



Taxonomy of *Toumeyella lomagundiae* Hall and *T. obunca* De Lotto, and their transfer to *Hallicoccus* gen. nov. (Hemiptera: Coccoidea: Coccidae)

TAKUMASA KONDO

Department of Entomology, University of California, 1 Shields Avenue, Davis, California 95616-8584, U.S.A.
E-mail: tkondo@ucdavis.edu

Abstract

Two African soft scale insects, *Toumeyella lomagundiae* Hall and *T. obunca* De Lotto, are transferred to *Hallicoccus* gen. nov. The adult females of both species are redescribed, and the first-instar nymph of *T. lomagundiae* is described. A revised taxonomic key to separate the adult females is provided. The affinity of *Hallicoccus* gen. nov. with the genus *Toumeyella* Cockerell is briefly discussed.

Key words: Africa, Coccidae, keys, new genus scale insect, taxonomy

Résumé

Deux espèces des cochenilles africains, *Toumeyella lomagundiae* Hall et *T. obunca* De Lotto sont transférés au nouveau genre *Hallicoccus* gen. nov. Les femelles adultes des les deux espèces et la larve du premier stade des *T. lomagundiae* sont redécrites (ou décrites) et illustrées. Une clé dichotomique est proposée pour les femelles. L'affinité du genre *Hallicoccus* dans du genre *Toumeyella* Cockerell, est discutée.

Introduction

The genus *Toumeyella* Cockerell, 1895, currently contains 18 species (Ben-Dov *et al* 2006), of which 16 occur in the New World and 2 in Africa. Kondo & Williams (2002) indicated that the African species are not congeneric with the type species, *T. mirabilis* (Cockerell), based on a morphological study of the adult females and first-instar nymphs.

Toumeyella is well represented in the Nearctic Region (North America and northern Mexico) with 12 described species, but it is also known from the Neotropical region, with 2 species described from Brazil and 1 species from Cuba (Ben-Dov *et al*, 2006; Heidel and Köhler, 1979; Hempel 1929, 1932; Kondo & Williams, 2002, 2003, 2004). Hall (1935), when describing *T. lomagundiae*, commented as follows: “It [*T. lomagundiae*] has very distinctive characteristics and appears to be referable to the genus *Toumeyella*, Ckll., where it has been placed provisionally”, suggesting that the species might not be congeneric with the New World *Toumeyella*. Later, De Lotto (1966) added a second African species, *T. obunca*, recognizing its close affinities with *T. lomagundiae*, and stated that it was uncertain whether the two African species were actually congeneric with the type of *Toumeyella*, *Lecanium mirabile* Cockerell. As noted by De Lotto (1966), the two African species are closely related to each other, but have little in common with the New World species; thus a new genus *Hallicoccus* is erected here to accommodate them.

Material and methods

Specimens were slide-mounted using the method discussed by Kosztarab (1996). The terms for morphological features of the adult female follows mostly that of Hodgson (1994), and for the first-instar nymph that of Kondo (2006). Measurements of specimens were made using an ocular micrometer on an Olympus phase-contrast microscope. The illustrations of the coccids follow the conventional style used for the Coccoidea, with the dorsal surface of the body depicted on the left side of the drawing and the ventral surface on the right, and with enlargements of important features arranged around the illustration. The total number of specimens used for each description is given in parentheses, e.g. (n=35). In the material studied, the number of slides and specimens on each slide are recorded as the number of slides followed by the total number of specimens and their corresponding stages; for example, 1 slide with 1 second-instar female and 1 adult male specimen would be: 1(2: 1 second-instar female + 1 adult male). The stage is not recorded when all specimens are adult females. The two species are here redescribed and illustrated adding previously unreported morphological features, i.e., preopercular pores (in *H. obunca*) and ventral tubular ducts (in *H. lomagundiae*). Although Hodgson (1969) provided morphological features to separate the two species, a key is given here which incorporates the new features given above.

Depositories

AUCC	Auburn University Coccoidea Collection, Alabama, U.S.A.
BMNH	The Natural History Museum, London, U.K.
SANC:	South African National Collection of Insects, Pretoria, South Africa

