

THE SCALE INSECTS OF THE SUBFAMILIES MONOPHLEBINAЕ AND MARGARODINAE TREATED BY MASKELL.

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INTRODUCTION.

The following paper is, in a sense, a continuation of the work begun through the publication of a previous article in these Proceedings¹ by the same authors, and the explanation of the circumstances which permitted the performance of that work, as given in the earlier paper, applies with equal aptitude to that which follows.

The species of the two subfamilies treated herewith, together with those of one other subfamily, the Ortheziinae, appear to be fairly definitely set off from the other members of the family Coccidae through the possession of abdominal spiracles in all stages and compound eyes in the adult male, but since Maskell described no new species of Ortheziinae, and since his collection apparently contains no improperly identified material belonging to this subfamily, no further consideration has been given in this paper to the species of Ortheziinae in his collection. Three species in this group, *Monophlebus fuscus* (Maskell), *Ultracoelostoma assimile* (Maskell), and *Coelostomidia zealandica* (Maskell), have already been redescribed in detail and discussed in the earlier paper, and are in consequence only briefly referred to in the following pages.

In those genera where a study of the included Maskell species has involved a consideration of most or all of the other congeneric species advantage has been taken of the opportunity to present the results of such extended study, and to describe certain apparently new species discovered in the course of the work.

The text figures showing the structural characteristics of the various species have been prepared by the junior author.

Subfamily MONOPHLEBINAЕ.

Genus MONOPHLEBUS Burmeister.

MONOPHLEBUS TAMARINDUS Green.

References.—*Monophlebus*, sp. Maskell, Trans. New Zealand Inst., vol. 25, for 1892 (1893) p. 245.—*Monophlebus tamarindus* Green, Mem. Dept. Agr. India, Ent. Ser., vol. 2, No. 2, Apr., 1908, p. 17.

¹ Proc. U. S. Nat. Mus., vol. 60, art. 12, no. 2407, 1922, pp. 1-120, figs. 1-37, pls. 1-6.

A careful comparison of the two specimens listed by Maskell under the above heading with a typical example of *M. tamarindus* Green indicates that Maskell's specimens are identical with the species described by Green, although little more than half as large, and with the derm still membranous and the areolations not yet visible. No attempt has been made to determine definitely whether or not the species is properly placed in the genus *Monophlebus*.

Genus DROSICHA Walker.

There can, the writers believe, be no question that the species definitely discussed below under the heading *Drosicha maskelli* (Cockerell), together with others from Peking, China, and elsewhere, are entirely typical of Walker's genus *Drosicha*, as his genotype specimens came from North China, and certain features of his all too-brief description coincide exactly with characters found in the specimens examined.

DROSICHA MASKELLI (Cockerell).

Reference.—Fernald Cat. Cocc. World, 1903, p. 19.

This species is represented in the Maskell collection by a number of slides, two of "adult female, 1896," one of "larva, 1896," one of "male pupa, 1896," one of "wing of male, 1896," one of "halterer of male, 1896," one of "eyes of male, 1896"; and by two adult females and one adult male mounted on black cardboard rectangles and bearing Maskell's No. 515.

Adult female.—Dried specimens much wrinkled, maximum length 6 mm., flat and rather thin dorsoventrally, but the body twisted; ground color dark brown, overlaid by a thin whitish pubescence, this more dense at the margin and dorsally; anterior notch plainly visible; derm clearing almost completely on treating with potassium hydroxide, but the insect retaining a light brown color due to the presence of numerous crowded dorsal spines; maximum length of mounted specimens 9 mm., maximum width 5 mm.; elongate oval, nearly elliptical, ends uniformly and equally rounded; antennae remaining dark brown, elongate, tapering somewhat, 8-segmented, the terminal longest; legs stout, fairly large, the under side of tibia and tarsus with two longitudinal rows of setae, these stout at base, very slender for most of their length; beak rather short and stout, with a narrow basal collar, and the large terminal section with an indistinct joint, the beak therefore possibly to be considered as 3-segmented; with two pairs of large thoracic and seven pairs of much smaller abdominal spiracles, the first with a few pores clustered at the opening, the last small, short, somewhat tapering tubes; derm pores small, scattered, but fairly numerous, multilocular disk type, mostly circular to somewhat oval, with oval center and six loculi, rarely with triangular center and eight loculi, or smaller and with

four loculi; derm densely clothed dorsally and ventrally with slender "spines," stout at base, but tapering to delicate tips, these considerably more abundant than the pores, about 82μ long in the middle region of the body, the dorsal heavier and stouter than the ventral and 96μ at the margin; with an occasional seta, larger than the spines, scattered over the body, these more numerous, much longer and aggregated to form segmental clusters of relatively very large and long setae along the body margin; anal tube short, the opening

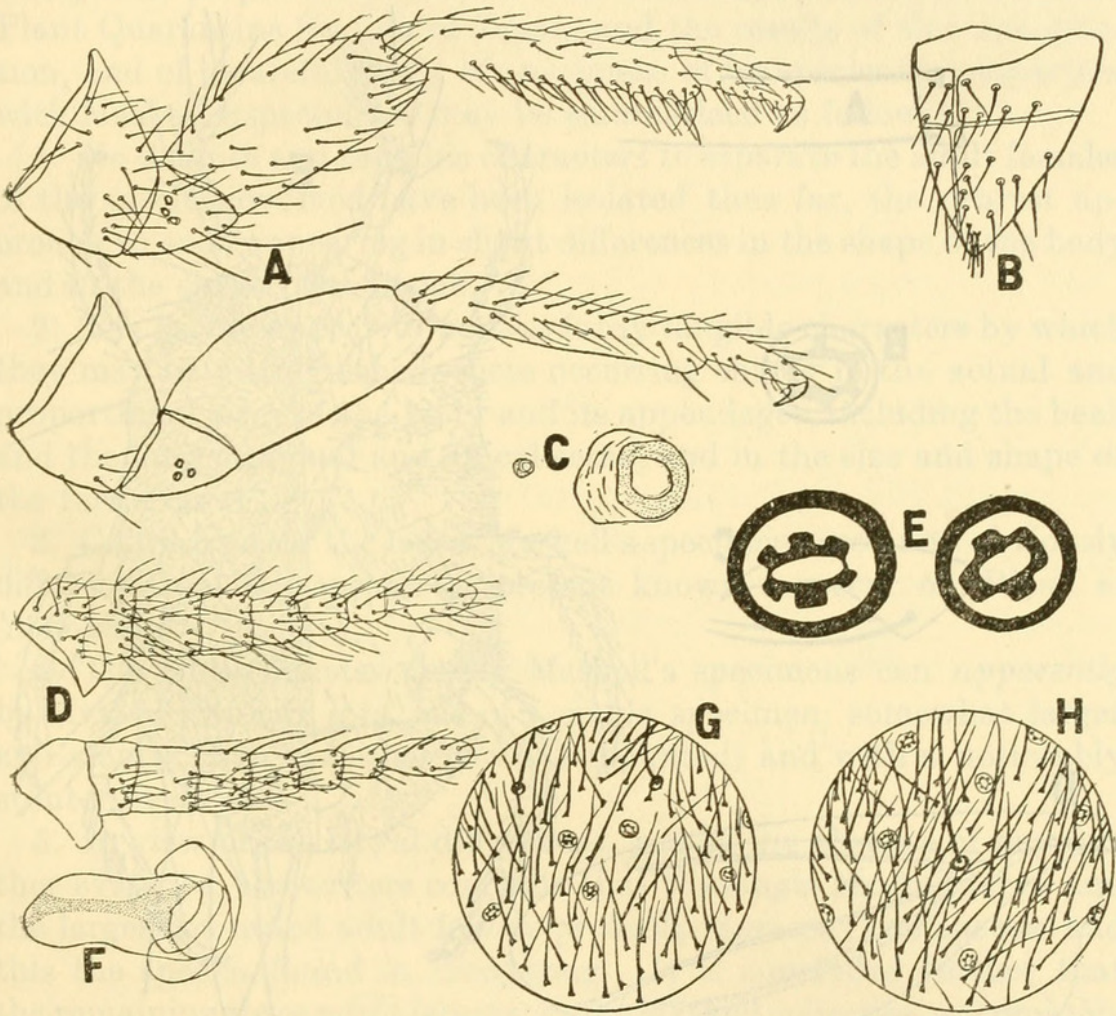


FIG. 1.—*DROSICHA MASKELLI* (COCKERELL). ADULT FEMALE. A, MIDDLE LEG, OPPOSITE SURFACES (1896 SLIDE), $\times 26.5$; B, BEAK, $\times 57.5$; C, ABDOMINAL SPIRACLE, $\times 57.5$ AND $\times 335$; D, ANTENNA, OPPOSITE SURFACES (1896 SLIDE), $\times 26.5$; E, DERM PORES, $\times 1,500$; F, THORACIC SPIRACLE, $\times 57.5$; G, VENTRAL DERM, $\times 220$; H, DORSAL DERM, $\times 220$.

with a chitinized rim with the posterior half more or less triangular; no ventral cicatrices located.

Larva.—Stout, oval, length 1 mm., width .65 mm.; antennae 5-segmented, the measurements in microns as follows: I, 68; II, 57–64; III, 118; IV, 36; V, 150–157; legs fairly long and stout for this stage, the measurements of middle leg in microns as follows: femur, 200, tibia, 214; tarsus, 168; claw, 39; claws with two hair-like digitules about as long as claw and two more or less distinct denticles near apex within; beak relatively elongate, 3-segmented and with a num-

ber of large and long setae at apex, length 161μ ; width at base 100μ ; spiracles not observed; derm pores of one sort only, small circular to oval disk pores with oval centers and six loculi, these probably in definite arrangement, never clustered; derm setae and "spines" much more numerous than pores particularly on dorsum, these similar in size and shape except at body margin, those on dorsum averaging about 43μ long, only the base showing the difference; margin of body with a series of relatively very long, prominent setae, each

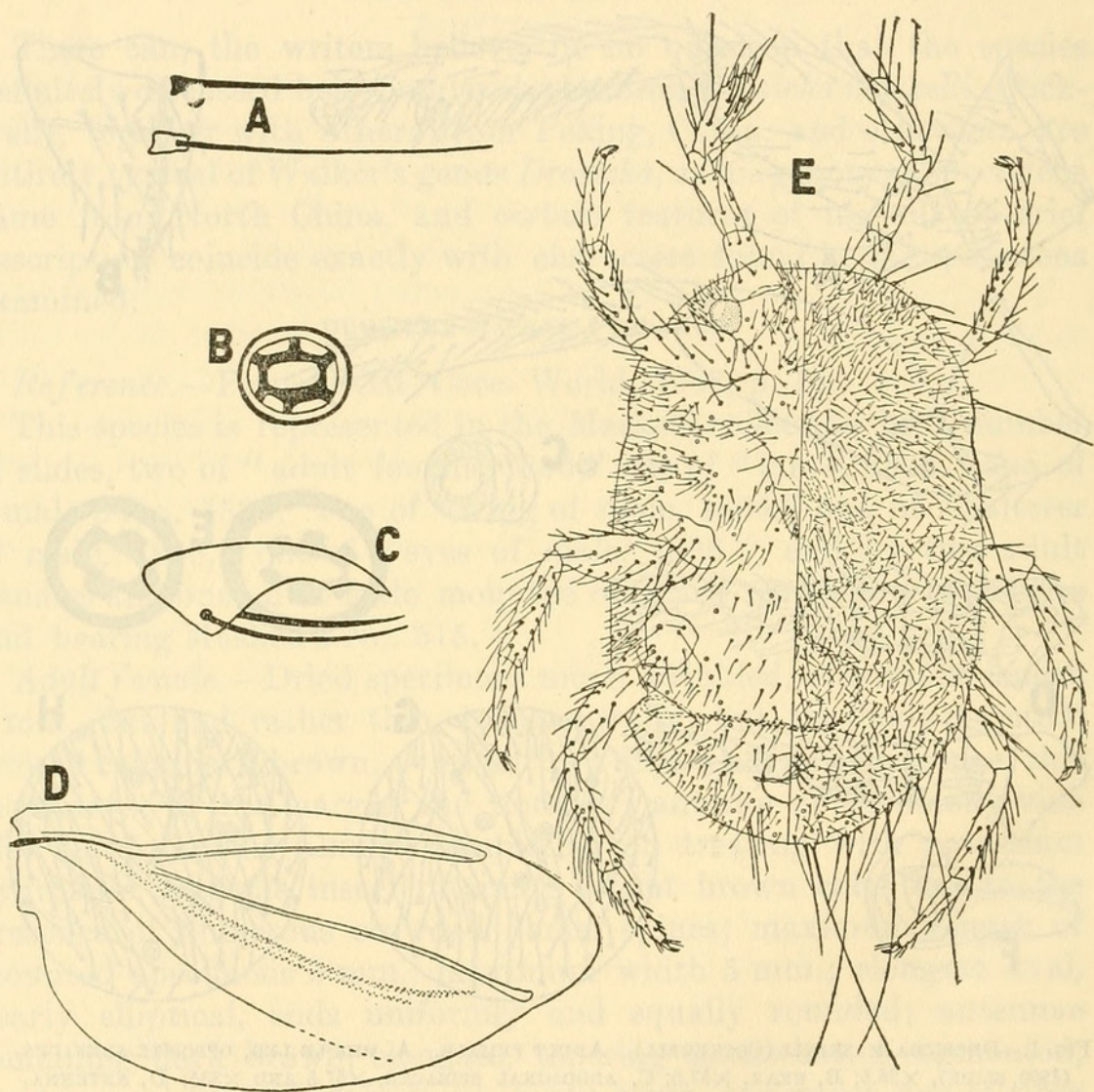


FIG. 2.—*DROSICHA MASKELLI* (COCKERELL). A, LARVA, DORSAL SPINE AND SETA, $\times 500$; B, LARVA, DORSAL PORE, $\times 1,500$; C, LARVA, CLAW, $\times 640$; D, ADULT MALE, WING, $\times 12$; E, LARVA, DORSAL AND VENTRAL, $\times 57.5$.

with a high basal collar, those along abdomen and on thorax not conspicuously shorter than the terminal setae as in some other species of the genus, the length of same in microns as follows: apical pair 518, second and third pairs (from apex) about 464; remaining abdominal pairs progressively shorter, prothoracic, 240; anal tube simple, without the double pore collar of many genera at its inner end, with a discontinuous circle of disk pores around its mouth; with a single, relatively large ventral cicatrix.

Cotype.—Cat. No. 25266, U.S.N.M.

Aside from his identification of this species as *Monophlebus burmeisteri* Westwood, a determination which appears to be wholly without justification, Maskell has hopelessly confused it by mixing together, as one species, specimens from Yokohama, Japan, on *Pinus*, species, and from Hongkong, China, on *Gardenia florida*.

The writers have been privileged to examine some very careful and detailed, but as yet unpublished, work² on the Japanese species of this genus, prepared by Prof. S. I. Kuwana, Director of the Imperial Plant Quarantine Station of Japan, and the results of this examination, and of a careful study of specimens of his species in comparison with Maskell's specimens, may be summarized as follows:

1. No definite and tangible characters to separate the adult females of the species involved have been isolated thus far, the nearest approach to such appearing in slight differences in the shape of the body and in the shape of the beak.

2. The larvae appear to possess fairly tangible characters by which they may be distinguished, these occurring chiefly in the actual and proportional sizes of the body and its appendages, including the beak and the long marginal and apical setae, and in the size and shape of the tarsal claw.

3. On the basis of the larva, Maskell's specimens are quite obviously different from the species at present known to occur on *Pinus* at Yokohama.

4. The adult females among Maskell's specimens can *apparently* be divided into two lots, one of a single specimen, somewhat larger and stouter than the other three (2 mounted) and with a noticeably stouter beak.

5. In view of the larval differences, and in the absence of any further evidence, the writers conclude that the single Maskell larva and the largest mounted adult female *probably* represent one species and this the species found in Hongkong. It is concluded further that the remaining three adult females in the Maskell collection are *probably* the same as the species now found on *Pinus* in Japan.

6. The situation is still further tangled by the fact that Maskell lists the specimens from Yokohama on *Pinus* before the specimens from Hongkong, and these would logically receive the specific name *maskelli* in any splitting of Maskell's species.

7. In the apparent absence of any positive differentiating characters in the adult female, and the presence of these in the larva, the writers propose the restriction of the specific name *maskelli* (Cockerell) to the single larva in the Maskell collection, and include with it doubtfully a single mounted adult female specimen. This will

²Published August, 1922. Bull. Imp. Plant Quar. Sta. Japan, No. 1, 1922, pp. 11-58, 12 pls.

leave the specimens on *Pinus* from Japan as an undescribed species which will be described presently by Professor Kuwana.³

8. It has not been possible from a comparative study of the single unmounted male specimen and the mounted parts of another male in the Maskell collection to determine anything regarding the proper status of these male specimens.

9. The correctness of the tentative conclusions given above can be verified only by the examination of additional material, including larvae, from the localities and hosts in question.

Genus **MONOPHLEBULUS** Cockerell.

Reference.—Morrison and Morrison, Proc. U. S. Nat. Mus., vol. 60, art. 12, 1922, p. 4.

This genus has already been described and discussed at such length as the condition of the specimens of the type species would permit. On undertaking a careful study of all the species of the genus *Monophlebus* that had been described by Maskell it became evident that *M. crawfordi* and its variety *pilosior* were closely related to and congeneric with *M. fuscus*, the genotype of *Monophlebulus*. An examination of the undetermined material of this group in the Coccid collections available in Washington produced two apparently new species of the genus *Monophlebulus*, and these have been described below. With more or less material of all the known species that seem to be entitled to inclusion in this genus available, their relationships and specific differences are discussed at some length following the descriptions.

MONOPHLEBULUS CRAWFORDI (Maskell).

Plate 1, fig. 1.

References.—*Monophlebus crawfordi* Maskell, Koebele, U. S. Dept, Agr. Div. Ent. Bull. 21, 1891, p. 20, fig. 9.⁴—*Drosicha crawfordi* (Maskell), Fernald Cat. Cocc. World, 1903, p. 19.

The Maskell collection includes the following slide mounts of this species: One of "adult females, 1888," one of antenna and foot of female, 1891, and one of "larva, 1892," and besides a few unmounted specimens under No. 92, while a few specimens from the local collections have also been available for study. From the above it will be evident that only the 1888 slide and an unmounted male are from the type material of this species.

Adult female.—External appearance discussed in some detail by Maskell in his various descriptive notes on the species and therefore not considered here, nor are the antennae and legs, which appear to possess no specific nor even generic peculiarities; body, as mounted, elongate oval, slightly broader behind the middle; derm clearing only

³Described as *Warajicoccus pinicola*. See p. 29 of reference cited in footnote 2.

