

OBSERVATIONS ON AFRICAN  
MEALY BUGS  
(HEMIPTERA : COCCOIDEA)



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# OBSERVATIONS ON AFRICAN MEALY BUGS (HEMIPTERA : COCCOIDEA)

By G. DE LOTTO

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## SYNOPSIS

Thirty new species of Pseudococcidae from Africa south of the Sahara are described ; *Chorizococcus lounsburyi* (Brain, 1912), and *Phenacoccus graminosus* McKenzie, 1960, are redescribed. Several records from new hosts and localities of old species, together with notes on their distribution and generic assignment are given. Seven new genera are described.

## INTRODUCTION

WITH the descriptions of thirty more species, the study of the new Pseudococcidae from Africa south of the Sahara accumulated in the past in the collection of the Scott Agricultural Laboratories, Nairobi, is practically completed. Some ten or twelve species, all very likely new, had to be omitted, however, either because the material available was in too poor a condition or because the structural differences which distinguished them from their closest relatives could not adequately be valued, and further series of specimens must be examined before any satisfactory conclusion can be reached.

Though the purpose of this paper is mainly concerned with the identity and distribution of the species, a preliminary attempt has been made to review the status and composition of some genera. In order to accommodate certain very peculiar species, seven new monotypical genera have been introduced. Some morphological features exhibited by a few species caused serious classificatory problems, which could not be settled at the present stage of this work. The generic assignment of the species in question is therefore entirely provisional, pending further study.

All records of host plants and localities or territories of species already known from the area under review, are new. On the basis of observations carried out so far, a few notes have been included on the distribution of some species, with particular emphasis on those of economic importance.

The present work has been financed by the Colonial Development and Welfare Fund.

## DESCRIPTIONS AND RECORDS OF SPECIES

**CATAENOCOCCUS** Ferris, 1955

*Cataenococcus* Ferris, 1955 : 3.

Type species : *Dactylopius olivaceus* Cockerell, 1896.

From Ferris's (1955) redescrptions of the type species, the only feature of taxonomic value by which this genus can be separated from the very closely related *Farinococcus* Morrison, 1922 (type species : *F. multispinosus* Morrison, 1922) is the position of the anal ring. In *Cataenococcus* this organ is situated at, or close to, the extremity of the abdomen, whilst in *Farinococcus* it is displaced towards the centre of the body by three or four times its diameter.

It was on the basis of this character that the two East African species, *jasmini* De Lotto, 1961, and *hypogeus* De Lotto, 1961, were assigned to *Cataenococcus* instead of *Farinococcus*. To them should be added *C. markhamiae*, here described as new.

## PROVISIONAL KEY TO SPECIES

- 1     Anal lobe cerarii with but two spines enclosed within an elongate chitinized area *markhamiae*
- Anal lobe cerarii with more than two spines ; area about the cerarian spines not chitinized 2
- 2 (1)   Ventral side of the anal lobes with an elongate irregularly shaped chitinized bar ; dorsal setae all finely pointed *jasmini*
- Anal lobes without ventral chitinized bar ; setae of the dorsal prosoma variously knobbed near the apex *hypogeus*

Balachowsky (1954) assigned *Farinococcus loranthi* Strickland, 1947, to the genus *Cataenococcus* and presented a detailed redescription and a diagram of the species based on specimens he collected in French Guinea on aerial roots of *Rhizophora racemosa*. On comparing his diagnosis with Strickland's, pronounced differences of specific significance in some morphological features suggest that the material Balachowsky had at hand did not in fact belong to the species Strickland originally described from Ghana on *Loranthus bangwensis*.

***Cataenococcus markhamiae* sp. n.**

(Plate 1)

Mounted specimens very broadly oval to nearly circular in outline ; length up to 3.6 mm. Anal lobe cerarii each with two robust conical spines surrounded by 5–7 auxiliary setae and 20–30 trilocular pores ; each cerarius is enclosed within an irregularly elongate chitinized area. The remaining spines along the margin of the body are very variable in size, and are arranged singly or in small groups set at irregular intervals. Ventral side of each anal lobe with an elongate chitinized bar ; apical seta 212–234 $\mu$ ;<sup>1</sup> subapical one 110–146 $\mu$ . Multilocular disc pores arranged in four or five transverse groups on the ventral midregion of the abdomen. Their number is as follows : (ix plus x) 15–22 ; (viii) 29–40 ; (vii) 25–37 ; (vi) 1–5 ; (v) 0–2. No multilocular pores occur on the ventral prosoma or on the dorsum. Tubular ducts of oral collar type of two sizes. The larger ones are arranged in small groups on the ventral marginal

<sup>1</sup> All measurements in microns refer to the length of the structure for which they are given.

area of the last four or five abdominal segments. Ducts of the smaller size very few on the ventral side of the abdomen. Trilocular pores numerous on either side of the body. Simple disc pores apparently absent. Circulus transversely elongate, with surface membranous. Dorsal setae numerous and very short, except a few on the median area of the last abdominal segments which are fairly long and robust; ventral setae long. Legs well developed, stout; hind coxae and tibiae with few minute translucent pores; dimensions of legs (iii): trochanter plus femur 270–300 $\mu$ ; tibia plus tarsus 248–270 $\mu$ . Anal ring entire, set close to the posterior end of the body, cellular, with six setae measuring 117–139 $\mu$ . Beak 212–226 $\mu$ . Antennae 8-segmented, or 7-segmented with a pseudoarticulation on the third segment; total length 372–409 $\mu$ .

Holotype. Adult ♀. UGANDA: Sebei, i.iii.1957, on roots of *Markhamia* sp. (D. N. McNutt). Coll. No. 2288.

Paratypes. 3 adult ♀. Same data as holotype.

### ***CENTROCOCCUS* Borchsenius, 1948**

*Echinococcus* Balachowsky, 1936: 157 [non Rudolphi, 1801].

*Centrococcus* Borchsenius, 1948: 953 [nomen novum].

Type species: *Centrococcus echinatus* (Balachowsky, 1936).

In Africa south of the Sahara this genus is represented so far by a single species only.

### ***Centrococcus insolitus* (Green, 1908)**

*Phenacoccus insolitus* Green; Newstead, 1911: 164.

*Tylococcus insolitus* (Green) Brain, 1915: 95.

*Tylococcus insolitus* (Green); Brain & Kelly, 1917: 182.

*Phenacoccus insolitus* Green; James, 1934: 272.

*Tylococcus insolitus* (Green); Munro & Fouché, 1936: 96.

*Centrococcus insolitus* (Green); Williams, 1958: 224.

Very likely this species is an immigrant. It has been twice recorded from Kenya. First by Newstead (1911) from Kibwezi on *Tabernaemontana* sp. and later by James (1934) from Naivasha on *Sida rhombifolia* L., the latter being the westernmost locality where the species has been found in East Africa so far. Very uncommon.

KENYA: Nairobi, vii.1926, on *Solanum giganteum* Jacq. (T. W. Kirkpatrick); Tabere, 26.viii.1959, on *Solanum incanum* L. (D. J. McCrae).

ZANZIBAR: 14.ii.1956, on *Physalis peruviana* L. (R. H. Le Pelley).

### ***CHAETOCOCCUS* Maskell, 1898**

*Chaetococcus* Maskell, 1898: 249.

Type species: *Sphaerococcus bambusae* Maskell, 1892.

Structurally this genus is very closely allied to *Antonina* Signoret, 1875 (type species: *A. purpurea* Signoret, 1875). As has been pointed out by Morrison and Morrison (1922), and more recently by Williams (1958a), the two genera are doubtfully distinct.

***Chaetococcus bambusae* (Maskell, 1892)**

*Chaetococcus bambusae* (Maskell); Williams, 1958 : 206.

UGANDA : Entebbe, 5.x.1952, on bamboo (*T. R. Odhiambo*).

***CHORIZOCOCCUS* McKenzie, 1960**

*Chorizococcus* McKenzie, 1960 : 692.

Type species : *Chorizococcus wilkeyi* McKenzie, 1960.

To this genus are referred at present only two African species, both structurally very closely allied to the type, despite the absence of the denticle on the plantar surface of the claws. They are *Pseudococcus lounsburyi* Brain, 1912, originally described from South Africa on specimens collected on *Agapanthus umbellatus* L'Herit., and *Spilococcus pusillus* De Lotto, 1961 from Kenya, from roots of *Bidens pilosa* L., as well as from roots of *Indigofera* sp., *Solanum tuberosum* L., and *Ipomoea batatas* Poir.

***Chorizococcus lounsburyi* (Brain, 1912)**  
(Plate 2)

*Pseudococcus lounsburyi* Brain, 1912 : 179.

*Pseudococcus lounsburyi* Brain ; Brain, 1915 : 119.

*Pseudococcus lounsburyi* Brain ; Munro & Fouché, 1936 : 92.

*Pseudococcus lounsburyi* Brain ; De Lotto, 1958 : 96.

On dealing with the identity of the mealy bugs described by C. K. Brain from South Africa (De Lotto, 1958), I assumed as correct the interpretation of this species given by Ferris (*in* : Zimmerman, 1948 ; Ferris, 1950). According to McKenzie (1960) the insect dealt with by Ferris from the Hawaiian Islands and California, U.S.A., was not *lounsburyi* but *Pseudococcus* (*Trionymus*) *peregrinus* described by Green in 1925 from England. Recently Williams (1962) after comparing the types of *peregrinus* with specimens of *lounsburyi* from South Africa, Egypt, Hawaii, Holland and England, came to the conclusion that the two species are structurally identical. He pointed out that the differences in colour and habit of the adult female of *peregrinus* come within the range of variation of *lounsburyi*.

According to Brain (1912) the adult female is " at the time of spinning the ovisac, large, 3.7 mm. (4.1 mm. with caudal appendages) by 1.65 mm. broad, becoming somewhat narrower towards the anterior and posterior ends ; colour purplish, showing distinctly through the ashy white secretion ; segmentation very distinct ; legs and antennae very pale ; lateral wax appendages absent, caudal ones stout at base, somewhat conical, snow white, and appearing granular. Inner pair longer and stouter than the outer ones. . . . Ovisac : when complete entirely enclosing the adult ♀, large, elongate, oval, composed of threads which, when seen under the microscope have almost a glassy appearance ; 4.5 mm. long, by 2.25 mm. broad. Large numbers of ovisacs were often found matted together between leaf-bases, sometimes forming a mass two inches long by almost two inches wide."

The following is a redescription of Brain's species based on five paratypes made available from the South African National Collection of Insects, Pretoria, and on a series of ten supplementary specimens from *Agapanthus* sp. from South Africa and Kenya, as listed below.

Mounted specimens elongate elliptical, with anal lobes fairly well developed ; length up to 3.1 mm. Margin of the body with one pair of marginal cerarii on each of the last two abdominal segments. Anal lobe cerarii each built up with two robust conical spines surrounded by 7 to 9 auxiliary setae and 35-45 trilocular pores ; area about the cerarian spines not chitinized. Penultimate cerarii (ii) each with two spines slightly smaller than those of the anal lobe cerarii. Ventral side of each anal lobe without chitinized bar. The apical seta in all paratypes at hand was missing ; according to Brain (1912) it attained the length of 144-160 [146-168] $\mu$ ;<sup>2</sup> sub-apical seta 44-51 [37-44] $\mu$ . Multilocular disc pores arranged in transverse groups on the midregion of the last five—occasionally six—abdominal segments as follows : (ix plus x) 31-40 [30-40] ; (viii) 31-42 [30-50] ; (vii) 15-26 [25-36] ; (vi) 16-28 [13-30] ; (v) 6-20 [3-13] ; (iv) 0 [0-2]. A few pores (1 to 3) occasionally are scattered on the dorsal side of some of the abdominal segments. No multilocular pores occur on the ventral and dorsal prosoma. Tubular ducts of oral rim type tending to be arranged in dorsal longitudinal series. The number of pores on the last six abdominal segments anterior to the anal lobe one, is : (viii) 5-6 [3-6] ; (vii) 3-6 [3-6] ; (vi) 6-9 [4-9] ; (v) 5-9 [3-9] ; (iv) 7-10 [5-7] ; (iii) 6-10 [3-6]. A few ducts are scattered on the dorsal prosoma and on the ventral marginal area of the abdominal segments anterior to the genital opening and the thorax. Tubular ducts of the oral rim type of two sizes. The larger ones very numerous ; they are set in irregular transverse rows on the ventral side of the last five abdominal segments and on the dorsal side of the segments (viii) and (vi) to (iv) ; other pores are arranged in groups on the ventral and dorsal marginal areas as far as the head. The ducts of smaller size are few and mostly associated with the abdominal multilocular disc pores ; a few are scattered on the dorsal side of the abdomen. Trilocular pores not numerous and evenly distributed on either side of the body. Simple disc pores smaller than the trilocular ones, few and sparse. Anterior and posterior dorsal ostioles well developed with lips membranous. Circulus lacking. Dorsal setae few, short and slender ; ventral ones noticeably longer. Legs well developed, without ungual denticle ; translucent pores missing ; dimensions of legs (iii) : trochanter plus femur 300-350 [256-307] $\mu$  ; tibia plus tarsus 321-350 [270-321] $\mu$ . Anal ring entire, apical, with six setae measuring 117-139 [110-124] $\mu$ . Beak 95-109 [80-95] $\mu$ . Antennae with eight segments ; total length 394-438 [350-416] $\mu$ .

SOUTH AFRICA : Kenilworth, 14.ix.1910,<sup>3</sup> on *Agapanthus umbellatus* L'Herit. (C. P. Lounsbury), type series ; Stellenbosch, 15.ii.1930, on *Agapanthus* sp. (C. J. Joubert) ; Pretoria, 16.i.1957, on *Agapanthus* sp. (G. De Lotto).

KENYA : Nairobi, 21.x.1941, on *Agapanthus* sp. (H. Wilkinson).

### ***Chorizococcus pusillus* (De Lotto, 1961) comb. n.**

*Spilococcus pusillus* De Lotto, 1961 : 233.

UGANDA : Tororo, 20.vii.1961, on roots of *Ocimum* sp. (G. De Lotto).

<sup>2</sup> The figures in square brackets are the values found on specimens of the supplementary series from South Africa and Kenya.

<sup>3</sup> In the original paper the collecting date is 10.ix.1910.

**CRYPTORIPERSIA** Cockerell, 1899

*Cryptoripersia* Cockerell in Ehrhorn, 1899 : 5.

Type species : *Ripersia arizonensis* Ehrhorn, 1899.<sup>4</sup>

Structurally *Cryptoripersia* is very closely related to *Trionymus* Berg, 1899. The main differences between the two genera are to be found in the structure of the anal lobe cerarii and in the position of the anal ring. In *Cryptoripersia* the anal lobe cerarii are formed of two longish slender spines, without any concentration of trilocular pores, and the anal ring is more or less removed from the apex of the abdomen. In *Trionymus* the spines of the anal lobe cerarii are short, normally robust and always surrounded by a grouping of trilocular pores ; the anal ring is apical.

According to Ferris (1953) the genus *Rhodania* Goux, 1935 (type : *R. porifera* Goux, 1935) is probably a synonym of *Cryptoripersia*.

The new species from South Africa here assigned to *Cryptoripersia* has many features in common with the type species, yet the antennae tend to have more segments and the anal ring is quite different in shape. These differences may well have a generic value. In the writer's opinion, however, they do not warrant the erection of a new genus at the present stage of this work.

***Cryptoripersia corpulenta* sp. n.**

(Plate 3)

The mounted female holotype is a fairly old adult, very broadly oval in outline, with anal lobe nearly obsolete ; length 1.5 mm. Marginal cerarii reduced to one pair on the anal lobe segment. Each cerarius is formed with two slender spines, without any grouping of trilocular pores and devoid of auxiliary setae ; area about the cerarian spines not chitinized. Ventral side of each anal lobe without chitinized bar ; apical seta 88 $\mu$  ; subapical one not differentiate from the surrounding ventral body setae. Multilocular disc pores numerous on either side of the body. Tubular ducts of the oral collar type of two sizes, both numerous all over the dorsum and venter. Trilocular pores not very abundant and evenly distributed. Simple disc pores smaller than the trilocular pores, rather few and sparse. Anterior and posterior dorsal ostioles inconspicuous with lips membranous. Circulus absent. Dorsal and ventral body setae short and slender, few. Legs short, otherwise normal ; translucent pores lacking ; dimensions of legs (iii) : trochanter plus femur 146 $\mu$  ; tibia plus tarsus 182 $\mu$ . Anal ring entire, subapical, with a few elongate cells ; the anterior portion of the ring is very narrow and heavily chitinized ; anal ring setae six in number, all very short, measuring 18 $\mu$  in length. Beak 80 $\mu$ . One of the antennae was formed with eight segments ; the other with seven, with a pseudoarticulation on the fourth segment ; total length 204 $\mu$ .

Holotype. Adult ♀. SOUTH AFRICA : Ceres, 23.iv.1945, on *Chrysocoma tenuifolia* Berg (C. J. Joubert). Coll. No. 2726.

**CYPERIA** gen. n.

Type species : *Pseudococcus percrassus* De Lotto, 1961.

Pseudococcidae with eighteen pairs of marginal cerarii, all built up with more than two conical spines and with many robust auxiliary setae ; outline of the body very broadly elliptical

<sup>4</sup> The type of the genus is *Ripersia arizonensis* Ehrhorn, 1899, not *R. trichura* Cockerell, 1901, as indicated by Ferris (1953 : 307).

to nearly circular ; antennae with eight segments ; legs well developed, stout, without denticle on the claws ; anterior and posterior dorsal ostioles prominent ; dorsal tubular ducts entirely lacking ; ventral tubular ducts of the oral collar type ; circulus present ; multilocular disc pores occurring in transverse segmental rows on the ventral side of the abdomen ; anal ring entire, cellular, set at the apex of the abdomen, with six setae.

Genus of the *Planococcus* series very closely allied to *Planococcoides* Ezzat & McConnell, 1956, from which it differs in having all marginal cerarii supplemented by numerous stout auxiliary setae. In *Planococcoides* only the spines of the anal lobe cerarii are associated with a few auxiliary setae.

### ***DYSMICOCCLUS* Ferris, 1950**

*Dysmicoccus* Ferris, 1950 : 53.

Type species : *Dactylopius brevipes* Cockerell, 1893.

In addition to the type species, two African species should be included in this genus. They are *Dysmicoccus senegalensis* Balachowsky, 1953 and *D. mollis* De Lotto, 1961.

#### KEY TO SPECIES

- |       |  |                            |
|-------|--|----------------------------|
| 1     | Multilocular disc pores set in small groups on the last two or three abdominal segments . . . . .      | <b><i>brevipes</i></b>     |
|       | Multilocular pores rather numerous and arranged in transverse rows on all abdominal segments . . . . . | 2                          |
| 2 (1) | Antennae with 8 segments . . . . .   | <b><i>mollis</i></b>       |
|       | Antennae with 7 segments only . . . . .  | <b><i>senegalensis</i></b> |

### ***Dysmicoccus brevipes* (Cockerell, 1893)**

- Dactylopius bromeliae* (Bouché) ; Signoret, 1875 : 310.  
*Dactylopius bromeliae* (Bouché) ; Cockerell, 1894 : 178.  
*Pseudococcus bromeliae* (Bouché) Fernald, 1903 : 98.  
*Pseudococcus bromeliae* (Bouché) ; Brain, 1915 : 109.  
*Pseudococcus crotonis* Green ; Green, 1916 : 375. [misidentification].  
*Pseudococcus bromeliae* (Bouché) ; Brain & Kelly, 1917 : 181.  
*Pseudococcus bromeliae* (Bouché) ; Gowdey, 1917 : 187.  
*Pseudococcus brevipes* (Cockerell) ; Kirkpatrick, 1927 : 20.  
*Pseudococcus bromeliae* (Bouché) ; Ghesquière, 1927 : 313.  
*Pseudococcus longirostralis* James, 1936 : 207.  
*Dysmicoccus brevipes* (Cockerell) ; De Lotto, 1957 : 197.  
*Dysmicoccus brevipes* (Cockerell) ; Williams, 1958 : 213.

The specimens at hand agree well with the redescription and diagram given by Ferris (1950). In East Africa the species is widely distributed and fairly common either on roots or on the aerial organs of the hosts.

KENYA : Kibarani, 30.vii.1942, on *Anacardium occidentale* L. (R. H. Le Pelley) ; Gazi, 24.ii.1951, on *Ananas sativus* Schult. f. (R. H. Le Pelley) ; Nairobi, 28.iii.1951, on roots of *Rumex acetosa* L. (A. Bogdan), 20.iii.1952, on bulbs of *Watsonia* sp. (G. M. Lavers), 30.iv.1959, on roots of *Anemone* sp. (J. F. Graham), 1.vi.1956, on roots of

*Aristida adoensis* Hochst. (G. De Lotto) ; Thika, 7.i.1938, on *Ananas sativus* Schult. f. (A. R. Melville) ; Ruiru, 21.i.1955, on roots of *Ipomoea batatas* Poir. (D. J. McCrae) ; Kisumu, 3.v.1955, on *Zea mays* L. (T. J. Crowe) ; Malindi, i.vi.1956, on *Mangifera indica* L. (A. R. Melville) ; Fort Ternan, 8.iv.1954, on *Ananas sativus* Schult. f. (T. J. Crowe).

TANGANYIKA : Arusha, 16.i.1961, on roots of *Pennisetum purpureum* K. Schum. (G. Swain) ; Lyamungu, 26.x.1937, on *Ananas sativus* Schult. f. (A. R. Melville).

UGANDA : Bwamba, 6.vi.1951, on *Coffea robusta* Lindl. (D. J. McCrae) ; Toro, 26.viii.1954, on roots of *Trifolium* sp. and *Rheum rhaponticum* L. (A. P. G. Michelmores) ; Mukono, 24.ii.1955, on *Musa sapientum* Kuntze (A. P. G. Michelmores) ; Kampala, 3.x.1958, on roots of *Gossypium* sp. (cotton) (E. D. L. Matega).

ZANZIBAR : 23.iii.1953, on *Cocos nucifera* L., 26.x.1942, on *Ananas sativus* Schult. f. (R. H. Le Pelley), 2.v.1961, on *Theobroma cacao* L. (C. P. Hoyt).

### ***EASTIA* gen. n.**

Type species : *Eastia jouberti* sp. n.

Pseudococcidae with the cerarian spines set in a continuous fringe all along the margin of the body and extending across the dorsal side of the last abdominal segment ; outline of the body apparently elongate ; antennae 8-segmented, at times with a pseudoarticulation on the last segment ; legs all well developed, stout, with a denticle on all claws ; anterior and posterior dorsal ostioles inconspicuous ; dorsal tubular ducts entirely absent ; ventral tubular ducts of the oral collar type present on the abdominal segments ; other ducts of the same type which partly project from the dermis, are set in a large group on the ventral midregion of the mesothorax ; quinquelocular pores distributed all over the venter ; trilocular pores occurring only on the lips of the dorsal ostioles and among the cerarian spines of the marginal fringe ; multilocular disc pores set in rows on the ventral midregion of the abdomen ; circulus absent ; anal ring entire, apical, with six setae ; dorsal setae very short, lanceolate ; ventral ones much longer and finely pointed.

