

THE NONDIASPINE COCCIDÆ OF THE PHILIPPINE ISLANDS, WITH DESCRIPTIONS OF APPARENTLY NEW SPECIES¹

BY HAROLD MORRISON

*Of the Bureau of Entomology, United States Department of Agriculture,
Washington, D. C.*

ONE PLATE AND FORTY TEXT FIGURES

Under the title Coccidæ of the Philippine Islands,² Miss Elizabeth Robinson published in 1917 an account of the species of the Coccidæ then known from the Islands, and described some new species in the family, subfamily Diaspinæ. In the meantime and subsequently I have received or obtained a considerable number of lots of material of the nondiaspine subfamilies for study, mostly through sendings of specimens for determination to Dr. L. O. Howard, chief of the Bureau of Entomology; and I have also worked over the specimens from the Philippines now in the United States National collection of Coccidæ with the result that a number of species have been added to the list hitherto known from the Philippines, and through the opportunity for examining type specimens of a number of the species, different conclusions from those of Miss Robinson in regard to the identity of several of the species listed by her have been reached. In view of the large amount of material examined and the changes in synonymy and identity noted, it has been considered advisable to prepare a paper covering the nondiaspine species of the family in their entirety, even where no new information is added to that given by Miss Robinson. This paper is supplementary to hers to the extent that no host or distribution records given by her are repeated.

I am indebted to Prof. T. D. A. Cockerell, Mr. D. B. Mackie, Mr. R. C. McGregor, Prof. C. F. Baker, Mr. Geo. Compere, and, through the Director of the Philippine Bureau of Science, Prof. C. S. Banks for material for study from the Islands. No effort

¹ Published with the permission of the Secretary, United States Department of Agriculture.

² Philip. Journ. Sci. § D 12 (1917) 1-47, pls. 1-6.

has been made to check the localities listed exactly, but it is believed that most of the specimens are from Luzon. The data regarding the host, date of collection, locality, and name of collector have been copied, so far as possible, exactly as given with the different lots of material.³

The specimens have been prepared for microscopic study largely by Misses B. M. Boss and Sadie Keen, employees of the Bureau of Entomology. The drawings illustrating the structural characteristics of the species have been prepared by Emily Morrison, who also aided in the preparation of the photographic illustrations and in many other ways. To these I am correspondingly indebted.

Although obviously unsatisfactory in a number of ways, the system of classification outlined by Fernald⁴ has been followed, except in a few unimportant details.

Unless some statement to the contrary is made, all of the identification keys which follow in this paper are based on the adult female of each species.

Key to the Philippine subfamilies of the Coccidæ.

- a¹. Abdomen not terminating in a compound segment or pygidium; body naked or covered by secretion or a sac, not by a firm waxy scale separable from the insect; legs and antennæ usually, but not always present.
- b¹. Anal opening at the apex of prominent dorsal lobe, with a spiniform organ between it and a pair of spiracular processes; anal ring with setæ; legs wanting; antennæ rudimentary; body inclosed in a resinous cell with three orifices (cf. *Ceroplastes*).
Tachardlinæ.
- b². Anal opening not so placed (on chitinized horn in *Ceroplastes*); body without spiniform organ or spiracular processes; not inclosed in a resinous cell with three orifices.
- c¹. With two or more pairs of abdominal spiracles; anal ring without setæ, placed dorsally some distance before the body apex and not at the end of a cleft, circular, not covered by triangular plates; body usually thickly set with large hairs and circular gland pores..... Monophlebinæ.
- c². Without abdominal spiracles; anal ring normally bearing setæ, placed at or close to the body apex or, if dorsally, at the anterior end of a cleft in the body.

³ Some evident errors in names of localities have been corrected.—
THE EDITORS.

⁴ A Catalogue of the Coccidae of the world, Bull. Hatch Exp. Sta. Mass. Agr. College 88 (1903).

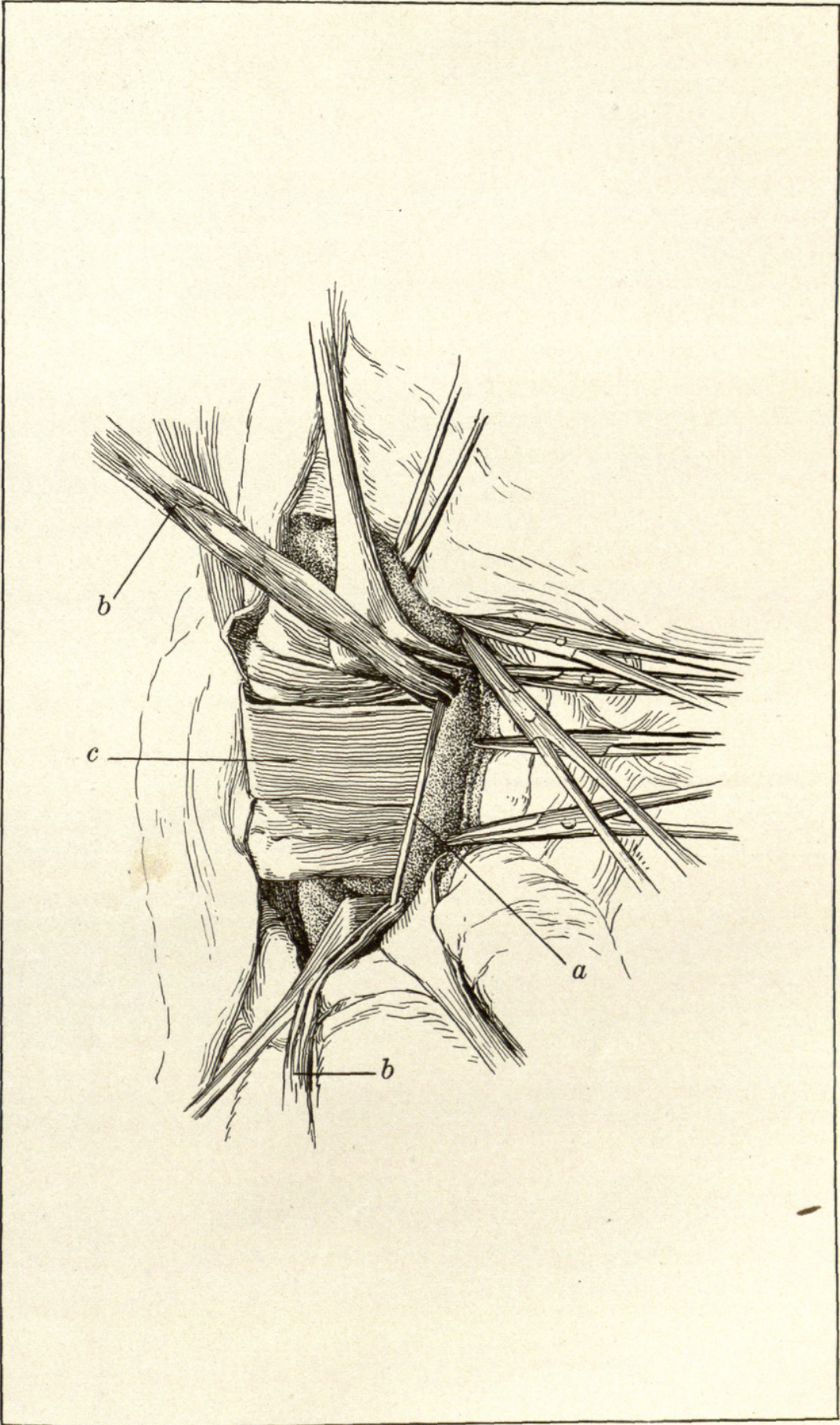


PLATE 1.

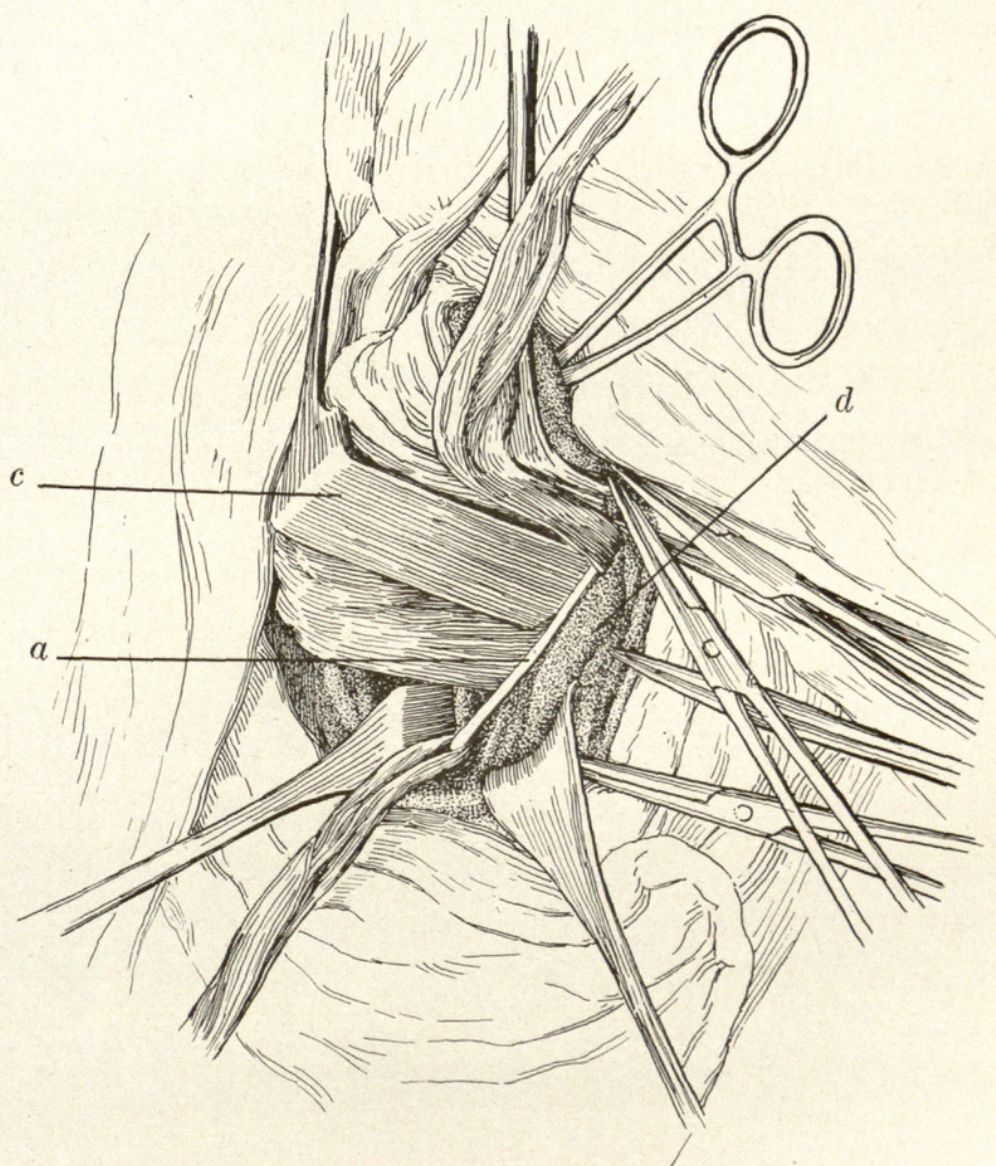


PLATE 2.

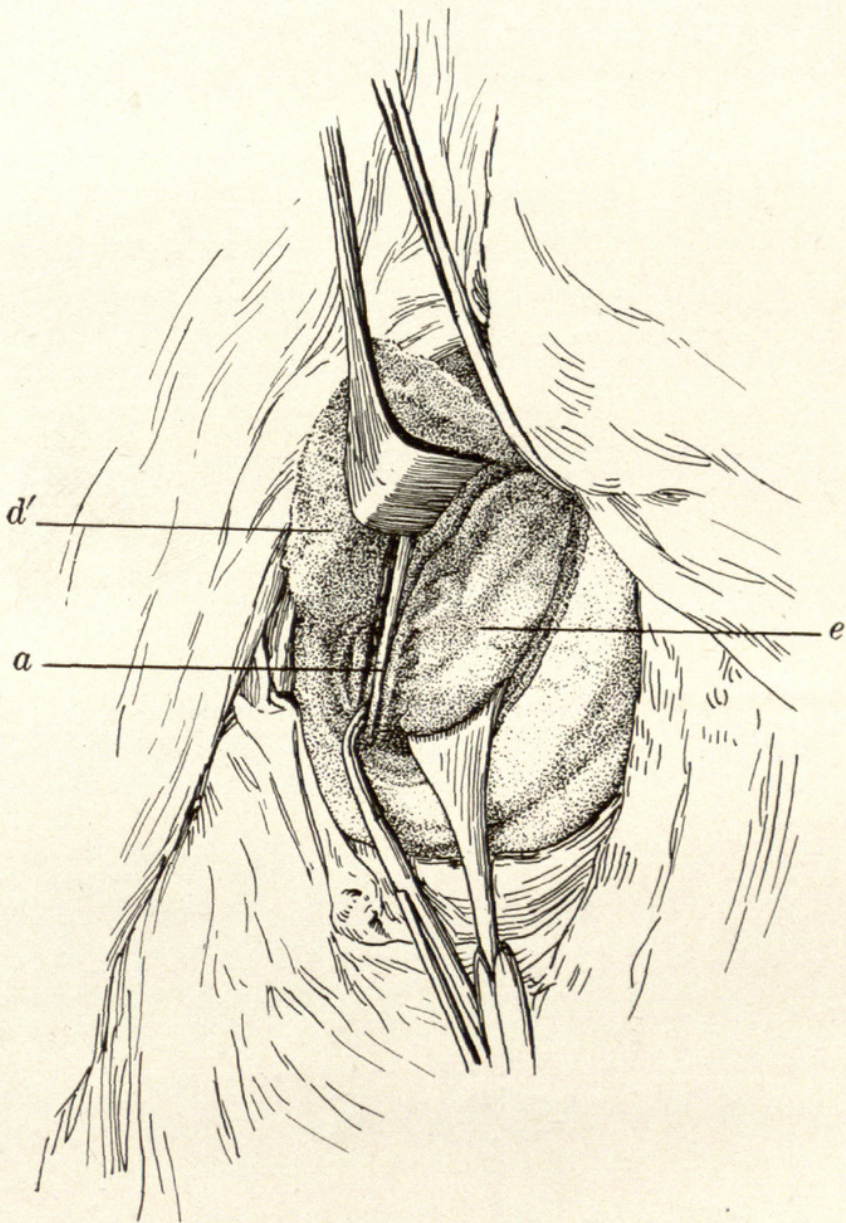


PLATE 3.

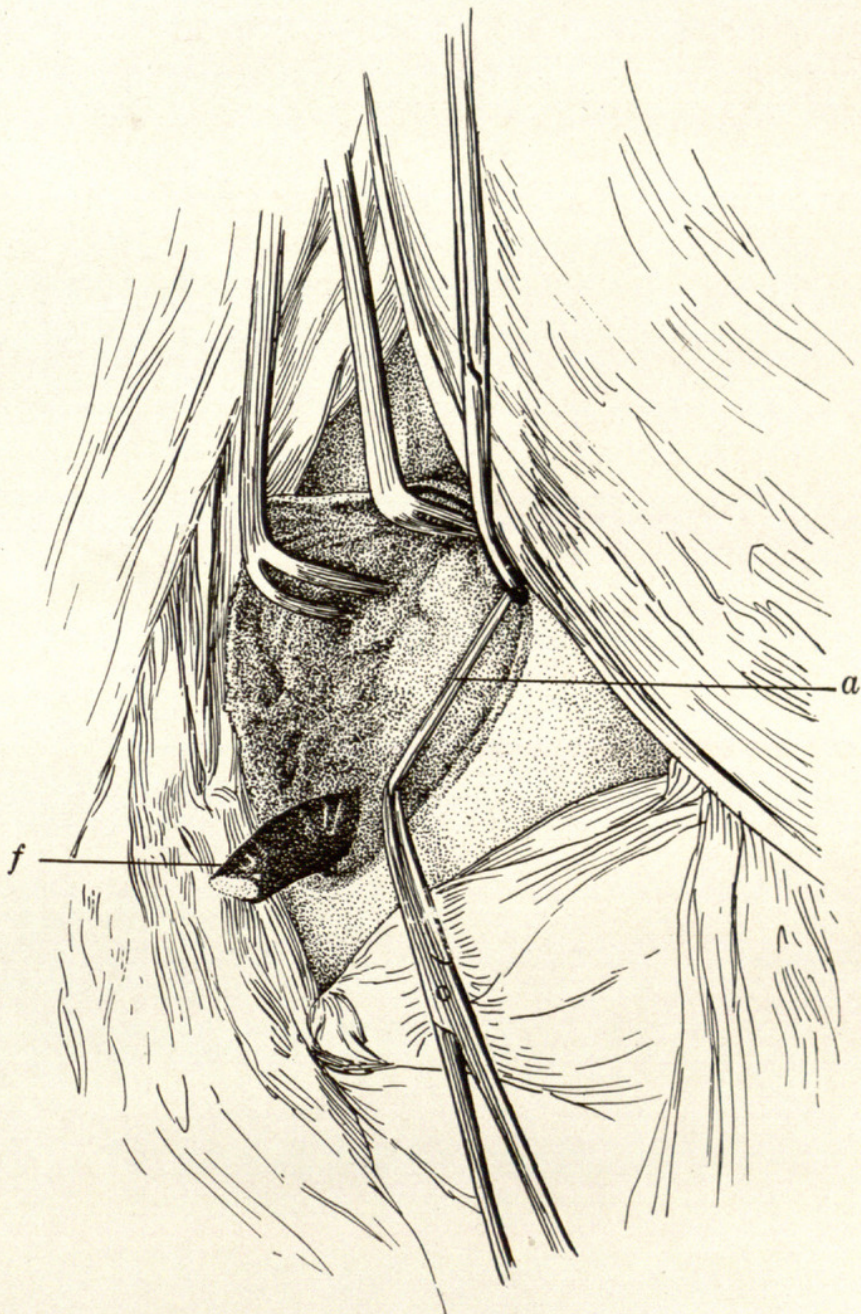


PLATE 4.



PLATE 5.

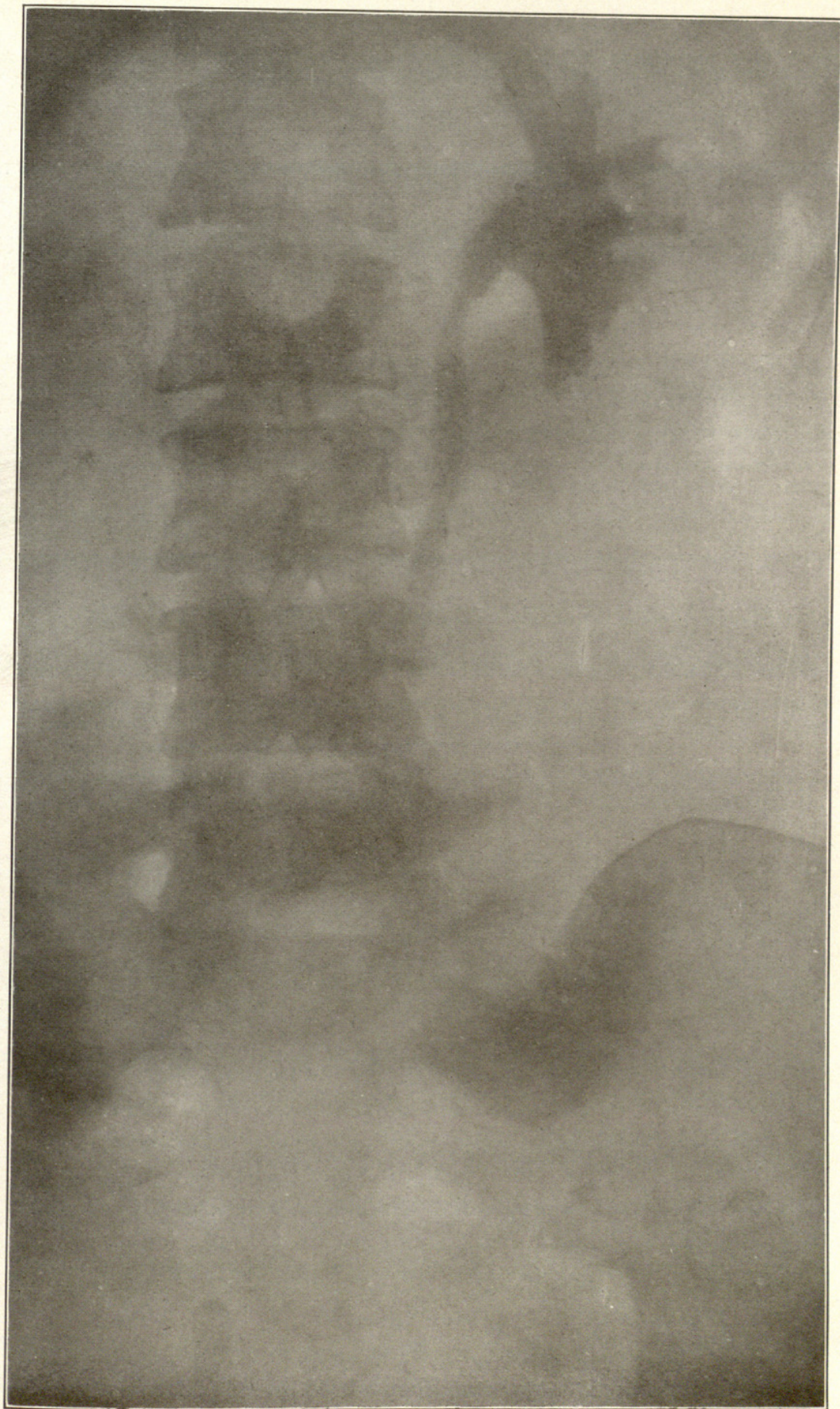


PLATE 6.