⁴Reference omitted by Fernald Catalogue of Coccidae.

incompletely, remaining light yellow brown after treatment with potassium hydroxide; beak short and stout, obviously 2-segmented; with two pairs of thoracic and seven pairs of abdominal spiracles, the first rather stout triangular, with a cluster of disk pores at the opening, the last much smaller, cylindrical or somewhat vasiform, less chiti-

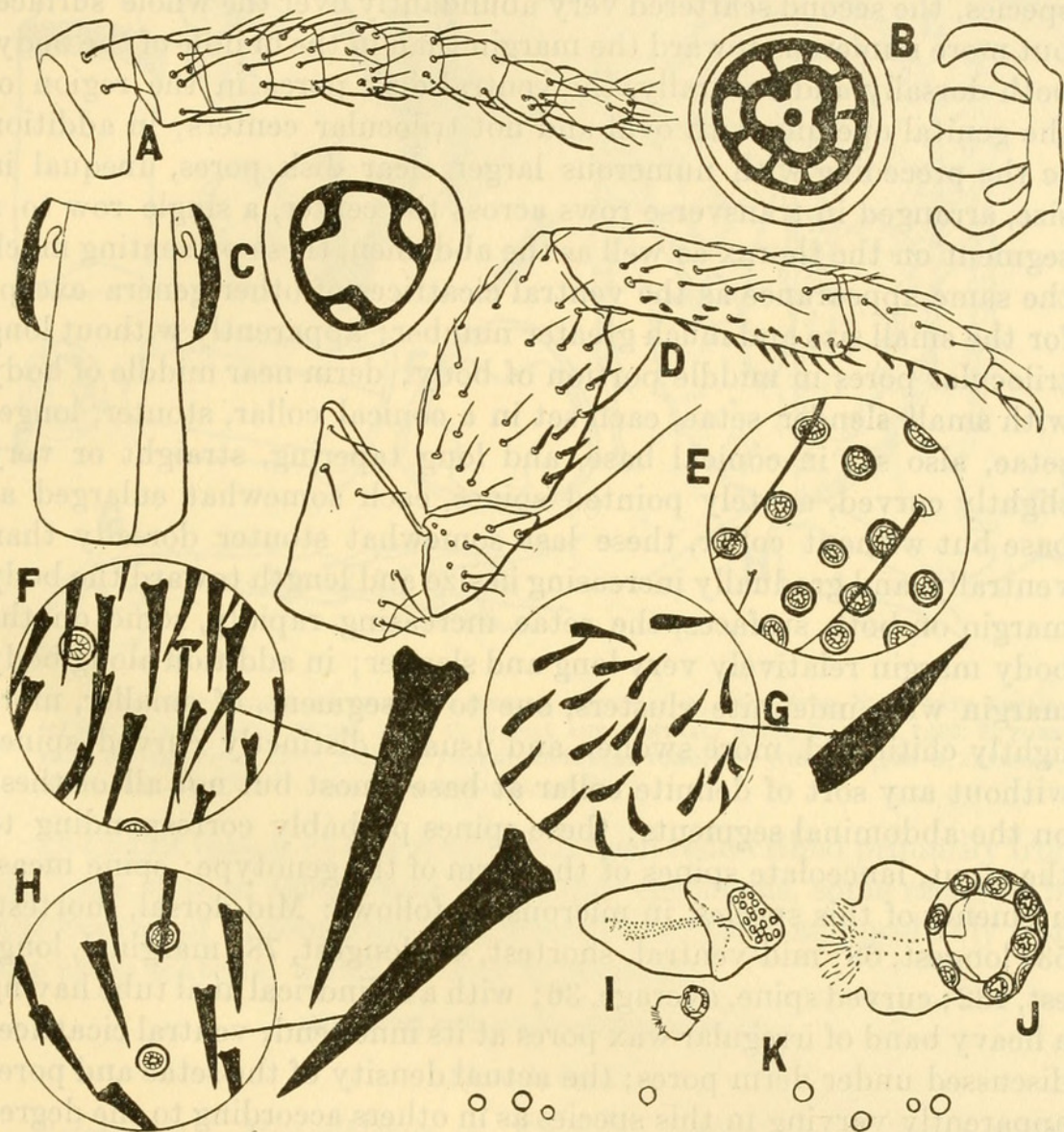


FIG. 3.—*MONOPHLEBULUS CRAWFORDI* (MASKELL). ADULT FEMALE. A, ANTENNA, $\times 57.5$; B, DISK PORE, TWO VIEWS, $\times 1,500$; C, TRILOCULAR TUBULAR PORE, TWO VIEWS, $\times 1,500$; D, LEG, $\times 57.5$; E, SECTION OF VENTRAL DERM JUST ANTERIOR TO VAGINAL OPENING, $\times 220$; F, SECTION OF DERM DORSALLY BETWEEN POSTERIOR LEGS, $\times 220$, WITH DETAIL OF SPINE, $\times 640$; G, DERM NEAR MARGIN DORSALLY, $\times 220$, WITH DETAIL OF SPECIALIZED SPINE, $\times 640$; H, SECTION OF DERM VENTRALLY BETWEEN POSTERIOR LEGS, $\times 220$, WITH DETAIL OF SPINE, $\times 640$; I, THORACIC AND ABDOMINAL SPIRACLE, $\times 57.5$; J, ABDOMINAL SPIRACLE, $\times 220$; K, PORTION OF TRANSVERSE BAND OF ABDOMINAL CICATRICES, $\times 57.5$.

nized, and with a collar, usually incomplete, of disk pores surmounting its external opening; derm pores of two distinct types, one elongate, tubular, but trilocular, and with three tiny loculi alternating with the larger ones at the external opening, the other multilocular disk, with the central portion usually trilocular, but somewhat vary-

ing, rarely oval, rarely quadrilocular, and with an outer band of smaller loculi, the appearance varying somewhat according to point focused upon, the dorsal pores of this type somewhat smaller than those occurring ventrally; the first type in indistinct clusters apparently confined to the body margin region in contrast to some other species, the second scattered very abundantly over the whole surface, but more numerous toward the margin than in the middle of the body, both dorsally and ventrally, the ventral disk pores in the region of the genital opening with oval and not trilocular centers; in addition to the preceding with numerous larger clear disk pores, unequal in size, arranged in transverse rows across the center, a single row to a segment on the thorax as well as the abdomen, these presenting much the same appearance as the ventral cicatrices of other genera except for the small size and much greater number; apparently without long trilocular pores in middle portion of body; derm near middle of body with small slender setae, each set in a conical collar, stouter, longer setae, also set in conical base, and long tapering, straight or very slightly curved, acutely pointed spines, each somewhat enlarged at base but without collar, these last somewhat stouter dorsally than ventrally, and gradually increasing in size and length toward the body margin on both surfaces, the setae increasing rapidly, some on the body margin relatively very long and slender; in addition along body margin with indefinite clusters, one to a segment, of smaller, more lightly chitinized, more swollen and usually distinctly curved spines without any sort of definite collar at base; most but not all of these on the abdominal segments; these spines probably corresponding to the stout, lanceolate spines of the derm of the genotype; spine measurements of this species, in microns, as follows: Mid-dorsal, shortest, 53; longest, 68; mid-ventral, shortest, 46, longest, 78; marginal, longest, 132; curved spine, average, 36; with a cylindrical anal tube having a heavy band of irregular wax pores at its inner end; ventral cicatrices discussed under derm pores; the actual density of the setae and pores apparently varying in this species as in others according to the degree of distension of the body as a result of the development of the ovaries.

Larva.—Essentially like that of *M. fuscus* in shape and other characteristics; antennae more elongate, 5-segmented, the third sometimes with faint indications of a division; legs long and slender, tip of claw with three indistinct denticles; digitules less than half length of the claw, with two pairs of large thoracic and seven pairs of relatively minute abdominal spiracles, all without pores; derm with some longitudinal rows of trilocular, rarely quadrilocular, disk pores dorsally and submarginally ventrally, and with a marginal series of 14 pairs of large trilocular tubular pores instead of 13 as in *fuscus*, with five longitudinal bands of lanceolate spines, one median, two marginal,

two submarginal, these confused anteriorly, and with additional rows of slender setae both dorsally and ventrally; anal tube apparently much as in *fuscus*; with four pairs of small circular ventral cicatrices.

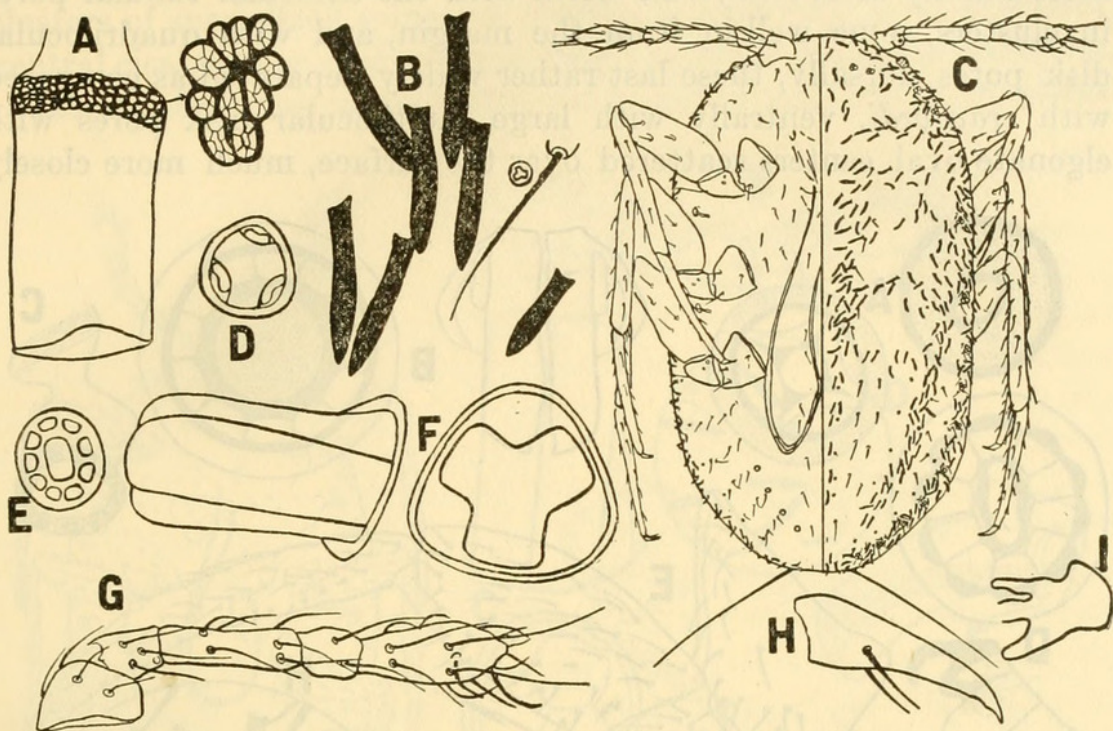


FIG. 4.—*MONOPHLEBULUS CRAWFORDI* (MASKELL). LARVA. A, ANAL TUBE, $\times 335$, WITH DETAIL, $\times 1,000$; B, PORTION OF DERM, $\times 500$; C, DORSAL AND VENTRAL, $\times 57.5$; D, PORE, $\times 1,500$; E, PORE FROM MOUTH OF ANAL TUBE, $\times 1,500$; F, MARGINAL TUBULAR PORE, TWO VIEWS, $\times 1,500$; G, ANTENNA, $\times 115$; H, CLAW, $\times 640$; I, ABDOMINAL SPIRACLE, $\times 1,500$.

The adult female of this species has been redescribed primarily from the type slide in comparison with other specimens, some received by the Bureau of Entomology from Crawford in 1888, and probably from the same material which he sent to Maskell.

***MONOPHLEBULUS PILOSIOR* (Maskell).**

Plate 1, fig. 2.

References.—*Monophlebus*, sp. Koebele, Bull. 21, U. S. Dept. Agri., Div. Ent., 1899, p. 20.—*Drosicha crawfordi*, var. *pilosior*, Fernald Cat. Cocc. World, 1903, p. 19.

This seems without question to be a distinct and valid species rather than a variety, the differences between it and *crawfordi* being particularly emphasized in the discussion following the specific description.

This species is represented in the Maskell collection under the name *crawfordi*, var. *pilosior*, by the following slides: One of "Adult female 1892," one of "antennae ♀, 1892," one of "larva 1892," and one of "larva 1893," and by a few specimens under No. 285.

The following description is based on Maskell's slides, together with one other, of an adult female, made from the type specimens.

Adult female.—External appearance, antennae and legs as described by Maskell and figured herewith; derm remaining somewhat chitinized, or clearing on treating with potassium hydroxide; spiracles exactly as in *crawfordi*; derm with the trilocular tubular pores in clusters, some well in from the margin, and with quadrilocular disk pores dorsally, these last rather widely separated as compared with *crawfordi*, ventrally with large multilocular disk pores with elgonate oval centers scattered over the surface, much more closely

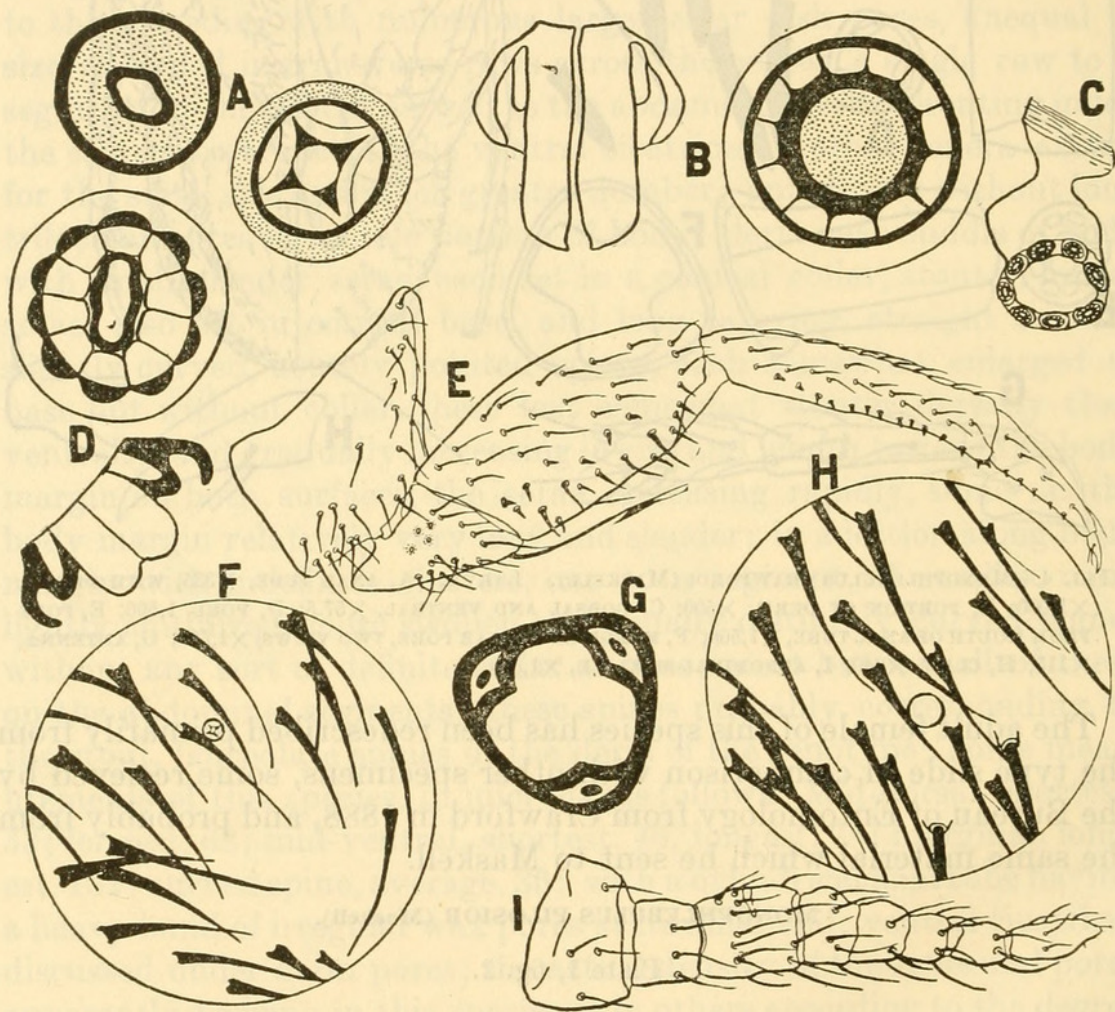


FIG. 5.—*MONOPHLEBULUS PILOSIOR* (MASKELL). ADULT FEMALE. A, DISK PORE, SHOWING APPEARANCE AT DIFFERENT FOCAL POINTS, $\times 1,500$; B, DISK PORE, TWO VIEWS, $\times 1,500$; C, ABDOMINAL SPIRACLE, $\times 220$; D, DISK PORE, TWO VIEWS, $\times 1,500$; E, POSTERIOR LEG, $\times 30$; F, SECTION OF DORSAL DERM BETWEEN POSTERIOR LEGS, $\times 220$; G, TRILOCULAR TUBULAR PORE, $\times 1,500$; H, SECTION OF VENTRAL DERM BETWEEN POSTERIOR LEGS, $\times 220$; I, ANTENNA, $\times 30$.

set in the genital region; in addition with circular center, deep, multilocular disk pores in segmental clusters at the margin ventrally; dermal setae slender, set in conical bases, small in mid-dorsal region, larger ventrally and much larger along the margin, scattered; derm spines longer and more slender than those of *crawfordi*, the tips hair-like, in this respect resembling those of *fuscus*, gradually increasing in length from center to margin of body, very abundant and closely crowded, this appearance depending to a considerable extent on the

distension of the derm, much more numerous than the pores over most of the body surface; spine measurements of this species in microns, as follows: Mid-dorsal, smallest 57, largest 82; mid-ventral, smallest 57, largest 86; marginal, largest, 178; without the lateral clusters of specialized spines of *crawfordi*; anal tube as in *crawfordi*; ventral cicatrices or clear pores in single irregular rows as in *crawfordi*.

Larva.—Differing in no visible particulars from that of *crawfordi*.

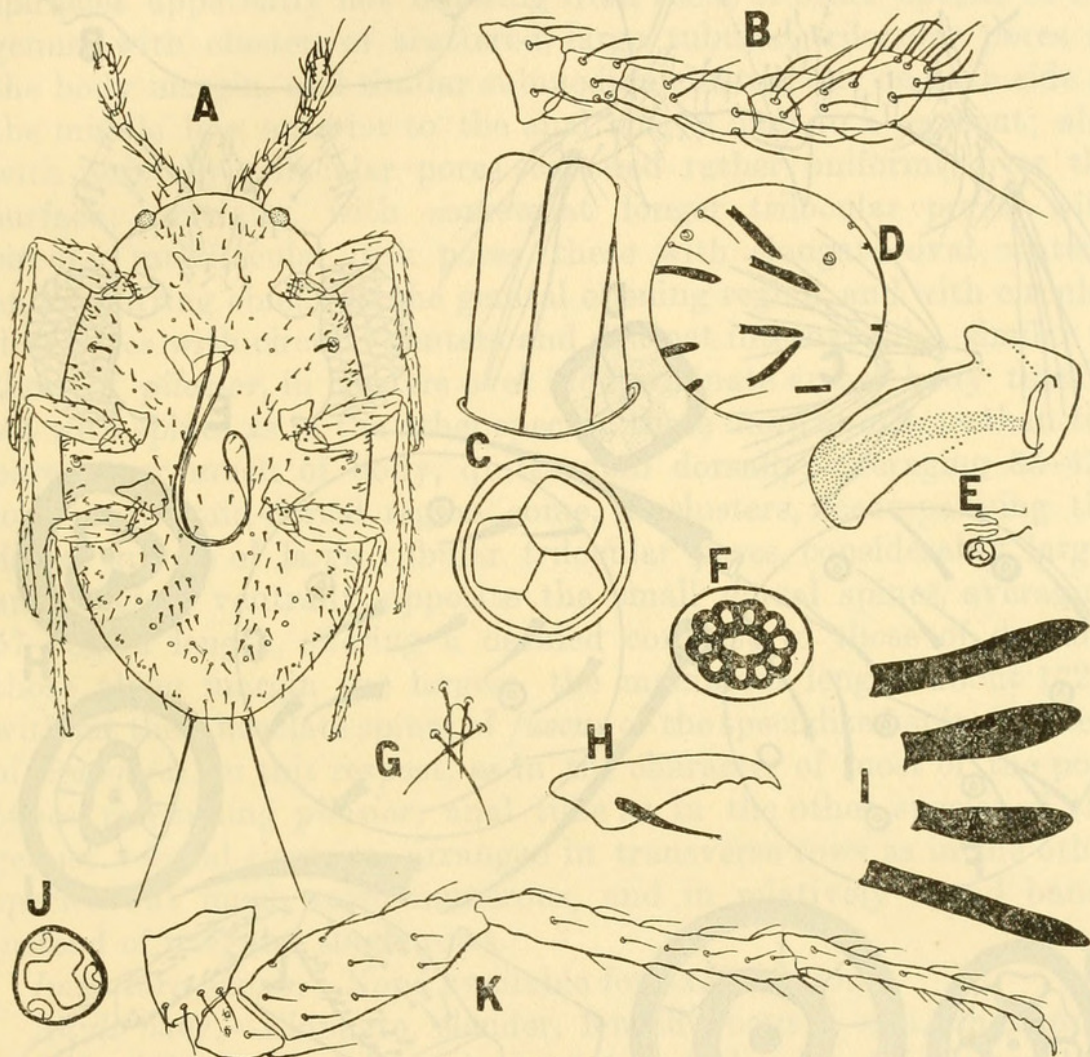


FIG. 6.—*MONOPHLEBULUS PILOSIOR* (MASKELL). LARVA. A, OUTLINE FROM BELOW, $\times 50$; B, ANTENNA, $\times 115$; C, TRILOCULAR TUBULAR PORE, TWO VIEWS, $\times 1,500$; D, SECTION OF DERM DORSALLY BETWEEN POSTERIOR LEGS, $\times 220$; E, THORACIC AND ABDOMINAL SPIRACLES, $\times 440$; F, PORE, $\times 1,500$; G, OPENING OF TRILOCULAR TUBULAR PORE, $\times 57.5$; H, CLAW, $\times 640$; I, DORSAL SPINES, $\times 640$; J, PORE, $\times 1,500$; K, LEG, $\times 115$.