Results

Taxonomy

The taxonomic position of *Hallicoccus* remains uncertain. It shares many features with the Eulecaniinae, Coccinae and Myzolecaniinae as defined by Hodgson (1994). *Hallicoccus lomagundiae* and *H. obunca* are clearly closely related. In the keys of Hodgson (1994) to subfamilies, tribes and type species of genera of Coccidae, *H. lomagundiae* keys out to the subfamily Coccinae, tribe Coccini, because of the presence of dorsal tubercles. However, *H. obunca* lacks dorsal tubercles and keys out to the subfamily Myzolecaniinae. Besides the reduction of limbs, *Hallicoccus* appears to have little in common with *Myzolecanium kibarae* Beccari, the type species of the Myzolecaniinae. Kondo & Williams (2002) suggested that the Myzolecaniinae is composed of several unrelated lineages, and that the morphology of first-instar nymphs indicates that many genera currently included in the Myzolecaniinae, including *H. lomagundiae* (as *Toumeyella lomagundiae*) are not closely related to the Myzolecanium-group, which group is composed of *Cribrolecanium* Green, *Cryptostima* Ferris, *Halococcus* Takahashi, *Houardia* Marchal and *Myzolecanium* Beccari. *Hallicoccus* shares some features with the Eulecaniinae, particularly to *Ericeroides* Danzig to which it shares the presence of numerous stigmatic spines (although these do not extend onto the dorsal submargin as in *Hallicoccus*) and a discal seta on each anal plate. It also shares many features with *Saissetia coffeae* (Walker) [Coccinae: Saissetiini], the type species of the genus *Saissetia*, particularly a characteristic H-shape ridge on the dorsum, dorsal submarginal tubercles (absent in *H. obunca*), and a discal seta on each anal plate.

Further studies using other growth stages, adult males, and molecular data should elucidate the phylogenetic relationships of *Hallicoccus* in the future.

Hallicoccus Kondo, new genus

Type species: *Toumeyella lomagundiae* Hall, 1935, by present designation.

Generic diagnosis.

Adult female.

Unmounted material. Body of adult female convex. Living insects with an H-shaped ridge on dorsum somewhat similar to that found on many members of the genus *Saissetia* Déplanche.

Slide-mounted material.

Dorsum: derm with well-developed areolations. Anal plates each with 4 apical setae. A narrow sclerotized crescent around anal plates present. Anal ring with 6 or 8 setae. Submarginal dorsal tubercles and preopercular pores present or absent. Dorsal setae sharply spinose, stout, with straight and pointed tips. Dorsal microducts heavily sclerotized, with a single central opening. Dorsal simple pores present, small. Eyespots not detected.

Margin: Marginal setae similar to dorsal setae. Stigmatic spines present submarginally on dorsum, totaling 3–16 in each group; each stigmatic area with usually more than 6 spines of various sizes.

Venter: Antennae small, 5 or 6 segmented. Mouthparts typical of the family; labium 1 segmented, with 8 labial setae. Legs greatly reduced, with all segments fused into one segment plus claw, or reduced to a minute sclerotized plate with a few associated setae. Spiracles relatively small. Ventral tubular ducts present on area between anterior and posterior spiracles. Ventral setae all slender or slender medially and sharply spinose submarginally and submedially; prevulvar setae similar to other ventral setae or only slightly longer. Spiracular disc-pores with 5–12 loculi, mostly with 5 loculi. Pregenital disc-pores each with 6–12 (mostly 10) loculi, present around vulva and extending medially on all median areas of abdomen and thorax. Ventral microducts scattered evenly on venter or most abundant submarginally and around mouthparts.

Etymology. The new genus *Hallicoccus* is named after the late Dr. Wilfrid John Hall (who collected and described the type species *Toumeyella lomagundiae*), and comprises the surname plus “*coccus*”, the latinized version of the Greek word “*kokkos*”, meaning a small grain or seed, an ending commonly used to describe scale insects.

Key to species of *Hallicoccus* gen. nov. based on adult females

1. Submarginal dorsal tubercles present; preopercular pores absent; most stigmatic spines bulbous.....
..... *Hallicoccus lomagundiae* (Hall), **comb. nov.**
- Submarginal dorsal tubercles absent; small preopercular pores present; all stigmatic spines sharply spinose.....
..... *Hallicoccus obunca* (De Lotto), **comb. nov.**

***Hallicoccus lomagundiae* (Hall), comb. nov.**

(Fig. 1 & 2)

Toumeyella lomagundiae Hall, 1935: 81; De Lotto 1966: 149; Hodgson 1969: 36; Ben-Dov 1993: 330.

Material studied.

Holotype. ZIMBABWE, 1 (1): Sinoia, coll., 15.xii.1927, ex *Bauhinia macrantha*, (det. date: 11.vii.1934), det. W.J. Hall, No. 1770 (BMNH).

Paratypes. ZIMBABWE, 1 (2): Same data as Holotype (BMNH); ZIMBABWE, 1 (4): Same data as Holotype, except No. 185 (Note: not labelled as Paratypes but with same data as Holotype) (BMNH); ZIMBABWE, 28 (28): Same data as Holotype, except AL-141-98 (mounted from BMNH dry Type material) (BMNH).

