgenotype. *C. vagus* is made a synonym of *C. dutoiti* while apomorphies common to the remaining species *camicasii*, *congolensis*, *dispar*, *moucheti*, *pellucidus*, *perettii*, *tauffliebi* and *vicinus* are discussed. The broad *similis* group of Cornet & Chateau (1971), under which these 10 species of *Synhelea* were originally assembled, is not only maintained but expanded by a further 11 species. Various distributional and descriptive data pertinent to *Synhelea* throughout the Afrotropical region are tabulated, and keys to adult males and females presented. *C. perettii* and *C. moucheti* are new records for South Africa. *C. dutoiti*, *C. perettii* and *C. tropicalis* are recorded for the 1st time from Malawi while *C. dutoiti* and *C. tropicalis* are newly recorded from Botswana and Namibia respectively. Where available, notes on larval habitats are given. *Synhelea* is considered endemic to the Afrotropical region and is briefly differentiated from the 25 subgenera currently recognized worldwide. Numerous illustrations accompany the diagnosis.

INTRODUCTION

Of the 25 subgenera currently recognized as forming the genus *Culicoides* today only 10 are represented in the Afrotropical region. These are *Avaritia* Fox, 1955; *Beltranmyia* Vargas, 1953; *Culicoides* Latreille, 1809; *Hoffmania* Fox, 1947; *Meijerehelea* Wirth & Hubert, 1960; *Monoculicoides* Khalaf, 1954; *Pontoculicoides* Remm, 1968; *Remmia* Glukova, 1977; *Silvaticulicoides* Glukhova, 1972 and *Trithecoides* Wirth & Hubert, 1959. With the exception of *Remmia* not 1 of these has as subgenotype an Afrotropical species. However, 2 genera, today considered to be synonyms of the genus *Culicoides*, were erected for species of the region in the 1st quarter of this century. These are *Oxyhelea* Kieffer, 1921 and *Synhelea* Kieffer, 1925. *Oxyhelea dentatus*, described from the Cameroons, is a 'plainwing' species of uncertain status as the whereabouts of the type specimen remains unknown. The oft indifferent taxonomic work of Kieffer would have led to *Synhelea* suffering a similar fate had not the type, *C. tropicalis*, been unearthed in the *Museum national d'Histoire naturelle*, Paris many years later. Its subsequent redescription by Kr mer (1972a) and its designation as genotype by Wirth, De Meillon & Haeselbarth (1980) now makes it possible for us to define the position of *Synhelea* more clearly today.

The Afrotropical *similis* group as defined by Cornet & Chateau (1971) is here considered too broad and partly artificial. Arising from the Afrotropical *similis* group is an offshoot of 10 species endemic to the region that have in their possession a combination of apomorphies that in our opinion merit subgenus status. They are embraced in the subgenus *Synhelea* Kieffer, 1925 which we accordingly resurrect.

MATERIALS AND METHODS

Over 150 slide-mounted specimens were examined, the majority of these from southern Africa which has the 4 species *C. tropicalis*, *C. dutoiti*, *C. perettii* and *C. moucheti*. Very limited material was available of the species *C. congolensis*, *C. dispar*

and *C. vicinus*. The holotype female of *C. pellucidus* was kindly loaned through Dr John Boorman (British Museum, Natural History) while the holotype male and paratype male of *C. tauffliebi* were provided by Dr Jean Clastrier (Paris Museum). Neither *C. camicasii* (male and female) nor the male of *C. vicinus* was examined. Most of the material studied was taken in light-traps with occasional specimens taken in a truck-trap. Only 1 of the species, *C. tropicalis*, was reared, this on 3 separate occasions, twice from pupae collected from fresh water/soil habitats and stored in stoppered vials until emergence of adults (A.L.D.), and once from an emergence trap placed over a drainage furrow (I.T.P. Pajor, unpublished data, 1986).

The descriptive format more or less follows that generally adopted by various authors working on the genus *Culicoides* worldwide. Wing and costal length is given in μm . Antennal and palpal segmental lengths are given in μm . Costal ratio (CR) is derived by dividing the length of the costa by the length of the wing, each measured from the arculus to the tip; the proboscis/head ratio (P/H) is derived by dividing the distance from the end of the labrum-epipharynx to the tormae, by the distance from the latter to the interocular seta. It must be noted that we do not follow the trend adopted by such workers as Khama & Kettle (1971) and Boorman & Dipeolu (1979) who use the reverse proportion of head/proboscis ratio (H/P). This is for reasons of priority and also because a low P/H ratio reflects a short proboscis, a high P/H ratio a long proboscis. The palpal ratio (PR) is obtained by dividing the length of palpal segment III by its greatest width. Antennal ratio (AR) for females is obtained by measuring the cumulative lengths of distal antennal segments XI-XV and dividing these by the cumulative lengths of basal antennal segments III-X. Tarsal ratio (TR) is obtained in the female by measuring the length of the 1st hind tarsal segment and dividing it by the length of the 2nd segment. The antennal ratio (AR) for males is obtained by measuring the cumulative lengths of distal antennal segments XIII-XV and dividing these by the cumulative lengths of III + IV-XII. Segment III is measured separately and then added to the length of IV-XII measured as a unit. In both sexes the proportional and compound lengths of antennal and palpal segments are given in μm . The antennal trichodea ratio (AtR) is obtained

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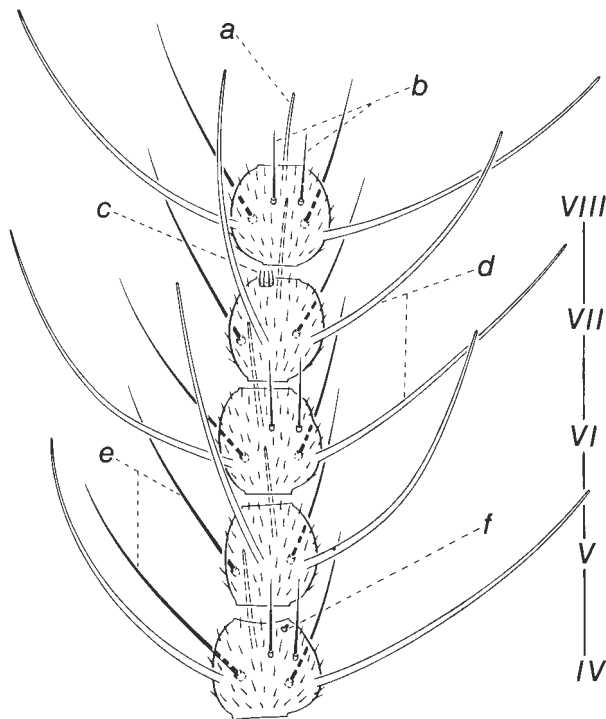


FIG. 1 *C. (Synhelea) dutoiti*. Antenna, female: segments IV–VIII showing various sensillae: (a) short, blunt-tipped sensilla trichodea (b) short, straight pair of thin subapical sensilla chaetica (c) sensilla coeloconica (d) long, blunt-tipped sensilla trichodea (e) long, curved subbasal sensilla chaetica (f) sensilla ampullacea

in the female by measuring the length of the longest blunt-tipped trichodea on antennal segment VI and dividing it by the length of segment VI (Meiswinkel, 1989). Most ratios given here have been measured from available material. The ratios are seldom drawn from the literature as there is a lack of consensus amongst authors as to results published.

The wing photographs were prepared from slide-mounted specimens by Mr Ian Roper (22 Danger Ave., Dolans Bay, New South Wales 2229, Australia) using the method described in the Nearctic wing-picture atlas (Wirth, Dyce & Peterson, 1985). The 3rd pale costal spot is recognized to be that spot which either straddles partially or immediately adjoins the 2nd radial cell on the anterior margin (Meiswinkel, 1989). Illustrations of the aedeagus and a paramere of the species *camicasi*, *tauffliebi* and *vicinus* were adapted from the original descriptions. The remaining illustrations were prepared from slide-mounted material (R.M.), those of the male genitalia having the left basimere showing dorsal setation and spiculation with the right basimere representing the ventral view. Illustrations of the antennae have those sensilla occurring ventrally drawn with broken lines. Sensillae referred to in the text and tables as 'L' are the long blunt-tipped sensilla trichodea occurring on the basal segments of both male and female antennae (Fig. 1d). Those sensillae referred to as 'c' are the short blunt-tipped ones usually found accompanying the long trichodea on these antennal segments (Fig. 1a). Those sensillae that are arrowed in the illustrations are very short and thin blunt-tipped trichodea whose presence on the distal segments is acknowledged but not mentioned in the descriptions.

RESULTS

SUBGENUS *SYNHELEA* KIEFFER

Culicoides, subgenus *Synhelea* Kieffer, 1925: 423.

Type-species, *Synhelea tropicalis* Kieffer, 1913 as designated by Wirth, De Meillon & Haeselbarth, 1980.

Subgeneric diagnosis

Small to medium-sized greyish midges with weakly to strongly patterned wings; female antenna with a pair of very short and thin sensilla chaetica which occur medianally to subapically on basal segments IV, VI and VIII; in the male the lateral arms of the aedeagus always with additional heavily chitinized projections these assuming contorted species-specific shapes.

Female (Fig. 1–15; Tables 1, 3)

Head. (Fig. 4): eyes bare, separated above by a distance of 1 facet then narrowing slightly over a distance of 3 facets but never touching (Fig. 4). Cibarium unarmed. Palp: 5-segmented; 3rd segment more or less clavate (Fig. 2), rarely swollen (Fig. 3), bearing 3–10 chaetica; PR: 1.87–2.25; sensory pit on III of moderate depth with moderate to large opening carrying 10–50 capitate sensillae; length of palp 115–153 $\frac{3}{4}$ m. Proboscis moderately short, P/H ratio 0.60–0.71; mandible with 8–11 fine teeth. Antenna (Fig. 1, 5; Table 1, 3): AR 1.16–1.43; AtR 2.54–3.90; basal segments rounded, distal segments elongate flask-shaped; all segments moderately clothed overall with microtrichia. Sensilla coeloconica: rarely small, usually moderately large with a fairly robust surround of dark microtrichia (Fig. 1, 5); coeloconica distribution specifically variable (Table 1, 3). Sensilla trichodea: basal segments IV–X with 2 very long and 1 short trichodea, III with 2 long trichodea only; on basal segments long trichodea arise in a spiral of alternating positions (Fig. 1). Sensilla chaetica: unique to the subgenus in that all species have a pair of very short and thin sensilla chaetica on basal segments IV, VI and VIII (Fig. 1, 5); these pairs of chaetica occur medianally to subapically on their respective segments and are accompanied by 2 much longer, more robust gently curved chaetica subbasally (Fig. 1, 5); intermediate segments of V, VII, IX and X each only have 2 long, robust chaetica subbasally (Fig. 1, 5); chaetica absent on XI–XV except for 1 apically on XV (Fig. 5). Legs: banded; TR 1.81–2.03; hind tibia with 4 spines the 1st being longest and strongest; 4th tarsus of the usual cylindrical form, about 2 \times as long as broad; tarsal claws simple. Wing (Fig. 8–15): CR 0.53–0.58; macrotrichia in moderate abundance more or less evenly distributed; a pattern of light and dark areas usually occurs throughout wing, poorly defined in *dutoiti*, *dispar* and especially *moucheti* the wing of which is yellowish; pattern well defined in *congolensis*, *pellucidus*, *perettii*, *tauffliebi*, *tropicalis* and *vicinus* in which species there is always a small, pale accessory spot below the 3rd large pale costal spot, either fused or narrowly separated from it and either touching or straddling vein M1; 2nd radial cell never included in a pale spot (Fig. 8–15).

Abdomen. Spermathecae (Fig. 6, 7): 2 fully developed, either ovoid or subspherical with long slender necks, with contours slightly bumpy; moderately to well pigmented; rudimentary 3rd spermatheca small, short and rugose often with a bulbous head; sclerotized ring of a moderate size, smooth and parallel-sided like a serviette ring. In 6 species examined the genital sclerotizations on each side of the gonopore divide to embrace the opening (Fig. 6, 7). In addition some species possess fairly large accessory island sclerotizations anterior of the main sclerotizations that surround the gonopore (Fig. 7).