Cotype.—Cat. No. 25268, U.S.N.M.

In addition to the Maskell specimens, adult females from under bark of eucalyptus tree, Sydney, New South Wales, collected by George Compere under his No. 1049, have been examined. In these specimens, apparently due to the stretching of the derm, the crowded appearance of the dermal spines is much less conspicuous.

MONOPHLEBULUS COMPEREI, new species.

Plate 1, fig. 3.

Adult female.—Secreting a considerable quantity of white pulverulence, this in the dried specimens adhering closely to the body and forming a compact coating, leaving only the more prominent por-

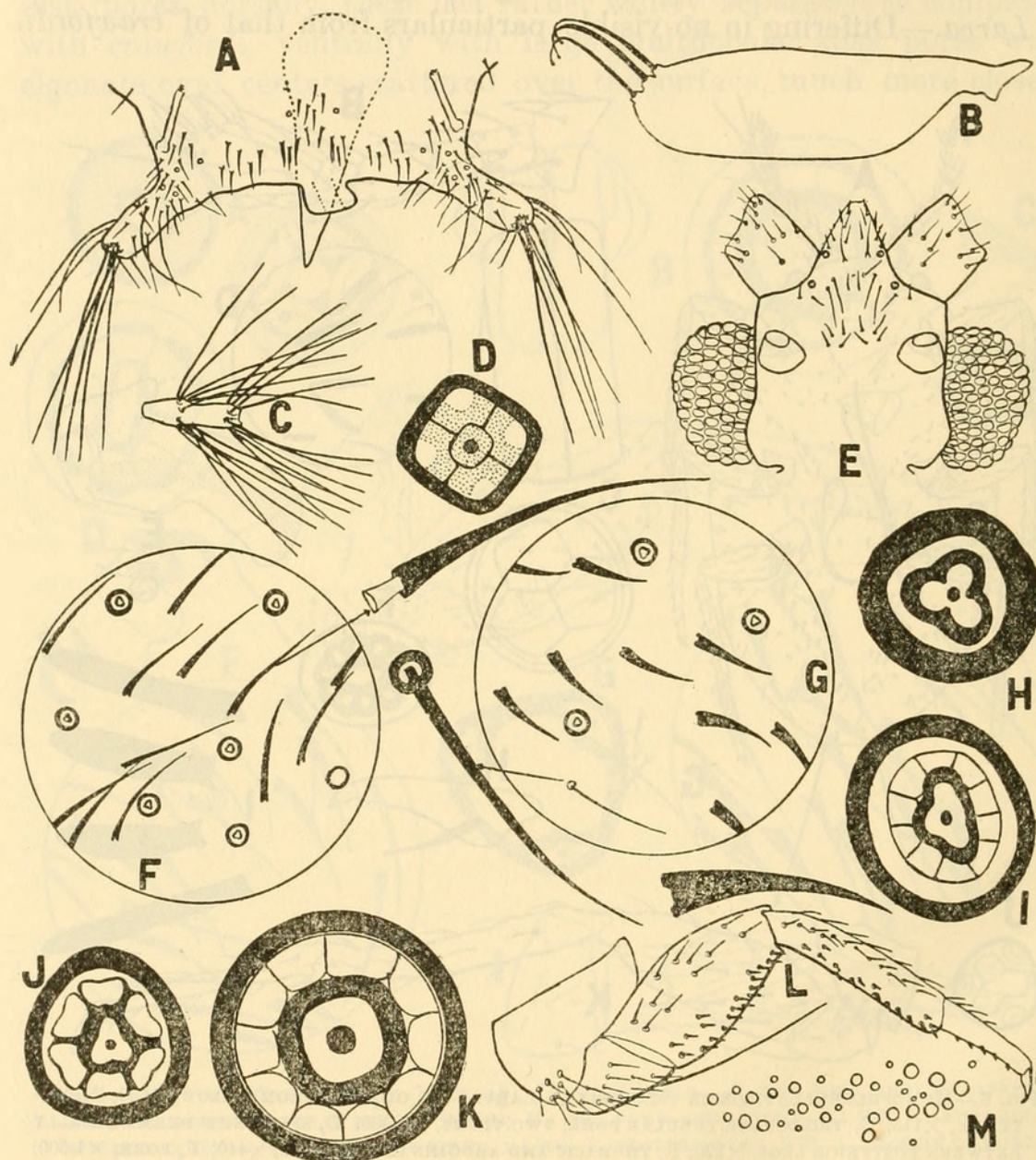


FIG. 7.—*MONOPHLEBULUS COMPEREI*, NEW SPECIES. A, ADULT MALE, APEX OF ABDOMEN, $\times 57.5$; B, ADULT MALE, HALTERER, $\times 115$; C, ADULT MALE, SINGLE ANTENNAL SEGMENT, $\times 57.5$; D, ADULT MALE, DERM PORE, $\times 1,500$; E, ADULT MALE, OUTLINE OF HEAD, $\times 57.5$; F, ADULT FEMALE, SECTION OF VENTRAL DERM BETWEEN POSTERIOR LEGS, $\times 220$, WITH DETAIL OF SPINE, $\times 640$; G, ADULT FEMALE, SECTION OF DORSAL DERM BETWEEN POSTERIOR LEGS, $\times 220$, WITH DETAIL OF SPINE AND SETA, $\times 640$; H, ADULT FEMALE, DISK PORE, $\times 1,500$; I, SAME, ANOTHER SORT, $\times 1,500$; J, SAME, ANOTHER SORT, $\times 1,500$; K, SAME, ANOTHER SORT, $\times 1,500$; L, ADULT FEMALE, LEG, $\times 30$; M, ADULT FEMALE, SECTION OF ONE ABDOMINAL BAND OF VENTRAL CICATRICES, $\times 57.5$.

tions of the body exposed due to contact with other specimens; exposed portions of dried specimens an indeterminate blackish red; body usually shriveled and wrinkled transversely dorsally, elongate oval, similar to other species of genus in shape; length of dried

specimens ranging from 8 to 15 mm., width from 5 to 8 mm., dimensions of specimens as mounted on slide averaging slightly larger; derm remaining yellow brown or clearing almost completely on treating with potassium hydroxide; antennae 7-segmented, rather strongly tapering, the terminal longest, legs short, stout and heavy, the femur as well as the tibia and tarsus bearing a considerable number of heavy spines; beak short and stout, indistinctly 2-segmented; spiracles apparently not differing from those of other species of the genus; with clusters of scattered, large tubular, trilocular pores at the body margin, and similar submedian clusters one on each side of the middle line anterior to the anal ring, a pair to a segment; also with normally trilocular pores scattered rather uniformly over the surface; ventrally, with somewhat longer trilocular pores, with circular multilocular disk pores, these with elongate oval centers, and occurring chiefly in the genital opening region, and with circular disk pores with circular centers and distinct internal tube, similar to those of *pilosior*, in clusters over indeterminate areas; body thickly set with spines as in the other species, these more numerous than the pores over much of body, quite small dorsally, averaging $35-43\mu$ long in the mid-dorsal region, some, in clusters, accompanying the dorsal groups of large tubular trilocular pores, considerably larger and longer; ventrally, opposite the small dorsal spines, averaging $57-68\mu$ in length, offering a decided contrast to those of dorsum, those along margin the largest, the maximum length about 172μ ; without the lanceolate spines of *fuscus* or the specialized spine clusters of *crawfordi*, in this respect, as in the character of most of the pore types, resembling *pilosior*; anal tube as in the other species of the genus; ventral cicatrices arranged in transverse rows as in the other species but much more numerous, and in relatively broad bands instead of irregular single rows.

Immature stages.—None available for examination.

Adult male.—Elongate, slender, length about 4 mm., maximum width (of flattened abdomen) about 1 mm.; head, antennae and legs dull pale brownish, thoracic lobes darker, with a blackish tinge, the wings slightly darker than the body, the anterior apical area darkest, the anal area nearly transparent; anterior apex of head triangular, antennae attached on basal portion of angles, posterior portion of head quadrate with the compound eyes strongly protruding and bulging; ocelli large, one placed just within each compound eye and nearly opposite its anterior margin; antennae more than 8-segmented (broken), the segments from III on elongate and slender, more or less distinctly constricted medially and each bearing a subbasal and a subapical whorl of long slender hairs; legs elongate, slender, bearing numerous long slender setae, these rather spine-like ventrally on tibia and tarsus; tarsus tapering, and slightly curved, without digitules,

claw elongate, tapering, only slightly curved, without denticles, claw digitules slender setae, acute at apices, perhaps one-third the length of the claw, trochanters each usually with five pores above and below; thoracic spiracles large and conspicuous; abdomen elongate, parallel-sided, the margins of the anterior segments slightly bulging, those of the last three progressively more strongly protruding till the margins of the apical segment are produced into fingerlike fleshy protuberances some three or four times as long as wide; abdomen dorsally with transverse segmental rows of scattered quadrilocular gland pores and much more numerous slender setae, these last much longer at body margin, ventrally with setae only; abdomen probably with the same number of spiracles that are present in the female, but only the posterior ones plainly developed; sheath of penis elongate triangular, somewhat swollen at base and sharply pointed at apex, length 500μ , width at base 207μ .

Holotype and paratypes.—Cat. No. 25269, U.S.N.M.

This species has been described from six adult females and one male mounted on slides and from a number of unmounted females, all collected on *Eucalyptus* at Brisbane, Australia, by George Compere under his No. 1130.

MONOPHLEBULUS SUBTERRANEUS, new species.

Reference.—*Monophlebus*, sp. Koebele, U. S. Dept. Agri. Div. Ent. Bull. 21, 1890, p. 21.

Adult female.—Occurring on the roots of the host; elongate oval, strongly convex, broadest and somewhat swollen behind the middle, maximum length 22 mm., width about 10 mm., reddish brown, mottled in abdominal region with blackish (alcoholic specimen); color when received dead in Washington dull, dark brick red, according to notes made by Theodore Pergande; with only faint traces of secretory covering, also according to Pergande; body as flattened on slide rather uniformly oval, maximum length 22 mm., maximum width 14 mm.; derm rather more heavily chitinized than in related species, remaining yellow brown after treatment with potassium hydroxide; antennae small compared to size of body, 9-segmented, stout and tapering, the terminal segment longest, legs a little larger, but small and fairly stout, the heavy spines on the tibia and tarsus distinctly longer and more slender than those of the other species in the genus; beak small, more elongate triangular than in the other species of *Monophlebus*, very obscurely 2-segmented; thoracic and abdominal spiracles similar in number and appearance to those of related species, but with the pores accompanying each spiracle more numerous than with the other species; derm pores and setae each surrounded by a more or less distinct circular to oval clear area in the yellow brown derm; derm pores, in general, entirely comparable

with those of the other species of the genus, with small multilocular disk pores, with usually triangular or quadrangular centers in the mid-dorsal region, scattered but not all abundant or crowded, with similar but somewhat larger pores in the mid-ventral region, laterally with a broad band of scattered, distinctly larger pores with circular to indefinitely pentagonal centers and relatively long internal tube, similar to those of *pilosior*, the area of larger pores delimited externally, at least on the posterior abdominal segments, by a fairly continuous band of small body spines; large trilocular tubular pores apparently lacking in this stage; derm spines small, the maximum

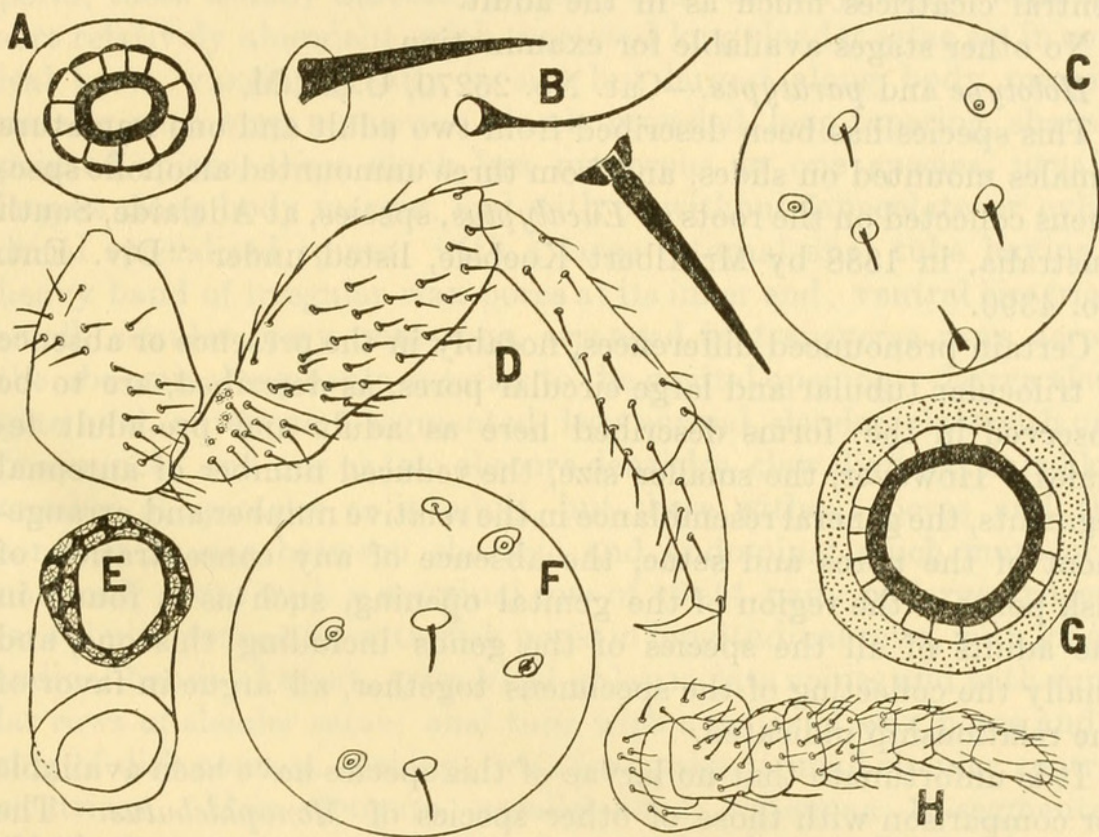


FIG. 8.—*MONOPHLEBULUS SUBTERRANEUS*, NEW SPECIES. A, ADULT FEMALE, DISK PORE, $\times 1,500$; B, ADULT FEMALE, SETAE AND SPINES, $\times 640$; C, ADULT FEMALE, SECTION OF DORSAL DERM JUST BEHIND POSTERIOR LEGS, $\times 165$; D, ADULT FEMALE, LEG, $\times 57.5$; E, PREADULT FEMALE, ANAL TUBE, $\times 165$; F, ADULT FEMALE, SECTION OF VENTRAL DERM IMMEDIATELY BELOW THAT FIGURED AT C, $\times 165$; G, ADULT FEMALE, DISK PORE FROM POSTERIOR PORTION OF ABDOMEN, $\times 1,500$; H, ADULT FEMALE, ANTENNA, $\times 57.5$.

length in the mid-dorsal region 39μ , in the mid-ventral region 57μ , dorsal spines averaging somewhat stouter and shorter than ventral; spines not conspicuously longer toward body margin, all spines relatively far less abundant and much more widely separated than in other species of the genus; body setae even more scattered than spines, a few near margin much longer; anal tube similar to that of other species in the genus; ventral cicatrices in irregular, transverse, single segmental rows in the abdominal region; in paired lateral clusters in thoracic region.

Intermediate stage female.—Elongate oval, slightly broader behind, convex, maximum length 9.5 mm., width 4.5 mm. dull brown; segmentation distinct; antennae 8-segmented; legs somewhat stouter than those of adult, beak similar, spiracles similar, but with fewer pores; derm pores, spines and setae similar in appearance and arrangement to adult except that the marginal setae appear longer, that there is no marginal abdominal band of setae, that the large tubular pores appear to be lacking and that there are from one to three of the long tubular pores behind each abdominal spiracle, and a similar number at the margin of the anterior body segments; anal tube and ventral cicatrices much as in the adult.

No other stages available for examination.

Holotype and paratypes.—Cat. No. 25270, U.S.N.M.

This species has been described from two adult and one immature females mounted on slides, and from three unmounted alcoholic specimens collected on the roots of *Eucalyptus*, species, at Adelaide, South Australia, in 1888 by Mr. Albert Koebele, listed under "Div. Ent. No. 4390."

Certain pronounced differences, notably in the presence or absence of trilocular tubular and large circular pores, as described, are to be observed in the forms described here as adult and pre-adult females. However, the smaller size, the reduced number of antennal segments, the general resemblance in the relative number and arrangement of the pores and setae, the absence of any concentration of disk pores in the region of the genital opening, such as is found in the adults of all the species of the genus including this one, and finally the collecting of the specimens together, all argue in favor of the relationship indicated.

It is unfortunate that no larvae of this species have been available for comparison with those of other species of *Monophlebulus*. The adult female of this species diverges much more widely from the characteristic structural condition of the genus than does any of the other species, and without the the location of the trilocular tubular pores in the immature form its assignment to this genus would have been open to question. The main points of difference distinguishing this species from others of the genus are indicated in the key which follows.

The addition of four species, including two with known males, to this genus makes it necessary to alter to some extent the generic diagnosis given in a previous paper, and to add a diagnosis of the male stage to it. The following is therefore given as a revised characterization of this genus:

Monophlebinae forms living on *Eucalyptus*, adult female elongate ovate, covered with more or less loose white secretion usually con-

taining numerous glassy threads, probably always secreting a mass of white fluffy matter at oviposition; antennae 7-9-segmented, tapering, terminal longest; legs well developed, stout, the tarsus, tibia, and in some species, the femora, bearing numbers of stout spines; these less developed in one species; beak indistinctly 2-segmented, short and stout; with two pairs of thoracic and seven pairs of abdominal spiracles, the first much larger, the abdominal pairs cylindrical and with a cluster of pores around the opening of each; derm usually with large tubular trilocular ducts (responsible for the glassy threads of the secretion), with one to three different sorts of multilocular disk pores, these usually different dorsally and ventrally, and at least one sort relatively abundant, with scattered long slender setae set in conical bases, varying greatly in size but largest along body margin, usually with very numerous, closely crowded, long tapering, sharply pointed spines, these much less numerous in one species, usually largest along body margin, and with or without lanceolate or cylindrical specialized spines; with a large internal anal tube having a heavy band of irregular wax pores at its inner end; ventral cicatrices small, circular, very numerous, arranged in transverse rows across the abdominal segments anterior to the genital opening. Larva elongate oval, antennae 5-segmented, legs normal, slender, claw with one pronounced and one or two obscure denticles, claw digitules hair-like, number of spiracles as in adult, but these without pores and the contrast in size between thoracic and abdominal much more pronounced; derm with a marginal row of 13-14 pairs of large trilocular tubular pores, and with disk pores in longitudinal rows, with longitudinal bands of stout, cylindrical or lanceolate spines and with similar rows of slender setae; anal tube with a collar of wax pores and a ring of disk pores at opening; with four pairs of small circular ventral cicatrices. Male elongate, parallel-sided, antennae 10-segmented (Maskell), segments, except basal, constricted medially and bearing two whorls of hairs on each; apex of head triangular; compound eyes large, protruding, ocelli large; wings not unusual; abdomen elongate, parallel-sided, with spiracles; apical margin of segments more or less produced into fleshy finger-like appendages; penis sheath stout, tapering to an acute point.