This genus somewhat resembles *Puto* Signoret, 1876 [type species : *Puto antennatus* (Signoret, 1875)], from which it differs in having the cerarian spines set in an uninterrupted fringe all along the margin of the body and in the presence of quinquelocular pores on the ventral side of the body. In *Puto* the spines are grouped in well separated marginal cerarii and the quinquelocular pores are entirely lacking.

### ***Eastia jouberti* sp. n.**

(Plate 4)

The type series is represented by old adult females with the ventral side of the body elongate and the dorsal dermis strongly dilated and extending on either side of the lateral margins of the body ; length up to 4 mm. Margin of the body with an uninterrupted fringe of cerarian spines, two to five spines wide ; the spines are well developed, conical or somewhat lanceolate, finely or bluntly pointed and slightly variable in size ; the fringe extends on the dorsum of the last abdominal segment, in front of the anal ring ; among the cerarian spines are intermingled some trilocular pores ; on the dorsal side of the last abdominal segment some spines are enclosed within an elongate chitinized area. Ventral side of each anal lobe without chitinized bar ; apical seta 146–220 $\mu$  long. Multilocular disc pores very numerous and arranged in transverse

rows on the ventral side of the last five abdominal segments ; the number of pores occurring on each segment could not be counted due to distortions of the body skin. Tubular ducts of the oral collar type very few on the ventral submedian area of the last two abdominal segments anterior to the genital opening. A large group of ducts of the same type, but slightly larger in diameter and partly extruding from the body integument, occurs on the ventral midregion of the mesothorax. Quinquelocular pores numerous all over the venter, except on the last abdominal segment and on the head where they are missing altogether. Besides the trilocular pores associated with the marginal fringe of spines, a few more are crowded on the lips of the dorsal ostioles ; on the remaining surface of the dorsum and venter they are entirely lacking. Anterior and posterior dorsal ostioles rather inconspicuous, with lips slightly chitinized. Circulus lacking. Dorsal setae very small, variable in size, all curved and somewhat lanceolate, rather few and scattered ; ventral setae much longer and robust. Legs all well developed, without translucent pores ; claws with a small denticle ; dimensions of legs (iii) : trochanter plus femur 400–438 $\mu$  ; tibia plus tarsus 452–482 $\mu$ . Anal ring entire, cellular, set at the apex of the body and provided with six setae 240–292 $\mu$  long. Anterior and posterior stigmatic openings very large. Beak dimerous 117–124 $\mu$ . Antennae 8-segmented, at times marked with a pseudoarticulation on the terminal segment ; total length 562–628 $\mu$ . Eyes prominent.

Holotype. Adult ♀. SOUTH AFRICA : East London, vi.1930, on *Podocarpus* sp. (H. K. Munro). Coll. No. 2607.

Paratypes. 6 adult ♀. Same data as holotype.

The species is named after Mr. C. J. Joubert, Assistant Director of Agriculture, Winter Rainfall Region, Stellenbosch, South Africa.

### ***EURYOCCUS* Ferris, 1950**

*Eurycoccus* Ferris, 1950 : 81.

Type species : *Pseudococcus jessica* Hollinger, 1916.

Ferris described this genus in order to accommodate a small batch of North American species, which, despite the strong reduction in the number of marginal cerarii—and in one instance their absence—could not be referred to *Trionymus*, as this genus was conceived by him.

Williams (1958a) assigned *Dactylopius coccineus* Newstead, 1908, to *Eurycoccus*, and De Lotto (1961) described as new *E. glomerulus* from Kenya from specimens collected on roots of a grass. The latter is somewhat atypical because the circulus is small, rounded and apparently unfoldable ; and the antennae are reduced to six or seven segments. In spite of these differences, its general appearance suggests a closer affinity with *Eurycoccus* than with any related genus whose identity is adequately known at present.

### ***Eurycoccus coccineus* (Newstead, 1908)**

*Dactylopius coccineus* Newstead, in Sjöstedt, 1908 : 8.

*Pseudococcus coccineus* (Newstead) Lindinger, 1913 : 68.

*Eurycoccus coccineus* (Newstead) Williams, 1958 : 217.

Described originally from Tanganyika on *Acacia* sp., the following is the first record from Kenya. In either territory the species is apparently very uncommon.

KENYA : Naivasha, 9.vii.1953, on *Acacia* sp. (H. Bredo).

**FERRISIANA** Takahashi, 1929

*Ferrisia* Fullaway, 1923 : 311 [non *Ferrissia* Walker, 1903].

*Ferrisiana* Takahashi, 1929 : 429 [nomen novum].

Type species : *Dactylopius virgatus* Cockerell, 1893.

In the region under review this genus is represented by the type species only, which very likely is an immigrant.

***Ferrisiana virgata*** (Cockerell, 1893)

*Dactylopius* (*Pseudococcus*) *virgatus madagascariensis* Newstead ; Newstead, 1911 : 166.

*Pseudococcus marchali* Vayssière, 1912 : 366.

*Pseudococcus virgatus madagascariensis* Newstead ; Lindinger, 1913 : 68.

*Dactylopius* (*Pseudococcus*) *virgatus madagascariensis* Newstead ; Macfie, 1913 : 34.

*Pseudococcus marchali* Vayssière ; Vayssière, 1913 : 428.

*Dactylopius virgatus madagascariensis* Newstead ; Newstead, 1914a : 523.

*Pseudococcus virgatus* (Cockerell) ; Brain, 1915 : 133.

*Pseudococcus virgatus* (Cockerell) ; Green, 1916 : 375.

*Pseudococcus virgatus* (Cockerell) ; Newstead, 1917 : 127.

*Pseudococcus virgatus* (Cockerell) ; Brain & Kelly, 1917 : 182.

*Pseudococcus virgatus* (Cockerell) ; Gowdey, 1917 : 187.

*Ferrisia* (*Pseudococcus*) *virgatus* (Cockerell) ; Kirkpatrick, 1927 : 16.

*Pseudococcus virgatus* (Cockerell) ; James, 1933 : 435.

*Ferrisiana virgata* (Cockerell) ; Colizza, 1934 : 237.

*Pseudococcus virgatus* (Cockerell) ; Munro & Fouché, 1936 : 93.

*Ferrisia virgata* (Cockerell) ; Hall, 1943 : 5.

*Ferrisia virgata* (Cockerell) ; Strickland, 1947 : 508.

*Ferrisia virgata madagascariensis* (Newstead) ; Strickland, 1947 : 509.

*Ferrisiana virgata* (Cockerell) ; Williams, 1958 : 214.

The available material listed below agrees well with Ferris's diagnosis (1950), except that the multilocular disc pores on the ventral midregion of the abdomen are normally arranged in three groups instead of two.

This mealy bug is very common and well established throughout Africa south of the Sahara. In the central highland of Kenya it has been observed that during long spells of dry weather the populations tend to move to the collar region of the host plant, under ground level and, occasionally, to the roots.

CONGO : Kivu, 8.i.1936, on *Coffea arabica* L. (C. D. Knight).

KENYA : Thika, 1.iii.1937, on *Coffea arabica* L. (A. R. Melville) ; Nairobi, 13.v.1951, on *Euphorbia pulcherrima* Willd., 6.iv.1951 on *Ficus elastica* Roxbg. (G. De Lotto) ; Gazi, 24.ii.1951, on *Anacardium occidentale* L. (R. H. Le Pelley) ; Athi River, 26.x.1953, on roots of *Tagetes minuta* L. (G. De Lotto) ; Kisumu, 10.ii.1956, on *Psidium guajava* L., 18.vii.1957, on *Primula* sp. (T. J. Crowe) ; Namanga, 21.i.1961, on *Abutilon mauritiense* (Jacq.) Medic. (G. De Lotto).

SUDAN : Torit, 31.iii.1953, on *Coffea arabica* L. (F. P. Cereda).

TANGANYIKA : Kibondo, 15.xi.1961, on *Coffea arabica* L. (R. G. Tapley).

SOUTH AFRICA : Durban, 17.v.1961, on *Agave* sp., 22.v.1961 on *Codiaeum* sp. (D. P. Annecke).

UGANDA, Serere, 17.xii.1953, on *Gossypium* sp. (cotton) (H. D. Mubbiro) ; Bugusege, 20.xii.1956, on *Coffea arabica* L. (D. N. McNutt) ; Kampala, 5.iv.1957, on *Coffea robusta* Lindl. (D. N. McNutt).

### ***GEOCOCCUS* Green, 1902**

*Geococcus* Green, 1902 : 262.

Type species : *Geococcus radicum* Green, 1902.

A very peculiar genus referable to the *Rhizoecus* series. In Africa south of the Sahara it is represented by one species only.

### ***Geococcus coffeae* Green, 1933**

*Geococcus coffeae* Green ; Strickland, 1947 : 502.

*Geococcus coffeae* Green ; Williams, 1958 : 225.

This minute hypogeic mealy bug is already known from Ghana, Nigeria and Zanzibar. The following is the first record of the species from the East African mainland.

KENYA : Nairobi, 13.iii.1956, on roots of *Physalis edulis* Sims (G. De Lotto).

### ***LENANIA* gen. n.**

Type species : *Lenania prisca* sp. n.

Pseudococcidae with marginal cerarii entirely absent ; outline of the body broadly elliptical ; antennae 6- to 8-segmented ; legs well developed, stout, without unguis ; either side of trochanters with three sensoria ; anterior and posterior dorsal ostioles present ; tubular ducts of oral collar type very numerous and either side of the body ; circulus lacking ; multi-ocular disc pores arranged in segmental rows on the ventral side of the abdomen ; others are scattered on the dorsal postsoma ; anal ring subapical, formed by a heavily chitinized ring devoid of cells and apparently without setae ; dorsal body setae short and slender ; ventral ones long and robust.

The peculiar form of the anal ring together with the presence of three sensoria on each side of the trochanters are the major features on which this genus is erected. The total absence of the marginal cerarii suggests a relationship with the genera *Mirococcus* Borchsenius, 1947 (type species : *Phenacoccus inermis* Hall, 1925), and *Mollicoccus* Williams, 1960 (type species : *M. guadalcanalanus* Williams, 1960). The type species of both are, however, provided with an unguis which is lacking in *Lenania prisca*.

### ***Lenania prisca* sp. n.**

(Plate 5)

Mounted specimens rather broadly elliptical or oval with the legs and antennae strongly chitinized ; anal lobes obsolete ; length up to 3.1 mm. Marginal cerarii entirely absent. Apical seta 139-153 $\mu$  ; subapical one not differentiated from the remaining ventral body setae.

Multilocular disc pores very numerous on the ventral side of the last five abdominal segments;<sup>5</sup> a few pores are scattered on the dorsal side of the abdomen ; no multilocular pores occur on either side of the prosoma. Tubular ducts of the oral collar type small, very numerous and distributed on either side of the body without any pattern. Trilocular pores abundant and evenly distributed ; a few are crowded near each stigmatic opening. Simple disc pores apparently missing. Anterior and posterior dorsal ostioles poorly developed with lips slightly chitinized and devoid of any grouping of trilocular pores or setae. Circulus absent. Dorsal setae on the last abdominal segment fairly long and robust ; remaining setae shorter and slender. Body setae on the midregion of the venter long and robust ; those on the marginal and submarginal areas much shorter and slender. Legs well developed, rather stout ; either side of the trochanters provided with three sensoria instead of the usual two ; translucent pores numerous on the femur and tibia of the hind legs ; claws without denticle ; dimensions of legs (iii) : trochanter plus femur 336–350 $\mu$  ; tibia plus tarsus 336–343 $\mu$ . Anal ring represented by a heavily chitinized ring, without cells, slightly opened anteriorly and with two minute rounded clear areas which very likely are the sockets of two setae. Beak apparently dimerous, but the segmentation is obscure ; length 95–102 $\mu$ . Antennae with 6 to 8 segments, in all cases one of them is marked with a pseudoarticulation ; total length 343–380 $\mu$ .

Holotype. Adult ♀. SOUTH AFRICA : Stellenbosch, ix.1930, on *Cliffortia strobilifera* Murr. (C. J. Joubert). Coll. No. 2644.

Paratype. 1 adult ♀. Same data as holotype.

### **LONDIANIA gen. n.**

Type species : *Londiania obesa* sp. n.

Pseudococcidae with six or seven pairs of marginal cerarii on the last abdominal segments ; anal lobe cerarii with two slender variously curved or straight spines ; remaining cerarii with many spines distinctly shorter and more slender than those of the anal lobe cerarii ; outline of the body broadly oval ; antennae 6-segmented ; legs small, otherwise normal, without ungual denticle ; anterior and posterior dorsal ostioles well developed ; tubular ducts of the oral collar type occurring on the ventral side of the abdomen ; circulus lacking ; multilocular disc pores set in transverse rows on the ventral side of the abdomen ; anal ring entire, with a double row of cells and with eight robust setae ; body setae short and slender.

The most distinctive character of this genus is the presence of eight strong setae on the anal ring. Other features such as the reduction of the number of the antennal segments and marginal cerarii suggest a close relationship with *Trionymus* Berg, 1899, but *Londiania* differs from it in having the preanal cerarii built up from more than one or two spines. In the shape of the spines of the anal lobe cerarii *Londiania* resembles *Cryptoripersia* Cockerell, 1899, yet in the latter the marginal cerarii are reduced to one single pair on the anal lobes. In both *Trionymus* and *Cryptoripersia* the anal ring is provided with six setae only.

### ***Londiania obesa* sp. n.**

(Plate 6)

Mounted specimens broadly oval, with anal lobes poorly developed ; length up to 2.3 mm. Margin of the body with apparently six or seven pairs of cerarii on the last abdominal segments. Anal lobe cerarii each with two long slender spines, straight or variously curved, without any

<sup>5</sup> The number of multilocular disc pores could not be properly counted owing to the distortions of the segmental folds.

concentration of trilocular pores and devoid of auxiliary setae ; area about the spines not chitinized. The remaining cerarii are formed by groupings of spines much more slender and noticeably shorter than those of the anal lobe cerarii, thus resembling tufts of dorsal body setae. Among the spines are intermingled a few trilocular pores. An elongate group of similar spines occurs on the head. Ventral side of each anal lobe without chitinized bar ; apical seta  $190-205\mu$  ; subapical one not differentiated from the surrounding ventral body setae. Multilocular disc pores set in transverse rows on the ventral side of the last six abdominal segments ; other pores are scattered on the midregion of the ventral prosoma and on the dorsal side of the abdomen. Dorsal tubular ducts lacking. Ventral tubular ducts of the oral collar type set in small groups on the marginal area of all abdominal segments ; a few are intermingled with the abdominal multilocular disc pores. Trilocular pores uniformly distributed, not numerous. Simple disc pores smaller than the trilocular pores, few and sparse. Anterior and posterior dorsal ostioles well developed with lips chitinized. Circulus absent. Dorsal and ventral body setae short and slender ; rather few. Legs short otherwise normal ; translucent pores lacking ; dimensions of legs (iii) : trochanter plus femur  $175-197\mu$  ; tibia plus tarsus  $183-190\mu$ . Anal ring entire, apical, with a double row of cells and with eight robust setae measuring  $160-180\mu$  in length. Beak  $117-131\mu$ . Antennae with 6 segments ; total length  $255\mu$ .

Holotype. Adult ♀. KENYA : Londiani, 2.iv.1957, on roots of *Panicum* sp. (G. De Lotto). Coll. No. 2152.

Paratype. 1 adult ♀. Same data as holotype.

### **MACONELLICOCCUS** Ezzat, 1958

*Maconellicoccus* Ezzat, 1958 : 380.

Type species : *Phenacoccus hirsutus* Green, 1908.

This genus has been recently erected by Ezzat (1958) for the inclusion of the type species only. As he pointed out, *hirsutus* lacks the main structural features which characterize the genus *Phenacoccus* Cockerell, 1893. In view of the presence of a chitinized bar on the ventral side of the anal lobes, he placed his genus in the tribe *Planococcini*, Ezzat and McConnell 1956. The distribution of the dorsal tubular ducts of oral collar rim type suggests, in my opinion, a far closer similarity with the genus *Spilococcus* Ferris, 1950. In addition to the type, the genus *Maconellicoccus* includes *Pseudococcus ugandae* Laing, 1925, and *Spilococcus perforatus* De Lotto, 1954.

### ***Maconellicoccus perforatus*** (De Lotto, 1954) **comb. n.**

*Spilococcus perforatus* De Lotto, 1954 : 114.

Structurally this species is very close to *M. hirsutus* (Green, 1908), and a study of the types may prove that the two species are identical. Williams (1958a) recently recorded *M. hirsutus* from the Sudan as living on many host plants.

From observations carried out so far in East Africa, the range of *M. perforatus* seems restricted to the eastern districts and offshore islands. The species is suspected of being a vector of a virus responsible for deformations which tend to arrest the growth of the young stems and branches of the host plants.

KENYA : Kibarani, 30.vii.1942, on *Hibiscus surratensis* L. and *Gossypium* sp. (cotton) (R. H. Le Pelley) ; Kilifi, viii.1942, on *Psidium guajava* L. (R. H. Le Pelley),

26.iv.1957, on *Ceiba pentandra* Gaertn. (P. E. Wheatley) ; Mombasa, 22.xii.1951, on *Hibiscus* sp. (N. A. Dotiwala).

TANGANYIKA : Tanga, 25.xi.1958, on *Theobroma cacao* L. (R. G. Tapley) ; Moshi, 20.ii.1956, on *Hibiscus* sp. (I. E. Taylor) ; Mbosho 20.i.1956, on *Coffea arabica* L. (R. G. Tapley).

ZANZIBAR : 2.vii.1953, on *Hibiscus* sp., 13.ii.1956 on *Theobroma cacao* L. (R. H. Le Pelley).

### ***Maconellicoccus ugandae* (Laing, 1925) comb. n.**

*Pseudococcus ugandae* Laing, 1925 : 53.

*Pseudococcus ugandae* Laing ; Williams, 1958 : 24.

This species was previously known from the original record only. The available material listed below agrees adequately with the redescription and diagram given by Williams (1958a).

KENYA : Kisii, 15.ii.1956, on *Coffea arabica* L. (A. Banks).

UGANDA : Kampala, 13.ix.1929, on *Markhamia platycalyx* (Baker) Sprague (H. Hargreaves), 24.ii.1944, on *Albizzia stipulata* Boiss. (T. H. C. Taylor), 17.xi.1951, on *Acacia* sp. (D. J. McCrae) ; Toro, 14.iii.1951, on *Coffea arabica* L. (D. J. McCrae).

### **MOMBASINIA gen. n.**

Type species : *Pseudococcus pulcherrimus* De Lotto, 1961.

Pseudococcidae with altogether six pairs of marginal cerarii, two of which occur on the last two abdominal segments and four on the head and prothorax ; each cerarius with more than two conical spines and enclosed within a large chitinized area ; body elongate ; antennae with nine long slender segments ; legs, too, long and slender without unguis denticles ; anterior and posterior dorsal ostioles absent ; dorsal tubular ducts simple, namely without oral collar or oral rim, set in two groups close to the margin of the body, each of which is enclosed by multilocular disc pores arranged in a continuous row ; ventral ducts similar to those of the dorsum but slightly extruding from the dermis ; circulus absent ; quinquelocular pores lacking ; ventral multilocular disc pores arranged in transverse groupings on all abdominal segments, others are scattered on the prosoma ; anal ring entire, apical, with six setae ; dorsal setae short, conical or somewhat lanceolate, set singly or in small groups ; ventral setae normal.

This is a strongly modified genus. Despite the absence of the unguis denticles, the structure of the marginal cerarii and dorsal setae as well as the presence of nine-segmented antennae suggest relationship with the *Puto* series.

### **NAIROBIA gen. n.**

Type species : *Nairobia bifrons* sp. n.

Pseudococcidae with altogether fourteen pairs of cerarii of which eight pairs occur on the abdomen, one on meta- and mesothorax, and two on the prothorax and head ; each cerarius bears up to 9 to 12 conical spines ; outline of the body elongate oval ; antennae with nine long, slender segments ; legs, too, long and slender without unguis denticles ; anterior and

posterior dorsal ostioles well developed ; tubular ducts of any type and multilocular disc pores entirely absent ; circulus lacking ; quinquelocular pores numerous and distributed all over the ventral side of the body only ; trilocular pores occurring on the dorsum and on ventral marginal area of the venter ; anal ring entire, cellular, set at the apex of the abdomen, with six setae ; dorsal setae minute, spiniform ; ventral ones long and slender.

The combination of the above characters is quite distinctive. Systematically, it may be retained as a modified genus of the *Phenacoccus* series.

### *Nairobiia bifrons* sp. n.

(Plate 7)

Mounted specimens elongate oval in outline, up to 2.2 mm. long. Margin of the body with a series of fourteen pairs of cerarii only. Anal lobe cerarii each built up with 9 to 12 conical spines somewhat different in size, beset by a few trilocular pores ; area about the cerarian spines not chitinized ; auxiliary setae lacking. Remaining cerarii similar to those of the anal lobes. Ventral side of each anal lobe without chitinized bar ; apical seta robust 175–210 $\mu$  long. Multilocular disc pores and tubular ducts of any type totally lacking. Quinquelocular pores rather numerous and uniformly distributed on the ventral side of body. Trilocular pores evenly distributed on the dorsum ; a few occur on the marginal area of the venter. Simple disc pores smaller than the trilocular pores, few on either side of the body. Dorsal setae very few, minute, spiniform ; ventral ones more numerous, fairly long and very slender. Posterior dorsal ostioles prominent ; anterior ones less so ; in either case the lips are membranous. Circulus absent. Legs very long and slender ; claws without denticle ; hind legs without translucent pores ; dimensions of legs (iii) : trochanter plus femur 385–445 $\mu$  ; tibia plus tarsus 520–560 $\mu$ . Beak dimerous, 75–90 $\mu$  long. Anal ring entire, apical, with six robust setae measuring 95–115 $\mu$ . Antennae very long and slender, 9-segmented ; total length 920–1,020 $\mu$ . Eyes prominent.

Holotype. Adult ♀. KENYA : Nairobi, 14.xii.1960, on the underside of leaves of *Linociera battiscombei* Hutch. (G. De Lotto). Coll. 2528.

Paratypes. 15 adult ♀. Same data as holotype.

### *OROCOCCUS* gen. n.

Type species : *Pseudococcus cryophilus* De Lotto, 1961.