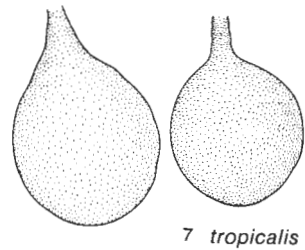
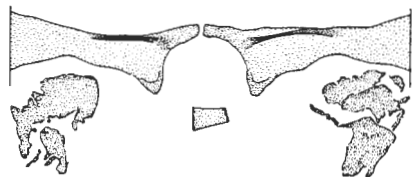
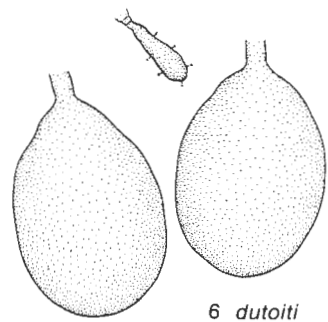
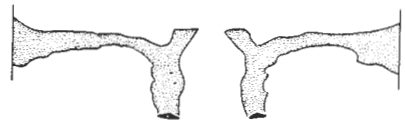
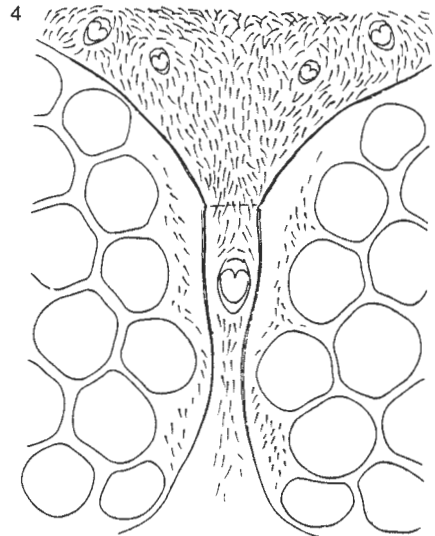
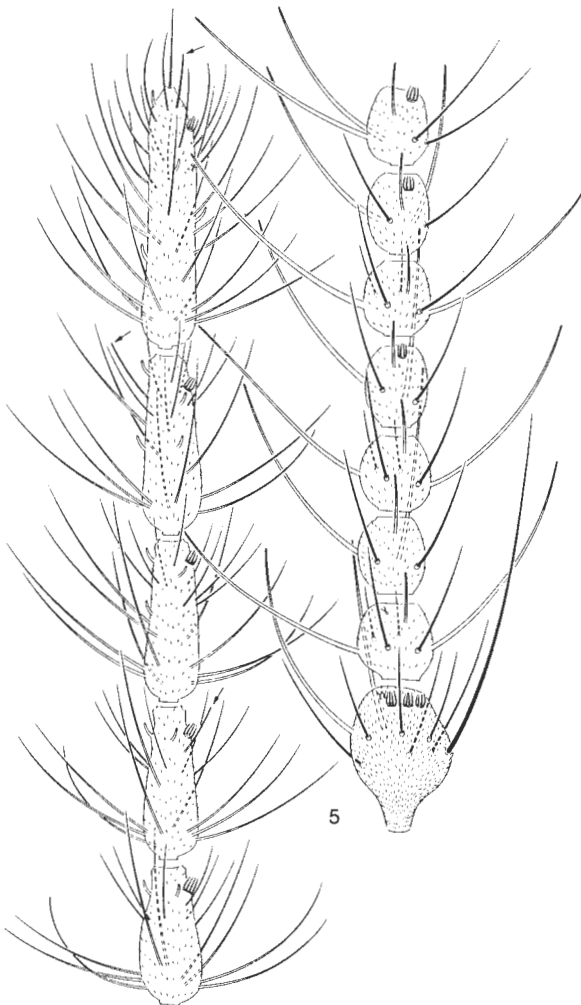
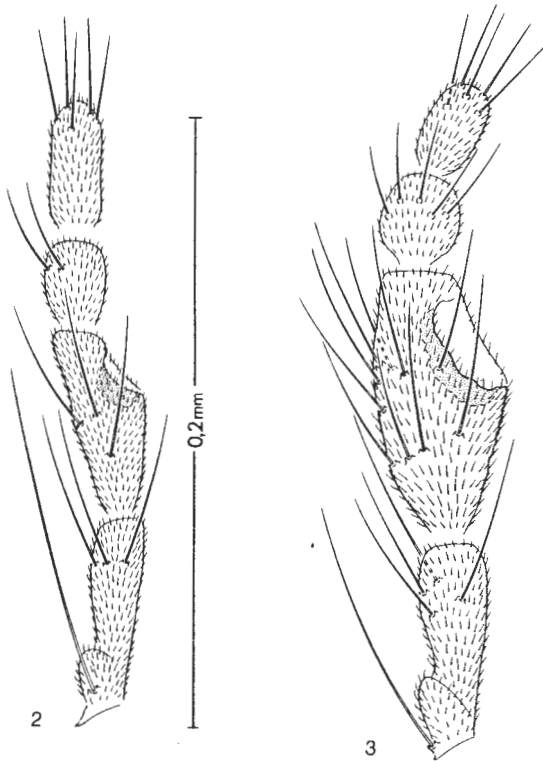


FIG. 2 *C. (Synhelea) dutoiti*. Palp, female

FIG. 3 *C. (Synhelea) tropicalis*. Palp, female

FIG. 4 *C. (Synhelea) dutoiti*. Eyes, female

FIG. 5 *C. (Synhelea) dutoiti*. Antenna, female: segments XI-XV on left, segments III-X on right

FIG. 6 *C. (Synhelea) dutoiti*. Genitalia, female: spermathecae and genital sclerotization

FIG. 7 *C. (Synhelea) tropicalis*. Genitalia, female: spermathecae and genital sclerotization showing accessory island sclerites

TABLE 1 Lengths of segments (µm), distributions and numbers of sensilla on the female antennae of *Synhelea* species

Species	Sensilla	Antennal segments														
		III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV		
<i>C. camicasi</i> *	coeloconica	3	0	0	0	1	2	2	2	1	1	0	0	0		
	chaetica	LL	←			LLc		unknown								
	trichodea	35	20	20	22	22	22	22	22	41	41	43	43			
	lengths of segments								22							
<i>C. congolensis</i> (n=1)	coeloconica	3	0	1	(1)	1	1	1	1	1	1	1	1			
	chaetica	6	4	2	4	4	4	2	2	0	0	0	0			
	trichodea	LL	←	24	25	26	26	25	26	48	50	50	50			
	lengths of segments	38	24	26	25	26	26	25	26	48	50	50	50			
<i>C. dispar</i> (n=1)	coeloconica	3	0	0	0	0	1	2	2	1	1	0	0			
	chaetica	5	4	2	4	2	4	2	2	0	0	0	0			
	trichodea	LL	←	24	25	25	25	25	25	50	53	55	55			
	lengths of segments	38	24	29	25	25	25	25	25	50	53	55	55			
<i>C. ditotii</i> (n=9)	coeloconica	3	0	0(1)	0	1	0	1	1	1	1	1	1			
	chaetica	5	4	2	4	2	4	2	2	0	0	0	0			
	trichodea	LL	←	23	23	24	23	24	26	47	49	54	54			
	lengths of segments	38	23	23	23	24	23	24	26	47	49	54	54			
<i>C. mouchei</i> (n=1)	coeloconica	3	0	1	1	1	1	1	2	0	0	0	0			
	chaetica	6	4	2	4	2	4	2	2	0	0	0	0			
	trichodea	LL	←	20	23	23	23	23	26	—	—	—	—			
	lengths of segments	38	20	23	23	23	23	23	26	—	—	—	—			
<i>C. pellicidus</i> (n=1)	coeloconica	3	0	0	0	0	0	1	1	1	1	2	2			
	chaetica	?	4	2	4	2	4	2	2	0	0	0	0			
	trichodea	LL	←	21	22	22	22	24	26	45	47	55	55			
	lengths of segments	36	21	22	22	22	22	24	26	45	47	55	55			
<i>C. peretti</i> (n=3)	coeloconica	3	0	0	0	1	2	2	2	0	0	0	0			
	chaetica	5	4	2	4	2	4	2	2	0	0	0	0			
	trichodea	LL	←	24	24	24	24	26	28	51	50	55	55			
	lengths of segments	38	24	24	24	25	24	26	28	51	50	55	55			
<i>C. tauffliebi</i>								female unknown								
<i>C. tropicalis</i> (n=6)	coeloconica	3(4)	1	1	1	2	2	2	2(3)	0	0	0	0			
	chaetica	6	4	2	4	2	4	2	2	0	0	0	0			
	trichodea	LL	←	23	24	24	24	25	28	45	45	50	50			
	lengths of segments	38	23	23	24	24	24	25	28	45	45	50	50			
<i>C. vicinus</i> *	coeloconica	?	1	1	1	1	1	1	1	(0)1	1	1	1			
	chaetica	?	4	2	4	2	4	2	2	0	0	0	0			
	trichodea	?	←	23	23	24	24	24	25	45	45	49	49			
	lengths of segments	34	23	23	23	24	24	24	25	45	45	49	49			

* After Cornet & Chateau, 1971

Male (Fig. 16–33; Table 2, 3)

Head. Antenna (Fig. 17; Table 2, 3): with sparsely haired, appressed plume; distal 3 segments elongate; basal segments well defined never fused or markedly reduced in size. Sensilla coeloconica (Fig. 17; Table 2): always present on segment III, never on segments IV–VII and either present or absent on remaining segments VIII–XV, depending on the species. Sensilla trichodea (Fig. 17; Table 2): segments III–V always with 2 very long blunt-tipped trichodea, VI with either 1 or 2 long trichodea, segments VII–X always with 1, segments XI and XII lacking long trichodea; a single short blunt-tipped trichodea always on segments IV–IX, with an additional 1 on X and/or XI in some species; segment XII lacking a short trichodea. Sensilla chaetica (Fig. 17): *perettii*, *tropicalis* and occasionally *C. dutoiti* with 2 moderately long but very slender chaetica basally on XIII and XIV; in *congolensis*, *dispar*, *dutoiti*, *moucheti* XIII differs in that it carries a 3rd chaetica, this being longer and more robust than the remaining 2; as in the female segment XV always with a single apical chaetica. Both the sensilla coeloconica and trichodea distributions for 8 species of *Synhelea* are shown in Table 2. Combinative arrangements of these 2 sensilla types are unique and species-specific.

Genitalia. (Fig. 18–33): Tergum IX with quite small and widely separated apicolateral processes; posterior margin more or less straight (Fig. 18). Sternum IX with membrane always heavily spiculate, (Fig. 19, 21–24); posterior margin either produced or only shallowly excavated, occasionally with median longitudinal "suture" (Fig. 19, 23, 24). Basimeres approximately 2 × as long as broad, sparsely adorned with long microtrichia (Fig. 19); both dorsal and ventral feet strongly developed, moderately to heavily chitinized and diagnostically shaped in 6 species examined (Fig. 19, 25–30). Distimeres slender, straight to gently curved, sharply hooked apically with basal half clothed with coarse microtrichia and 5–6 chaetica of varying lengths and thicknesses (Fig. 19). Aedeagus unique and complex, lateral arms carry additional heavily chitinized basal projections these facing posteriad, laterad or mesad and assuming contorted species-specific shapes (Fig. 20, 25–33); apex of aedeagus rounded or flattened, laterally flanked by membranous pale pointed blades (Fig. 20, 25–30). Parameres separate; apices strongly recurved, moderately to deeply toothed much in the shape of moose or elk horns; with or without median knob (Fig. 19, 25–33).

TAXONOMY

Species included in the subgenus *Synhelea*.

camicasi Cornet & Chateau, 1971

congolensis Clastrier, 1960

dispar Clastrier, 1960

dutoiti de Meillon, 1943

moucheti Cornet & Krêmer, 1970

pellucidus Khamala & Kettle, 1971

perettii Cornet & Chateau, 1971

tauffliebi Clastrier, 1960

tropicalis Kieffer, 1913 (subgenotype)

vicinus Clastrier, 1960

The following key is in part based on published data much of which is derived from single specimens only. Furthermore there are disparities in the literature which will be briefly commented upon under

the relevant species. Table 3 shows the differing coeloconica distributions recorded by various authors for these species. The resultant lack of knowledge on the range of variation in the sensilla coeloconica distributions, the most important character for identifying females, may result in error in some determinations. Populations need to be examined, especially males, as this sex is the most diagnostic.