On the basis of our present knowledge, the genus is exclusively Australian in its geographic distribution.

The principal distinguishing characters of the adult females of the included species are to be found in the character and proportional abundance of the derm pores and setae, structures whose differences are quite apparent on comparison but are difficult to express in words.

An attempt to indicate these is made in the following key to the species of the genus:

*a*¹. Derm with specialized, usually lanceolate or cylindrical spines; derm disk pores of two sorts only.

*b*¹. Disk pores of two sorts, smaller trilocular, and large multilocular with oval to quadrilocular centers; specialized spines stout lanceolate, apparently scattered; antennae 7-segmented; size small (about 6 mm.).

fuscus Maskell.⁵

*b*². Disk pores mostly multilocular with large trilocular centers, smaller dorsally, larger ventrally, rarely, in genital region, with oval centers, trilocular tubular pores, occurring only at and near body margin; with clusters of small, slender, cylindrical to somewhat lanceolate specialized spines along body margin, especially in abdominal region; ventral cicatrices in single irregular rows; antennae 8-9-segmented; size larger, 8-14 mm.

crawfordi (Maskell).

*a*². Specialized spines wanting, only the long slender conical sort present; ventrally and at margin with large tubular multilocular disk pores with circular centers, not found in preceding species, making three sorts of disk pores.

*c*¹. Dorsal disk pores not appearing multilocular, but tri- or quadrilocular; derm spines crowded and abundant, tibia and tarsus with heavy spines; large tubular trilocular pores present; derm only slightly chitinized at maturity; size smaller, length not over 16 mm.; living on the trunks or branches of the host.

*d*¹. Dorsal disk pores normally with quadrilocular centers; derm spines large and closely crowded, distinctly more abundant than pores; dorsal and ventral spines in middle region of body averaging approximately the same length; ventral cicatrices in single irregular row; antennae 8-9-segmented..... *pilosior* (Maskell).

*d*². Dorsal disk pores normally with trilocular centers; derm spines not so numerous, not distinctly more numerous than pores; dorsal spines in middle region of body averaging much smaller than ventral in same region; the ratio approximately 6 to 10; ventral cicatrices more numerous, in transverse bands several pores wide; antennae 7-segmented.

comperei, new species.

*c*². Dorsal disk pores multilocular, with triangular or quadrangular centers; derm spines comparatively few, widely separated; tibia and tarsus with the spines longer and more slender; large trilocular tubular pores apparently wanting; derm relatively heavily chitinized at maturity; size large, 20-22 mm.; ventral body spines slightly longer than dorsal; abdominal cicatrices in single irregular rows; antennae 9-segmented; living on the roots of the host..... *subterraneus*, new species.

The larva of *M. fuscus* offers two definite characters which differentiate it from those of *crawfordi* and *pilosior*. These are the presence of thirteen instead of fourteen pairs of large, trilocular, tubular marginal pores, and the presence of a relatively decidedly shorter and stouter third antennal segment. No distinguishing characters have been observed between larvae of *crawfordi* and *pilosior* in the limited material available for examination.

Regarding Maskell's various comments on these species, particular mention may be made of his use of the presence or absence of a

⁵ Included after the study of only a small portion of one specimen.

"long white anal setae" as of value in separating *crawfordi* and *pilosior*. It seems evident that this refers to a hollow wax tube secreted for the purpose of conveying the liquid excrement into the open from the usual location of the insect beneath the back of the host, and equally evident from an examination of the anal tube of these insects that all of these species possess the structures necessary for the production of such a wax tube.

NODULICOCCUS, new genus.⁶

Monophlebinae coccids, living on *Eucalyptus* in Australia; adult female oval, broader behind; antennae 9-segmented, tapering very strongly; legs normal; beak incompletely 2-segmented; with two thoracic and seven abdominal pairs of spiracles, the former with a cluster of pores at opening of each, the latter with a band of pores around opening of each; derm pores of two sorts, triangular, and multilocular disk with triangular or oval centers; derm with very stout, rounded conical spines dorsally and somewhat longer and more slender spines with rounded tips ventrally; derm setae of two sorts, stout, tapering but with bluntly rounded tips, not very long, and normal, slender, tapering, acute setae; anal tube short, with a band of irregular wax pores at inner end; ventral cicatrices intermediate in number, arranged in a semicircle. Larva elongate, outline irregular; antennae 5-segmented; legs normal; with a single pair of large apical setae, body dorsally with many small buttonlike tubercles, and laterally with clusters of fingerlike tubercles; dorsally also with small triangular disk pores and small setae set in stout bases.

The characters which cause this genus to diverge from any other known to the writers are found chiefly in the larva, in the curious development and modification of what are presumably to be considered as the dorsal cylindrical spines of the larvae of some other genera. The nature of the other larval characters and of many of those found in the adult seem to justify the inclusion of this genus with the group comprising *Monophlebulus*, *Walkeriana*, and others, although in no respect can *Nodulicoccus* be regarded as characteristic of the group, and it is probably the most widely divergent from the typical condition of any form that will be included in this group of genera. Why Maskell considered the type species *levis* as only a variety of his *Monophlebus crawfordi*, particularly after an examination of the larva of the species, is wholly incomprehensible.

NODULICOCCUS LEVIS (Maskell).

Plate 1, fig. 4.

Reference.—*Drosicha crawfordi*, var. *levis* (Maskell), Fernald Cat. Cocc. World, 1903, p. 19.

The Maskell collection includes two slides of this species, one of "adult female, 1892," the other of "larva, 1893," and two unmounted

⁶New genera should be credited to the senior author only.

adults, one much larger than the other, bearing the Maskell No. 284. Only the two slides have been available for microscopic study.

Adult female.—External appearances described by Maskell; apparently naked; shape as mounted on slide elongate ovate, distinctly broadened behind, length 10 mm., maximum width 6.5 mm., derm clearing completely on treating with potassium hydroxide; antennae 9-segmented, small, the basal segment greatly enlarged, the intermediate segments transverse, the apical elongate, almost lanceolate, the whole antenna tapering strongly from base to apex; legs very large and stout as compared with the antennae, with rows of slender spines on tarsus, tibia, and femur, claw entire, but the inner face often roughened, with two claw digitules of uncertain character (all broken); beak small, short, stout, incompletely 2-segmented; with two pairs of thoracic and seven pairs of abdominal spiracles similar in general to those of *Monophlebulus*, the abdominal located ventrally near margin, each with a collar of pores three wide around its opening; derm with pores of three sorts, small trilocular, scattered over most of the upper surface of the body, somewhat larger multilocular disk, with triangular, circular or short oval centers, found particularly dorsally around anal ring opening, and considerably larger multilocular disk with elongate oval centers, occurring over most of the ventral abdominal area, and most numerous around the genital opening; derm spines very short, stout and blunt dorsally, longer but still stout with rounded apices toward the margin ventrally, abundant but not closely crowded, most numerous in a poorly defined band running around the body ventrally just inside the abdominal spiracles; derm setae (as distinguished from spines by possession of basal collar) of two sorts, one short, stout, tapering but with bluntly rounded tips, the other, the normal slender, acutely pointed sort, usually much longer than the first, and found mostly around the anal opening and along the body margin; anal tube short, but of indeterminate length, with an external band of irregular wax pores, and on the dorsum immediately around the opening, a band of small setae, each pointing out, and, well outside of this, a single circle of very much larger, long, stiff setae; ventral cicatrices eleven in number, arranged in a semicircle about opposite the anal opening, the anterior four on each side circular to oval, the posterior three elongate, the size decreasing more or less continuously from the middle to apex of each horn.

Larva.—Elongate, somewhat wider about the middle, outline irregular, length 928μ , maximum width 400μ , anterior apex tapering somewhat; eyespots prominent, conical, antennae 5-segmented, the third and fifth longest, the third sometimes with a suggestion of a further diversion; legs long; terminal portions slender; claw with three more or less pronounced denticles on apical half; beak very short and stout, segmentation not discernible; spiracles not discernible; derm dorsally with a few trilocular disk pores in longitudinal

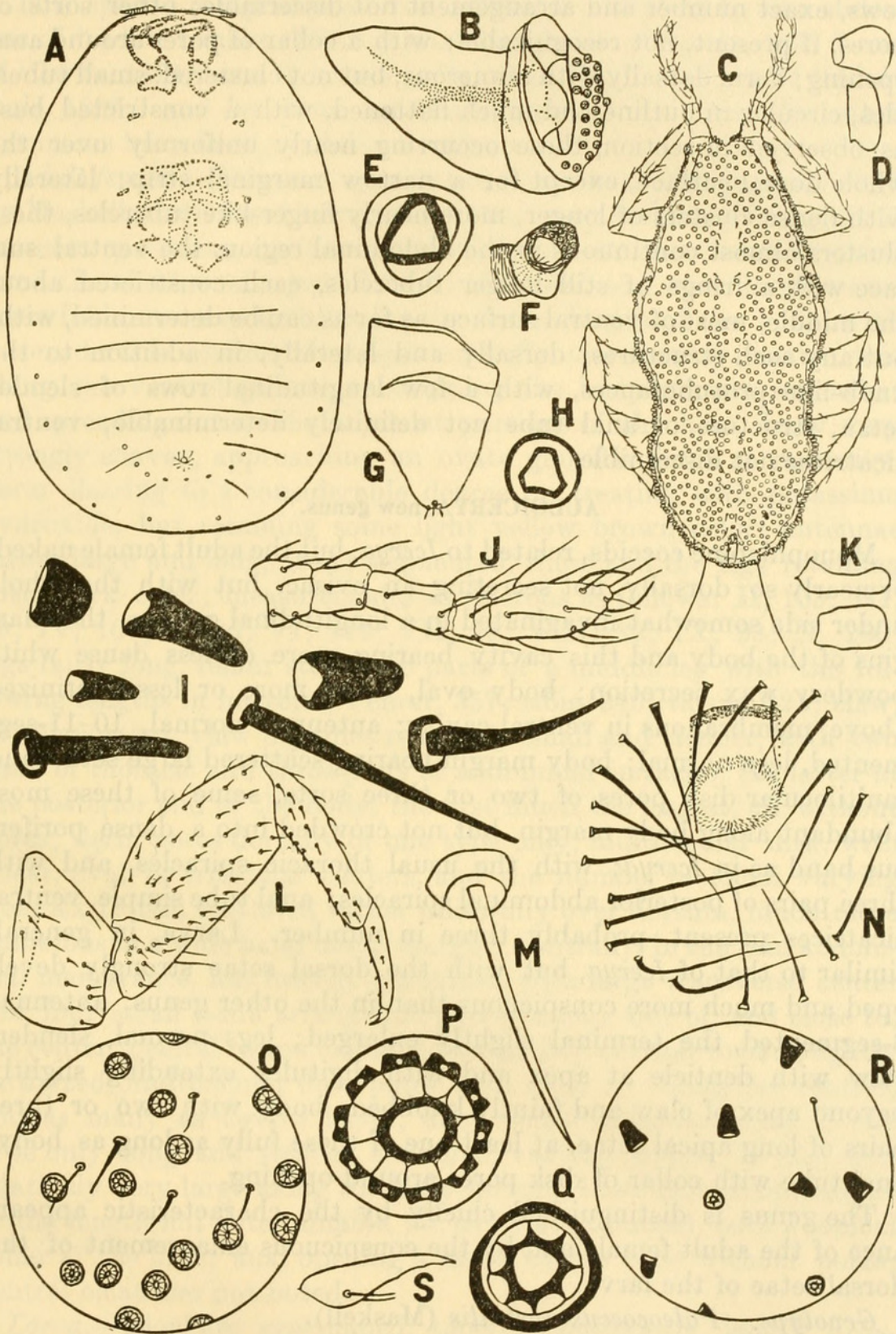


FIG. 9.—*NODULICOCCLUS LEVIS* (MASKELL). A, ADULT FEMALE, OUTLINE FROM ABOVE, $\times 57.5$; B, ADULT FEMALE, THORACIC SPIRACLE, $\times 115$; C, LARVA, OUTLINE FROM ABOVE, $\times 57.5$; D, LARVA, DORSAL "SPINES," $\times 640$; E, ADULT FEMALE, DERM PORE, $\times 1,500$; F, ADULT FEMALE, ABDOMINAL SPIRACLE, $\times 115$; G, ADULT FEMALE, BEAK, $\times 57.5$; H, LARVA, DISK PORE, $\times 1,500$; I, ADULT FEMALE, DERM SPINES AND SETAE, $\times 640$; J, LARVA, ANTENNA, $\times 165$; K, LARVA, MARGINAL "SPINES," $\times 640$; L, ADULT FEMALE, LEG, $\times 57.5$; M, LARVA, SETA, $\times 1,500$; N, ADULT FEMALE, ANAL RING AREA $\times 57.5$; O, ADULT FEMALE, SECTION OF VENTRAL DERM ANTERIOR TO ANAL RING, $\times 220$; P, ADULT FEMALE, DISK PORE, $\times 1,500$; Q, ADULT FEMALE, DISK PORE, $\times 1,500$; R, ADULT FEMALE, SECTION OF DORSAL DERM ANTERIOR TO ANAL RING, $\times 220$; S, LARVA, CLAW, $\times 640$.

rows, exact number and arrangement not discernible; other sorts of pores, if present, not recognizable; with a collar of pores around anal opening; derm dorsally with numerous, but not clustered, small tubercles, circular in outline and much flattened, with a constricted base as observed in section, these occurring nearly uniformly over the whole dorsal surface, except for a narrow marginal strip; laterally with dense clusters of longer, more nearly finger-like tubercles, these clusters almost continuous in the abdominal region, the ventral surface with a fringe of still longer tubercles, each constricted about the middle, most of ventral surface, as far as can be determined, without any such structures; dorsally and laterally, in addition to the knob-like protuberances, with a few longitudinal rows of slender setae; structure of anal tube not definitely determinable; ventral cicatrices not discernible.

AULOICERYA, new genus.⁷

Monophlebine coccids, related to *Icerya*, but the adult female naked, or nearly so, dorsally, not secreting an ovisac, but with the whole under side somewhat invaginated in a longitudinal groove, the margins of the body and this cavity bearing more or less dense white powdery wax secretion; body oval, derm more or less chitinized above, membranous in ventral cavity; antennae normal, 10-11-segmented, legs normal; body margin bearing scattered large setae and multilocular disk pores of two or three sorts, some of these most abundant along body margin, but not crowded into a dense poriferous band as in *Icerya*; with the usual thoracic spiracles, and with three pairs of posterior abdominal spiracles; anal tube simple, ventral cicatrices present, probably three in number. Larva, in general, similar to that of *Icerya*, but with the dorsal setae strongly developed and much more conspicuous than in the other genus; antennae 6-segmented, the terminal slightly enlarged; legs normal, slender, claw with denticle at apex and with digitules extending slightly beyond apex of claw and faintly knobbed; body with two or three pairs of long apical setae, at least one of these fully as long as body; anal tube with collar of disk pores around opening.

The genus is distinguished chiefly by the characteristic appearance of the adult female and by the conspicuous enlargement of the dorsal setae of the larva.

Genotype.—*Paleococcus australis* (Maskell).

AULOICERYA AUSTRALIS (Maskell).

Plate 1, fig. 5.

References.—*Paleococcus australis* (Maskell), Fernald Cat. Cocc. World, 1903, p. 21.—*P. rosae australis* (Maskell), Sanders, U. S. Dept. Agri. Bur. Ent. Tech. Ser. 16, pt. 3, 1909, p. 34.

⁷ New genera should be credited to the senior author only.

This species is represented in the Maskell collection by five slides, one of "adult female, 1894," one of "antennae of female, 1893," one of "larva, 1894," one of "male larva, alate, 1896," and one of "adult male, 1896," and by some specimens bearing No. 389. No other specimens have been available for study.

Adult female.—External appearance of mature females as described by Maskell, the colored spots of secretion very indistinct in the dried museum specimens, uniform dark reddish brown, maximum length 6 mm., the abdominal region dorsally shriveled and with large transverse folds, concave beneath for the entire length of the body, with a considerable amount of compacted fluffy secretory matter, this filling the ventral groove, overlapping the body margin somewhat and spreading out on the adjacent portions of the host; body very strongly convex, approaching an ovate globular form at maturity; derm clearing to a considerable degree on treating with potassium hydroxide, but retaining some light yellow brown color; antennae rather large and long, 10–11 segmented, these and the legs retaining their dark color; measurements in microns as follows: II, 103; III, 89; IV, 107; V, 86; VI, 114; VII, 78; VIII, 82; IX, 93; X, 200; legs fairly long, femur stout, the parts of a middle leg with the following lengths in microns: Femur, 357; tibia, 346; tarsus, 321; claw, 89; claw stout, claw digitules relatively small and slender, with two pairs of thoracic and three pairs of abdominal spiracles, the latter at the posterior end of the body, the first much the largest, all without pores; derm pores dorsally of one type only, multilocular disk, with linear, oval, or trilocular centers, and the number of loculi varying from six to ten, scattered rather uniformly over dorsum, much more numerous in a wide band along margin; ventrally, in the thin abdominal membrane, less heavily chitinized, with large transverse center and four small loculi arranged in pairs on each side of, and close to, the center; genital region closely crowded with circular to oval, lightly chitinized, multilocular disk pores with oval or triangular centers, and as many as twelve loculi; derm setae, so far as noted, of one type only, long and slender, scattered, varying greatly in size, and relatively very large along the body margin, these last all broken, so actual length not determinable, all, so far as examined, with a conical collar at the base; anal opening a short, simple tube without pores; ventral cicatrices not noted.