- d*¹. Body usually with the posterior extremity cleft, anal opening at the anterior end of this cleft and covered by a pair of triangular plates; these characters more or less obscured in the species that are covered with wax. Coccinæ.
- d*². Posterior extremity of body not cleft, sometimes more or less indented; without plates over anal opening; body usually covered with cottony or mealy secretion or inclosed in a sac, rarely naked Dactylopiinæ.
- a*³. Abdomen terminating in a compound segment or pygidium; legs wanting; body covered by a firm waxy scale readily separable from the insect and made up in part of larval exuviae..... Diaspinæ.⁵

MONOPHLEBINÆ

This subfamily is represented in the Philippines by species having the legs and antennæ well developed, the latter 8- to 11-segmented in the adult female, the body more or less covered dorsally with waxy, powdery, or cottony secretion, the anal ring dorsal and without setæ, the derm usually closely crowded with pores and hairs over practically the whole surface, and abdominal spiracles in all stages.

Key to the Philippine genera of the Monophlebinæ.

- a*¹. With not more than three pairs of abdominal spiracles; body hairs slender, tapering; adult female usually secreting a distinct elongated posterior ovisac (one exception)..... *Icerya* Sign.
- a*². With more than three pairs of abdominal spiracles; adult female with more or less waxy or mealy secretion, but without ovisac.
- b*¹. Dorsal body hairs stout, not tapering, bluntly rounded at apices; with seven pairs of abdominal spiracles..... *Lophococcus* Ckll.
- b*². Dorsal body hairs slender, tapering, acute at apices; adult female naked or more or less covered with mealy secretion dorsally; with seven pairs of abdominal spiracles..... *Drosicha* Walker.

In this subfamily a number of males, without females, have been described from the Philippines. Unfortunately it has not been possible to connect more than a single one of these with already described females, and as they are given in Miss Robinson's paper no further mention is made of any but the one which has been placed in synonymy.

Genus ICERYA Signoret

The usual, but superficial, distinguishing character of this genus is the development of a posterior ovisac in the adult fe-

⁵ Not discussed in this paper.

male, but this is lacking in *Icerya jacobsoni* Green among those found in the Philippines. This species is evidently closely related to *Icerya* in its other characters, however, and, pending a revision of the genera of this subfamily, it is preferable to leave it here. In addition to the development of the ovisac, the Philippine species of the genus have 10- or 11-segmented antennæ in the adult female; three pairs of abdominal spiracles in all species except *I. purchasi*, which has two; and a more or less definite band of glands and hairs ventrally for secreting the ovisac.

Key to the Philippine species of Icerya.

α^1 . Antennæ 10-segmented in adult female; without ovisac; with at least two types of gland pores, some, in clusters along the body margin, large, with trilocular centers and a projecting tongue.

I. jacobsoni Green.

α^2 . Antennæ 11-segmented and ovisac developed in adult female; without gland pores with trilocular centers.

b^1 . Derm gland pores of two types, one smaller, varying in size and arrangement, with solid center, the other much larger, ringlike, with large open center; marginal wax filaments of body not very long, dorsal secretion with numerous glassy threads through it.

c^1 . With two pairs of abdominal spiracles; large open center gland pores along body margin only; body hairs numerous, conspicuously black; ovisac fluted..... *I. purchasi* Mask.

c^2 . With three pairs of abdominal spiracles; large open center gland pores present on both dorsum and margins of body; body hairs dark reddish, not conspicuously black; ovisac smooth.

I. seychellarum (Westw.).

b^2 . Derm gland pores of different sizes, but none so large as in preceding species, all with solid centers; body with a number of long, twisted, lateral and caudal filaments..... *I. aegyptiaca* (Dougl.).

Icerya jacobsoni Green.

Icerya jacobsoni Green, ROBINSON, Philip. Journ. Sci. § D 12 (1917) 2.

I have seen some of the material on which Miss Robinson based her record, and in addition have examined specimens collected at Los Baños, Laguna Province, on *Litsea glutinosa*, December 11, 1917 (*Banks 18353*) and at the same place on *Psidium guajava*, January, 1919 (*Baker 10098*). The specimens from Banks were as much as 9 millimeters long. The figure copied by Miss Robinson and the accompanying drawings of the structural details of the species should make it readily recognizable.

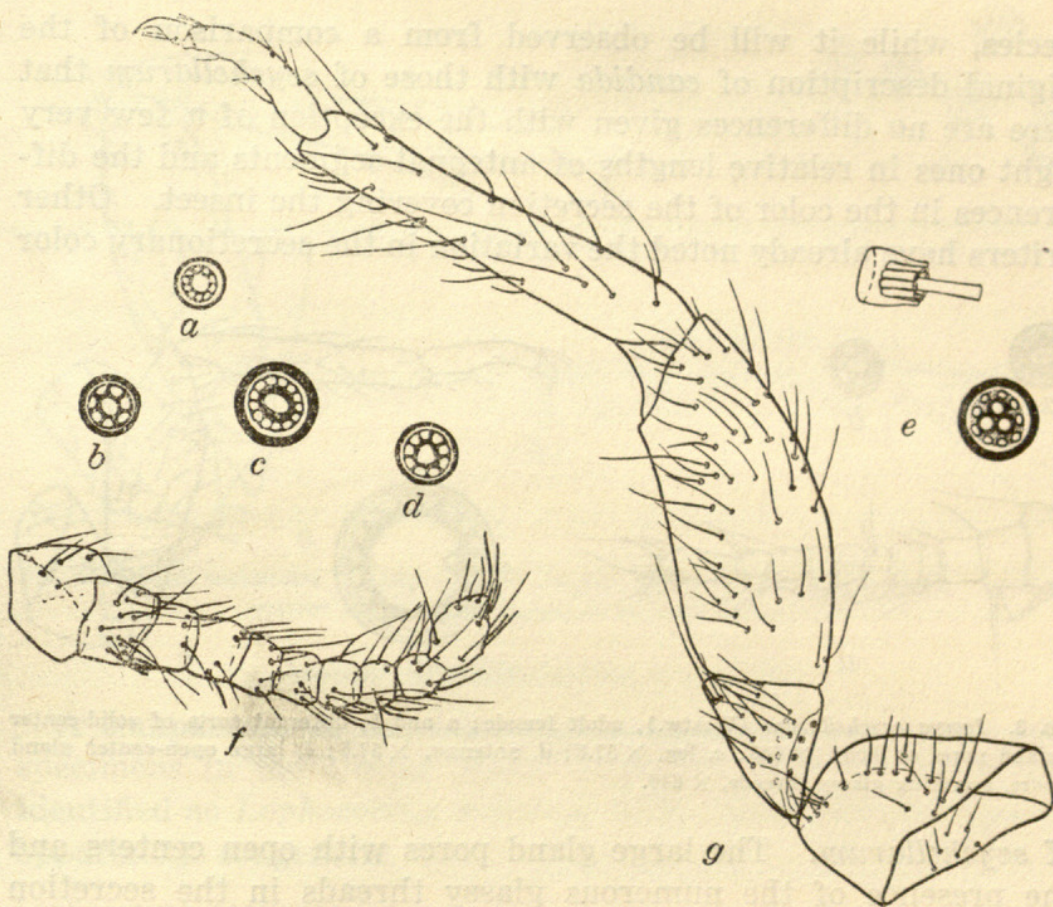


FIG. 1. *Icerya jacobsoni* Green, adult female; a to d, surface views of various sorts of circular wax gland pores found on body, $\times 640$; e, surface view and section of trilocular center pores found in clusters along body margin, $\times 640$; f, antenna, $\times 57.5$; g, leg, $\times 57.5$.

Icerya purchasi Mask.

Icerya purchasi MASKELL, Trans. New Zealand Inst. 11 (1878) 221.

I was much surprised when a few specimens of this species were located in the midst of a mass of *Drosicha townsendi* (Ckll.), and it seems very strange that it has not been collected again in Manila, but the material at hand has produced no other specimens of this species. Those found were from Manila "on various trees" (coll. *Compere*), and were collected in 1911.



FIG. 2. *Icerya purchasi* Mask., adult female, showing two types of gland pores, $\times 640$.

Icerya seychellarum (Westw.). Plate I, fig. 2.

Icerya seychellarum (Westwood), ROBINSON, Philip. Journ. Sci. § D 12 (1917) 3.

Icerya candida COCKERELL, Proc. Dav. Acad. Sci. 10 (1905) 128.

A careful comparison of the type specimens of *Icerya candida* with a considerable amount of material of *I. seychellarum* fails to reveal any structural characters distinctive for the former

species, while it will be observed from a comparison of the original description of *candida* with those of *seychellarum* that there are no differences given with the exception of a few very slight ones in relative lengths of antennal segments and the differences in the color of the secretion covering the insect. Other writers have already noted the variation in the secretory color

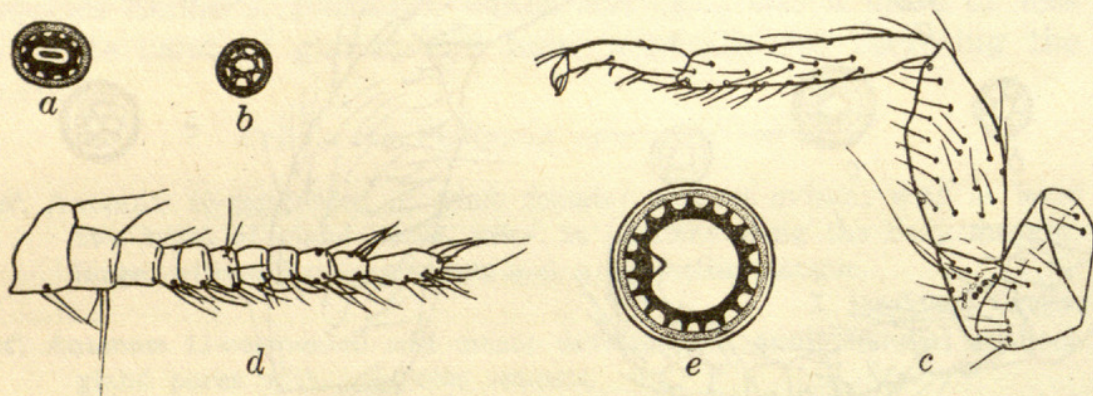


FIG. 3. *Icerya seychellarum* (Westw.), adult female; a and b, different sorts of solid-center gland pores on body, $\times 640$; c, leg, $\times 57.5$; d, antenna, $\times 57.5$; e, large open-center gland pore, secreting glassy threads, $\times 640$.

of *seychellarum*. The large gland pores with open centers and the presence of the numerous glassy threads in the secretion make this species easily recognizable.

In addition to the collection records given by Miss Robinson for the two species, the following may be cited:

LUZON, Manila, on *Artocarpus integrifolia* (coll. P. J. Wester), on *Citrus decumana* (coll. B. Arce 2594): Batangas Province, Tanauan, on *Citrus nobilis* (coll. Wester): Bulacan Province, Baliuag, on *Artocarpus integrifolia* (coll. Arce 2614): Quingua, on *Litsea glutinosa* (coll. Arce 2616): Laguna Province, Los Baños, on *Psidium guajava* (coll. Banks 18453), on *Streblus asper* (coll. Baker 10093).

Icerya aegyptiaca (Dougl.). Plate 1, fig. 1.

Crossotosoma aegyptiacum DOUGLAS, Ent. Month. Mag. 26 (1890) 79.
Icerya aegyptiacum (Dougl.), RILEY and HOWARD, Insect Life 3 (1890) 97.

This species does not appear to have been previously reported from the Philippine Islands, but the material sent by Mr. Mackie for determination gave the following records: Manila on *Barleria cristata* (coll. Arce 2606) and *Morus alba* (coll. Arce 2568). In addition it is known from Manila on *Citrus* (coll. Compere).

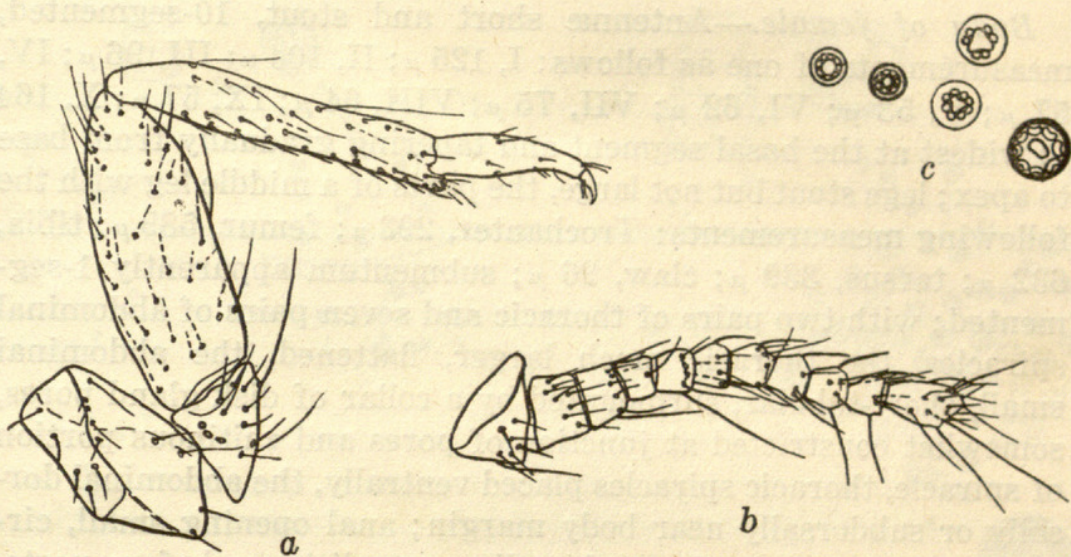


FIG. 4. *Icerya aegyptiaca* (Dougl.), adult female; a, leg, $\times 57.5$; b, antenna, $\times 57.5$; c, various sorts of gland pores present on body, $\times 640$.

Genus **LOPHOCOCCUS** Cockerell ⁶

A comparison of the following apparently new species with specimens in the United States National collection of Coccidæ identified as *Lophococcus mirabilis* Ckll. shows that the two are apparently congeneric.

Lophococcus convexus sp. nov.

Adult female.—Presumably occurring on the branches of the host; maximum length, 12.5 millimeters; maximum width, 9; maximum height, 7; oval, strongly convex, anterior apex truncate, posterior rounded; sides of body nearly perpendicular for two-thirds of its total height, this area terminated above by distinct and rather prominent lateral ridges about three-fourths as long as total length of body; with a broad, rounded longitudinal ridge, more convex medially, along median line dorsally; ventrally flat or somewhat concave; color dark reddish brown; body in life evidently covered by more or less mealy or waxy secretion, apparently only by a rather thin, more or less uniform coat which is easily rubbed off of the more prominent portions of the body; this view is borne out by the absence of any specially differentiated groups of gland pores or hairs dorsally, but the exact condition in life is not determinable from the preserved material.

⁶I do not desire to undertake any discussion regarding the possible identity or priority of *Lophococcus* Ckll., *Aspidoproctus* Newst., and *Walkeriana* Sign., as there is not sufficient material available for study to determine this question finally.

Body of female.—Antennæ short and stout, 10-segmented, measurements of one as follows: I, 125 μ ; II, 104 μ ; III, 96 μ ; IV, 57 μ ; V, 53 μ ; VI, 62 μ ; VII, 75 μ ; VIII, 64 μ ; IX, 57 μ ; X, 164 μ ; widest at the basal segment and tapering gradually from base to apex; legs stout but not large, the parts of a middle leg with the following measurements: Trochanter, 293 μ ; femur, 589 μ ; tibia, 632 μ ; tarsus, 339 μ ; claw, 96 μ ; submentum apparently 1-segmented; with two pairs of thoracic and seven pairs of abdominal spiracles, the thoracic much larger, flattened, the abdominal small, short-tubular, surmounted by a collar of disk gland pores, somewhat constricted at junction of pores and chitinous portion of spiracle, thoracic spiracles placed ventrally, the abdominal dorsally or subdorsally near body margin; anal opening small, circular, without setæ, placed dorsally some distance before poste-

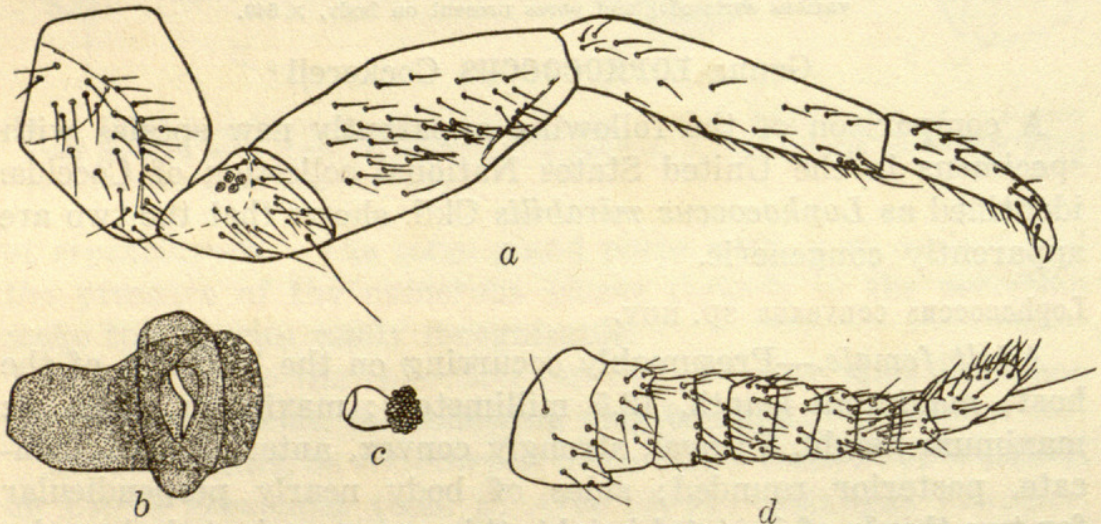


FIG. 5. *Lophococcus convexus* sp. nov., adult female; a, leg, $\times 57.5$; b, thoracic spiracle, $\times 57.5$; c, abdominal spiracle, $\times 57.5$; d, antenna, $\times 57.5$.

rior apex of body, joined by a short chitinized tube; genital opening placed ventrally near middle of abdomen and surrounded by a dense circular cluster of disk gland pores accompanied by some slender hairs; ventral cicatrices numerous, in groups of from one to five or more, arranged in six clusters curving forward from median posterior group on each side, making a total of thirteen groups; body dorsally and around the margin ventrally with a dense covering of stout, closely set, cylindrical hairs with bluntly rounded apices, among which are scattered disk gland pores with heavy walls, and occasionally a longer, slender, acute hair; ventrally with the area surrounding and posterior to the mouth parts bearing only numerous slender hairs and multilocular disk gland pores, a similar area present over venter of abdomen behind posterior legs, including cicatrices and genital opening, but with