Pseudococcidae with two pairs of cerarii on the last abdominal segments ; anal lobe cerarii with up to eight spines of different size ; preanal ones with no more than four spines ; outline of the body elongate elliptical ; antennae normally with seven segments ; legs well developed, without unguis denticle ; anterior and posterior dorsal ostioles present ; tubular ducts very short, strongly chitinized, with a small median cup-like depression and with a heavily chitinized oral rim beneath the body integument ; in the type species these ducts are very numerous on either side of the body ; circulus lacking ; multilocular disc pores distributed on both sides of the body ; trilocular pores few and sparse ; anal ring entire, cellular, apical, with six setae ; body setae short and slender.

The most distinctive feature of this genus is the peculiar form of the tubular ducts, not yet found in any other Pseudococcid genus known to me. Other characters suggest a relationship with genera of the *Trionymus* series.

**PARACOCCUS** Ezzat & McConnell, 1956

*Paracoccus* Ezzat & McConnell, 1956 : 37.

Type species : *Pseudococcus burnerae* Brain, 1915.

This genus was erected by Ezzat and McConnell (1956) in their monograph of the world *Planococcini*, a new Pseudococcid tribe established by them for a group of genera having a chitinized bar on the ventral side of the anal lobes. The genus is believed to be valid, yet two major changes must be made to its original diagnosis in order to accommodate a batch of African species structurally very close to the type. The changes concern the chitinized bar and the dorsal oral rim ducts the presence or absence of which must be regarded as of specific significance only. Thus amended the genus *Paracoccus* should include species whose main feature is the occurrence of a series of seventeen pairs of marginal cerarii, all normally built up with two spines and devoid of auxiliary setae, except on the anal lobe cerarii in which one or more auxiliary setae are always present.

Besides the type *Pseudococcus burnerae* Brain, 1915, and *Paracoccus busiaensis*, *mutabilis*, *pinguis*, *tectus* and *trichinus* described as new in this paper, the following species from Africa south of the Sahara are referable to the genus *Paracoccus* : *Pseudococcus muraltae* Brain, 1912, from South Africa; *P. erigeroni* James, 1935, from Kenya, *P. bruguierae* De Lotto, 1961, also from Kenya ; *P. spinulosus* De Lotto, 1961, from Uganda ; *Spilococcus diversus* De Lotto, 1961, from Kenya and Uganda ; *S. kajiadoensis* De Lotto, 1961 and *S. limuricus* De Lotto, 1961, both from Kenya.

## PROVISIONAL KEY TO SPECIES

- |   |   |                          |
|---|---|--------------------------|
| 1 | Circulus lacking . . . . .  | 2                        |
|   | Circulus present . . . . .  | 7                        |
| 2 | (1) Ventral side of each anal lobe with an elongate chitinized bar . . . . .  | <b><i>pinguis</i></b>    |
|   | Chitinized bar on the anal lobes entirely absent . . . . .  | 3                        |
| 3 | (2) Dorsal setae long and robust ; ventral abdominal multilocular disc pores arranged in three or four small groups . . . . .   | <b><i>spinulosus</i></b> |
|   | Dorsal setae short and slender ; multilocular disc pores set in five to seven groups . . . . .  | 4                        |
| 4 | (3) Dorsum with some oral rim ducts . . . . .   | 5                        |
|   | Dorsal oral rim ducts lacking . . . . .   | 6                        |
| 5 | (4) Ventral abdominal multilocular disc pores arranged in seven groups ; on the segments (viii) to (vi) part of the pores are scattered near the basal margin . . . . .                 | <b><i>trichinus</i></b>  |
|   | Multilocular disc pores set in five groups ; on the abdominal segments anterior to the genital opening the pores are arranged in transverse rows along the distal margin only . . . . . | <b><i>muraltae</i></b>   |
| 6 | (5) Multilocular disc pores present on the ventral side of the abdomen only ; dorsal oral rim ducts very few . . . . .  | <b><i>erigeroni</i></b>  |
|   | A few multilocular disc pores always present on the ventral prosoma and on the dorsal side of the abdomen ; dorsal oral rim ducts rather numerous . . . . .                             | <b><i>busiaensis</i></b> |
| 7 | (1) Ventral side of each anal lobe with a chitinized bar . . . . .  | 8                        |
|   | Chitinized bar lacking . . . . .  | 10                       |
| 8 | (7) Dorsal oral rim ducts lacking . . . . .   | <b><i>bruguierae</i></b> |
|   | Dorsal oral rim ducts present . . . . .   | 9                        |

- 9 (8) Spines of the most anterior cerarii long, setolose, not appreciably differentiated from the dorsal body setae . . . . . **diversus**  
 Spines of all cerarii conical . . . . . **burnerae**
- 10 (7) Ventral abdominal multilocular disc pores arranged in two or three groups . . . . . 11  
 Multilocular disc pores set in five or six groups . . . . . 12
- 11 (10) Circulus large, apparently foldable ; ventral body setae long and rather robust **kajiadoensis**  
 Circulus very small ; ventral body setae short and slender . . . . . **mutabilis**
- 12 (10) Hind tibiae with a group of large translucent pores each provided with a strongly chitinized rim . . . . . **limuricus**  
 Translucent pores on hind tibiae minute in size and without chitinized rim **tectus**

### *Paracoccus burnerae* (Brain, 1915)

*Pseudococcus burnerae* Brain, 1915 : 111.

*Pseudococcus burnerae* Brain ; Brain & Kelly, 1917 : 182.

*Pseudococcus* ? *comstocki* Kuwana ; Kirkpatrick, 1927 : 17 [misidentification].

*Pseudococcus simulator* James, 1933 : 434.

*Pseudococcus burnerae* Brain ; Munro & Fouché, 1936 : 91.

*Pseudococcus burnerae* Brain ; Hall, 1937 : 126.

*Paracoccus burnerae* (Brain) Ezzat & McConnell, 1956 : 39.

*Pseudococcus simulator* James ; Ezzat & McConnell, 1956 : 106.

*Pseudococcus muraliae* Brain ; De Lotto, 1958 : 198 [misidentification].

*Pseudococcus burnerae* Brain ; De Lotto, 1958 : 89.

KENYA : Nairobi, 15.vi.1950, on *Olea europaea* L. (R. H. Le Pelley), 21.i.1951, on *Nerium oleander* L., 24.i.1951, on *Berberis holstii* Engl. (G. De Lotto), 3.i.1951, on *Malva* sp. (R. M. Nattrass), 14.iii.1951, on *Acokanthera longiflora* Stapf., 26.ii.1951, on *Bauhinia purpurea* L., 3.x.1951, on *Musa ensete* Gmel., 5.i.1956, on *Vernonia* sp. (G. De Lotto), 25.x.1956, on *Beaumontia* sp. (R. H. Le Pelley), 18.v.1961, on *Asparagus* sp. (H. Wilkinson) ; Ruiru, 31.x.1953, on *Indigofera* sp. and *Hibiscus fuscus* Garcke (G. De Lotto) ; Namanga, 22.i.1961, on *Ipomoea hildebrandtii* Vatke (G. De Lotto).

NORTHERN RHODESIA : Shangombo, 6.viii.1952, on *Combretum zeyheri* Sond. (H. K. Munro).

SOUTH AFRICA : Zebediela, 5.ii.1957, on *Coleus* sp. (G. De Lotto) ; Pretoria, 16.vii.1954, on *Caralluma caudata* N. E. Brown (H. K. Munro).

### *Paracoccus busiaensis* sp. n.

(Plate 8)

Mounted specimens elliptical with anal lobes rather poorly developed ; length up to 2.6 mm. Margin of the body with seventeen pairs of cerarii, at times reduced to sixteen due to the absence of the (xv) pair. Anal lobe cerarii each with two conical spines beset by 15–20 trilocular pores and 2–3 auxiliary setae ; area about the cerarian spines not chitinized. The spines of the remaining cerarii are slightly shorter and more slender than those of the anal lobe cerarii. Each preanal cerarius is built up with two spines, except the (xv) which, where present, is reduced to one spine only. Ventral side of each anal lobe without chitinized bar ; apical seta 190–212 $\mu$  ; subapical one 44 $\mu$ . Multilocular disc pores arranged in transverse rows on the ventral midregion of the last six abdominal segments, as follows : (ix plus x) 30–37 ; (viii) 44–48 ; (vii) 35–46 ; (vi) 25–33 ; (v) 30–35 ; (iv) 2–4. A few multilocular pores are scattered

on the ventral prosoma and on the dorsal side of the abdomen. Tubular ducts of the oral rim type entirely absent. Tubular ducts with oral collar of two sizes. The larger ones are few and scattered all over the dorsum ; the small ones are set in irregular groupings on the ventral marginal area as far as the head ; others are intermingled with the multilocular pores and scattered on the midregion of the ventral prosoma. Trilocular pores not numerous. Simple disc pores apparently absent. Anterior and posterior dorsal ostioles very poorly developed. Circulus lacking. Dorsal body setae few, very short and slender ; ventral ones slightly longer. Legs well developed ; hind tibiae with a few translucent pores ; dimensions of legs (iii) : trochanter plus femur  $241-255\mu$  ; tibia plus tarsus  $263-277\mu$ . Anal ring entire, apical, with six setae  $117\mu$  long. Beak  $110\mu$ . Antennae 8-segmented ; total length  $343-365\mu$ .

Holotype. Adult ♀. UGANDA : Busia, I.ix.1955, on *Coleus* sp. (T. J. Crowe). Coll. No. 1885.

Paratypes. 2 adult ♀. Same data as holotype.

### *Paracoccus mutabilis* sp. n.

(Plate 9)

Mounted specimens rather broadly elliptical, with anal lobes fairly well developed ; length up to 2.2 mm. Margin of the body with seventeen pairs of cerarii, at times reduced to sixteen or fifteen, due to the absence of one or two pairs mostly on the thorax. Anal lobe cerarii each with two robust conical spines beset by 15-20 trilocular pores and two auxiliary setae. The spines of the remaining cerarii are progressively more slender and shorter anteriorly, and on the thorax and head they at times attain the same size and shape of the dorsal body setae and tend to be set rather apart from each other. Each cerarius normally bears two spines, but occasionally they are reduced to one spine only. The average number of spines in the specimens of the type series is (i) 1.9 ; (ii) 2 ; (iii) 1.8 ; (iv) 1.7 ; (v) 1.6 ; (vi) 2 ; (vii) 2 ; (viii) 1.9 ; (ix) 1.7 ; (x) 0.6 ; (xi) 1.7 ; (xii) 1.1 ; (xiii) 1.7 ; (xiv) 2 ; (xv) 1.4 ; (xvi) 2.1 ; (xvii) 1.6. Ventral side of each anal lobe without chitinized bar ; apical seta  $146-175\mu$  ; subapical one  $36-44\mu$ . Multilocular disc pores arranged in transverse rows on the ventral midregion of the last six abdominal segments as follows : (ix plus x) 19-27 ; (viii) 23-30 ; (vii) 20-23 ; (vi) 18-26 ; (v) 20-26 ; (iv) 7-11. No multilocular pores occur on the ventral prosoma or on the dorsum. One single tubular duct of the oral rim type occurs on the dorsum near each frontal cerarius (xvii). Ventral tubular ducts of the oral collar type set in marginal groupings as far as the head ; others are intermingled with the multilocular disc pores and scattered on the midregion of the thorax. Trilocular pores rather few on either side of the body. Simple disc pores noticeably smaller than the trilocular pores, few and sparse. Anterior and posterior dorsal ostioles inconspicuous, with lips membranous. Circulus very small, rounded or slightly elongate transversely, unfoldable. Dorsal setae few, short and slender ; ventral ones slightly longer. Legs normal with some minute translucent pores on the hind coxa and tibia ; dimensions of legs (iii) : trochanter plus femur  $241-255\mu$  ; tibia plus tarsus  $255-270\mu$ . Anal ring entire, apical, with six setae measuring  $88-95\mu$  in length. Beak  $95-117\mu$ . Antennae with eight segments ; total length  $314-321\mu$ .

Holotype. Adult ♀. SOUTH WEST AFRICA : Walvis Bay, 25.iii.1954, on *Welwitschia mirabilis* Hook. f. (J. Nel). Coll. No. 2745.

Paratypes. 4 adult ♀. Same data as holotype.

### *Paracoccus pinguis* sp. n.

(Plate 10)

Mounted specimens broadly elliptical, with anal lobes poorly developed ; length up to 2.2 mm. Margin of the body with seventeen pairs of cerarii. Anal lobe cerarii each with two conical spines beset with 15 to 20 trilocular pores and two or three—seldom four—auxiliary setae ;

area about the cerarian spines not chitinized. All remaining cerarii normally built up with two spines slightly smaller than those of the anal lobe cerarii. Ventral side of each anal lobe with a small, elongate chitinized area ; apical seta 182-197 $\mu$  ; subapical one 51-66 $\mu$ . Multilocular disc pores set in small groups on the ventral midregion of the last three or four abdominal segments ; their number is as follows : (ix plus x) 22-33 ; (viii) 22-28 ; (vii) 5-7 ; (vi) 0-2. No multilocular pores occur on the ventral prosoma or on the dorsum. Dorsal tubular ducts of the oral rim type very variable in number (2 to 11) and arrangement ; in the holotype specimen they are entirely missing. Ventral tubular ducts of the oral collar type of two sizes, both fairly numerous on all abdominal segments. Trilocular pores not numerous and uniformly distributed on either side of the body. Simple disc pores smaller than the trilocular pores, few and sparse. Anterior and posterior dorsal ostioles inconspicuous with lips membranous. Circulus absent. Dorsal and ventral body setae few, short and slender. Legs well developed ; translucent pores lacking ; dimensions of legs (iii) ; trochanter plus femur 263-292 $\mu$  ; tibia plus tarsus 285-314 $\mu$ . Anal ring apical, entire, with six setae 102-117 $\mu$  long. Beak 146-153 $\mu$ . Antennae normally 8-segmented, except in two specimens in which one of the antennae was reduced to seven segments only, with a pseudoarticulation on the third segment ; total length 343-372 $\mu$ .

Holotype. Adult ♀. TANGANYIKA : Mwanza, 20.x.1961, on roots of grass (*G. De Lotto*). Coll. No. 2687.

Paratypes. 2 adult ♀. Same data as holotype.

### *Paracoccus tectus* sp. n.

(Plate 11)

Mounted specimens elongate to rather broadly elliptical ; with anal lobes well developed ; length up to 1.9 mm. Margin of the body with seventeen pairs of cerarii. Anal lobe cerarii each with two conical spines beset with 30-40 trilocular pores and 5-7 auxiliary setae ; area about the cerarian spines not chitinized. Each preanal cerarius bears two spines which become longer and more slender anteriorly ; on the most anterior cerarii they attain the same size and shape of the dorsal body setae. Ventral side of each anal lobe without chitinized bar ; apical seta robust, 248-263 $\mu$  long ; subapical one 50-55 $\mu$ . Multilocular disc pores arranged in two or three small groups on the ventral midregion of the last abdominal segments, as follows : (ix plus x) 17-25 ; (viii) 17-21 ; (vii) 0-5. No multilocular pores occur on the ventral prosoma or on the dorsum. Dorsal tubular ducts of the oral rim type present on the abdomen and thorax only, where they tend to be arranged in longitudinal series ; the total number ranges from 14 to 24 ; one to three ducts occasionally occur on the ventral submarginal area of the thorax. Ventral tubular ducts of oral collar type arranged in transverse groups on the mid-region and marginal area of all abdominal segments ; a group of 2 to 4 ducts occurs on the head, near the frontal cerarius (xvii). Trilocular pores numerous and uniformly distributed on the dorsum and venter. Simple disc pores noticeably smaller than the trilocular pores, few and scattered on either side of the body. Anterior and posterior dorsal ostioles well developed with lips membranous. Circulus transversally elongate, with surface plain. Dorsal setae rather long and fairly numerous ; ventral ones more abundant and longer. Legs all well developed ; hind tibiae with a few minute translucent pores ; dimensions of legs (iii) : trochanter plus femur 263-300 $\mu$  ; tibia plus tarsus 307-350 $\mu$ . Anal ring apical, with six setae 117-131 $\mu$  long. Beak 117-125 $\mu$ . Antennae with eight segments ; total length 394-360 $\mu$ .

Holotype. Adult ♀. UGANDA : North Bugishu, 7.ii.1957, on roots of *Erlangea tomentosa* Moore (*D. N. McNutt*). Coll. No. 2137.

Paratypes. 2 adult ♀. Same data as holotype.

***Paracoccus trichinus* sp. n.**

(Plate 12)

Mounted specimens elongate elliptical, with anal lobes well developed ; length up to 2.2 mm. Margin of the body with seventeen pairs of cerarii. Anal lobe cerarii each with two robust conical spines beset with 18–25 trilocular pores and 3 to 5 auxiliary setae ; area about the spines not chitinized. In one specimen one of the anal lobe cerarii bears only one spine, and in another specimen the spines are lacking altogether in one cerarius. All remaining cerarii with two spines, except the frontal one (xvii) which at times is built up with three. The spines are somewhat shorter and more slender than those of the anal cerarii. Ventral side of each anal lobe without chitinized bar ; apical seta 204–226 $\mu$  ; subapical one 58–73 $\mu$ . Multilocular disc pores set in transverse rows on the ventral side of the last seven abdominal segments as follows : (ix plus x) 28–33 ; (viii) 45–52 ; (vii) 47–54 ; (vi) 48–59 ; (v) 45–57 ; (iv) 12–20 ; (iii) 5–7. A few pores are scattered on the ventral prosoma. Dorsal tubular ducts of the oral rim type few, tending to be set in longitudinal series, but their arrangement and number are very variable ; they occur on the venter and thorax, except in the holotype specimen in which one duct is set close to the frontal cerarius (xvii). Altogether 11 to 23 ducts were found on the specimens of the type series. Ventral tubular ducts of the oral collar type arranged in irregular groupings on the marginal area of all abdominal segments ; a small group of pores occurs on the ventral marginal area near the (xiii) and (xvii) cerarii ; other ducts are associated with the ventral abdominal multilocular disc pores. Trilocular pores numerous on either side of the body. Simple disc pores few and sparse. Anterior and posterior dorsal ostioles well developed with lips membranous. Circulus absent. Dorsal setae rather few, short and slender ; ventral ones more numerous, long and robust. Legs well developed ; hind tibiae with a few small translucent pores ; dimensions of legs (iii) : trochanter plus femur 270–300 $\mu$  ; tibia plus tarsus 314–336 $\mu$ . Anal ring apical, cellular, with six setae 124–146 $\mu$  long. Beak 102–117 $\mu$ . Antennae with 8 segments measuring together 358–387 $\mu$ .

Holotype. Adult ♀. UGANDA : North Bugishu, 5.ii.1957, on roots of *Galinsoga* sp. (*D. N. McNutt*). Coll. No. 2136.

Paratypes. 4 adult ♀. Same data as holotype.

Other records of the same species on material not included in the type series, are :

UGANDA : North Bugishu, 6.ii.1957, on roots of *Cynura* sp., 27.ii.1957, on roots of *Dichrocephala integrifolia* D. C. (*D. N. McNutt*).

**PARAPUTO** Laing, 1929

*Paraputo* Laing, 1929 : 473.

Type species : *Paraputo ritchiei* Laing, 1929 = *Ripersia anomala* Newstead, 1908.

This genus was erected by Laing (1929) for *P. ritchiei* which has been recently synonymized with *Ripersia anomala* Newstead, 1908, by Williams (1958a) who had the opportunity to study the types of both species.

In addition to the type species, the following species are apparently referable to the genus *Paraputo* : *Ripersia glandulifera* Newstead, 1912, described from South West Africa on specimens collected on *Adiantum* sp. ; *Pseudococcus mazoeensis* Hall, 1937, from Southern Rhodesia on *Acacia* sp. and *Zizyphus jujuba* Lam. ; and *Paraputo barbatus* here described as new.

## PROVISIONAL KEY TO SPECIES

- |       |  |                    |
|-------|--|--------------------|
| 1     | Antennae 6-segmented . . . . .   | 2                  |
|       | Antennae with seven or eight segments . . . . .                                    | 3                  |
| 2 (1) | Frontal and preocular cerarii always present . . . . .                             | <i>anomalus</i>    |
|       | Frontal and preocular cerarii lacking . . . . .                                    | <i>glandulifer</i> |
| 3 (1) | Multilocular disc pores on the ventral midregion of the abdomen set in five groups | <i>mazoeensis</i>  |
|       | Multilocular disc pores arranged in two or three groups only . . . . .             | <i>barbatus</i>    |

***Paraputo anomalus* (Newstead, 1908)**

- Ripersia anomala* Newstead, in Sjöstedt, 1908 : 9.  
*Ripersia anomala* Newstead ; Lindinger, 1913 : 68.  
*Paraputo ritchiei* Laing, 1929 : 473.  
*Paraputo multispinosa* James, 1935 : 233.  
*Paraputo ritchiei* Laing ; Strickland, 1947 : 512.  
*Paraputo ritchiei* Laing ; Ferris, 1955 : 5.  
*Paraputo ritchiei* Laing ; De Lotto, 1957 : 188.  
*Paraputo anomalus* (Newstead) Williams, 1958 : 217.  
*Paraputo anomalus* (Newstead) ; Williams, 1958a : 21.

The synonymy of this species was first studied by Strickland (1947), who found *Paraputo multispinosa* James, 1935 to be the same species described by Laing (1929) as *P. ritchiei*. According to Williams (1958) the latter is a synonym of *Ripersia anomala* Newstead, 1908.

Although widely distributed in East Africa, the species apparently does not rank as a pest of any economic importance.

KENYA : Nairobi, 27.viii.1958, on *Acacia* sp. (G. De Lotto).

TANGANYIKA : Arusha, 25.i.1961, on *Pterolobium lacerans* R. Br. (G. De Lotto).

UGANDA : Sebei, 2.iii.1957, on roots of *Musa* sp. (D. N. McNutt) ; Kampala, 23.vii.1961, on *Eugenia* sp. (G. De Lotto).