Larva.—Elongate egg-shaped, tapering posteriorly, length 875μ , width 494μ , antennae 6-segmented, all but the first slender, the last strongly clavate, of normal, *Icerya*-like form, the measurements of one in microns as follows: I, 50; II, 61; III, 71; IV, 46; V, 54; VI, 143; legs slender, measurements in microns of a middle leg, femur, 140; tibia, 211; tarsus, 164; claw, 39; claw with a tiny denticle

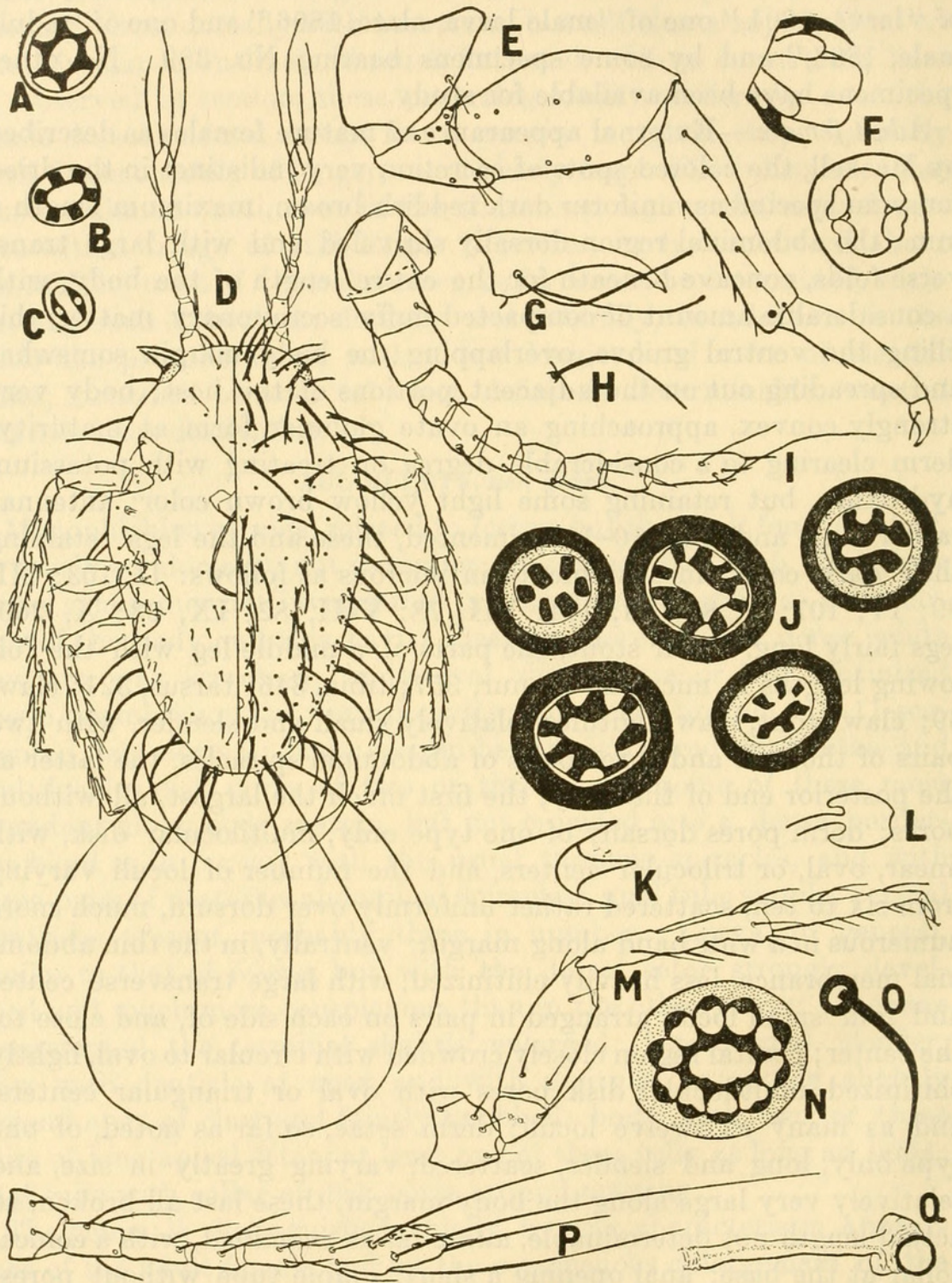


FIG. 10.—*AULOICERYA AUSTRALIS* (MASKELL). A, LARVA, DISK PORE FROM AROUND ANAL RING, $\times 1,500$; B, LARVA, DORSAL DISK PORE, $\times 1,500$; C, LARVA, VENTRAL DISK PORE, $\times 1,500$; D, LARVA, DORSAL AND VENTRAL, $\times 57.5$; E, ADULT FEMALE, LEG, $\times 57.5$; F, ADULT FEMALE, DISK PORE, TWO VIEWS, $\times 1,500$; G, LARVA, CLAW, $\times 640$; H, LARVA, SETA, $\times 115$; I, ADULT FEMALE, ANTENNA, $\times 57.5$; J, ADULT FEMALE, VARIATIONS IN MORE ABUNDANT DISK PORES, $\times 1,500$; K, LARVA, TRICUSPIDATE APEX OF SETA, $\times 1,500$; L, LARVA, ABDOMINAL SPIRACLE, $\times 1,500$; M, LARVA, LEG, $\times 115$; N, ADULT FEMALE, VENTRAL DISK PORE FROM REGION OF VAGINAL OPENING, $\times 1,500$; O, ADULT FEMALE, DERMAL SETA, $\times 500$; P, LARVA, ANTENNA, $\times 115$; Q, ADULT FEMALE, ABDOMINAL SPIRACLE, $\times 500$.

near tip, and slender, delicate digitules with a slight apical knob, longer than claws; beak very broad, short triangular, length in microns 89, width 143; number and position of spiracles as in adult, difference in size even greater than in adult; dorsally with four longitudinal rows of tiny multilocular disk pores; ventrally with some longitudinal rows of small setae; dorsally with a few small setae in longitudinal rows, and with others, much larger and stouter and with stout, tricuspidate apices in three rows on each body half, one submedian, one marginal, the third intermediate, at least in the abdominal region, an average length for the median row $68-89\mu$, of the in-

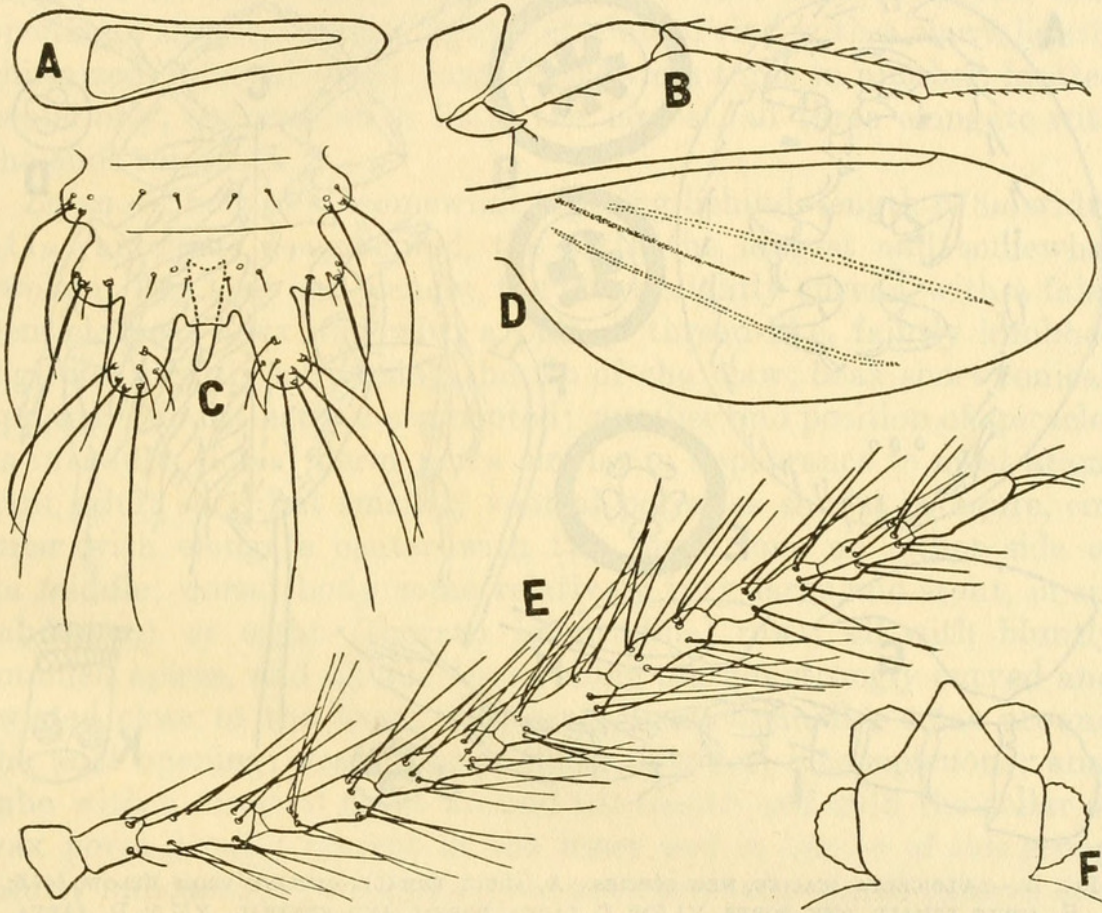


FIG. 11.—AULOICERYA AUSTRALIS (MASKELL). ADULT MALE. A, SHEATH OF PENIS, $\times 115$; B, LEG, $\times 57.5$; C, APEX OF ABDOMEN, $\times 57.5$; D, WING, $\times 30$; E, ANTENNA, $\times 57.5$; F, OUTLINE OF HEAD, $\times 57.5$.

termediate $75-100\mu$, of the marginal $100-150\mu$, all these normally more or less curved, the marginal strongly so; with three pairs of long primary apical setae, the inner, the shortest, about 642μ , the middle about 821μ , the outer about 607μ ; anal tube normal, with a double band of pores at its inner end and a single continuous circle of disk pores around its mouth; no ventral cicatrices observed.

Adult male.—No attempt has been made to redescribe the male, but some figures showing some of the structural characters are appended.

Cotype.—Cat. No. 25271, U.S.N.M.

AULOICERYA ACACIAE, new species.

Adult female.—Specimens originally preserved in a fluid which has evaporated, so nothing can be stated as to the normal secretory covering of the insect; the shriveled insects strongly wrinkled, with the margin distinctly flattened, and a more or less pronounced hollow beneath; general color of body blackish brown, the thin margins very much lighter, pale reddish brown, translucent; legs and antennae black; body oval, evidently strongly convex in life; length flattened on slide about 8 mm., width about 6 mm.; derm retaining a faint

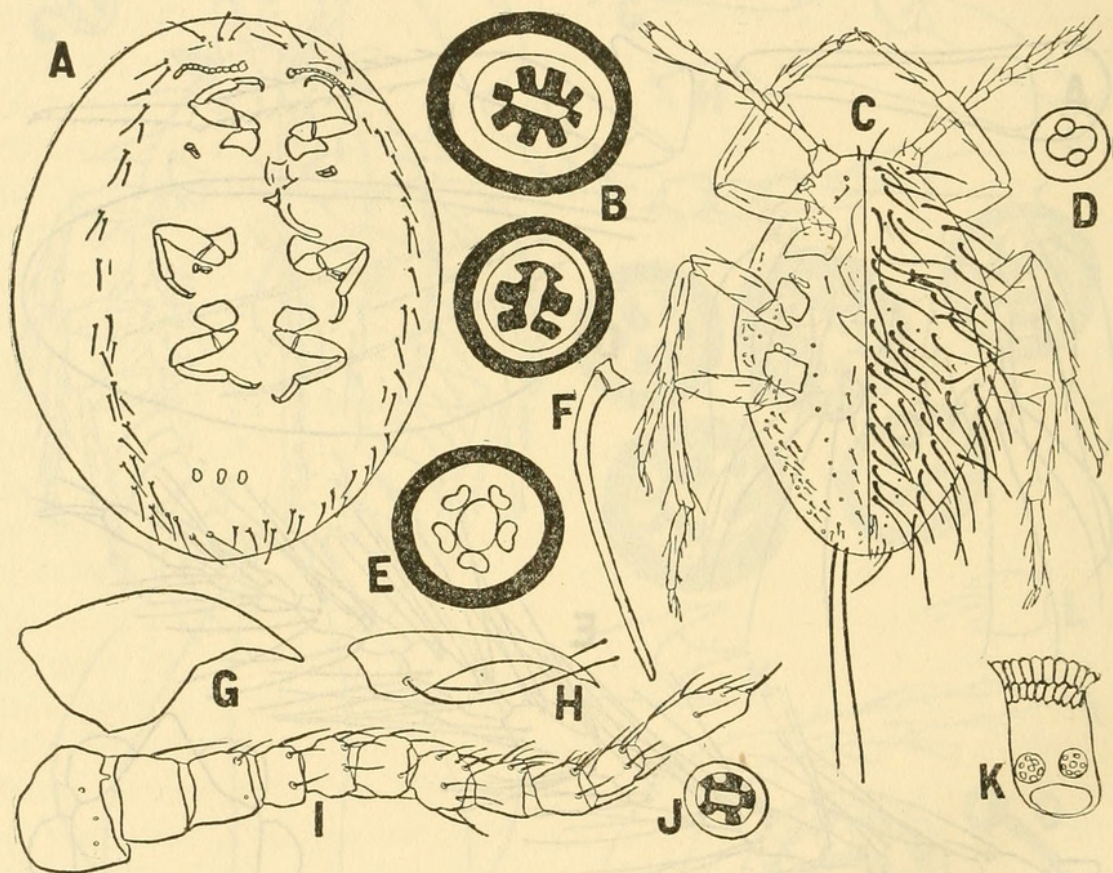


FIG. 12.—AULOICERYA ACACIAE, NEW SPECIES. A, ADULT FEMALE, OUTLINE FROM BELOW, $\times 7.5$; B, ADULT FEMALE, DISK PORES, $\times 1,500$; C, LARVA, DORSAL AND VENTRAL, $\times 57.5$; D, LARVA, VENTRAL PORE, $\times 1,500$; E, ADULT FEMALE, DISK PORE, $\times 1,500$; F, LARVA, DORSAL SETA, $\times 220$; G, ADULT FEMALE, CLAW, $\times 220$; H, LARVA, CLAW, $\times 220$; I, ADULT FEMALE, ANTENNA, $\times 57.5$; J, LARVA, DISK PORE, $\times 1,500$; K, LARVA, ANAL TUBE, $\times 500$.

yellowish tinge after treatment with potassium hydroxide; antennae normally 11-segmented, the basal cylindrical, the intermediate indistinctly moniliform, the apical elongate and longest, color blackish brown, even after treatment; legs moderately large, rather stout, darker than antennae, trochanters with two special pores on each face, with relatively few hairs, and the tibia and tarsus beneath with a few spines, each stout at base but tapering to an acute apex; beak short and stout, tapering, number of segments not determinable; with the usual two pairs of thoracic spiracles, the posterior somewhat larger and more expanded at inner and outer ends, and each with a

loose cluster of disk pores just beyond its opening; with three pairs of much smaller, simple, abdominal spiracles located at the posterior apex of the body; derm pores all of the multilocular disk type but varying in size and appearance as shown in figure, and including, in the region of the genital opening, the larger multilocular pores with thin wall, as figured for the genotype; body with a number of relatively very large, stout, blackish setae, with stout heavily chitinized bases, scattered along the margin all the way round and among these and over the rest of the body, but never clustered or crowded, much smaller, relatively inconspicuous, pale setae, varying considerably in size, and on the average a little less abundant than the pores; anal opening a simple, circular, lightly chitinized ring with a short, lightly chitinized, internal tube; ventral cicatrices three in number, located posteriorly, the median a little the largest, all three elongate with the ends rounded.

Larva.—Short oval, somewhat tapering behind, length 678μ , width 411μ ; antennae 6-segmented, the sixth the longest and somewhat swollen; legs long and slender, the claws slightly curved, with a faint denticle near apex and with a pair of thread-like, faintly knobbed digitules slightly surpassing the tip of the claw; beak short conical, appearing indistinctly 2-segmented; number and position of spiracles as in adult; dorsal derm pores similar in appearance to most abundant adult sort, but smaller, ventral pores, as shown in figure, circular with elongate center with two loculi, one on either side of its middle; dorsal body setae relatively very large and stout, in six (abdomen) or eight (thorax) longitudinal rows, all with bluntly rounded apices, and all but those along margin strongly curved and twisted close to the base; with several much smaller setae around the anal opening; ventral setae small, slender, inconspicuous; anal tube with a circle of pores around the mouth and with the collar of wax pores usually present at the inner end in larvae of this group faintly indicated; ventral cicatrices not observed; apical setae in two pairs, broken, but probably about as long as the body.

Holotype and *paratypes*.—Cat. No. 25272, U.S.N.M.

This species has been described from one adult female and one larva mounted on slides, and from two or three unmounted females, collected on *Acacia hueglini*, Swan River, West Australia, by George Compere (No. 950).

In view of the lack of information regarding the normal habit characteristics of the adult female of this second species and certain structural divergences in the larvae, there is some question as to the correctness of the generic association indicated. With the limited material available for comparison, no definite key for separating the adults can be given; however, in *australis* the pores in the marginal band appear to be about twice as numerous for the same area as in

acaciae, while the reverse of this condition appears to hold in regard to the large marginal setae, these being much more conspicuous and more numerous in *acaciae* than in *australis*. The larvae may be very readily differentiated by an examination of the large dorsal setae, these having slightly enlarged, usually tricuspidate apices in *australis* and bluntly rounded apices in *acaciae*, and by the presence of three pairs of long apical setae and some shorter, lateral slender setae in *australis* in contrast to the two apical pairs and the lack of lateral slender setae in *acaciae*.

Genus STEATOCOCCUS Ferris.

STEATOCOCCUS NUDATUS (Maskell).

Reference.—*Paleococcus nudatus* (Maskell), Fernald Cat. Cocc. World, 1903, p. 22.

This species is represented in Maskell's collection by two slides as follows: One of "adult female, 1895," and one of "larva, 1895." No unmounted specimens have been located, although according to Maskell's notebook there should be some present under No. 475. Additional specimens from the National Collection of Coccidae, collected by George Compere (No. 361), at Corawa, New South Wales, "on various species of grass" have been available for comparative study.