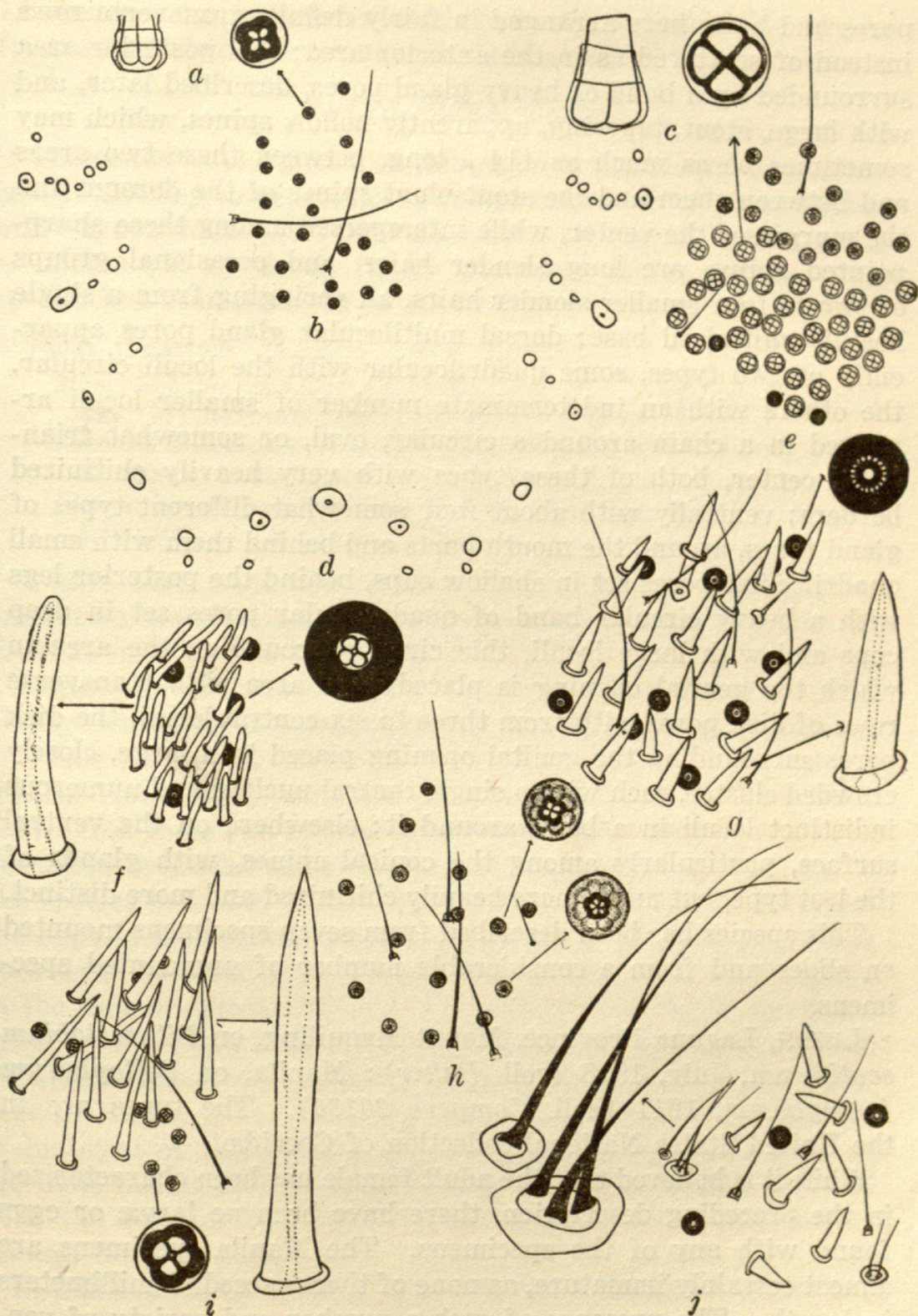


FIG. 6. *Lophococcus convexus* sp. nov., adult female, showing types of gland-pore and hair arrangements and ventral cicatrices; a, detail of quadrilocular pores placed ventrally posterior to beak, $\times 640$; b, gross view of portion of same region, $\times 165$; c, detail of glands from heavy band present ventrally in abdominal region, $\times 640$; d, ventral cicatrices, showing large number and arrangement, $\times 30$; e, portion of band mentioned under c, $\times 165$; f, dorsal glands and spines, $\times 165$, detail drawings, $\times 640$; g, ventral submarginal spine, gland, and hair group, $\times 165$, details of first two, $\times 640$; h, glands and hairs occurring ventrally near genital opening, $\times 165$, detail of gland, $\times 640$; i, ventral spines, glands, and hairs near gland band mentioned under c, $\times 165$, details of spine and gland, $\times 640$; j, from same region as g, $\times 165$, showing occasional development of more than one hair from a single base, with detail, $\times 640$.

pores and hairs here arranged in fairly definite transverse rows instead of scattered as in the anterior area; this posterior area surrounded by a band of heavy gland pores, described later, and with large, stout, tapering, apparently hollow spines, which may sometimes be as much as $114\ \mu$ long, between these two areas and between them and the stout blunt spines of the dorsum and the margin of the venter, while interspersed among these sharp-pointed spines are long slender hairs, and occasional groups of two to four smaller slender hairs, all springing from a single heavily chitinized base; dorsal multilocular gland pores apparently of two types, some quadrilocular with the loculi circular, the others with an indeterminate number of smaller loculi arranged in a chain around a circular, oval, or somewhat triangular center, both of these types with very heavily chitinized borders; ventrally with about four somewhat different types of gland pores, around the mouth parts and behind them with small quadrilocular pores set in shallow cups, behind the posterior legs with a heavy circular band of quadrilocular pores set in deep cups and with large loculi, this circle surrounding the area in which the genital opening is placed; this area with transverse rows of disk pores with from three to six central loculi, the disk pores surrounding the genital opening placed in a large, closely crowded cluster, each with a single central nucleus and numerous indistinct loculi in a band around it; elsewhere on the ventral surface, particularly among the conical spines, with glands of the last type, but much more heavily chitinized and more distinct.

This species has been described from seven specimens mounted on slides and from a considerable number of unmounted specimens.

LUZON, Laguna Province, Mount Maquiling, on *Pithecolobium scutiferum*, July, 1918 (coll. Baker): Manila, on *Peltophorum ferrugineum*, 1911 (coll. Compere 20186). The types are in the United States National collection of Coccidæ.

While it is believed that the adult female has been characterized in the preceding description, there have been no larvæ or eggs found with any of the specimens. The Manila specimens are almost certainly immature, as none of them exceeds 9 millimeters in length. The presence of such a number and variety of ventral glands indicates the probability of the development of special secretions at the time of oviposition, and it may be found that when the female is fully mature she is even larger than the dimensions given in the description. Fully mature females, young larvæ, and males should certainly be looked for in the Philippines.

I have also seen specimens that are almost certainly this species from Java, where they were collected by Mr. P. van der Goot.

Genus DROSICHA Walker

The genus as recognized in this paper is sufficiently characterized in the key to genera to be recognizable. It is in all probability synonymous with *Monophlebus* Burm. as the latter genus is understood by E. E. Green and some other writers. One species has been collected in the Philippines.

Drosicha townsendi (Ckll.). Plate 1, fig. 3.

Monophlebulus townsendi COCKERELL, Proc. Dav. Acad. Sci. 10 (1905) 127 (♀); ROBINSON, Philip. Journ. Sci. § D 12 (1917) 4.

Drosicha lichenoides COCKERELL, Journ. Econ. Ent. 6 (1913) 142 (♀); ROBINSON, Philip. Journ. Sci. § D 12 (1917) 4.

Llaveia benguetensis COCKERELL, Journ. Econ. Ent. 9 (1916) 235 (♂); ROBINSON, Philip. Journ. Sci. § D 12 (1917) 5.

I have been especially fortunate in having available for examination the type material of both of the females listed above. A study of *M. townsendi*, the type material of which consists of a single specimen, shows clearly that at least one, and in all probability two, of the terminal segments of both antennæ are broken off, thus giving the impression that they are 6-segmented. A careful comparison with the type material of *D. lichenoides* shows that these two are the same. Neither of these females, as described by Cockerell, seems to be fully mature nor as large as the species becomes, in spite of the fact that Cockerell describes the eggs in his original description of the latter species. There does seem, however, to be a wide range in size of the adult female at the time of oviposition, and this may account for the fact that most of the adult females examined by me were larger than Cockerell's specimens. Through the collections of Mr. Geo. Compere in Manila it has been possible to examine a large quantity of material of this species, and to determine the synonymy of the male included above by a comparison of the males collected with the females by Compere, with Cockerell's description of *Llaveia benguetensis*.

In addition to the records given by Miss Robinson under the three different names, I have examined a large number of specimens as follows:

LUZON, Manila, on unnamed plant host, 1909 (coll. Compere 15057), on various plants, 1911 (coll. Compere 21038), on *Enterolobium saman* (coll. Banks 9943), on *Cassia* (coll. H. S. Smith), on *Hibiscus* (coll. Arce 2567): Laguna Province, Los

Baños, on *Eugenia malaccensis* (coll. J. de Leon, under Banks 18456), on unnamed host (coll. Banks 18457), on *Ipomoea carica* (coll. Banks 18454): Rizal Province, Pasig, on *Gymnosporia spinosa* (coll. McGregor 376-4).

On account of the previous confusion with regard to this species, some additional descriptive notes may assist in facilitating its recognition. The female becomes quite large, as much as 16 millimeters long, and strongly convex when mature and

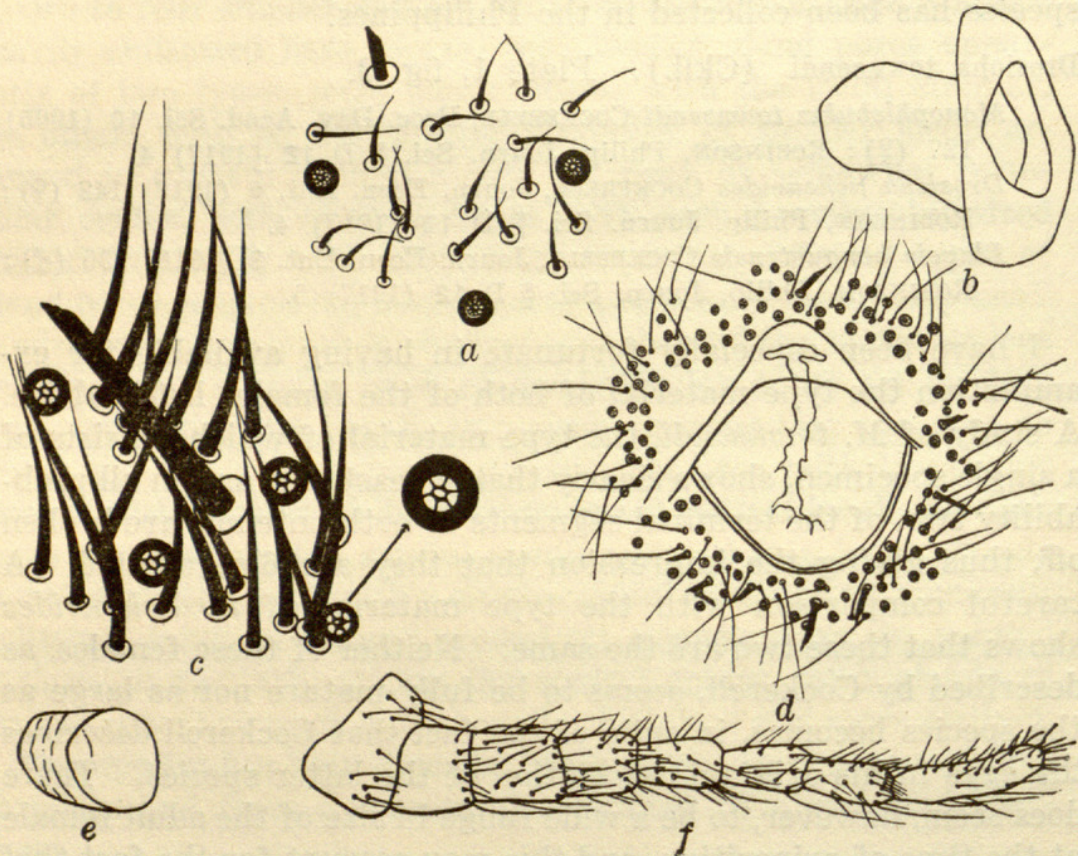


FIG. 7. *Drosicha townsendi* (Ckll.), adult female; a, hairs and glands from underside of body, $\times 335$; b, thoracic spiracle, $\times 57.5$; c, hairs and glands from dorsum near body margin, $\times 335$, detail of gland, $\times 640$; d, anal ring region, $\times 115$; e, abdominal spiracle, $\times 335$; f, antenna, $\times 57.5$.

ready for oviposition. The anterior median notch seems to be constantly in evidence, although more conspicuous in the immature forms. At the time of oviposition, the female is much swollen, particularly behind the middle, and is concave as viewed from beneath, with the cavity well packed with cottony secretion. In the dried state, the female exhibits a considerable variety in size, shape, and coloring, and might easily be mistaken for more than a single species if isolated specimens had been collected. In spite of these apparent differences, the specimens examined seem to be identical structurally and there is sufficient variation in some of the large lots of material collected by Mr. Compere

from a single colony to include most of the differences in appearance shown by individually collected specimens.

The whole derm of this species is closely crowded with fine hairs, with larger ones of varying lengths, and a single type of multilocular disk gland pore but, with the number of loculi varying, scattered among the finer hairs, with the exception that dorsally in the anal ring region and ventrally in the region of the genital opening the glands are far more numerous and more closely crowded than elsewhere and the hairs are also more numerous. There are more or less distinct clusters of much larger and longer blackish hairs around the body margin and also some longer hairs ventrally between the antennæ and around the mouth parts. There are seven pairs of abdominal spiracles. In spite of the fact that Cockerell described *D. lichenoides* as having 9-segmented antennæ, none of the specimens examined, including part of the type material of that species, shows more than eight. There are three large ventral cicatrices or clear spaces, posterior to the genital opening, but these are collapsed and so faintly outlined in all the specimens examined that their exact size and shape are not determinable.

The young larva is oval with numerous body hairs and glands, and marginal groups, each composed of two or three, very long blackish hairs. The antennæ are 5-segmented, with the third and fifth segments much longer than the others and about equal in length, and the fifth distinctly clavate. The seven pairs of abdominal spiracles are present, although minute.

DACTYLOPIINÆ

This subfamily group is used here according to the classification in the Fernald Catalogue of the Coccidae of the World, although the collection of species placed here probably includes several subfamilies. The Philippine species of this group are united mostly by the characters given in the subfamily key. The legs and antennæ are present or wanting, or variously reduced; the body is naked, covered with secretion, or inclosed in a sac. The anal ring is located at the posterior apex of the body and bears setæ in all the known Philippine species.

Key to the Philippine genera of the Dactylopiinæ.

- a*¹. Body inclosed in a complete horny test or sac; body margin with a row of 8-shaped gland pores; legs wanting; antennæ very much reduced, minute..... *Asterolecanium* Targ.

- a*². Body naked or covered with cottony or mealy secretion; without 8-shaped gland pores; legs and antennæ usually present.
- b*¹. Without dorsal ostioles; without cerarii; anal lobes prominently developed, with dorsal spines and ventral setæ; body with a marginal fringe of large stout spines; naked; with a fringe of white thread-like filaments..... *Rhizococcus* Sign.
- b*². With at least a posterior pair of dorsal ostioles or oval openings near the caudal apex of the body; usually with cerarii or groups of spines and glands along the body margin, but without a continuous marginal fringe of spines; anal lobes not or very poorly developed; body covered with cottony or mealy white secretion, rarely naked.
- c*¹. Legs and antennæ well developed; body depressed, oval, covered with white mealy secretion and with more or less developed and protruding lateral and caudal filaments; posterior apex of body not invaginated.
- d*¹. Body with small chitinized areas laterally and dorsally, each bearing a pair of large, conical spines....*Synacanthococcus* g. nov.
- d*². Body without large, stout, grouped spines on dorsum, though sometimes with slender spines scattered over the upper surface.
- e*¹. Margins of each body segment bearing large, more heavily chitinized areas with a number of stout truncate spines and triangular gland pores on each; antennæ 9-segmented....
Puto Sign.
- e*². Margins of each body segment with not more than four or five spines in a single group, these all slender, pointed at apex, and not placed on a conspicuously chitinized area.
- f*¹. Antennæ normally 9-segmented..... *Phenacoccus* Ckll.
- f*². Antennæ normally 8-segmented or less. *Pseudococcus* Westw.
- c*². Legs wanting; antennæ very rudimentary; body naked; globose, much wrinkled when dry, reddish brown; apex of body invaginated in the form of a small cylindrical tube with the anal ring at the inner end..... *Antonina* Sign.

Genus *ASTEROLECANIUM* Targioni Tozzetti

The members of this genus are all of small size, and have the female and immature stages completely inclosed in a horny and, usually, more or less transparent test or sac which bears a marginal fringe of filaments, usually brightly colored in life. The legs are wanting, the antennæ very minute, and there is a row, sometimes more than a single pore deep, of 8-shaped gland pores around the body margin, while additional pores of this type are frequently found on the dorsum. At present only one species from the Philippines has been examined, although, considering the large number which have been reported from the leaves of bamboo from Ceylon, it is difficult to believe that there are no more species in these Islands.

Asterolecanium bambusæ (Bdv.).

Chermes bambusæ BOISDUVAL, Insectologie Agricole 3 (1869) 261.

Asterolecanium bambusæ (Bdv.) GREEN, Cocc. Ceylon 4 (1909) 328.

This species is listed from three lots of material collected at Manila on bamboo (*Compere 20230* and unnumbered) and (*Banks 10213*). It is one of the largest species in the genus, somewhat convex, broad oval in shape, and with a pinkish marginal fringe, at least in life. There is a single row of 8-shaped pores completely surrounding the body along the margin, and a few of the same type, but somewhat larger, dorsally near the middle line of the body.

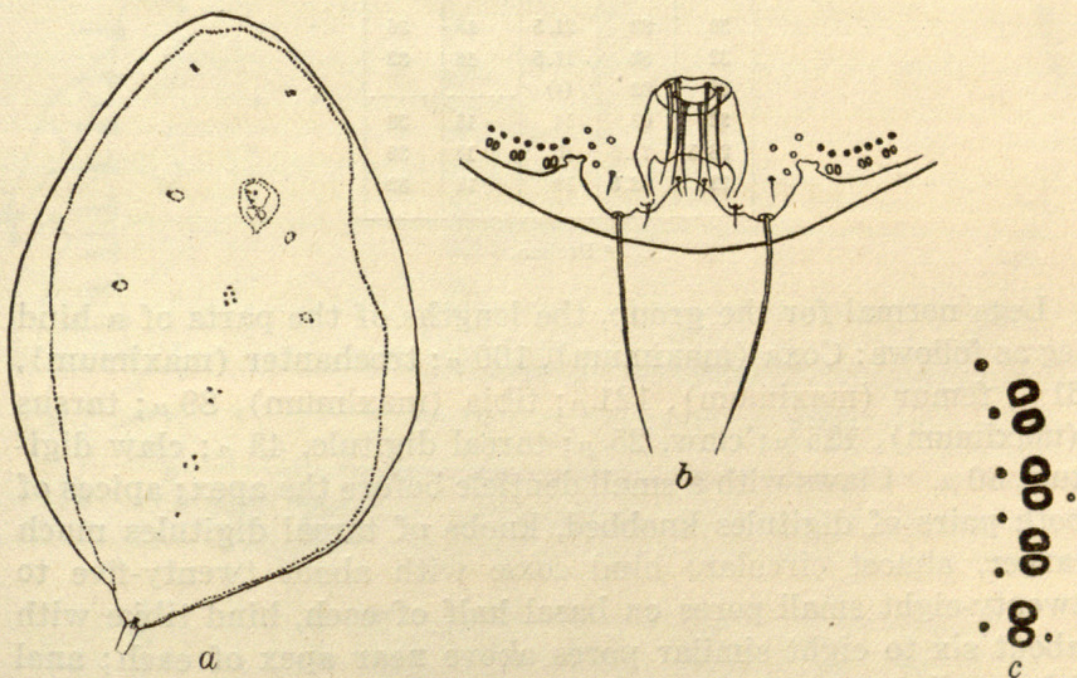


FIG. 8. *Asterolecanium bambusæ* (Bdv.), adult female; a, outline of body, showing marginal pores, dorsal pores, antennæ, spiracles, mouth parts, $\times 32$; b, caudal apex of body, showing anal ring and lobes, $\times 325$; c, detail of marginal double-pore band, $\times 640$.

Genus RHIZOCOCCUS Signoret

It is possible to include here a single, new species of this genus, through the kindness of Professor Cockerell in sending specimens which had been sent to him for determination.

Rhizococcus philippinensis sp. nov. Plate 1, fig. 5.

Adult female.—Occurring on the small twigs of the host, particularly in the crevices formed at points where branches are given off; broad oval, the abdomen narrowed, about 1.5 millimeters long and nearly as wide, convex medially, the margins more or less flattened, strongly wrinkled or ridged transversely

on thorax and abdomen; reddish brown, mottled and spotted with lighter yellow; with a normally complete marginal fringe of short, white, cylindrical wax threads with tapering tips.

Body of female.—When mounted on a slide, oval; maximum length a little more than 1.5 millimeters, maximum width a little more than 1 millimeter; body and derm clearing completely when boiled in caustic potash; antennæ 6-segmented, III longer than the following segments combined, the measurements in microns as follows (measurements of I omitted):

II	III	IV	V	VI
36	82	21.5	18	36
32	82	17.5	16	32
36	82	(a)	-----	-----
32	68	14	15	32
28.5	71.5	15	18	36
32	78.5	18	18	32

^a Broken.