KEY TO FEMALES AND MALES OF *SYNHELEA*
(slide-mounted specimens)

1. Female (*tauffliebi* unknown) 2
Male (*pellucidus* unknown) 10
2. Sensilla coeloconica absent from distal antennal segments 11–15 3
Sensilla coeloconica present on at least 1 of these distal segments 5
3. Sensilla coeloconica present on each of basal segments 3–10.....*tropicalis*
Sensilla coeloconica absent on at least 1 of these basal segments 4
4. Coeloconica on segments 3, 7–10; distal wing spots well defined.....*perettii*
Coeloconica on segments 3, 5–10; wing yellowish, distal spots poorly defined...*moucheti*
5. Coeloconica usually present on each of segments 3–15.....*vicinus*
Coeloconica absent on 2 or more segments 6
6. Coeloconica absent on segment 15..... 7
Coeloconica present on segment 15..... 8
7. Coeloconica usually present on segments 3, 7–11; sclerotized ring duct present*camicasi*
Coeloconica usually present on segments 3, 8–12; sclerotized ring duct absent*dispar*
8. Coeloconica distribution very variable being present on 3–15; 3, 5–15 or 3, 5, 7–15.....*congolensis*
Coeloconica absent on basal segment 5 9
9. Coeloconica usually on segments 3, 7, 9–15; distal wing spots very faint to absent*dutoiti*
Coeloconica on segments 3, 9–15; distal wing spots more strongly defined.....*pellucidus*
10. Coeloconica present on antennal segment 15; parameres without a prominent median knob 11
Coeloconica absent on antennal segment 15; parameres with or without median knob..... 13
11. Coeloconica present on antennal segments 3, 10–15; aedeagus as in Fig. 32*vicinus*
Coeloconica present on antennal segments 3, 11–15 or 3, 11, 13–15; aedeagus otherwise..... 12
12. Heavily chitinized basal projections of aedeagus bifid posteriorly (Fig. 29) ..*congolensis*
These projections rounded and simple posteriorly (Fig. 27).....*dutoiti*
13. Coeloconica absent on antennal segment 8; parameres with median knob 14
Coeloconica present on antennal segment 8; parameres with or without median knob 15
14. Heavily chitinized basal projections of aedeagus only 1/2–2/3 length of entire aedeagus (Fig. 31).....*tauffliebi*
These projections reaching to near the apex of the aedeagus (Fig. 28).....*moucheti*

TABLE 2. Lengths of segments, (μm) distributions and numbers of sensilla on the male antennae of *Synhelea* species

Species	Sensilla	Antennal segments														
		III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV		
<i>C. camicasi</i> *	coeloconica	2	0	0	0	0	0	0	2	2	2	0	0	0		
	chaetica trichodea lengths of segments	LL 55	LLc ↓	LLc	Lc	Lc	Lc 224	unknown Lc	L	0	0	—	—	—		
<i>C. congolensis</i> (n=1)	coeloconica	2	0	0	0	0	0	0	0	1	1	1	1			
	chaetica trichodea lengths of segments	LL 71	LLc ↓	LLc	Lc	Lc	Lc 338	Lc	L	—	—	—	—			
<i>C. dispar</i> (n=1)	coeloconica	3	0	0	0	0	0	0	2	2	2	0	0			
	chaetica trichodea lengths of segments	LL 69	LLc ↓	LLc	Lc	Lc	Lc 335	Lc	L	—	—	—	—			
<i>C. duroiti</i> (n=7)	coeloconica	2	0	0	0	0	0	0	0	(0)1	(1)2	(1)2	(1)2			
	chaetica trichodea lengths of segments	LL 72	LLc ↓	LLc	Lc	Lc	Lc 335	Lc	L	—	—	—	—			
<i>C. moucheiti</i> (n=2)	coeloconica	2	0	0	0	0	0	0	2	2	1	0	0			
	chaetica trichodea lengths of segments	LL 63	LLc ↓	LLc	LLc	Lc	Lc 303	Lc	L	—	—	—	—			
<i>C. pellucidus</i>																
<i>C. perettii</i> (n=3)	coeloconica	2	0	0	0	0	1	1	1	2	2	0	0			
	chaetica trichodea lengths of segments	LL 73	LLc ↓	LLc	LLc	Lc	Lc 318	Lc	Lc	—	—	—	—			
<i>C. tauffliebi</i> (n=2)	coeloconica	2	0	0	0	0	0	0	2	3	2	0	0			
	chaetica trichodea lengths of segments	LL 85	LLc ↓	LLc	Lc	Lc	Lc 332	LLc	L	—	—	—	—			
<i>C. tropicalis</i> (n=4)	coeloconica	2	0	0	0	0	1	0	1	(1)2	(1)2	0	0			
	chaetica trichodea lengths of segments	LL 66	LLc ↓	LLc	LLc	Lc	Lc 297	Lc	Lc	—	—	—	—			
<i>C. vicinus</i> *	coeloconica	+	0	0	0	0	0	0	+	+	+	+	+			

lengths of segments and distributions of sensilla remain unrecorded

* After Cornet & Chateau, 1971

15. Coeloconica absent on segment 9.....*tropicalis*
Coeloconica present on segment 9 16
16. Antennal segment 6 with 2 long blunt-tipped sensilla trichodea*perettii*
This segment with only 1 long blunt-tipped trichodea.....*dispar*

***Culicoides (Synhelea) camicasi* Cornet & Chateau, 1971**

(Fig. 33; Table 1-3)

C. camicasi Cornet & Chateau, 1971: 160 (Fig.—female: wing, eyes, palp, genitalia, spermathecae; male: genitalia, aedeagus, paramere).

Notes.—In the female *C. camicasi* comes very near *C. dispar* Clastrier (see comments below). According to Cornet & Chateau (1971) they differ in leg-colouration and in that the former species lacks pale wing spots in cells R5, M1, and M2. These, though reduced, are present in *dispar*.

Though the males of these 2 species share the same antennal coeloconica and trichodea distributions they differ significantly in the shape of the aedeagus; also in that *C. camicasi* lacks the median knob of the paramere found in *C. dispar*.

Comments. In the literature there is little consensus as to the true differences between the females of *camicasasi* and *dispar*. Cornet & Chateau (1971), as stated above, report them to be closely related species and in their discussion note that they differ in leg colouration and in that *camicasasi* lacks the distal wing spots present in *dispar*. However, a comparison of their descriptions of the 2 species reveals further differences:

- (1) *camicasasi* with a sclerotized ring duct; *dispar* without,
- (2) *camicasasi* with an AR of 1,27; *dispar* 2,15–2,24
- (3) *dispar* with female palpal segment IV half the length of V; in *camicasasi* they are almost equal in length, and
- (4) *camicasasi* with coeloconica on female antennal segments 3, 7–11; *dispar* with 3, 8–12.

However, some of the data in Cornet & Chateau's 1971 study is to be questioned as in only 1 of their 14 tables do the antennal measurements presented therein tally with the total length of the antenna given directly underneath each table. This in turn affects the AR obtained. In *camicasasi* the total antennal length is given as 420 μm , which correctly reflects the figures shown in the table, but conflict in *dispar* where the text total of 645–649 μm differs strongly from the table total of only 494 μm . The resultant antennal ratio (AR) is given correctly as 1,27 for *camicasasi*. However, for *dispar* the AR is given as 2,15–2,24 but recalculation from the table figures gives a value of 1,53. This recalculated ratio is still not near that of 1,37–1,38 given by Boorman & Dipeolu (1979) for Nigerian material of *dispar*.

In the only other study in which the female of *dispar* is treated, Boorman & Dipeolu (1979) describe it as follows:

- (1) With sclerotized ring duct (illustrated without) in Cornet & Chateau (1971) without ring duct;
- (2) palpal segment IV of *dispar* illustrated as virtually the same length as V; in Cornet & Chateau (1971) it is half the length; and
- (3) AR 1,37–1,38 ($n=4$); in Cornet & Chateau (1971) it is given as 2,15–2,24 but herein recalculated as 1,53.

In conclusion it is pointed out that Cornet & Chateau (1971) illustrate 2 forms of male aedeagus for

C. dispar which may eventually prove to be representative of 2 species and if so may explain some of the above discrepancies. Boorman & Dipeolu (1979) figured the form of aedeagus seen in Clastrier's original illustration of *C. dispar*.

Distribution. At present known only from Niokolo-Koba National Park, Senegal.

Biology. Unknown.

Material examined. None.

***Culicoides (Synhelea) congolensis* Clastrier, 1960**

(Fig. 14, 29; Table 1-3)

C. congolensis Clastrier, 1960: 98 (Fig.—male: genitalia).

C. congolensis Clastrier; Kr mer & Callot, 1964: 511 (Fig.—female: thorax, palp, 2 antennal segments, 2 spermathecae, eye space).

C. congolensis Clastrier; Cornet & Chateau, 1971: 153 (Fig.—female: wing).

C. congolensis Clastrier; Boorman & Dipeolu, 1979: 22 (Fig.—female: palp, spermathecae, wing; male: genitalia, aedeagus, paramere).

Notes.—The females of *congolensis* are difficult to identify and according to authors are rather variable in the distribution of the sensilla coeloconica on the antenna. Kr mer & Callot (1964) record a 3, 5, 7, 9–15 distribution for a Senegalese female; also from Senegal Cornet & Chateau (1971) report 3, 5, 7, 9–15 on 1 antenna and 3, 9–15 on 5 other antennae; Kr mer (1972b) counted on Angolan females a 3, 5, 7–15; 3, 7–15 or a 3, 7, 9–15 distribution. Finally, Boorman & Dipeolu (1979) state that Nigerian specimens usually possess a 3, 5–15 and only occasionally a 3, 5, 7–15 distribution.

This variability leads to an overlap occurring in coeloconica distribution between the females of *congolensis*, *dutoiti* and *pellucidus*. Though the males of *congolensis* and *dutoiti* are easily separable on their genitalia the male of *pellucidus* remains unknown (see notes under *dutoiti*).

Distribution. Congo; Senegal, Angola and Nigeria.

Biology. Unknown.

Material examined. Nigeria. 1 ♀, Vom, 19. III. 1976, W. Taylor, at light. 1 ♂, Vom, 22. I. 1975, J. Boorman, at light.

***Culicoides (Synhelea) dispar* Clastrier, 1959**

(Fig. 15, 30; Table 1-3)

C. dispar Clastrier, 1959: 175 (Fig.—male: genitalia).

C. dispar Clastrier; Callot, Kr mer, Mouchet & Bach, 1965: 545 (Fig.—female: antenna, palp, eye space).

C. dispar Clastrier; Cornet & Chateau, 1971: 154 (Fig.—female: wing, eye space, palp genitalia, spermathecae; male: 2 forms of aedeagus).

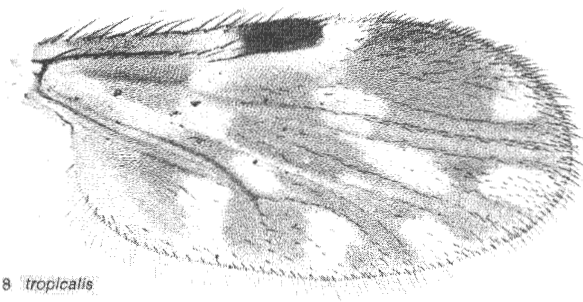
C. dispar Clastrier; Boorman & Dipeolu, 1979: 24 (Fig.—female: wing, palp spermathecae; male: genitalia, aedeagus, paramere).

Notes.—See under *C. camicasi*.

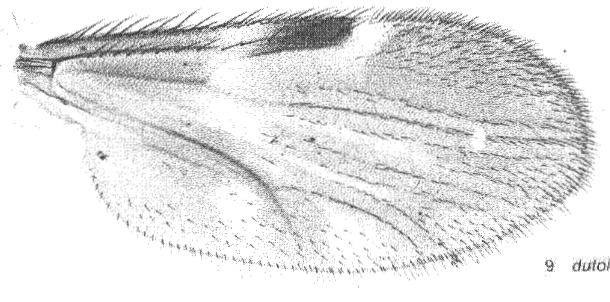
Distribution. Senegal; Camerouns, Burkina Faso and Nigeria.

Biology. Unknown.

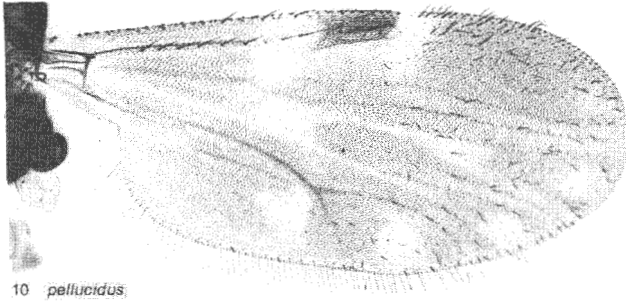
Material examined. Nigeria. 1 ♀, Jemaa, 23. II. 1975, W. Taylor, at light. 1 ♂, Jemaa, 23. II. 1975, W. Taylor, at light.