Adult female.—Maskell's description of the external appearance of of this insect sufficiently characteristic; abdominal cavity largely filled at maturity by a dermal sac, invaginated from a point on the center of the abdomen just posterior to the hind legs, in which the eggs are presumably laid, and from which the larvae emerge, the entrance to the sac indicated by a somewhat transverse oval opening, the posterior border of this forming a heavily chitinized rim, the anterior hardly distinguishable from the adjacent derm, all this overlooked by Maskell; specimens as mounted on slides as much as 6 mm. long by 5 mm. wide, egg-shaped, broadest behind the middle; derm clearing almost completely on treating with potassium hydroxide; antennae moderate in size, 10-segmented, not unusual; legs large and stout, the claw stout, the digitules slender; beak short and stout, indistinctly 2-segmented; with two pairs of large thoracic and three pairs of much smaller abdominal spiracles, the latter at the posterior end of the body, the thoracic much the larger, all simple; derm with small, circular to somewhat oval, disk pores scattered widely and rather uniformly over the surface both dorsally and ventrally, with circular, triangular or oval centers, the latter predominating, and about nine loculi, also some with fewer loculi, perhaps the same sort incompletely developed; dorsally in anal ring region and ventrally and internally in genital region with somewhat larger, less heavily chitinized circular pores, these quite crowded in the genital region,

and finally with an irregular band of considerably larger, scattered, circular, tubular, open center pores, similar to those of *Icerya seychellarum* and *purchasi*, for example, each with about six to eight widely separated loculi; these also occurring between head and anal opening in about six clusters; derm setae, so far as noted, of one sort only, long, slender, tapering, all with a distinct basal collar,

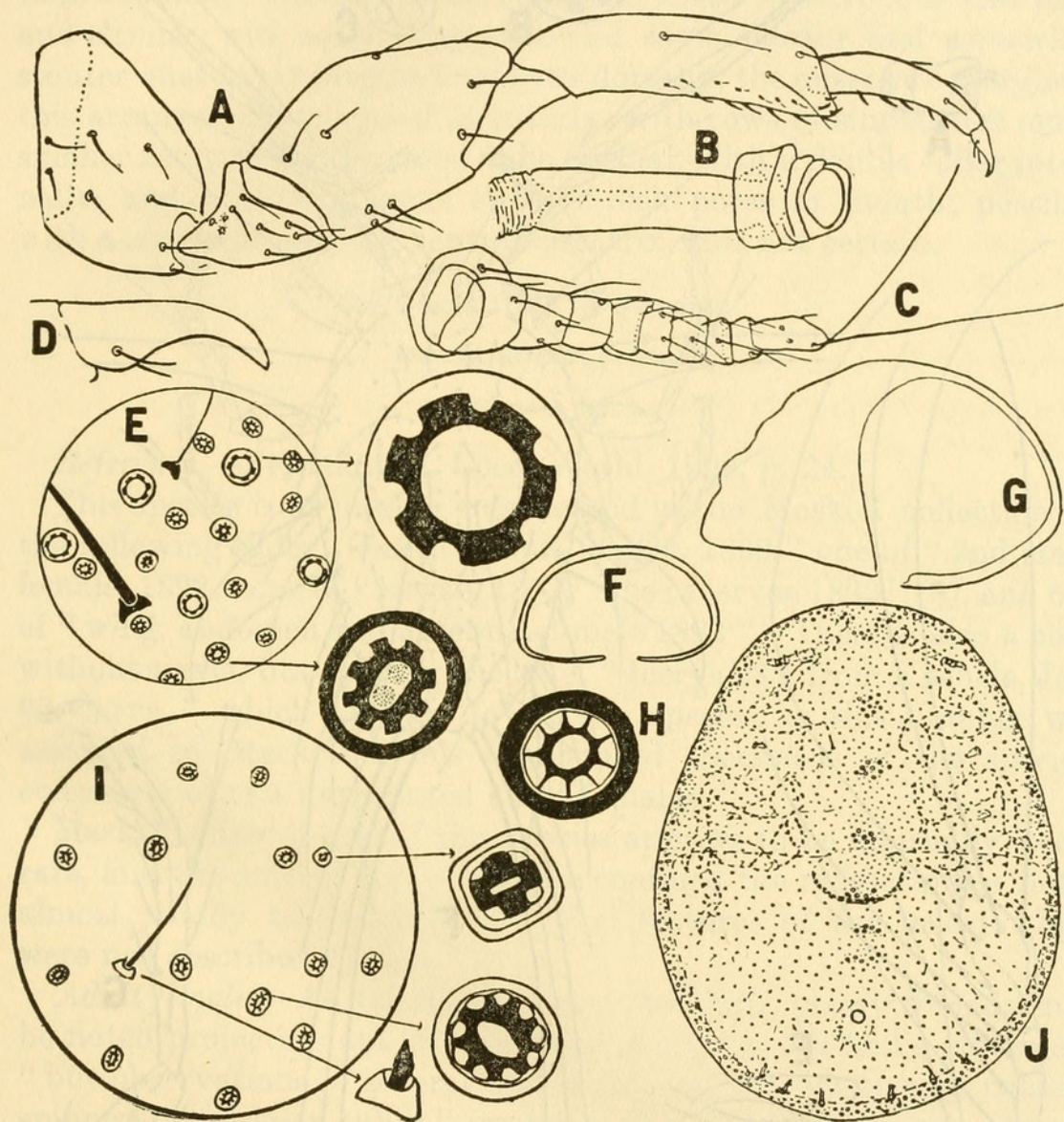


FIG. 13.—*STEATOCOCCUS NUDATUS* (MASKELL). ADULT FEMALE. A, LEG, $\times 57.5$; B, ABDOMINAL SPIRACLE, $\times 440$; C, ANTENNA, $\times 57.5$; D, CLAW, $\times 165$; E, SECTION OF DORSAL DERM ANTERIORLY AT MARGIN, $\times 220$, WITH DETAILS OF PORES, $\times 1,500$; F, CROSS SECTION THROUGH ABDOMEN (DIAGRAMMATIC); G, LONGITUDINAL VERTICAL SECTION THROUGH BODY, $\times 7.5$; H, DISK PORE, $\times 1,500$; I, SECTION OF DORSAL DERM, $\times 220$, WITH DETAILS OF PORES AND SETA BASE, $\times 1,500$; J, OUTLINE OF BODY FROM ABOVE, $\times 12$.

these setae varying greatly in size and relatively very large along the body margin and in the anal ring region; anal opening a simple ring with a short, simple, somewhat chitinized tube; with a single, large, approximately circular, ventral cicatrix.

Larva.—Elongate ovid, broadest before the middle, length about 821μ , width about 465μ ; antennae 6-segmented, the measurement in

microns as follows: I, 57; II, 64; III, 54; IV, 54; V, 39; VI, 136; legs normal, slender, length of a middle one in microns, femur, 150; tibia, 200; tarsus, 150; claw, 43, claw with a single pronounced den-

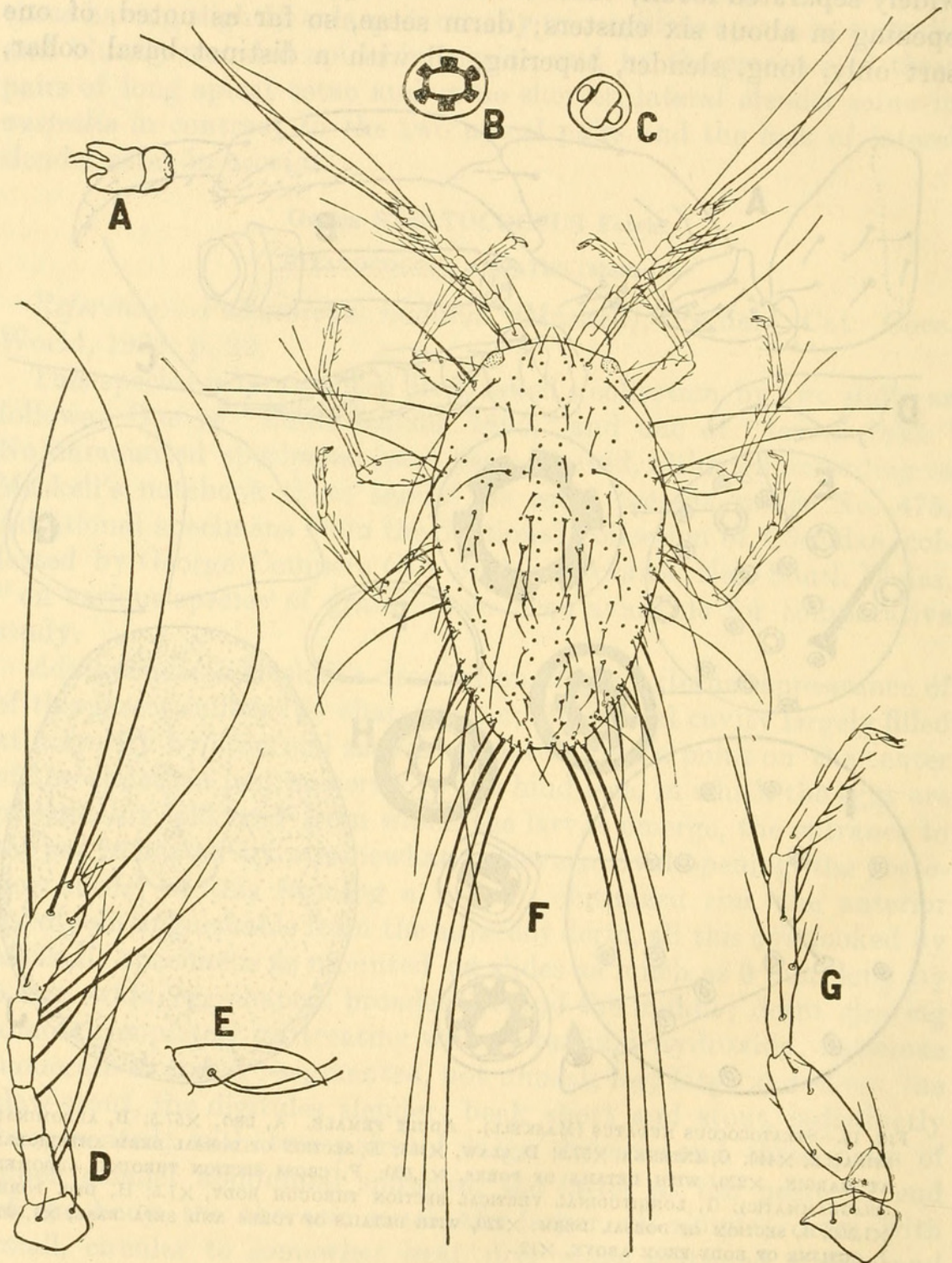


FIG. 14.—*STEATOCOCCUS NUDATUS* (MASKELL). LARVA. A, ABDOMINAL SPIRACLE, $\times 1,500$; B, DORSAL DISK PORE, $\times 1,500$; C, VENTRAL DISK PORE, $\times 1,500$; D, ANTENNA, $\times 115$; E, CLAW, $\times 440$; F, OUTLINE, $\times 57.5$; G, LEG, $\times 115$.

ticle near apex, digitules slender, delicate, longer than claws, with a slight knob at apex; beak short and stout; spiracles as in adult; dorsally with eight longitudinal rows of small, oval, multilocular disk

pores, the inner submedian, the outer marginal, at least in the abdominal region; ventrally with a single submarginal row of circular bilocular pores with large and elongate centers, and finally with an interrupted circle of round pores with six loculi around the anal opening; derm setae all slender, all with basal collars, with three pairs of long, primary setae at the posterior apex of abdomen, these longer than the body, lateral abdominal setae much shorter, but still long and slender, with some long setae and some shorter and somewhat stouter ones in six longitudinal rows dorsally, the outer two marginal, this arrangement confused anteriorly; with rows of similar but much smaller setae ventrally; anal tube normal, with a double collar internally, and a discontinuous circle of disk pores at mouth; possibly with a single protruding ventral circatrix, this not certain.

Genus ICERYA Signoret.

ICERYA KOEBELEI Maskell.

Plate 2, fig. 1.

Reference.—Fernald Cat. Cocc. World, 1903, p. 24.

This species is at present represented in the Maskell collection by the following slides: One of "adult female, 1892," one of "2nd stage female, 1892," one of "larvae, 1892," one of "larvae 1892" (3), and one of "wing, abdomen and antenna of male 1892." There is also a slide without name, but bearing the label "Icerya 283, from Koebele, Jan. 92, larva," which appears to be this species, as this number was assigned by Maskell to his unmounted specimens of the species, consisting of two unmounted adult females.

Maskell's description of this species appears to be unusually accurate, and the writers have therefore confined the redescriptive notes almost wholly to certain anatomical features of the insect which were not described by him.

Adult female.—As described, except that long, glassy threads may be noted projecting out of the body secretion, Maskell's statement "but observations of several specimens did not show any tubular spinnerets or glassy tubes," implying that these are wanting; length 2.5 mm., derm clearing completely on treating with potassium hydroxide, bearing numerous, long, conspicuously blackish, hair-like setae, these not plainly segregated in tufts as in *purchasi*; antennae of the usual form for the genus, 10-segmented; legs normal; with two pairs of thoracic and, so far as can be determined, two pairs of abdominal spiracles, these located at the posterior apex of the body and with the hinder pair larger; derm pores, as in *purchasi*, of two sorts the smaller circular to oval, with oval centers and six to eight loculi, these scattered abundantly over the body, the larger circular, short tubular, with an open circular center with a little point on one

side, and about 8-10 loculi, these pores apparently confined to the body margin; ventral ovisac secreting pore band made up of pores

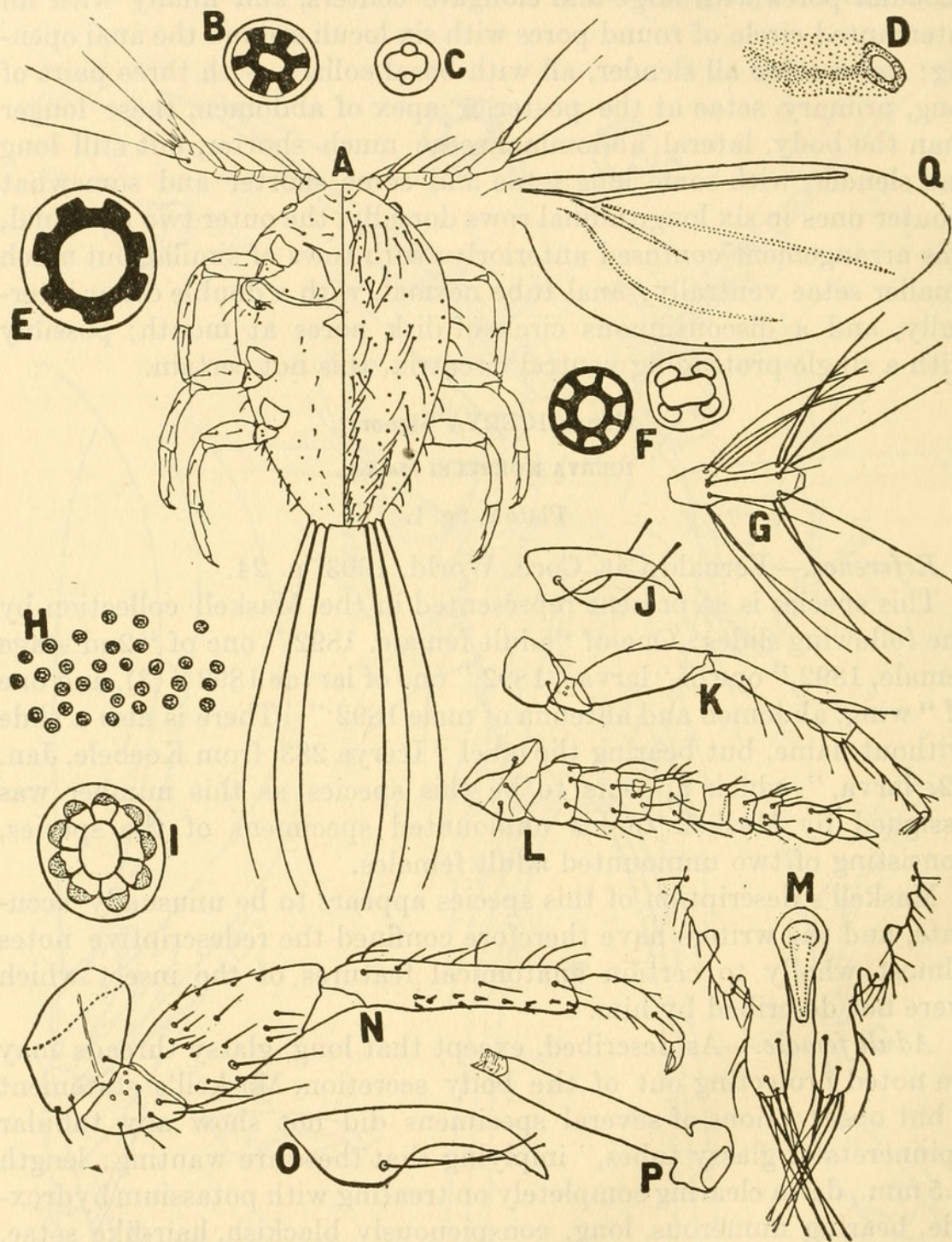


FIG. 15.—*ICERYA KOEBELEI* MASKELL. A, LARVA, DORSAL AND VENTRAL, $\times 57.5$; B, LARVA, DORSAL DISK PORE, $\times 1,500$; C, LARVA, VENTRAL DISK PORE, $\times 1,500$; D, LARVA, THORACIC SPIRACLE, $\times 500$; E, ADULT FEMALE, DISK PORE, $\times 1,500$; F, ADULT FEMALE, DISK PORES, $\times 1,500$; G, ADULT MALE, SINGLE ANTENNAL SEGMENT, $\times 57.5$; H, ADULT FEMALE, PORTION OF VENTRAL PORE BAND NEAR POSTERIOR LEGS, $\times 220$; I, ADULT FEMALE, DISK PORE FROM AREA AROUND VAGINAL OPENING, $\times 1,500$; J, LARVA, CLAW, $\times 220$; K, LARVA, LEG, $\times 115$; L, ADULT FEMALE, ANTENNA, $\times 150$; M, ADULT MALE, APEX OF ABDOMEN, $\times 57.5$; N, ADULT FEMALE, ANTERIOR LEG, $\times 150$; O, ADULT FEMALE, CLAW, $\times 440$; P, ADULT FEMALE, ABDOMINAL SPIRACLE, $\times 440$; Q, ADULT MALE, WING, $\times 17.5$.

of the first type and apparently without accessory setae anteriorly, laterally with an occasional small seta; derm setae, as already stated,

numerous, long, blackish and hair-like, but not aggregated into conspicuous marginal tufts; anal opening with a simple ring and a short, simple, internal tube; with three rather large ventral cicatrices, the median approximately circular, the two lateral elliptical.

Intermediate stage female.—Essentially similar to adult; for details see Maskell's description.

Larva.—Length 0.625 mm., width 0.36 mm., ovoid, strongly tapering posteriorly; antennae and legs of the normal form for the genus, the antennal club fairly stout; tarsal claw slender with a single distinct denticle near apex, the claw digitules slender, thread-like, with a tiny knobbed apex extending beyond claw; beak very short conical; with two pairs of thoracic and two pairs of very much smaller abdominal spiracles, these located at the tip of the abdomen and the posterior pair larger; derm with longitudinal rows of small, approximately circular, multilocular disk pores, four rows on each half of the abdomen, and similiar rows of rather large, more or less blackish setae, two rows on each half of the abdomen, many of these appearing somewhat blunted at apices, but this, so far as can be determined, due to injury; marginal setae, particularly near apex of abdomen, somewhat longer than those dorsally; with three pairs of large setae, a little longer than the entire body, at the apex of the abdomen; anal tube with internal double pore collar, and circle of disk pores at mouth, as is usual in the genus; with a single ventral cicatrix.

Adult male.—This is represented by the slide of the various parts in the Maskell collection showing no conspicuous peculiarities, differing, however, from *purchasi* in the greater length of the caudal tassels and the greater prominence of the margins of the penultimate abdominal segment.

Cotypes (larvae).—Cat. No. 25273, U.S.N.M.

As noted by Maskell, the unusual feature of this insect is its close resemblance to *purchasi*. The differences which he indicated in the size, the presence of the large dorsal pencil of secretion, the normally 10-segmented antennae and so on, seem quite sufficient to distinguish the two. The available larvae of *koebelei* are in poor condition and possibly on this account fail to show any distinctive characteristics which might be cited to separate this stage from the corresponding one of *purchasi*. While not intending to revive a subject of some previous controversy, it seems desirable to point out that this species, fully accepted as being indigenous to Australia, appears to possess in common with *I. purchasi*, besides many other points of close similarity, two pairs of adominal spiracles, in contrast to all the other species of *Icerya* known to the writers, three pairs of these being the usual number in the genus.

ICERYA PURCHASI Maskell.

Reference.—Fernald Cat. Cocc. World, 1903, p. 25-27.

The Maskell collection contains slides of this species as follows: One of "females, 3rd stage beginning to form sac, March, 1878" (two adult females); one of "female, early in 3rd stage, March, 1878" (one adult female); one of "young insect from acacia, March, 1878"; one of "male, 1888." The unmounted material is in three lots all bearing No. 95, none of which is definitely recognizable as part of the material on which Maskell based his original description.

In view of the widespread distribution, the characteristic superficial appearance, the numerous figures and descriptions in literature, and the degree of familiarity which the economic importance of this insect has developed in every entomologist, it has not been considered necessary to prepare an extended redescription of it.

In addition to the characteristic appearance of the ovisac and body secretions, and the size and shape of the mature female, the combination of morphological characters possessed by the species, including the presence of only two pairs of abdominal spiracles, the presence of large pores secreting glassy filaments, and the presence of the numerous, conspicuously blackish, long, hair-like setae dorsally, and in rather distinct clusters along the body margin, seems quite sufficient to distinguish this species from any other known to belong in the same genus, with the single exception of *koebeleri*, and the differences between these two species have already been discussed.

Subfamily MARGARODINAE.