Legs normal for the group, the lengths of the parts of a hind leg as follows: Coxa (maximum), 100 μ ; trochanter (maximum), 61 μ ; femur (maximum), 121 μ ; tibia (maximum), 89 μ ; tarsus (maximum), 125 μ ; claw, 25 μ ; tarsal digitule, 43 μ ; claw digitule, 30 μ . Claws with a small denticle before the apex; apices of both pairs of digitules knobbed, knobs of tarsal digitules much larger, almost circular; hind coxæ with about twenty-five to twenty-eight small pores on basal half of each, hind tibiæ with about six to eight similar pores above near apex of each; anal lobes well developed and chitinized, rather long, outer sides nearly straight, inner curved, inner faces more or less roughened and tuberculate, total length about 100 to 107 μ , apical hair at least 196 μ long, with three dorsal spines, the subapical near inner margin of lobe, stout at base, but with its apical half distinctly hairlike, inner and outer basal spines stouter, but with acute tips; with three hairs ventrally, the subapical one largest, the others close to the base, and the basal one smallest; with a large hair, about 115 μ long on each side between anal ring and anal lobe; anal ring surrounded by a chitinized band, united with the lobes and produced dorsally into a median chitinized cauda about 46 μ long and 57 μ wide, with a rounded and crenulate posterior margin; anal ring with six rather stout hairs, the longest noted about 107 μ long, the ring itself with a single row of large

pores, accompanied by from one to three smaller pores on the inner side of the middle seta, on each half; with a continuous row of rather closely set, large, tapering spines, varying somewhat in length, all around the margin of body, this row supplemented by an interior median pair between the eyespots, largest spines noted about $50\ \mu$ long; dorsally without tapering

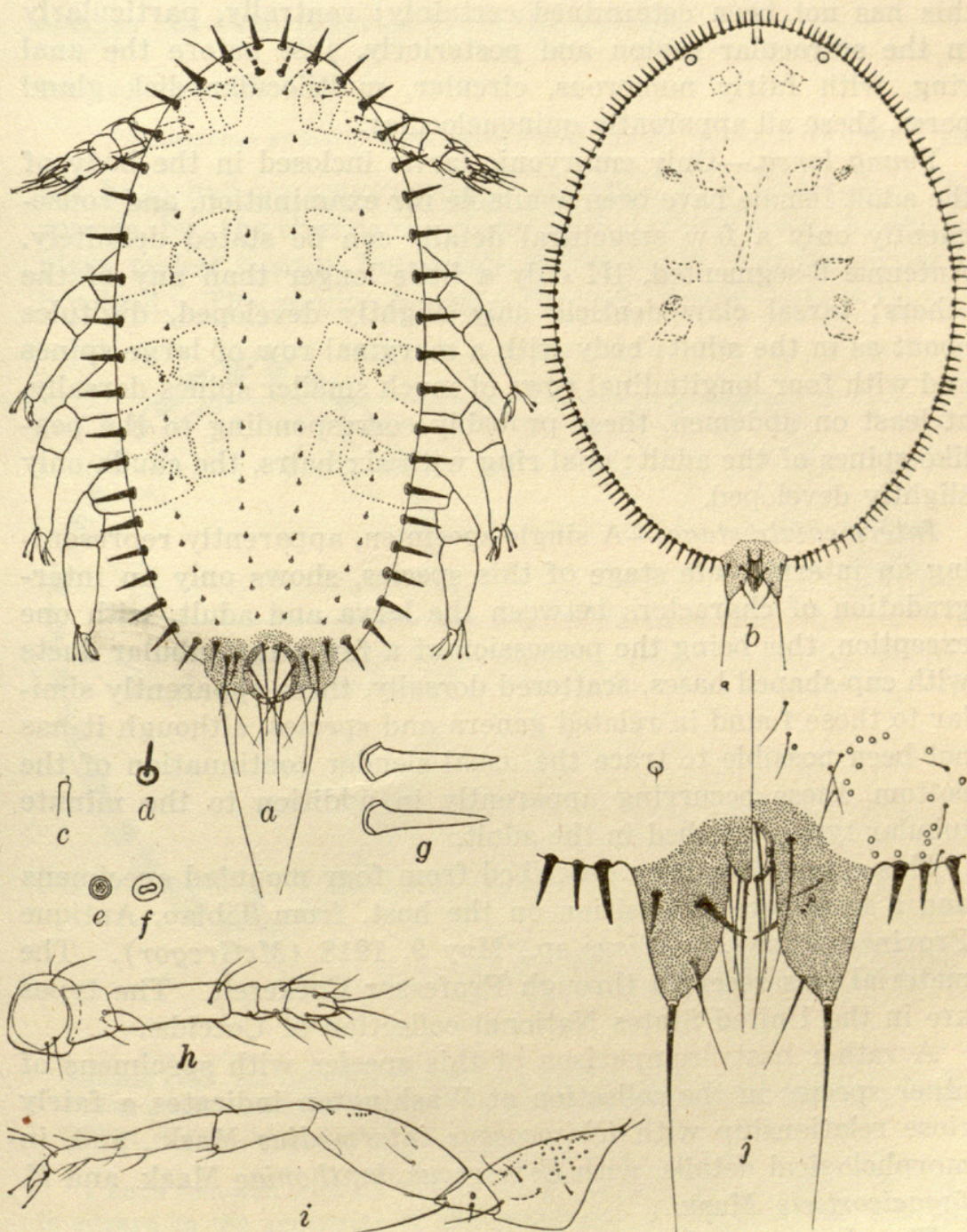


FIG. 9. *Rhizococcus philippinensis* sp. nov., young larva; a, outline of body, $\times 230$; adult female; b, outline of body, showing spines and anal lobes, $\times 44$; c and d, minute tubular ducts, $\times 640$; e and f, body gland pores, $\times 640$; g, marginal spines, $\times 335$; h, antenna, $\times 165$; i, hind leg, showing pores, $\times 165$; j, anal lobe and ring region, $\times 165$.

spines, with only a few minute cylindrical peglike spines set in circular bases, the spines about $7\ \mu$ long; ventrally, at least on abdomen, with transverse segmental rows of rather large hairs of varying length, the longest occurring near median line; dorsally, more particularly laterally, with fairly numerous minute tubular ducts, apparently with cup-shaped bottoms, although this has not been determined certainly; ventrally, particularly in the spiracular region and posteriorly, just before the anal ring, with fairly numerous, circular, multilocular disk gland pores, these all apparently quinquelocular.

Young larva.—Only embryonic larvæ inclosed in the body of the adult female have been available for examination, and consequently only a few structural details can be stated definitely. Antennæ 6-segmented, III only a little longer than any of the others; tarsal claw denticle only slightly developed, digitules about as in the adult; body with a marginal row of large spines and with four longitudinal rows of much smaller spines dorsally, at least on abdomen, these probably corresponding to the peglike spines of the adult; anal ring with six hairs, the cauda only slightly developed.

Intermediate stage.—A single specimen, apparently representing an intermediate stage of this species, shows only an intergradation of characters between the larva and adult, with one exception, this being the possession of a few large tubular ducts with cup-shaped bases, scattered dorsally, these apparently similar to those found in related genera and species, although it has not been possible to trace the usual slender continuation of the bottom, these occurring apparently in addition to the minute tubular type described in the adult.

This species has been described from four mounted specimens and a few more in position on the host, from Tibiao, Antique Province, Panay, on *Ficus* sp., May 9, 1918 (McGregor). The material was received through Professor Cockerell. The types are in the United States National collection of Coccidæ.

A rather hasty comparison of this species with specimens of other species in the collection at Washington indicates a fairly close relationship with *Rhizococcus intermedius* Mask., and, in morphological details, with *Eriococcus danthoniae* Mask. and *E. fagacicorticis* Mask.

The character of a majority of the descriptions of species in this genus is such that this species cannot be accurately compared with many of the species at present included here.

Genus *PUTO* Signoret⁷

The presence of the numerous groups of glands and spines, encompassed by more or less definitely chitinized areas, along the body margin of the species of this genus makes it readily recognizable. In addition, in the Philippine species the antennæ are 9-segmented and the tarsal claws have a denticle. Only a single species has been reported from the Islands.

Puto spinosus (Rob.).

Phenacoccus spinosus ROBINSON, Philip. Journ. Sci. § D 13 (1918) 145.

I have had no opportunity to examine type material of this species, but the abundance of material received from the Philippines makes it seem impossible that any other species could be involved. The species is evidently very closely related to *Phe-*

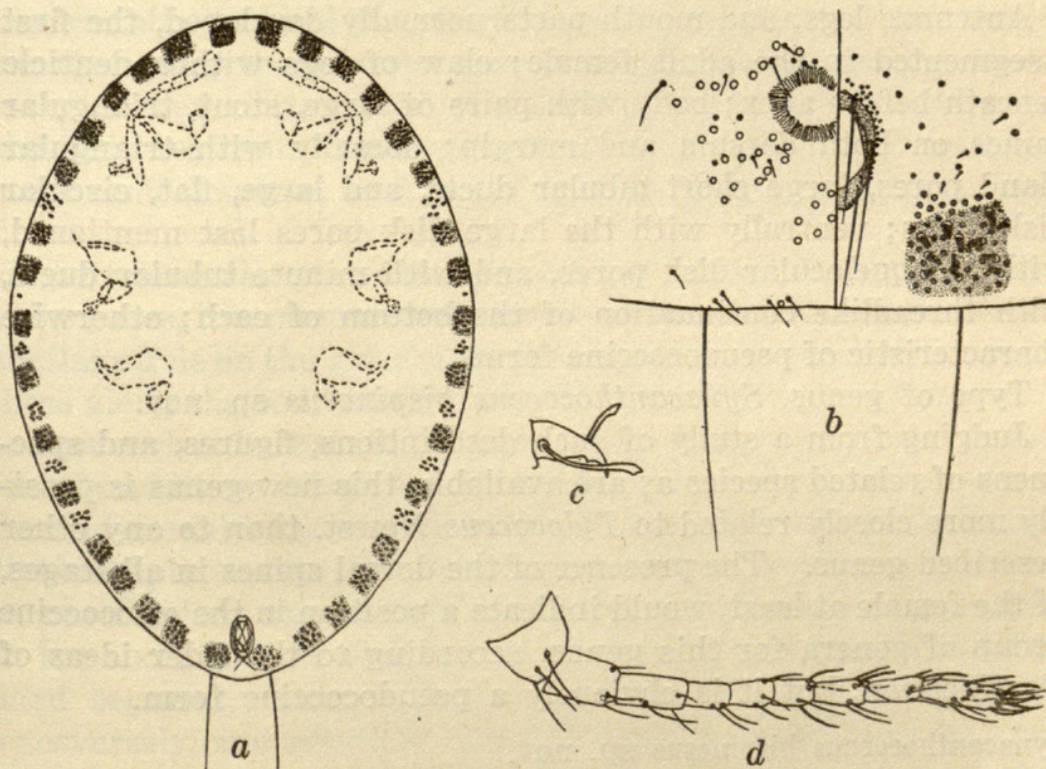


FIG. 10. *Puto spinosus* (Rob.), adult female; a, outline of body, showing principally the chitinized gland- and spine-bearing areas along the body margin, $\times 38$; b, apex of abdomen, showing posterior chitinized area, anal and genital openings, and apical seta, $\times 110$; c, claw, showing denticle, $\times 325$; d, antenna, $\times 115$.

⁷ I have followed with no further study the conclusions reached by Ferris in regard to the synonymy of this genus and of *Ceroputo* Sulc, and have no opinion to express regarding this rearrangement. See G. F. Ferris, The California species of mealy bugs, Leland Stanford Junior University Publications, Univ. Ser. (1918) 61, 62.

nacoccus mangiferae Green, described from Ceylon, and Mr. Green, who has very kindly compared specimens with some of his material from Ceylon, states that it is identical with specimens which he has collected in Ceylon. In addition to the records given by Miss Robinson, I have examined specimens as follows:

LUZON, Manila, on "wild plants" (*Compere 20194*), "wild grass" (*Compere 20233*): Bulacan Province, Baliuag, on *Tabernaemontana* sp. (coll. *Arce 2619*); Katagpo, on *Antidesma leptocladum* (coll. *Arce 2609*); Quingua, on *Antidesma leptocladum* (coll. *Arce 2615*); Rizal Province, Balintauac, on *Mangifera indica* (coll. *Arce 2599*).

The accompanying figures and the characters given in the key should be sufficient to make this species recognizable.

Genus SYNACANTHOCOCCUS novum

Antennæ, legs, and mouth parts normally developed, the first 9-segmented in the adult female; claw of legs with a denticle beneath before apex; body with pairs of large, stout, triangular spines on both dorsum and margin; dorsally with triangular gland pores, large short-tubular ducts, and large, flat, circular disk pores; ventrally with the large disk pores last mentioned, with quinquelocular disk pores, and with minute tubular ducts, with threadlike continuation of the bottom of each; otherwise characteristic of pseudococcine forms.

Type of genus, *Synacanthococcus bispinosus* sp. nov.

Judging from a study of such descriptions, figures, and specimens of related species as are available, this new genus is possibly more closely related to *Tylococcus* Newst. than to any other described genus. The presence of the dorsal spines in all stages, of the female at least, would indicate a position in the eriococcine group of genera for this genus, according to the older ideas of classification, but it is obviously a pseudococcine form.

Synacanthococcus bispinosus sp. nov.

Adult female.—All of the material studied preserved in liquid at one time, and external secretion therefore wanting; occurring on small twigs of the host; the denuded forms, after preservation in liquid and subsequent drying out, clay yellow in color; maximum length, mounted on a slide, a little more than 2 millimeters; maximum width, nearly 1 millimeter; elongate oval, broadest a little behind the middle; not giving off any appreciable color or stain when boiled in caustic potash; antennæ normally 9-segmented, the joint between the last two segments only slightly

constricted, the measurements of the segments in microns as follows (segment I omitted) :

II	III	IV	V	VI	VII	VIII	IX
46.5	28.5	23	28.5	24	28	28	46.5
40	32	25	32	25.5	32	25.5	46.5
46.5	28.5	(a)	-----	-----	-----	-----	-----
50	32	(a)	-----	-----	-----	-----	-----
50	32	26.5	35	26.5	32	25	50
47	35.5	26.5	35.5	35.5	32	28.5	52

^a Broken.

Legs rather small, normal, the lengths of a middle leg as follows: Coxa, 64 μ ; trochanter (maximum), 68 μ ; femur (maximum), 161 μ ; tibia (maximum), 164 μ ; tarsus, 75 μ ; claw, 25 μ ; tarsal digitules, 39 μ ; claw digitules, 21 μ . All digitules slender, slightly knobbed at apex, claw with a distinct denticle before the apex; only the posterior pair of dorsal ostioles noted; without marginal cerarii or groups of glands, pores, spines, and hairs on the body segments, these structures being replaced by pairs of stout conical spines, each set on a small, roughly circular, chitinized area, each of these chitinized areas also normally bearing a single triangular pore immediately inside and between the two spine bases, two minute clear circles on the same side and a single similar circle on the outer side; with sixteen or seventeen pairs of these along the body margin, all with two spines, except the second on each side from the anterior body apex, which usually has one; in addition with a row of nine similar spine clusters down the mid-dorsal body line, of which the anterior two have the individual spines separated by more than their own length and have an unchitinized space between them; with the last median pair on the sixth abdominal segment, and the next to the last on the third segment, these median pairs with the spines arranged transversely, and normally with two triangular gland pores, one on each side in the triangle between the spine bases; where the spines are separated, with one pore joined to each spine; with most of these pairs of large spines only slightly unequal in size, but with those on the anal lobes distinctly unequal, one about 21 μ long and 11 μ wide at base, the other about 25 μ long and only 7 μ wide at base, the spines in the median groups about equal; anal lobes not prominent, with an apical hair about 78 μ long, from which a ventral chitinized thickening, tapering anteriorly, extends forward; body with several types of gland tubes and pores: dorsally with some relatively very large, short-

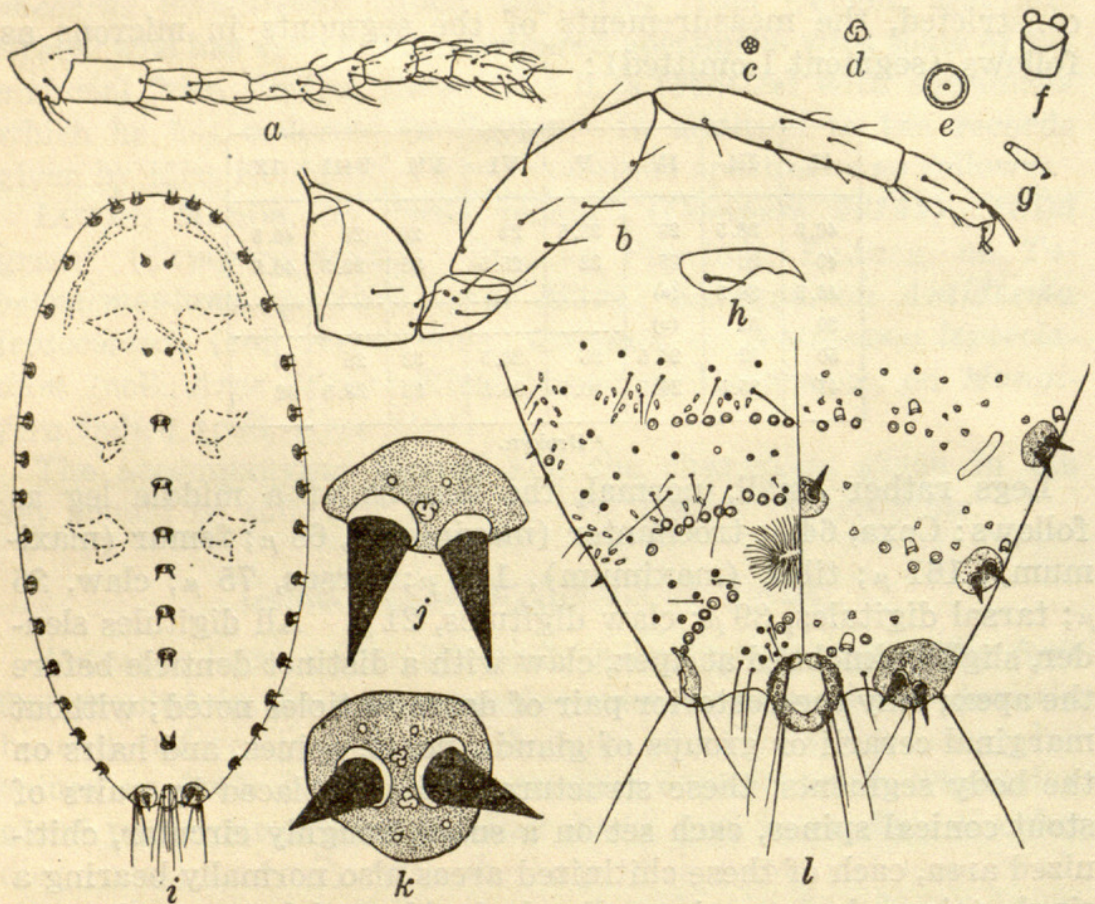


FIG. 11. *Synacanthococcus bispinosus* g. et sp. nov., adult female; a, antenna, $\times 165$; b, leg, $\times 165$; c to g, five different types of gland pores found on body, $\times 640$; h, tarsal claw, $\times 640$; i, outline of body, showing arrangement of spine groups, $\times 45$; j, lateral abdominal spine group, $\times 640$; k, median abdominal spine group, $\times 640$; l, apex of abdomen, $\times 165$.

tubular ducts with two or three minute circles attached to their outer margins, these two on the anal lobe segment, four with one pair marginal on the next segment anteriorly, six with one pair marginal on the next, and eight with one pair marginal on the remaining abdominal segments, these gland tubes also present, but in fewer numbers and uncertain arrangement, on head and thorax; next in size, with somewhat smaller, flat, circular disk glands with minute central pore and crenulations, possibly representing openings, near the outer margin, normally with four of these on the anal lobe segment, eight on the next anterior, and an increasing number on the anterior abdominal segments, and in the thoracic and head region, these usually more or less grouped in connection with the larger glands previously described; finally with a much larger number of the ordinary triangular and trilocular gland pores scattered over the whole dorsum and margin; ventrally with large disk glands already described for the dorsum but much more numerous, in transverse segmental rows, with tiny tubular glands

with a minute threadlike continuation of the bottom of each, also quite numerous, and with numerous quinquelocular disk pores, all of these obviously arranged in transverse rows according to the segmental divisions; thus with five different types of gland pores in this species; dorsally in addition to the large spines already described, with transverse segmental rows of minute conical spines; without spines ventrally, but with transverse segmental rows of relatively long slender hairs, these varying greatly in length among themselves; anal ring small, nearly circular, with six setæ, the longest about 90 μ long, and with two rows of pores on each half.

Young larva.—No satisfactory mounts of this stage obtained, but apparently with the paired spines of the adult present and in much the same arrangement, and with some, at least, of the same gland pore types present.

The species has been described from six adults and four larvæ mounted on slides, and from a small additional amount of material originally preserved in liquid but now dried out. The specimens are all from Manila, some from *Ficus* (20158), some from "wild plant" (20176), and some from wild fig (without number), all collected by Geo. Compere, exact date of collection not stated. The types are in the United States National collection of Coccidæ.

The presumed relationships of this genus and species have been indicated in the previous discussion of the genus. So far as my acquaintance with this group of coccids extends, it is rather unusual to find five different types of secreting gland pores in a single species.

Genus PHENACOCOCCUS Cockerell

This genus as limited here is characterized only by the occurrence of 9-segmented antennæ in the adult female. The cerarii of the single species included from the Philippines are poorly developed, in contrast to the usual condition in *Pseudococcus* and in the two preceding genera.

Phenacoccus hirsutus Green.

Phenacoccus hirsutus GREEN, Mem. Dept. Agr. Ind. 2² (1908) 25.