***Paraputo barbatus* sp. n.**

(Plate 13)

Young adult females obovate, with anal lobes and lateral margins of the three preceding abdominal segments very broadly rounded ; length up to 2.6 mm. Marginal cerarii recognizable only on the last five abdominal segments. Anal lobe cerarii each with 30–40 conical spines arranged in a band 2–4 spines wide along the margin of the lobe ; among the spines are intermingled some trilocular pores ; area about the spines not chitinized ; auxiliary setae absent. Remaining cerarii similar to those of the anal lobes, except that the number of spines tends to be progressively smaller anteriorly. Ventral side of each anal lobe with a well developed elongate chitinized bar ; apical seta short and robust, 146–160 $\mu$  long ; subapical one 73–80 $\mu$ . Multilocular disc pores set in two, occasionally three, small groups on the ventral midregion of the last abdominal segments. Their number is as follows : (ix plus x) 5–8 ; (viii) 11–21 ; (vii) 0–3. Tubular ducts of the oral collar type very few on the ventral side of the anal lobes and marginal area of the preceding segment. Trilocular pores very numerous on either side of the body. Simple disc pores somewhat smaller than the trilocular pores, few and scattered on the dorsum and venter. Anterior and posterior dorsal ostioles prominent with lips moderately chitinized. Circulus transversely elongate. Dorsal setae very short, numerous ; cisanal setae

and a few setae set on either side of the anal ring longer and robust ; ventral setae also numerous and similar to those of the dorsum, except on the last two abdominal segments where they are longer and stouter. Legs short, stout, without translucent pores ; dimensions of legs (iii) : trochanter plus femur 248–255 $\mu$  ; tibia plus tarsus 182–197 $\mu$ . Beak 204–219 $\mu$ . Anal ring normal, apical, with six setae 73–80 $\mu$  long. Antennae 7- or 8-segmented ; where the antennae are reduced to seven segments, one of them is marked with a pseudoarticulation ; total length 306–328 $\mu$ .

Holotype. Adult ♀. TANGANYIKA : Longido, 23.i.1961, on *Acacia* sp. (G. De Lotto). Coll. No. 2609.

Paratypes. 2 adult ♀. Same data as holotype.

### **PELIOCOCCUS** Borchsenius, 1948

*Peliococcus* Borchsenius, 1948 : 954.

Type species : *Phenacoccus chersonensis* Kiritshenko, 1936.

The type species of the genus, *Phenacoccus chersonensis* Kiritshenko, 1936, is palaearctic and entirely unknown to me, therefore the characters of this genus had to be based on the diagnosis of two congeneric North American forms dealt with by Ferris (1950).

Three species from the region under review are apparently referable to *Peliococcus*. They are : *Pseudococcus bantu* Brain, 1915, from roots of grass, South Africa ; *Phenacoccus locustus* James, 1936, from roots of *Hyparrhenia ruprechtii* Fourn. and *P. trispinosus* James, 1936, from roots and rhizomes of *Solanum tuberosum* L. the last two having been described from Kenya. To them should be added *Peliococcus orophilus*, a species somewhat atypical, here described as new.

#### PROVISIONAL KEY TO SPECIES

- |       |  |                    |
|-------|--|--------------------|
| 1     | Clusters of large multilocular disc pores numerous and distributed all over the body . . . . .                             | 2                  |
|       | Clusters of multilocular disc pores few on either side of the abdomen only   | <b>orophilus</b>   |
| 2 (1) | Circulus lacking . . . . .   | <b>locustus</b>    |
|       | Circulus present . . . . .   | 3                  |
| 3 (2) | Large multilocular disc pores in clusters of two to three, seldom four ; hind tibiae with some translucent pores . . . . . | <b>bantu</b>       |
|       | Large multilocular pores arranged in clusters of five to eight ; hind tibiae without translucent pores . . . . .           | <b>trispinosus</b> |

### ***Peliococcus bantu* (Brain, 1915) comb. n.**

*Pseudococcus bantu* Brain, 1915 : 137.

*Pseudococcus bantu* Brain ; Munro & Fouché, 1936 : 91.

*Pseudococcus bantu* Brain ; De Lotto, 1958 : 84.

Originally described (Brain, 1915) from Pietermaritzburg, Natal, South Africa, as living on crowns of grass. The following record is from Transvaal.

SOUTH AFRICA : Klaserie, 20.iv.1955, on roots of grass (*E. C. G. Bedford*).

***Peliococcus orophilus* sp. n.**

(Plate 14)

Mounted specimens elongate, with anal lobes prominent ; length up to 3.1 mm. Margin of the body with a complete series of eighteen pairs of cerarii. Anal lobe cerarii each with three slender conical spines set rather apart from one another and surrounded by a loose group of 15–20 trilocular pores and two or three very short spiniform auxiliary setae ; area about the cerarian spines not chitinized. Remaining cerarii each built up with two spines similar to those of the anal lobe cerarii, or slighter, longer and somewhat more slender ; each cerarius is beset with six to ten trilocular pores but devoid of auxiliary setae. Ventral side of each anal lobe with an ill-shaped elongate chitinized bar, at times reduced in size owing to the absence of the tract between the attachments of the apical and subapical setae ; apical seta robust, 292–336 $\mu$  long ; subapical one 146–175 $\mu$ . Multilocular disc pores few on the ventral midregion of the last three abdominal segments.<sup>6</sup> Other multilocular pores, at times slightly larger than those occurring on the ventral abdominal segments, are set in groups of two to four. Each group of pores has associated with it one or two small tubular ducts of oral collar type. These clusters of pores occur on either side of the abdomen only, and their number and arrangement are very variable. Quinquelocular pores fairly numerous on the ventral median and submedian areas, and distributed without any regular pattern. Tubular ducts of oral collar type set in small groups on the ventral marginal area of all abdominal segments ; others are intermingled among the ventral multilocular disc pores. Trilocular pores few and sparse on both sides of the body. Simple disc pores apparently lacking. Anterior and posterior dorsal ostioles well developed with lips membranous. Circulus large. Dorsal setae short, spiniform, very few ; a few setae similar in size and shape to those of the marginal cerarii are set in pairs and beset with some trilocular pores, giving the appearance of supplementary dorsal cerarii. Ventral body setae much more numerous, fairly long. Legs all well developed ; claws with a denticle ; translucent pores absent ; dimensions of legs (iii) : trochanter plus femur 438–496 $\mu$  ; tibia plus tarsus 533–606 $\mu$ . Anal ring entire, apical, with six setae 160–190 $\mu$  long. Beak dimerous 146–168 $\mu$ . Antennae with nine segments, measuring together 650–695 $\mu$ .

Holotype. Adult ♀. TANGANYIKA : Mount Kilimanjaro (altitude not recorded), iii.1951, on *Senecio* sp. (*R. G. Tapley*). Coll. No. 1669.

Paratypes. Seven adult ♀. Same data as holotype.

***Peliococcus trispinosus* (James, 1936) comb. n.**

*Phenacoccus trispinosus* James, 1936 : 206.

*Phenacoccus trispinosus* James ; De Lotto, 1957 : 191.

KENYA : Nairobi, 13.iii.1956, on roots of *Panicum maximum* Jacq. (*G. De Lotto*).

**PHENACOCCLUS** Cockerell, 1893

*Phenacoccus* Cockerell, 1893 : 318.

Type species : *Pseudococcus aceris* Signoret, 1875.

The composition of the genus *Phenacoccus* is still far from satisfactory. In the writer's view only three species from Africa south of the Sahara are structurally congeneric with the type. They are : *Pseudococcus stelli* Brain, 1915, and *Pseudococcus graminosus* McKenzie, 1960, both occurring in South Africa ; and *Phenacoccus*

<sup>6</sup> The number of multilocular disc pores occurring on each segment could not be satisfactorily counted owing to distortions of the body skin.

*madeirensis* Green, 1928, recently recorded by Williams (1958) from Ghana and Nigeria. The generic assignment of all remaining species, including those described as new in the following pages, is entirely provisional.

***Phenacoccus cotyledonis* sp. n.**

(Plate 15)

Mounted specimens elongate, up to 1.2 mm. long. Marginal cerarii present only on the anal lobe segment. Each cerarius is formed with two rather slender spines surrounded by 5–8 trilocular pores; auxiliary setae absent; area about the spines not chitinized. Ventral side of each anal lobe without chitinized bar; apical seta 80–95 $\mu$ ; subapical one not differentiated from the remaining ventral body setae. Multilocular disc pores arranged in loose transverse rows on the ventral side of the last five abdominal segments as follows: (ix plus x) 10–15; (viii) 8–15; (vii) 11–19; (vi) 9–20; (v) 4–10. No multilocular pores occur on the ventral prosoma or on the dorsum. Quinquelocular pores entirely absent. Tubular ducts of oral collar type of two sizes. The larger ones are not numerous and tend to be arranged in loose, irregular transverse rows on either side of the abdomen; a few more are scattered on the dorsal prosoma. Tubular ducts of smaller size very few on the dorsal and ventral side of the abdomen only. Trilocular pores few. Simple disc pores smaller than the trilocular pores, few and sparse. Anterior and posterior dorsal ostioles fairly prominent with lips membranous. Circulus lacking. Dorsal and ventral body setae few, short and slender. Legs well developed; claws with a minute denticle; hind tibiae with numerous translucent pores; dimensions of legs (iii): trochanter plus femur 146–168 $\mu$ ; tibia plus tarsus 175–183 $\mu$ . Anal ring very narrow with a few elongate cells; opened posteriorly, and provided with six slender setae 22–29 $\mu$  long. Beak 88–95 $\mu$ . Antennae 8-segmented with a pseudoarticulation on the apical segment; total length 212–248 $\mu$ .

Holotype. Adult ♀. SOUTH AFRICA: Pretoria, vii.1959, on *Cotyledon* sp. (*J. S. Odendaal*). Coll. No. 2505.

Paratypes. Four adult ♀. Same data as holotype.

This species has some affinity with *Ph. trionymoides* De Lotto, 1961, and *Ph. distinctus* here described as new. It differs, however, from both in having the marginal cerarii reduced to one pair only, and in having the anal ring very narrow and slightly opened posteriorly.

***Phenacoccus distinctus* sp. n.**

(Plate 16)

Mounted specimen holotype elongate, with anal lobes fairly well developed; length 2.3 mm. Marginal cerarii present only on the last two abdominal segments. Anal lobe cerarii each with two conical spines beset with six auxiliary setae and about 40 trilocular pores; area about the cerarian spines not chitinized. Preanal cerarii with two spines slightly smaller than those of the anal lobe cerarii. Ventral side of each anal lobe without chitinized bar; apical seta 168 $\mu$ ; subapical one about half as long. Multilocular disc pores arranged in transverse rows on the midregion of the last five abdominal segments; the number of pores is as follows: (ix plus x) 94; (viii) 113; (vii) 115; (vi) 104; (v) 62. Other multilocular pores are scattered on the ventral prosoma and on the dorsum. Tubular ducts of three sizes. The ducts of the largest size are simple, that is without oral collar or oral rim, and slightly extrude from the body integument; these ducts are arranged in loose, irregular rows on the dorsal side of the abdomen and thorax; others are scattered on the dorsal side of the head and on the ventral marginal

area of the abdomen and thorax. Medium-sized ducts very numerous on either side of the body ; on the dorsal side of the abdomen and thorax they are set in transverse segmental rows. Ducts of the smaller size fairly abundant on the dorsum and venter in association with the medium-sized ones. Quinquelocular pores absent. Trilocular pores not numerous and uniformly distributed. Simple disc pores apparently absent. Anterior dorsal ostioles not recognizable ; posterior ones poorly developed with lips membranous. Circulus lacking. Dorsal setae short and slender ; ventral ones long and fairly robust. Legs well developed with a denticle on the claws ; hind tibiae with a few small translucent pores ; dimensions of legs (iii) : trochanter plus femur  $372\mu$  ; tibia plus tarsus  $372\mu$ . Anal ring apical, entire, with six setae measuring  $117\mu$ . Beak dimerous,  $131\mu$ . Antennae 8-segmented with a pseudoarticulation on the apical segment ; total length  $496\mu$ .

Holotype. Adult ♀. SOUTH AFRICA : Bonnievale, 23.iv.1938, on *Galenia africana* L. (kraalbos) (*P. Joubert*). Coll. No. 2706.

This species resembles very closely *Ph. trionymoides* De Lotto, 1961, described from Kenya, Nairobi, on *Carallumma drummeri*, from which it differs in having a conspicuously larger number of multilocular disc pores and tubular ducts. The large simple ducts which in *trionymoides* are arranged in fairly regular longitudinal series, in *distinctus* tend to be set in segmental transverse rows. Furthermore in the latter the antennae, legs, apical seta and beak are noticeably longer than in the former.

### *Phenacoccus graminosus* McKenzie, 1960

(Plate 17)

This species has been recently described from California, U.S.A., and South Australia (McKenzie, 1960). The following redescription is based on six mounted adult females from South Africa which were compared with two specimens of the type series.<sup>7</sup>

Mounted specimens elongate elliptical, with anal lobes fairly well developed ; length up to 3.5 mm. Margin of the body with a complete series of eighteen pairs of cerarii. Anal lobe cerarii each with two conical spines beset with 20–25 trilocular pores and three, occasionally four, spiniform auxiliary setae. These setae are minute, except one which at times is nearly as large as the cerarian spines. Spines of all remaining cerarii shorter and more slender than those of the anal lobe cerarii. Each preanal cerarius is formed with two spines, except the ocular (xvi), frontal (xviii) and, occasionally, the preocular (xvii) cerarii, each of which bears three spines. Ventral side of each anal lobe without chitinized bar ; apical seta  $183\text{--}204$  [ $190\text{--}204$ ] $\mu$ ;<sup>8</sup> subapical one  $73\text{--}87$  [ $73\text{--}80$ ] $\mu$ . Multilocular disc pores numerous on either side of the abdomen ; others are scattered on the ventral and dorsal side of the prosoma. On the ventral side of the (iv) to (vi) abdominal segments the multilocular pores are arranged in median and marginal groups. The number of pores on the ventral side of the last six abdominal segments is as follows : (ix plus x)  $57\text{--}71$  [ $69\text{--}93$ ] ; (viii)  $87\text{--}108$  [ $107\text{--}139$ ] ; (vii)  $91\text{--}103$  [ $108\text{--}123$ ] ; (vi)  $69\text{--}84$  [ $89\text{--}121$ ] ; (v)  $73\text{--}87$  [ $89\text{--}121$ ] ; (iv)  $29\text{--}46$  [ $69\text{--}85$ ]. On the dorsal side of the abdomen the number of pores is : (ix) none ; (viii)  $25\text{--}33$  [ $32\text{--}43$ ] ; (vii)  $15\text{--}23$  [ $21\text{--}36$ ] ; (vi)  $42\text{--}55$  [ $45\text{--}81$ ] ; (v)  $19\text{--}31$  [ $35\text{--}56$ ] ; (iv)  $4\text{--}10$  [ $16\text{--}33$ ]. Tubular ducts of the oral rim type entirely absent. Tubular ducts with oral collar present on both sides of the body. Those occurring

<sup>7</sup> U.S.A.: California, paratype No. 53 J 165, San Pablo, Contra Costa County, 10.x.1953, on ryegrass (*D. J. Bingham*) ; paratype No. 59 D 15–37, Sunnyvale, Santa Clara County, 7.iv.1959, on lawngrass (*T. R. Haig & E. Winkler*).

<sup>8</sup> The figures in square brackets are the values found in the two specimens of the type series.

on the dorsum are slightly larger in diameter ; they are few and scattered, except on the marginal area of the last three abdominal segments where they are set in small groupings. On the venter numerous ducts are associated with the abdominal multilocular disc pores. Quinquelocular pores distributed on the ventral midregion from the (vii) or (vi) abdominal segment as far as the prothorax. Trilocular pores not numerous and uniformly distributed on both sides of the body. Simple disc pores noticeably smaller than the trilocular pores, few and sparse. Anterior and posterior dorsal ostioles rather inconspicuous with lips membranous. Circulus situated in the middle of the (iv) abdominal segment, transversely elongate, with surface membranous. Dorsal setae very small, spiniform, few and scattered ; ventral ones long and robust. Legs well developed with a small denticle on the claws ; translucent pores lacking ; dimensions of legs (iii) : trochanter plus femur 300–350 [340–350] $\mu$  ; tibia plus tarsus 358–430 [409–416] $\mu$ . Anal ring entire, apical, with six setae measuring 102–117 [131–139] $\mu$ . Beak 95–103 [95–110] $\mu$ . Antennae 9-segmented ; total length 416–467 [489–540] $\mu$ .

SOUTH AFRICA : Stellenbosch, 14.iv.1938, on grass (*R. I. Nel*). Coll. No. 2488. One specimen will be deposited in the collection of the British Museum (Natural History), London.

As far as the paratypes seen are concerned, the South African material is structurally identical with the species described by McKenzie from California. There are, however, noticeable differences in the number of multilocular disc pores and in the length of legs, antennae and anal ring setae, which, in view of the discontinuity between the two areas of distribution, may well have a taxonomic significance and thus justify, if confirmed, the recognition of a geographic subspecies.

### ***Phenacoccus orcinus* sp. n.**

(Plate 18)

Mounted specimens elliptical with anal lobes poorly developed ; length up to 2.9 mm. Margin of the body with altogether twenty-four pairs of cerarii, of these, eighteen pairs represent the normal series, whilst the remaining are interspersed on the last six abdominal segments anterior to the anal lobes. Anal lobe cerarii each formed with two robust, somewhat lanceolate spines surrounded by 20–30 trilocular pores and two to four small lanceolate auxiliary setae ; area about the cerarian spines not chitinized. All remaining cerarii of the normal series built up with two lanceolate spines, except the ocular cerarius (xvi) which has three, occasionally four, spines. The spines are slightly smaller than those of the anal lobe cerarii and are beset with 6–10 trilocular pores and devoid of auxiliary setae. The additional cerarii on the last two abdominal segments anterior to the anal lobes are similar to those of the normal series, although at times the spines are somewhat different in size ; the remaining four supplementary cerarii are reduced to one spine only. Ventral side of each anal lobe with a minute, irregularly shaped chitinized bar in front of the subapical seta ; apical seta robust, 175–212 $\mu$  long ; subapical one 95–102 $\mu$ . Multilocular disc pores set in three or four groups in the midregion of the last abdominal segments as follows : (ix plus x) 5–14 ; (viii) 21–31 ; (vii) 12–19 ; (vi) 0–6. On the segments anterior to the genital opening the pores are set in loose transverse rows along the distal margin only. No pores occur on the ventral prosoma or on the dorsum. Dorsal tubular ducts entirely absent. Ventral tubular ducts of the oral collar type very few on the marginal area of all abdominal segments ; a few are scattered on the midregion of the abdomen. Quinquelocular pores totally lacking. Trilocular pores not numerous and evenly distributed all over the body. Simple disc pores smaller than the trilocular ones, very few on either side of the body. About twenty simple disc pores are set in an irregular transverse group on the dorsum, near the basal margin of the last abdominal segment. Anterior and posterior dorsal

ostioles rather inconspicuous with lips membranous. Circulus absent. Dorsal setae small, lanceolate in shape, at times beset with one to three trilocular pores; ventral setae long and slender, rather few. Legs normal with a denticle on the claws; translucent pores absent; dimensions of legs (iii): trochanter plus femur  $270-282\mu$ ; tibia plus tarsus  $321-350\mu$ . Anal ring entire, with six setae  $95-117\mu$  long. Beak  $95-110\mu$ . Antennae with nine segments; total length  $357-402\mu$ .

Holotype. Adult ♀. SOUTH AFRICA: Stellenbosch, 28.viii.1921, on roots of grass (*C. J. Joubert*). Coll. No. 2643.

Paratypes. Four adult ♀. Same data as holotype.

The supplementary series of marginal cerarii on the last abdominal segments anterior to the anal lobes is a distinctive feature among all species still retained in the genus *Phenacoccus* known to the writer.

### *Phenacoccus pauculus* sp. n.

(Plate 19)

Mounted specimens elongate elliptical, up to 1.6 mm. long. Margin of the body with eighteen pairs of cerarii. Anal lobe cerarii each with two conical spines beset with 6 to 8 trilocular pores; auxiliary setae lacking; area about the spines not chitinized. The spines of the remaining cerarii attain the same size as those of the anal lobe cerarii, but are slightly more slender. Each preanal cerarius carries two spines, except one or two cerarii on the thorax which at times are reduced to one spine only; and the three most anterior cerarii (xvi) to (xviii) which are normally built up with three spines. Each cerarius is surrounded by 3-6 trilocular pores. Ventral side of each anal lobe without chitinized bar; apical seta  $168-183\mu$ ; subapical one  $88-110\mu$ . Multilocular disc pores set in transverse groups on the ventral side of the last five abdominal segments as follows: (ix plus x)  $50-51$ ; (viii)  $74-77$ ; (vii)  $53-58$ ; (vi)  $15-26$ ; (v) 4. A few pores occur on the dorsal side of the last two abdominal segments. Quinquelocular pores very few on the ventral midregion of the thorax and head. Tubular ducts with oral collar rim very numerous on either side of the body. Tubular ducts of the oral collar type rather few on the ventral midregion and marginal area of the last five abdominal segments. Trilocular pores fairly numerous and uniformly distributed. Simple disc pores smaller than the trilocular pores, few and scattered on both surfaces of the body. Anterior and posterior dorsal ostioles well developed with lips membranous. Circulus absent. Dorsal setae very short, spiniform; ventral ones much longer, rather robust. Legs well developed with a small denticle on the claws; hind coxae with a few very minute translucent pores; dimensions of legs (iii): trochanter plus femur  $226-234\mu$ ; tibia plus tarsus  $270-285\mu$ . Anal ring entire, cellular, with six setae measuring  $73-88\mu$  in length. Beak  $81-88\mu$ . Antennae 8-segmented with a pseudoarticulation on the apical segment; total length  $336-358\mu$ .

Holotype. Adult ♀. UGANDA: Kampala, 23.vii.1961, on roots of grass (*G. De Lotto*). Coll. No. 2681.

Paratype. One adult ♀. Same data as holotype.

This is the second African species of *Phenacoccus* with oral rim tubular ducts, the other being *Pseudococcus nitidus* Brain, 1915, described from specimens collected on *Acacia caffra* Willd. in Pretoria, South Africa. The two species are easily separable on the basis of the number of marginal cerarii, which in *nitidus* are reduced to five pairs on the last abdominal segments.

**PLANOCOCCOIDES** Ezzat & McConnell, 1956

*Planococcoides* Ezzat & McConnell, 1956 : 53.

Type species : *Pseudococcus njalensis* Laing, 1929.

Structurally this genus represents a link between *Planococcus* Ferris, 1950, in which the cerarii are normally formed from two spines, and *Cataenococcus* Ferris, 1955, in which the cerarian spines tend to be arranged in a continuous series all along the margin of the body.

A species congeneric with *njalensis* is *Planococcoides ireneus* n. n. (= *Pseudococcus latipes* De Lotto, 1955 [non Green, 1917]), which differs from the former in having some multilocular disc pores scattered on the ventral prosoma and on the dorsum.

***Planococcoides ireneus* n. n.** De Lotto, 1963

*Pseudococcus latipes* De Lotto, 1955 : 271. [non Green, 1917]

Following the conclusions of Williams (1962) on the identity and present status of the mealy bug originally described by Green in 1917 as *Pseudococcus longispinus* var. *latipes*, *Pseudococcus latipes* De Lotto, 1955 becomes a primary homonym of Green's species and the new name *Planococcoides ireneus* is here proposed.