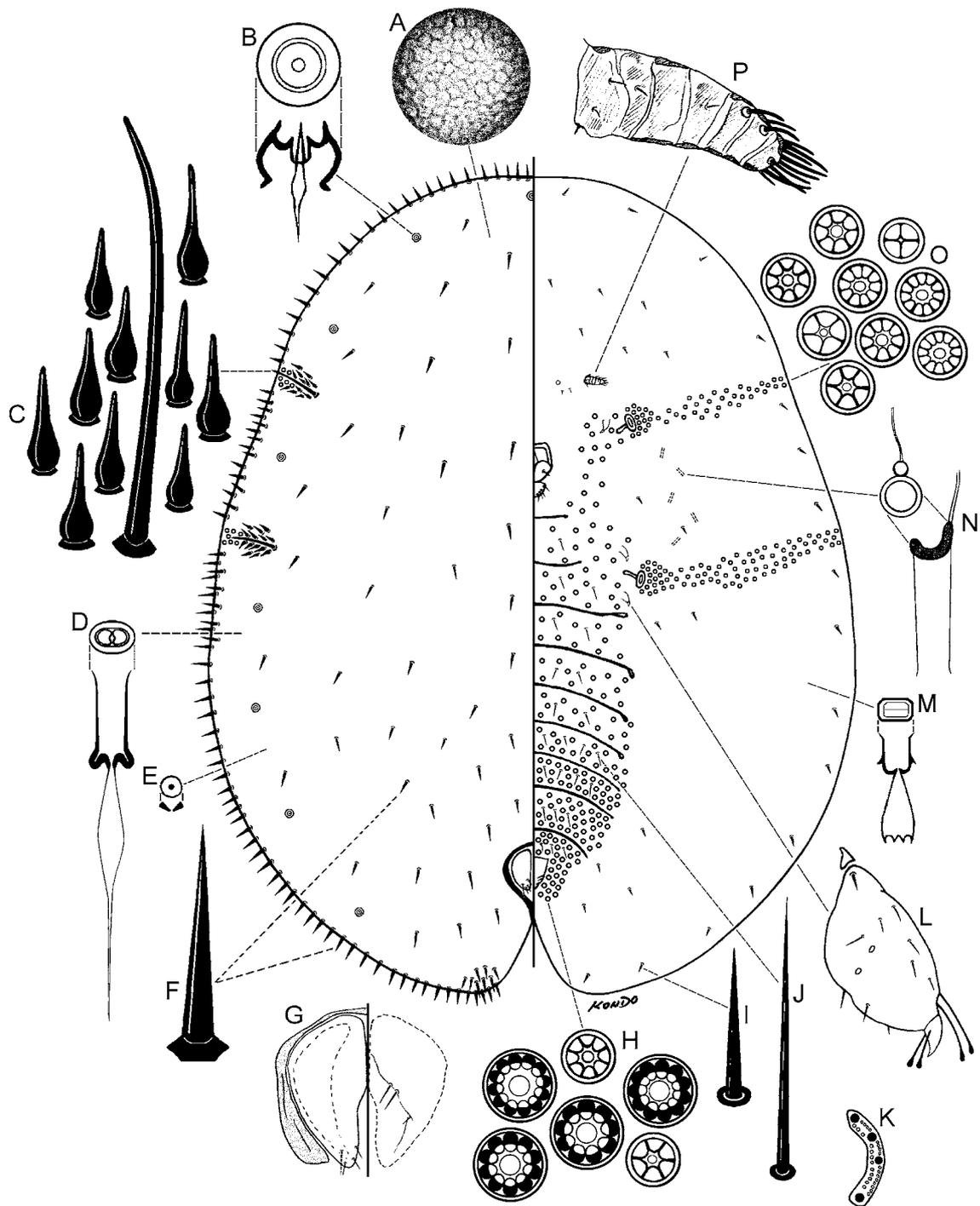


FIGURE 1. *Hallicoccus lomagundiae* (Hall), adult female. A, derm areolation; B, submarginal dorsal tubercle; C, stigmatic setae; D, dorsal microduct; E, simple pore; F, dorsal and marginal seta; G, anal plate; H, pregenital disc-pores; I, spinose ventral submarginal seta; J, slender ventral submedial seta; K, anal ring (right half); L, reduced metathoracic legs; M, ventral microduct; N, top and side view of ventral tubular duct; O, spiracular disc-pores; P, antenna.

Non-type material. MALAWI, 1 (1): Chitedzi Exp. Station, 1.vii.1966, ex *Piliostigma thouingii*, coll. C.J. Hodgson, BM 1967-558 (528), det. C.J. Hodgson (BMNH).