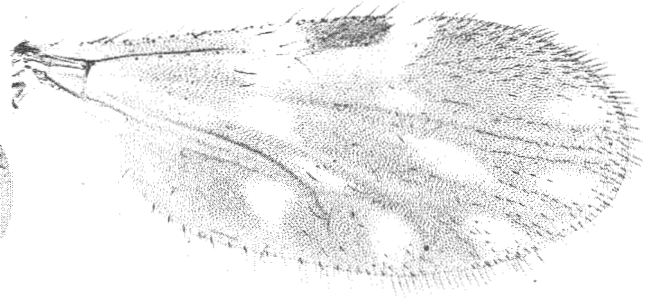
8 *tropicalis*



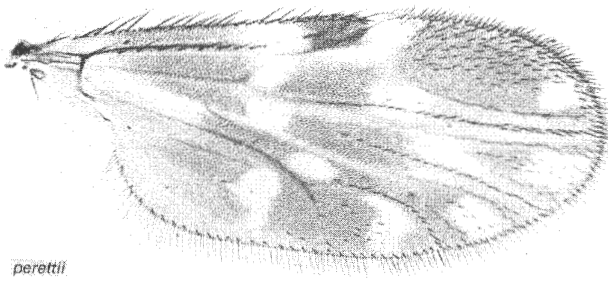
9 *dutoiti*



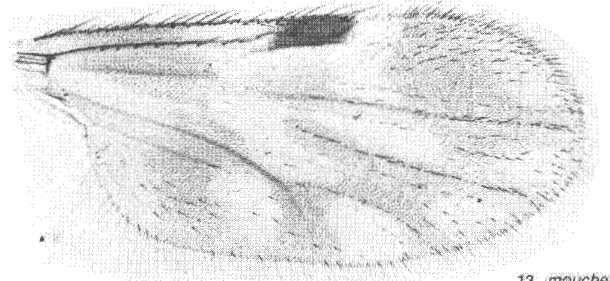
10 *pellucidus*



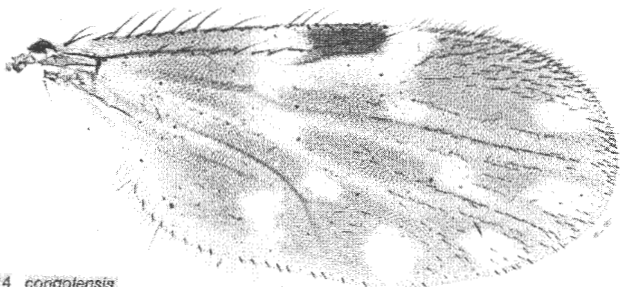
11 *vicinus*



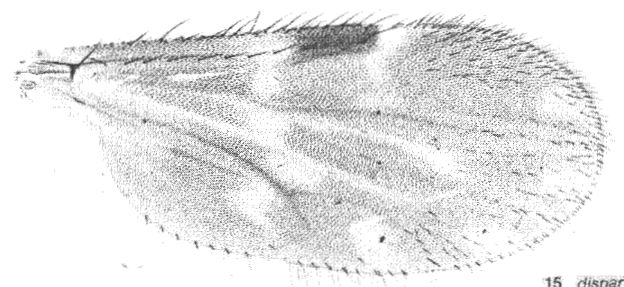
12 *perettii*



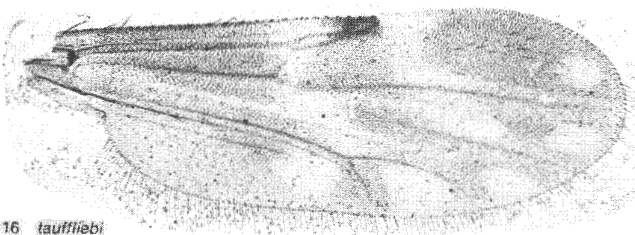
13 *moucheti*



14 *congolensis*



15 *dispar*



16 *tauffliebi*

FIG. 8 *C. (Synhelea) tropicalis*. Wing, female
FIG. 9 *C. (Synhelea) dutoiti*. Wing, female
FIG. 10 *C. (Synhelea) pellucidus*. Wing, female (holotype)
FIG. 11 *C. (Synhelea) vicinus*. Wing, female
FIG. 12 *C. (Synhelea) perettii*. Wing, female
FIG. 13 *C. (Synhelea) moucheti*. Wing, female
FIG. 14 *C. (Synhelea) congolensis*. Wing, female
FIG. 15 *C. (Synhelea) dispar*. Wing, female
FIG. 16 *C. (Synhelea) tauffliebi*. Wing, male (paratype)

***Culicoides (Synhelea) dutoiti* de Meillon, 1943**

(Fig. 1, 2, 4–6, 9, 17–21, 27; Table 1–3)

C. dutoiti de Meillon, 1943: 100 (Fig.—female: wing; male: aedeagus, aedeagus and paramere, paramere, genitalia, distimere).*C. dutoiti* de Meillon; Fiedler, 1951: 26 (Fig.—female: thorax, wing, tibial comb, antenna, palp, spermathecae; male: paramere, aedeagus).*C. vagus* Cornet & Chateau, 1971: 156 (Fig.—female: wing, eye space, palp, genitalia, spermathecae; male: genitalia, aedeagus, paramere).
New synonymy.*C. vagus* Cornet & Chateau; Boorman & Dipeolu, 1979: 59 (Fig.—female: wing, palp, spermathecae; male: genitalia, aedeagus, paramere).

Notes.—In only 2 of the above studies are the sensilla coeloconica distributions on the female antennae given in some detail for *dutoiti*. Cornet & Chateau (1971) record 3, 7, 9–15 for the allotype female of *vagus* but go on to say that of the 60 antennae examined 36 (60%) did not fall into this range having the coeloconica missing on segment VII. Thus a 3, 9–15 distribution is the norm in their material.

In the 2nd study, that by Boorman & Dipeolu (1979), it is difficult to assess the exact distributions found on the 12 antennae of their *vagus* examined as all the data were lumped to provide a mean total. The norm, however, appears to have been 3, 7, 9–15 which agrees well with southern African material of *dutoiti* where 13 (81%) of 16 antennae examined had a distribution of 3, 7, 9–15, 1 with 3, 9, 11–15, 1 with 3, 7, 9, 11–15 and 1 with 3, 5, 7, 9–15. In a number of these, the coeloconica distribution on 1 antenna differs from that found on the 2nd antenna.

Comments. As noted earlier this variability in coeloconica distribution embraces the 4 species *congolensis*, *dutoiti*, *pellucidus* and *vagus*. The 1st 2 species are easily separable on male genitalia and while the male of *pellucidus* remains unknown there appears to be no difference between those of *vagus* and *dutoiti*. In our opinion *vagus* is a junior synonym of *dutoiti*. *C. pellucidus*, known only from the holotype female, has a coeloconica distribution of 3, 9–15 which falls into the peripheral range established for *dutoiti* in South Africa but well within that established for *vagus* by Cornet & Chateau (1971). However, *pellucidus* differs marginally from both *dutoiti* and *vagus* in that it possesses pale distal wing spots in cells R5, M1 and M2 (Fig. 10). These are normally absent in *dutoiti* but will in certain specimens appear in cells M2 and M1 this variability also noted by Cornet & Chateau (1971). In the genus *Culicoides* it is usual for the pale spots in the male wing to be more extensive than those in the female wing. This is true for southern African material of *dutoiti* where the distal pale spots in cells R5, M1 and M2 can either be absent or markedly present. We have found no indication that these 2 extremes may be representative of 2 species.

Until greater clarity has been achieved as regards the variability of coeloconica distributions and wing pattern characters both inter- and intraspecifically we are reluctant also to synonymize *pellucidus* with *dutoiti*. This brings home that it is most difficult to identify single female specimens of any species within the subgenus *Synhelea* without an associated male.

Distribution. South Africa; Senegal, Mali, Burkina Faso, Botswana, Zimbabwe, Malawi.

Biology. Unknown.

Material examined. SOUTH AFRICA: Transvaal. Paratype ♀: Onderstepoort, 10. X. 1942, R. M. du Toit, light trap.

Paratype ♂, Onderstepoort, 10. X. 1942, R. M. du Toit, light trap.

1 ♂, Matangari, 25 km north of Thohoyandou, Vendlaland, north-eastern Transvaal, 21. IV. 1983, R. Meiswinkel, black light at edge of vlei.

1 ♂, Mooketsi, north-eastern Transvaal, 14. XII. 1986, R. Meiswinkel, black light.

2 ♀ 1 ♂, Pafuri, northern Kruger National Park, 15. IV. 1986, R. Meiswinkel & L. E. O. Braack, black light 14 m up *Acacia albida* tree in riverine forest.

2 ♀ 2 ♂, Shingwidzi, northern K.N.P., 19. IV. 1983 (1 ♂) and 7. IX. 1984 (2 ♀ 1 ♂), R. Meiswinkel, G. J. Venter & I. T. P. Pajor, black light in camp.

1 ♂, 15 km west of Skukuza, southern K.N.P., 26. II. 1986, 17 h 57–18 h 17, R. & P. Meiswinkel, truck-trap along Sabie River.

1 ♂, Skukuza, southern K.N.P. 11. III. 1984, R. Meiswinkel & L. E. O. Braack, black light 50 m from banks of Sabie River.

3 ♀ 4 ♂, farm 'Heuningneskranz', 10 km north of Onderstepoort, 23. XI. 1978 (1 ♂) and 6. XI. 1979 (3 ♀, 3 ♂), R. Meiswinkel, black light.

2 ♀ 5 ♂, Honeydew, 15 km north-west of Johannesburg, 17. III. 1983 (1 ♂), 19. III. 1983 (1 ♀), 15. VII. 1983 (1 ♂), 15. X. 1983 (1 ♀), 5. XI. 1983 (1 ♂), 20. XI. 1983 (1 ♂) and 8. IV. 1984 (1 ♂), M. Wasserthal, black light.

Natal. 1 ♀, Ngome Tea Estate, northern Natal, 24. XII. 1986, R. Meiswinkel, black light at pumphouse.

Orange Free State. 1 ♂, Golden Gate National Park, III. 1985, L. E. O. Braack, black light.

BOTSWANA

1 ♀ 1 ♂, Magadigadi Pan, 21. V. 1987, H. V. de V. Clarke, light trap.

MALAWI1 ♂, Kawalazi, 40 km east of Mzuzu, northern Malawi, 5. VII. 1988, K. Verster, black light in *Brachystegia* woodland.***Culicoides (Synhelea) moucheti* Cornet & Kr mer, 1970**

(Fig. 13, 22, 28; Table 1–3)

C. moucheti Cornet & Kr mer, 1970: 266 (Fig.—female: wing, antenna, palp, eye space, spermathecae; male: genitalia, 2 aedeagi, paramere).*C. moucheti* Cornet & Kr mer; Cornet & Chateau, 1971: 156 (Fig.—female: wing).

Notes.—*C. moucheti* is distinctive in that it is the only yellowish to ochreous member of the subgenus. Pale spots occur throughout the wing but are ill-defined and difficult to see. In the female sensilla coeloconica occur on basal segments 3, 5–10.

The male genitalia of *moucheti* are distinctive for 2 reasons:

- (1) The heavily chitinized basal projections of the aedeagus are long, nearly reaching the apex of the aedeagus whereas in all other species of *Synhelea* these are only 1/2–2/3 length of entire aedeagus, and
- (2) though the apical 1/2 of the parameres are recurved as in all *Synhelea* species the teeth are very fine and equal in length.