Since first described in 1955, several lots of specimens have been received from Uganda from both arabica and robusta coffee, indicating that this species is fairly common in that country. A large percentage of the material seen was collected on the roots or on the collar region of the host, under or just above ground level.

UGANDA : North Bugishu, 19.xii.1956, on *Coffea arabica* L. (D. N. McNutt).

***Planococcoides njalensis*** (Laing, 1929)

*Pseudococcus njalensis* Laing, 1929 : 472.

*Pseudococcus exitiabilis* Laing, 1944 : 91.

*Pseudococcus njalensis* Laing ; Hall, 1945 : 305.

*Pseudococcus njalensis* Laing ; Strickland, 1947 : 507.

*Planococcoides njalensis* (Laing) Ezzat & McConnell, 1956 : 55.

*Planococcoides njalensis* (Laing) ; Williams, 1958 : 21.

A detailed study of the identity of this species was made by Hall (1945), who examined an extensive range of material collected on several host plants in western Africa, including the types of both *njalensis* and *exitiabilis*. He came to the conclusion that the species is extremely variable and there is no morphological ground for a specific distinction between *njalensis* and *exitiabilis*.

According to him, one of the most variable characters is the number of the cerarian spines. The specimens at hand from the Congo show a noticeable reduction in the number of spines occurring on some cerarii. The following is the average found in 24 specimens : (i) 2.1 ; (ii) 4.1 ; (iii) 3.3 ; (iv) 3 ; (v) 2.7 ; (vi) 2.6 ; (vii) 2.4 ; (viii) and (ix) 2 ; (x) 1.8 ; (xi), (xii) and (xiii) 2 ; (xiv) 1.3 ; (xv) 0.7 ; (xvi) 2.9 ; (xvii) 2.3 ; (xviii) 1.8. In all other structures the material agrees adequately with Ezzat & McConnell's redescription and diagram, as well as with specimens from Ghana collected on *Cola acuminata* and *Theobroma cacao*.

CONGO : Rutshuru, 5.vii.1937, on *Coffea arabica* (J. Ghesquière). Coll. Nos. 138 and 142. Two specimens have been deposited in the British Museum (Natural History), London ; two in the U.S. National Collection, Washington, D.C.

### *PLANOCOCCUS* Ferris, 1950

*Planococcus* Ferris, 1950 : 164.

Type species : *Dorthesia citri* Risso, 1813.

Three more new species are to be added to those already recorded or described from Africa south of the Sahara. The rapid increase of species, often very closely related, strongly suggests that the genus may be of African origin.

#### PROVISIONAL KEY TO SPECIES

- |         |   |                           |
|---------|---|---------------------------|
| 1       | All cerarii normally built up with two spines only . . . . .  | 2                         |
|         | Some of the cerarii anterior to the anal lobe ones either with 3-4 spines or with 1-2 auxiliary setae . . . . .   | 13                        |
| 2 (1)   | Ventral marginal area of the body with groupings of oral collar ducts extending as far as the prothorax or the head . . . . .   | 3                         |
|         | Ventral marginal ducts either absent or occurring in small groups on the abdominal segments only . . . . .  | 10                        |
| 3 (2)   | Circulus lacking . . . . .  | <i>euphorbiae</i>         |
|         | Circulus present . . . . .  | 4                         |
| 4 (3)   | Anal lobe cerarii enclosed within a well marked chitinized area . . . . .   | <i>kenyae</i>             |
|         | Area about the anal lobe cerarii not chitinized . . . . .   | 5                         |
| 5 (4)   | Some of the dorsal setae long, robust and strongly bifurcate . . . . .  | <i>subterraneus</i>       |
|         | Dorsal setae short, slender and finely pointed . . . . .  | 6                         |
| 6 (5)   | Spines of the marginal cerarii longer and more slender than those of the anal lobe cerarii, strongly flagellate . . . . .   | <i>flagellatus</i>        |
|         | Spines of all cerarii not appreciably differentiate in size and shape . . . . .   | 7                         |
| 7 (6)   | Dorsum with some multilocular disc pores and with numerous oral collar ducts arranged in segmental transverse rows . . . . .  | <i>epulus</i>             |
|         | Multilocular disc pores never occurring on the dorsum ; dorsal oral collar ducts when present never arranged in transverse rows . . . . .   | 8                         |
| 8 (7)   | Dorsal marginal area of the abdominal segments anterior to the anal lobes with 1 to 4 oral collar ducts . . . . .   | <i>kraunthiae</i>         |
|         | Dorsal marginal oral collar ducts either lacking or reduced to one only . . . . .   | 9                         |
| 9 (8)   | With a small group of ventral oral collar ducts between the (x) and (ix) abdominal segments ; ventral marginal ducts not appreciably differentiate in size from those on the midregion of the abdomen . . . . . | <i>citri</i> <sup>9</sup> |
|         | Ventral marginal oral collar ducts between the (x) and (ix) abdominal segments lacking ; ventral marginal ducts noticeably larger than those occurring on the ventral midregion of the abdomen . . . . .        | <i>nigritulus</i>         |
| 10 (2)  | Ventral marginal oral collar ducts lacking . . . . .  | 11                        |
|         | Ventral marginal ducts set in small groupings on the last four or five abdominal segments . . . . .   | 12                        |
| 11 (10) | Hind legs without translucent pores ; simple disc pores large and occurring on either side of the body . . . . .  | <i>hospitus</i>           |
|         | Coxae and tibiae of hind legs with translucent pores ; simple disc pores apparently absent . . . . .  | <i>hosnyi</i>             |

<sup>9</sup>Inclusive of *citricus* Ezzat & McConnell, 1956, and *ficus* (Signoret, 1875). See p. 373.

- 12 (10) Multilocular disc pores on the two or three abdominal segments anterior to the genital opening partly arranged in linear rows along the distal margin and partly scattered over the surface of the segment involved ; hind legs without translucent pores . . . . . *aemulor*  
 Multilocular disc pores anterior to the genital opening set in transverse linear rows along the distal margin only ; coxae and tibiae of the hind legs with translucent pores . . . . . *subukiaensis*
- 13 (1) Cerarii anterior to the anal lobes situated at the apex of a small slightly chitinized tubercle ; dorsal setae at times associated with one or two trilocular pores . . . . . *boafoensis*  
 Marginal cerarii situated as normal ; dorsal body setae never associated with trilocular pores . . . . . 14
- 14 (13) Marginal cerarii at times with one or two auxiliary setae . . . . . 15  
 Abdominal cerarii anterior to the anal lobes partly built up with 3-4 spines . . . . . 16
- 15 (14) Anal lobe cerarii enclosed within a chitinized area ; ventral multilocular disc pores in five groups . . . . . *celtis*  
 Area about the anal lobe cerarii not chitinized ; ventral multilocular pores in three groups . . . . . *rotundatus*
- 16 (14) Anal lobe cerarii enclosed within a well marked chitinized area ; simple disc pores of two sizes ; ventral multilocular disc pores in three small groups ; trilocular pores few . . . . . *formosus*  
 Area about the anal lobe cerarii not chitinized ; simple disc pores of one size ; ventral multilocular pores in five groups ; trilocular pores numerous . . . . . *crassus*

### *Planococcus aemulor* sp. n.

(Plate 20)

Mounted specimens broadly elliptical, with anal lobes well developed ; length up to 1.9 mm. Margin of the body with a complete series of eighteen pairs of cerarii. Anal lobe cerarii each with two conical spines which are surrounded by 7 to 10 trilocular pores and devoid of auxiliary setae ; area about the cerarian spines not chitinized. All remaining cerarii also with two spines, except the frontal (xviii) and the preocular (xvii) cerarii each of which occasionally carries three spines. Ventral side of each anal lobe with an elongate irregularly shaped chitinized bar, at times reduced in size due to the absence of the tract between the attachments of the apical and subapical setae ; apical seta robust, 255-265 $\mu$  ; subapical one 58-73 $\mu$ . Multilocular disc pores arranged in transverse rows on the ventral side of the last five abdominal segments, as follows : (ix plus x) 22-44 ; (viii) 30-44 ; (vii) 36-48 ; (vi) 21-33 ; (v) 18-28. No multilocular pores occur on the ventral prosoma or on the dorsum. Tubular ducts of oral collar type all attaining the same size ; they are set in small groups on the ventral marginal area of the last four or five abdominal segments anterior to the genital opening ; one or two ducts at times occur on the ninth segment ; a few more ducts are associated with the multilocular disc pores. Trilocular pores fairly numerous on either side of the body. Simple disc pores somewhat larger than the trilocular pores, few and sparse on dorsum and venter. Anterior and posterior dorsal ostioles prominent with lips slightly chitinized. Circulus large with surface membranous. Dorsal setae short and slender, rather numerous ; ventral ones slightly longer. Legs well developed ; translucent pores on hind legs lacking ; dimensions of legs (iii) : trochanter plus femur 263-284 $\mu$  ; tibia plus tarsus 270-284 $\mu$ . Anal ring entire, cellular, bearing six setae 80-95 $\mu$  long. Beak 168-182 $\mu$ . Antennae with 7 or 8 segments ; in 7-segmented antennae the 4th segment is normally marked with a pseudoarticulation ; total length 343-387 $\mu$ .

Holotype. Adult ♀. KENYA : Ruiru, 20.viii.1957, on *Combretum splendens* Engl. (R. H. Le Pelley). Coll. No. 2224.

Paratypes. Nine adult ♀. Same data as holotype.

The following record is based on specimens not included in the type series :

KENYA : Turbo, 12.xii.1942, on *Asparagus* sp. (R. H. Le Pelley).

This species is extremely close to *Planococcus citri* from which, however, it differs in having the ventral marginal groupings of oral collar ducts on the abdominal segments only. In the common citrus mealy bug, groups of these ducts always extend as far as the prothorax and head, as shown in the diagram by Ezzat & McConnell (1956).

### *Planococcus citri* (Risso, 1813)

- Pseudococcus citri* (Risso) ; Brain, 1912 : 178.  
*Pseudococcus citri* (Risso) ; Lindinger, 1913 : 68.  
*Pseudococcus citri* (Risso) ; Lindinger, 1913 : 100.  
*Dactylopius* (*Pseudococcus*) *citri* (Risso) ; Gowdey, 1914 : 247.  
*Pseudococcus citri* (Risso) ; Brain, 1915 : 115.  
*Pseudococcus citri phenacocciiformis* Brain, 1915 : 116.  
*Pseudococcus citri* (Risso) ; Green, 1916 : 375.  
*Pseudococcus citri* (Risso) ; Newstead, 1917 : 126.  
*Pseudococcus citri* (Risso) ; Brain & Kelly, 1917 : 182.  
*Pseudococcus citri* (Risso) ; Gowdey, 1917 : 187.  
*Pseudococcus citri* (Risso) ; De Seabra & Vayssi re, 1918 : 163.  
*Pseudococcus citri* Boisduval [*sic*] ; De Seabra, 1922 : 15.  
*Pseudococcus citri* (Risso) ; Ghesqu re, 1927 : 311.  
*Pseudococcus citri* (Risso) ; Kirkpatrick, 1927 : 18.  
*Pseudococcus citri* (Risso) ; Laing, 1928 : 214.  
*Pseudococcus citri* (Risso) ; James, 1933 : 433.  
*Pseudococcus citri* (Risso) ; Munro & Fouch , 1936 : 92.  
*Pseudococcus citri phenacocciiformis* Brain ; Munro & Fouch , 1936 : 92.  
*Pseudococcus citri* (Risso) ; Hall, 1937 : 126.  
*Pseudococcus citri* (Risso) ; Strickland, 1947 : 505.  
*Planococcus citri* (Risso) ; Ezzat & McConnell, 1956 : 65.  
*Planococcus citri* (Risso) ; De Lotto, 1958 : 94.

Discussing the identity of this species, Ferris (1950) pointed out that the considerable range of variation normally observed in *citri* very likely represents a complex of different ecological, biological or geographical races, phenotypically very closely related to one another. The study of the material available from Africa fully supports his views.

Ezzat & McConnell (1956) redescribed *Dactylopius ficus* Signoret, 1875, which they studied on material from various parts of the world, including specimens collected on grape berry in South Africa. According to them Signoret's species differs from *citri* in having a small group of multilocular disc pores near the attachment of the front legs and near the posterior stigmatic openings ; the multilocular pores on the ventral side of the abdomen are arranged in rows one pore wide, which on segments (iv) and (v) are often interrupted on the median area ; furthermore in *ficus* there are fewer ventral oral collar ducts than in *citri*. In the same paper they described as new *Planococcus citricus* of which they had at hand a long series of specimens, including two collected on roots of *Dioscorea* sp. in Nigeria, intercepted

in New York (U.S.A.). This species, too, is very close to *citri*, from which however it differs in such characters as shorter legs and antennae, fewer trilocular pores, tubular ducts and multilocular disc pores. Among the African material examined in connection with this paper are specimens which agree with the descriptions of both *ficus* and *citricus*, but in neither instance was it possible to separate them clearly. Specimens of the same population furnished, at times, intermediate forms linking the species to one another.

A few years ago the present writer carried out a study of the identity of *Planococcus citri* to ascertain whether there was any ground for the taxonomic separation of the populations living on the roots of coffee, which at times are responsible for the death of young trees. Detailed observations led to the conclusion that two races are involved in East Africa. There is one race—in *sensu lato* typical—in which the circulus is large, strongly constricted in the middle and foldable. As a rule it thrives on the aerial parts of the host, though occasionally it may be found on the roots. In the other race the circulus is variable in size, at times very small, roundish or transversely elongate and mostly unfoldable; furthermore, the antennae and legs tend to be shorter and the dermal structures fewer in number. This race attacks only the roots of the host plant, thus displaying a very close ecological and morphological affinity with *Planococcus citricus* Ezzat & McConnell. The specimens from roots are often associated with a fungus. Further research may well warrant the recognition of a true ecological subspecies. Specimens living on roots of coffee were submitted to Prof. S. W. Brown of the Department of Genetics, University of California, Berkeley (U.S.A.); and to Prof. P. Buchner of Porto d' Ischia, Naples (Italy), for examination of the chromosome pattern and symbiotic micro-organisms respectively; but in neither instance were differences found from the common citrus mealy bug. In slide smears of the mycetoma, stained with Heidenhain's iron haematoxylin, the writer often observed large numbers of rod-like bacteria, but was unable to ascertain whether their presence had a pathogenic or merely symbiotic significance.

CONGO : Kivu, 15.ii.1958, on *Coffea arabica* L. (D. J. McCrae).

KENYA : Nairobi, 1.xii.1950, on *Gardenia* sp., 7.v.1951 on *Chenopodium pumilo* R. Br. (M. S. Mattrass), 3.iii.1937, on *Aberia caffra* Hook. f. & Harv. (A. R. Melville), 26.iv.1951 on *Solanum muricatum* Ait., 24.ix.1948, on *Vernonia* sp. (R. H. Le Pelley), 5.xii.1951, on *Spartium junceum* L., 8.iv.1952, on *Solanum tuberosum* L., 27.x.1953, on *Acacia* sp., 7.i.1957, on *Pterolobium exosum* E. G. Baker (G. De Lotto); Donyo Sapuk, 12.iv.1937, on *Combretum* sp. (A. R. Melville); Kibarani, 3.viii.1942, on *Gossypium* sp. (cotton) (R. H. Le Pelley); Kiambu, 5.v.1938, on *Psychotria nairobiensis* Brem. (R. H. Le Pelley); Meru, 21.viii.1938, on *Coffea arabica* L. (R. H. Le Pelley); Kakamega, 16.ix.1940, on *Coffea robusta* Lindl. (R. H. Le Pelley); Voi, 22.ix.1951, on *Coffea arabica* L. (A. A. Talbott); Ruiru, 10.xii.1950, on roots of *Coffea arabica* L., 27.vii.1950, on *Cassia didymobotrya* Fres. (D. J. McCrae); Kisumu, 9.vi.1955, on *Persea gratissima* Gaertn. f. (T. J. Crowe); Machakos, 17.iv.1956, on *Citrus aurantium* L. (R. H. Le Pelley).<sup>10</sup>

<sup>10</sup> First and only record of the species from citrus in East Africa.

MOZAMBIQUE : Vila Gondola, 1.iii.1962, on *Eugenia jambolana* Lam. (D. P. Annecke).

NYASALAND : Misuku, v.1930, on *Coffea* sp. (C. Smee).

SOUTH AFRICA : Pretoria, 9.vi.1955, on *Poinsettia* sp. (E. C. G. Bedford) ; Mossel Bay, iv.1930, on *Coffea* sp. (C. J. Joubert).

TANGANYIKA : Moshi, 28.x.1937, on *Coffea arabica* L. (A. R. Melville) ; Maramba, 30.x.1958, on *Theobroma cacao* L. (G. Swain) ; Nronga, 28.ix.1960, on roots of *Coffea arabica* L. (R. G. Tapley) ; Arusha, 25.i.1961, on *Cordia* sp., *Croton* sp., *Annona* sp., *Canna* sp. and *Ficus* sp. (G. De Lotto).

UGANDA : Tororo, 16.iii.1951, on *Coffea arabica* L. (D. J. McCrae) ; Kampala, 4.iv.1952, on roots of *Coffea robusta* Lindl. (T. E. Taylor) ; North Bugishu, 27.ii.1957, on roots of *Solanum indicum* L. (D. N. McNutt).

ZANZIBAR : 13.ii.1956, on *Theobroma cacao* L. (R. H. Le Pelley).

Two specimens of the race infesting the roots will be deposited in the collection of the British Museum (Natural History), London, (coll. No. 2278) ; and two in the U.S. National Collection, Washington, D.C. (coll. No. 1239).

### ***Planococcus crassus* De Lotto, 1961**

*Planococcus crassus* De Lotto, 1961 : 219.

TANGANYIKA : Arusha, 25.i.1961, on *Rauwolfia caffra* Sond., *Croton* sp. and *Ficus* sp. (G. De Lotto).

### ***Planococcus epulus* sp. n.**

(Plate 21)

Mounted holotype specimen elongate, with anal lobe well developed ; length 1.6 mm. Margin of the body with a complete series of eighteen pairs of cerarii. Anal lobe cerarii each with two conical spines beset by a loose group of about 20 trilocular pores and four auxiliary setae ; area about the cerarian spines not chitinized. Remaining cerarii each built up with two conical spines surrounded by 5-8 trilocular pores ; auxiliary setae lacking. Ventral side of each anal lobe with an elongate chitinized bar ; apical seta robust, 255 $\mu$  long ; subapical one 65 $\mu$ . Multilocular disc pores arranged in transverse rows on the ventral side of the last six abdominal segments as follows : (ix plus x) 34 ; (viii) 58 ; (vii) 44 ; (vi) 42 ; (v) 12 ; (iv) 25. A few more multilocular disc pores are scattered on the ventral prosoma and on the dorsum. Tubular ducts of oral collar type very numerous on either side of the body, all attaining the same size. On the ventral and dorsal side of the abdomen and partly on the dorsal side of the thorax the ducts are arranged in transverse segmental rows. Trilocular pores slightly more numerous on the dorsum. Simple circular pores having a granulate surface, poorly marked, few and sparse. Anterior and posterior dorsal ostioles well developed with lips slightly chitinized. Circulus large. Dorsal and ventral body setae not numerous, rather robust. Legs all well developed ; hind tibiae with a few minute translucent pores near the distal end ; dimensions of legs (iii) : trochanter plus femur 307 $\mu$  ; tibia plus tarsus 358 $\mu$ . Anal ring with six setae 117 $\mu$  long. Beak 131 $\mu$ . Antennae with eight segments measuring together 482 $\mu$ .

Holotype. Adult ♀. KENYA : Nairobi, 7.i.1957, on *Pterolobium lacerans* R. Br. (G. De Lotto). Coll. No. 2695.

The specimen was found among a population of the common *Planococcus citri* (Risso).

***Planococcus flagellatus* De Lotto, 1961**

*Planococcus flagellatus* De Lotto, 1961 : 220.

UGANDA : Sebei, 2.iii.1957, on roots of *Cassia petersiana* Bolle (D. N. McNutt).

***Planococcus kenya* (Le Pelley, 1935)**

*Pseudococcus lilacinus* Cockerell ; Kirkpatrick, 1927 : 15 [misidentification].

*Pseudococcus lilacinus* Cockerell ; James, 1932 : 2 [misidentification].

*Pseudococcus lilacinus* Cockerell ; James, 1933 : 429 [misidentification].

*Pseudococcus kenya* Le Pelley, 1935 : 185.

*Pseudococcus kenyaensis* Betrem, 1936 : 129.

*Pseudococcus kenya* Le Pelley ; Betrem, 1937 : 62.

*Planococcus kenya* (Le Pelley) Ezzat & McConnell, 1956 : 83.

KENYA : Karatina, 15.vii.1936 on *Gossypium* sp. (cotton) (H. Wilkinson) ; Kiambu, 3.iv.1953, on roots of *Coccinia* sp. (A. R. Melville) ; Nairobi, 5.i.1951, on *Ficus verrucocarpa* Warb., 6.i.1951 on roots of *Phaseolus* sp., 7.i.1951 on *Jacaranda mimosaeifolia* D. Don., 26.ii.1951, on *Bauhinia purpurea* L., 3.iii.1951, on *Beta vulgaris* L., 19.ii.1951, on *Lolium perenne* L. and *Sonchus oleraceus* L., 3.viii.1951, on *Annona squamosa* L., 24.viii.1951, on *Carissa edulis* Vahl, 19.x.1951, on *Cassia didymobotrya* Fres. (G. De Lotto), 16.iii.1951, on *Pueraria thumbergiana* Benth. (G. M. Lavers), 18.xii.1951, on *Solanum seaforthianum* Andr. (F. J. Graham), 25.ii.1951, on *Hedysarum coronarium* (M. S. Nattrass).

TANGANYIKA : Bukoba, 2.x.1935, on *Coffea* sp. (F. B. Notley).

UGANDA : Bunyoro, 13.xi.1959, on *Tristania conferta* R. Br. (C. H. Lyadda) ; Bwamba, 5.vi.1951, on *Coffea robusta* Lindl. (D. J. McCrae) ; Entebbe, 30.iii.1938, on *Coffea eugenoides* S. Moore, 16.iii.1938, on *Annona cherimola* Mill. (A. R. Melville) ; 19.xi.1951, on *Gardenia* sp. (D. J. McCrae) ; Kampala, 29.ii.1935, on *Gliciridia* sp. (F. B. Notley), 30.xi.1951 on *Codiaeum variegatum* Blume (D. J. McCrae), 28.xi.1951, on *Erythrina abyssinica* Lam. (R. H. Le Pelley), 22.iii.1955, on *Psidium guajava* L. and *Solanum* sp. (T. J. Crowe), 6.i.1955, on *Ricinus communis* L. (M. Magala), 10.x.1956, on *Coffea arabica* L. (D. N. McNutt) ; Nomyoyo, 20.ii.1959, on *Theobroma cacao* L. (J. Brown).