This species may be separated from the other known Philippine members of the group by the characters given in the generic key. Whether it will remain in the genus *Phenacoccus* when any generic revision of this subfamily is undertaken is very doubtful. There is no tooth on the tarsal claw, and there are only about six distinguishable pairs of cerarian spines on the

abdomen, on each side, the anterior pairs apparently becoming modified into large hairs or setæ, and the joint separating the eighth and ninth antennal segments is not so distinctly constricted as in other species of the genus. Each anal lobe bears a stout hair at least twice as long as the anal ring hairs. There appear to be four different types of glands present, large tubular, small tubular, large disk, and medium triangular, all of which are quite abundant, although not in the same numerical quan-

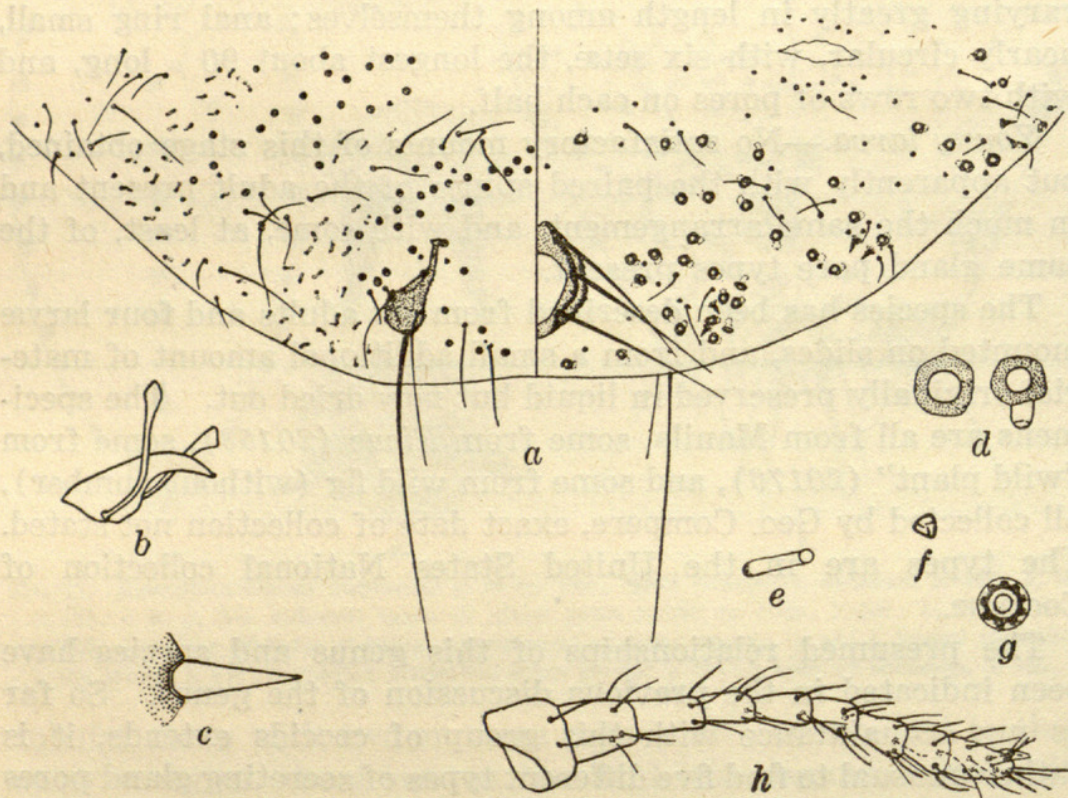


FIG. 12. *Phenacoccus hirsutus* Green, adult female; a, posterior apex of body, showing cerarii, glands, anal ring, apical setæ, and ventral chitinized area, $\times 115$; b, tarsal claw, $\times 440$; c, cerarian spine, $\times 640$; d to g, four different types of gland pores found on body, $\times 640$; h, antenna, $\times 115$.

tity. The species as found in the Philippines occurs in abundance on the small twigs and leaves of its hosts, often in masses, and appears to form a matted sac, although the poor condition of all of the material studied prevents an accurate statement regarding the external appearance. I have examined specimens from the following lots of material:

LUZON, Manila, on *Hibiscus* (coll. Compere 20172): Bulacan Province, Baliuag, on *Samanea saman* (coll. Arce 2608): Rizal Province, Alabang, on *Hibiscus* (coll. B. Duckworth 2566).

Genus PSEUDOCOCCUS Westwood

This genus as used here includes some species which would need to be distributed to other genera in any revision of the

group, but is substantially as it is constituted in the Fernald Catalogue. It is characterized chiefly by having the antennæ normally 8-segmented or less, by the absence of a claw on the denticle, and by the usually well-developed cerarii. I have examined specimens of five species from the Philippines.

Key to the Philippine species of Pseudococcus.

- a*¹. Margin of body segments dorsally with a varying number of large, tubular glands, and with a dorsal median pair on most of the segments, each of these opening into a heavily chitinized plate bearing several hairs, these glands most numerous on the caudal abdominal segments and near the antennæ; with only an apical pair of cerarii; secretory covering of female with glassy threads in it.
P. virgatus (Ckll.).
- a*². Without such prominent tubular glands, but often with smaller inconspicuous tubular glands present; cerarii more numerous in most species.
 - b*¹. With the three or four abdominal segments anterior to the anal ring with a long slender seta on each margin, all of these approaching in length those found on the anal lobe segment; body large, plump, legs and antennæ short and stout; cerarii wanting except on the posterior abdominal segments. *P. sacchari* (Ckll.).
 - b*². With such large setæ only on the anal lobes.
 - c*¹. With dorsal lanceolate spines; cerarii poorly developed, the spines lanceolate, and those anterior to the last four or five pairs widely separated and without grouped trilocular pores; antennæ normally 7-segmented, short and stout, as are the legs; female very plump, inclosed in a more or less distinct white secreted sac.
P. filamentosus (Ckll.).
 - c*². Without dorsal spines, although sometimes with rather stout hairs; cerarii all well developed, the conical spines surrounded by a varying number of trilocular gland pores; antennæ normally 8-segmented; female not inclosed in a sac.
 - d*¹. Ventral chitinized area on anal lobes irregularly quadrate; anal lobe hair only a little longer than anal ring hair; the penultimate or antepenultimate, and some of the anterior cerarii usually with three or even more spines in each cerarius.
P. bromeliae (Bouché).
 - d*². Ventral chitinized area on anal lobes linear; anal lobe hair about twice as long as anal ring hair; abdominal segments with only two spines in each cerarius. *P. lilacinus* Ckll.

Pseudococcus virgatus (Ckll.). Plate 1, fig. 7.

Pseudococcus virgatus (Cockerell), ROBINSON, Philip. Journ. Sci. § D 12 (1917) 6.

Pseudococcus virgatus (Cockerell), variety, Proc. Dav. Acad. Sci. 10 (1905) 130; ROBINSON, Philip. Journ. Sci. § D 12 (1917) 7.

A careful examination of the type material of *P. virgatus*, variety, fails to show any characters that would definitely distinguish the so-called variety from the species, and the suggestion

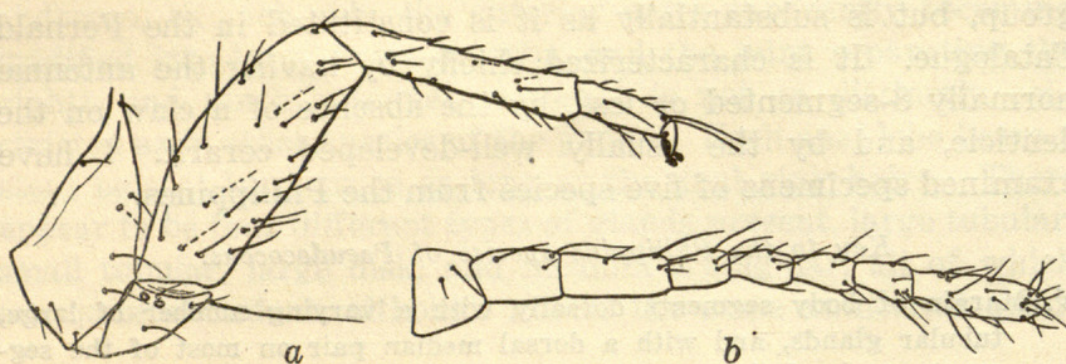


FIG. 13. *Pseudococcus virgatus* (Ckll.), adult female; a, leg, $\times 115$; b, antenna, $\times 115$.

of Brain⁸ that the variety is not to be considered as distinct from typical *virgatus* seems to be entirely correct. The unreliability of the antennal formula and of the relative lengths of antennal segments as a specific characteristic has been proven so frequently that it hardly seems worth while to call attention to it again.

Specimens of this species from the following lots of material have been examined:

LUZON, Manila, on *Pithecolobium dulce*, *Achyranthes aspera*, *Amaranthus spinosus*, and *Acalypha wilkesiana* (coll. Mc-

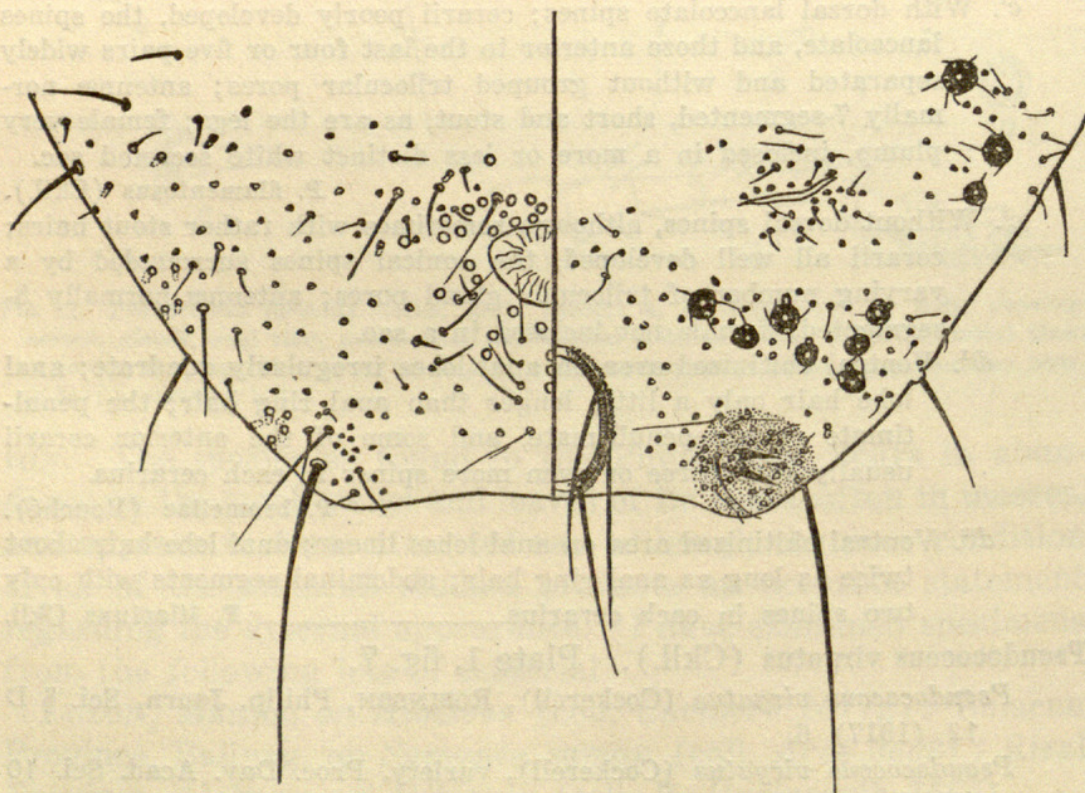


FIG. 14. *Pseudococcus virgatus* (Ckll.), adult female; posterior apex of abdomen, showing cerarius, peculiar heavy gland openings, anal ring, etc., $\times 97$.

⁸ Coccidae of South Africa, Trans. Royal Soc. South Africa 5² (1915) 133.

Gregor), on cowpea (coll. Arce 2588), on *Lycopersicum esculentum* (coll. Arce 2586, 2587): Bulacan Province, on guava (McGregor): Laguna Province, Los Baños, on *Ricinus communis* (coll. Banks 18461), on *Mimosa pudica* (coll. Banks 18460), on *Xanthosoma sagittifolium* (Coccidæ Malayana, 9, coll. Baker); Paete, on *Cyathula prostrata* (coll. McGregor): Rizal Province, Fort William McKinley, on *Leucaena glauca* (coll. McGregor); Las Piñas, on *Wrightia laniti* (coll. McGregor); Pasay, on *Annona squamosa*, *Gliricidia sepium*, *Antigonon leptopus*, and *Jatropha curcas* (coll. McGregor); San Pedro Makati on *Pithecolobium dulce* and *Lantana camara* (coll. McGregor). Also from the Philippines on "Marang" [= *Artocarpus odoratissima*], collected at plant quarantine, Washington, D. C., by H. L. Sanford (F. H. B. 1320).

Pseudococcus sacchari (Ckll.).

Dactylopius sacchari COCKERELL, Journ. Trin. Field Nat. Club 2 (1895) 195.

Pseudococcus sacchari (Ckll.), FERNALD, Cat. Cocc. World (1903) 109.

This species is represented by two lots of material, both collected at Manila by Geo. Compere, one on sugar cane (20165), the other on bamboo grass (20229).

Pseudococcus filamentosus (Ckll.). Plate 1, fig. 8.

Pseudococcus filamentosus (Ckll.), ROBINSON, Philip. Journ. Sci. § D 12 (1917) 8.

The following records, in addition to those given by Miss Robinson, may be listed for this species:

LUZON, Manila, on *Tamarindus indicus* (2589), *Annona reticulata* (2570) (coll. Arce); "wild bush" (20170), citrus (no number), and unnamed host (20232) (coll. Compere): Bataan Province, Lamao, on orange (coll. Wester). The illustrations and key characters should make its separation from other Philippine species comparatively easy.

Pseudococcus bromeliae (Bouché).

Lecanium bromeliae BOUCHÉ, Schäd. Gart. Ins. (1833) 49.

Pseudococcus bromeliae (Bouché) FERNALD, Cat. Cocc. World (1903) 98.

What is unquestionably this species, as it is identified to-day, and as determined by a comparison with numerous specimens from pineapple from all over the world, was included in the material received for identification from Mr. Mackie. According to

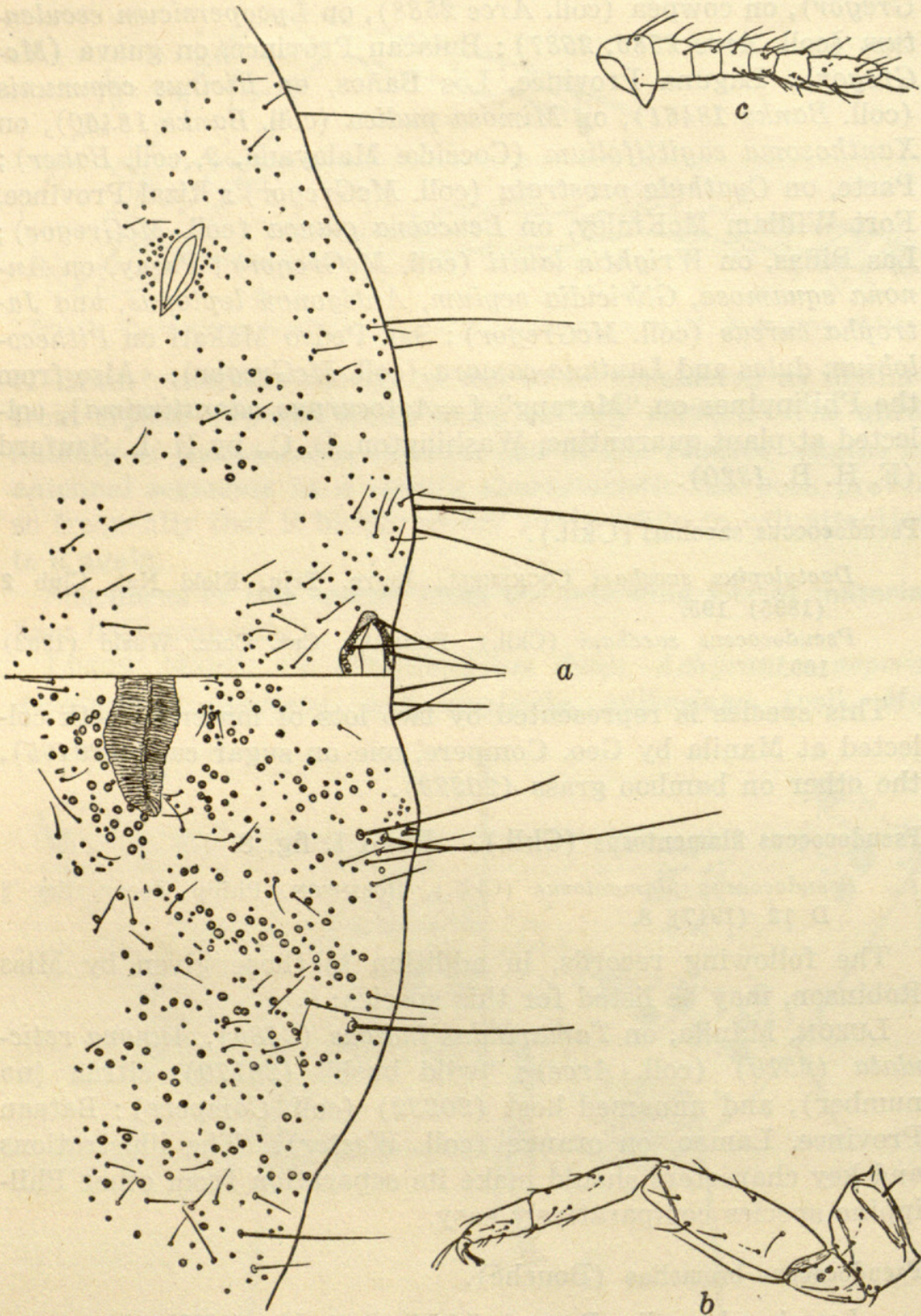


FIG. 15. *Pseudococcus sacchari* (Ckll.), adult female; *a*, posterior apex of abdomen, showing series of marginal hairs, etc., $\times 115$; *b*, leg, $\times 115$; *c*, antenna, $\times 115$.

the records furnished by him, the material on which a record of the occurrence of this species in the Philippines is chiefly based was collected on "*Annona sativus*" at Manila (*Arce* 2603). I have consulted with Mr. W. E. Safford, of the Bureau of Plant

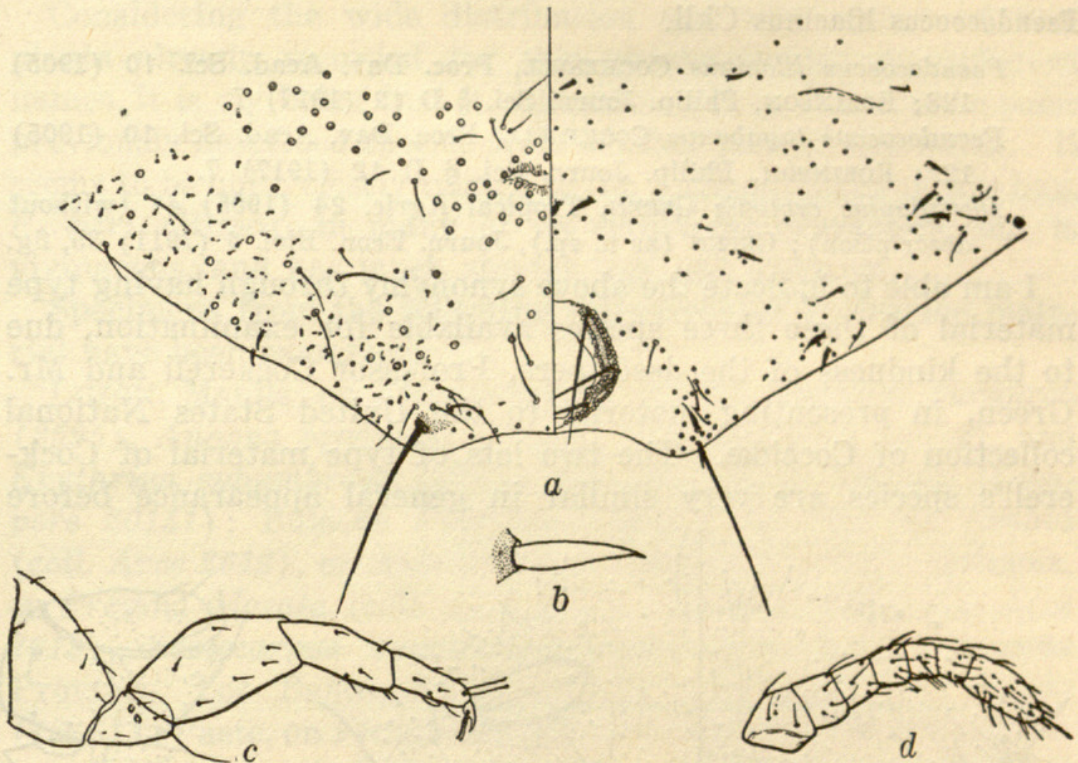


FIG. 16. *Pseudococcus filamentosus* (Ckll.), adult female; a, posterior apex of abdomen, showing cerarii, dorsal spines, anal setæ, anal ring, etc., $\times 115$; b, dorsal spine, $\times 640$; c, leg, $\times 115$; d, antenna, $\times 115$.

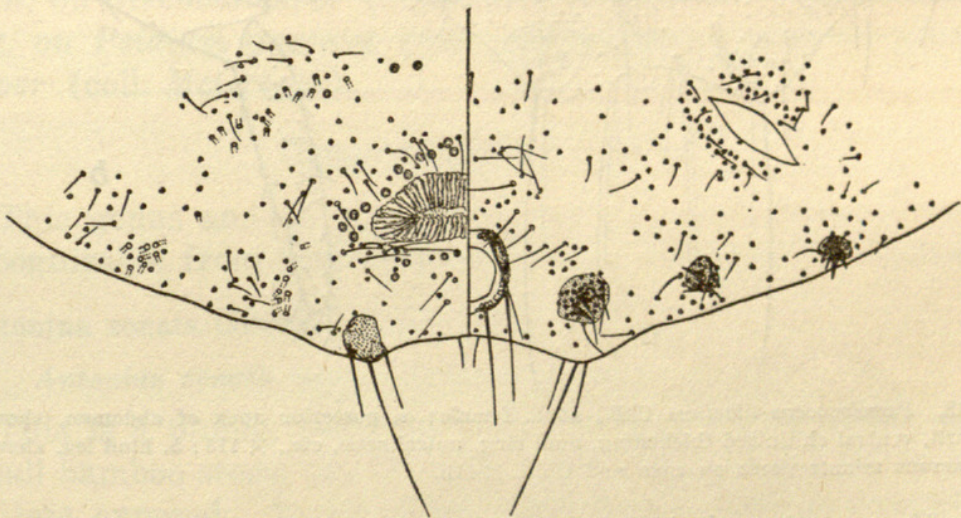


FIG. 17. *Pseudococcus bromeliæ* (Bouché), adult female; end of abdomen, showing cerarii, apical setæ, ventral chitinized thickening, anal ring, etc., $\times 115$.

