

SOME NONDIASPINE COCCIDÆ FROM THE MALAY
PENINSULA, WITH DESCRIPTIONS OF
APPARENTLY NEW SPECIES ¹

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ONE PLATE AND THIRTEEN TEXT FIGURES

The work reported on in the following pages was begun on the basis of two small collections of coccids sent for possible identification to the Bureau of Entomology by Prof. C. F. Baker in 1918. In the following year, I received from Professor Baker a compiled list of the known Singapore Coccidæ, prepared by himself and Mr. I. H. Burkill. This list included a number of manuscript new species names assigned by Mr. E. E. Green, these giving me my first intimation that Mr. Green was actively engaged in working on Singapore coccids. Following some correspondence regarding the best means of avoiding confusion or duplication, Mr. Green, with his usual generosity, forwarded to me specimens of all of his new nondiaspine species, together with certain notes on the same, and gave me the privilege of describing these new species and of adding them to the work which had been completed on Professor Baker's specimens.

All of the specimens forwarded for description by Mr. Green, and some of those from Professor Baker, were collected by Mr. I. H. Burkill, to whom I am thus indirectly much indebted for the opportunity to examine some very interesting coccids.

Some of the species found in this small collection have presented serious difficulties with respect to proper generic assignment and specific differentiation, and certain of these questions have been settled tentatively only.

All information regarding host, locality, and date of collection was copied from the notes in the packages containing the specimens, and all of the specimens were collected either by Mr. Burkill or by Professor Baker. The drawings illustrating the

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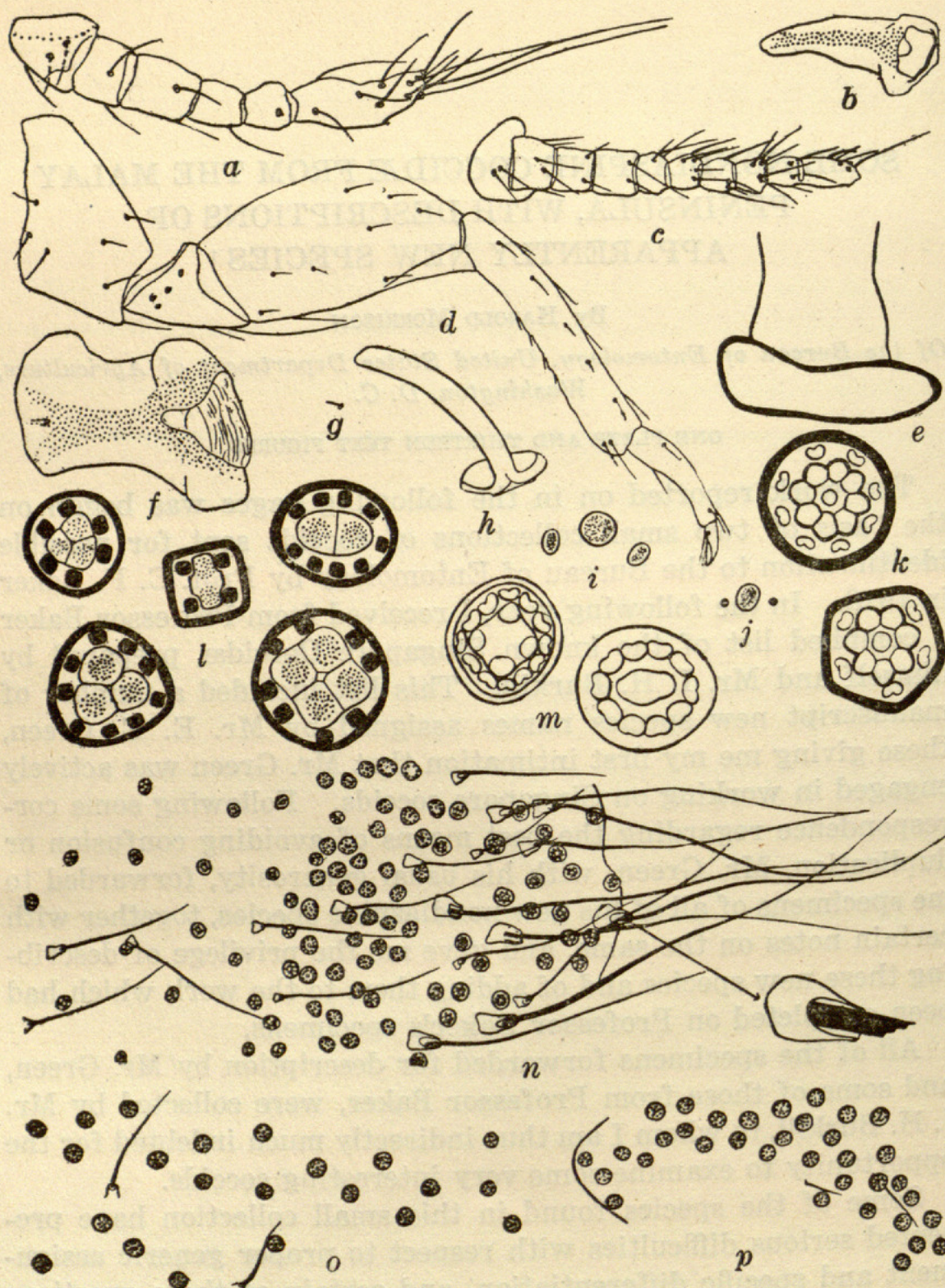


FIG. 1. *Paleococcus pulcher* Leonardi; a, intermediate-stage female, antenna, $\times 115$; b, intermediate-stage female, thoracic spiracle, $\times 57.5$; c, adult female, antenna, $\times 57.5$; d, adult female, middle leg, $\times 57.5$; e, adult female, anal ring, $\times 165$; f, adult female, thoracic spiracle, $\times 165$; g, adult female, abdominal spiracle, $\times 165$; h, same, $\times 640$; i, adult female, ventral abdominal cicatrices, $\times 57.5$; j, intermediate-stage female, ventral cicatrices, $\times 57.5$; k, adult female, types of dorsal and ventral body pores, $\times 1,500$; l, same, types of pores from marginal tufts of body, $\times 1,500$; m, same, types of pores from region close to genital opening, $\times 1,500$; n, same, a lateral abdominal cluster of pores and setae, $\times 220$, with detail of base of seta, $\times 640$; o, same, portion of ventral abdominal pore band between hind legs, $\times 220$; p, same at point where curve around body margin commences, $\times 220$.

structural characteristics of the species have been made by Emily Morrison, who has also been of assistance in other ways; the plate figures showing the superficial appearance of certain of the species have been prepared by Miss Aime Motter.

COCCIDÆ²

MONOPHLEBINÆ

Genus PALEOCOCCUS Cockerell

Paleococcus pulcher Leonardi.

Paleococcus pulcher LEONARDI, Ann. R. scuola Sup. Agr. Portici 7 (1907) 1.

Leonardi's placing of this species in the genus *Paleococcus* is followed here without critical consideration.

This species has been identified from a comparison of specimens received from Mr. E. E. Green collected on *Michelia champaca* at the Botanic Gardens, Singapore, April 8, 1916, by Burkill, and on *Rhopaloblasta* palm, Singapore, February, 1917, by Burkill, with a translation of Leonardi's original description. This description, while not so detailed in some respects as is desirable, seems quite sufficient to establish the identity of the Singapore specimens. Mr. Green had tentatively placed these two lots of material under the manuscript names *Icerya ordinata* and *I. palmarum*, respectively, but as careful a comparison of the structural characters of the two lots of specimens as is possible from the limited number of each present fails to disclose any differentiating characters, while the only difference indicated in Mr. Green's notes is in the color of the secretory covering, the surface coating of that of *ordinata* being lemon yellow, while *palmarum* is supposed to have a pure white coating.

This species is briefly redescribed herewith, with particular emphasis on the structure of the derm pores and the setæ.

Adult female.—Ovate, broadened behind, somewhat convex; maximum length of specimens examined, 6.5 millimeters; width, 4.25; dorsally with a dense coating of white secretion usually strongly tinged superficially with lemon yellow, broken up into distinct plates, these broadly transverse in the center of the dorsum, bordered by a double row of square to oblong plates running clear around the body, with the outer, or marginal, row

² The scheme of classification followed is that used by Fernald, M. E., Catalogue of the Coccidae of the World, Bull. Hatch Exp. Sta. Mass. Agr. College 88 (1903).

produced into triangular teeth, giving a serrate appearance; ovisac not developed, the eggs laid beneath the body; maximum length of mounted specimens examined, 6 millimeters; shape when mounted uniformly broad oval; antennæ 9-segmented (normal for genus), sometimes with an indication of a division of the terminal segment; legs normal, rather slender for the group; with two pairs of large thoracic spiracles, and three pairs of very much smaller, simple, abdominal spiracles, the latter placed at the posterior apex of the body; derm pores all multilocular disk, possibly to be considered as of one type, but showing at least three sorts, as shown in figures, one (*k*) grouped along the body margin together with a number of setæ in rather distinct clusters, another (*l*) scattered over the body surface, and the third (*m*) present ventrally around the genital opening; ventrally near the margin with a heavy band of pores running around the abdomen as in typical *Icerya*; derm setæ numerous, varying in size very decidedly, the largest in the tufts along the body margin, all long, slender, rather delicate and hairlike, mostly with long stout sockets, but some with a very short and flat triangular base; anal opening a short, simple tube; with three small ventral cicatrices, the median much the largest.

? *Perissopneumon* sp.

I desire to place on record here collections of a few specimens of a monophlebine coccid of uncertain affinities in the hope that more material, including larvæ, fully developed adult females, and males, will be discovered by some collector at Singapore, as the correct placing of this species will be almost impossible without such additional material. The collection records are as follows: From rhizomes of *Alpinia conchigera* (Baker 9020) and from fruit scales of *Garcinia mangostana* (one specimen) (Baker 9023), both from the Botanic Gardens, Singapore, October, 1917. I have had only the brief description of *Perissopneumon ferox* available for consideration in the generic placing of these specimens, but they appear to be more closely related to Newstead's genus than to any other at present known to me.

ORTHEZIINÆ

Genus **ORTHEZIA** Bosc d'Antic

Orthezia insignis Douglas.

This species is represented among Professor Baker's material by a few specimens collected on *Clerodendron penduliflorum*, Botanic Gardens, Singapore, August, 1917 (Baker 8941).

DACTYLOPIINÆ

Genus **ANOMALOCOCCUS** Green*Anomalococcus multipori* sp. nov. Plate 1, fig. 1.

Adult female.—Occurring on the stems of the host, beneath the cartons or sheds of some species of ant; inclosed in a rather dark brownish or reddish sac, which is irregular in shape, circular to oval, usually broader behind, somewhat convex, typically with rounded, clear, shining, median longitudinal ridge, bordered on each side by a pitted longitudinal groove of varying distinctness, all the surface except the median ridge covered over with white wax, which becomes thick and almost platelike along the margin, while varying in thickness in different spots dorsally; the sack itself homogeneous, tough, but fracturing when torn or broken, translucent, with a nearly circular to slitlike opening dorsally at the posterior end of the median ridge, and the latter sometimes broken into; the inclosed insect much wrinkled and shriveled, strongly convex medially, but flattened along the body margins, almost completely filling the sac, but probably shrinking very decidedly on the birth of the young; light brown, but mottled with piceous, and otherwise discolored.

Body of adult female.—Maximum length mounted on a slide, a little more than 2 millimeters; irregularly broad oval; maximum width, nearly 2 millimeters, most individuals somewhat smaller; antennæ 6- to 8-segmented, the lengths of the different segments quite variable, the measurements in microns as follows:

II.	III.	* IV.	V.	VI.	VII.
21.4	32.1	21.4	19.6	10.7	12.5
21.4	39.3	17.8	14.3	10.7	12.5
32.1	25	42.8	17.9	14.3	14.3
28.6	25	25.7	17.9	14.3	14.3
32.1	30.4	32.1	17.9	14.3	10.7
25	43	17.9	17.8	10.7	10.7
32.1	26.8	39.3	17.9	12.5	10.8
28.6	25	*39.3	-----	14.3	17.9
21.4	25	25	19.4	17.9	*21.4
14.3	23.2	28.5	14.3	14.3	14.3
17.9	25	25	16.1	*21.4	

* With a pseudojoint.

Legs wanting; spiracles large and stout, placed at the body margin and continuous with a heavily chitinized, crescentic, marginal area at the outer or dorsal end of which is usually, with the posterior spiracle a single, and with the anterior spiracle

two, stout, usually slightly clavate, spiracular spines, none of these to be found in some specimens, and all probably easily broken off, these spiracular characters so easily disarranged in mounting that it is almost impossible to determine the exact relations; submentum apparently 1-segmented, broadly rounded apically; body margin with two rows of slender setæ, those in the lower row smaller, set relatively close together, the other row with the setæ much more widely separated, larger, the bases of the hairs in both about the same diameter, none of the larger setæ quite so long as the spiracular spines; with an occasional small dorsal seta; with numerous 8-shaped pores and elongate tubular ducts dorsally, these particularly crowded along the body margin; and with two groups of cribriform plates running cephalad, one on each side of the middle line, from opposite the anal ring region, these groups distinctly separated from each other, and each made up of numerous plates, the number of these varying considerably, but averaging around seventy to eighty; ventrally with a cluster of multilocular disk pores around and immediately posterior to the anal ring region, with some similar transversely scattered ones anterior to this, and with smaller quinquelocular pores in the chitinized marginal plate of each spiracle; anal ring about 54 to 64 μ long, nearly circular, broadly open behind, with ten large, flattened setæ, these as much as 132 μ long, and with a single row of pores, this anal ring surrounded by a heavily chitinized structure, with its upper and anterior half arched and its lower half broadened posteriorly on each side into a sort of triangular lobe with recurved posterior margin; with a pair of setæ in the bottom of the ventral groove thus formed and a pair, arranged longitudinally, on the posterior margin of each lateral lobe; in only one specimen, of those examined, with more than ten anal ring hairs, in this case with seven on one-half of the ring and five on the other, the extra setæ apparently resulting from the division of the two anterior ones of that side.

Intermediate-stage female.—Such intermediate-stage specimens as have been available for examination show only a lesser development of the adult structures, except that the cribriform plates are wholly wanting.