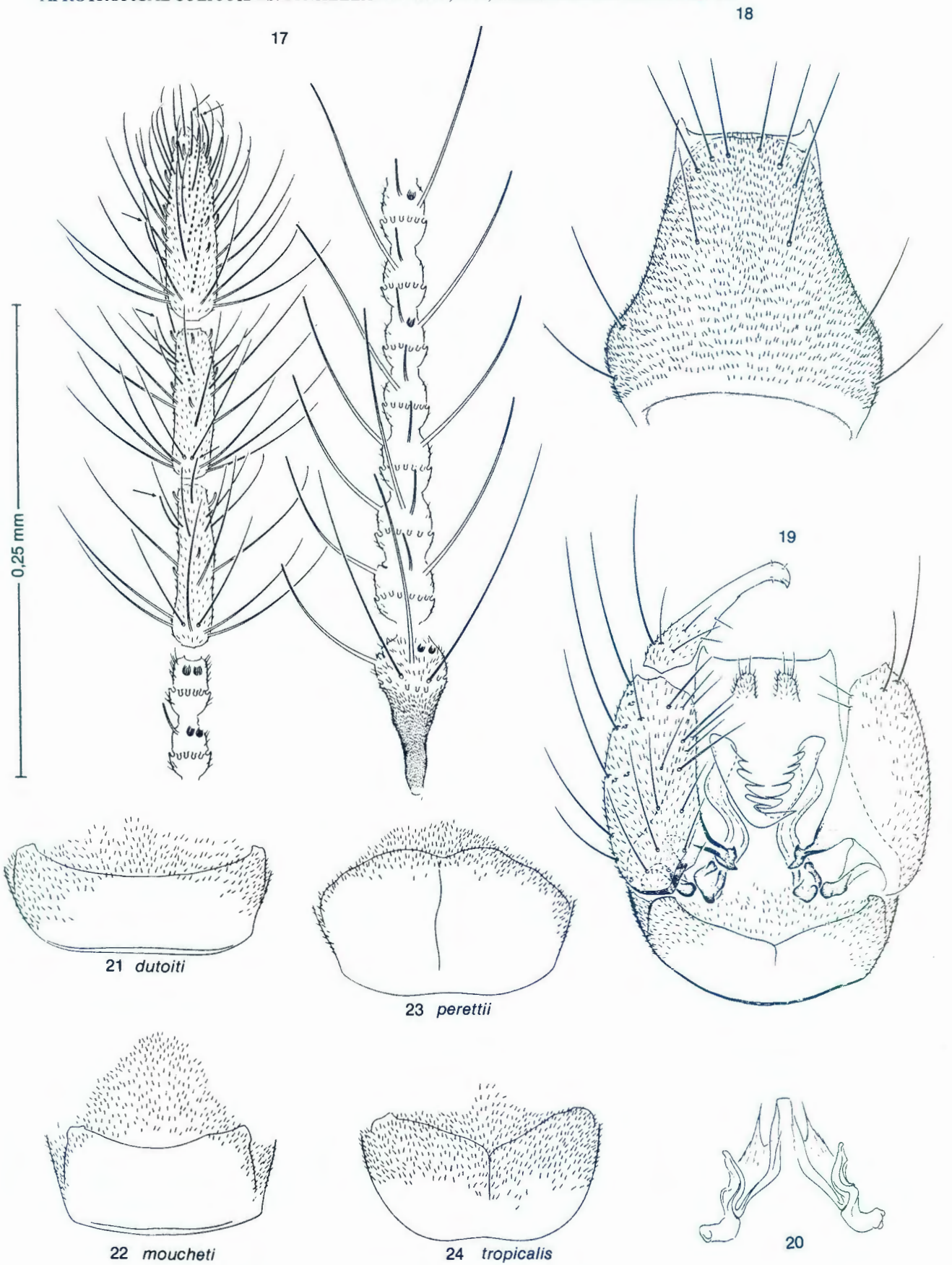


FIG. 17 *C. (Synhelea) dutoiti*. Antenna, male: segments XI-XV on left, segments III-X on right
 FIG. 18 *C. (Synhelea) dutoiti*. Genitalia, male: tergum IX
 FIG. 19 *C. (Synhelea) dutoiti*. Genitalia, male: without aedeagus
 FIG. 20 *C. (Synhelea) dutoiti*. Genitalia, male: aedeagus

FIG. 21 *C. (Synhelea) dutoiti*. Genitalia, male: Sternum IX
 FIG. 22 *C. (Synhelea) moucheti*. Genitalia, male: sternum IX
 FIG. 23 *C. (Synhelea) perettii*. Genitalia, male: sternum IX
 FIG. 24 *C. (Synhelea) tropicalis*. Genitalia, male: sternum IX

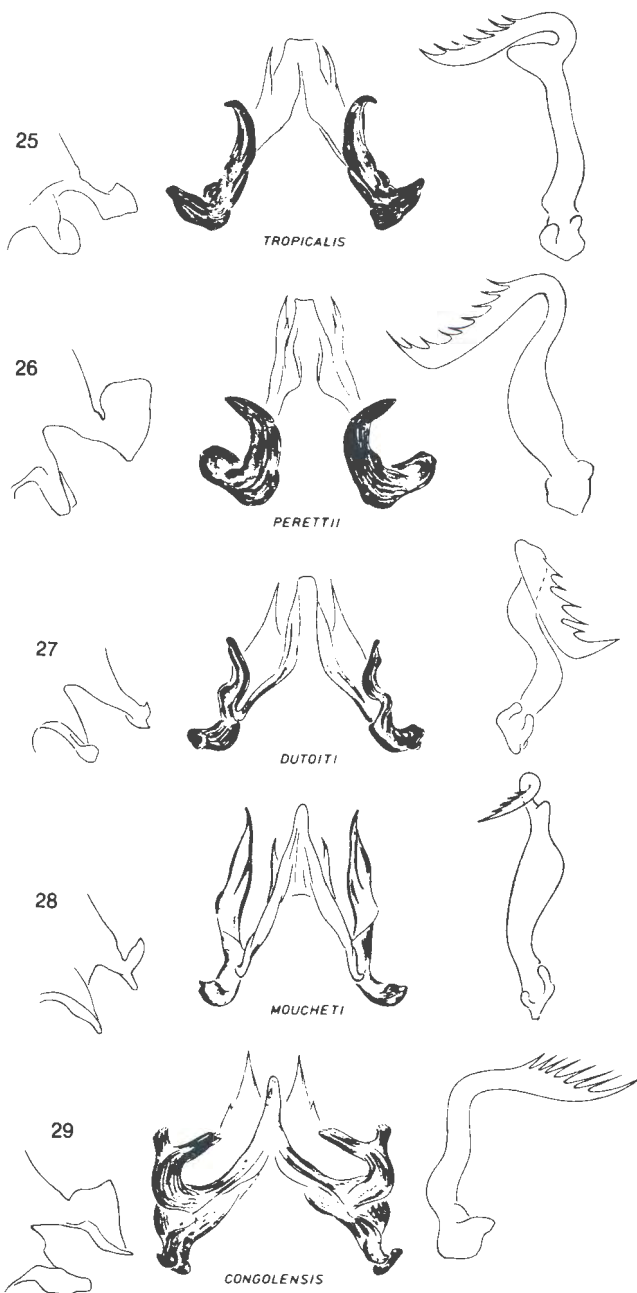


FIG. 25 *C. (Synhelea) tropicalis*. Genitalia, male: left, dorsal and ventral feet of basimere; centre, aedeagus; right, a paramere
 FIG. 26 *C. (Synhelea) perettii*. Genitalia, male: left, dorsal and ventral feet of basimere; centre, aedeagus; right, a paramere
 FIG. 27 *C. (Synhelea) dutoiti*. Genitalia, male: left, dorsal and ventral feet of basimere; centre, aedeagus; right, a paramere
 FIG. 28 *C. (Synhelea) mouchei*. Genitalia, male: left, dorsal and ventral feet of basimere; centre, aedeagus; right, a paramere
 FIG. 29 *C. (Synhelea) congolensis*. Genitalia, male: left, dorsal and ventral feet of basimere; centre, aedeagus; right, a paramere

Distribution. Chad; Mali, Senegal, Burkina Faso, South Africa.

Biology. Unknown.

Material examined. SOUTH AFRICA. 1 ♂, Shingwidzi, northern Kruger National Park, 2. IX. 1979, B. de Meillon & R. Meiswinkel, light trap.

1 ♀ 1 ♂, Pafuri, northern Kruger National Park, 15. IV. 1986, R. Meiswinkel & L. E. O. Braack, black

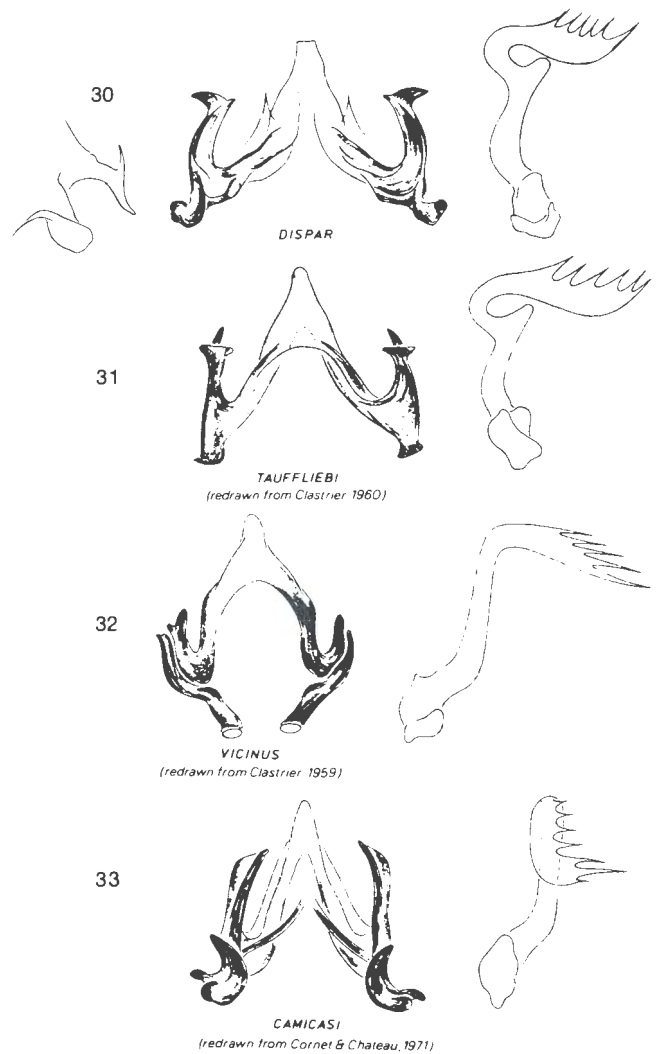


FIG. 30 *C. (Synhelea) dispar*. Genitalia, male: left, dorsal and ventral feet of basimere; centre, aedeagus; right, a paramere
 FIG. 31 *C. (Synhelea) tauffliebi*. Genitalia, male: left, aedeagus; right, a paramere
 FIG. 32 *C. (Synhelea) vicinus*. Genitalia, male: left, aedeagus; right, a paramere
 FIG. 33 *C. (Synhelea) camicasi*. Genitalia, male: left, aedeagus; right, a paramere

light 14 m up *Acacia albida* tree in riverine forest on banks of Pafuri River.

***Culicoides (Synhelea) pellucidus* Khamala & Kettle, 1971**

(Fig. 10; Table 2, 3)

C. pellucidus Khamala & Kettle, 1971: 62 (Fig.—female: wing, eye space, antennae, palp, spermathecae, tibial comb).

Notes.—See under *dutoiti*.

Distribution. Tanzania.

Biology. Unknown.

Material examined. Holotype ♀, Amani, 16. V. 1967, C. Khamala, light trap.