Industry, United States Department of Agriculture, a specialist on the genus *Annona*, and he informs me that the specific name *sativus* has never been used in this genus. On the other hand, the name commonly given to the cultivated pineapple is *Ananas sativa*, and in view of the identity of the insect, it seems almost certain that the host record should be the latter name. The species has also been collected at quarantine, Washington, D. C., on banana received from the Philippines, by Mr. E. R. Sasscer.

Pseudococcus lilacinus Ckll.

Pseudococcus lilacinus COCKERELL, Proc. Dav. Acad. Sci. 10 (1905) 128; ROBINSON, Philip. Journ. Sci. § D 12 (1917) 7.

Pseudococcus tayabanus COCKERELL, Proc. Dav. Acad. Sci. 10 (1905) 129; ROBINSON, Philip. Journ. Sci. § D 12 (1917) 7.

Dactylopius crotonis GREEN, Tropical Agric. 24 (1905) 44 (without description); GREEN (as n. sp.), Journ. Econ. Biol. 6 (1911) 35, fig.

I am able to indicate the above synonymy through having type material of these three species available for examination, due to the kindness of the describers, Professor Cockerell and Mr. Green, in presenting material to the United States National collection of Coccidæ. The two lots of type material of Cockerell's species are very similar in general appearance before

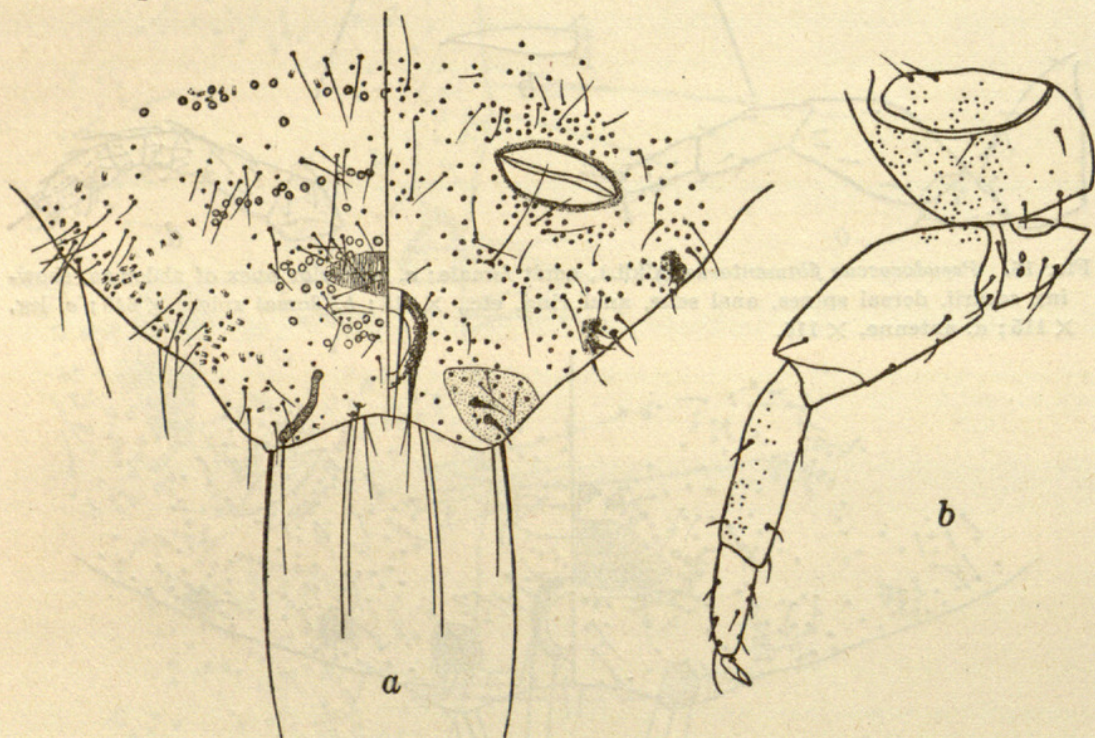


FIG. 18. *Pseudococcus lilacinus* Ckll., adult female; a, posterior apex of abdomen, showing cerarii, ventral chitinized thickening, anal ring, apical setae, etc., $\times 115$; b, hind leg, showing numerous minute pores on coxa and tibia, $\times 115$.

mounting, and each is labeled "part of type"—of *lilacinus* and *tayabanus*, respectively. The two lots are of the same species so far as I have been able to determine from an extended study of mounted specimens. No attempt is made to account for the apparent discrepancy in regard to the color of the body after boiling in caustic potash, as given in the original description, although a possible explanation might be that the two species are really different, but that we had received two lots of the same species with different names attached. In the absence of any confirmation of this hypothesis it is only possible to place the second one described in the synonymy along with Green's *D. crotonis*.

Considering the wide distribution and wide range of host plants already recorded for this species, under its different names, it is my belief that it will ultimately be found to be some previously described species from another part of the world. It seems to be quite closely related to the common citrus mealy bug, *P. citri* (Risso), in many of its structural characters, but is viviparous, and has much stouter legs and antennæ.

Specimens from the following collections of Philippine material have been examined:

LUZON, Manila, on *Ficus cumingii* (2605), *Spondias purpurea* (2595), *Annona squamosa* (2593), *Annona glabra* (2569), and *Erythrina subumbrans* (2604) (all coll. Arce), bamboo (*Compere* 20141): Bulacan Province, Baliuag, on *Eugenia jambos* (coll. Arce 2612), on *Antidesma* sp. (coll. Arce 2611); Quingua, on *Premna odorata* (coll. Arce 2610), *Streblus asper* (coll. Arce 2618), *Semecarpus cuneiformis* (coll. Arce 2613): Laguna Province, Los Baños, on *Canangium odoratum* (coll. Banks 18451); Paete, on *Ficus ulmifolia* (coll. McGregor): Rizal Province, Balintauac, on *Ceiba pentandra* (coll. Arce 2601), on coffee (coll. Arce 2600), on *Psidium guajava* (coll. McGregor); Culi Culi, on *Streblus asper* (coll. McGregor); Fort William McKinley, on *Psidium guajava* (coll. McGregor); Pasig, on *Streblus asper* (coll. McGregor).

Genus ANTONINA Signoret

This genus and its single Philippine species should be easily recognizable from the characters given in the key to genera.

Antonina zonata Green. Plate 1, fig. 6.

Antonina zonata GREEN, Ent. Month. Mag. 55 (1919) 175.

This is a plump, globular species found at the points where small bamboo stems branch, either beneath leaf sheaths or more or less exposed. In its dried condition it shrivels irregularly and is dark reddish brown in color, varying in size from 2 to 4 millimeters. The anal tube is surrounded by a somewhat circular, more heavily chitinized plate bearing numerous glands and hairs, and the anal ring setæ protrude half or more of their length beyond the mouth of the tube.

The species would appear to be at least fairly common from the records of material examined.

LUZON, Manila, on bamboo (coll. *Compere* 20149), on *Bambusa* sp. (coll. Banks 10093), on *Bambusa blumeana* (coll. Arce 2598): Bulacan Province, Baliuag (coll. Banks 10151).

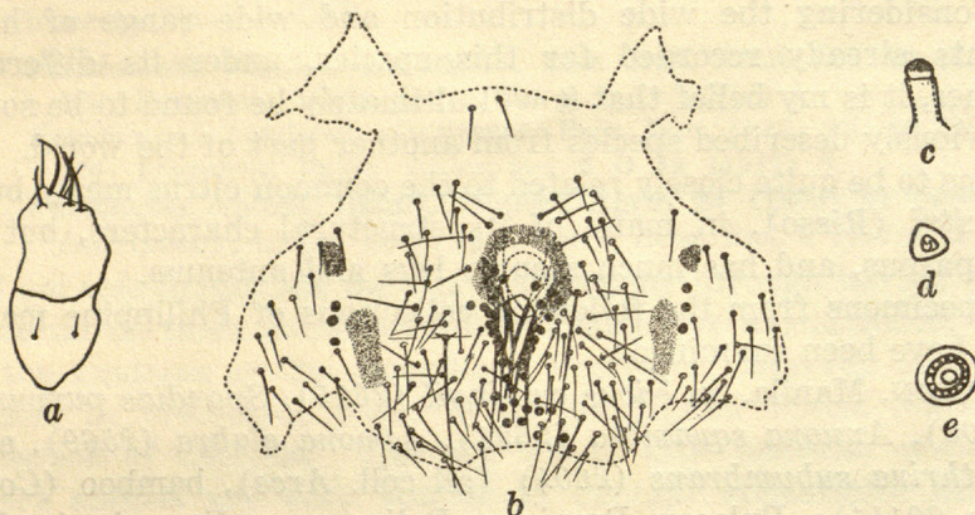


FIG. 19. *Antonina zonata* Green, adult female; a, antenna, $\times 335$; b, anal plate and ring, $\times 115$; c to e, different types of gland pores found on body, $\times 640$.

TACHARDIINÆ

This subfamily includes only a single known genus, which is sufficiently characterized in the key to subfamilies.

Genus *TACHARDIA* R. Blanchard

This genus is now represented in the Philippines by two species, of which one has been previously reported from India, while the other is described as new in this paper. These species may be separated by the following key.

Key to the Philippine species of Tachardia.

- α^1 . Apex of spiracular processes or stigmatic plate large, circular or oval, with a broad chitinized area surrounding the central region containing numerous minute pores and about four to eight large tubular ducts, but no spines; posteriorly, near the anal lobe process, with several ball-like clusters of multilocular gland pores; plates surrounding the anal ring numerous, deeply and irregularly incised at apices; antennæ very short and stout..... *T. fici* Green.
- α^2 . Apex of spiracular processes smaller, with a ridge surrounding a circular to oval area containing from two to six scattered pores and from nine to eleven conical spines, but no tubular ducts; without multilocular disk gland pores, except those near the spiracles; with sixteen clusters of peculiar gland ducts around the body margin; with only two plates and a few heavy spines around the anal ring; antennæ, while reduced, longer, fingerlike..... *T. minuta* sp. nov.

Tachardia fici Green.

Tachardia fici GREEN, Ind. Mus. Notes 5 (1903) 97.

This record is based on specimens collected at Manila from the aerial roots of a banyan tree (coll. *Compere* 20157).

This species appears to be very closely related to the common lac insect, *Tachardia lacca* Kerr.

Tachardia minuta sp. nov. Plate 1, fig. 4.

Adult female.—Occurring on the leaves of the host, mostly on the underside along the midrib; test somewhat egg-shaped, broadest behind, but with a constriction on each side about the middle, strongly convex, broadly ribbed laterally, this more pronounced on the anterior portion, posterior dorsal opening oval, located just at the end of the larval exuvium, the anterior pair of openings diagonally slitlike, placed just before the exuvium; maximum length, about 1.5 millimeters; color dark reddish to almost black.

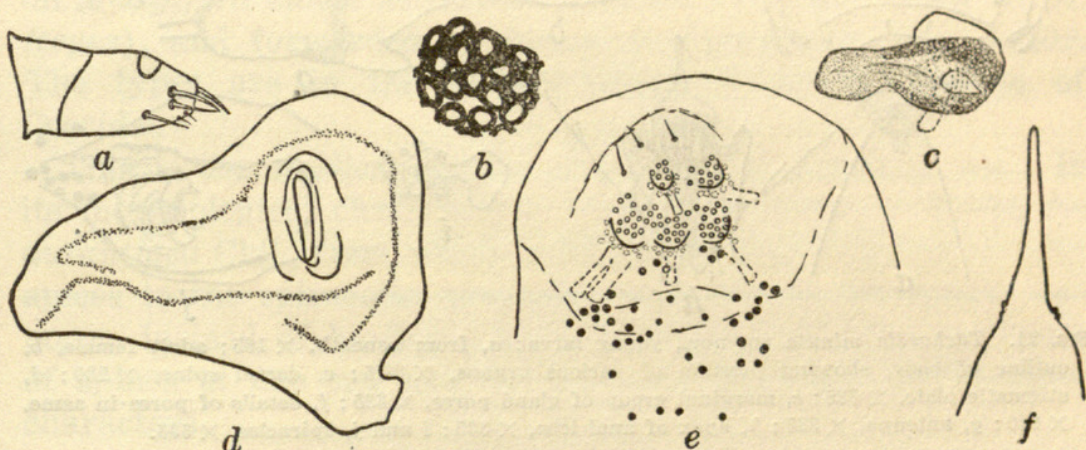


FIG. 20. *Tachardia fici* Green, adult female; a, antenna, $\times 335$; b, group of gland pores from near anal lobe, $\times 640$; c and d, spiracles, $\times 165$; e, stigmatic plate, $\times 165$; f, dorsal spine, $\times 165$.

Body of female.—Shaped much as is the test; antennæ small, fingerlike, apparently 2-segmented, terminating in a chitinized plate bearing two long, stout, and two tiny, spines; total length, not including spines, about 53μ , but variable; length of spines, about 12μ ; small spiracles strongly constricted medially, the larger nearly straight, several times larger than the smaller pair; spiracular processes apparently elongate, cylindrical, each terminating in a roughly circular chitinized plate bearing a large oval ring inclosing spines and pores, spines averaging nine to eleven in number, pores, two to six; the lobe bearing dorsal spine shorter than spine, stout, tapering somewhat, the spine about 80 to 90μ long by 53μ wide at base, basal third tapering strongly, the remainder very gradually, tip rounded, slender apical portion straight or slightly curved; anal lobe somewhat chitinized, the apical cap more than the rest, conical-rounded in shape with anal ring set in deeply at apex and surrounded by lobes and spines, the arrangement of the latter difficult to determine with certainty, but apparently posteriorly with two large lobes with a deep notch between them and with their apices more or less irregular or incised, laterally with two or three protuber-

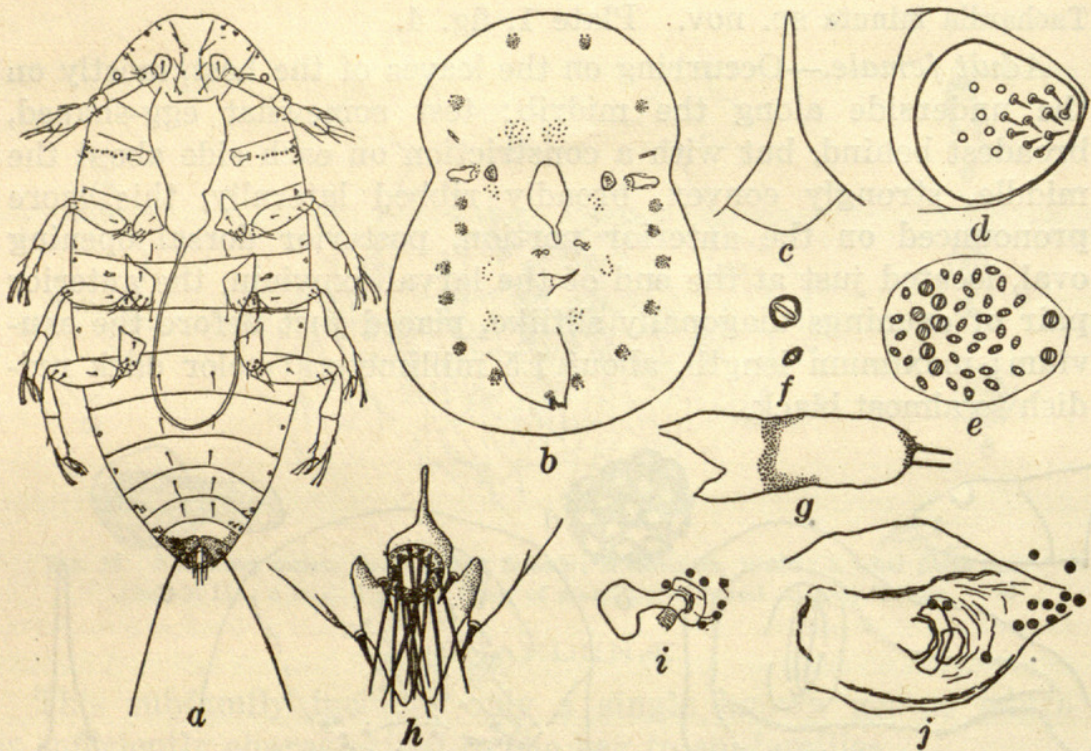


FIG. 21. *Tachardia minuta* sp. nov., young larva; a, from beneath, $\times 165$; adult female, b, outline of body, showing position of various organs, $\times 38.5$; c, dorsal spine, $\times 230$; d, stigmatic plate, $\times 335$; e, marginal group of gland pores, $\times 335$; f, details of pores in same, $\times 640$; g, antenna, $\times 335$; h, apex of anal lobe, $\times 335$; i and j, spiracles, $\times 335$.

ances or tubercles on each side, each of these bearing a large stout spine, and anteriorly with the margin curving down more or less irregularly between the first spine on each side; anal ring with ten hairs, the longest about $50\ \mu$, the division of each lateral half of the ring into upper and lower portions indistinct or incomplete; apparently with only a single type of gland over the body, but with a few circular, indistinctly quinelocular gland pores near each spiracle; body gland pores peculiar in appearance, but so minute that it has not been possible to determine the structure definitely; apparently oval to circular, and either trilocular, with the loculi in a single row, or obscurely quadrilocular with one pair of loculi larger than the other, these in two sizes, the smaller occurring scattered in the body margin region, in about four small loose clusters, forming a row on each side, and outside of this row in sixteen compact clusters, surrounded by faint chitinization, running clear around the body, of which clusters the four anterior are the largest, the large pores occurring only in these last clusters, in which there are two on the outer edge of each cluster except the fifth and sixth from the caudal apex on each side, these having only one, and from two to eight in the inner half of each cluster, the latter surrounded by smaller pores.

Young (embryonic) larva.—Elongate oval, about $346\ \mu$ long by $150\ \mu$ wide, antennæ 6-segmented, the third and sixth longest, legs small, tarsal claw with denticle, all digitules long and slender; with a notch opposite the anterior spiracle, bordered in front by two and behind by one spear-shaped spine and with a single row of relatively large pores leading to spiracle; anal ring surrounded by a chitinized area, with six or eight setæ.

This species has been described from several females mounted on slides and some additional unmounted material, all collected on *Mangifera indica* at Isabel, Basilan, December, 1918 (S. A. Reyes), and forwarded by Professor Baker under No. 10102. The types are in the United States National collection of Coccidæ.

This is the smallest species of this genus known to me. In its morphological characters it seems quite close to *Tachardia aurantiaca* Ckll., from which it differs in size, in having circular apices to the spiracular processes, with only a few spines and pores, instead of having a large triangular cap with a cluster of spines at one end and of pores at the other, and in other characters.

COCCINÆ

Members of this subfamily should be readily recognizable from the characters given in the subfamily key, since all the species have the pair of anal plates well developed, and all but *Ceroplastes* and *Vinsonia* show the anal cleft distinctly, while the heavy coating of solid wax covering the species of these genera is sufficient to distinguish them from any other Philippine coccids, with the possible exception of *Tachardia*. Species representing nine genera of the subfamily, as they are at present recognized, have been collected in the Philippines.

Key to the Philippine genera of the Coccinæ.

- α^1 . Marginal spines slender, linear, at most somewhat dilated and frayed at apices.
 - b^1 . Body of female covered with and adherent to a thick coating of waxy or glassy secretion; spiracular spines usually numerous, stout, conical or bullet-shaped, clustered or spread out along the margin of the body.
 - c^1 . Cephalic apex of body separated from remainder by a distinct suture; covering secretion of body extended into fingerlike prolongations, the whole giving the appearance of a 7-rayed star with hemispherical center..... *Vinsonia* Sign.
 - c^2 . Without a separated cephalic lobe; waxy covering of body not protruding as in the preceding..... *Ceroplastes* Gray.

- b*². Female not covered with wax or, if present, this very thin and easily separable from the body, transparent and glassy; spiracular spines usually with three or less in each group, rarely more.
- d*¹. Abdomen dorsally without compound "cribriform plates," three on each side of the anal opening; antennæ and legs present and at least fairly well developed.
- e*¹. With only a single, very long, spiracular spine opposite each spiracle; body inclosed in, but not attached to, a glassy test or sac..... *Ceroplastodes* Ckll.
- e*². With three or more spiracular spines in each group; body not inclosed in a glassy test.
- f*¹. Each anal plate very much longer than wide, these plates located near the center of the body; body more or less triangular with rounded angles; flat, with a small ovisac bordering the posterior margin of the body of the adult (cf. *Coccus* spp. if without ovisac) *Protopulvinaria* Ckll.
- f*². Each anal plate more nearly triangular, the anterolateral margin usually only a little longer than the posterolateral, if much longer without ovisac in adult female; anal plates located nearer the posterior end of the body than the anterior; ovisac either wanting or very well developed; body slightly convex to hemispherical.
- g*¹. Adult female secreting a well-developed posterior ovisac and, sometimes, a cottony pad on which it rests.
Pulvinaria Targ.
- g*². Adult female not secreting a posterior ovisac.
- h*¹. Body convex to strongly hemispherical; derm with large, heavily chitinized, polygonal or oval cells, each with a central pore..... *Saissetia* Despl.
- h*². Body only slightly convex; derm without the large, closely crowded, polygonal or oval areas, although sometimes with widely separated circular or oval areas *Coccus* Linn.
- d*². Abdomen dorsally with six compound "cribriform plates," arranged in a semicircle, three on each side of and anterior to the anal plates; antennæ and legs rudimentary or absent.
Platylecanium Ckll. and Rob.
- a*². Marginal spines much enlarged, flattened, broadly fan-shaped; body flat, broad-oval to nearly circular..... *Paralecanium* Ckll.