Larva.—Only embryonic larvæ have been available for examination, so only certain structures can be characterized. Antennæ 6-segmented, legs stout and short, total length about that of antennæ, the tarsal claw large, all four digitules long, slender and slightly knobbed at apices, the tarsal projecting a little beyond those of claw, both extending beyond apex of claw;

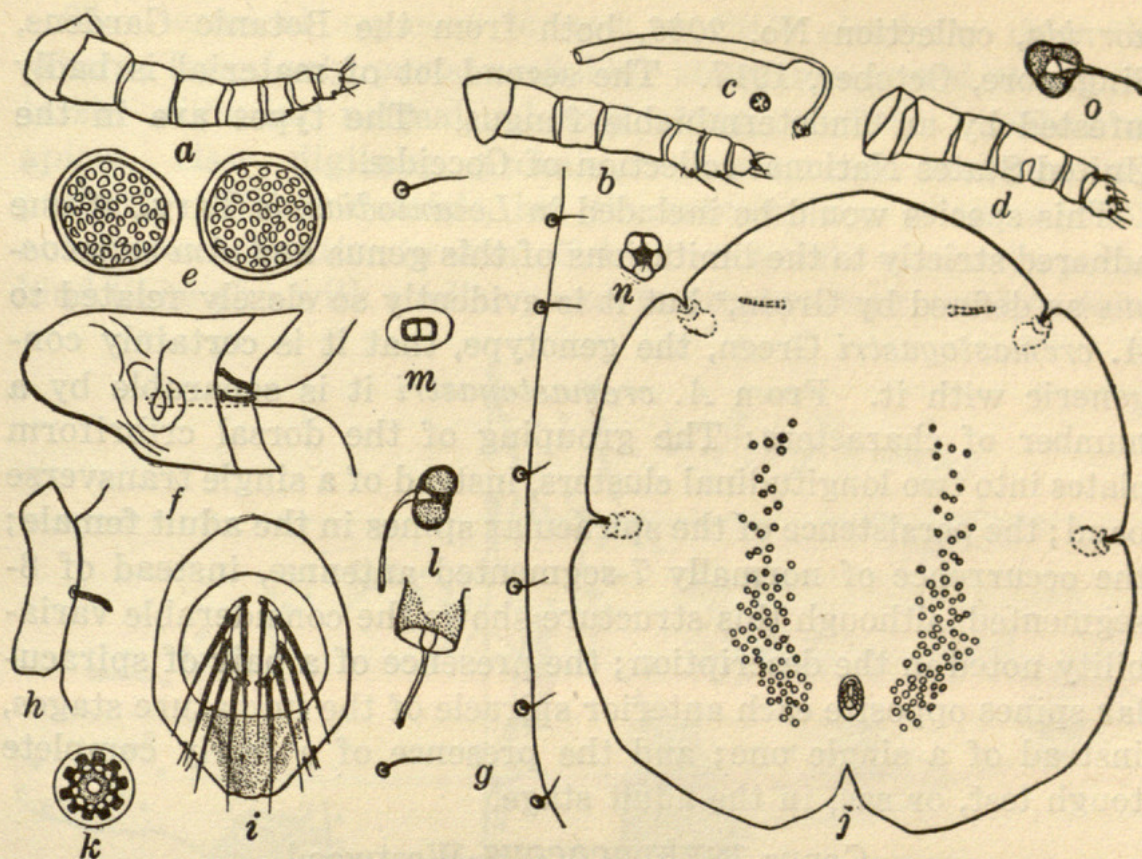


FIG. 2. *Anomalococcus multipori* sp. nov., adult female; a, antenna, showing eight segments, $\times 165$; b, same, showing seven segments, $\times 165$; c, tubular body duct, $\times 640$; d, antenna, showing six segments, $\times 165$; e, detail of two cribriform plates, $\times 640$; f, anterior spiracle, with plate and spines, $\times 165$; g, margin of body, showing size and position of two sizes of setae, $\times 335$; h, posterior spiracular plate, with single spine, $\times 165$; i, anal ring, with surrounding chitinous band, $\times 165$; j, outline of body, showing especially the position of the cribriform plates, $\times 20$; k, anal multilocular disk pore, $\times 1,500$; l, 8-shaped pore, side and diagonal views, $\times 1,500$; m, same, dorsal view, another focal point, $\times 1,500$; n, quinquelocular disk pore from spiracular plate, $\times 1,500$; o, normal 8-shaped pore modified to form trilocular pore, $\times 1,500$.

spiracles close to body margin, with two spiracular spines opposite anterior and one opposite posterior spiracles; body margin with a single row of slender setae, about as long as spiracular spines, and set rather widely apart; the chitinous structure surrounding the anal ring well developed, quite plainly composed of a dorsal and ventral half, anal ring circular, with six setae and two rows of pores; without anal lobes, but with a pair of long setae at the apex of the body, these as much as one-third the body length; dorsally and at margin with a few longitudinal rows of minute 8-shaped pores, ventrally with similar rows of small setae; with one or two tiny quinquelocular pores between each spiracle and the body margin.

This species has been described from twelve specimens and parts of specimens mounted on slides, and from additional unmounted material in position on the host, collected by Prof. C. F. Baker on stems of *Nephelium lappaceum* beneath ant cartons, under collection No. 9028, and on the leaves of *Oncosperma*

horrida, collection No. 9026, both from the Botanic Gardens, Singapore, October, 1917. The second lot of material is badly infested by an undeterminable fungus. The types are in the United States National collection of Coccidæ.

This species would be included in *Lecaniodiaspis* Targ., if one adhered strictly to the limitations of this genus and *Anomalococcus* as defined by Green,³ but it is evidently so closely related to *A. cremastogastri* Green, the genotype, that it is certainly congeneric with it. From *A. cremastogastri* it is separable by a number of characters: The grouping of the dorsal cribriform plates into two longitudinal clusters, instead of a single transverse band; the persistence of the spiracular spines in the adult female; the occurrence of normally 7-segmented antennæ, instead of 8-segmented, although this structure shows the considerable variability noted in the description; the presence of a pair of spiracular spines opposite each anterior spiracle of the immature stages, instead of a single one; and the presence of a fairly complete tough test, or sac, in the adult stage.

Genus PSEUDOCOCCUS Westwood

Pseudococcus bromeliæ (Bouché).

This species, as it is at present identified, has been collected at quarantine, Washington, D. C., on pineapple plants, received from Singapore. The records are as follows: On *Ananas*, July 19, 1916, F. H. B. 18520 (coll. H. Morrison); on Rubby pineapple, August 18, 1916, F. H. B. 18730 (coll. H. Morrison).

Pseudococcus hispidus sp. nov.

Adult female.—Nothing regarding superficial appearance before mounting known (only two mounted specimens available for examination); length of body as mounted, a little more than 2 millimeters; width, about 1.5; oval, perhaps a little narrowed anteriorly and broadened posteriorly; derm clearing completely after treatment; antennæ normally 7-segmented, the measurements of those available as follows (in microns):

II.	III.	IV.	V.	VI.	VII.
50	43	46.5	32	35.7	87
57	43	50	35.7	39.3	85.6
50	(*)	-----			
50	39.3	35.7	32	39.3	82

* Broken.

³ Coccidae of Ceylon, pt. 4 (1909) 295, 297, 302.

The terminal segment longest, a little slenderer than the others; legs (only parts available) stout, heavy and short, the tarsal digitules normal, slender, long, slightly knobbed at apices, claw digitules probably similar, but broken, claw probably without denticle, but the extreme tips of those available for examination broken off, hind coxæ with numerous pores, hind tibiæ also with similar pores, but their extent not determin-

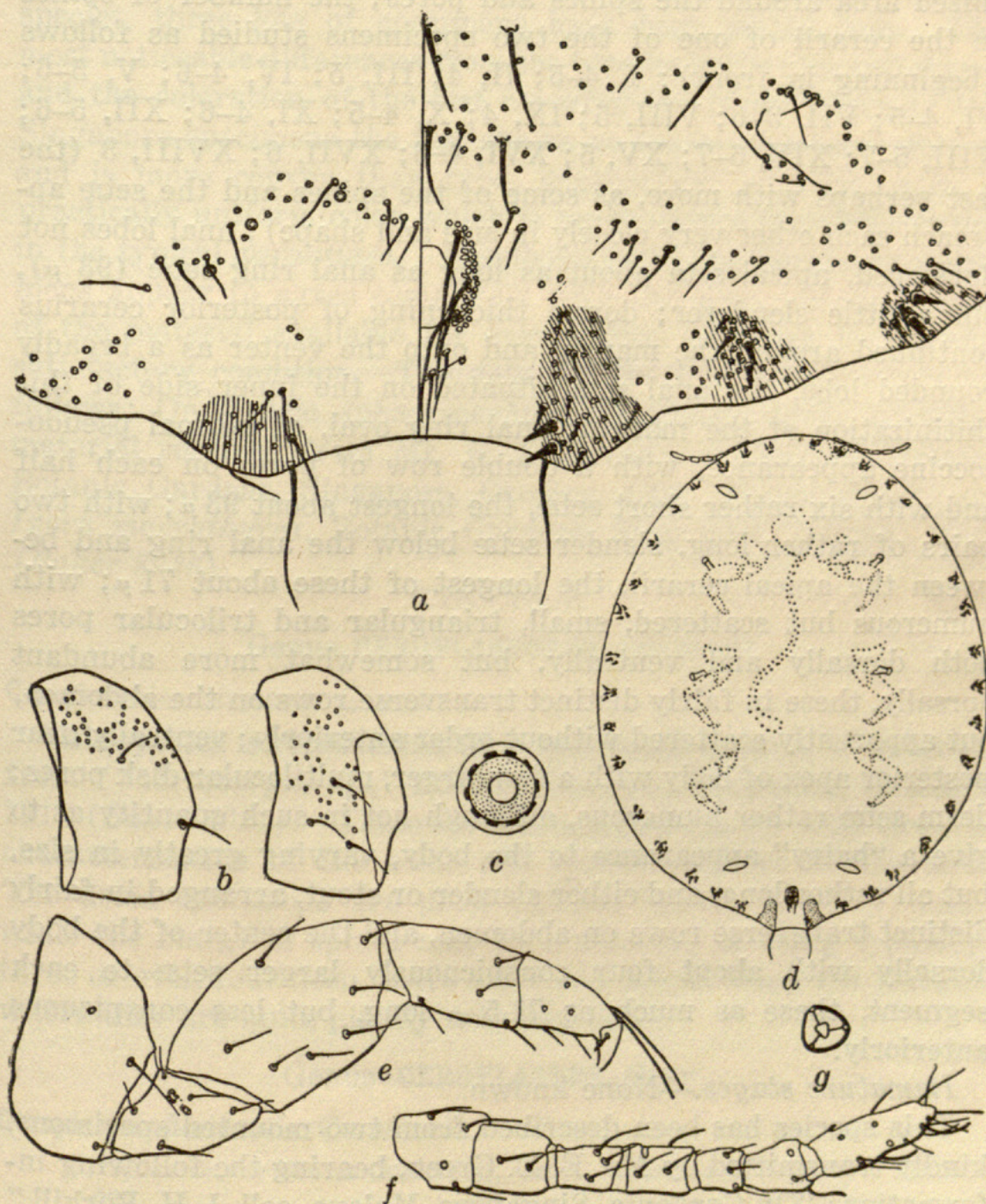


FIG. 3. *Pseudococcus hispidus* sp. nov., adult female; a, posterior apex of abdomen, showing anal ring, cerarii, pores, and unusually large dorsal setæ, $\times 165$; b, hind coxa, showing both surfaces, $\times 165$; c, large ventral multilocular disk pore, $\times 1,500$; d, outline of body, showing number and position of cerarii, etc., $\times 30$; e, foreleg, $\times 165$; f, antenna, $\times 165$; g, triangular pore, $\times 1,500$.

able as only a fragment of a tibia is present; beak apparently 2-segmented; with both posterior and anterior pairs of dorsal ostioles well developed; with eighteen pairs of cerarii, each of these with more than two spines, these varying in size, and each with a loose cluster of triangular pores and with a few more or less distinctly associated accessory setæ, the posterior pairs, at least, and particularly the anal lobe cerarii, with a large chitinized area around the spines and pores; the number of spines in the cerarii of one of the two specimens studied as follows (beginning in front): I, 4-5; II, 4; III, 5; IV, 4-6; V, 5-6; VI, 4-5; VII, 3-6; VIII, 5; IX, 4; X, 4-5; XI, 4-6; XII, 5-6; XIII, 5-7; XIV, 6-7; XV, 5; XVI, 4-6; XVII, 6; XVIII, 3 (the last perhaps with more, as some of the spines and the setæ approach each other very closely in size and shape); anal lobes not developed, apical seta about as long as anal ring setæ ($93\ \mu$), but a little slenderer; dorsal thickening of posterior cerarius continued around the margin and onto the venter as a broadly rounded lobe, the anal seta situated on the inner side of this chitinization at the margin; anal ring oval, of normal pseudococcine appearance, with a double row of pores on each half and with six rather short setæ, the longest about $93\ \mu$; with two pairs of rather long, slender setæ below the anal ring and between the apical cerarii, the longest of these about $71\ \mu$; with numerous but scattered, small, triangular and trilocular pores both dorsally and ventrally, but somewhat more abundant dorsally, these in fairly distinct transverse rows on the abdomen, but apparently scattered without order anteriorly; ventrally near posterior apex of body with a few larger, multilocular disk pores; derm setæ rather numerous, although not in such quantity as to give a "hairy" appearance to the body, varying greatly in size, but all rather long, and either slender or stout, arranged in fairly distinct transverse rows on abdomen, and the center of the body dorsally with about four conspicuously larger setæ to each segment, these as much as $71.5\ \mu$ long, but less conspicuous anteriorly.

Immature stages.—None known.

This species has been described from two mounted specimens, kindly transmitted by Mr. E. E. Green, bearing the following information: "On *Gordonia*, Singapore, Malaya, coll. I. H. Burkill."

The type is in the United States National collection of Coccidæ; the paratype is in Mr. Green's collection.

Mr. Green had placed this species in *Tylococcus* Newst., and had given it the specific name *hispidus*, used above. As there is

very considerable question regarding both the validity and the characteristics of *Tylococcus* Newst., I consider it preferable to assign the species to *Pseudococcus*, for the present, at least.

TACHARDIINÆ

Genus **TACHARDIA** R. Blanchard

Tachardia aurantiaca Cockerell.

After a careful comparison with the type material of this species, three lots of specimens have been placed here. The most noticeable differences from the type lie in the size and shape, and the coloration of the test covering the insect, since in the Singapore specimens the test shows no traces of lateral ribbing and is more convex than type, approaching globular, with a practically uniform color which is much darker than that found in the typical *aurantiaca*. Morphologically the Singapore specimens appear to agree completely with the type, although none of the material available for examination has been in entirely satisfactory condition. The data for the lots examined are as follows: On *Acacia sphaerocephala*, Singapore (coll. *Burkill*), material received from Mr. E. E. Green; on *Cajanus indicus*, Botanic Gardens, Singapore, October, 1917 (*Baker 9027*); on *Ixora macrothyrsa*, Botanic Gardens, Singapore, August, 1917 (*Baker 8936*).