Description. Adult female (Fig. 1)

Unmounted material. "Old adult female very highly convex, the height being approximately the same as

the diameter. The sides are roughly vertical with the top more or less evenly rounded but surmounted at the apex by a minute protuberance. The margin is outwardly turned so as to give a small flattened base. On either side of the dorsum is a large and usually conspicuous dent, as though the insect has been pinched between the finger and thumb. In cross-section the adult female is either irregularly broadly oval or circular. In some specimens the dorsum exhibits vertical ridges making it six or seven sided. The colour is a dull brown, darker brown generally in the vicinity of the ridges. The surface of the dorsum is not smooth but has little irregularly shaped flattish protuberances at wide intervals. Very young specimens have a distinct dorsal keel and the margin is set with crystalline outgrowths which are more or less regular and tend to be conical in shape. Similar conical outgrowths occur submarginally and are directed outwards towards the margin. In somewhat older specimens three spurs run down to the margin from the dorsal keel on either side, the conical marginal processes are present and similar crystalline masses occur at intervals over the dorsum giving a somewhat glassy appearance. Diameter of adult female, 5.5–7.5 mm; height, 5–7.5 mm.” (Hall, 1935).

Mounted material. Body outline subcircular or elongate oval; body 2.7–6.4 mm long, 2.3–5.0 mm wide (n=35).

Dorsum. Derm of young adult females only slightly sclerotized; derm areolations well developed. Anal plates located about 1/5 of body length from body apex. Each plate 156–199 μm long, 81–97 μm wide, anterolateral margin 102–113 μm long, posterolateral margin 156–194 μm long; with 4 dorsal apical setae: 2 short setae on inner margin, 1 large subapical seta close to outer margin, and 1 short apical seta displaced towards outer margin, often broken off, but setal sockets clearly present; plus 2 ventral anterior margin and 1 shorter lateral margin seta. Anal ring with 8 setae and 2 rows of translucent pores. Submarginal dorsal tubercles present, each about 24 μm in diameter, totalling 6–18 around body. Preopercular pores absent. Setae scattered over dorsum, each 13–17 μm long. Dorsal microducts elongate oval, each about 5 μm wide, scattered throughout dorsum. Simple pores each about 2 μm in diameter, scattered evenly over dorsum.

Margin. Marginal setae more or less in two rows, each 11–28 μm long, longest on anal lobes, with about 12–16 setae between groups of anterior and posterior stigmatic setae. Stigmatic spines of two shapes, totalling 11–16 in each group, located on dorsal submargin, longest sharply spinose, slender, 77–98 μm long; others spinose with greatly swollen bases, each shorter, 13–43 μm long.

Venter. Derm membranous. Antennae reduced, 6 or 7 segmented, each 76–108 μm long. Clypeolabral shield 162–205 μm wide. Legs greatly reduced, with all segments fused but with a claw; prothoracic legs shortest; metathoracic legs longest; total length of each leg, 32–76 μm long. Tarsal digitules on each prothoracic leg dissimilar, one knobbed and the other spiniform; tarsal digitules on each meso- and metathoracic leg similar, knobbed. Claws simple, with no denticle; each claw with a pair of slender, knobbed digitules. Spiracles relatively small, anterior spiracles usually smaller than posterior spiracles, each anterior peritreme 92–113 μm wide, posterior peritreme 92–124 μm wide. Ventral tubular ducts scarce, present in a narrow band between anterior and posterior spiracles. Ventral setae of two types, those on mid areas of abdomen and thorax slender and long, each 13–17 μm long; rest of setae with broader bases, shorter, each 10–12 μm long. With 2–4 pairs of interantennal setae present. Spiracular disc-pores with 4–12 loculi, mostly with 5 loculi, each 2–5 μm in diameter; spiracular pore bands each 2–5 pores wide. Pregonital disc-pores numerous, each 4–6 μm in diameter, each with 6–12 (mostly 10) loculi, present medially on all abdominal segments, extending anteriorly onto both sides of mouthparts, and reaching area around prothoracic legs; often with 1 or 2 multilocular disc-pores on area between antennae. Microducts each about 4 μm wide, abundant around body margin and labium, less frequent elsewhere on venter.

Diagnostic features. The adult female of *Hallicoccus lomagundiae* (Hall) can be easily separated from *Hallicoccus obunca* (De Lotto) by the following combination of character states (character states of *H. obunca* in brackets): (i) absence of preopercular pores (present), (ii) presence of submarginal dorsal tubercles (absent), (iii) legs with all segments fused, but with a distinct claw (legs vestigial, composed of a small sclerotized plate plus 2 or 3 associated setae), and (iv) presence of bulbous stigmatic spines (stigmatic spines

sharply spinose).

Remarks. The present description of *H. lomagundiae* differs from previous descriptions by Hall (1935) and Hodgson (1969) in the following points (character states of present description in parenthesis): (i) dorsal setae most abundant near the anal plates (dorsal setae not particularly abundant around anal plates), (ii) antennae 7 segmented (6 or 7 segmented), and (iii) ventral tubular ducts absent (present in a narrow band between anterior and posterior spiracles).