***Planococcus nigrutilus* De Lotto, 1961**

*Planococcus nigrutilus* De Lotto, 1961 : 222.

TANGANYIKA : Mwanza, 20.x.1961, on *Ficus* sp. (G. De Lotto).

***Planococcus rotundatus* De Lotto, 1954**

*Planococcus rotundatus* De Lotto, 1954 : 110.

*Planococcus rotundatus* De Lotto ; Ezzat & McConnell, 1956 : 97.

KENYA : Nairobi, 2.iii.1937, on *Coffea arabica* L. (A. R. Melville) ; Limuru, 15.iii.1951, on *Croton megalocarpum* Hutch. (G. De Lotto) ; Kisumu, 6.vi.1958, on *Acacia* sp. (G. De Lotto).

***Planococcus subterraneus* sp. n.**

(Plate 22)

Mounted holotype specimen elliptical, with anal lobes fairly well developed ; length 2.3 mm. Margin of the body with eighteen pairs of cerarii. Anal lobe cerarii each with two finely pointed conical spines surrounded by about twenty trilocular pores and one or two slender auxiliary setae ; area about the cerarian spines not chitinized. Remaining cerarii each with two spines, except in one side of the body where the (x) and (xvii) cerarii are each reduced to one spine only ; the spines tend to be slightly longer than those of the anal lobe cerarii and at times they are somewhat lanceolate. Ventral side of each anal lobe with a well marked elongate chitinized bar ; apical seta on both lobes missing ; subapical one  $95\mu$  long. Multilocular disc pores set in transverse rows on the ventral side of the last six abdominal segments ; the number of pores occurring on each segment is as follows : (ix plus x) 71 ; (viii) 104 ; (vii) 114 ; (vi) 116 ; (v) 98 ; (iv) 32. A few pores are scattered on the thorax. No multilocular pores occur on the dorsum. Dorsal tubular ducts of oral collar type set singly on the marginal area on some of the abdominal segments, except in one side of the preanal segment in which two ducts are present. Ventral tubular ducts also of oral collar type ; all having the same diameter, but somewhat variable in length ; besides a few associated with the ventral abdominal multilocular disc pores, small groups of ducts occur on the ventral marginal area of all abdominal segments and thorax. Trilocular pores not numerous. Simple disc pores very poorly marked, few and sparse. Anterior and posterior dorsal ostioles well developed with lips slightly chitinized. Circulus rather large. Dorsal setae not numerous ; some of them are very robust, at times strongly bifurcate ; ventral ones also robust, all finely pointed. Legs well developed ; hind coxae and tibiae with some minute translucent pores ; dimensions of legs (iii) : trochanter plus femur  $372\mu$  ; tibia plus tarsus  $401\mu$ . Anal ring normal with six setae measuring  $175\mu$  in length. Beak  $146\mu$ . Antennae with eight segments measuring together  $496\mu$ .

Holotype. Adult ♀. SOUTH AFRICA : Pretoria, 15.viii.1958, on roots of *Ficus* sp. (*H. K. Munro*). Coll. No. 2389.

***Planococcus subukiaensis* De Lotto, 1954**

*Planococcus subukiaensis* De Lotto, 1954 : 110.

*Planococcus subukiaensis* De Lotto ; Ezzat & McConnell, 1956 : 99.

This species was described as living on an unknown plant. Subsequently I have been informed by Dr. R. H. Le Pelley, former Senior Entomologist, Scott Agricultural Laboratories, Nairobi, that in fact the specimens were found on leaves of arabica coffee. The original collecting data therefore should be read as follows :

Holotype. Adult ♀. KENYA : Subukia : 8.viii.1933, on *Coffea arabica* L. (*F. B. Notley*). Coll. No. 56.

Paratypes. Five adult ♀. Same data as holotype.

***PSEUDOCOCCUS* Westwood, 1840**

*Pseudococcus* Westwood, 1840 : 448.

*Trechocorys* Curtis, 1843 : 444.

*Cocconidia* Amyot, 1847 : 494.

Type species : *Coccus adonidum* Linnaeus, 1767.

As has been pointed out by Laing (1944) and Ferris (1950), the use of *Coccus adonidum* Linnaeus, 1767, as the type species of the genus *Pseudococcus* Westwood,

1840, is invalid. Despite the strong evidence against this practice, no attempt is here made to introduce any change. Hence the genera *Trechocorys* Curtis, 1843, and *Cocconidia* Amyot, 1847, having the same type species, are listed as synonyms of *Pseudococcus*.

Another genus linked by some earlier workers with *C. adonidum* is *Diaprostocetus*—at times spelt *Diaprostetus* or *Diaprostechus*—which according to them was erected by O. G. Costa (1828) in his “Prospetto di una nuova divisione metodica del genere *Coccus*.”<sup>11</sup> Actually in this paper Costa only used the word “*Diaprosteci*”, which, as Fernald (1903) and Ferris (1957) pointed out, is a vernacular name with no nomenclatural status.<sup>12</sup>

As conceived by Ferris (1950) the genus *Pseudococcus* now represents a fairly natural group of forms. Seven species have been recorded or described so far from Africa south of the Sahara, some of which are very likely immigrants.

#### PROVISIONAL KEY TO SPECIES

- |       |   |                       |
|-------|---|-----------------------|
| 1     | Preanal cerarii (ii) enclosed within a well marked chitinized area . . . . .  | 2                     |
|       | Preanal cerarii not enclosed within a chitinized area . . . . .   | 5                     |
| 2 (1) | With more than one dorsal oral rim duct near each of most of the cerarii . . . . .  | 3                     |
|       | With only one dorsal oral rim duct associated with some of the marginal cerarii . . . . .   | 4                     |
| 3 (2) | With 2 or 3 oral rim ducts of different sizes near most of the cerarii ; ventral multilocular disc pores very few about the genital opening only . . . . .  | <i>adonidum</i>       |
|       | Dorsal oral rim ducts variable in number, all attaining the same size, small ; ventral multilocular disc pores extending as far as the (v) abdominal segment . . . . .  | <i>occiduus</i>       |
| 4 (2) | Anal and preanal cerarii each situated in a deep depression . . . . .   | <i>concavocerarii</i> |
|       | Anal and preanal cerarii situated as normal . . . . .   | <i>fragilis</i>       |
| 5 (1) | With a single fairly large oral rim duct near the frontal cerarii (xvii) ; remaining dorsal ducts associated with most of the remaining marginal cerarii of the oral collar type ; body setae long and robust . . . . . | <i>citriculus</i>     |
|       | All dorsal tubular ducts associated with the marginal cerarii of the oral rim type ; body setae rather short and slender . . . . .  | 6                     |
| 6 (5) | Dorsal oral rim ducts large and set singly near each of most of the marginal cerarii . . . . .  | <i>maritimus</i>      |
|       | Dorsal oral rim ducts small, very few . . . . .   | <i>kikuyuensis</i>    |

#### *Pseudococcus adonidum* (Linnaeus, 1767)

*Dactylopius* (*Pseudococcus*) *longispinus* Targioni ; Newstead, 1911 : 165.

*Pseudococcus longispinus* (Targioni) ; Brain, 1912 : 177.

*Pseudococcus adonidum* (Linnaeus) ; Lindinger, 1913 : 67.

*Pseudococcus adonidum* (Linnaeus) ; Vayssière, 1913 : 429.

*Dactylopius longispinus* Targioni ; Newstead, 1914 : 523.

*Dactylopius* (*Pseudococcus*) *longispinus* Targioni ; Newstead, 1914 : 305.

*Pseudococcus adonidum* (Linnaeus) ; Brain, 1915 : 106.

*Pseudococcus adonidum* (Linnaeus) ; Brain & Kelly, 1917 : 181.

<sup>11</sup> This paper was first published in “*Il Pontano*”, a short-lived journal of sciences, letters and technology printed in Naples (Italy) from 1828. See list of references at the end of this paper.

<sup>12</sup> Apparently Westwood (1840 : 447) first changed “*Diaprosteci*” to *Diaprostocetus* in a footnote. However, he made no reference to *Coccus adonidum*, but only to two other Linnean species, *C. cacti* and *polonicus*.

*Pseudococcus adonidum* (Linnaeus) ; Munro & Fouché, 1936 : 91.

*Pseudococcus longispinus* (Targioni) ; Hall, 1937 : 127.

*Pseudococcus longispinus* (Targioni) ; Strickland, 1947 : 506.

Newstead (1911) first recorded *Pseudococcus adonidum* from East Africa, Tanganyika, on an unknown plant at Kissaki (or Kisaki), a small centre south of Morogoro and about 110 miles from the coast. Lindinger (1913) recorded the species again from Kissaki on *Codiaeum variegatum* and from Amani (about 30 miles from the coast) on *Manihot glaziovii*. The third record was by James (1933) from western Kenya, and was based on specimens he found on *Coffea arabica* at Cherengani, about 15 miles east of Kitale. As he pointed out he failed to breed adults for microscopic preparations and the identification merely rested on the external appearance of two living specimens. Undoubtedly the material he had at hand was not *Ps. adonidum*, because according to observations carried out so far, the Linnean species does not occur in central and western Kenya or in Uganda. The specimens collected by James very likely belonged to one of the endemic long-tailed mealy bugs such as *Ps. concavocerarii*, *kikuyuensis* or, more probably, *occiduus*, which seems to be the commonest of the three on coffee in Kenya. The presence of *Ps. adonidum* in East Africa has been verified only in the eastern and coastal districts as well as on the offshore island of Zanzibar, where it does not rank as an economic pest.

The material listed below agrees well with Ferris' (1950) diagram and description.

SOUTH AFRICA : Pretoria, 10.ii.1957, on *Aloe arborescens* Mill. (H. K. Munro), 18.i.1957, on *Phalaenopsis* sp. (G. De Lotto) ; Stellenbosch, 15.viii.1960, on a fern (*J. H. Giliomee*) ; Durban, 15.vi.1961, on *Stangeria paradoxa* Moore (H. D. Brown), 22.v.1961, on *Nerium oleander* L. (D. P. Annecke).

ZANZIBAR : 14.ii.1956, on *Nephelium lappaceum* L., 13.ii.1956, on *Theobroma cacao* L. (R. H. Le Pelley), 27.v.1950, on *Eugenia* sp. (M. J. Way).

### ***Pseudococcus citriculus* Green, 1922**

*Pseudococcus citriculus* Green ; Williams, 1958 : 233.

The identification of the material at hand is based on the redescription of the species published by Ferris (*in* : Zimmerman, 1948). As in *Ps. adonidum* the area of distribution of this species is apparently restricted to the coastal districts and offshore islands, where it has never been recorded as a pest.

KENYA : Mombasa, 24.v.1951, on *Cocos nucifera* L. (R. H. Le Pelley).

ZANZIBAR : 13.ii.1956, on *Citrus* sp. (R. H. Le Pelley).

### ***Pseudococcus concavocerarii* James, 1934**

*Pseudococcus concavocerarii* James, 1934 : 105.

*Pseudococcus concavocerarii* James ; Strickland, 1947 : 505.

*Pseudococcus concavocerarii* James ; De Lotto, 1957 : 192.

UGANDA : Toro, 12.iii.1951, on *Coffea arabica* L. (D. J. McCrae).

***Pseudococcus fragilis* Brain, 1912**

*Pseudococcus fragilis* Brain, 1912 : 186.

*Pseudococcus fragilis* Brain ; Brain, 1915 : 117.

*Pseudococcus fragilis* Brain ; Brain & Kelly, 1917 : 182.

*Pseudococcus gahani* Green ; Joubert, 1928 : 209.

*Pseudococcus fragilis* Brain ; Munro & Fouché, 1936 : 92.

*Pseudococcus gahani* Green ; Munro & Fouché, 1936 : 92.

*Pseudococcus fragilis* Brain ; Essig, 1942 : 351.

*Pseudococcus gahani* Green ; Williams, 1958 : 233.

*Pseudococcus fragilis* Brain ; De Lotto, 1958 : 96.

This mealy bug was originally described from specimens attacking *Citrus* sp. at Constantia, Cape Province, South Africa (Brain, 1912), and later recorded by Joubert (1928) as *P. gahani* from pear at Elsenburg, also in the Cape Province, on material examined by the late Prof. G. F. Ferris. Munro and Fouché (1936) listed *gahani* as living on *Citrus* sp. and *Mesembryanthemum edule* L.

The synonymy of *gahani* with *fragilis* was first published by Essig (1942), on the basis of a communication he received from Joubert, who studied the identity of the two species, and found them structurally identical (De Lotto, 1958).

The species was previously known only from the southern districts of Cape Province. The record listed below from Walvis Bay in South West Africa indicates that the insect is actually much more widely distributed.

SOUTH AFRICA : Hout Bay, 15.x.1956, on *Kalanchoë beharensis* Drake (H. K. Munro) ; Stellenbosch, 15.viii.1960, on *Solanum tuberosum* L. (J. H. Giliomee).

SOUTH WEST AFRICA : Walvis Bay, September 1954, on *Welwitschia mirabilis* Hook. f. (J. J. C. Nel).

***Pseudococcus kikuyuensis* James, 1935**

*Pseudococcus kikuyuensis* James, 1935 : 235.

*Pseudococcus kikuyuensis* James ; De Lotto, 1957 : 194.

ERITREA : Asmara, 5.vii.1947, on *Ficus carica* L. (G. De Lotto).

KENYA : Nairobi, 10.vii.1951, on *Acacia abyssinica* Hochst., 25.v.1952 on *Ficus hochstetteri* A. Rich., 24.ii.1954, on *Aberia caffra* Hook. f. Harv., 2.ix.1951, on *Acokanthera schimperi* (D.C.) Benth., 14.ix.1954, on *Flacourtia indica* L. (G. De Lotto).

TANGANYIKA : Arusha, 20.x.1957, on *Psidium guajava* L. and *Coffea arabica* L. (A. R. Melville), 25.i.1961, on *Phyllanthus discoideus* Mill. Arg. (G. De Lotto).

***Pseudococcus occiduus* De Lotto, 1961**

*Pseudococcus occiduus* De Lotto, 1961 : 225.

UGANDA : Mukono, 20.ii.1962, on *Theobroma cacao* L. (J. Bowden).

**RASTROCOCCUS** Ferris, 1954

*Rastrococcus* Ferris, 1954 : 55.

Type species : *Phenacoccus iceryoides* Green, 1908.

This genus is very likely of oriental origin. In Africa south of the Sahara it is represented by the type species only.

***Rastrococcus iceryoides*** (Green, 1908)

*Dactylopius* (*Pseudococcus*) *obtusus* Newstead, 1911 : 164.

*Phenacoccus obtusus* (Newstead) Lindinger, 1913 : 67.

*Dactylopius* (*Pseudococcus*) *obtusus* Newstead ; Newstead, 1913 : 68.

*Phenacoccus iceryoides* Green ; Green, 1922 : 391.

*Rastrococcus iceryoides* (Green) ; Williams, 1958 : 233.

The material at hand agrees adequately with the redescription published by Ferris (1954). The species is so far known from Zanzibar and eastern areas of Tanganyika.

TANGANYIKA : Morogoro, 15.i.1957, on *Ceiba pentandra* Gaertn. (R. G. Tapley), 15.vi.1959, on *Gossypium* sp. (cotton) (G. R. Cunningham van Someren).

**RHIZOECUS** Künckel d' Herculis, 1878

*Rhizoecus* Künckel d'Herculis, 1878 : 163.

Type species : *Rhizoecus falcifer* Künckel d' Herculis, 1878.

The first extensive study of this and a few related genera, was made by Hambleton (1946), whose views on their characters and composition were later questioned and in part rejected by Ferris (1953).

In this paper Hambleton erected the new genus *Radicoccus* with *Rhizoecus globosus* James, 1935, as the type species, and in it he included *Rhizoecus incrassatus* James, 1935, and a few other non-African species. The characters used by him for the recognition of the genus were based on the absence of the eyes, on the rounded form of the body and on the shape and size of the unguis digitules. As regards the form of the body it should be noted that James's species were described on very old adult specimens, hence their globular appearance. The taxonomic significance of the other features does not warrant the removal of the two African species from *Rhizoecus*.

The generic concept of *Rhizoecus* adopted by Ferris is unquestionably sounder and is here accepted, except that it should be restricted to those species which have tritubular ducts. Thus amended it would include the following species described or recorded from Africa south of the Sahara : *Rhizoecus albus* James, 1935 ; *angustus* James, 1935 ; *falcifer* Künckel, 1878 (of which *africanus* Brain, 1915, is a synonym) ; *globosus* James, 1935 ; *immsi* James, 1935 ; *incrassatus* James, 1935 ; *perprocerus* De Lotto, 1961 ; and *Coccidella spelaea* Strickland, 1947. Of the remaining species originally assigned to *Rhizoecus*, *graminicola* James, 1936, has been transferred to *Ripersiella* on the ground of the presence of bitubular ducts, whilst the generic

position of *geniculatus* James, 1935 (of which *mabokoensis* James, 1935, is a synonym) is at present uncertain.

#### PROVISIONAL KEY TO SPECIES

- |       |  |                    |
|-------|--|--------------------|
| 1     | Circulus lacking . . . . .   | 2                  |
|       | With up to three circuli . . . . .   | 3                  |
| 2 (1) | Anal lobes with up to seven long setae ; antennae 5-segmented ; chitinized cephalic plate present . . . . .                    | <i>falcifer</i>    |
|       | Anal lobes with only three long setae ; antennae 6-segmented ; chitinized cephalic plate absent . . . . .                      | <i>perprocerus</i> |
| 3 (2) | With one circulus only . . . . .   | 4                  |
|       | With two or three circuli . . . . .  | 6                  |
| 4 (3) | Anal lobe cerarii partly or entirely enclosed within a chitinized area . . . . .   | 5                  |
|       | Anal lobe cerarii not enclosed within a chitinized area . . . . .  | <i>angustus</i>    |
| 5 (4) | Multilocular disc pores lacking ; chitinized cephalic plate present . . . . .  | <i>albus</i>       |
|       | Multilocular disc pores occurring on either side of the body ; chitinized cephalic plate lacking . . . . .                     | <i>immsi</i>       |
| 6 (3) | With two circuli . . . . .   | <i>incrassatus</i> |
|       | With three circuli . . . . .   | 7                  |
| 7 (6) | Tubular ducts entirely absent ; either side of the abdomen with the tritubular ducts arranged in longitudinal series . . . . . | <i>globosus</i>    |
|       | Tubular ducts present ; tritubular ducts entirely lacking on the abdomen . . . . .   | <i>spelaeus</i>    |

#### *RIPERSIELLA* Tinsley, 1899

*Ripersiella* Tinsley, in Cockerell, 1899 : 278.

Type species : *Ripersia rumicis* Maskell, 1892.

The redescription of the type species by Morrison & Morrison (1922) offers enough evidence to assume that this is a valid genus. *Ripersiella* differs from the closely allied genus *Rhizoecus* Künckel, 1878, mainly by the total absence in the former of the large tritubular ducts, which are replaced by small bitubular ones. Hambleton (1946) in his paper on hypogeic mealy bugs did not give any taxonomic value to this feature and based his diagnosis of *Ripersiella* on the shape and size of the ungual digitules, presence of the eyes and on the elongate form of the body. He included in it four African species, all originally described by James as *Rhizoecus*. They are : *albus*, *geniculatus*, *graminicola*, and *mabokoensis*. Of these, only *graminicola* James, 1936, is referable to *Ripersiella*, as the genus is here understood. Of the remaining species, *albus* should be retained in *Rhizoecus* on the basis of the presence of the tritubular ducts typical of that genus. The generic status of *geniculatus*, of which *mabokoensis* is a synonym, is at present obscure. In this species the bi- or tritubular ducts are replaced by minute unitubular ones.

#### *SACCHARICOCCUS* Ferris, 1950

*Saccharicoccus* Ferris, 1950 : 216.

Type species : *Dactylopius sacchari* Cockerell, 1895.

This genus was established by Ferris in his revision of the North American species previously described or assigned to *Trionymus* Berg, 1899. Up to present it includes the type species only.

***Saccharicoccus sacchari* (Cockerell, 1895)**

- Pseudococcus sacchari* (Cockerell) ; Brain, 1915 : 127.  
*Pseudococcus sacchari* (Cockerell) ; Brain & Kelly, 1917 : 182.  
*Pseudococcus sacchari* (Cockerell) ; Kirkpatrick, 1927 : 20.  
*Pseudococcus sacchari* (Cockerell) ; Munro & Fouché, 1936 : 93.  
*Trionymus praegrandis* James, 1936 : 200.  
*Trionymus sacchari* (Cockerell) ; Hall, 1937 : 134.  
*Saccharicoccus sacchari* (Cockerell) ; De Lotto, 1957 : 223.  
*Saccharicoccus sacchari* (Cockerell) ; Williams, 1958 : 215.

In Kenya this species seems to be well established in all sugar cane growing areas.

KENYA : Mombasa, 31.viii.1951, on *Saccharum officinarum* L. (R. H. Le Pelley) ; Thika, 11.ix.1951, on *Saccharum officinarum* L. (R. H. Le Pelley) ; Kisumu, 23.iii.1954, on *Saccharum officinarum* L. (T. J. Crowe).

SOUTH AFRICA : Stellenbosch, 15.viii.1960, on *Saccharum officinarum* L. (J. H. Giliomee).

***SPILOCOCCLUS* Ferris, 1950**

*Spilococcus* Ferris, 1950 : 219.

Type species : *Dactylopius gutierreziae* Cockerell, 1896.

Of the six species from Africa south of the Sahara originally assigned by the present writer to the genus *Spilococcus*, only *S. commiphorae* De Lotto, 1961, displays a genuine similarity with the generic characters given by Ferris and should be retained in it.

The remaining species have been referred to other genera, as follows : *Spilococcus diversus* De Lotto, 1961, *S. kajiadoensis* De Lotto, 1961, and *S. limuricus* De Lotto, 1961, to the genus *Paracoccus* Ezzat & McConnell, 1956, on the grounds of having the dorsal oral rim ducts arranged in fairly regular longitudinal series ; *S. pusillus* De Lotto, 1961, in which the dorsal oral rim ducts are also set in longitudinal series, to *Chorizococcus* McKenzie, 1960, on the basis of having the marginal cerarii reduced to ten pairs only ; *S. perforatus* De Lotto, 1954, to the genus *Maconellicoccus* Ezzat, 1958, because, though having the marginal cerarii reduced to 4-6 pairs only, the dorsal oral rim ducts are numerous and distributed without any pattern, and the antennae are nine-segmented.