COCCINÆ

Genus **CEROPLASTODES** Cockerell

Ceroplastodes virescens Green.

This species is represented by a very small amount of material from “? *Artocarpus* sp.,” Botanic Gardens, Singapore, October, 1917 (*Baker 9021*). These specimens agree exactly with Green’s characterization of the color and surface texture of the test. The dried specimens are dark reddish brown, however; and, while the marginal spines may be considered as being typically three or even four deep, there are many points along the margin where they are quite plainly only two deep.

Genus **CEROPLASTES** Gray

Ceroplastes floridensis Comstock.

Ceroplastes floridensis COMSTOCK, Green, Coccidae of Ceylon 4 (1909) 277.

A few specimens agreeing exactly with Green’s description and figures, cited above, have been received from Professor Baker with the following data: On *Gleichena dichotoma*, Penang (coll. *I. H. Burkill*).

Genus **ALECANIUM** novum

Coccine form, female flattened, oval, with a median elevated ridge, covered by a transparent, thin, easily deciduous, waxy coat; antennæ and legs very much reduced, of the rudimentary type; derm not chitinized, only the mouth parts, spiracles, body margin, anal plates and a band surrounding these chitinized; the thickened margin deeply, irregularly incised, with a single row of long, slender setæ dorsally and an alternating double row of much stouter setæ ventrally; spiracular spines apparently wanting, their normal position indicated by quadrate chitinized plates; anal plates elongate, narrow dorsal surface bearing numerous setæ distributed over the whole plate surface, each plate terminating caudally in a single much longer seta; fringe setæ numerous, anal ring with ten to twelve setæ and pores, small, inclosed within the plates; derm with quinquelocular disk pores of two sizes ventrally, with tubular ducts with cup-shaped bases ventrally, with minute tubular ducts dorsally and with disk pores, possibly with loculi, dorsally grouped near the anal plates; larva elongate oval, antennæ 6-segmented, legs normal, with a single marginal row of slender setæ, three spiracular spines, approximately equal in length, in each group and anal plates similar in shape to those of the adult, slightly reticulate, but with only a long terminal and two or three other setæ.

This genus appears to differ from any other known to me in the characters of the anal plates and the marginal region of the body; it is, unfortunately, not possible to indicate any genus of the subfamily Coccinæ as a close relative of this one and little can be said at present regarding its probable position within that subfamily.

Type of the genus, *Alecanium hirsutum* sp. nov.

Alecanium hirsutum sp. nov. Plate 1, fig. 2.

Adult female.—Not definitely known to occur in the material studied, and possibly not observed; the form examined probably either the next to the last stage female, or the immature last stage; occurring on the twigs of the host, accompanied by male puparia; oval, somewhat pointed anteriorly, flattened dorsally, with a distinct, rounded, longitudinal ridge medially, the elongate oval pair of anal plates placed in this ridge about one-third of the total body length from the posterior end; body dorsally, irregularly wrinkled and pitted on each side of the median ridge; yellow-brown, more or less suffused with darker brown, anal

plates and the narrow chitinized ring surrounding them distinctly reddish; probably uniformly, moderately convex in life, without definite longitudinal ridge; covered by a thin, transparent, easily shed film of brittle wax, this appearing somewhat whitish when removed from the insect; maximum length of specimens examined, 1.75 millimeters.

Body of female.—Maximum length mounted on a slide, about 1.75 millimeters; body clearing when boiled in caustic potash, except for the anal plate and marginal regions; oval, somewhat pointed anteriorly, lateral margins slightly lobed due to shallow incisions opposite the spiracles; antennæ minute, rudimentary, indistinctly 3-segmented, the apex bearing a cluster of six setæ, some of these nearly as long as the whole antenna; preapical segment with at least one long seta, total length, averaging $36\ \mu$; legs minute, rudimentary, broadly triangular from base to apex, the width at base, including the extended attachment sclerite, about $68\ \mu$; the total length to apex of claw, about $25\ \mu$, the divisions between the different parts so faintly indicated that it is impossible to trace them; with numerous relatively large chitinous circles, these the bases for the short setæ, present on the leg, claw present but poorly developed, both the tarsal and claw digitules present, relatively well developed, about $17\ \mu$ long; claw, about $5\ \mu$ long; beak apparently 1-segmented, short, stout and broad; spiracles rather large, placed nearer the margin than the center of the body, each connected with the margin by a line of scattered pores, which passes through a chitinous thickening at the edge and then barely up onto the upper surface; spiracular spines wanting in all specimens examined and no traces such as presence of chitinized bases visible; marginal spine and hair arrangement unusual, the margin just at the edge or a very little on the dorsum with a row of relatively long, slender, hairlike setæ, below this broken up by deep irregular incisions and crenulations, some of which extend the whole width of the chitinized portion, and bearing, usually on the inner portion of the chitinization, an unevenly spaced and irregularly placed row of stout but long setæ, these about half the length of the dorsal setæ or a little more, and as much as two or even three deep at the posterior end of the body; dorsally with fairly numerous but scattered setæ, similar in shape and base to those occurring dorsally at the margin, but smaller, present over the whole surface, slightly larger near the margin than near the middle; ventrally with more numerous, similar, but smaller setæ, those just anterior to the anal plates arranged in fairly definite straight transverse rows;

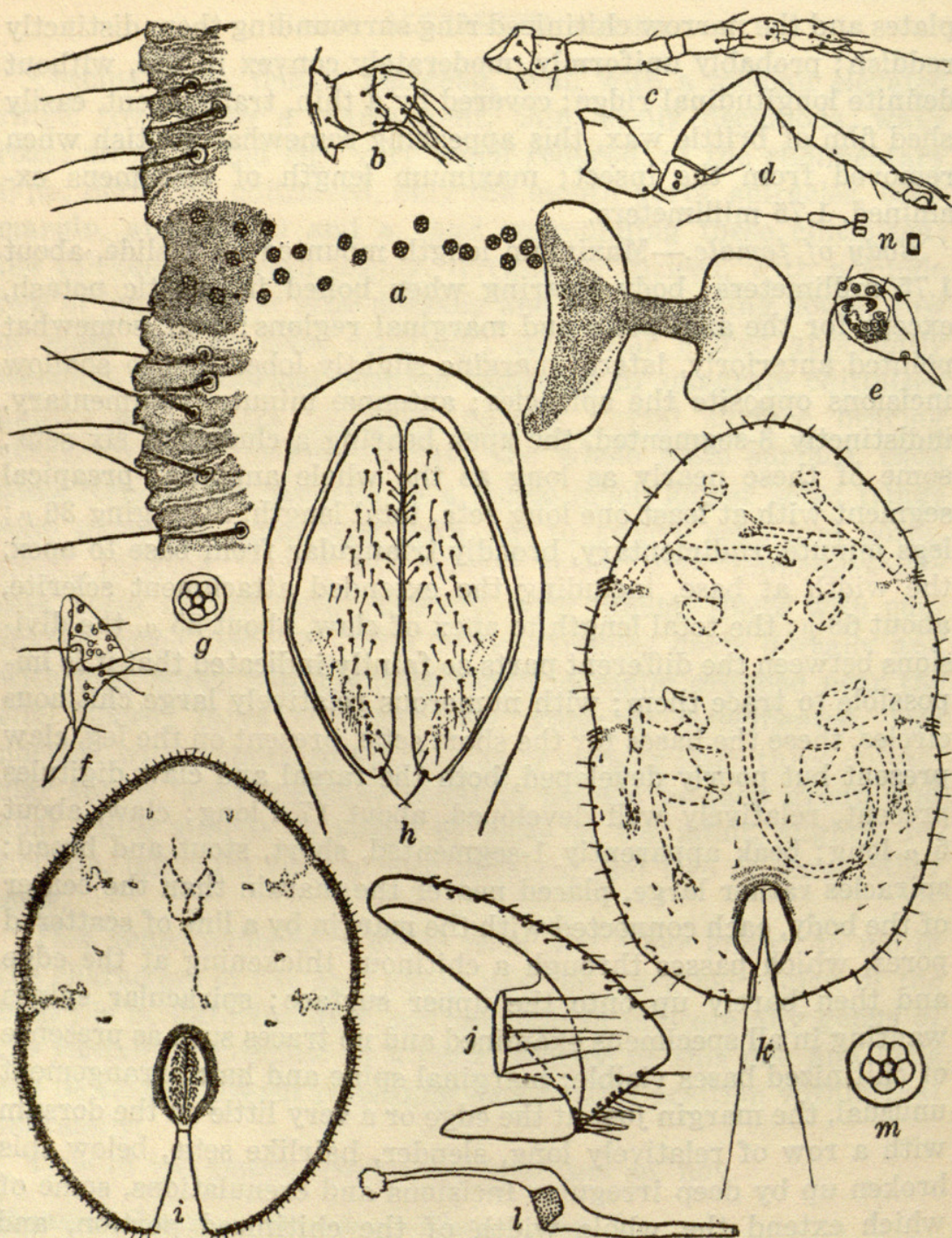


FIG. 4. *Alecanium hirsutum* g. et. sp. nov.; a, adult female, body margin opposite spiracle, $\times 335$; b, adult female, antenna, $\times 335$; c, larva, antenna, $\times 165$; d, larva, leg, $\times 165$; e, adult female, disk pore from spiracular row, $\times 1,500$; f, adult female, anal plates, $\times 165$; g, adult female, outline of body, $\times 30$; h, adult female, anal plates, lateral view, somewhat diagrammatic, $\times 165$; i, adult female, anal plates, lateral view, somewhat diagrammatic, $\times 165$; j, larva, outline, $\times 90$; k, adult female, ventral tubular duct, $\times 1,500$; l, adult female, quinquelocular disk pore from anal plate region, $\times 1,500$; m, adult female, dorsal pore, $\times 1,500$.

dorsally with numerous, but well-separated and scattered, minute, circular to quadrate pores over the whole surface, these with small internal ducts and long internal filaments, and with somewhat larger but unequal-sized pores with heavy borders in scattered groups on each side of the anal plates, the groups ex-

tending both anterior and posterior to the plates, and having the appearance of poorly constructed bi-, tri-, or quadrilocular pores, with a circular or slightly oval outline; ventrally with at least two types of pores, the circular disklike multilocular pores, apparently all quinquelocular, a small row running from each spiracle to the body margin, and a few, widely separated, for some distance around the anal plates, the nearest approach to grouping coming just posterior to the plates, the latter noticeably larger than the first, and the elongate, slender, tubular ducts with deep asymmetrical cup-shaped bases, most numerous along the margin, here apparently opening into the margin itself, and again somewhat more numerous along the median ventral line anteriorly, but scattered more or less over the whole surface; anal plates surrounded by a narrow chitinous band about as long as the whole of the mouth parts, plates about $265\ \mu$ long, and each about 80 to $85\ \mu$ wide, bluntly rounded anteriorly, more or less pointed posteriorly, widest at a point about one-third of the total length from the posterior apex, the outer angle rounded or very bluntly angular, dorsally with numerous, rather long, slender setæ scattered from base to apex, arranged in very indefinite transverse and usually diagonal rows, the number varying from forty to fifty-three, with forty-four or forty-five as the commonest number, each plate with a large apical seta about twice as long as the dorsal setæ, with six to eight somewhat stouter setæ on the short posterior ventral ridge, the inner lower corner of the ridge attached to a chitinized plate which extends downward and cephalad along the median line, and together with the anal plates completely incloses the anal ring, except for the narrow dorsal and apical slit between the plates; this chitinized plate bearing eight or nine setæ at its upper posterior extremity, these appearing to correspond to the fringe setæ found in other species, and standing two or sometimes three deep; with a cluster of small spinelike setæ visible in mounts just posterior to the apex of the anal plates, these possibly homologous with the hypopygial setæ of some other species, but more probably merely a group of ventral setæ; anal ring small, placed within the posterior half of the anal plates, the setæ about a third or a little more of the plate length, the total number varying from at least ten to twelve, the ring itself with a double to triple row of pores.

Larva.—Oval, pale brown in dried condition, flat, naked; length, about 0.77 millimeters; width, about 0.48; becoming clear when boiled in caustic potash; legs and antennæ well developed, the

former 6-segmented, the third segment longest, somewhat curved and slightly clavate, nearly twice as long as the terminal which is next longest; legs with all the parts well developed, the tarsus distinctly longer than the tibia, the tarsal digitules much longer than those of the claw, slender, both slightly knobbed, extending just beyond the apex of the claw, this faintly denticulate close to the apex; spiracles elongate, rather slender, slightly enlarged at each end; three spiracular spines opposite each spiracle, nearly equal or the middle one very slightly longer; margin with a single row of fairly large setæ, these spaced irregularly, and with an occasional much smaller submarginal seta ventrally; dorsally with at least a single row of very small setæ extending cephalad from the anal plates on each side and about halfway between margin and median line, the individual setæ widely separated, only about six altogether; ventrally with two similar rows on each side, the setæ in these slightly larger; without pores except for three or four quinquelocular disk pores between each spiracle and the margin; anal plates elongate, each about $100\ \mu$ long and $32\ \mu$ wide, broadly rounded anteriorly, tapering to a point posteriorly, broadest just caudad of the middle, the apical hair very long, slender, about $268\ \mu$ long; plates with a single tiny seta at a point about one-third the length from the anterior apex, another about the same distance from the posterior apex, both close to the inner margin of the plate, and a larger subapical seta at the outer margin and just anterior to the apical seta; with a single rather large seta at the base of the ventral ridge, with a single rather large fringe seta below the plate on each side; anal ring and hairs located in the middle of the anal plates, the hairs a little more than half the length of the plate, apparently six in number, this not definitely determinable.

Male puparium.—Elongate oval, fairly convex, about 1.25 millimeters long, broadest opposite the anal plates, of thin transparent wax, only the slightly flattened margins whitish: the lines indicating the plates faint, with a submedian on each side dorsally, the others all quite indistinct, with traces of a cross-line probably joining these two just before the anal plates and another close to the cephalic apex, and additional lines running diagonally from these meeting points to the body margin, occasionally with traces of a line dividing each lateral plate into anterior and posterior parts; without any traces of transverse dorsal carinæ.