PLATYCOELOSTOMA, new genus.⁸

Coccids of the Margarodine series as at present recognized; adult female of medium size, elongate oval, convex, segmentation visible, secreting a quantity of cottony matter at the time of oviposition; antennae placed rather close together at apex of body, 10-segmented, tapering gradually from base to apex, the apical longest and slightly stouter; legs of good size and rather short, not unusual for the group, each face of trochanter with several pores; beak wanting (Maskell); with two pairs of thoracic and seven pairs of abdominal spiracles (inferred); derm pores of one sort only, multilocular disk, thin walled, with usually three to five central loculi, encircled by a band of numerous small, half-oval loculi; derm setae of one sort only, rather small, slender setae set in flat, inconspicuous, circular collars; anal opening simple (Maskell); ventral cicatrices not known. Intermediate stage female occurring in waxy cells beneath bark; oval, flattened; with antennae reduced to mere stubs and legs to flat patches of pores and setae; beak small, 2-segmented; with two pairs

⁸ New genera should be credited to the senior author only.

of thoracic and seven pairs of only slightly smaller abdominal spiracles; derm pores of one sort, large, circular, multilocular disk with granular center and a single marginal circle of small loculi; derm setae small, slender, with light basal collar, comparatively few in number; anal opening a simple tube; ventral cicatrices small, numerous, circular, in transverse rows. Larva elongate oval, tapering somewhat anteriorly; antennae nearly contiguous, tapering, 7-segmented; legs not unusual; tarsal digitules with faint knob; beak long conical, 2-segmented; with two pairs of thoracic and (assumed) seven pairs of abdominal spiracles; derm pores of two sorts, ventral as in intermediate stage, dorsal somewhat suggestive of those of adult; body setae few, small, slender; apical pair of setae differentiated but inconspicuous; anal opening apical; with a single, median, posterior ventral cicatrix.

This genus appears to have its proper location among the group including *Steingelia*, *Matsucoccus*, *Stomacoccus*, and *Kuwania*.

The genotype and only included species is the following:

PLATYCOELOSTOMA COMPRESSA (Maskell).

Plate 2, fig. 2.

Reference.—Fernald Cat. Cocc. World, 1903, p. 30.

The Maskell collection contains four slides of this species, as follows: One of "antennae and feet of adult female, 1890," two of "2nd stage female, 1890," and one of "larva, 1891." There are besides a few unmounted specimens of the intermediate stages with No. 140. No other specimens have been available for study.

Adult female.—Nothing could be added to Maskell's description of the external appearance and the general morphological characters of the whole body, as only a portion of one adult, including fore legs, antennae and a very small amount of derm, is available for examination; the derm pores apparently of one type only, multilocular disk with numerous loculi in the outer band and four or five in the central cluster, roughly circular or with more or less distinctly flattened outer faces opposite each of the loculi in the inner cluster; derm setae, so far as can be determined, of one type only; slender, not large, with flat circular collar at base, not abundant; no information regarding the spiracles, anal opening and other abdominal structures available.

Intermediate stage female.—General appearance as described by Maskell; antennae reduced to tiny tubercles, not distinctly segmented, but with faint indications of incomplete joints, bearing a cluster of setae at the apex; legs not entirely wanting, but each represented only by an oval area in the derm bearing clusters of pores and small setae (see figure); beak small, apparently 2-segmented, no traces of a third segment, as indicated by Maskell, observed; with two pairs of

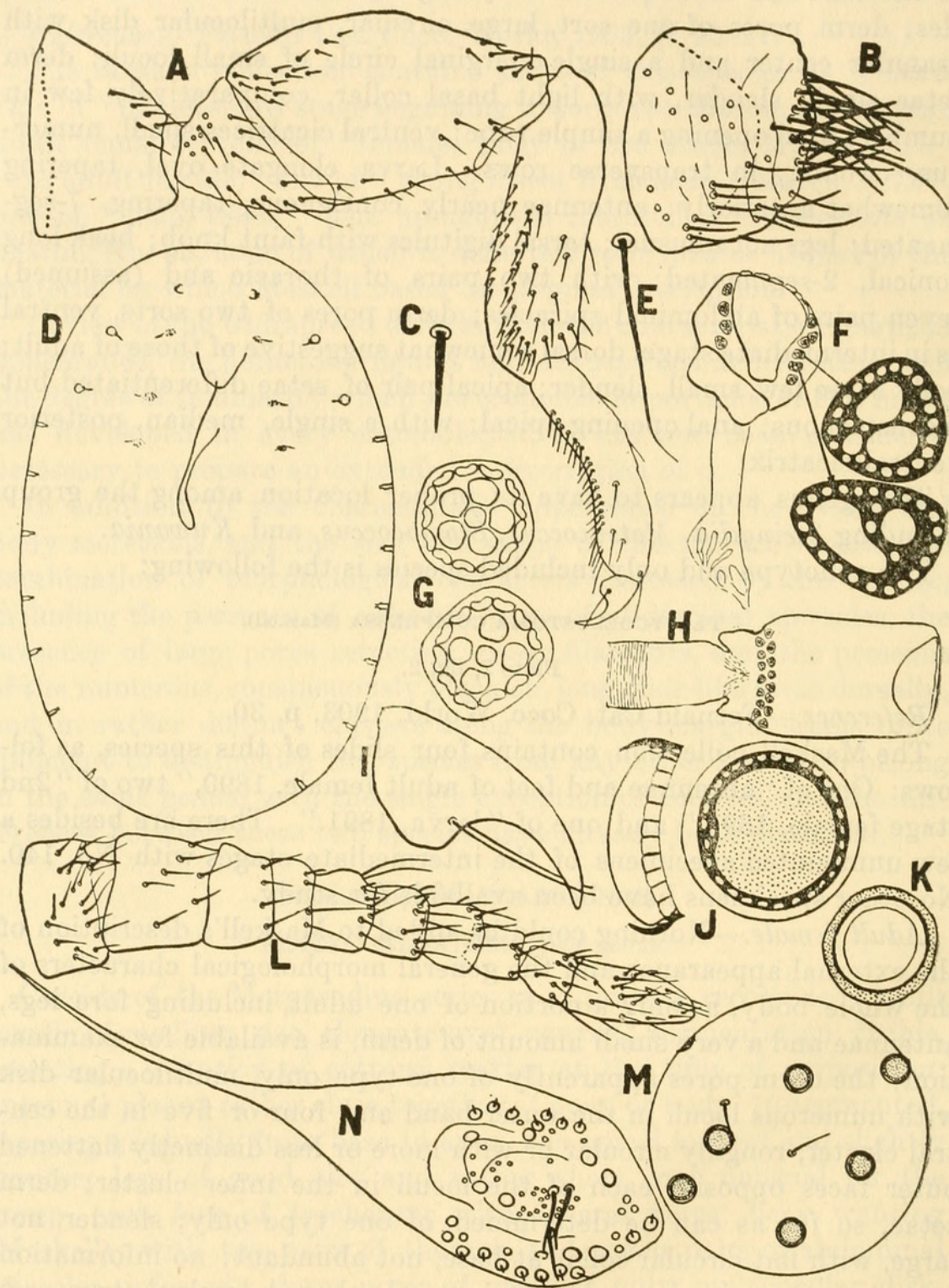


FIG. 16.—*PLATYCOELOSTOMA COMPRESSA* (MASKELL). A, ADULT FEMALE, LEG, $\times 57.5$; B, INTERMEDIATE STAGE FEMALE, ANTENNA, $\times 500$; C, INTERMEDIATE STAGE FEMALE, SETA, $\times 500$; D, INTERMEDIATE STAGE FEMALE, OUTLINE FROM BELOW, $\times 17.5$; E, ADULT FEMALE, SETA, $\times 500$; F, INTERMEDIATE STAGE FEMALE, THORACIC SPIRACLE, $\times 220$, WITH DETAIL OF PORES, $\times 1,500$; G, ADULT FEMALE, DISK PORES, $\times 1,500$; H, INTERMEDIATE STAGE FEMALE, ABDOMINAL SPIRACLE, $\times 220$; I, ADULT FEMALE, CLAW, $\times 220$; J, INTERMEDIATE STAGE FEMALE, DISK PORE, TWO VIEWS, $\times 1,500$; K, INTERMEDIATE STAGE FEMALE, VENTRAL CICATRIX OR SIMPLE DISK PORE, $\times 1,500$; L, ADULT FEMALE, ANTENNA, $\times 57.5$; M, INTERMEDIATE STAGE FEMALE, VENTRAL DERM ANTERIOR TO ANAL RING, $\times 220$; N, INTERMEDIATE STAGE FEMALE, MIDDLE LEG, $\times 500$.

thoracic and seven pairs of abdominal spiracles, the first of different construction, but only slightly larger than the abdominal pairs, all with pore collar, at opening in thoracic, set well in from opening in abdominal spiracles;⁹ derm pores of one type only, relatively very large, circular, flat disk pores with large clear centers, apparently slightly granular, and marginal circles of numerous (about 30) small loculi, the outer ring with a slight internal swelling at one point, and an additional still smaller pore in this; derm setae all small, stiff, rather stout, set in a flat circular collar, not numerous, scattered, less abundant than the pores, but, like these, in greater number along the body margin; anal tube small, short, simple; ventral cicatrices all small, some little larger than the pores, in transverse rows of well-

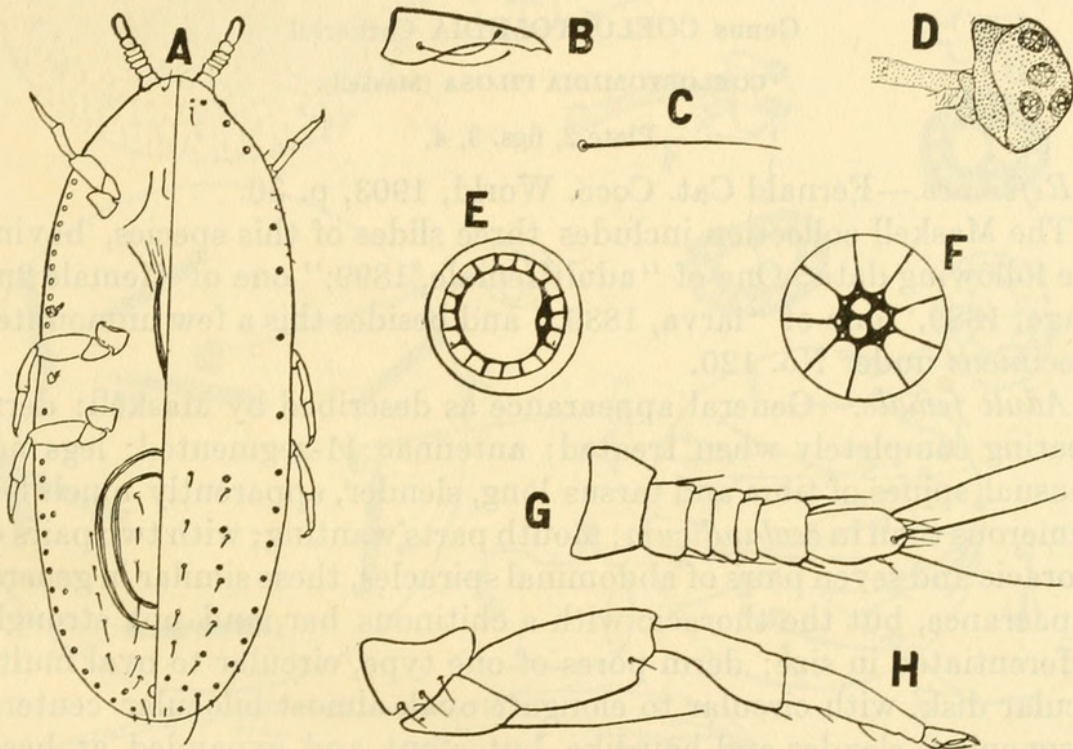


FIG. 17.—*PLATYCOELOSTOMA COMPRESSA* (MASKELL). LARVA. A, DORSAL AND VENTRAL, $\times 57.5$; B, CLAW, $\times 640$; C, SETA, $\times 500$; D, THORACIC SPIRACLE, $\times 1,500$; E, DISK PORE, $\times 1,500$; F, DISK PORE, $\times 1,500$; G, ANTENNA, $\times 57.5$; H, LEG, $\times 220$.

separated cicatrices on the abdomen at least, the ends of each row with a cluster of larger ones.

Larva.—Elongate, posterior apex rounded, anterior somewhat pointed; length 1.115 mm. width .45 mm.; antennae short, distinctly 7-segmented, the intermediate segments very short; legs short, widely separated, tarsal claw with denticle and slender, slightly knobbed digitules extending beyond the apex of the claw; beak long and

⁹ In one of the Maskell slides of this stage, in which the tracheal system has been preserved to a large extent, there may be seen quite plainly an eighth pair of abdominal spiracles, about half the size of the others, and without the pore collar, but with the usual band of small internal hairs. Neither these nor their external openings have been definitely located in any of the other intermediate stage females examined (three). This condition suggests the beginning of a process of suppression in the abdominal spiracles commencing with the apical pair.

slender, tapering, apparently 2-segmented; thoracic spiracles similar in shape to those of intermediate stage, and with similar pores; abdominal spiracles not observable in single specimen available for study; derm with large disk pores of two sorts, dorsally, in definite pattern, with pores somewhat similar to those of adult, at margin ventrally, also definitely arranged, with disk pores similar to those found in the intermediate stages; derm with an occasional long, slender seta, with two longer apical setae, but these short and inconspicuous compared with the total body length, widely separated and each curving inward; anal tube simple, opening apically; with a single median ventral cicatrix near apex of abdomen.

Cotype.—Cat. No. 25274, U.S.N.M.

Genus COELOSTOMIDIA Cockerell.

COELOSTOMIDIA PILOSA (Maskell).

Plate 2, figs. 3, 4.

Reference.—Fernald Cat. Cocc. World, 1903, p. 30.

The Maskell collection includes three slides of this species, having the following data: One of "adult[♀] female, 1899," one of "female 2nd stage, 1889," one of "larva, 1889," and besides this a few unmounted specimens under No. 120.

Adult female.—General appearance as described by Maskell; derm clearing completely when treated; antennae 11-segmented; legs not unusual, spines of tibia and tarsus long, slender, apparently much less numerous than in *zealandicum*; mouth parts wanting; with two pairs of thoracic and seven pairs of abdominal spiracles, these similar in general appearance, but the thoracic with a chitinous bar, and not strongly differentiated in size; derm pores of one type, circular to oval multilocular disk, with circular to elongate oval, almost bilocular centers; derm spines slender and hair-like, but stout and expanded at base, very abundant; derm setae also slender, with conical basal collars, these less numerous than the "spines" and in many cases much larger, but varying in size, largest along the body margin; anal tube simple; no ventral cicatrices noted.

Intermediate stage female.—General appearance as described by Maskell; antennae much reduced, triangular, apex rounded, with faint indications of joints near base; apex with a number of spines and hairs; legs similarly reduced, triangular, trochanter with a very long seta below, tarsus much reduced, claw with denticle, the digitules long, slender, with knob at apex; beak short, conical, distinctly 2-segmented, with a membranous basal portion possibly representing the third segment considered present by Maskell; with two pairs of thoracic and seven pairs of abdominal spiracles, the first about twice as large as the second, all with two or more pores near opening; derm pores of one type only, small, circular, with a large bi-, tri-, or

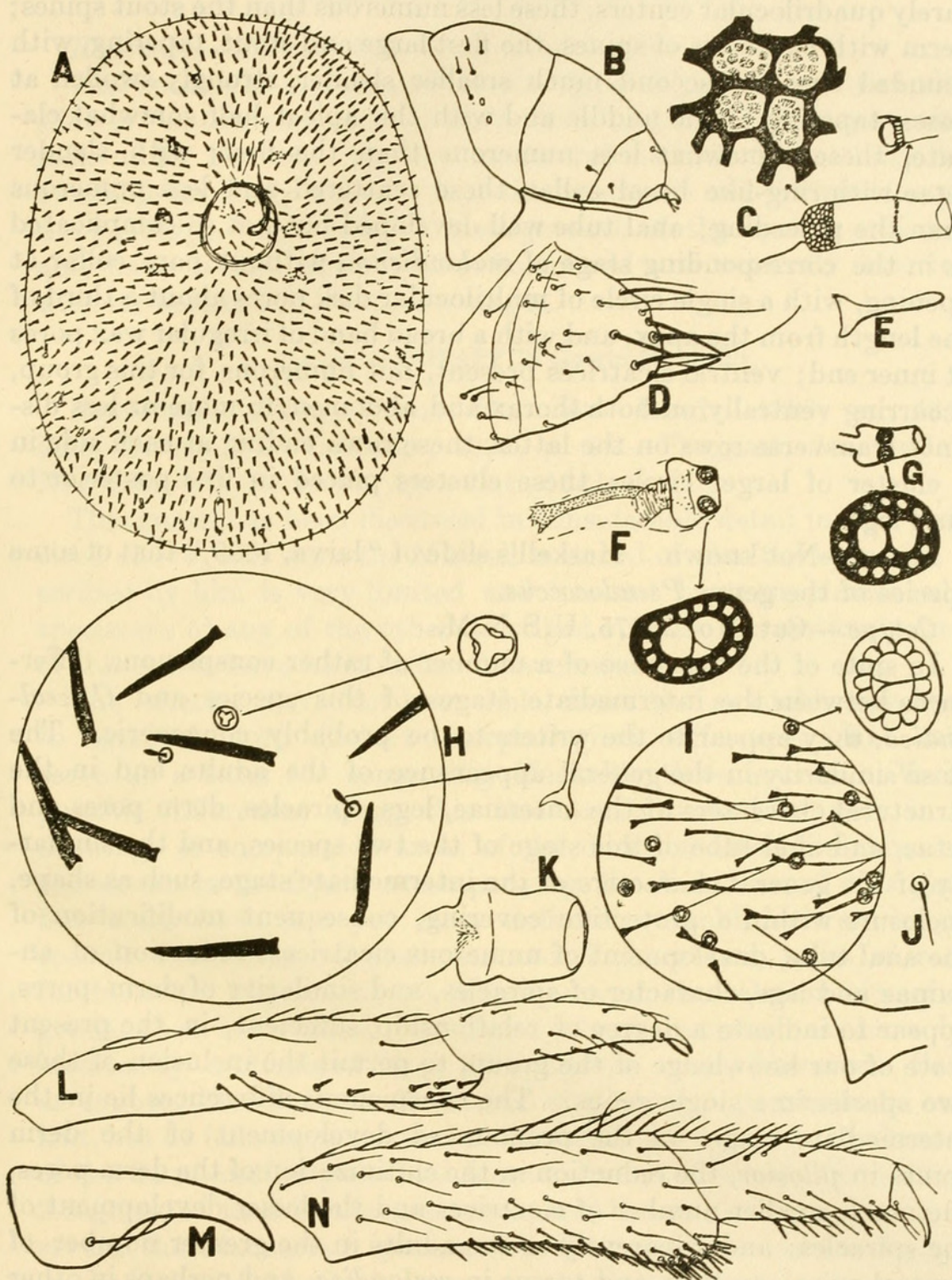


FIG. 18.—*COELOSTOMIDIA PILOSA* (MASKELL). A, INTERMEDIATE STAGE FEMALE, OUTLINE FROM ABOVE, $\times 30$; B, INTERMEDIATE STAGE FEMALE, LEG, $\times 220$; C, INTERMEDIATE STAGE FEMALE, ANAL TUBE, $\times 57.5$; D, INTERMEDIATE STAGE FEMALE, ANTENNA, $\times 220$; E, INTERMEDIATE STAGE FEMALE, BODY SPINE, $\times 1,280$; F, INTERMEDIATE STAGE FEMALE, THORACIC SPIRACLE, $\times 220$, WITH DETAIL OF PORE, $\times 1,280$; G, INTERMEDIATE STAGE FEMALE, ABDOMINAL SPIRACLE, $\times 220$, WITH DETAIL OF PORE, $\times 1,280$; H, INTERMEDIATE STAGE FEMALE, SECTION OF DERM NEAR MARGIN, $\times 500$, WITH DETAIL OF PORE, $\times 1,500$, AND OF SPINE, $\times 1,280$; I, ADULT FEMALE, SECTION OF DERM, $\times 220$, WITH DETAIL OF PORE AND SPINE BASE, $\times 1,500$; J, INTERMEDIATE STAGE FEMALE, SETA, $\times 460$; K, ADULT FEMALE, ABDOMINAL SPIRACLE, $\times 220$; L, ADULT FEMALE, TIBIA AND TARSUS, $\times 57.5$; M, ADULT FEMALE, CLAW, $\times 220$; N, *COELOSTOMIDIA ZEALANDICA* (MASKELL), TIBIA AND TARSUS, FOR COMPARISON WITH L, $\times 57.5$.

rarely quadrilocular centers, these less numerous than the stout spines; derm with two sorts of spines, the first large and stout, tapering, with rounded tips, the second much smaller, slender, strongly swollen at bases, tapering to the middle and with the apical half somewhat clavate, these somewhat less numerous than the first; with slender setae with ring-like basal collar, these scattered and less numerous than the preceding; anal tube well developed but not so complicated as in the corresponding stage of *zealandicum*, without pore collar at opening, with a single circle of multilocular disk pores about a third of the length from the apex, and with a broad band of irregular wax pores at inner end; ventral cicatrices present, not numerous for this group, occurring ventrally on both thorax and abdomen, in more or less distinct transverse rows on the latter, these rows ending at each side in a cluster of larger circles, these clusters placed in line posterior to hind legs.