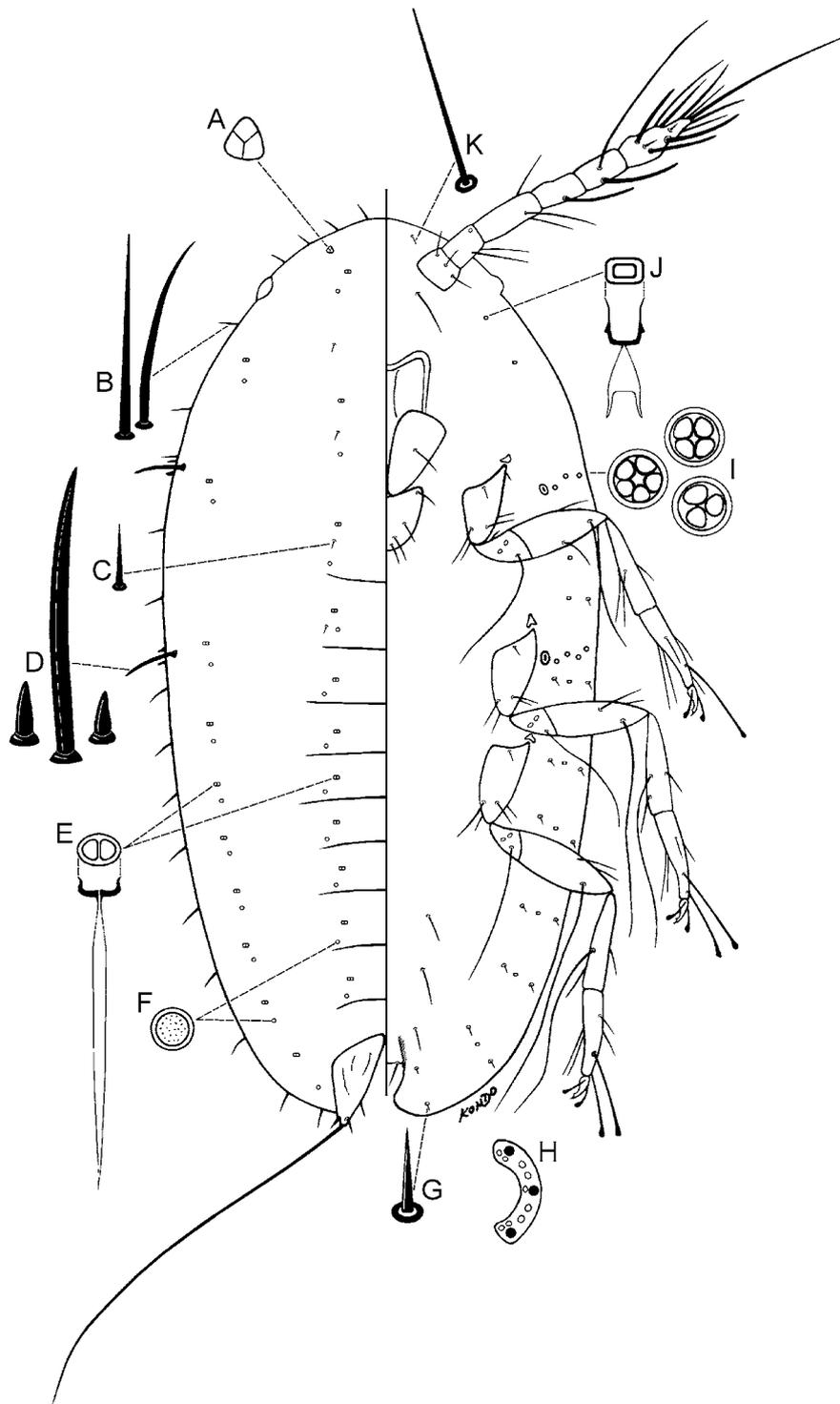


FIGURE 2. *Hallicoccus lomagundiae* (Hall), first-instar nymph. A, trilocular pore; B, marginal setae; C, dorsal seta; D, stigmatic spines; E, dorsal microduct; F, simple pore; G, ventral submarginal seta; H, anal ring (right half); I, spiracular disc-pores; J, ventral microduct; K, ventral submarginal cephalic seta.

According to Hall (1935), *Hallicoccus lomagundiae* (as *Toumeyella lomagundiae*) was a common species on *Bauhinia* in the Sinoia district (Lomagundi) of Zimbabwe. The second host, *Piliostigma thonningii*, is closely related to *Bauhinia*, a genus in which it was formerly included (Missouri Botanical Garden: “w³TROPICOS”, 2006).