Male pupa and larva (second stage).—The inclosed male pupa almost uniformly reddish brown, shaped much as is the

puparium; the poorly developed male pupa surrounded by the larval skin, but whether this condition continues through the entire pupal period cannot be stated; the male larval structure appears intermediate between the young larva and the oldest female form as already described; legs and antennæ much reduced; anal plates elongate, slender, with about seven or eight dorsal pores, possibly bearing setæ, scattered through the whole length of the plate; apical seta broken; with two relatively large fringe setæ on each side; with three spiracular spines of equal length in each group; marginal spine arrangement much as in young larva; multilocular disk pores observed only between spiracles and margin; cup-shaped tubular ducts numerous, especially along the margin and, in transverse groups, on each side anterior to the anal plates; the short developing legs and antennæ of the male pupa about twice as large as those of the larva; the pupa not sufficiently developed to show any characters for description.

This species has been described from five females mounted on a slide, five young larvæ mounted on a slide, two male larvæ and pupæ mounted on a slide, and a number of specimens attached to the host. The specimens were found on *Alsodeia echinocarpa*, Botanic Gardens, Singapore, August, 1917 (*Baker 8935*) and were covered by a carton and attended by ants. The types are in the United States National collection of Coccidæ.

I have described this material as representing a new genus and species with great hesitancy, as there is considerable evidence to indicate that the species may be founded on the immature female. There is no evidence of the development of the ovaries in any of the specimens examined, the difference in size of young larva and the largest female found is much less than might be expected normally, and the male puparia are much larger in proportion to the size of the largest female than is usual in the subfamily. In spite of this, however, the differences noted, particularly with reference to the anal plates and the marginal region, are such as to indicate a considerable divergence from the typical condition in the subfamily; and, assuming that the females described are only second or preadult stage, any further modifications of structure in the adult might reasonably be expected to follow along the lines shown by the form described.

Genus COCCUS Linnæus

With the possible exception of the first, the species that are placed in this genus in this paper are a decided puzzle in respect

to their true generic relationships. The whole group of new species described here have a similar habit and are evidently closely related, possibly excluding the first new species, and in view of the chaotic condition of the genera of the Coccinæ it has seemed advisable to place them in a well-known genus, from which they can be readily transferred to their proper position if this should prove necessary.

Coccus discrepans (Green).

This record is based on some specimens from the undersides of leaves of *Murraya caloxylon*, Botanic Gardens, Singapore, August, 1917 (*Baker 8940*), the individuals attended and covered by ants. These specimens have been compared with mounts made from material forwarded to the United States National collection of Coccidæ from Ceylon by Mr. E. E. Green, the describer of the species. Green lists this species as belonging to the genus *Saissetia* as recognized by the Fernald Catalogue of Coccidae; but from an examination of the material at hand, I can see no reason for not including it in *Coccus* as this genus is at present recognized by American coccidologists. The only structural differences noted in the Singapore specimen, as compared with the description and the Ceylon specimens, are that the anal plates are wider in proportion to their length in the former than in the latter and that no submarginal tubercle has been located between the groups of spiracular spines on the Singapore specimens, although they are present elsewhere. Both of these apparent differences are in all probability due to the condition of the mounts obtained from the specimens from Singapore, since all these have been rather poor and have apparently been so badly crushed in mounting that the anal plates have been flattened.

For the present another lot of specimens, from the leaves of an unknown host, Singapore, August, 1917 (*Baker 8934*), colonized by ants under carton nests, is also considered as of this species, although these specimens show some structural differences as compared with the other specimens of the species that have been examined. There are six well-developed submarginal tubercles on each side, two anterior to the first spiracle, one between the spiracles, and three posterior to the second spiracle, all widely separated. The body of the female, which is fully developed, as evidenced by the presence of young larvæ beneath it, averages about one-fourth smaller than the Ceylon specimens; and, while the marginal setæ are frayed apically and curved as in the typical specimens from Ceylon, the two lateral spiracular spines are

quite noticeably smaller in proportion to the length of the middle spine in this lot of specimens as compared with typical material.

Coccus tumuliferus sp. nov. Plate 1, fig. 3.

Adult female.—Occurring within the hollow stems of the host, probably attended by ants; rarely broad oval, but usually broadened behind and triangular with the angles rounded; plane of dorsal surface flat, but in dried specimens covered with relatively large knobs having a fairly definite arrangement of a median longitudinal single row and on each side of this two other rows, the outer one forming a continuous row around the body at the margin; dorsally covered with a thin, brittle, whitish but more or less translucent, glassy secretion, very easily broken and usually more or less wanting, molded into elevations and depressions corresponding to those of the body, this covering normally wanting over the flattened extreme margin of the body; body color dull brown, of secretory covering, as stated, translucent whitish; maximum length noted, 2 millimeters; width, 2; body as mounted on slide similar in shape and size to unmounted specimens; derm in fully matured individuals becoming somewhat chitinized, more especially along the margin where the inner border of the chitinized zone is broadly scalloped, corresponding to the borders of the adjacent knoblike elevations, the tongues of these scallops continued inward and united with a chitinized pattern corresponding exactly with the deep grooves running between the conspicuous body knobs; antennæ normally 8-segmented, the measurements of those available for study as follows (in microns): II, 43–50; III, 39–43; IV, 32–35.7; V, 18; VI, 16–18; VII, 14; VIII, 18–21; legs of normal form, rather small and slender, claw rather stout and strongly curved, without denticle, all digitules slender, threadlike, with slightly swollen tips, spiracles not unusual, placed rather near the body margin and each with a slight depression in the margin opposite it; with a wide band of scattered pores between spiracle and margin; mentum apparently 1-segmented, short, and broad triangular, apex rounded; derm pores of several sorts, tiny tubular ducts scattered over the dorsum, large tubular ducts with cup-shaped inner ends mostly close to the body margin, and a very few circular disk pores, apparently simple, in line anterior to the anal plates; ventrally with multilocular disk pores of two sizes, a few large, with eight to ten loculi beneath the anal plates, the others smaller, normally with five loculi in wide bands between spiracles and margin; marginal setæ long, slender, hairlike, in a

scattered and irregular row, this at times appearing double, and with a number of somewhat smaller submarginal setæ; apparently without dorsal setæ, ventrally with a number of setæ, much smaller and stiffer than those of margin, these appearing as if scattered, but probably actually in transverse rows, and largest near the antennæ and anterior to the anal plates; spiracular spines possibly normally occurring in threes, but no more than one noted opposite each spiracle in any of the specimens examined, this fairly long and stout, but much shorter

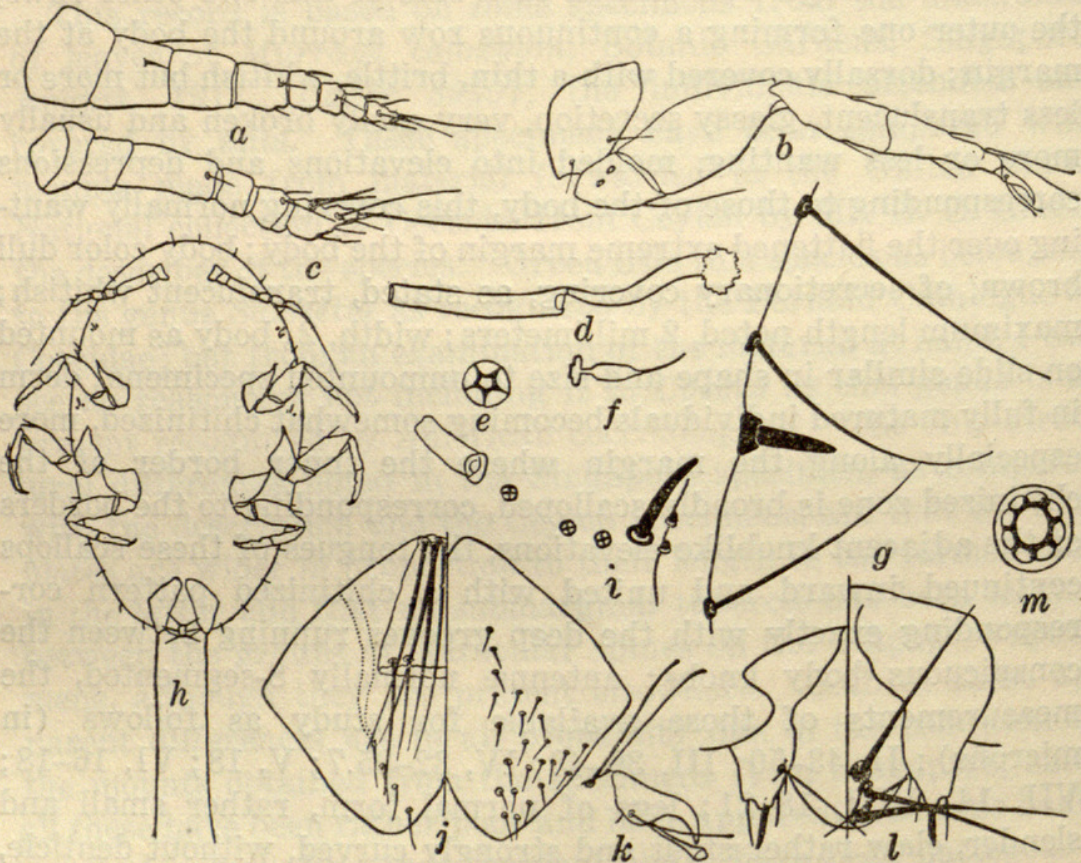


FIG. 5. *Coccus tumuliferus* sp. nov.; a, adult female, antenna, $\times 165$; b, larva, leg, $\times 335$; c, larva, antenna, $\times 335$; d, adult female, large tubular duct, $\times 1,500$; e, adult female, spiracular disk pore, $\times 1,500$; f, adult female, small tubular duct, $\times 1,500$; g, adult female spiracular and marginal spines, $\times 640$; h, larva, outline, $\times 115$; i, larva, spiracle to margin, $\times 640$; j, adult female, anal plates, $\times 220$; k, adult female, claw, $\times 500$; l, larva, anal plates, $\times 335$; m, adult female, posterior ventral disk pore, $\times 1,500$.

than the marginal setæ; anal plates triangular, posterolateral margin somewhat shorter than anterolateral, the corners usually rounded; plates high and, consequently, subject to considerable distortion on mounting; dorsally with as many as twenty-four small slender setæ scattered over the posterior two-thirds of each plate, with three or four ventral ridge setæ, somewhat larger than the dorsal setæ, and with two pairs of relatively large and long fringe setæ; anal ring placed below and within the

plates, small, stout, with pores and eight relatively large and long setæ; no hypopygial setæ.

Intermediate-stage female.—Similar to adult, except for smaller size, reduced number of pores and setæ, and the presence of a pair of stout spiracular spines, one larger than the other, opposite each spiracle.

Larva.—Oval, tending toward oblong, antennæ 6-segmented, the third longest; legs normal, rather slender, claw long, slightly curved at apex, with denticle, digitules long and slender, slightly knobbed; margin of body with a row of rather widely separated slender setæ; spiracular spines three in each group, two short, rounded-conical, one, the median, much larger and cylindrical, all about same diameter at base; with a ventral submarginal row of smaller setæ, and a few longer, very slender ones anterior to the anal plates and near antennæ; with three or four quadri-ocular pores between each spiracle and margin, no other pores noted; anal plates triangular, slender, with a large and long apical seta, three much smaller subapical marginal setæ and one ventral ridge seta on each.

This species has been described from five mounted adults, several mounted larvæ, and a number of unmounted specimens, all received from Mr. E. E. Green with the following information: In hollow stems of *Macaranga hypolema*, Singapore (coll. I. H. Burkill). The name used above is the manuscript one assigned to the species by Mr. Green, who had also tentatively assigned the species to the genus *Ctenochiton* Mask. I have examined the type of this genus and consider the correctness of such an assignment to be very questionable, and consequently I have placed the species in the genus *Coccus*, though from our present knowledge of the genera of the Coccinæ there is little more to be said in favor of its location here than in *Ctenochiton*. The species itself appears to be a very distinct one, and there should be little danger of confusing it with other species that have been assigned to *Coccus*. The most conspicuous characters are the external appearance, the size and shape of the marginal setæ, the number and size of the spiracular spines, and the numerous dorsal setæ on the anal plates. The types are in the United States National collection of Coccidæ.

Coccus penangensis sp. nov.

Adult female.—Normally short oval, flat, dorsal surface dull, naked, wrinkled radially near margin, outer portion light brown, central disk usually much darker brown to blackish; maximum length, about 2.5 millimeters; width, a little less than 2; mounted

specimens similar in size and shape; derm clearing to a considerable degree on treatment with caustic potash, but showing more or less distinctly numerous, large, rather closely crowded areolations, each with a tiny pore, these areolations similar to those found in species of *Saissetia*, but much less conspicuous on account of the much lighter chitinization, more pronounced along the body margin; antennæ normally 7-segmented, the third sometimes incompletely divided, the measurements of those examined as follows (in microns): II, 35-39; III, 39-48; IV, 35-37; V, 22; VI, 18-22; VII, 35-39; legs normal, rather small and slender, claws rather strongly curved at tips, digitules all long, slender, knobbed at tips, but one of claw about three times as thick as the others; spiracles not unusual; beak apparently 1-segmented, very short; derm with numerous, but scattered simple pores over dorsum in center of areolations,