***Culicoides (Synhelea) perettii* Cornet & Chateau, 1971**

(Fig. 12, 23, 26; Table 1–3)

C. perettii Cornet & Chateau, 1971: 145 (Fig.—male: wing, genitalia, aedeagus, paramere).

C. perettii Cornet & Chateau; Boorman & Dipeolu,

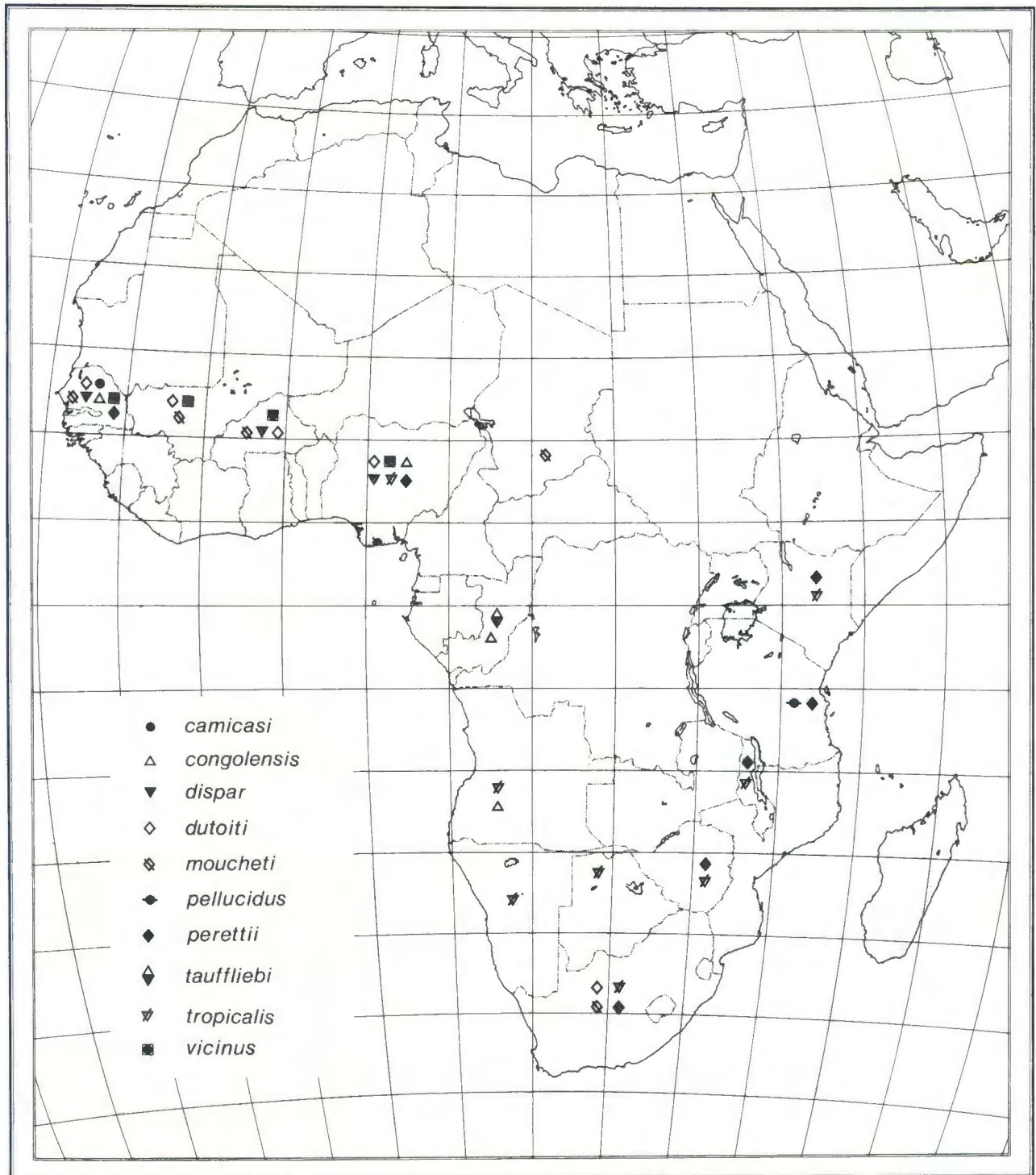


FIG. 34 Distribution of the 10 known species of *Culicoides* subgenus *Synhelea* in the Afrotropical region, according to the literature

1979: 47 (Fig. — female: wing, palp, spermathecae; male: genitalia, aedeagus, paramere).

Notes.—*C. perettii* is most closely related to *C. tropicalis* the females differing in antennal sensilla coeloconica distributions, this being 3, 7–10 in *perettii* and 3–10 in *tropicalis*. The males differ most significantly in the shape of the ventral root of the basimere, it being strongly bulbous and rounded in *perettii* (Fig. 26), smaller and more elegant in *tropicalis* (Fig. 25). The male genitalia differ too in the precise shape of the heavily chitinized basal projections of the aedeagus (Fig. 25, 26) and in that the posterior margin of sternum IX is produced in *perettii*, excavated in *tropicalis* (Fig. 23, 24). Finally, the

male antennal sensilla coeloconica distributions serve to further separate the 2 species: 3, 8–12 in *perettii*, 3, 8, 10–12 in *tropicalis*.

Comments. The antennal sensilla coeloconica distribution of 3, 7–10 recorded for female *babrius* (= *tropicalis*) by Khamala & Kettle (1971) in fact belongs to *perettii* whereas the male genitalia illustrated by them belong to *tropicalis*. Similarly Boorman & Dipeolu (1979) gave for male *C. tropicalis* an antennal coeloconica distribution of 3, 8–12 which belongs to *perettii*. But as in the Khamala & Kettle study their illustrated male genitalia are those of *tropicalis*, the paramere possessing the median knob which is absent in *perettii*. Cornet & Chateau (1971)

appear to have omitted recording certain antennal sensilla trichodea in their description of *perettii* saying that it has no short trichodea on segments IV–VI and XI. These are always present in South African and Malawian material and must for the moment be considered mere descriptive omissions as the short trichodea can be difficult to see if the antennal plume is well preserved.

Distribution. Senegal; Nigeria, Malawi, South Africa.

Biology. Unknown.

Material examined. SOUTH AFRICA: Transvaal. 1 ♂, farm 'Greystones' 12 km north-east of Tzaneen, northern Transvaal, 3. X. 1978, R. Meiswinkel, black light.

1 ♂, farm 'Carpe Diem', Trichardtsdal, 50 km east of Tzaneen, northern Transvaal, 11. XII. 1979, H. Cross, black light.

1 ♀, Tzaneen, northern Transvaal, 30. XII. 1977, R. Meiswinkel, black light in town garden.

1 ♂, Letsitele Valley, 15 km east of Tzaneen, northern Transvaal, T. Ikin, black light.

MALAWI

3 ♀ 3 ♂, Kawalazi Estate 40 km east of Mzuzu, northern Malawi, 24. X. 1987, R. Meiswinkel, black light in *Brachystegia* woodland.

3 ♀ 4 ♂, same data but collected 6. IX. 1988, K. Verster.

15 ♀ 8 ♂, same data but collected 14. XI. 1988, K. Verster.

NIGERIA

1 ♀ 1 ♂, Vom, 28. VIII. 1975, W. Taylor, at light.

ZIMBABWE

1 ♀, Harare, 1977, R. J. Phelps, light trap.

Culicoides (Synhelea) tauffliebi Clastrier, 1960

(Fig. 16, 31; Table 1–3)

C. tauffliebi Clastrier, 1960: 96 (Fig.—male: genitalia).

Notes.—Only the male of this species is known. The genitalia, especially the aedeagus, are quite distinctive (Fig. 31).

Comment. Examination of the holotype male showed the genitalia to be skewed sideways hence difficult to interpret. A paratype male was poorly dissected, broken up and appendages shrunken with the genitalia clouded. In the holotype sensilla coeloconica were present on antennal segments 3, 10–12. The sensilla chaetica and trichodea were difficult to see in both specimens but appeared to be distributed as presented in Table 2.

Distribution. Congo Republic (Brazzaville).

Biology. Unknown.

Material examined. Holotype ♂, Buku N'Situ, XII. 1955, light trap. Paratype ♂, same data.

Culicoides (Synhelea) tropicalis Kieffer, 1913

(Fig. 3, 7, 8, 24, 25; Table 1–3)

C. tropicalis Kieffer, 1913: 10.

C. babrius de Meillon, 1943: 112 (Fig.—male: wing, genitalia, aedeagus, aedeagus in side-view, paramere).

C. babrius de Meillon; Colaco, 1946: 235 (Fig.—female: wing, thorax, palp, spermathecae).

C. babrius de Meillon; Fiedler, 1951: 28 (Fig.—

female: wing, thorax, 3rd palpal segment, distal antennal segments, spermathecae, tibial comb; male: genitalia, basimere and distimere, paramere, tergum IX, aedeagus).

C. expectator sensu Callot, Krêmer & Molet, 1967: 43 non Clastrier, 1959 (Fig.—male: genitalia).

C. babrius de Meillon; Caeiro, 1961: 200 (Fig.—female: wing, thorax, distal antennal segments, palp, spermathecae, tibial comb; male: genitalia, basimere and distimere, paramere, aedeagus, tergum IX).

C. babrius de Meillon; Khamala & Kettle, 1971: 79 (Fig.—female: wing, thorax, eye space, palp, antenna, spermathecae, tibial comb; male: genitalia).

C. tropicalis Kieffer; Krêmer, 1972a: 651 (Fig.—female: wing, basal antennal segments, eye space, palp, spermathecae).

C. tropicalis Kieffer; Boorman & Dipeolu, 1979: 58 (Fig.—female: wing, palp, spermathecae; male: genitalia, aedeagus, paramere).

Notes.—Females of *tropicalis* have sensilla coeloconica on basal antennal segments 3–10. Wing pattern well-defined with the distal pale spot in cell R5 usually in the shape of an inverted comma. Its congener, *perettii*, has this spot mostly round. Males of *tropicalis* have sensilla coeloconica on antennal segments 3, 8, 10–12 very rarely on 9, paramere with median knob and sternum IX shallowly excavated (see notes under *perettii*).

Comments. There seems little doubt that the species commonly referred to as *babrius* in the literature is in most cases *tropicalis*, occasionally *perettii* (see notes under this species) and once *expectator*, this error by Callot, Krêmer & Molet (1967) was later corrected by Krêmer (1972a). We agree with Krêmer (1972a) that *babrius* de Meillon is a synonym of *tropicalis*. Two paratype males of *babrius* from Hunyani, southern Zimbabwe were examined. Though the 4 wings and 3 of the 4 antennae were missing as also the genitalia partly destroyed in 1 specimen, the remaining dissections showed genitalia and an antennal sensilla coeloconica distribution (3, 8, 10–12) typical for *tropicalis*.

Distribution. Kenya; Tanzania, Malawi, Zimbabwe, South Africa, Angola and Nigeria.

Biology. In Kenya, Lubega & Khamala (1976) reared *C. babrius* (= *tropicalis*?) from 'waterlogged' mud from freshwater marshes overgrown with *Cyperus* and *Typha* vegetation; pH 6.9, organic matter content 6–7%, water content 50–65%. They also reared it from mud from edges of puddles, pools, lakes, rivers and streams, exposed or covered by growing vegetation. In Zimbabwe, Braverman (1978) reared *tropicalis* from mud along drainage canals very low in organic matter. Similarly here at Onderstepoort (I. T. P. Pajor, personal communication, 1987) low numbers of *tropicalis* were reared from shaded, waterlogged mud, pH 7.3 on the edge of a small, occasionally flowing stream choked with *Carex* and *Matricaria*. This water originated some 300 m away during the cleaning of animal stables and though the effluent-enriched drainage furrow had been sampled along much of its length *tropicalis* had only been reared from the well-filtered endpoint site. One of us (A.L.D.) has reared *tropicalis* from a grazed area of short, coarse natural pasture in which were sizeable, almost completely grassed, broad-bottomed gullies holding scattered, grey silty depressions; in these depressions were hoofmarks recently

TABLE 3 A summary of the distribution and identity based on certain taxonomic characters of the 10 species of Afrotropical *Synhelea* according to various authors