Description. First-instar nymph (Fig. 2)

Material studied.

Paratypes. ZIMBABWE, 6(33): Same data as Holotype (slide-mounted from type dry material) (BMNH); ZIMBABWE, 1(6): Same data as Holotype, except No.185, (BMNH).

Unmounted material. External morphology not recorded.

Mounted material. Body outline elongate oval; body 464–507 µm long, 226–280 µm wide (n=39).

Dorsum. Derm membranous. Anal plates each 47–55 µm long, 21–24 µm wide, with 4 dorsal setae: 1 inner margin seta and 3 apical (including long median apical seta), plus 1 anterior margin seta. Anal ring with 6 setae and an irregular row of pores. Dorsal setae short, each about 3 µm long; in 2 submedian parallel rows of 4 setae on head and thorax. A trilocular pore present on each side of head region near margin. Dorsal microducts each about 3 µm wide, present submarginally and in 2 submedian rows. Simple pores each about 2 µm in diameter, usually closely associated with a microduct. Eyespots present on margin of head.

Margin. Marginal setae slender, each 11–15 µm long, totalling about 32 around body, with 8 anteriorly between eyes, plus (on each side) 2 between eye and anterior stigmatic setae, 2 between anterior and posterior stigmatic setae, and 8 between posterior stigmatic setae and body apex on each side. Each stigmatic area with a group of 3 stigmatic spines, each well differentiated from marginal setae; each median spine sharply spinose, 24–28 µm long; lateral spines short, sharply spinose or bulbous, each 5–7 µm long.

Venter. Antennae 6 segmented, each 162–178 µm long. Clypeolabral shield 76–86 µm wide. Legs well developed, each trochanter and femur with a very long seta; also with a long seta on each meso- and metathoracic tibia; trochanter + femur of each leg 81–86 µm long, tibia + tarsus 108–113 µm long; anterior tarsal digitules dissimilar, one long and knobbed, the other short and spiniform; meso- and metathoracic tarsal digitules both knobbed and subequal in size; claw digitules all similar and knobbed; claw with a small denticle. Anterior and posterior spiracular peritremes similar in size, each 6–9 µm wide. Submedian abdominal setae in pairs on posterior 3 segments. Submarginal setae arranged in an inner and outer row, each with 7 setae on each side, between posterior stigmatic areas and posterior body apex, plus 1 seta on each side between anterior and posterior stigmatic areas, and 1 pair present anteriorly on head region; other ventral setae present in a submedian line, with 1 seta on each abdominal segment. Spiracular disc-pores each about 3 µm in diameter, with 3–5 loculi (mostly 3 or 5); present in a line between each spiracle and margin, with 3 pores in each anterior line and 4 in each posterior line. Ventral microducts each about 2 µm wide, present submarginally on each segment between inner and outer submarginal setae, except absent from between posterior-most pair; also with 2 microducts on each side between anterior and posterior stigmatic areas, and 2 on each side posterior to antennae.

Diagnostic features. The first-instar nymphs of *H. lomagundiae* can be easily diagnosed by the presence of a very long seta on each coxa and femur, with a long seta found also in the meso- and metathoracic tibiae (see remarks for additional comments).

Distribution of *H. lomagundiae*: Afrotropical Region: Zimbabwe, Malawi.

Host plants. Fabaceae: *Bauhinia macrantha* Oliv.; *B. variegata* (Ben-Dov, 1993; Hodgson, 1969); *Piliostigma thonningii* (Schumach. & Thonn.) Milne-Redh.

Remarks. The extremely long setae observed in the legs of *H. lomagundiae* are unique among the Coccidae in their distribution, being present in each trochanter and femora, and on each tibia of the meso- and metathoracic legs. Williams & Hodges (1997) discussed the taxonomic features of first-instar nymphs of 52 species in 45 genera representative of 8 out of the 10 subfamilies of the Coccidae as recognized by Hodgson (1994). In their study, Williams and Hodges reported similar long setae in the leg segments of first-instar

nymphs of several coccids, i.e., one long seta on the trochanters of *Coccus hesperidum* L., two long setae on the trochanters of *Eulecanium tiliae* (L.), one long and one short seta on each trochanter of *Ceroplastodes dugesii* (Signoret), and the presence of an extremely long seta on the femur which extends to near the apex of the leg of *Etiennaea petasus* Hodgson, *Kilifia americana* Ben-Dov, *Milviscutulus mangiferae* (Green) and *Protovulvinaria pyriformis* Cockerell. However, long setae on the legs of the first-instar nymphs discussed by Williams and Hodges were restricted to one segment on each leg, rather than two or more leg segments as observed on *H. lomagundiae*.