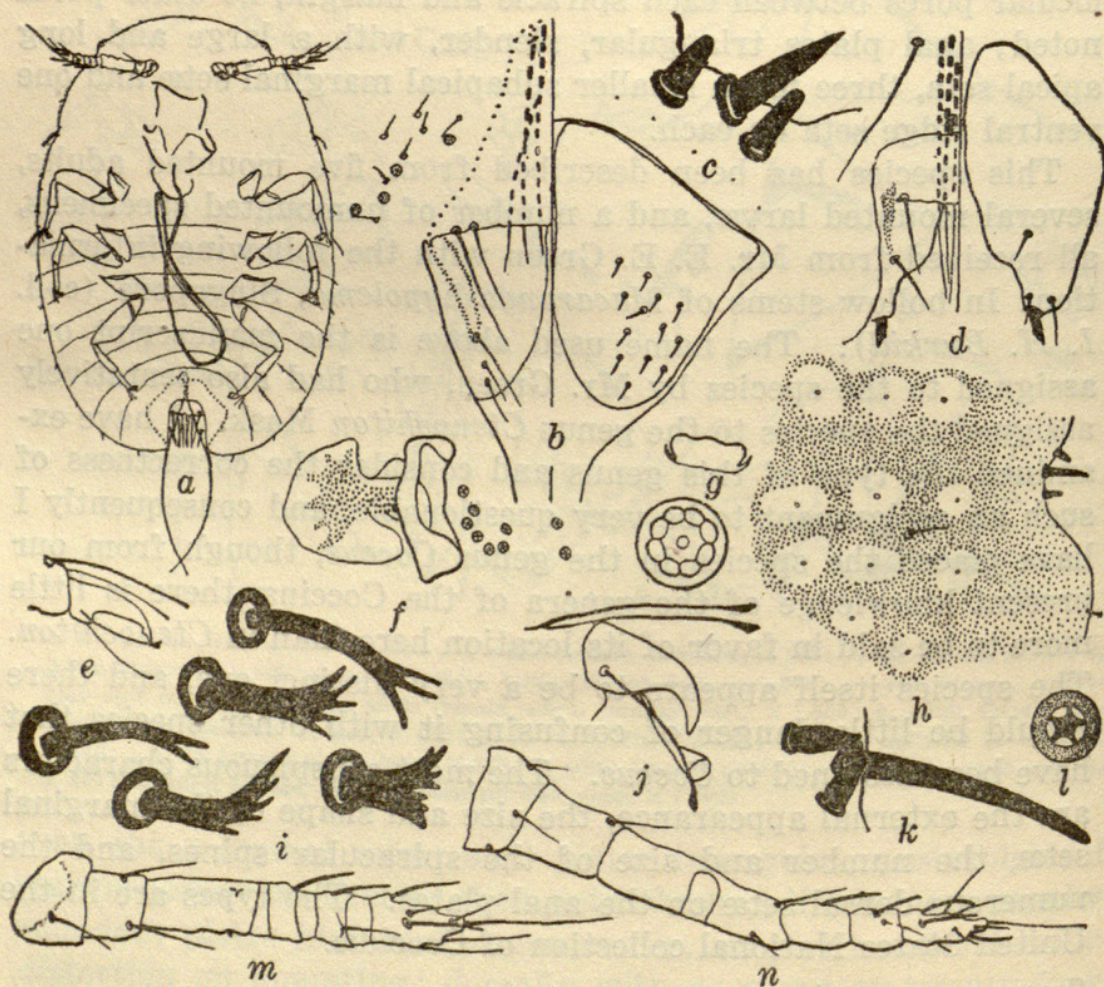


FIG. 6. *Coccus penangensis* sp. nov.; a, larva, outline from beneath, $\times 115$; b, adult female, anal plates, $\times 220$; c, adult female, spiracular spines, $\times 640$; d, larva, anal plates, $\times 335$; e, larva, claw, $\times 640$; f, adult female, spiracle, $\times 220$; g, adult female, posterior disk pore, $\times 1,500$; h, adult female, portion of derm showing areolations, $\times 220$; i, adult female, marginal setæ, showing range of variation, $\times 1,500$; j, adult female, claw, $\times 640$; k, larva, spiracular spines, $\times 1,500$; l, adult female, spiracular pore, $\times 1,500$; m, larval antenna, $\times 440$; n, adult female, antenna, $\times 220$.

laterally with small long-tubular ducts with cup-shaped bottoms; ventrally with a row of quinquelocular pores between each spiracle and margin, and with a few somewhat larger disk pores, each with about eight loculi, below the anal plates; body with rather variable, but usually fairly stout, short, marginal setæ, normally bifid, trifid, or fringed at apices, rarely with one or more lateral teeth; spiracular spines normally in threes, with one plainly but not conspicuously longer than the other two, rarely with four in a group, the median rather sharp conical, the laterals rounded conical; dorsal surface with an occasional, isolated, fairly long, slender but stiff seta, these setæ probably in definite arrangement, but this not determinable from the material at hand; ventrally with the setæ more numerous and, in general, smaller than dorsally, but with a few, anterior to anal plates and near antennæ, much larger; anal plates rather broadly triangular, but much subject to distortion in mounting, the apical angle rounded, dorsally bearing about sixteen to eighteen short, rather stiff setæ on the apical half of each plate, ventrally with three larger setæ on the ridge, and a pair of still larger fringe setæ on each side; no hypopygial setæ; anal ring with pores and eight setæ.

Larva.—Rather stout oval, antennæ 6-segmented, legs rather stout, margin of body with widely separated slender setæ, spiracular spines in threes, the median much longer than the laterals; anal plates triangular, with a long apical seta, about three subapical dorsal setæ, a single larger ventral seta and a single large fringe seta.

This species has been described from two mounted adults, three mounted larvæ, and a few unmounted specimens, all of the material kindly transmitted by Mr. E. E. Green and bearing the following information: In hollow stems of *Macaranga triloba*, Penang Ids. (coll. *I. H. Burkill*). The types are in the United States National collection of Coccidæ.

The salient characters which distinguish this species from the closely related forms found in similar situations and in the same locality are indicated in the key which follows this series of descriptions of new species of *Coccus*.

Coccus caviramicolus sp. nov. Plate 1, fig. 4.

Adult female.—Flat, broad oval, approaching circular, dull brown, central area darker, dull or faintly shining, without or with a very slight secretory coating; maximum length, 2.5 millimeters; width, about 2; individuals mounted on slides similar in size and shape; some individuals showing faint traces

of areolations similar to those described for *C. penangensis*, mostly near the posterior apex of the body; antennæ normally 7-, rarely 8-segmented, the measurements of the 7-segmented form in microns as follows: II, 43; III, 53.5–60.5; IV, 27–39; V, 14–18; VI, 18–21.5; VII, 44–50 (3 antennæ); of the 8-segmented form: II, 46.5; III, 43; IV, 18; V, 14; VI, 21.5; VII, 25; VIII, 46.5; legs not unusual, claws without denticle, one digitule about three times as large as the other, all elongate, slender, knobbed at apices; spiracles normal; derm dorsally with numerous, scattered, tiny quadrate pores with internal tubular prolongations, also with

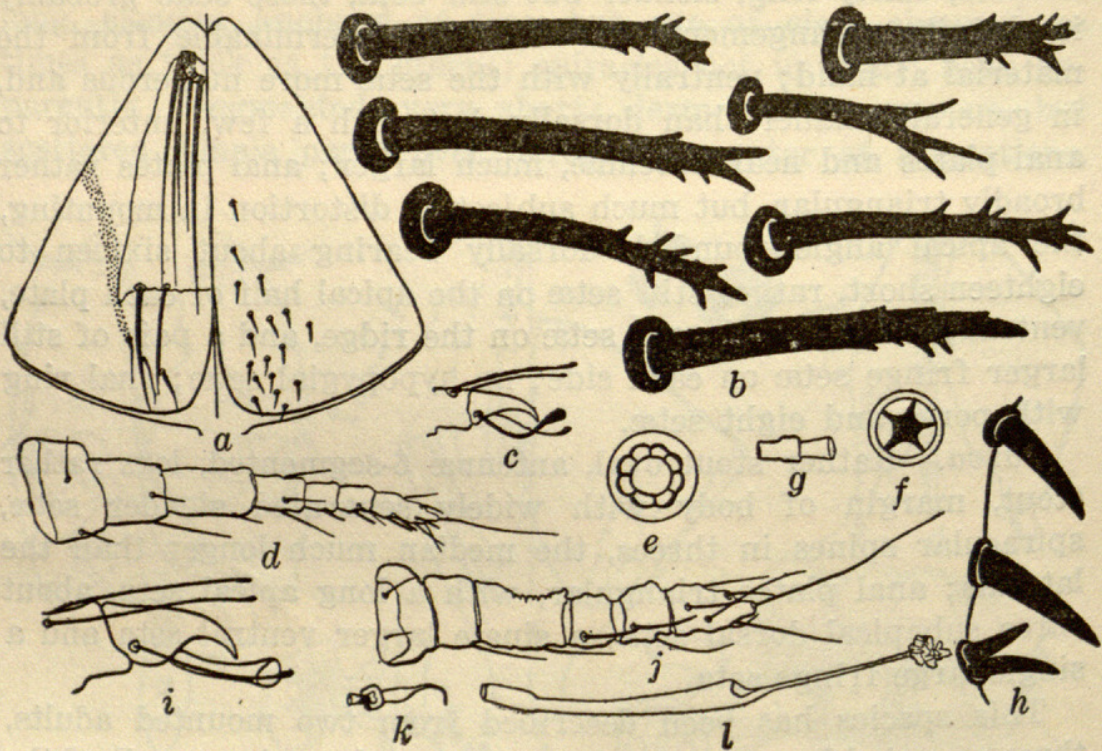


FIG. 7. *Coccus caviramicolus* sp. nov.; a, adult female, anal plates, $\times 220$; b, adult female, marginal setæ, $\times 1,500$, showing range of variation; c, larva, claw, $\times 460$; d, adult female, antenna, $\times 165$; e, adult female, posterior ventral disk pore, $\times 1,500$; f, same, spiracular disk pore, $\times 1,500$; g, adult female, ventral tubular duct, $\times 1,500$; h, adult female, spiracular spines, $\times 640$; i, adult female, claw, $\times 640$; j, larva, antenna, $\times 440$; k, adult female, dorsal tubular duct, $\times 1,500$; l, adult female, long tubular duct, $\times 1,500$.

a few larger, scattered, simple disk pores anterior to anal plates; ventrally with some tiny, short tubular ducts, some larger, long tubular ducts near the body margin, with a narrow band of quinquelocular disk pores between each spiracle and the margin, and with a few somewhat larger disk pores beneath the anal plates, these with six to eight loculi; marginal setæ fairly large and stout, nearly as long as the spiracular spines, the apical third of each more or less strongly frayed laterally and apically; spiracular spines normally in threes, the median somewhat larger, rarely with four present, all stout, tapering, pointed at

tips; ventrally with a submarginal row of fairly large, slender, entire setæ, and with others near antennæ and anterior to anal plates; no dorsal setæ noted; anal plates triangular, the anterolateral margin of each longer than the posterolateral, but the shape of the plates much subject to distortion through mounting, inner and posterior half of each plate with about seventeen to twenty small setæ; ventral ridge with three larger setæ and with two pairs of much larger fringe setæ, the inner smaller; anal ring small, with pores and ten setæ.

Larva.—So far as can be determined from the very limited material available, the larva is entirely similar to that of *C. penangensis*, previously described.

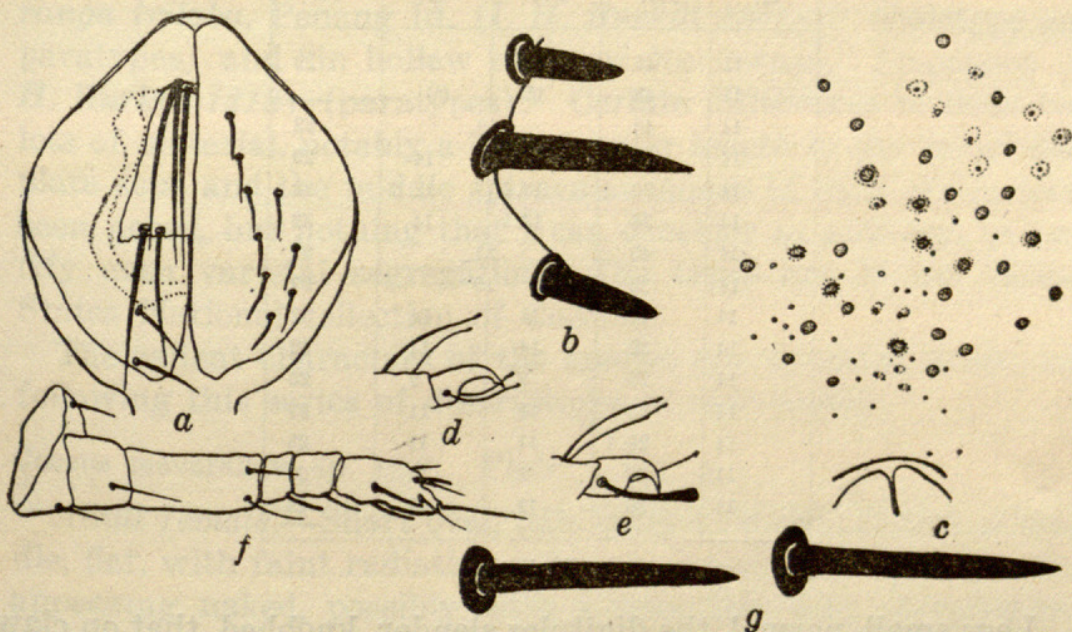


FIG. 8. *Coccus secretus* sp. nov.; a, adult female, anal plates, $\times 220$; b, adult female, spiracular spines, $\times 640$; c, adult female, derm dorsally immediately anterior to anal plates, $\times 220$; d, larva, claw, $\times 640$; e, adult female, claw, $\times 640$; f, adult female, antenna, $\times 335$; g, adult female, marginal setæ, $\times 1,500$.

This species has been described from the following specimens mounted on slides: One adult (holotype) from hollow stems of *Macaranga* sp., Singapore (*I. H. Burkill X-2*); two adults, in hollow stems of *Macaranga triloba*, Kendong, Malacca, Malay Peninsula (*I. H. Burkill 1440*); one adult, in hollow stem of *Macaranga triloba*, foot of Tampin Hill, north of Malacca, Malay Peninsula (*I. H. Burkill 1331*); one intermediate stage, the same; one late larva, the same; and from one or more unmounted specimens of each of these lots of material, all of which was received from Mr. E. E. Green. The types are in the United States National collection of Coccidæ.

The salient characters of the species are indicated in the key at the end of this series of descriptions of new species.

Coccus secretus sp. nov.

Adult female.—Slightly longer than wide, flat, the center usually slightly elevated, with faint radiating ridges around the margin, dirty pale brown, appearing as if covered with a thin film of dust; maximum length, 1.75 millimeters; width, 1.5; usually a little smaller than this; body as mounted similar in shape and size; derm clearing completely on treatment with caustic potash, without traces of the *Saissetia*-like areolations of some related species; antennæ small, normally 6-segmented, the measurements of the segments in microns as follows:

II.	III.	IV.	V.	VI.
11	45	12	12	29
11	43	15	(a)	-----
14	43	18		32
14	39	14	14	29
14	39	12.5	12.5	32
14	36	12.5	14	32
14	40	21		27
14	32	18		27
14	43	14	14	32
14	32	14	14	32
14	25	7	9	25
14	25	11	11	27
14	28.5	11	11	25
11	36	8	11	25
11	36	11	11	25

^a Broken.