Larva.—Not known. Maskell's slide of "larva, 1889," that of some species of the genus *Pseudococcus*.

Cotype.—Cat. No. 25275, U.S.N.M.

In spite of the existence of a number of rather conspicuous differences between the intermediate stages of this species and *C. zealandica*, they appear to the writers to be probably congeneric. The close similarity in the general appearance of the adults and in the structural characters of the antennae, legs, spiracles, derm pores and setae, and anal tube of this stage of the two species, and the similarity of the general characters of the intermediate stage, such as shape, enclosure within a protective covering, consequent modification of the anal tube, development of numerous cicatrices, reduction of antennae and legs, character of spiracles, and similarity of derm pores, appear to indicate a degree of relationship sufficient, in the present state of our knowledge of the group, to permit the inclusion of these two species in a single genus. The conspicuous differences lie in the intermediate stages in the pronounced development of the derm spines in *pilosior*, the reduction in the chitinization of the derm pores, the much smaller number of cicatrices and the lesser development of the spiracles; and apparently in the adults in the greater number of ventral spines on tibia and tarsus in *zealandica*, and perhaps in other characters. It is very unfortunate that there is no true larva of *pilosa* available for examination, as this stage would help materially in determining the generic relationship existing between these two species. The generic diagnosis previously based on *C. zealandica* at present needs modification only with respect to the derm spines and setae and the anal tube in the intermediate stage female. The statement "no ventral cicatrices" should also be changed, as it is now believed that the large simple circular disk pores correspond to the ventral cicatrices found in some other genera.

COELOSTOMIDIA WAIROENSIS (Maskell).

Reference.—Fernald Cat. Cocc. World, 1903, p. 31.

This species is represented in the Maskell collection by a single slide of "antenna and foot of male, 1896," and by a single unmounted male under No. 99. The few structural characters that have been available for study indicate that this species is not congeneric with the genotype, but a definite reassignment of the species will probably have to wait until it is rediscovered and correctly associated with its female and immature stages.

Genus CALLIPAPPUS Guerin Meneville.

References.—Fuller, Trans. Ent. Sec. Lond., 1899, p. 435.—MacGillivray, The Coccidae, 1921, p. 94.—Froggatt, Sci. Bull. 19, New South Wales Dept. Agr., Oct., 1921, p. 41.

This genus has been discussed in considerable detail in the papers cited above, and since the Maskell material of the three species described by him is very limited and has not been supplemented by specimens of any of the other described species, the writers' studies of this genus have been rather inconclusive.

The writers have not been able, from the available specimens, to establish any distinct morphological differences that might serve as a basis for separating Maskell's three species. Various possible differences along this line are indicated in part in the drawings of comparable areas of the derm of Maskell's three species shown in the figure accompanying the discussion of this genus, but these have not yet been definitely established as tangible specific characters. Certain structural characters, some of rather fundamental importance as indications of the relationship of the genus, that have either not previously been noted or have been incorrectly understood may be remarked upon, however. So far as it goes, Mr. Fuller's discussion of the genus appears to be excellent, but he fails to mention the abdominal spiracles or the character of the derm and its pores and setae in the adult female, the distinctly 2-segmented tarsi in the adult male and the abdominal spiracles and several short lanceolate spines on the intermediate antennal segments in the larva, all of which appear to the writers to possess taxonomic significance. The derm in the adult, except for the invaginated pouch, becomes heavily chitinized, but retains numerous large, clear areolations, each of which has a multilocular disk pore in its center. The abdominal spiracles are fairly large, cylindrical tubes slightly constricted by a band of pores near the inner end. In the one or two specimens where they can be plainly observed, there are eight pairs present in the abdomen, of which the six anterior pairs are approximately uniform in size and appearance, while the seventh pair is considerably reduced,

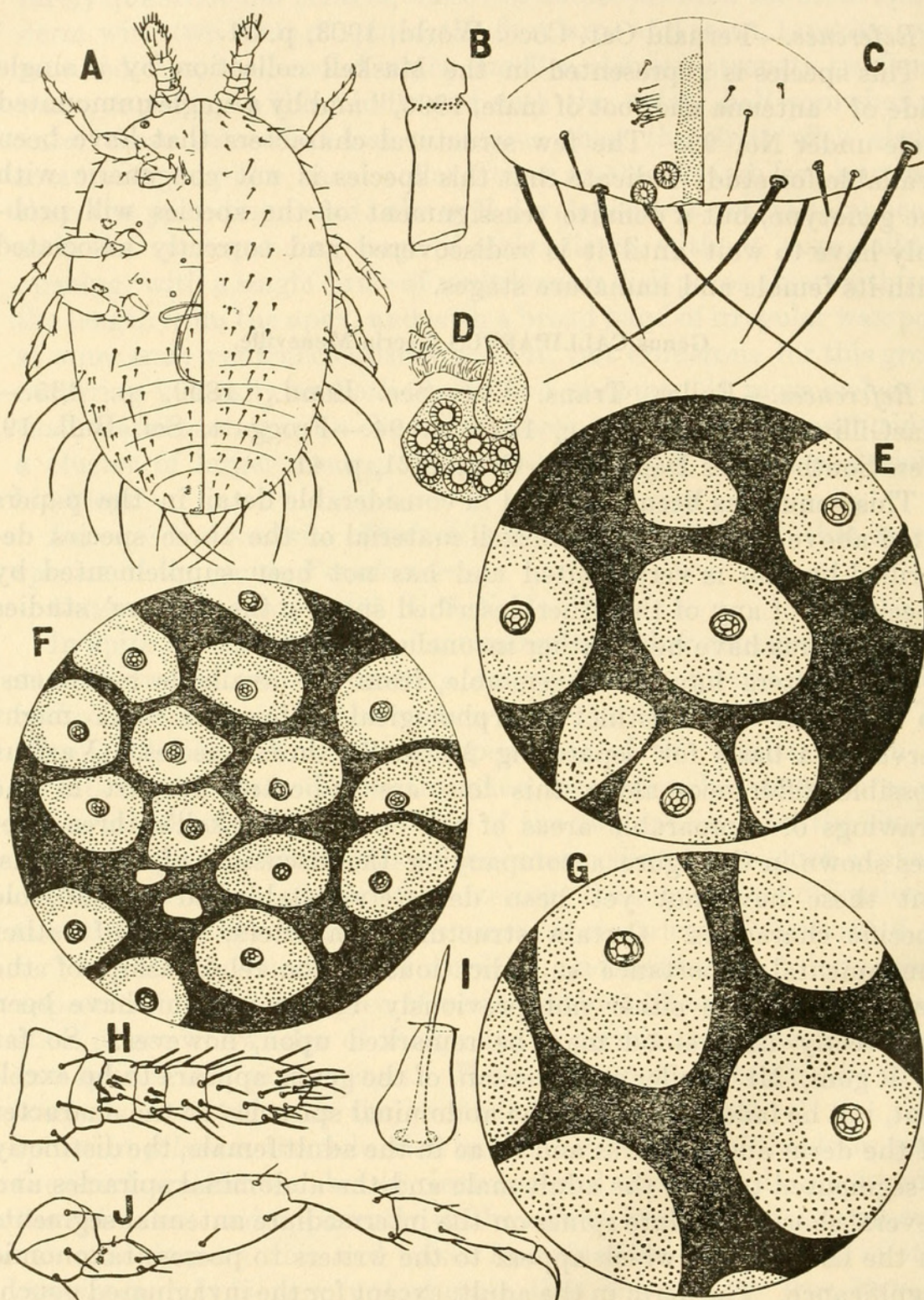


FIG. 19.—GENUS CALLIPAPPUS. A, *C. AUSTRALIS* (MASKELL), LARVA, DORSAL, AND VENTRAL, $\times 57.5$; B, SAME, ADULT FEMALE, ABDOMINAL SPIRACLE, $\times 57.5$; C, SAME, LARVA, APEX OF ABDOMEN, DORSAL AND VENTRAL, $\times 230$; D, SAME, LARVA THORACIC SPIRACLE, $\times 540$; E, *C. IMMANIS* (MASKELL), ADULT FEMALE, SECTION OF DORSAL DERM, $\times 22$; F, *C. RUBIGINOSUS* (MASKELL), SAME AS E, AND FROM COMPARABLE AREA, $\times 220$; G, *C. AUSTRALIS* (MASKELL), SAME AS E, AND FROM COMPARABLE AREA, $\times 220$; H, *C. AUSTRALIS*, LARVA, ANTENNA, $\times 165$; I, SAME, ADULT FEMALE, INVAGINATED SETA NEAR INNER END OF POUCH, $\times 540$; J, SAME, LARVA, LEG, $\times 165$.

but still retains the pore collar, and the eighth pair is much reduced, only a slender, delicate simple tube remaining in the single species in which these can be studied, suggesting the possibility that this pair may be wholly suppressed in some of the other members of the genus. In the larva the spiracles are very minute, simple openings, which have only been located with extreme difficulty, and only seven pairs of such openings have been found thus far. The derm of the adult female bears the large multilocular disk pores already mentioned, these being fairly uniform in size but with centers varying from circular to elongate oval or triangular, and fairly large and stout hairs of variable length, which are more abundant in particular areas, as near the anterior apex of the body. There are, besides, some unusual setae, invaginated for perhaps half their length, fairly abundant at the inner end of the invaginated sac. The anal tube is simple, slender, and delicate. If the figures given by Signoret for the larva of *C. westwoodi* and by Fuller for *C. bufo* are entirely accurate, it is possible that good morphological characters for the separation of specimens of this stage of the known species may be found in the number and proportional length of the marginal abdominal setae, as these in the larva of *australis*, the only larva available, are long on all the abdominal segments, while as figured in *westwoodi* and *bufo* only those at the apex of the abdomen are long. A tentative key to the species included in this genus, based largely on the information given in Mr. Fuller's paper and quite possibly of little value if put into actual use with specimens collected in the field, has been drawn up and has been supplemented with certain illustrations from Maskell's specimens. Mr. Froggatt has recently (1921) stated that *C. bufo* Fuller is the old final form of one of the other West Australian species, and, as it has not been possible to place it accurately in the key, it has been omitted.

TENTATIVE KEY TO SPECIES OF CALLIPAPPUS.

- a*¹. External opening of abdominal pouch located ventrally near posterior apex of body (Fuller).....*westwoodi* Guérin Meneville.
- a*². External opening of abdominal pouch apical, not ventral.
 - b*¹. Body more or less completely clothed (depending on condition) with brick to orange red, hair-like filaments.....*rubiginosus* (Maskell).
 - b*². Body without such filaments, bare or with whitish waxy or glassy secretion.
 - c*¹. External opening of abdominal pouch a linear transverse slit
farinosus Fuller.
 - c*². External opening of abdominal pouch circular to triangular or roughly 8-shaped.
 - d*¹. Opening roughly 8-shaped; derm coarsely and uniformly punctured
australis (Maskell).
 - d*². Opening circular to inverted triangular; derm finely punctured
immanis (Maskell).

The Maskell species are the following:

CALLIPAPPUS AUSTRALIS (Maskell).

Plate 2, fig. 5; plate 3, fig. 1.

Reference.—Fernald Cat. Cocc. World, 1903, p. 31.

This species is represented in the collections in Washington by a fair series of specimens collected in New South Wales by Mr. George Compere, and from these specimens mounts showing the larva as well as the adult and supplying most of the material for the figures on the genus have been obtained.

Cotype.—Cat. No. 25276, U.S.N.M.

CALLIPAPPUS IMMANIS (Maskell).

Plate 3, figs. 2, 3.

Reference.—Fernald Cat. Cocc. World, 1903, p. 31.

Only the few Maskell specimens have been available for examination. The derm aerolation is shown in one of the accompanying figures as well as the character of the external opening of the abdominal pouch.

Cotype.—Cat. No. 25277, U.S.N.M.

CALLIPAPPUS RUBIGINOSUS (Maskell).

Plate 3, figs. 4, 5.

Reference.—Fernald Cat. Cocc. World, 1903, p. 32.

This species is represented in the Maskell collection by the two specimens photographed and by a portion of another, mounted on a slide. The character of the reddish filaments covering the body was not definitely determined from an examination of Maskell's unmounted specimens, but since no comparable structures could be found on the mounted specimens it seems a reasonable assumption that these filaments are secretion from the disk pores over the body and not setae or spines.

Besides the species discussed in the preceding pages, the Maskell collection includes a number of others belonging in these two subfamilies, which it seems desirable to place on record, even if they are not discussed. These are the following: Subfamily Monophlebinae, *Gueriniella serratulae* (Fabricius) (No. 93),¹⁰ *Steatococcus townsendi* (Cockerell) (No. 511), *Walkeriana floriger* (Walker) (No. 350), *W. poleii* Green (No. 450), *W. speciosa* Green (No. 394), *Icerya aegyptiaca* (Douglas) (No. 210), *I. crocea* Green (No. 440), *I. natalensis* (Douglas) (No. 114), *I. rileyi* Cockerell (No. 379), and *I. seychellarum* (Westwood) (No. 96); subfamily Margarodinae, *Margarodes formicarum* Guilding (No. 449), *M. vitium* (Giard) (No. 448), *Kuwania zeylanica* (Green) (No. 427), and *Xylococcus filiferus* Loew (No. 89).

¹⁰The numbers in parentheses are Maskell collection catalogue numbers.

EXPLANATION OF PLATES.

PLATE 1.

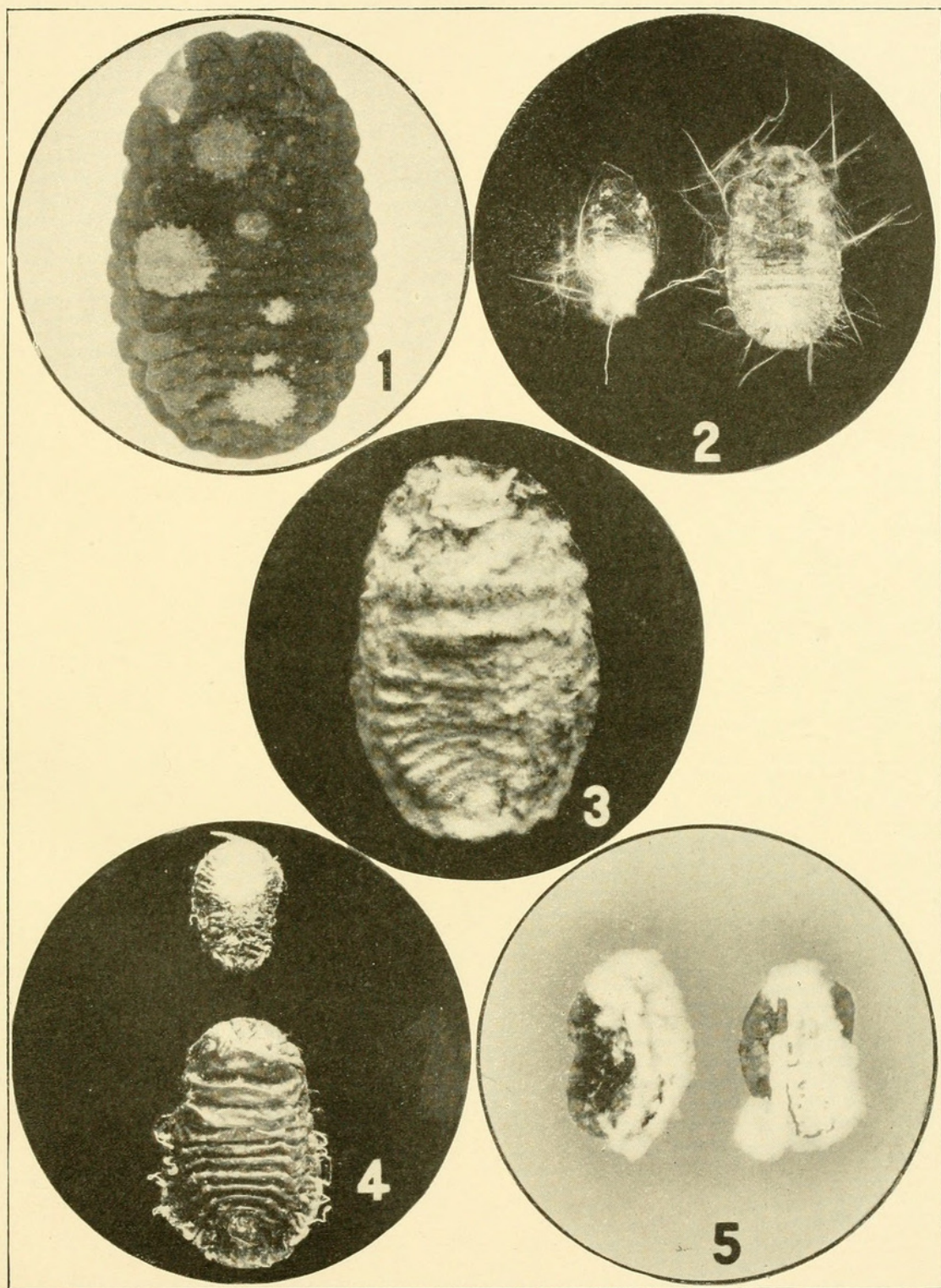
- FIG. 1. *Monophlebulus crawfordi* (Maskell), adult female.
2. *Monophlebulus pilosior* (Maskell), adult females.
3. *Monophlebulus comperei*, new species, adult female.
4. *Nodulicoccus levis* (Maskell), adult females.
5. *Autoicerya australis* (Maskell), adult females.

PLATE 2.

- FIG. 1. *Icerya koebelei* Maskell, adult females.
2. *Platycoelostoma compressa* (Maskell), immature female and cells.
3. *Coelostomidia pilosa* (Maskell), adult female.
4. *Coelostomidia pilosa* (Maskell), tests of immature females.
5. *Callipappus australis* (Maskell), adult female.

PLATE 3.

- FIG. 1. *Callipappus australis* (Maskell), adult female, apex of abdomen.
2. *Callipappus immanis* (Maskell), adult females.
3. *Callipappus immanis* (Maskell), adult female, apex of abdomen.
4. *Callipappus rubiginosus* (Maskell), adult females.
5. *Callipappus rubiginosus* (Maskell), adult females, apex of abdomen.



MASKELL SPECIES OF MONOPHLEBINAЕ AND MARGARODINAE.

FOR EXPLANATION OF PLATE SEE PAGE 45



Morrison, H and Morrison, Emily R. 1923. "The scale insects of the sub-families Monophlebinae and Margarodinae treated by Maskell." *Proceedings of the United States National Museum* 62, 1-47.

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