***Hallicoccus obunca* (De Lotto), comb. nov.**

(Fig. 3)

Toumeyella obunca De Lotto, 1966: 149; Hodgson 1969: 39; Ben-Dov 1993: 381.

Material studied.

Holotype. South Africa, 1 (1): Natal, Richmond, 21.iii.1964, coll. J. Munting, ex *Cnestis natalensis*, H.C. #856 (SANC).

Paratypes. South Africa, 3(3): same data as Holotype, H.C. #856/3, 4 & 7 (BMNH).

Description. Adult female (Fig. 3)

Unmounted material. “Living adult females at the beginning of the stage moderately convex, with a well developed H-mark on the dorsum; colour evenly brown.” (De Lotto, 1966).

Mounted material. Body outline elongate oval; body 1.9–2.3 mm long, 1.6–2.0 mm wide (n=3).

Dorsum. Derm of young adult females membranous, with well-developed derm areolations. Anal plates located about 1/5–1/6 of body length from body apex. Each plate 117–121 µm long, 55–57 µm wide; anterolateral margin 64–66 µm long, posterolateral margin 100–102 µm long; each with 4 dorsal setae: 2 short setae on inner margin, 1 long subapical seta and 1 short apical seta; plus 2 ventral anterior margin setae and 1 lateral margin seta. Anal ring with 6 setae and 2 rows of translucent pores. Submarginal dorsal tubercles absent. Preopercular pores each 2–3 µm in diameter, present in a group of 15–40 pores on area anterior to anal plates. Setae robust, scattered over dorsum, each 15–22 µm long. Dorsal microducts heavily sclerotized, each about 4 µm wide, scattered throughout dorsum. Simple pores each about 2 µm in diameter, scattered evenly over dorsum.

Margin. Marginal setae each 12–16 µm long, longest at anal lobes, with 10–15 setae between groups of anterior and posterior stigmatic spines. Stigmatic spines of one type only present on dorsal submargin, each sharply to bluntly spinose, totalling 3–7 in each group, longest 120–150 µm long, others shorter, each 15–120 µm long.

Venter. Derm membranous. Antennae reduced; antennal segments indistinct, probably 3–5 segmented, 98–107 µm long. Clypeolabral shield 164–175 µm wide. Legs vestigial, each composed of a small sclerotized plate plus 2 or 3 associated setae, not easy to detect. Spiracles: anterior pair usually smaller than posterior pair, each anterior and posterior peritreme 36–43 µm wide. Ventral tubular ducts present in a narrow band between anterior and posterior spiracles. Ventral body setae slender, each 7–16 µm long. Interantennal setae numbering about 2 pairs. Spiracular disc-pores each with 5–7 (mostly 5) loculi, rarely with an occasional disc-pore with 10 loculi, 3–5 µm in diameter; spiracular pore bands each 2–4 pores wide. Pregenital disc-pores numerous, each 5–6 µm in diameter, with 10 loculi, present medially on all abdominal segments, extending anteriorly onto area near anterior spiracles. Ventral microducts each 3 µm wide, scattered throughout venter.

Diagnostic features. See under diagnostic features of *H. lomagundiae* comb. nov.

Remarks. The present description of *H. obunca* differs from that given by De Lotto (1966) in the following points (character states of present description in parenthesis): (i) preopercular pores absent (present), (ii)

absence of legs (legs vestigial), and (iii) slightly larger ranges for some measurements. Perhaps De Lotto did not notice the vestigial legs and the preopercular pores in *H. obunca* because of their small size, each leg being represented by a small sclerotized plate plus 2 or 3 associated setae, and the preopercular pores being only about 0.5–1.0 μm wider than the more abundant dorsal microducts. First-instar nymphs were not available during the present study.

Distribution of *H. obunca*: Afrotropical Region: South Africa.

Host plants. Connaraceae: *Cnestis natalensis* (Hochst.) Planch. ex Sond.