Species	Antennal sens coeloconica: female	Antennal sens coeloconica: male	Palpal ratio	Geographic distribution	Author(s)
<i>camiciasi</i> (holotype)	3, 7-12	3, 10-12	2,25	Senegal	Cornet & Chateau, 1971
<i>congolensis</i> (holotype)	—	—	—	Congo	Clastrier, 1960
<i>congolensis</i>	3, 5, 7, 9-15	—	—	Senegal	Cornet & Chateau, 1971
<i>congolensis</i>	3, 5-15	3, 11-15	1,89-1,97	Nigeria	Boorman & Dipeolu, 1979
<i>congolensis</i>	3, 5, 7, 9-15	3, 11-15	—	Angola	Kr�mer, 1972b
<i>dispar</i> (holotype)	—	—	—	Senegal	Clastrier, 1959
<i>dispar</i>	3, 8-12	3, 10-12	2,15-2,24	Senegal and Burkina Faso	Cornet & Chateau, 1971
<i>dispar</i>	3, 7-12	3, 9-12	1,37-1,38	Nigeria	Boorman & Dipeolu, 1979
<i>dutoiti</i> (holotype)	—	—	—	South Africa	De Meillon, 1943
<i>dutoiti</i>	3, 7, 9-15	3, 11-15	2,33-2,50	South Africa, Malawi and Botswana	Meiswinkel & Dyce (unpublished data)
"vagus"	3, 6-15	3, 11-15	1,77-2,64	Nigeria	Boorman & Dipeolu, 1979
"vagus"	3, 7, 9-15	3, 11-15	3,00	Senegal, Mali and Burkina Faso	Cornet & Chateau, 1971
<i>moucheti</i> (holotype)	—	—	—	Chad, Senegal and Mali	Cornet & Kr�mer, 1970
<i>moucheti</i>	3, 5-10	3, 10-12	—	Senegal, Mali and Burkina Faso	Cornet & Chateau, 1971
<i>moucheti</i>	—	3, 10-12	—	South Africa	Meiswinkel & Dyce (unpublished data)
<i>pellucidus</i> (holotype)	3, 9-15	—	2,44	Tanzania	Khamala & Kettle, 1971
<i>perettii</i> (holotype)	—	3, 8-12	—	Senegal	Cornet & Chateau, 1971
<i>perettii</i>	3, 7-10	3, 8-12	2,05-2,38	Nigeria	Boorman & Dipeolu, 1979
<i>perettii</i>	3, 7-10	3, 8-12	—	South Africa and Malawi	Meiswinkel & Dyce (unpublished data)
"babrius"	3, 7-10	—	2,30	Kenya and Tanzania	Khamala & Kettle, 1971
<i>tauffliebi</i> (holotype)	—	3, 10-12	—	Congo	Clastrier, 1960
<i>tropicalis</i> (holotype)	3-10	—	—	Kenya	Kieffer, 1913
<i>tropicalis</i>	3-10	3, 8-12	1,65-2,11	Nigeria	Boorman & Dipeolu, 1979
"babrius"	—	—	—	Zimbabwe	De Meillon, 1943
"babrius"	—	—	—	Angola	Caeiro, 1961
"babrius"	—	—	—	South Africa	Fiedler, 1951
"expectator"	—	—	—	Angola	Callot, Kr�mer & Molet, 1967
<i>tropicalis</i>	3-10	3, 8, 10-12	1,9-2,25	South Africa, Malawi and Namibia	Meiswinkel & Dyce (unpublished data)
<i>vicinus</i> (holotype)	—	—	—	Senegal	Clastrier, 1960
<i>vicinus</i>	3-15	3, 10-15	1,77	Senegal, Mali and Burkina Faso	Cornet & Chateau, 1970

filled with rain that yielded a single male and female of *tropicalis*. This species was also reared from the unvegetated fine sand to coarse silt margins of a metre-wide running stream. The water was clear and unpolluted emanating from a large limestone spring 300 m away.

Material examined. SOUTH AFRICA: Transvaal.

13 ♀, farm 'Krugerspan' 30 km north-west of Thabazimbi, north-western Transvaal, 13. I. 1987 (1 ♀), 21. IV. 1987 (1 ♀) and 12. V. 1987 (11 ♀), M. Ras, black light.

1 ♀ 4 ♂, Skukuza, southern K.N.P., 15. I. 1985 (1 ♀ 1 ♂) and 17. I. 1985 (3 ♂), L. E. O. Braack, black light 50 m from banks of Sabie River.

2 ♀ 1 ♂ 15 km east of Skukuza, southern K.N.P., 26. II. 1986, 17 h 56-18 h 17, R. & P. Meiswinkel, truck trap along Sabie River.

2 ♀, Shingwidzi, northern K.N.P., 2. IX. 1979, B. de Meillon & R. Meiswinkel, black light.

1 ♂, Pafuri, northern K.N.P., 15. IV. 1986, R. Meiswinkel & L. E. O. Braack, black light 14 m up *Acacia albida* tree in riverine forest.

1 ♂, farm 'Hoek van Hel', at foot of Magoebaskloof escarpment, north-eastern Transvaal, 18. IX. 1979, R. Meiswinkel, black light.

1 ♂, Tzaneen, north-eastern Transvaal, 19. X. 1978, R. Meiswinkel, black light in town garden.

2 ♀, farm 'Carpe Diem', Trichardtsdal, 50 km east of Tzaneen, north-eastern Transvaal, 18. VII. 1983, R. Meiswinkel & C. von Gunten, black light near vlei.

1 ♀ 2 ♂, farm 'Heuningneskranz' 10 km north of Onderstepoort, 6. XI. 1979, R. Meiswinkel, black light.

3 ♀ 4 ♂, Honeydew, 15 km north-west of Johannesburg, 10. III. 1983 (1 ♀), 19. III. 1983 (1 ♀), 26. III. 1983 (1 ♀), 15. VIII. 1983 (2 ♀), 22. IX. 1983 (1 ♂) and 20. I. 1984 (1 ♂), M. Wasserthal, black light.

1 ♀ 1 ♂, farm 'Zoutpan', 45 km north of Onderstepoort, 10. I. 1974, A. L. Dyce, adults reared from pupae collected from 'fresh ground waters; sandy broad-bottomed, vegetation-covered gully; scattered silty depressions; recent showers filled hoof-marks in these depressions; silt grey'.

Natal. 1 ♂, Mfomoti, False Bay, 24. IX. 1983, R. Bagnall, black light.

13 ♀ 13 ♂, Ngome Tea Estate, northern Natal, 8. I. 1981 (1 ♂), 23. XII. 1982 (1 ♂) and 24. XII. 1986 (13 ♀ 11 ♂), R. Meiswinkel, black light.

1 ♂, farm 'Broedersrust', near Louwsburg, northern Natal, 11. III. 1987, A. Kriel, black light.

2 ♀ 1 ♂, Umlalazi Coastal Nature Reserve, 128 km north of Durban, 20. VII. 1988, E. & H. Nevill; (2 ♀), black light 100 m from *Phragmites* and *Juncus*; 26. VII. 1988, E. & H. Nevill (1 ♂), black light overlooking lagoon and mangroves.

Cape. 1 ♀, Grootfontein Agricultural College, Mid-delburg, 30. IX. 1983, J. C. van Straten, black light.

4 ♀ 9 ♂, Verlorenvlei near Redelinghuys, western Cape, 3. V. 1987, G. v. Eeden, black light.

1 ♀, 'The Eye', Kuruman, northern Cape, 21. I. 1974, A. L. Dyce, adult reared from a pupa collected from the unvegetated fine sand to coarse silt margins of a metre-wide running stream; water clear, unpolluted, emanating from large limestone spring 300 m away.

NAMIBIA

1 ♀, farm 'Bergvlug' 30 km east of Windhoek, XI. 1979, H. C. Biggs, black light.

ZIMBABWE

2 ♂, paratypes *C. babrius*, Hunyani River, Norton, s. Zimbabwe, 15. VI. 1942, C. V. Meeser.

MALAWI

1 ♂, Kawalazi Estate 40 km east of Mzuzu, northern Malawi, 14. VI. 1988, K. Verster, black light in *Brachystegia* woodland.

5 ♀, Mzuzu, northern Malawi, 14. IX. 1988, K. Verster, black light.

Culicoides (Synhelea) vicinus Clastrier, 1960

(Fig. 11, 32; Table 1-3)

C. vicinus Clastrier, 1960: 104 (replacement name for *intermedius* Clastrier).

C. intermedius Clastrier, 1959: 173 (Junior homonym, preoccupied *intermedius* Santos Abreu, 1918 (Fig. — male: genitalia).

C. vicinus Clastrier; Cornet & Chateau, 1971: 151 (Fig. — female: wing, eye space, palp, genitalia, spermathecae).

C. vicinus Clastrier; Boorman & Dipeolu, 1979: 60 (Fig. — female: wing).

Notes. — Female with sensilla coeloconica on each of antennal segments 3-15. Male genitalia distinctive in the shape of the aedeagus (Fig. 32); paramere without median knob. The sensilla coeloconica and trichodea distributions on the male antenna remain unrecorded.

Distribution. Senegal, Mali, Burkina Faso and Nigeria.

Biology. Unknown.

Material examined. NIGERIA. 1 ♀, Vom, 22. I. 1975, J. Boorman, at light.

DISCUSSION

Historical biogeography and current distribution

Synhelea is considered to be an austral element with Gondwanan connections. It appears to be unique to the Afrotropical region and is clearly allied to the diverse *similis* group of Cornet & Chateau (1971). Fig. 34 reveals that *Synhelea* is broadly restricted to the African tropics and major categories of woodland and savanna, and fades towards the temperate south. Thus, for 2 basic reasons, we postulate a tropical rather than a temperate origin for *Synhelea*:

1. Fewer species are known from the more southerly and cooler regions of Africa, and
2. South Africa, the most temperate of the Afrotropical subregions, has no endemic *Synhelea* species; of the 4 species recorded from there 2 (*moucheti* and *perettii*) are restricted to the hot, low-lying areas of the north-eastern Transvaal lowveld, this further indicating that the majority of the species of the subgenus are sensitive to low temperatures. Only *C. tropicalis* and *C. dutoiti* penetrate into the more temperate zones, comprising transitional forest and scrub types to pure grassveld types.

It is instructive to look at Table 3 and to see that 7 species of *Synhelea* are known from Senegal. Four of these (1 a synonym) have the 9000 km² Niokolo-Koba National Park in eastern Senegal as their type locality while a fifth species has been recorded there, fully half the species known from the Afrotropical region. We give a brief description of the Niokolo-Koba area i.e. a 'character sketch' of the type of country inhabited by *Synhelea*: it lies in generally flat or undulating country, its vegetation grading from fairly open savanna with scattered trees to being well-wooded with denser riverine thickets and forest along the Gambia and its major tributaries. Niokolo-Koba is further characterized by having old flood plains and oxbow lagoons, a fairly high annual rainfall (1100 mm), poor soils, fire and the tsetse fly. Though having a fairly low carrying capacity for large game, perhaps due to the broad-leaved trees having a fairly high concentration of secondary chemical compounds which make them unpalatable to ruminants, Niokolo-Koba nevertheless has a varied fauna as a result of it lying on the transition zone from Guinea forest to the Sudanian savanna (Bosman & Hall-Martin, 1986). Cornet & Chateau (1971) note for e.g. the *C. moucheti* is very abundant in certain situations only, and that its larval habitat is probably in the sandy, moist beds of larger rivers such as the Niokolo and Gambia in Senegal. This observation agrees well with our own in South Africa where, on only 2 occasions, has a species of *Synhelea*, *C. tropicalis*, been caught in relatively high numbers. In the 1st, a light-trap on the banks of a fairly small (15 m wide) very sparsely vegetated sand river with little water in the Nwatomhiri area east of Skukuza in the lowveld thickets of the Kruger National Park, yielded more than 200 specimens. The 2nd was a series of 93 ♀♀ 1 ♂ collected with a truck-trap at dusk along the banks of the Luvuvhu river in the northern Kruger National Park (R. Meiswinkel & L.E.O. Braack, unpublished data, 1986). The reddish, sandy Luvuvhu has dense riparian vegetation, but, in being broad (25-50 m), is mostly sunlit. The climate and vegetation of this area is briefly reviewed in Meiswinkel (1987). The frequent occurrence of gynandromorphs in collections further supports the notion that the immature stages have a predilection for warm sunlit situations. As recorded under *C. tropicalis* emergence traps positioned permanently at Onderstepoort in situations that were either shaded, vegetated or organically enriched yielded less than 5 specimens in 2 years. These low returns strongly indicate that such habitats are either peripheral or unsuitable for *Synhelea* species.

According to Keay (1959) the Afrotropical region comprises 32 major vegetation types. *Synhelea* has been recorded in only 12 of these the clear majority of records (65/85=75 %) being from the savanna-

woodland types of 16–22 (Keay, 1959). There is perhaps an element of truth in the argument that the *Synhelea* distribution pattern seen in Fig. 34 is the result of poor collecting, this exacerbated by the fact that savanna-woodland is the major phytochorion in Africa. Furthermore, *Synhelea* species are very rarely trapped in large numbers and if not slide-mounted can be easily misidentified as species belonging to the broader *similis* assemblage.

In the foregoing we appear to intimate a direct link between *Synhelea* and savanna-woodlands. This is perhaps misleading. We regard vegetation as necessary but only secondary in bringing hosts and bloodsucking midges together. The occurrence of many insects in the tropics- and subtropics- restricted *Brachystegia* woodlands for e.g. is often an indirect association and only the result of both biotas being sensitive to low temperatures. We are also aware that the direct coupling of *Synhelea* to a floristic regime could negatively influence any future phylogenetic study on the broad *similis* assemblage, one of the reasons being that it suggests that *Synhelea* is a more recent offshoot arising only with the spread of woodlands and savannas during the trend to aridity in the Miocene starting some 23 million years ago. The prehistory of *Synhelea* may go even deeper if we consider that this subgenus is endemic to the Afro-tropical region. This implies that it may have arisen earlier but only after the break-up of Gondwana once the African plate had separated from the remaining southern landmasses 100–80 million years ago.