***TRIDISCUS* Ferris, 1950**

*Tridiscus* Ferris, 1950 : 248.

Type species : *Trionymus distichlii* Ferris, 1918.

Originally Ferris (1950) introduced the genus *Tridiscus* for the inclusion of a single species whose main character is the presence of two supplementary circuli. Later (1953) he assigned to it two more North American species whose structural affinity with the type species is in the writer's opinion somewhat doubtful.

Besides the three species here described as new the genus should include *Ripersia littoralis* described by James in 1936 from Kenya. All have only one supplementary

circulus and live on grasses. It may be open to question whether *T. setariae* is a true representative of *Tridiscus*, as in this species there are some oral rim ducts on the dorsal side of the body which are entirely lacking in the type species.

#### PROVISIONAL KEY TO SPECIES

- |       |  |                      |
|-------|--|----------------------|
| 1     | Oral rim ducts entirely absent . . . . .   | 2                    |
|       | Oral rim ducts always present on the dorsum and occasionally on the ventral marginal area of the thorax . . . . .                      | <i>setariae</i>      |
| 2 (1) | Multilocular disc pores and tubular ducts occurring only on the ventral side of the body . . . . .                                     | <i>biumbelicatus</i> |
|       | Multilocular disc pores and tubular ducts present on either side of the body . . . . .   | 3                    |
| 3 (2) | Marginal cerarii reduced to one pair only on the anal lobe segment ; cerarian spines beset with a few robust auxiliary setae . . . . . | <i>littoralis</i>    |
|       | With two or three pairs of marginal cerarii on the last abdominal segments ; cerarian spines without auxiliary setae . . . . .         | <i>stenosomus</i>    |

### *Tridiscus biumbelicatus* sp. n.

(Plate 23)

Mounted specimens very broadly elliptical, with anal lobes obsolete ; length up to 2.9 mm. Cerarii confined to one pair on the anal lobe segment. Each cerarius is formed of two slender conical spines surrounded by a few trilocular pores ; auxiliary setae absent ; area about the cerarian spines not chitinized. Ventral side of each anal lobe without chitinized bar ; apical seta 131–146 $\mu$  ; subapical one 51–66 $\mu$ . Multilocular disc pores rather numerous on the ventral side of the last five abdominal segments.<sup>13</sup> A few multilocular pores extend in small irregular groups on the submarginal area as far as the thorax. No pores occur on the dorsum. Tubular ducts of the oral collar type of two sizes. Those of the larger size are set in small groups on the ventral marginal and submarginal areas of the abdomen ; a few are intermingled with the groups of multilocular disc pores on the thorax. Tubular ducts of smaller size scattered on the ventral side of the abdomen and thorax, and on the dorsal marginal area of the last four or five abdominal segments. Trilocular pores fairly numerous on either side of the body. Simple disc pores noticeably smaller than the trilocular pores, few and sparse. Anterior and posterior dorsal ostioles poorly developed with lips membranous. Circuli two, both transversely elongate, with surface not chitinized. Dorsal and ventral body setae few, very small and slender. Legs well developed, with a few small translucent pores on the hind coxae ; dimensions of legs (iii) : trochanter plus femur 197–226 $\mu$  ; tibia plus tarsus 197–219 $\mu$ . Anal ring entire, cellular, with six setae measuring 73–88 $\mu$ . Beak 95–109 $\mu$ . Antennae 7-segmented ; total length 263–306 $\mu$ .

Holotype. Adult ♀. SOUTH AFRICA : Pretoria, 28.i.1957, on roots of grass (*G. De Lotto*). Coll. No. 2183.

Paratypes. Four adult ♀. Same data as holotype.

### *Tridiscus setariae* sp. n.

(Plate 24)

Body very elongate, with anal lobes poorly developed ; length up to 2.9 mm. Marginal cerarii reduced to one pair on the anal lobe segment, each of which is built up with two rather slender conical spines surrounded by 5–10 trilocular pores and devoid of auxiliary setae ; area about the cerarian spines not chitinized. Ventral side of each anal lobe without chitinized

<sup>13</sup> The number of pores could not be satisfactorily counted because on the marginal and submarginal areas there was not a clear division between the segmental groups.

bar ; apical seta  $109-131\mu$  ; subapical one  $29-36\mu$ . Multilocular disc pores set in transverse rows on the ventral side of the last abdominal segments. The number of pores on the last five segments, inclusive of those which occasionally occur on the dorsal marginal area, is as follows : (ix plus x)  $67-91$  ; (viii)  $114-155$  ; (vii)  $86-140$  ; (vi)  $61-93$  ; (v)  $28-37$ . A few multilocular pores are scattered along the marginal and submarginal areas of the prosoma as far as the head. Dorsal tubular ducts of the oral rim type, small, very variable in number and distribution ; on the last five abdominal segments anterior to the anal lobe one, the number of ducts is : (viii)  $2-5$  ; (vii)  $1-2$  ; (vi)  $2-5$  ; (v)  $3-6$  ; (iv)  $2-5$ . Two to four ducts occur on the ventral marginal area of the thorax. Ventral tubular ducts of the oral collar type all having the same size, fairly numerous on the venter in association with the multilocular disc pores ; a few are scattered on the marginal area of the prosoma. Trilocular pores not numerous and evenly distributed on either side of the body. Simple disc pores on the ventral side of the abdomen roundish, rather variable in size, at times nearly as large as the multilocular disc pores, with surface slightly granulate ; those occurring on the ventral prosoma and on the dorsum are smaller in size and with the surface plain. Anterior and posterior dorsal ostioles rather inconspicuous with lips membranous. Circuli two, apparently unfoldable ; the posterior circulus is variable in diameter, at times reduced to a minute dot. Dorsal and ventral body setae few, short and slender. Legs short, otherwise normal ; hind legs without translucent pores ; dimensions of legs (iii) : trochanter plus femur  $182-197\mu$  ; tibia plus tarsus  $182-204\mu$ . Anal ring entire, apical, with six setae measuring  $88-95\mu$ . Beak  $67-73\mu$ . Antennae with six or seven segments ; total length  $241-255\mu$ .

Holotype. Adult ♀. KENYA : Nairobi, 15.xi.1953, on leaf sheaths of *Setaria verticillata* Beauv. (*G. De Lotto*). Coll. No. 1505.

Paratypes. Three adult ♀. Same data as holotype.

### *Tridiscus stenosomus* sp. n.

(Plate 25)

Mounted specimens very elongate, with anal lobes poorly developed ; length up to 2.8 mm. Marginal cerarii reduced to two or three pairs on the last abdominal segments. Anal lobe cerarii each formed by two robust conical spines without any grouping of trilocular pores or auxiliary setae ; area about the spines not chitinized. The penultimate and, where present, the antepenultimate cerarii are reduced to one spine only, slightly smaller in size than those of the anal lobe cerarii. Ventral side of each anal lobe without chitinized bar ; apical seta  $131-139\mu$  ; subapical one not differentiate from the remaining ventral body setae. Multilocular disc pores distributed all over the body and particularly numerous on the ventral side of the abdomen. The number of pores on the last three abdominal segments is as follows : (ix plus x)  $88-105$  ; (viii)  $99-106$  ; (vii)  $59-69$ . Tubular ducts of the oral collar type of two sizes. The larger ones are few, set in small groups on the dorsal and ventral marginal areas of the abdominal segments ; others are associated with the multilocular disc pores on the last three abdominal segments ; on the ventral prosoma and all over the dorsum. Tubular ducts of smaller size very few and sparse on the ventral side of the abdominal segments. Trilocular pores entirely missing, except 1 to 5 on each lip of the dorsal ostioles and 3 to 7 close to each of the stigmatic openings. Simple disc pores small, few and sparse on either side of the body. Anterior and posterior dorsal ostioles inconspicuous with lips membranous. Circuli two, both rounded and set close to the distal margin of the (iii) and (iv) abdominal segments. Dorsal and ventral setae few, short and slender. Legs short, otherwise normal ; claws without denticle ; hind coxae with about a dozen of large rounded translucent pores ; dimensions of legs (iii) : trochanter plus femur  $161-168\mu$  ; tibia plus tarsus  $161-175\mu$ . Anal ring entire, cellular, with six setae measuring  $131-146\mu$ . Beak  $58-66\mu$ . Antennae with six segments ; total length  $212-219\mu$ .

Holotype. Adult ♀. KENYA : Nairobi, 16.xii.1955, on *Themeda triandra* Fork. (G. De Lotto). Coll. No. 1897.

Paratype. One adult ♀. Same data as holotype.

### TRIONYMUS Berg, 1899

*Westwoodia* Signoret, 1875 : 337 [non : Brullè, 1846].

*Signoretia* Kraatz, 1888 : 176 [non : Stål, 1859].

*Bergrothia* Kraatz, 1888 : 360 [non : Reitter, 1884].

*Bergrothiella* Reitter, 1898 : 54 [non : Reitter, 1897].

*Trionymus* Berg, 1899 : 78 [nomen novum].

*Bergrothula* Strand, 1928 : 47.

Type species : *Trionymus perrisii* (Signoret, 1875).

This is one of the oldest genera of the coccoid family Pseudococcidae. Several species characterized by a reduction in the number of marginal cerarii and antennal segments have been described or referred to it in the past. The first critical study on the composition of the genus, though restricted to the forms occurring in the northern continent of America, was made by Ferris (1950 and 1953). Later McKenzie (1960) introduced some changes, the most important of which was the removal of all species provided with dorsal oral rim ducts. As a result of his action, the genus *Trionymus* is now reduced to a more natural assemblage of species, the majority of which live on grasses.

Besides the species here described as new, the genus should include *Ripersia themedae* James, 1936, from Uganda ; and *Trionymus inyazurae* Hall, 1937, from Southern Rhodesia.

#### PROVISIONAL KEY TO SPECIES

- |       |   |                               |
|-------|---|-------------------------------|
| 1     | Circulus lacking . . . . .  | 2                             |
|       | Circulus present . . . . .  | 6                             |
| 2 (1) | Multilocular disc pores entirely absent on the dorsal side of the body . . . . .  | <i>rhizophilus</i>            |
|       | Dorsum with some multilocular disc pores . . . . .  | 3                             |
| 3 (2) | Margin of the body with four or five pairs of cerarii on the last abdominal segments . . . . .  | <i>demertor</i>               |
|       | Marginal cerarii reduced to one pair only . . . . .   | 4                             |
| 4 (3) | Anal lobe cerarii enclosed within a chitinized area ; oral collar tubular ducts of three sizes ; hind coxae with a few translucent pores . . . . .      | <i>inyazurae</i>              |
|       | Area about the anal lobe cerarian spines not chitinized ; oral collar ducts of one or two sizes only ; translucent pores on hind legs missing . . . . . | 5                             |
| 5 (4) | Anal lobe cerarii without auxiliary setae . . . . .   | <i>acomus</i>                 |
|       | Anal lobe cerarii with 3 to 5 auxiliary setae . . . . .   | <i>zebedielae</i>             |
| 6 (1) | Margin of the body with 2 or 3 pairs of cerarii . . . . .   | <i>oblongus</i>               |
|       | Cerarii present on the anal lobe segment only . . . . .   | 7                             |
| 7 (6) | Multilocular disc pores on the dorsum present only on the submarginal area of the last abdominal segments ; circulus transversely elongate . . . . .    | <i>themedae</i> <sup>14</sup> |
|       | Multilocular disc pores on the dorsum extending as far as the head ; circulus rounded . . . . .   | 8                             |

<sup>14</sup> In the specimen of the type series available for the redescription of the species (De Lotto, 1957), one of the anal lobe cerarii was ill-formed, being built up with four cerarian spines.

- 8 (7) Multilocular disc pores on the ventral and dorsal side of the prosoma set in small marginal groups ; cerarian spines slender . . . . . *longissimus*  
 Multilocular disc pores distributed all over the ventral and dorsal prosoma ; cerarian spines short and robust . . . . . *prolatus*

*Trionymus acomus* sp. n.

(Plate 26)

Mounted holotype specimen very elongate, with anal lobes poorly developed ; length 2.7 mm. Marginal cerarii reduced to one pair only on the anal lobes. Each cerarius is built up with two small conical spines beset with 7-9 trilocular pores ; auxiliary setae absent ; area about the cerarian spines not chitinized. Ventral side of each anal lobe without chitinized bar ; apical seta 124 $\mu$  ; subapical one not differentiated from the remaining ventral body setae. Multilocular disc pores fairly numerous and distributed all over the dorsum and venter. Tubular ducts of two sizes, both of oral collar type. The larger ones are very few and mostly scattered on the ventral and dorsal marginal areas. Tubular ducts of smaller size set in small groups on the ventral marginal area of the last four abdominal segments ; a few more occur on the midregion of the three abdominal segments anterior to the genital opening. Trilocular pores scarce and sparsely distributed on either side of the body. Simple disc pores apparently missing. Anterior and posterior dorsal ostioles inconspicuous with lips membranous. Circulus lacking. Dorsal and ventral body setae very few, very short and slender. Legs short, otherwise normal ; translucent pores absent ; dimensions of legs (iii) : trochanter plus femur 182 $\mu$  ; tibia plus tarsus 212 $\mu$ . Anal ring entire, cellular, with six setae measuring 102 $\mu$ . Beak 66 $\mu$ . Antennae with seven segments measuring together 248 $\mu$ .

Holotype. Adult ♀. KENYA : Sagana, 15.vi.1956, on roots of *Aristida* sp. (*G. De Lotto*). Coll. No. 2036.

*Trionymus demertor* sp. n.

(Plate 27)

Mounted specimens elongate with anal lobes poorly developed ; length up to 2.4 mm. Margin of the body with four, occasionally five, pairs of cerarii on the last abdominal segments. Anal lobe cerarii each with two conical spines surrounded by 10-15 trilocular pores and one auxiliary seta ; area about the cerarian spines not chitinized. Preanal cerarii each built up with two spines which tend to be progressively more slender anteriorly, and are beset with 3-6 trilocular pores. Ventral side of each anal lobe without chitinized bar ; apical seta 168-175 $\mu$  ; subapical one not differentiate from the remaining ventral setae. Multilocular disc pores numerous and arranged in transverse rows on the ventral side of the last five or six abdominal segments ; a few pores are scattered on the dorsal side of the abdomen. Tubular ducts of oral collar type rather numerous on the ventral side of the abdomen in association with the multilocular disc pores ; a few occur on the dorsal side of the abdomen and on the ventral prosoma. Trilocular pores evenly distributed on either side of the body. Simple disc pores somewhat smaller than the trilocular pores, few and sparse. Anterior and posterior dorsal ostioles rather inconspicuous with lips membranous. Circulus absent. Dorsal and ventral body setae few, short and slender. Legs well developed ; hind coxae with a few translucent pores ; dimensions of legs (iii) : trochanter plus femur 212-255 $\mu$  ; tibia plus tarsus 241-285 $\mu$ . Anal ring entire, cellular, with six setae 73-102 $\mu$ . Beak dimerous 109-117 $\mu$ . Antennae with eight segments measuring together 328-358 $\mu$ .

Holotype. Adult ♀. KENYA : Mombasa, 31.x.1957, on roots of grass (*G. De Lotto*). Coll. No. 2375.

Paratypes. Four adult ♀. Same data as holotype.

***Trionymus longissimus* sp. n.**

(Plate 28)

Mounted specimens very elongate with anal lobes very poorly developed ; length up to 2.9 mm. Marginal cerarii confined to one single pair on the anal lobes ; each cerarius is formed of two slender conical spines beset with a loose group of 3 to 6 trilocular pores ; area about the spines not chitinized ; auxiliary setae missing. Ventral side of each anal lobe without chitinized bar ; apical seta 88–117 $\mu$  ; subapical one not differentiate from the remaining ventral body setae. Multilocular disc pores numerous on the ventral side of the abdomen and extending in irregular groups along the ventral marginal area as far as the head. A few more pores occur on the dorsal marginal area and on the dorsal midregion of some abdominal segments anterior to the anal one. Tubular ducts of the oral collar type of two sizes. The larger ones are set in groups on the dorsal and ventral marginal areas of the last five abdominal segments ; a few are intermingled with the ventral marginal groupings of multilocular disc pores. The ducts of smaller size occur only on the ventral midregion of the abdomen. Trilocular pores not numerous and uniformly distributed on either side of the body. Simple disc pores rather few and scattered on the ventral side of the abdomen only. They are often irregularly rounded and variable in size ; the largest ones may attain the same diameter of the multilocular disc pores ; the surface is slightly granulate. Anterior and posterior dorsal ostioles inconspicuous with lips membranous and devoid of setae. Circulus rounded, apparently unfoldable, with surface membranous. Dorsal body setae few, minute, slender ; ventral ones somewhat longer. Legs short otherwise normal, without translucent pores ; dimensions of legs (iii) : trochanter plus femur 168–190 $\mu$  ; tibia plus tarsus 175–190 $\mu$ . Anal ring apical, with six setae 66–80 $\mu$  long. Beak 66–80 $\mu$ . Antennae short, 7-segmented ; total length 219–255 $\mu$ .

Holotype. Adult ♀. KENYA : Nairobi, 16.xii.1955, on roots of *Themeda triandra* Forsk. (G. De Lotto). Coll. No. 1896.

Paratypes. Three adult ♀. Same data as holotype.

***Trionymus oblongus* sp. n.**

(Plate 29)

Mounted specimens very elongate with anal lobes poorly developed ; length up to 2.2 mm. Margin of the body with two or three pairs of cerarii. Anal lobe cerarii each formed with two short, robust conical spines surrounded by six to ten trilocular pores and one, occasionally two, auxiliary setae ; area about the cerarian spines not chitinized. In one specimen one of the anal lobe cerarii was missing. Penultimate (ii) cerarii each with one or two spines similar to those of the anal lobe cerarii. Antepenultimate (iii) cerarii, where present, usually reduced to one spine only. Ventral side of each anal lobe without chitinized bar ; apical seta rather robust, 160–175 $\mu$  long ; subapical one not differentiated from the surrounding ventral body setae. Multilocular disc pores arranged in transverse rows on the ventral side of the last five abdominal segments. Their number is as follows : (ix plus x) 34–41 ; (viii) 51–78 ; (vii) 55–69 ; (vi) 35–50 ; (v) 6–25. On the segments (viii) to (vi) a few pores are set near the basal margin. Other disc pores are scattered on the ventral prosoma and on the dorsal side of the abdomen. Tubular ducts with oral collar of two sizes. The largest ones slightly project from the integument of the body and superficially they look like those of the oral rim type. Small groups of these pores occur on the ventral marginal area of the abdomen ; a few are associated with the ventral abdominal rows of multilocular disc pores ; on the dorsum they tend to be arranged in irregular transverse segmental rows. Ducts of smaller size very few on the ventral side of the abdomen, mostly intermingled with the multilocular disc pores. Trilocular pores not numerous and evenly distributed on either side of the body. Simple disc pores apparently absent. Anterior dorsal ostioles not recognizable ; posterior ones very poorly developed with lips membranous and devoid of any grouping of trilocular pores or setae.

Circulus "dumbbell" shaped, except in one specimen in which it is rounded; in either instance the surface is membranous. Dorsal setae rather few, short and slender; ventral ones longer. Legs short otherwise normal; hind coxae with a few translucent pores; dimensions of legs (iii): trochanter plus femur  $212-263\mu$ ; tibia plus tarsus  $248-292\mu$ . Anal ring entire, apical, with six setae  $139-168\mu$  long. Beak  $73-80\mu$ . Antennae with seven segments measuring together  $292-328\mu$ .

Holotype. Adult ♀. SOUTH AFRICA: Stellenbosch, no date, on *Cliffortia* sp. (*C. J. Joubert*). Coll. No. 2665.

Paratypes. Two adult ♀. Same data as holotype.

### *Trionymus prolatus* sp. n.

(Plate 30)

Mounted specimens very elongate with anal lobes poorly developed; length up to 2.8 mm. Margin of the body with a single pair of cerarii on the anal lobe segment. Each cerarius is built up with two small conical spines surrounded by 8-12 trilocular pores; area about the spines not chitinized; auxiliary setae missing. Ventral side of each anal lobe without chitinized bar; apical seta  $102-109\mu$ ; subapical one not differentiated from the remaining ventral body setae. Multilocular disc pores rather numerous; some of them are arranged in irregular transverse rows on the ventral side of the last three or four abdominal segments; other pores are scattered on the ventral prosoma and on the dorsum. Tubular ducts of the oral collar type of two sizes. The larger ones are not very numerous and set in small groups on the dorsal and ventral marginal areas as far as the head; a few are associated with the multilocular disc pores on the ventral side of the abdomen. Ducts of smaller size very few, mostly intermingled with the ventral abdominal multilocular disc pores. Trilocular pores fairly numerous and evenly distributed on either side of the body. Simple disc pores smaller than the trilocular pores, with surface plain; few of them occur on the dorsum and venter. Anterior and posterior dorsal ostioles inconspicuous, with lips membranous. Circulus rounded, unfoldable. Dorsal and ventral body setae few, short and slender. Legs small and slender, without translucent pores; dimensions of legs (iii): trochanter plus femur  $175-190\mu$ ; tibia plus tarsus  $197-219\mu$ . Anal ring entire, apical, with six setae  $51-62\mu$  long. Beak  $66-77\mu$ . Antennae 7-segmented, total length  $212-241\mu$ .

Holotype. Adult ♀. KENYA: Nairobi, 31.v.1956, on roots of *Themeda triandra* Forsk. (*G. De Lotto*). Coll. No. 2029.

Paratypes. Two adult ♀. Same data as holotype.

### *Trionymus rhizophilus* sp. n.

(Plate 31)

Mounted specimens elongate elliptical, with anal lobes poorly developed; length up to 2.7 mm. Marginal cerarii reduced to two pairs on the anal and preanal abdominal segments. Anal lobe cerarii each with two conical spines surrounded by 10-14 trilocular pores and one, or occasionally, two auxiliary setae; area about the cerarian spines not chitinized. The preanal cerarii are at times reduced to one spine only; the spines are slightly smaller than those of the anal cerarii and are beset with 5 to 7 trilocular pores. Ventral side of each anal lobe without chitinized bar; apical seta  $146-161\mu$ ; subapical one  $44-58\mu$ . Multilocular disc pores arranged in transverse rows on the ventral side of the last four or five abdominal segments, as follows: (ix plus x) 29-36; (viii) 31-51; (vii) 21-39; (vi) 10-20; (v) 0-2. No multilocular pores occur on the ventral prosoma or on the dorsum. Tubular ducts of three sizes, all of the oral collar type. The largest ones are very few and are set in groups of 1 to 4 on the dorsal marginal

area of the last three abdominal segments and on the head ; the medium-sized ducts are numerous and set in groups on the dorsal marginal area of the abdominal segments. The smallest ducts are somewhat variable in size, at times being very slender ; they are distributed on the ventral marginal area of the abdomen and intermingled with the multilocular disc pores ; a few are scattered on the ventral prosoma. Trilocular pores not numerous and uniformly distributed on either side of the body. Simple disc pores smaller than the trilocular pores, few and scattered. Anterior and posterior dorsal ostioles rather inconspicuous, with lips membranous. Circulus absent. Dorsal setae few, short and slender ; ventral ones more numerous, somewhat longer. Legs well developed, without translucent pores ; dimensions of legs (iii) : trochanter plus femur 234–256 $\mu$  ; tibia plus tarsus 248–285 $\mu$ . Anal ring apical, cellular, with six setae 44–66 $\mu$  long. Beak 88–95 $\mu$ . Antennae with eight segments measuring together 292–336 $\mu$ .