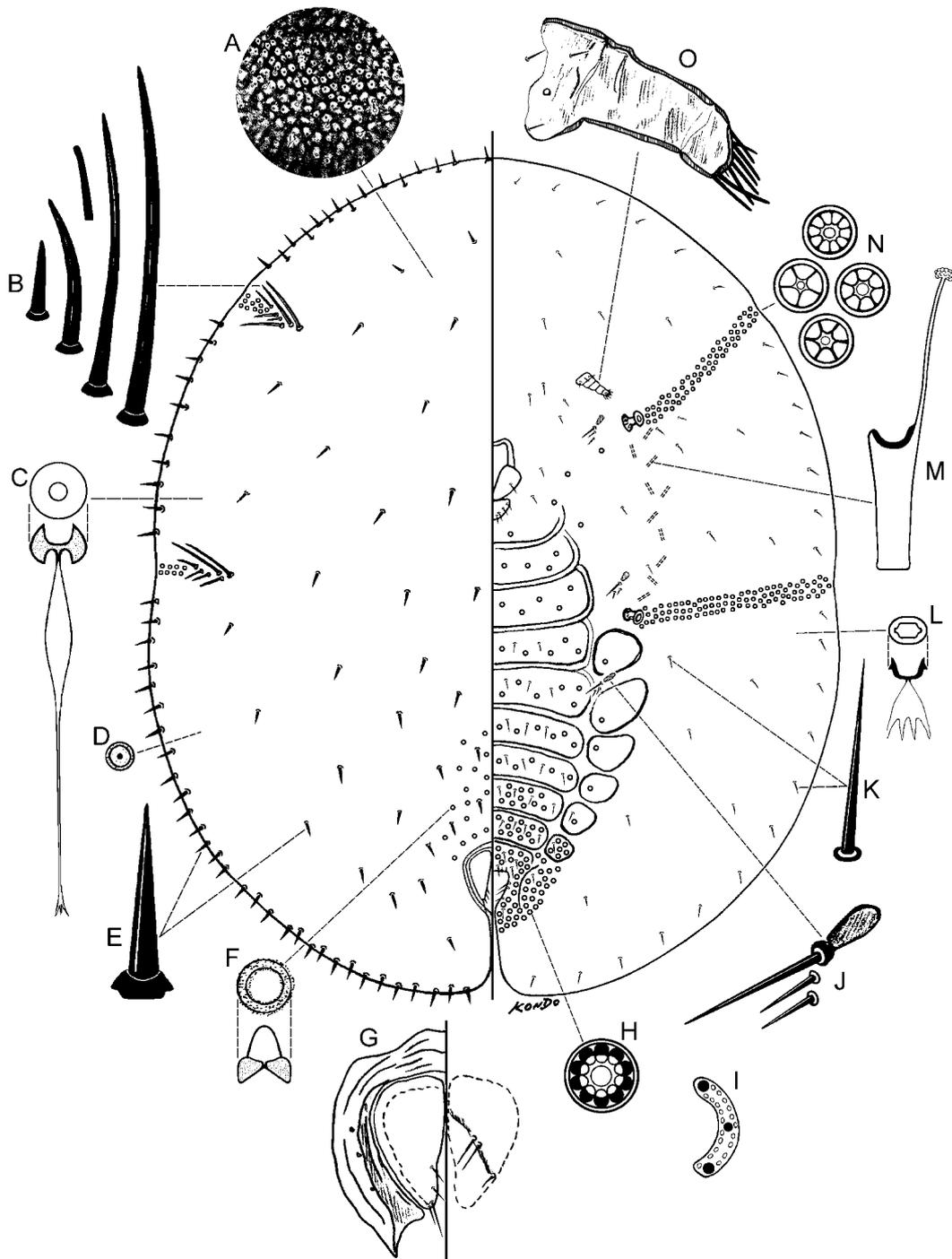


FIGURE 3. *Hallicoccus obunca* (De Lotto), adult female. A, enlargement of dorsal derm; B, stigmatic spines; C, dorsal microduct; D, simple pore; E, dorsal and marginal seta; F, preopercular pores; G, anal plate; H, pregenital disc-pore; I, anal ring (right half); J, metathoracic leg; K, ventral setae; L, ventral microduct; M, ventral tubular duct; N, spiracular disc-pores; O, antenna.

Discussion

The two African species hitherto included in *Toumeyella* (i.e., *H. lomagundiae* and *H. obunca*) have very little in common with the New World genus *Toumeyella*. The adult females of *Hallicoccus* differ from *Toumeyella* mainly in possessing the following features (character states of *Toumeyella* in brackets): (i) female body with an H-shaped ridge on dorsum (without an H-shaped ridge on dorsum), (ii) dorsal and marginal setae subequal in shape (not subequal in shape), (iii) submarginal dorsal tubercles present or absent (always absent), (iv) stigmatic spines numbering 3–16 in each group, usually more than 6 (0–3, usually 3), (v) ventral tubular ducts present in a narrow band between anterior and posterior spiracles (usually present around perivulvar area and restricted to abdomen), and (vi) pregenital disc-pores mostly with 10 (mostly with 5) loculi (Williams & Koszarab, 1972; Kondo & Williams 2003, 2004). Furthermore, the first-instar nymphs of the two genera differ mainly in possessing the following features (character states of *Toumeyella* in brackets): (i) dorsal setae present, about 4 pairs present in 2 parallel rows on head and thorax (dorsal setae present or absent, when present numbering 1 pair on head region), (ii) antennae 6 segmented (5 segmented), and (iii) legs with extremely long setae on trochanters, femora and tibiae (legs without extremely long setae).

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