Legs small, normal, the digitules slender, knobbed, that on claw larger and heavier than the other; spiracles not unusual, placed rather near body margin; derm dorsally with a fairly close cluster of relatively large, circular to oval, apparently simple pores placed just anterior to anal plates, and with numerous other much smaller circular pores (probably the openings of tiny tubular ducts) scattered almost uniformly over the dorsal surface; ventrally with long tubular ducts with cup-shaped bottoms near margin, with quinquelocular disk pores between each spiracle and the margin and with larger disk pores, usually with eight loculi, beneath the anal plates; marginal setæ large, entire, stout and stiff, tapering to a blunt point, each set in a heavy socket, and separated from adjacent spines by, usually, more than its own length; spiracular spines in threes, stout, the laterals tapering to a rounded apex, about as long as the marginal setæ, the median plainly but variably longer, tapering to a sharper point; dorsally with an occasional small seta, ventrally

with somewhat more numerous and larger, but scattered setæ, and with a few pairs, still larger, anterior to anal plates and near antennæ, anal plates triangular, the anterolateral margin more or less distinctly longer than the posterolateral, the angles, especially the outer, rounded; dorsally with eight to ten comparatively large, stout setæ, scattered through the posterior two-thirds of each plate; with a single larger ventral ridge seta and two pairs of fringe setæ, the outer of these larger; anal ring with pores and six setæ.

No other stage has been available for examination.

This species has been described from ten mounted adults having the following information: "In hollow stems of *Macaranga triloba*, Penang Id. (I. H. Burkill 2693a)" (holotype and paratypes) and "in hollow stems of *Macaranga*," Singapore (I. H. Burkill 1318) (paratypes). Certain differences in these two lots of material, notably a little greater length to the dorsal anal plate setæ and the middle spiracular spines of each group, have been noted, but nothing that I can consider as sufficient to justify even varietal segregation. The types are in the United States National collection of Coccidæ.

The salient characters of the species are indicated in the key following this series of descriptions of new species.

Coccus macarangæ sp. nov. Plate 1, fig. 5.

Adult female.—Short oval, pale reddish brown, darker in middle, flat, with faint radiating ridges near margin; dorsal surface appearing naked, possibly with a very thin film of secretion; maximum length, 3.25 millimeters; width, 2.25; size and shape when mounted similar; derm clearing almost completely, but retaining indistinct traces of an areolation similar to that developed in *C. penangensis*, especially around the margin and anteriorly; antennæ normally 8-segmented, the measurements of the single entire example available for examination as follows (in microns): II, 36; III, 36; IV, 21.5; V, 34; VI, 18; VII, 21.5; VIII, 33; legs normal but small, the digitules slender, knobbed, one of tarsus somewhat larger than the other; spiracles not unusual; derm dorsally with a rather conspicuous but irregular cluster of relatively large, circular, simple pores anterior to anal plates; elsewhere over the dorsum with numerous and rather uniformly scattered tiny circular pores, the openings of minute tubular ducts; ventrally near margin with long tubular ducts with cup-shaped inner ends, these also unusually small,

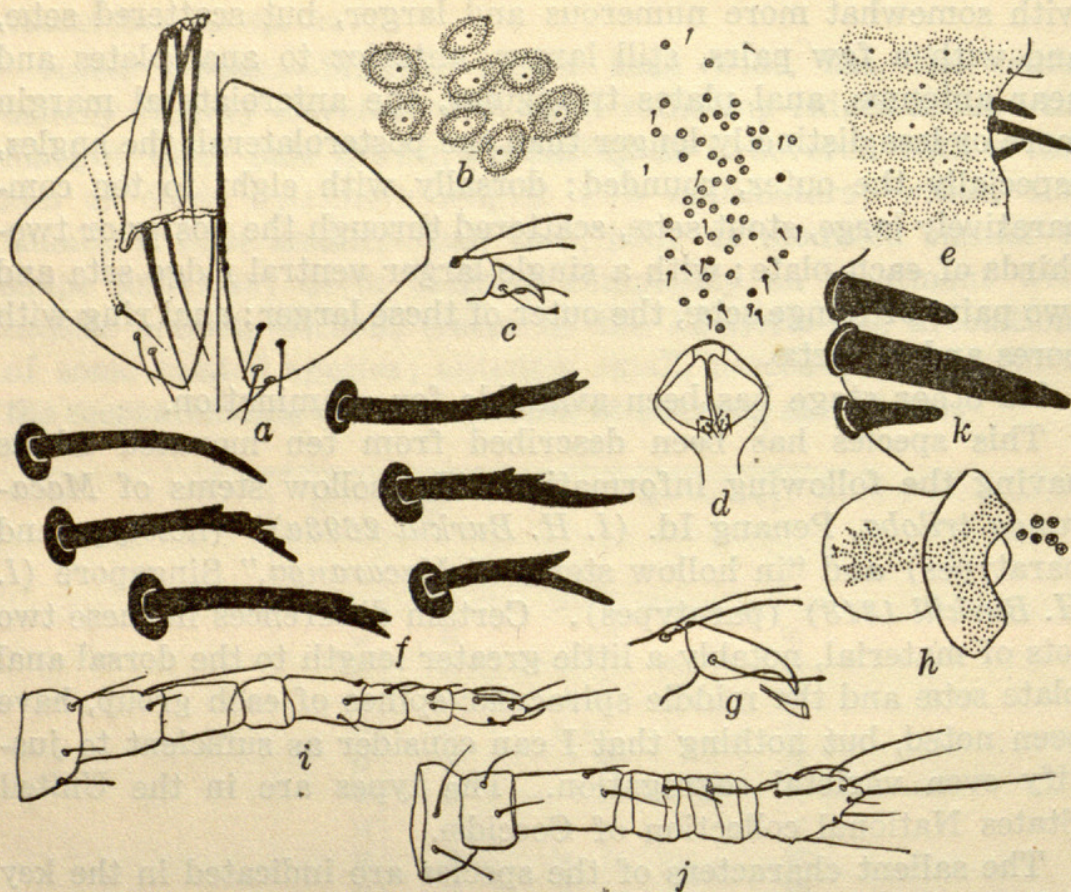


FIG. 9. *Coccus macarangæ* sp. nov.; a, adult female, anal plates, $\times 220$; b, adult female, derm showing areolation, $\times 220$; c, larva, claw, $\times 640$; d, adult female, derm anterior to anal plates, showing dorsal circular pores, $\times 57.5$; e, adult female, derm and spiracular spines, $\times 220$; f, adult female, marginal setae, showing range of variation, $\times 1,500$; g, adult female, claw, $\times 640$; h, adult female, spiracle, $\times 220$; i, adult female, antenna, $\times 220$; j, larva, antenna, $\times 440$; k, adult female, spiracular spines, $\times 640$.

with quinquelocular disk pores between spiracles and margin, and slightly larger disk pores with six to eight loculi beneath anal plates; dorsally with a number of rather large, stiff setae, scattered apparently indefinitely; ventrally also with scattered setae, these smaller and perhaps a little less abundant; marginal setae appearing rather delicate, elongate, the terminal portion ragged or frayed, about as long as or even shorter than dorsal setae and on the average about as long as lateral spiracular spines; the latter in threes, the middle distinctly longer than the other two, all stout, tapering to a bluntly rounded tip, the bases of the laterals usually somewhat swollen; anal plates triangular, the angles rather sharply rounded, with four rather long dorsal setae placed close to the apex of each plate, three ventral ridge setae and two pairs of much larger fringe setae, the latter nearly equal in size; anal ring with pores and, apparently, eight setae.

Larva.—Apparently entirely similar to those of closely related species.

This species has been described from a single mounted adult female, several mounted embryonic larvæ, and two unmounted adults, all "in hollow stems of *Macaranga*, Selander forest, Singapore" (*I. H. Burkill 1319*), received from Mr. E. E. Green. The types are in the United States National collection of Coccidæ.

The more prominent salient characters of this species are indicated in the key following this series of descriptions of new species.

Coccus circularis sp.^{*} nov. Plate 1, fig. 6.

Adult female.—Nearly to quite circular, dull grayish, appearing as if sprinkled with gray powder or dust; flat, but slightly ridged transversely about the middle and with low radiating ridges around the margin; anal cleft a little less than one-third the body length; extreme margin of body slightly elevated all the way around, forming a more or less distinct marginal ridge; maximum length, 3 millimeters; width the same; body, as mounted on slide, similar in size and shape to the unmounted form; without traces of dermal areolation in the specimens examined; antennæ normally 7-segmented, the lengths of the segments in microns as follows:

II.	III.	IV.	V.	VI.	VII.
40	46.5	40	12.5	18	46.5
46.5	46.5	36	14	21	50
50	46.5	40	18	18	46.5
50	57	40	14	18	46.5
50	43	43	14	14	43
43	50	36	14	18	46.5

Legs normal, small, spiracles normal; derm dorsally with an occasional small, circular, simple pore, these scattered widely anterior to the anal plates, and with numerous, scattered, very tiny, tubular ducts over much of the surface; ventrally near margin with numerous large tubular ducts with cup-shaped inner ends, with a row of quinquelocular pores between each spiracle and the margin, and with a number of somewhat larger disk pores with six to eight loculi beneath the anal plates; marginal setæ fairly large, stiff, normally simple and tapering to the apex, but occasionally cleft to form two unequal prongs near apex; spiracular spines in threes, the middle one distinctly but not prominently the longest, all stout in basal portion, but tapering to a rounded point at apex; dorsally with an occasional rather large, stiff, pointed seta, ventrally with submarginal setæ

and others anterior to the anal plates and near antennæ; anal plates triangular, the anterolateral margin longer than the posterolateral, the angles rounded, with about six rather long (as compared with related species described herewith) apical and subapical setæ, with three or four ventral ridge setæ, also relatively large, and two pairs of larger fringe setæ; anal ring with pores and ten setæ, of which two pairs are smaller than the others; no hypopygial setæ.

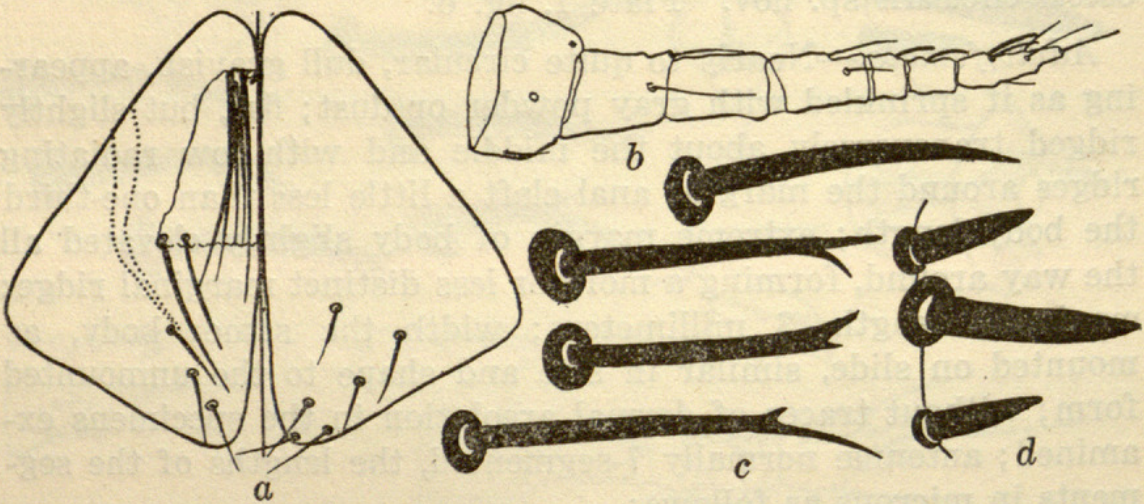


FIG. 10. *Coccus circularis* sp. nov., adult female; a, anal plates, $\times 220$; b, antenna, $\times 220$; c, marginal setæ, showing range of variation, $\times 1,500$; d, spiracular spines, $\times 640$.

Larva.—So far as can be determined from a single not very good mounted specimen, the larva is identical with those of already described species.

This species has been described from three mounted adults, two, including the holotype, in hollow stems of *Macaranga* sp., Singapore (I. H. Burkill 1389), one in hollow stems of *Macaranga triloba*, Singapore (I. H. Burkill 1396); from a single larva from the same material as the two adults; and from a very few unmounted specimens also from this first lot of material. The types are in the United States National collection of Coccidæ.

The more conspicuous salient characters of this and the preceding newly described species are indicated in the following key:

Key to new species of Coccus Linnæus.

- a^1 . Anal plates with numerous (12 to 24) small dorsal setæ; without a distinct cluster of heavy disk pores anterior to anal plates; anal ring with eight or ten setæ.
- b^1 . Dorsal surface of body with numerous, large, rounded-conical elevations in definite arrangement; marginal setæ long slender hairs, at least twice length of spiracular spines; dorsum with a brittle, glassy coating, molded to conform to elevations and depressions of body; anal ring with eight setæ..... *C. tumuliferus* sp. nov.

- b*². Dorsal surface flat, at most slightly wrinkled radially around margin; without elevations or a distinct glassy secretion; marginal setæ much shorter and stouter, not conspicuously longer than spiracular spines.
- c*¹. Marginal setæ short, comparatively stout, and usually strongly fimbriate at apices; anal ring with eight setæ.
C. penangensis sp. nov.
- c*². Marginal setæ longer, slenderer, sometimes entire, usually frayed along both sides near apices; anal ring with ten setæ.
C. caviramicolus sp. nov.
- a*². Anal plates with a few, larger, dorsal setæ, usually four to six; if with as many as ten then with a distinct cluster of circular disk pores anterior to anal plates, and anal ring with six setæ.
- b*¹. Marginal setæ stiff, straight, entire, tapering to bluntly pointed tips; with cluster of simple, heavy disk pores anterior to anal plates dorsally; plates each with nine or ten dorsal setæ; anal ring with six setæ..... *C. secretus* sp. nov.
- b*². Marginal setæ at least often frayed or cleft before apex; anal plates with four to six large dorsal setæ close to apex of each; anal ring with eight to ten setæ.
- c*¹. Marginal setæ distinctly frayed in most cases; with a distinct cluster of heavy simple disk pores anterior to anal plates dorsally; anal ring apparently with eight setæ.
C. macarangæ sp. nov.
- c*². Marginal setæ rarely frayed, then usually unequally cleft near apex; without a distinct cluster of heavy, simple disk pores anterior to anal plates, but with a few, scattered; anal ring with ten setæ..... *C. circularis* sp. nov.

Genus *PLATYLECANIUM* Cockerell and Robinson

Platylecanium asymmetricum sp. nov. Plate 1, fig. 7.