Genus PULVINARIA Targioni Tozzetti

This genus as at present recognized is characterized only by the full development of a posterior ovisac in the adult female. In the Philippine species the ovisac is well developed when completely formed, and the anal plates of all species have the posterolateral and anterolateral margins about equal in length, in contrast to *Protopulvinaria*, which has at times been included in

Pulvinaria. Four species and one variety have been reported from the Philippines, but I believe that the variety is invalid.

Key to the Philippine species of Pulvinaria.

- a*¹. Marginal spines large, stout, cylindrical or slightly tapering, and truncate at apices..... *P. thespesiæ* Green.
- a*². Marginal spines more slender, acute apically, or flattened and incised or fimbriated, never truncate, and much slenderer than spiracular spines.
 - b*¹. Spiracular spines in each group four or five, one longer than the others, very rarely with only three in a group; marginal spines slender, the apices more or less fimbriated..... *P. polygonata* Ckll
 - b*². Spiracular spines in each group normally three, one longer than the other two; marginal spines more or less distinctly flattened toward apices and incised at tips.
 - c*¹. Marginal spines typically flattened at apices, but not or only very slightly broadened, strongly incised; mature female apparently without dorsal secretion..... *P. tyleri* Ckll.
 - c*². Marginal spines typically distinctly broadened and incised apically, as well as flattened; mature female with more or less cottony or waxy secretion dorsally..... *P. psidii* Mask.

Pulvinaria thespesiæ Green.

Pulvinaria thespesiæ Green, ROBINSON, Philip. Journ. Sci. § D 12 (1917) 10.

The truncate marginal spines and the numerous spiracular spines of this species, as shown in the accompanying figure, make it readily recognizable among the other Philippine species. The following is the record of the material examined:

LUZON, Manila, on *Samanea saman* (coll. Compere), on *Zizyphus jujube* (coll. Arce 2571): Bulacan Province, Baliuag, on *Jatropha curcas* (coll. Arce 2607): Laguna Province, Los Baños (coll. Banks 18465): Rizal Province, Montalban, on *Homonioia riparia* (coll. McGregor).

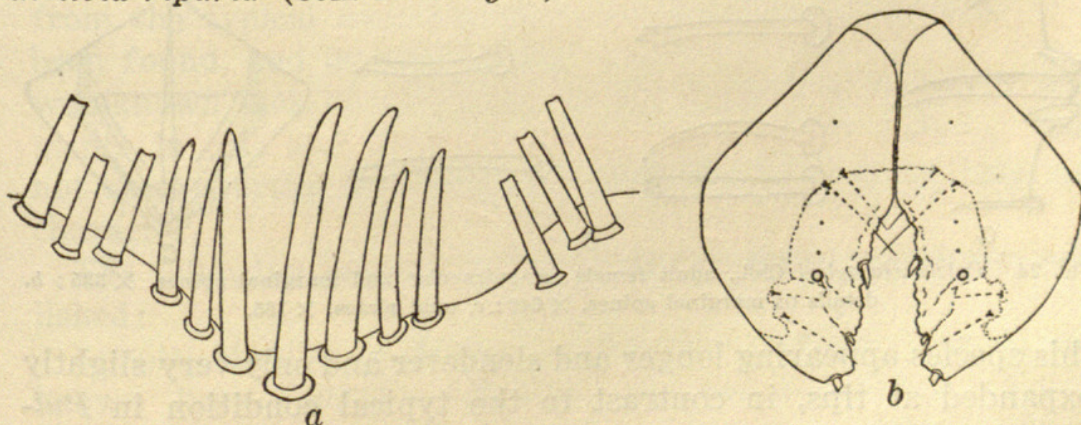


FIG. 22. *Pulvinaria thespesiæ* Green, adult female; *a*, spiracular and marginal spines, $\times 325$; *b*, anal plates from above, $\times 165$.

Pulvinaria polygonata Ckll. Plate 1, fig. 9.

Pulvinaria polygonata Ckll., ROBINSON, Philip. Journ. Sci. § D 12 (1917) 10.

Pulvinaria cellulosa GREEN, Cocc. Ceylon, pt. 4 (1909) 262.

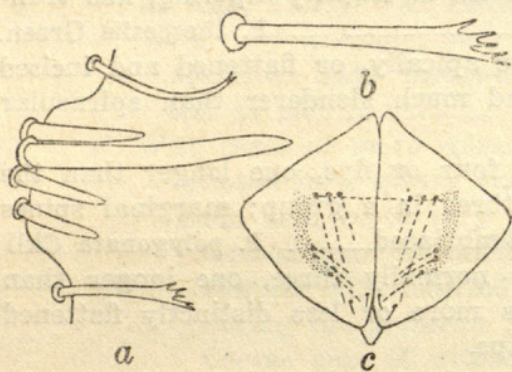


FIG. 23. *Pulvinaria polygonata* Ckll., adult female; a, spiracular and marginal spines, $\times 335$; b, detail of marginal spine, $\times 640$; c, anal plates from above, $\times 165$.

Through the kindness of the describers of these two species in sending to the United States National collection of Coccidæ cotype material of each, it has been possible to make a direct comparison of specimens resulting in the synonymy indicated above. It is unfortunate that Green's species, which is excellently described and figured, should have to fall. In addition to the type material the follow-

ing specimens have been examined:

LUZON, Manila, on orange (coll. *Compere*): Laguna Province, Los Baños, on *Citrus nobilis* (coll. *Baker* 10096, 10097).

Pulvinaria tyleri Ckll.

Pulvinaria tyleri Ckll., ROBINSON, Philip. Journ. Sci. § D 12 (1917) 9.

This species is somewhat doubtfully separated from the following, and it is possible that further study may show it to be some other already described species. In any event, this and the following are very closely related, but it is possible in the material at hand to separate two groups of specimens which show a somewhat different appearance of the marginal spines, those of

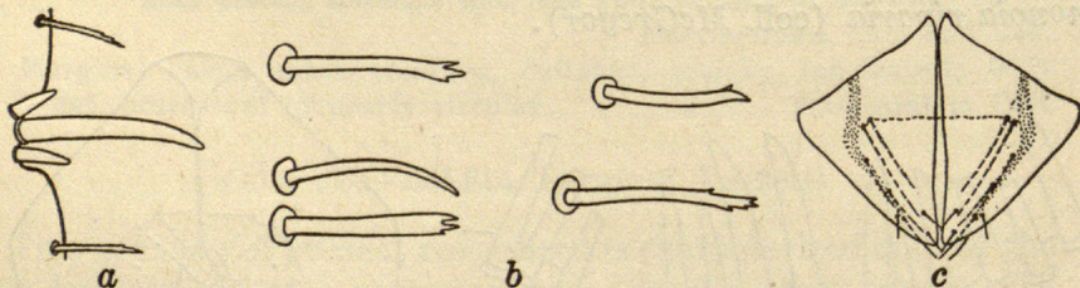


FIG. 24. *Pulvinaria tyleri* Ckll., adult female; a, spiracular and marginal spines, $\times 335$; b, details of marginal spines, $\times 640$; c, anal plates, $\times 165$.

this species appearing longer and slenderer and only very slightly expanded at tips, in contrast to the typical condition in *Pulvinaria psidii*. There appears to be considerable normal variation in the spines of both species, and this appearance is increased through alterations from the normal position for the

spine, as when one is turned on edge, when viewed from above, or is foreshortened through curving up or down. Unfortunately all of the gross material examined is in very poor condition, so it is not possible to learn anything of the normal appearance of the adult female after the secretion of the ovisac, nor to obtain any very good mounted specimens. The lots of material included here are as follows:

LUZON, Manila, on various plants (coll. *Compere*), on *Antigonon leptopus* (coll. *Banks 14375*): Batangas Province, Batangas, on "Cadena de amor" (coll. *C. H. T. Townsend*) (type material): Rizal Province, San Pedro Makati, on *Lantana camara* (coll. *McGregor*). The type slide includes only three badly parasitized and mutilated specimens, and all of the material studied shows a decided degree of parasitism.

Pulvinaria psidii Mask.

Pulvinaria psidii Mask., ROBINSON, Philip. Journ. Sci. § D 12 (1917) 10.

Pulvinaria psidii philippina Ckll., ROBINSON, Philip. Journ. Sci. § D 12 (1917) 11.

A comparison of the type specimens of the subspecies listed above with the type specimens of Maskell's *Pulvinaria psidii* fails to disclose any characters by which I am able to differentiate the two. All of the specimens of the subspecies that have been examined unfortunately have the antennæ broken off, but no other characters which would separate it from the typical material have been found, and in view of the well-known lack of constancy in the number of antennal segments in this and other groups of coccids, this material does not seem worthy of subspecific rank on the basis of this one character.

The following records may be added to those previously published:

LUZON, Manila, on *Eugenia jambolana* (10210) and on unknown host (10212) (*Banks*), on unknown host (*Frank Dean*): Bulacan Province, on guava (*McGregor*): Laguna Province, Los Baños, on *Psidium guajava* (coll. *J. de Leon, Banks 13452*).

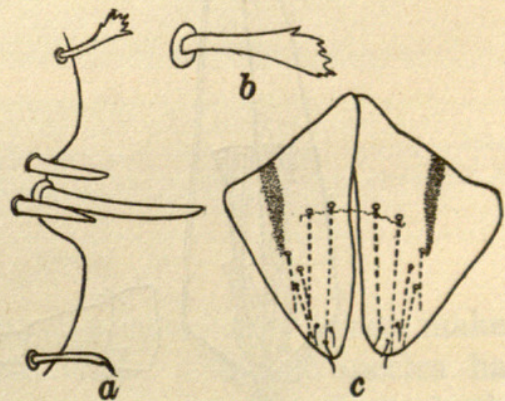


FIG. 25. *Pulvinaria psidii* Mask., adult female; a, spiracular and marginal spines, $\times 335$; b, detail of marginal spine, $\times 640$; c, anal plates from above, $\times 165$.

Genus **PROTOPULVINARIA** Cockerell

The single Philippine species of this genus might possibly be confused with two species of the genus *Coccus* in its immature stages prior to the formation of the fringe of white secretion around the posterior portion of the body, although in reality the tremendous length of the anal plates in relation to their width, together with the character of the marginal hairs, makes this species easily recognizable; but to prevent confusion, the species has been included in the key to the species of the genus *Coccus*.

Protopulvinaria longivalvata Green.

Protopulvinaria longivalvata bakeri COCKERELL and ROBINSON, Bull. Am. Mus. Nat. Hist. 33 (1914) 332, fig. 9; ROBINSON, Philip. Journ. Sci. § D 12 (1917) 9.

A careful comparison of type specimens of Green's species and Cockerell's subspecies has been possible on account of the receipt of such material from both of these men. While there is recognizable a tendency toward those differences indicated by

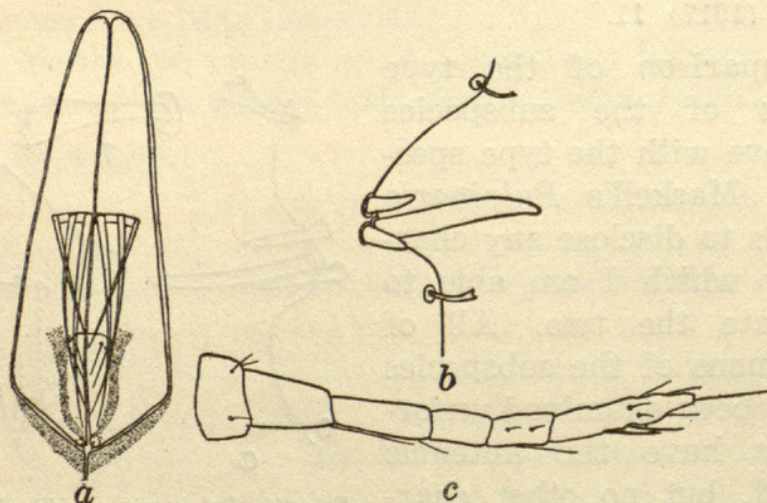


FIG. 26. *Protopulvinaria longivalvata* Green, adult female; a, anal plates, $\times 115$; b, spiracular and marginal spines, $\times 640$; c, antenna, $\times 165$.

Cockerell when describing *bakeri*, I have been unable to conclude that the subspecies is based on anything that is not covered by individual variation. Both Green and Cockerell state that the antennæ are 8-segmented, yet a majority of the antennæ on the specimens available for examination are 7-segmented; with this much variation to begin with, any further consideration of the relative lengths of antennal segments seems quite futile. In addition to the type material of Cockerell's subspecies, material on *Piper betle* var., from Paete, Laguna Province, Luzon (McGregor) has been examined.

Genus **VINSONIA** Signoret

The single species included in this genus is represented by one lot of material from the Philippines.

Vinsonia stellifera (Westw.). Plate 1, fig. 10.

Coccus stellifera WESTWOOD, Proc. Ent. Soc. London (1871) 3, 111.

The external appearance and other characters of this species, as given in the key, are such that it can hardly be confused with any other coccid now known to occur in the Philippines.

The material examined was collected at Manila on mango (*Compere*). Green⁹ gives an excellent account and figures of this species.

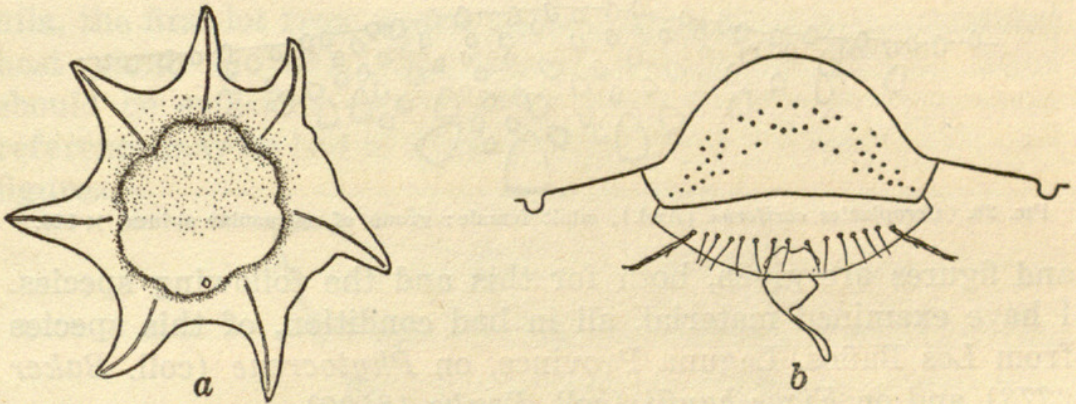


FIG. 27. *Vinsonia stellifera* (Westw.), adult female; a, outline of body, showing pointed secretory projections, $\times 12$; b, anterior portion of body, showing suture separating off the "head" and the antennæ, $\times 57.5$.

Genus **CEROPLASTES** Gray

The thick waxy covering of the species of this genus makes their recognition an easy matter. Only a single species has been known from the Philippines heretofore, but through the collections received it is possible to add two others, while in all probability it will be possible to make still further additions when more specimens of certain collected lots of material are available for study.

Key to the Philippine species of Ceroplastes.

- a^1 . Size very large, length, about 17.5 millimeters; wax white, with a deep dorsal median pit..... *C. gigas* Ckll.¹⁰
 a^2 . Size smaller, usually not more than 12 millimeters; without a dorsal median pit.

⁹ Coccidae of Ceylon pt. 4 (1909) 280.

¹⁰ Included in the key from the original description only; no specimens examined.

*b*¹. Anal opening at the end of a long, nearly cylindrical, chitinized tube; spiracular spines numerous, mostly bullet-shaped; color of wax in life white or cream; size large, usually 10 to 12 millimeters.

C. ceriferus (And.).

*b*². Anal opening on a short conical process; with one large conical and numerous globular spiracular spines; color in life rose red or grayish pink with conspicuous lateral white stripes; maximum length usually about 4 to 5 millimeters..... *C. rubens* Mask.

Ceroplastes ceriferus (And.).

Coccus ceriferus ANDERSON, Mon. Cocci ceriferi (1791).

If the characters given in the preceding key will not easily separate this species from the other known Philippine species, reference may be made to Green ¹¹ where an excellent description



FIG. 28. *Ceroplastes ceriferus* (And.), adult female; group of spiracular spines, $\times 165$.

and figures are given, both for this and the following species. I have examined material, all in bad condition, of this species from Los Baños, Laguna Province, on *Phytocrene* (coll. Baker 2373) and on *Ficus hawili* (coll. Banks 18400).

Ceroplastes rubens Mask.

Ceroplastes rubens MASKELL, Trans. N. Z. Inst. 25 (1892) 214.

I have examined specimens of this species from Manila on "palm, etc." (coll. Compere 20180), and on *Psidium guajava* (coll. Banks 10624). After death and some drying the specimens become dull yellowish brown and the wax becomes translucent.

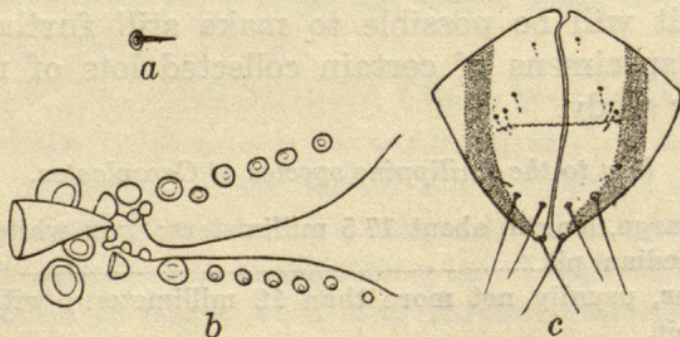


FIG. 29. *Ceroplastes rubens* Mask., adult female; a, marginal spine, $\times 640$; b, spiracular spines, $\times 165$; c, anal plates from above, $\times 165$.

¹¹ Coccidae of Ceylon, pt. 4 (1909) 270.

Genus CEROPLASTODES Cockerell

The species of this genus are characterized by the presence of a glassy test which retains its stout oval shape while the adult female shrinks and shrivels into the anterior end as she deposits her eggs. This test is variously ornamented externally according to the species, and is usually extremely brittle, at least in dried specimens. Only a single species has been collected in the Philippines so far.

Ceroplastodes cajani (Mask.).

Eriochiton cajani MASKELL, Ind. Mus. Notes 2 (1891) 61.

Specimens which are apparently this species, although in very poor condition, are in Mr. Geo. Compere's collections from Manila, the first lot from guava (1221), the second on an unnamed host plant (10243). The generic characters already given should be sufficient to place this species, although here again reference may be had to Green¹² for an extended description and figures.

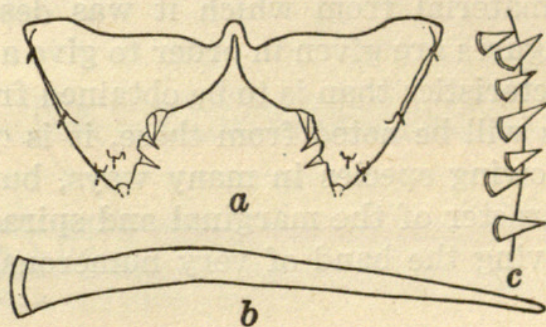


FIG. 30. *Ceroplastodes cajani* (Mask.), adult female; a, anal plates, $\times 165$; b, spiracular spine, $\times 335$; c, marginal spines, $\times 335$.

Genus COCCUS Linnæus

This genus, as used here, agrees with the use in the Fernald Catalogue and consequently takes in a number of the species described by English entomologists under *Lecanium*. Four species, one of which is believed to be confined to the Philippines, have been collected in the Islands.

Key to the Philippine species of Coccus.

- a¹. Cephalolateral margin of anal plates distinctly much longer than caudolateral; body more or less distinctly triangular.
- b¹. Marginal spines distinctly shorter than smallest spiracular spines; anal plates extremely elongate; with a fringe of ovisac in adult female *Protopulvinaria longivalvata* Green.

¹² Coccidae of Ceylon, pt. 4 (1909) 285.

b³. Marginal spines distinctly longer than the smallest spiracular spines; anal plates less elongate; without traces of an ovisac at maturity.

c¹. With a heavy median band of very minute pores running cephalad from the anal plates, this with some lateral arms; with small circular pores more or less definitely arranged on the dorsum.

Coccus diversipes Ckll.

c². Without such a band of minute pores; dorsally with fairly numerous medium-sized oval pores with rather definite arrangement.