Given that the immature stages of all *Culicoides* species require moisture it is our current assessment that conjecture as to *Synhelea*'s origin and resultant distribution would be more accurate if centred around the preference of adults for higher temperatures (or sensitivity to lower temperatures) and of the immature stages for sunlit, broad-bottomed sandy rivers.

It is clear that more data on larval habitats, distribution and adult host preference of *Synhelea* species are needed to refine what little is known.

Subgeneric position of Synhelea

There has been no complete world revision of *Culicoides* subgenera. The following differentiation between *Synhelea* and the 25 currently recognized subgenera is based in part on the key given for 17 of these by Ratanaworabhan (1969) and on additional unpublished data of W. W. Wirth. Furthermore, slide-mounted material of 24 of these subgenera has been examined the only omissions being *Jilinocoides* and *Sinocoides* these recently erected for certain Chinese species on females only (Chu, 1983). Our list of subgenera agrees closely with that recently provided by Boorman (1988) differing only in that he failed to list *Synhelea* and *Oxyhelea*. We consider *Callotia* Vargas & Kr mer, 1972 to be a synonym of *Pontoculicoides*, Remm, 1968. As shown by Boorman (1988) the subgenera *Silvaiculicoides* Glukhova, 1972 and *Sensiculicoides* Shevchenko, 1977 share the species *C. fascipennis* (Staeger, 1839) as subgenotype. The former name should therefore take precedence over the latter.

Synhelea Kieffer differs as follows from the 25 subgenera now recognized as constituting the genus *Culicoides*:

- (i) Worldwide there are nearly 100 species of "plain-winged" *Culicoides*. To date some 20 of these have been placed in the 3 subgenera

Pontoculicoides Remm, 1968, *Selfia* Khalaf, 1954 and *Wirthomyia* Vargas, 1973, (*Callotia* Vargas & Kr mer, 1972, is a synonym of *Pontoculicoides*). All known species of *Synhelea* have the wings patterned.

- (ii) The subgenera *Beltranmyia* Vargas, 1953, *Meijerehelea* Wirth & Hubert, 1960 and *Monoculicoides* Khalaf, 1954 possess only 1 fully developed functional spermatheca while the subgenera *Jilinocoides* Chu, 1983, *Sinocoides* Chu, 1983 and *Trithecooides* Wirth & Hubert, 1959 possess 3. *Synhelea* and the 15 remaining subgenera differ in having 2 fully developed functional spermathecae.
- (iii) Of the remaining 15 subgenera *Haemophoructus* Macfie, 1925, known only from the Oriental region, is unusual and unique in that the wing of the female has 1 long radial cell as opposed to the 2 cells found in the male. In *Synhelea* and others both sexes have either 1 short radial cell or 2 short radial cells more or less equal in size.
- (iv) Turning to the male genitalia the 3 subgenera *Anilomyia* Vargas, 1960, *Hoffmania* Fox, 1947 and *Culicoides* Latreille, 1809 are unlike any other in that the inner margins of the basimeres are coarsely spinose. All other subgenera, including *Synhelea*, have these inner margins only sparsely adorned with smaller unmodified hairs or microtrichia.
- (v) In the subgenus *Avaritia* Fox, 1955, the posterior margin of tergum IX lacks apicolateral processes in 95 % of species. Furthermore all species have the apical half of the parameres narrowing to slender tips which can be either simple or only very finely feathered. *Synhelea* differs firstly in always carrying apicolateral processes and secondly in having the apical half of the parameres strongly recurved and usually broadly toothed.
- (vi) Of the remaining 10 subgenera, 6 have the apices of the parameres erect or recurved, these being either stoutly ended or finely pointed and are either bare or with very fine hairs only. The subgenera are: *Drymodesmyia* Vargas, 1960, *Glaphiromyia*, Vargas, 1960, *Macfiella* Fox, 1955, *Mataemyia* Vargas, 1960, *Remmia* Glukhova, 1977 and *Silvaiculicoides* Glukhova, 1972. *Synhelea*, along with *Diphaomyia* Vargas, 1960, *Diplosella* Kieffer, 1921, *Haematomyidium* Goeldi, 1905 and *Oecacta* Poey, 1851 differ in having the apical half of the parameres strongly recurved these often broad and always armed with medium to large-sized teeth, the whole very much resembling elk-horns.
- (vii) The 27 species comprising *Haematomyidium* set it apart from all other subgenera in that there is no difference in length or shape between female antennal segments X and XI. More than 95 % of the world species of *Culicoides*, including those in *Synhelea*, have segment X noticeably shorter and differently shaped from XI (Fig. 4 & 5).
- (viii) Though a number of characters align *Diplosella* with the broad *similis* group the unusual possession of an enlarged antennal scape in the female and the absence of recurved leaflets on the shoulders of the aedeagus in the male places *Diplosella* outside the group. This unique position is strengthened by the

female having a high number of chaetia on all antennal segments whereas in *Synhelea* and the remaining segments of the *similis* line the number of chaetia is lower on the basal segments and invariably absent on all or most of the distal segments. Szadziewski (1984) considered *Diplosella* to be a junior synonym of *Oecacta* Poey. We feel that *Diplosella* should be retained until it is more strictly appraised as a possible relict of the eremic Afro-Eurasian fauna. If so, it more likely would have derived from the Afrotropical *similis* group than from *Oecacta*, a subgenus essentially Neotropical in distribution.

(xi) The last 2 subgenera, *Diphaomyia* and *Oecacta* differ from *Synhelea* in that the shoulders of the aedeagus carry either a process in the shape of a recurved leaflet or are unadorned. Though *Synhelea* partly shares this diagnosis in having the shoulders of the aedeagus unadorned, the 10 species embraced by the subgenus differ uniquely by virtue of the following 4 apomorphies:

(a) Contorted, species-specific processes arise from the bases of the legs of the aedeagus (Fig. 25–33). Close on 750 species of world *Culicoides* have been examined and as far as could be further ascertained from the literature no species was found to have similar aedeagal configurations.

(b) A 2nd unusual apomorphy is that of the 4 sensilla chaetica located on the basal female antennal segments IV, VI and VIII, 2 are displaced onto the apical half of these segments. Furthermore they are markedly shorter, thinner and straight (Fig. 1, 5). In the entire genus these chaetia are found only on the basal 1/2 of the relevant segments and are much longer and curved in shape. It is important to note here that if there is a tendency to displacement of these chaetia from the sub-basal to the subapical position it occurs in the broad *similis* group only, in both the Afrotropical and Australasian sections.

(c) A 3rd apomorphy is that of the 7 species of *Synhelea* examined all had only 2 or 3 chaetia basally on male antennal segment XIII (Fig. 17); of 11 of the 15 species comprising the Afrotropical section of the *similis* outgroup, examined, all possessed 5 or 6 chaetia on segment XIII.

(d) The 4th and final apomorphy is that all species of *Synhelea* have the posterior margin of sternum IX of the male genitalia only shallowly excavated or produced with the sternital membrane always heavily spiculate (Fig. 21–24).

It is appropriate here to comment briefly upon the 6 character states utilized by Cornet & Chateau (1971) in their broad *similis* group definition.

- (i) "basal antennal segments III and IV with sensilla ampullacea" (Fig. 1). This is not only true for all species of *Culicoides* but in fact occurs throughout the Ceratopogonidae (R.M., personal observations).
- (ii) "each of basal female antennal segments III–X with 2 long transparent sensilla trichodea these

positioned close together on segments III, V, VII, IX and X while being well separated on segments IV, VI and VIII". Referring to Fig. 1 & 5 it can be seen that these trichodea are, as observed by Cornet & Chateau (1971), staggered in a spiral of alternating positions. This spiralling in all likelihood improves signal-receiving from any angle, and though it occurs throughout the genus is especially pronounced in *Synhelea*. In this subgenus the trichodea are very long and would in touching one another, have their functioning impeded.

(iii) "eyes bare, separated for their entire length" (Fig. 4). This is true for all *Synhelea* and *similis* group species. As a character its value is limited as it is also found outside these groups in a number of subgenera worldwide.

(iv) "male genitalia with the parameres toothed on their apical portion" (Fig. 19, 25–33). As stated above this character unites the 3 subgenera *Diphaomyia*, *Haematomyidium* (pro parte) and *Synhelea* and is further represented in other *Culicoides* groups from all faunal regions of the world. This form of paramere is considered by us to be of very early origin within the phylogeny of *Culicoides* and has been retained by several long-separated, distinct lineages.

(v) "dorsal and ventral feet of the basimeres of the male genitalia well developed". Along with the toothed parameres, well-developed dorsal and ventral feet are diagnostic for all the *similis* group species worldwide. However, these feet, though well-developed, can exhibit quite some variation in groups such as *Synhelea* (Fig. 25–30). In other groups they can be remarkably uniform and are thus open to misinterpretation as similar feet are to be found outside the 3 subgenera mentioned in (iv). This will undoubtedly complicate assignment of species to the *similis* group if based on this character alone.

(vi) "male genitalia with tergum IX possessing apicolateral processes" (Fig. 18). Once again this is a feature that occurs widely within the genus *Culicoides*.

CONCLUSION

Cornet & Chateau (1971) placed 16 Afrotropical species within their *similis* group, 9 of these now removed to *Synhelea* Kieffer. To the remaining 7 species of their broad group we here propose addition of a further 11: *Culicoides herero* (Enderlein), *C. albopunctatus* Clastrier, *C. corneti* Kr mer, *C. olysageri* Kr mer & Nevill, *C. papillatus* Khamala & Kettle, *C. pretoriensis* Kr mer & Nevill, *C. spinulosus* Khamala & Kettle, *C. translucens* Khamala & Kettle, *C. parvulus* Khamala & Kettle, *C. radiomaculatus* Khamala & Kettle and *C. onderstepoortensis* Fiedler. Besides these 18 species here recognized as comprising the broad *similis* group there remain additional species in the Afrotropical region still to be described. This assemblage is taxonomically difficult but the majority appear to us to split into 2 entities. The 1st embraces *C. similis* Carter, Ingram & Macfie, *C. expectator* Clastrier, *C. ravis* de Meillon, *C. kobae* Cornet & Chateau, *C. micheli* Cornet & Chateau and *C. herero*; the 2nd contains *C. accraensis* Carter, Ingram & Macfie, *C. grenieri* Vattier & Adam, *C. albopunctatus*, *C. spinulosus*, *C. corneti*, *C. olysageri*, *C. papillatus* and *C. translucens*, *C. parvulus*, *C. radiomaculatus*,

C. pretoriensis and *C. onderstepoortensis* do not fit readily into either category and must for the present be considered distant outliers of the broad *similis* group.

As stated elsewhere the broad *similis* group fraternity is principally austral in its distribution with the majority of species confined to the tropics. This group carries some large assemblages worldwide such as the Australasian-Oriental *clavipalpis* and *williwilli* groups (Wirth & Hubert, 1989) while in the New World another sector falls within the subgenera *Diphaomyia* Vargas, *Haematomyidium* Goeldi and *Oecacta* Poey. Only a handful of *similis* group species are to be found in the Holarctic region. There is a complexity in the inter-group affinities and these will only be elucidated once the very broad *similis* group is appraised throughout its essentially southern hemisphere distribution.

The 10 species of *Synhelea* remain separated from their congeners in that they uniquely possess contorted, species-specific processes which arise from the bases of the legs of the aedeagus, and carry medially to subapically on female antennal segments IV, VI and VIII 2 short, thin and straight chaetia. Finally *Synhelea* appears to be endemic to the Afrotropical region.

ACKNOWLEDGEMENTS

We should like to dedicate this paper to our respective wives Penelope and Hilda for their care during 5 months of togetherness in Sydney and Pretoria. Also we thank Dr John Boorman for loan of West African species of *Synhelea*, Dr Jean Clastrier for the holotype and a paratype of *C. tauffliebi*, and Mr Istvan Pajor, Onderstepoort, for allowing us access to his records of reared *C. tropicalis*. Our thanks too to Mr Ian Roper for wing photography and Dr Willis Wirth for loan of representative material from the Nearctic and Neotropical *Culicoides* faunas. Finally our sincere appreciation to the Directorship of Onderstepoort, especially Drs R. D. Bigalke, J. D. Bezuidenhout and E. M. Nevill who have wholeheartedly supported our interchange during the last few years.

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