Adult female.—Occurring on the under surface of the leaves of the host; length, 4 to 4.5 millimeters; width, 1.5 to 2; elongate, narrowed at each end, flat, dark reddish brown, sometimes almost blackish in the dried specimens, with more or less black mottling, probably due to the drying of the internal organs; eye spots pale, surrounded by a blackish area; all specimens prominently asymmetrical, with either the left or the right margin nearly straight and the opposite side broadly rounded; with slight incisions opposite the spiracles; fading out to yellow or reddish brown when boiled in caustic potash, the discal area darker; cleared derm showing numerous faint areolations, especially in the caudal region and dorsally pores of two sizes, the larger of these scattered over the surface, particularly near the margins and in about six irregular rows extending across the body between the eyespots and the anal plates, the smaller pores occurring mostly in irregular groups on each side and cephalad of the

anal plates, in a semicircular arrangement, three groups on each side of the plates, these the "cribriform plates" of the describers of the genus, most of the larger pores apparently with a flexible extrusible portion with a small seta at the apex; body margin unevenly crenulate, a narrow strip more heavily chitinized; antennæ small, of the rudimentary type, indistinctly 2-segmented, with faint traces of a third segment occurring as a narrow chitinized strip at the base of each antenna, this bearing a long, slender seta, the apical segment with five or six setæ; the whole antennæ about 54 to 57 μ long; legs apparently wholly wanting; spiracles small, shank slender, outer end widely expanded, inner end less so; marginal setæ slender, hairlike, scattered, apparently occurring in groups of twos or threes, with relatively long intervals between the groups; spiracular spines stout, not tapering, apices rounded, somewhat longer than the marginal setæ, placed in a deep closed incision in the body margin; dorsal surface setæ apparently confined to those mentioned in connection with the pores; ventral setæ not observed; with a single row of minute, quinquelocular disk gland pores running from each spiracle to the corresponding group of spines, and with a few, similar, but much larger pores with more loculi, ventrally in the anal plate region; no other gland pores noted; anal plates triangular, together diamond-shaped, length about 190 to 203 μ ; width of each, about 71 μ ; the anterolateral and posterolateral margins about equal in length; normally with an apical and three dorsal setæ close to the posterior end of each plate, with four or five ventral setæ on each and with one fringe seta on each side, all of these minute; anal plates with two or three minute dorsal pores near and posterior to the middle of each; anal ring small, thick, approximately circular, with six relatively long and prominent setæ, these somewhat swollen just before the base, the longest about 268 μ .

Young larva.—Elongate oval, more narrowed anteriorly, nearly 0.5 millimeter long and 0.22 wide; yellowish brown before treating with caustic potash; antennæ 6-segmented, the last longest, the third nearly as long, average lengths of these (in microns): II, 14; III, 43; IV, 16; V, 10; VI, 53; total length of legs about a fourth greater than that of antennæ; with a few, widely separated, tiny marginal setæ; with a single, relatively stout, spiracular spine set in a heavily chitinized incision in the body margin opposite each spiracle; with four or five minute multi-ocular disk pores between each spiracle and its spine; no other ducts or pores noted; anal plates proportionately more elongate

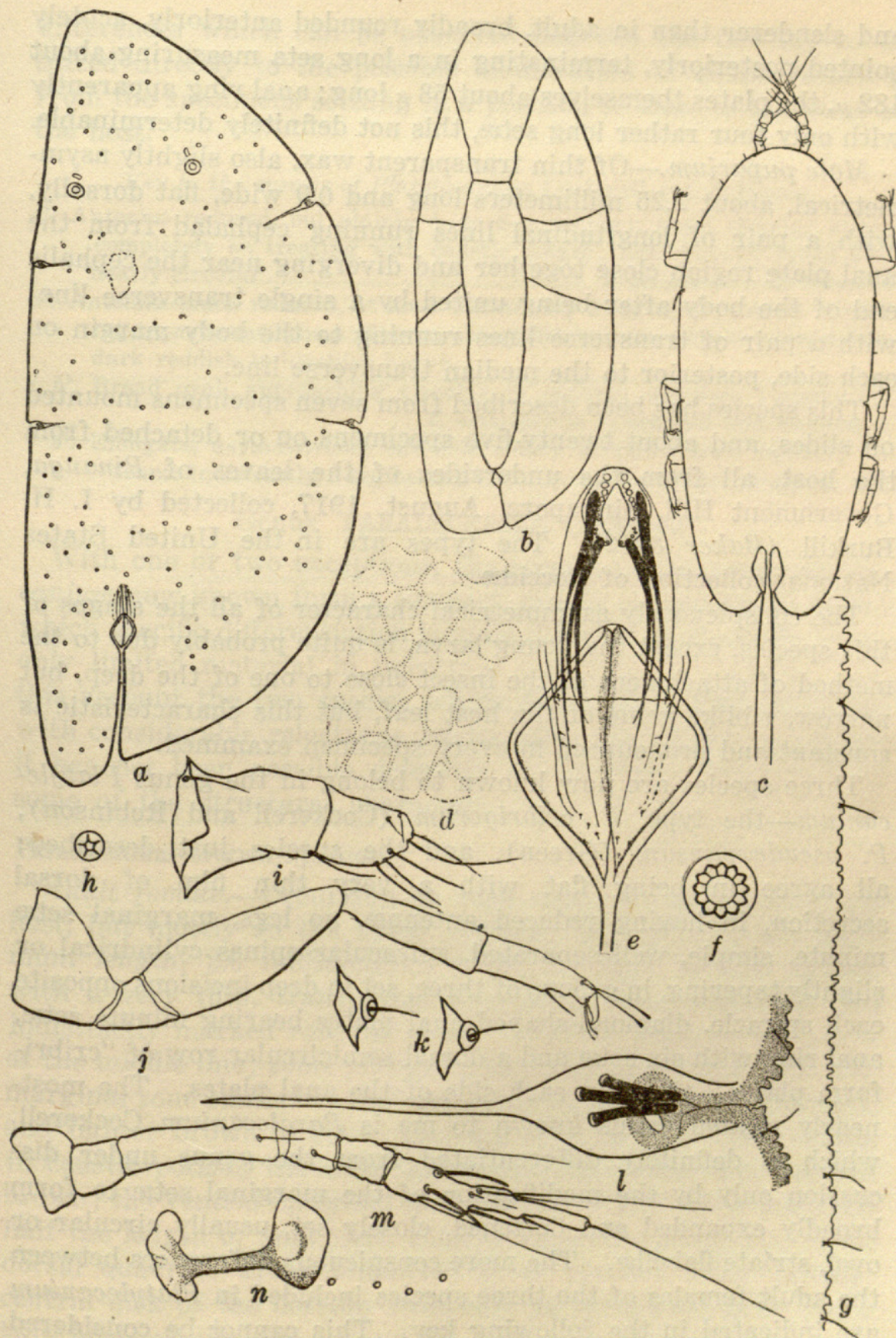


FIG. 11. *Platylecanium asymmetricum* sp. nov.; a, adult female, outline of body, showing shape, arrangement of large pores, etc., $\times 17.5$; b, male puparium, $\times 30$; c, larva, outline, $\times 165$; d, adult female, dermal areolations, $\times 335$; e, adult female, anal plates, $\times 165$; f, adult female, pore from beneath anal plates, $\times 1,500$; g, adult female, body margin, $\times 335$; h, adult female, spiracular pore, $\times 1,500$; i, adult female, antenna, $\times 640$; j, larva, leg, $\times 640$; k, adult female, dorsal setae, $\times 640$; l, adult female, spiracular spines, $\times 335$; m, larva, antenna, $\times 640$; n, adult female, spiracle, $\times 640$.

and slenderer than in adult, broadly rounded anteriorly, acutely pointed posteriorly, terminating in a long seta measuring about $182\ \mu$, the plates themselves about $53\ \mu$ long; anal ring apparently with only four rather long setæ, this not definitely determinable.

Male puparium.—Of thin transparent wax, also slightly asymmetrical, about 2.25 millimeters long and 0.9 wide, flat dorsally, with a pair of longitudinal lines running cephalad from the anal plate region close together and diverging near the cephalic end of the body after being united by a single transverse line; with a pair of transverse lines running to the body margin on each side, posterior to the median transverse line.

This species has been described from seven specimens mounted on slides, and about twenty-five specimens on or detached from the host, all from the undersides of the leaves of *Pinanga*, Government Hill, Singapore, August, 1917, collected by I. H. Burkill (*Baker 8942*). The types are in the United States National collection of Coccidæ.

The conspicuously asymmetrical character of all the stages of this species, except the young larva, is quite probably due to the method of attachment of the insect close to one of the deep, but narrow, riblike veins of the host leaf, but this characteristic is constant and pronounced in every specimen examined.

Three species are now known to belong in the genus *Platylecanium*—the type, *P. cribrigerum* (Cockerell and Robinson), *P. pseudexpansum* (Green), and the species just described; all agree in being flat with a very thin film of dorsal secretion, in having reduced antennæ, no legs, marginal setæ minute, simple, well separated, spiracular spines cylindrical or slightly tapering, in groups of three, set in deep incisions opposite each spiracle, diamond-shaped anal plates bearing minute setæ, anal ring with six setæ and a dorsal semicircular row of "cribri-form plates," three on each side of the anal plates. The most-nearly related genus known to me is *Paralecanium* Cockerell, which is definitely differentiated from the genus under discussion only by the modification of the marginal setæ to form broadly expanded and flattened, closely set, usually circular or oval, striate flabellæ. The more conspicuous differences between the adult females of the three species included in *Platylecanium* are indicated in the following key. This cannot be considered final, on account of lack of specimens of the genotype, only a small portion of one specimen being available for examination, and indeed it is possible that the new species described here is actually *cribrigerum* (Cockerell and Robinson), and that the

differences which can be observed between the two are to be traced directly to the possible modification of shape resulting from the specimens settling in a position so close to the veins of the host.

Key to the species of Platylecanium Cockerell and Robinson.

- a*¹. Antennæ reduced, but plainly 4- to 6-segmented; derm clearing almost completely on treating with caustic potash; light brown; broad oval, nearly circular..... *P. pseudexpansum* (Green).
- a*². Antennæ much reduced, at most indistinctly 2-segmented; derm remaining translucent brown after treating with caustic potash; normal color dark reddish to blackish brown.
- b*¹. Broad oval, approaching circular in outline; antennæ 1-segmented.
P. cribrigerum (Cockerell and Robinson).
- b*². Elongate, asymmetrical, one side nearly straight, ends pointed; antennæ indistinctly 2-segmented..... *P. asymmetricum* sp. nov.

Genus **PARALECANIUM** Cockerell

With one or two exceptions, the species of the genus *Paralecanium* now known form a compact, closely related group within which specific differentiation is quite difficult, particularly where only limited material in uncertain condition is available. On this account the two species which follow have been described with considerable reluctance, particularly the second one, where it has not been possible definitely to determine the nature of some of the structural characters.

Paralecanium ovatum sp. nov.

Adult female.—Occurring on both sides of the leaves of the host, but mostly on the upper surface; flat, broad oval; maximum length, 2.6 millimeters; width, 2; dark reddish brown, with a very thin, transparent coating of wax, and with two indistinctly marked rows of dorsal quadrate areas on each side of the middle line; some younger specimens showing a light sub-marginal zone similar to that described for *P. zonatum* (Green), and lighter brown in color; clearing only slightly after boiling in caustic potash, the older specimens remaining dark reddish brown; the ventral marginal zone narrow, width much less than half the length of anal cleft, slightly recurrent along this cleft; dorsal quadrate areas somewhat more distinct after boiling; central disk of the dorsum with only an occasional pore, outer two-thirds all the way around the body with numerous, obscure, oval or round areolations, and with an occasional clear pore; with a very poorly defined row of clear pores, usually in pairs, curving outward and forward on each side of the anal plates, these corresponding to the well-defined "cribriform plates"

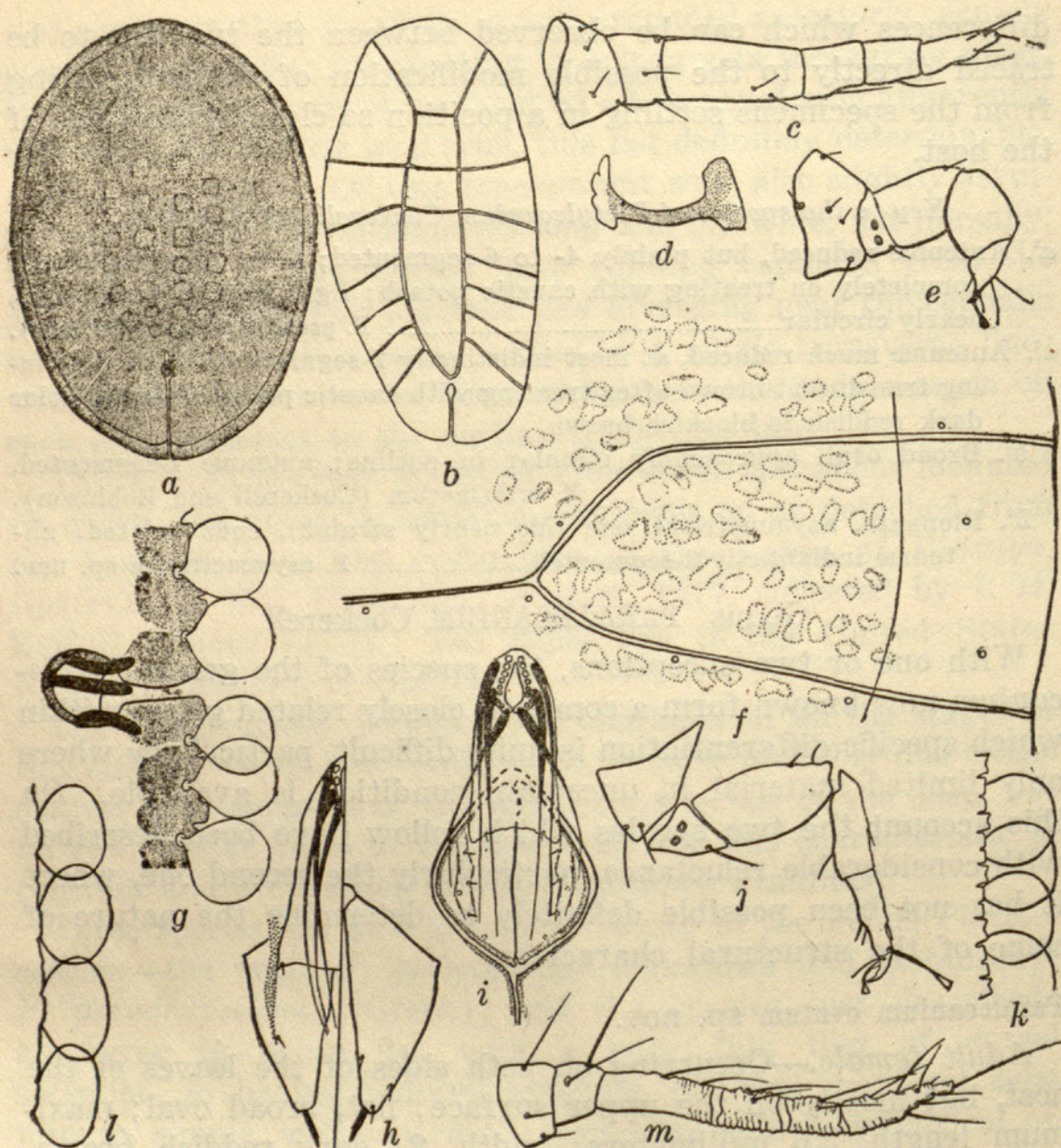


FIG. 12. *Paralecanium ovatum* sp. nov.; a, adult female, outline, $\times 16.5$; b, male puparium, $\times 30$; c, adult female, antenna, $\times 335$; d, larva, spiracle, $\times 335$; e, adult female, leg, $\times 335$; f, adult female, section of body margin showing areolation, etc., $\times 165$; g, adult female, spiracular spines, $\times 335$; h, larva, anal plates, $\times 440$; i, adult female, anal plates, $\times 165$; j, larva, leg, $\times 335$; k, marginal flabellæ of younger adult female, $\times 335$; l, same, of older adult female, $\times 335$; m, larva, antenna, $\times 335$.