Holotype. Adult ♀. KENYA : Nairobi, 15.xii.1955, on roots of *Panicum maximum* Jacq. (G. De Lotto). Coll. No. 1902.

Paratypes. Eight adult ♀. Same data as holotype.

### *Trionymus zebedielae* sp. n.

(Plate 32)

Mounted specimens rather broadly elliptical with anal lobes very poorly developed ; length up to 2.9 mm. Marginal body cerarii reduced to one pair on the anal lobe segment. Each cerarius is formed of two conical spines beset with 25–30 trilocular pores and three to five slender auxiliary setae ; area about the cerarian spines not chitinized. Ventral side of each anal lobe without chitinized bar ; apical seta 124–139 $\mu$  ; subapical one not differentiated from the remaining ventral body setae. Multilocular disc pores rather numerous all over the venter ; a few occur on the dorsal side of the abdomen. On the ventral abdominal segments anterior to the genital opening the pores tend to be arranged in irregular transverse rows near the basal margin of the segment involved. Tubular ducts of the oral collar type of two sizes, both numerous on either side of the body. Trilocular pores fairly numerous and evenly distributed. Simple disc pores noticeably smaller than the trilocular pores, not numerous and sparse. Anterior and posterior dorsal ostioles inconspicuous with lips membranous. Circulus absent. Dorsal and ventral body setae very few, short and slender. Legs rather stout, otherwise normal ; translucent pores lacking ; dimensions of legs (iii) : trochanter plus femur 204–219 $\mu$  ; tibia plus tarsus 197–212 $\mu$ . Anal ring entire, apical, with six setae measuring 66–80 $\mu$ . Beak 109–124 $\mu$ . Antennae normally with 8 segments, except in two specimens in which one of the antennae is reduced to 7 segments only ; total length 233–255 $\mu$ .

Holotype. Adult ♀. SOUTH AFRICA : Zebediela, 5.ii.1957, on roots of grass (G. De Lotto). Coll. No. 2191.

Paratypes. Five adult ♀. Same data as holotype.

#### LOCATION OF TYPE SERIES

The holotype and paratype specimens of the new species dealt with in this paper have been deposited as follows :

		Type series	B.M.*	U.S.A.	S.A.	E.S.	S.A.L.
<i>Cataenococcus markhamiae</i>	. . . .	4	2	1	—	—	1
<i>Cryptoripersia corpulenta</i>	. . . .	1	1	—	—	—	—
<i>Eastia jouberti</i>	. . . .	7	2	1	—	4	—
<i>Lenania prisca</i>	. . . .	2	1	—	—	1	—
<i>Londiania obesa</i>	. . . .	2	1	1	—	—	—
<i>Nairobi bifrons</i>	. . . .	16	10	4	—	—	2

			Type series	B.M.*	U.S.A.	S.A.	E.S.	S.A.L.
<i>Paracoccus busiaensis</i>	.	.	3	2	I	—	—	—
<i>mutabilis</i>	.	.	5	2	I	—	2	—
<i>pinguis</i>	.	.	3	2	I	—	—	—
<i>tectus</i>	.	.	3	2	I	—	—	—
<i>trichinus</i>	.	.	5	3	I	—	—	I
<i>Paraputo barbatus</i>	.	.	3	2	I	—	—	—
<i>Peliococcus orophilus</i>	.	.	8	5	2	—	—	I
<i>Phenacoccus cotyledonis</i>	.	.	5	2	I	I	—	I
<i>distinctus</i>	.	.	1	I	—	—	—	—
<i>orcinus</i>	.	.	5	2	I	—	2	—
<i>pauculus</i>	.	.	2	I	I	—	—	—
<i>Planococcus aemulor</i>	.	.	10	5	3	—	—	2
<i>epulus</i>	.	.	1	I	—	—	—	—
<i>subterraneus</i>	.	.	1	I	—	—	—	—
<i>Tridiscus biumbelicatus</i>	.	.	5	2	I	I	—	I
<i>setariae</i>	.	.	4	2	I	—	—	I
<i>stenosomus</i>	.	.	2	I	I	—	—	—
<i>Trionymus acomus</i>	.	.	1	I	—	—	—	—
<i>demertor</i>	.	.	5	3	I	—	—	I
<i>longissimus</i>	.	.	4	2	I	—	—	I
<i>oblongus</i>	.	.	3	I	I	—	I	—
<i>prolatus</i>	.	.	3	2	I	—	—	—
<i>rhizophilus</i>	.	.	9	5	3	—	—	I
<i>zebedielae</i>	.	.	6	3	I	I	—	I

\*B.M. = British Museum (Natural History), London. Inclusive of the holotype.

U.S.A. = U.S. National Collection, Washington, D.C.

S.A. = South African National Collection of Insects, Pretoria.

E.S. = Elsenburg-Stellenbosch Agricultural College, Stellenbosch, South Africa.

S.A.L. = Scott Agricultural Laboratories, Nairobi, Kenya.

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## REFERENCES

- AMYOT, C. J. B. 1847. Entomologie française. *Ann. Soc. ent. France*, (2), **5** : 453-506.
- BALACHOWSKY, A. 1936. Sur deux remarquables Pseudococcinae découverts dans le Sahara marocain par Ch. Rungs. *Bull. Soc. ent. France*, **41** : 157-165.
- 1953. Sur un *Dysmicoccus* nouveau (Hom. Coccoidea-Pseudococcini) nuisible au *Casuarina* en A.O.F. *Bull. Inst. franç. Afr. noire*, **15** : 1046-1050.
- 1954. Sur l'indigénat et le statut de *Catenococcus loranthei* Strickl. (Coccoidea-Pseudococcini) en Afrique occidentale. *Rev. Path. vég.*, **33** : 247-250.
- BERG, C., 1899. Substitucion de nombres genericos, iii. *Comun. Mus. nac. B. Aires*, **1** : 77-80 [not seen].
- BETREM, J. G. 1936. De oecologie en epidemiologie van de witte luize. *Arch. Koffiecult. Ned.-Ind.* **10** : 85-186.
- 1937. De morphologie en systematiek van enkele van de voornaamste witte-luizensoorten van Java. *Arch. Koffiecult. Ned.-Ind.* **11** : 1-118.
- BORCHSENIUS, N. S. 1947. Two new genera of mealy bugs and a new species of scale insect (Homoptera : Coccoidea) from Armenia. *Trud. armyansk. Fil. Akad. Nauk S.S.S.R.* **7** : 141-143 [not seen]. [In Russian.]
- 1948. Contribution to the revision of the genus *Phenacoccus* Ckll. (Insecta : Homoptera : Coccoidea). *C.R. Acad. Sci. U.R.S.S. (N.S.)* **61** : 953-956 [in Russian].
- BRAIN, C. K. 1912. Contribution to the knowledge of mealy bugs, genus *Pseudococcus*, in the vicinity of Cape Town, South Africa. *Ann. ent. Soc. Amer.* **5** : 177-189.
- 1915. The Coccidae of South Africa, i. *Trans. roy. Soc. S. Afr.* **5** : 65-194.
- 1918. The Coccidae of South Africa, ii. *Bull. ent. Res.* **9** : 107-139.
- 1924. Host plant index of South African scale insects (Coccidae) with a list of species found on each plant recorded. *Ann. Univ. Stellenbosch* **1** (sect. A, No. 2) : 1-44.
- BRAIN, C. K. & KELLY, A. E. 1917. The status of introduced coccids in South Africa in 1917. *Bull. ent. Res.* **8** : 181-185.
- COCKERELL, T. D. A. 1893. Note on the genus *Pseudococcus* Westwood. *Ent. News* **4** : 317-318.
- 1894. A check-list of African Coccidae. *Psyche* **7** : 178.
- 1899. Tables for the determination of the genera of Coccidae. *Canad. Ent.* **31** : 273-279.
- 1901. South African Coccidae, i. *Entomologist* **34** : 223-227.
- 1902. South African Coccidae, ii. *Entomologist* **35** : 111-114.
- COLIZZA, C. 1933. Contributo alla conoscenza delle cocciniglie del Mozambico (Hemipt. Coccidae). *Boll. Soc. ent. ital.* **65** : 174-178.
- 1934. Contributo alla conoscenza delle cocciniglie del Mozambico (Hemipt. Coccidae). *Boll. Soc. ent. ital.* **66** : 237-242.
- COSTA, O. G. 1828. Prospetto di una nuova divisione metodica del genere *Coccus* Lin. Fabr., Latr., Lamark. *Pontano* **1** : 449-454.  
[Reprinted with separate pagination].
- CURTIS, J. 1843. The black turtle-scale. *Coccus testudo* (Curtis). *Gdnrs'. Chron.* 443-444.
- DE LOTTO, G. 1954. Three apparently new mealy bugs from Kenya. *Proc. R. ent. Soc. Lond. (B)* **23** : 110-114.
- 1955. Three new coccids (Hemipt. : Coccoidea) attacking coffee in East Africa. *Bull. ent. Res.* **46** : 267-273.
- 1957. The Pseudococcidae (Hom. : Coccoidea) described by H. C. James from East Africa. *Bull. Brit. Mus. (Nat. Hist.) Ent.* **5** : 183-232.
- 1958. The Pseudococcidae (Hom. : Coccoidea) described by C. K. Brain from South Africa. *Bull. Brit. Mus. (Nat. Hist.) Ent.* **7** : 77-120.
- 1961. New Pseudococcidae (Homoptera : Coccoidea) from Africa. *Bull. Brit. Mus. (Nat. Hist.) Ent.* **10** : 209-238.
- DE SEABRA, A. F. 1922. Insectes de S. Thomé provenant de la mission d'étude du Professeur Sousa da Camera en 1920. *Mem. Mus. zool. Univ. Coimbra* **21** : 1-16.

- DE SEABRA, A. F. & VAYSSIÈRE, P. 1918. Les coccides de l'île de San Thomé (Hem.). *Bull. Soc. ent. France* **10** : 162-164.
- EHRHORN, E. M. 1899. Five new Coccidae. *Canad. Ent.* **31** : 5-7.
- ESSIG, E. O. 1942. College Entomology. vii+900 pp. Macmillan Co., New York.
- EZZAT, Y. M. 1958. *Maconellicoccus hirsutus* (Green), a new genus, with redescription of the species (Homoptera : Pseudococcidae-Coccoidea). *Bull. Soc. ent. Egypte* **42** : 377-383.
- EZZAT, Y. M. & MCCONNELL, H. S. 1956. A classification of the mealy bug tribe Planococcini (Pseudococcidae : Homoptera). *Bull. Md agric. Exp. Sta.* **A84** : 108 pp.
- FERNALD, M. E., 1903. Notes on the Coccidae. *Canad. Ent.* **35** : 22.
- 1903a. A catalogue of the Coccidae of the world. *Bull. Mass. agric. Exp. Sta.* **88** : 360 pp.
- FERRIS, G. F. 1950. *Atlas of the scale insects of North America*. **5** : vii+278 pp. Stanford Univ. Press, Stanford (California).
- 1953. *Atlas of the scale insects of North America*. **6** : vii+279-506 pp. Stanford Univ. Press, Stanford (California).
- 1954. Report upon scale insects collected in China (Homoptera : Coccoidea), v. *Microentomology*, **19** : 51-66.
- 1955. On some genera of the Pseudococcidae (Homoptera : Coccoidea). *Microentomology* **20** : 1-19.
- 1957. A brief history of the study of the Coccoidea. *Microentomology* **22** : 39-57.
- FULLAWAY, D. T. 1923. Notes on the mealy-bugs of economic importance in Hawaii. *Proc. Hawaii. ent. Soc.* **5** : 305-321 [not seen].
- GHSQUIÈRE, J. 1927. Note sur les coccides parasites des agrumes au Congo belge. *Rev. zool. afr.* **14** : 310-316.
- GOWDEY, C. C. 1914. A list of Uganda Coccidae and their food-plants. *Bull. ent. Res.* **4** : 247-249.
- 1917. A list of Uganda Coccidae, their food-plants and natural enemies. *Bull. ent. Res.* **8** : 187-189.
- GREEN, E. E. 1902. Three new genera of Coccidae from Ceylon. *Ent. mon. Mag.* **38** : 260-263.
- 1916. Report on some Coccidae from Zanzibar, collected by Dr. W. M. Aders. *Bull. ent. Res.* **6** : 375-376.
- 1922. *The Coccidae of Ceylon*, **5** : 345-472, Dulau & Co., London.
- 1924. On some new species of Coccidae from various sources. *Bull. ent. Res.* **15** : 41-48.
- HALL, W. J. 1937. Observations on the Coccidae of Southern Rhodesia, viii. *Trans. R. ent. Soc. Lond.* **86** : 119-134.
- 1939. A new genus and four apparently new species of Coccidae (Homoptera) from the Union of South Africa. *J. ent. Soc. S. Afr.* **2** : 93-100.
- 1943. Notes on some Coccidae (Homoptera) from Southern Rhodesia, with descriptions of two new species. *J. ent. Soc. S. Afr.* **6** : 1-6.
- 1945. The identity of a mealybug vector of "swollen shoot" virus disease of cacao in West Africa. *Bull. ent. Res.* **36** : 305-313.
- HAMBLETON, E. J. 1946. Studies of hypogeic mealybugs. *Rev. Ent., Rio de J.* **17** : 1-77.
- 1946a. A new name for a mealybug. *Proc. biol. Soc. Wash.* **59** : 177.
- JAMES, H. C. 1932. Coffee mealy bug research. *Bull. Dep. Agric. Kenya* **18** : 18 pp.
- 1933. Taxonomic notes on the coffee mealybugs of Kenya Colony. *Bull. ent. Res.* **24** : 429-436.
- 1934. A new mealybug (Coccidae) from coffee in East Africa. *Stylops* **3** : 105-107.
- 1934a. A new species of Coccidae (Hem.) from Kenya. *Stylops*, **3** : 270-272.
- 1935. New hypogeic mealybugs (Coccidae) from East Africa. *Bull. ent. Res.* **26** : 379-390.
- 1935a. New Coccidae (Hem.) from Kenya. *Stylops* **4** : 233-237.
- 1936. New mealybugs from East Africa. *Trans. R. ent. Soc. Lond.* **85** : 197-216.

- JOUBERT, C. J. 1928. *Pseudococcus gahani* Green, in South Africa. *Bull. ent. Res.* **19** : 209.
- KIRKPATRICK, T. W., 1927. The common coffee mealybug (*Pseudococcus lilacinus* Ckll.) in Kenya Colony. *Bull. Dep. Agric. Kenya*, **18**, 110 pp.
- KRAATZ, G. 1888. *Signoretia* Kraatz statt *Westwoodia* Sign. *Dtsch. ent. Z.* **32** : 176.
- 1888a. Synonymische Bemerkung. *Dtsch. ent. Z.* **32** : 360.
- KÜNCKEL d' HERCULAIS, J. 1878. Histoire de la cochenille vivant sur les racines des palmiers de la section des *Seaforthia*. *Ann. Soc. ent. France*, (5) **8** : 161-164.
- LAING, F. 1925. Descriptions of some new genera and species of Coccidae. *Bull. ent. Res.* **16** : 51-66.
- 1928. A list of the Coccidae of San Thomé, *Entomologist* **61** : 214-215.
- 1929. Descriptions of new, and some notes on old, species of Coccidae. *Ann. Mag. nat. Hist.* (10) **4** : 465-501.
- 1944. A new injurious mealy-bug from the Gold Coast. *Bull. ent. Res.* **35** : 91-93.
- LE PELLEY, R. H. 1935. The common coffee mealy-bug of Kenya (Hem. Coccidae). *Stylops* **4** : 185-188.
- LINDINGER, L. 1913, Afrikanische Schildläuse, v. *Jb. hamburg. wiss. Anst.* **30** : (3) : 59-95.
- 1913a. Einige Cocciden aus dem ausserdeutschen Ostafrika. *Jb. hamburg. wiss. Anst.* **30** (3) : 96-100.
- MACFIE, J. W. S. 1913. On a new African species of Coccidae. *Bull. ent. Res.* **4** : 31-34.
- MAGNIN, J. 1955. Description d' un nouveau Pseudococcidae de Côte d' Ivoire. *Agron. trop.*, *Nogent*. **10** : 238-240.
- MANN, W. M. 1922. Notes on a collection of West African myrmecophiles. *Bull. Amer. Mus. nat. Hist.* **45** : 623-630.
- MASKELL, W. M. 1892. Further coccid notes, with descriptions of new species and remarks on coccids from New Zealand, Australia and elsewhere. *Trans. Proc. N.Z. Inst.* **24** (1891) : 1-64.
- 1898. Further coccid notes with descriptions of new species, and discussion of points of interest. *Trans. Proc. N.Z. Inst.* **30** (1897) : 219-252.
- McKENZIE, H. L. 1960. Taxonomic study of California mealybugs with descriptions of new species (Homoptera : Coccoidea : Pseudococcidae). *Hilgardia*, **29** : 681-770.
- 1961. Second taxonomic study of California mealybugs with descriptions of new species (Homoptera : Coccoidea : Pseudococcidae). *Hilgardia* **31** : 15-52.
- MORRISON, H. 1945. The mealybug genus *Heterococcus* Ferris and some of its relatives (Homoptera : Coccoidea). *J. Wash. Acad. Sci.* **35** : 38-55.
- MORRISON, H. & MORRISON, E. 1922. A redescription of the type species of the genera of Coccidae based on species originally described by Maskell. *Proc. U.S. nat. Mus.* **60** (12) : 1-120.
- MUNRO, H. K. & FOUCHÉ, F. A. 1936. A list of the scale insects and mealybugs (Coccidae) and their host-plants in South Africa. *Bull. Dep. Agric. S. Afr.* **158** : 104 pp.
- NEWSTEAD, R. 1911. On a collection of Coccidae and Aleurodidae, chiefly African, in the collection of the Berlin Zoological Museum. *Mitt. zool. Mus. Berl.* **5** : 155-174.
- 1912. On a collection of African Coccidae collected by Prof. Dr. L. Schultze in South and South West Africa. (Zool. anthrop. Ergeb. Forsch. West. Zent. Süd afrika, 5 (1)) *Denkschr. med.-naturw. Ges. Jena* **13** : 15-20.
- 1913. Notes on scale-insects (Coccidae), i. *Bull. ent. Res.* **4** : 67-81.
- 1914. Notes on scale-insects (Coccidae), ii. *Bull. ent. Res.* **4** : 301-311.
- 1914a. Homoptera (Psyllidae and Coccidae) collected in the Lagos District by W. A. Lamborn. *Trans. R. ent. Soc. Lond.* **1913** : 520-524.
- 1917. Observations on scale-insects (Coccidae), v. *Bull. ent. Res.* **8** : 125-134.
- 1920. Observations on scale-insects (Coccidae), vi. *Bull. ent. Res.* **10** : 175-207.
- REITTER, E. 1898. Coleopterologische Notizen, lxiii. *Wien. ent. Ztg.* **17** : 54-56 [not seen].
- SIGNORET, V. 1875, Essai sur les cochenilles ou gallinsectes (Homoptères-Coccides), xv. *Ann. Soc. ent. France*, (5) **5**, 305-345.

- SILVESTRI, F. 1915. Contributo alla conoscenza degli insetti dell' olivo dell' Eritrea e dell' Africa meridionale. *Boll. Lab. Zool. Portici*, **9** : 240-334.
- SJÖSTEDT, Y. 1908. *Wissenschaftliche Ergebnisse der schwedischen zoologischen Expedition nach dem Kilimandjaro, dem Meru und dem umgebenden Massaisteppen Deutsch-Ostafrikas 1905 bis 1906*, **2** (12) : 1-10.
- STRAND, E. 1926. Miscellanea nomenclatorica zoologica et palaeontologica. *Arch. Naturgesch.* **92** : 30-75 [not seen].
- STRICKLAND, A. H. 1947. Three new species of Coccoidea (Hemiptera : Homoptera) from the Gold Coast, British West Africa. *Proc. R. ent. Soc. Lond. (B)* **16** : 149-156.
- 1947a. Coccids attacking cacao (*Theobroma cacao* L.) in West Africa, with descriptions of five new species. *Bull. ent. Res.* **38** : 497-523.
- TAKAHASHI, R. 1929. Aphididae and Coccidae of the Pescadores. *Trans. nat. Hist. Soc. Formosa* **19** : 425-431 [not seen].
- VAYSSIÈRE, P. 1912. Deux coccides nouveaux de l' Afrique occidentale (Hem.). *Bull. Soc. ent. France* **17** : 366-368.
- 1913. Note sur les coccides de l' Afrique occidentale. *Ann. Épiphyt.* **1** : 424-432.
- WESTWOOD, J. O. 1840. *An introduction to the modern classification of insects*. **2** : 587 pp. Longman & Co., London.
- WILLIAMS, D. J. 1958. The mealybugs (Pseudococcidae-Homoptera) described by W. M. Maskell, R. Newstead, T. D. A. Cockerell and E. E. Green from the Ethiopian Region. *Bull. Brit. Mus. (Nat. Hist.) Ent.* **6** : 203-236.
- 1958a. The mealybugs (Pseudococcidae : Homoptera) described by W. J. Hall, F. Laing and A. H. Strickland from the Ethiopian Region. *Bull. Brit. Mus. (Nat. Hist.) Ent.* **7** : 1-37.
- 1960. The Pseudococcidae (Coccoidea : Homoptera) of the Solomon Islands. *Bull. Brit. Mus. (Nat. Hist.) Ent.* **8** : 385-430.
- 1961. Notes on the genus *Heterococcus* Ferris (Coccoidea : Homoptera) with a description of a new species injurious to guineacorn (*Sorghum vulgare*) in Nigeria. *Bull. ent. Res.* **51** : 671-675.
- 1962. The British Pseudococcidae (Homoptera : Coccoidea). *Bull. Brit. Mus. (Nat. Hist.) Ent.* **12** : 1-79.
- ZIMMERMAN, E. C. 1948. *Insects of Hawaii*. **5** : 464 pp. Univ. Hawaii Press, Honolulu.

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