found in some other species; marginal third or a little more of the dorsum divided into large plates by thin transparent lines through the derm, the resulting arrangement at the margin somewhat similar to that found in *Eucalymnatus tessellatus*; antennæ small, 6-segmented, average lengths of the segments about as follows (in microns): I, 18; II, 14; III, 46.5; IV, 18; V, 17; VI, 27; the third segment nearly twice as long as any other; antennæ sometimes even more reduced than indicated by the preceding measurements, and some of the joints indistinct or apparently wanting; legs present, but much reduced, approach-

ing the rudimentary type; spiracles small, with slender shank and expanded ends; marginal flabellæ fan-shaped, large, broadly expanded, roughly circular in outline, widest at or a little beyond the middle, the edge entire, faintly striate, the striæ diverging from base; in older individuals the flabellæ usually distinctly wider than long and widest about the middle, overlapping more or less, this varying from adjacent flabellæ only slightly, overlapping to alternate flabellæ nearly meeting across the intervening one; spiracular spines three to a group, stout, but not very large, each group set in a distinct chitinized incision of the margin, all three approximately equal in size; body margin with tiny incisions between the insertions of the flabellæ, usually with only a single incision, making two lobules, sometimes with two incisions and three lobules, this arrangement inconspicuous, and sometimes obliterated in the older, mature individuals; with an occasional minute dorsal seta at least near the margin; no differentiated ducts or pores observed on the dorsum; ventrally with a single row of quinquelocular pores running from each spiracle to its corresponding spines, and with some similar, but larger, pores with more loculi around the anal plates; anal plates small, each about $125\ \mu$ long by $46\ \mu$ wide, set at the apex of a short cleft with contiguous sides; each plate sharply angulate anteriorly and posteriorly, the outer angle rounded off, widest at or a little behind the middle, the posterolateral margin faintly crenulate; perhaps with two very minute subapical setæ dorsally, apparently with three ventral setæ and a single fringe seta on each side, all these minute; with two minute dorsal pores on each plate at and posterior to the middle; anal ring small, normally placed well anterior to the anal plates, the setæ longer than the plates, curved and noticeably expanded at base, six in number.

Larva.—Elongate oval, about 0.63 millimeter long by 0.32 wide; antennæ 6-segmented, fairly well developed, average measurements as follows (in microns): I, 14; II, 13.5; III, 35.7; IV, 21.4; V, 17.8; VI, 35.7; legs fairly well developed; the lengths of a middle leg, coxa, $29\ \mu$; trochanter and femur, $64\ \mu$; tibia, $35\ \mu$; tarsus, $32\ \mu$; tibiotarsal articulation indistinct; marginal setæ slender, hairlike, in no way resembling the flabellæ of the adult; spiracular spines set in a chitinous incision of the margin, three in number, the intermediate the largest; anal plates elongate, slender, rounded anteriorly, sharply pointed posteriorly, about $50\ \mu$ long, with an apical seta about $46\ \mu$ long.

Second-stage female.—About twice as large as the larva, somewhat broader, with the legs and antennæ much reduced as in the adult, the apical seta of anal lobes reduced in size, the marginal setæ widely separated and still hairlike.

Male puparium.—Apparently characteristic of the genus as described and figured for other species; see figure.

This species has been described from seven specimens mounted on slides and from a few additional specimens on the host. The material was collected on *Pandanus* sp. at the Botanic Gardens, Singapore, October, 1917 (*Baker 9029*). The types are in the United States National collection of Coccidæ.

This species appears to differ from the other described species of the genus most conspicuously in having the legs and antennæ present, but semirudimentary. Disregarding this difference, the species would run to the pair *zonatum* and *maritimum* in Green's key to the Ceylon species of the genus,⁴ and from these two it appears to be separable by the distinctly greater width of the anal plates in proportion to their length, and by having the anterolateral margin of each of these at least slightly longer than the posterolateral.

Paralecanium vacuum sp. nov. Plate 1, fig. 8.

Adult female.—Occurring on the upper surface of the leaves of the host; very faintly convex, nearly circular, somewhat broadened behind; length, about 10 millimeters; width, about 9; margin not or only slightly sinuate opposite the spiracles and at the anal cleft; light brown, varying and variegated, the median area with numerous irregular blackish blotches, apparently produced by the discoloration of the dried internal organs; marginal area irregularly areolate with lighter streaks, with most of the extreme edge light; all this not constant; coated dorsally with a relatively thick, rather brittle, detachable layer of nearly transparent wax, this densely and minutely areolate, and showing near the margin radial rows of tiny holes corresponding in position to small conical elevations of the underlying derm, these bearing small setæ, showing also clusters of similar holes corresponding to the group pores, arranged in a semicircle on each side of the anal plates, and finally six very faint and slightly depressed longitudinal rows of quadrate areas of the sort usually found in the genus; derm clearing almost completely on treating with caustic potash, but showing numerous faint areolations, these scattered or irregularly grouped in the central

⁴ Coccidæ of Ceylon, pt. 3 (1904) 185.

area, but very closely crowded along the margin, although interrupted at intervals here by solid radial clear streaks, each bearing a few tiny setæ; with some additional small setæ, widely scattered, dorsally; antennæ probably, but not certainly, present, development not known; legs probably, but not certainly, wanting; spiracles and mouthparts not observed; dorsally with eight clusters of pores and small cicatrices, arranged in a semicircle, four on each side of the anal plates, the rows curving forward; no other specialized dorsal gland pores observed; ventrally with small quinquelocular pores between spiracles and margin, no others noted, probably due to condition of specimens; dorsally

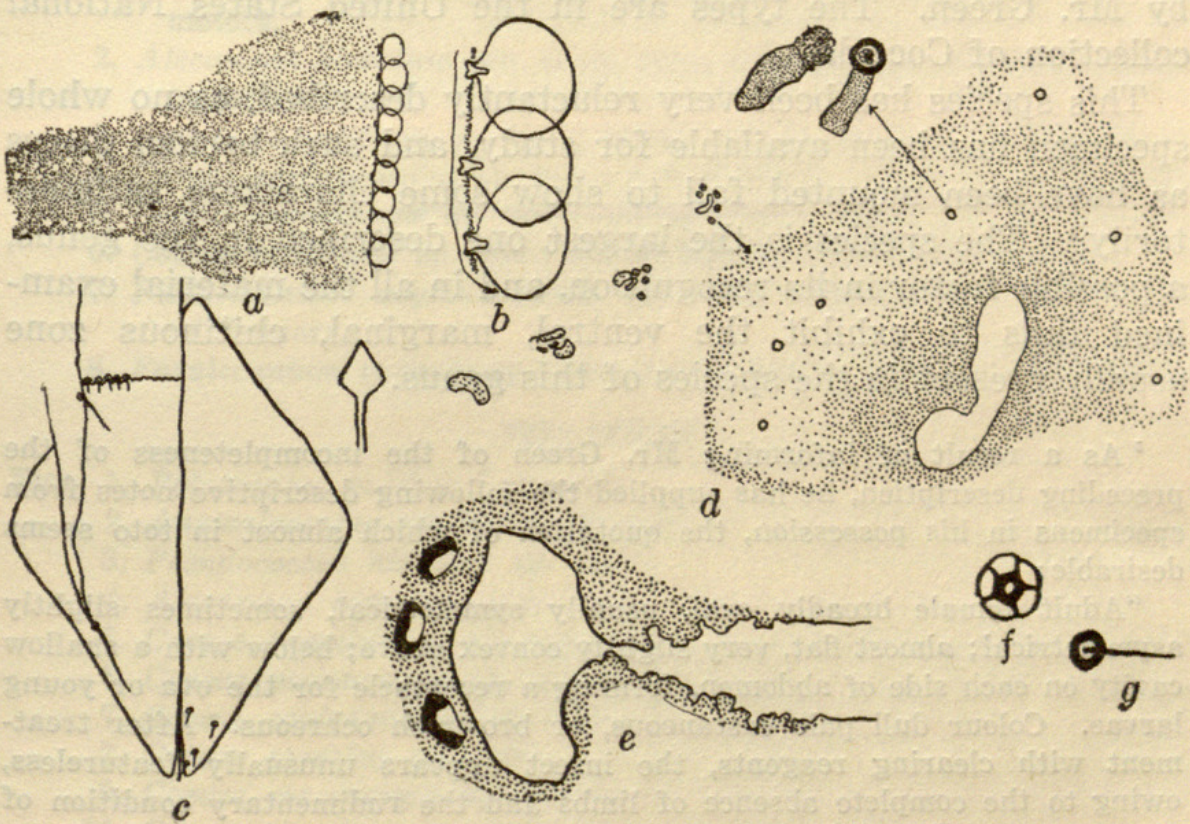


FIG. 13. *Paralecanium vacuum* sp. nov., adult female; a, portion of derm at margin, showing flabellæ and areolation, $\times 57.5$; b, detail of body margin and flabellæ, $\times 220$; c, anal plates, $\times 115$; d, number and position of "cribriform plates," $\times 12$, with detail of one plate, $\times 220$, and detail of single pore from plate, $\times 1,500$; e, spiracular spine incision, showing bases of spines, $\times 500$; f, spiracular disk pore, $\times 1,500$; g, dorsal seta, $\times 1,500$.

with the small, stiff, scattered setæ already mentioned; spiracular spines in threes, but all broken, so the size and shape indeterminate; marginal flabellæ small as compared with the total size of the insect, broader than long, but varying to some extent, nearly sessile, normally slightly overlapping; no ventral setæ observable, due to condition of specimens; marginal interspaces between insertions of flabellæ very indefinitely incised, with from three to six visible incisions at some points, these indistinct at others, and with only minute crenulations showing; anal plates

long triangular, each more than twice as long as wide, all the angles rather sharp, the posterior and anterior acute, dorsally at or close to the apex of each with four small, stiff setæ, ventral ridge with one larger seta at base and another, still larger, at apex, with five fringe setæ on each side; no hypopygial setæ; anal ring placed anterior to the plates, small, with pores and six relatively large, stout setæ.

This species has been described from a few broken specimens received from Mr. E. E. Green with the following information: "On *Ficus* sp., Singapore, coll. I. H. Burkill." The name assigned to it here is the manuscript one given to the species by Mr. Green. The types are in the United States National collection of Coccidæ.

This species has been very reluctantly described, as no whole specimen has been available for study, and such broken pieces as have been mounted fail to show some characters satisfactorily.⁵ The species is the largest one described in the genus, a possible factor in its recognition, and in all the material examined fails to exhibit the ventral, marginal, chitinous zone usually present in the species of this genus.

⁵ As a result of informing Mr. Green of the incompleteness of the preceding description, he has supplied the following descriptive notes from specimens in his possession, the quotation of which almost in toto seems desirable:

"Adult female broadly oval, usually symmetrical, sometimes slightly asymmetrical; almost flat, very slightly convex above; below with a shallow cavity on each side of abdomen, forming a receptacle for the ova or young larvae. Colour dull pale castaneous, or brownish ochreous. After treatment with clearing reagents, the insect appears unusually featureless, owing to the complete absence of limbs and the rudimentary condition of the antennae. Rostral apparatus small and inconspicuous. A pair of circular vacuoles (each with an approximate diameter of 0.25 mm.) at a distance of 1 mm. within the margin, represent eye spots. Antennae 0.15 mm. long; with from four to five confused segments; a few short stout setae upon the apical point. Valves of anal operculum with acute apices; narrow; outer angle rounded; basal margin equal to outer margin. Two scattered series of beaded pores on each side of anal aperture. Stigmatic clefts extending to a distance of 0.25 mm. within the margin; terminating in a semilunar chitinous plate bearing three to five stout club-shaped spines. Spiracle at a distance of 2 mm. from the base of each stigmatic cleft. Length of anal cleft approximately 2 mm. Length of complete insect, 10 mm.; breadth, 8.5 mm. Very near *expansum* Green (which see). Differing in little but its extreme size. It is a question if it should rank as more than a variety or subspecies."

ILLUSTRATIONS

PLATE 1

- FIG. 1. *Anomalococcus multipori* sp. nov.; actual length, about 2 millimeters.
2. *Alecanium hirsutum* gen. et sp. nov.; actual length, about 1.75 millimeters.
3. *Coccus tumuliferus* sp. nov.; actual length, about 2 millimeters.
4. *Coccus caviramicolus* sp. nov.; actual length, about 2.5 millimeters.
5. *Coccus macarangæ* sp. nov.; actual length, about 3.25 millimeters.
6. *Coccus circularis* sp. nov.; actual length, about 3 millimeters.
7. *Platylecanium asymmetricum* sp. nov.; actual length, about 4.5 millimeters.
8. *Paralecanium vacuum* sp. nov.; actual length, about 10 millimeters.

TEXT FIGURES

- FIG. 1. *Paleococcus pulcher* Leonardi.
2. *Anomalococcus multipori* sp. nov.
3. *Pseudococcus hispidus* sp. nov.
4. *Alecanium hirsutum* gen. et sp. nov.
5. *Coccus tumuliferus* sp. nov.
6. *Coccus penangensis* sp. nov.
7. *Coccus caviramicolus* sp. nov.
8. *Coccus secretus* sp. nov.
9. *Coccus macarangæ* sp. nov.
10. *Coccus circularis* sp. nov.
11. *Platylecanium asymmetricum* sp. nov.
12. *Paralecanium ovatum* sp. nov.
13. *Paralecanium vacuum* sp. nov.



Morrison, H. 1921. "Some nondiaspine Coccidae from the Malay peninsula, with descriptions of apparently new species." *The Philippine journal of science* 18, 637–677.

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