Coccus mangiferæ (Green).

a². Cephalolateral margin of anal plates at most very slightly longer than caudolateral margin; body more or less oval.

d¹. Marginal setæ small, short, prominently dilated and frayed at apices; antennæ normally 7-segmented.... *Coccus viridis* (Green).

d². Marginal setæ much longer, slender, entire or rarely very faintly frayed at apices; antennæ normally 8-segmented.

Coccus elongatus (Sign.).

Coccus diversipes Ckll.

Coccus diversipes Ckll., ROBINSON, Philip. Journ. Sci. § D 12 (1917) 15.

This species does not appear to have been collected since the original lot of material from which it was described was obtained. Some figures are given in order to give a more elaborate idea of its characteristics than is to be obtained from the original description. As will be noted from these, it is quite closely related to the following species in many ways, but differs in the relation and character of the marginal and spiracular spines, as well as as in having the band of very numerous, minute dorsal pores.

Coccus mangiferæ (Green).

Lecanium mangiferæ GREEN, Ent. Month. Mag. (1889) 249; *Cocc.* Ceylon, pt. 3 (1904) 216.

This species is represented by a single lot of material collected at Paete, Laguna Province, on *Cocos nucifera* (coll. McGregor). The microscopic characters of the species as illustrated are quite distinctive.

Coccus viridis (Green).

Lecanium viride GREEN, Ent. Month. Mag. (1889) 284; *Cocc.* Ceylon, pt. 3 (1904) 216.

Coccus viridis (Green) ROBINSON, Philip. Journ. Sci. § D 12 (1917) 16.

While this is apparently a widespread tropical species, it has so far been collected only rarely in the Philippines. I have examined the following material:

LUZON, Manila, on *Citrus* sp. (coll. Banks 10201): Bataan

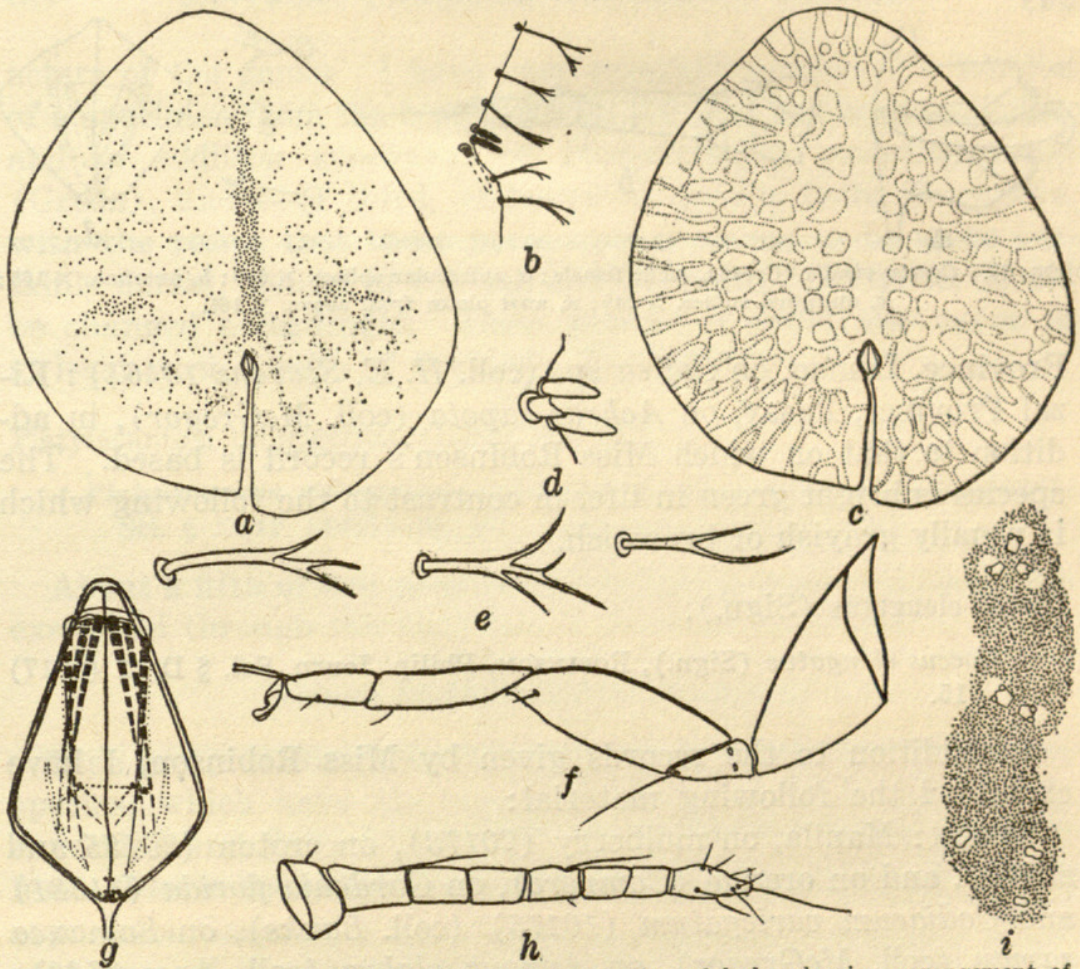


FIG. 31. *Coccus diversipes* Ckll., adult female; a, outline of body, showing arrangement of minute derm pores, $\times 17.5$; b, spiracular and marginal spines, $\times 335$; c, outline of body, showing faint areolation of dorsum, $\times 17.5$; d, spiracular spines, $\times 640$; e, marginal spines, $\times 640$; f, leg, $\times 165$; g, anal plates from above, $\times 165$; h, antenna, $\times 165$; i, detail of median pore band, $\times 640$.

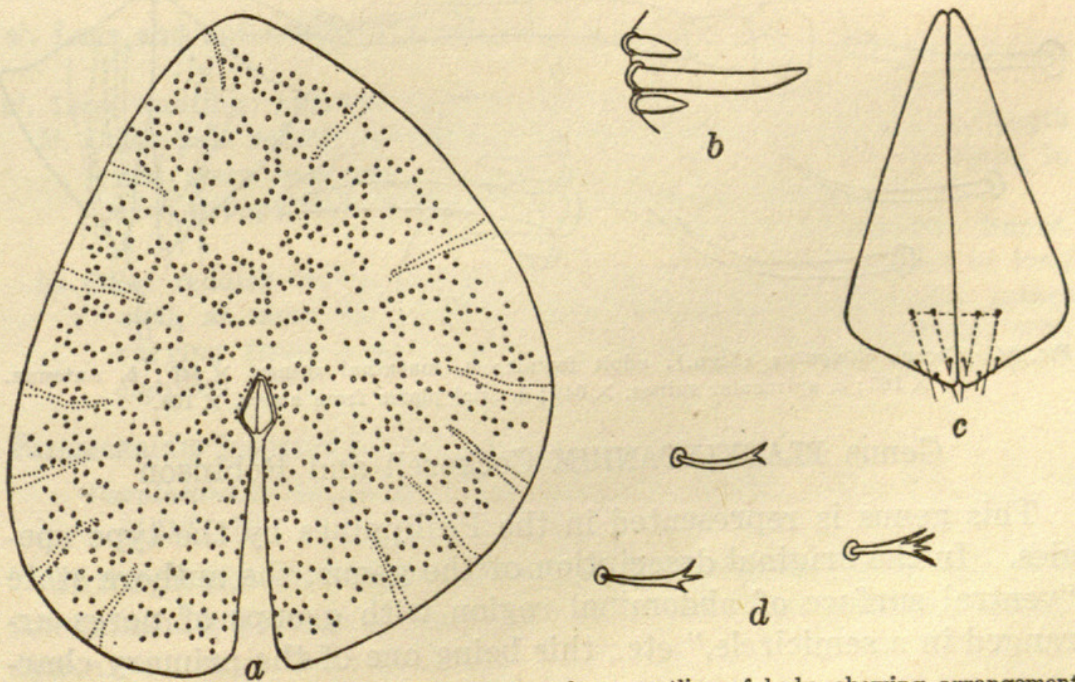


FIG. 32. *Coccus mangiferæ* (Green), adult female; a, outline of body, showing arrangement of derm pores, $\times 22.5$; b, spiracular spines, $\times 640$; c, anal plates from above, $\times 165$; d, marginal spines, $\times 640$.

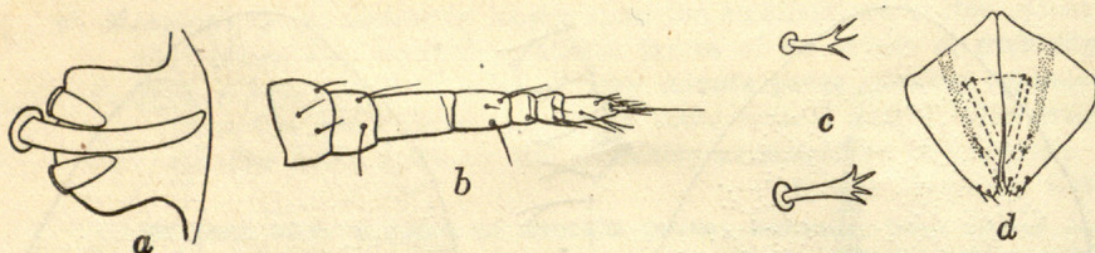


FIG. 33. *Coccus viridis* (Green), adult female; a, spiracular spines, $\times 640$; b, antenna, $\times 165$; c, marginal spines, $\times 640$; d, anal plates from above, $\times 165$.

Province, Lamao, on *Coffea* sp. (coll. H. E. Stevens 18464): Rizal Province, Pasay, on *Achras sapota* (coll. McGregor), in addition to that on which Miss Robinson's record is based. The species is bright green in life, in contrast to the following which is usually grayish or brownish.

Coccus elongatus (Sign.).

Coccus elongatus (Sign.), ROBINSON, Philip. Journ. Sci. § D 12 (1917) 15.

In addition to the records given by Miss Robinson, I have examined the following material:

LUZON: Manila, on mulberry (20173), on croton (20155 and 20177), and on orange (*Compere*), on *Gardenia florida* (14581) and *Codiaeum variegatum* (10175) (coll. Banks), on *Samanea saman* (coll. McGregor), on *Annona glabra* (coll. Arce 2569): Laguna Province, Los Baños, on *Annona muricata* (coll. Banks 18458).

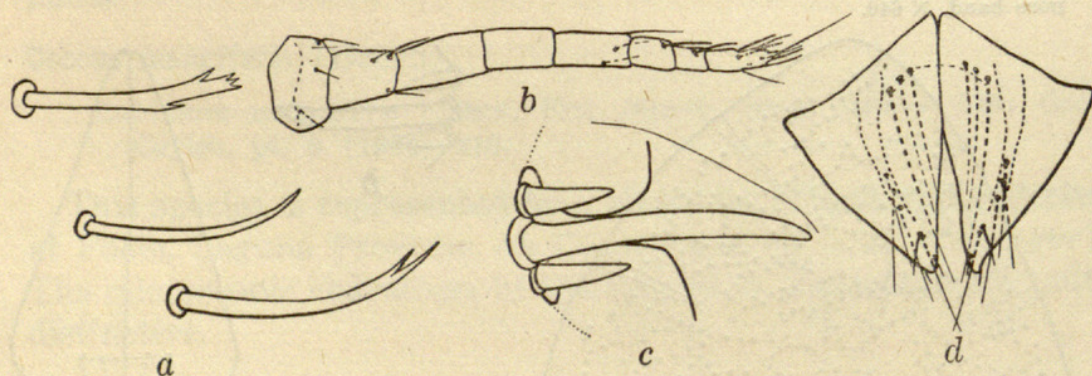


FIG. 34. *Coccus elongatus* (Sign.), adult female; a, marginal spines, $\times 640$; b, antenna, $\times 165$; c, spiracular spines, $\times 640$; d, anal plates from above, $\times 165$.

Genus *PLATYLECANIUM* Cockerell and Robinson

This genus is represented in the Philippines by the type species. In the original description of the genus, the authors state "ventral surface of abdominal region with groups of pores arranged in a semicircle," etc., this being one of the primary char-

acters of the genus. I have very carefully examined a portion of a specimen from the type material, all that has been available, and in addition specimens of *Platylecanium pseudexpansum* (Green), and of a third, undescribed species from Singapore, with the result that these pores appear to me to be quite certainly dorsal, instead of ventral, and the genus description should be changed accordingly. These groups of pores also occur in at least some species of the genus *Paralecanium*.

Platylecanium cribrigerum (Ckll. and Rob.).

Platylecanium cribrigerum (Ckll. and Rob.), ROBINSON, Philip. Journ. Sci. § D 12 (1917) 12, 13.

About a fifth of one specimen from the type material has been examined through the kindness of Professor Cockerell.

Genus *PARALECANIUM* Cockerell

This genus is composed of medium-sized, flat, oval to circular species, which have the marginal hairs modified into broadly expanded and flattened flabellæ which usually overlap more or less. I have been unable certainly to differentiate *Paralecanium expansum* Green and *P. cocophyllæ* Banks, and have therefore made use of the comparative characters given by Banks in his description in preparing the following key:

Key to the Philippine species of Paralecanium.

- α^1 . Legs and antennæ well developed, the latter 7-segmented.
P. luzonicum Ckll.
- α^2 . Legs wanting; antennæ at most indistinctly 4- or 5-segmented.
 - b^1 . Color pale yellow; marginal flabellæ broader in proportion to length and more narrowed at base; spiracular spines always three in each group; male puparium with seventeen plates.
P. cocophyllæ Banks.
 - b^2 . Color reddish brown; marginal flabellæ more nearly circular or long oval, at most very slightly narrowed at base; spiracular spines varying from three to nine in each group; male puparium with eighteen plates..... *P. expansum quadratum* (Green).

Paralecanium luzonicum Ckll.

Paralecanium luzonicum Ckll., ROBINSON, Philip. Journ. Sci. § D 12 (1917) 12.

Through the kindness of Professor Cockerell, I have been able to examine a portion of the type material. This species does not appear to have been collected since the time it was described. It is easily separable from the other two known from the Phil.

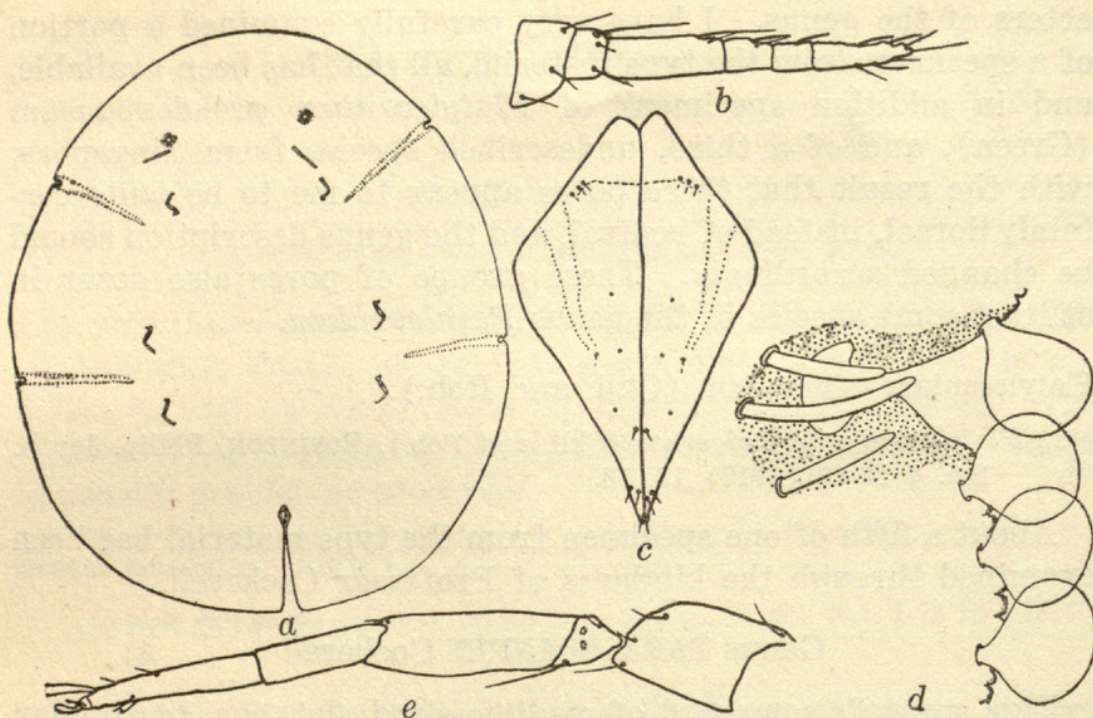


FIG. 35. *Paralecanium luzonicum* Ckll., adult female. a, outline of body, showing legs, antennae, grooves opposite spiracles, etc., $\times 12$; b, antenna, $\times 165$; c, anal plates from above, $\times 165$; d, spiracular and marginal spines, $\times 335$; e, leg, $\times 165$.

ippines, and also appears to be distinct from the numerous species with well-developed legs and antennae described from Ceylon by Green in his Coccidae of Ceylon.

Paralecanium cocophyllæ Banks.

Paralecanium cocophyllæ Banks, ROBINSON, Philip. Journ. Sci. § D 12 (1917) 12.

Paralecanium expansum quadratum (Green). Plate 1, fig. 11.

Lecanium expansum var. *quadratum* GREEN, Cocc. Ceylon, pt. 3 (1904) 236.

Material from the Philippines which I have considered to be this species has been compared with specimens from Ceylon, sent by Mr. Green. While a number of variations from the normal characters found in typical *P. expansum* from Ceylon have been noted, I have been unable to conclude that the Philippine specimens are distinct from *expansum* var. *quadratum*, and place them under this name for the present without attempting to decide whether or not var. *quadratum* should be considered to be specifically distinct from true *expansum*. The Philippine material that has been examined appears to be intermediate between typical *expansum* and *cocophyllæ* as described by Banks.

In the collections listed below, the shape and the size of the body agree with *expansum*; the marginal flabellæ are more rounded and not quite so close together, so that the overlapping seems less pronounced; the spiracular spines occur normally in groups of three, but one clear example of five in a group was noted; the large derm pores are arranged approximately as in *ex-*

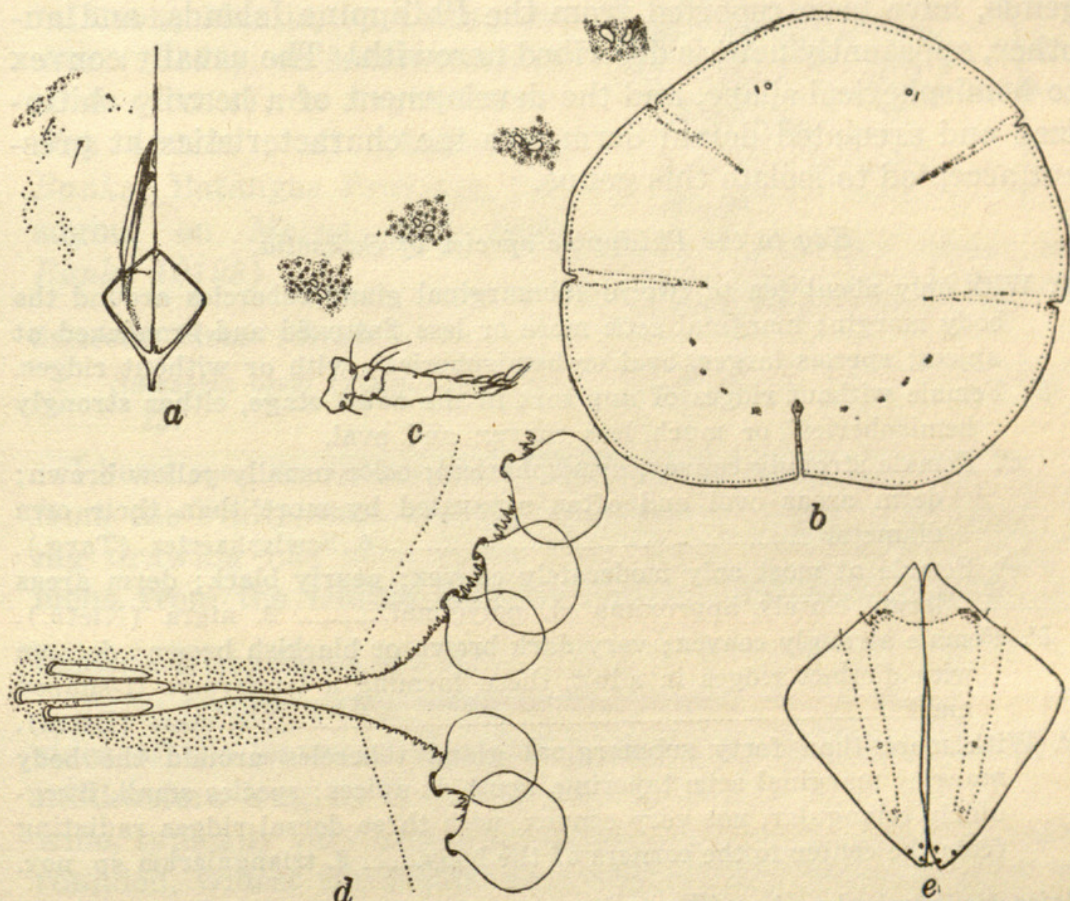


FIG. 36. *Paralecanium expansum quadratum* (Green), adult female; a, anal plate region, ventral and dorsal, showing pores and cribriform plates, $\times 57.5$; b, outline of body, $\times 12$; c, antenna, $\times 165$; d, spiracular and marginal spines, $\times 335$; e, anal plates from above, $\times 165$.

pansum, but the grouped pores or "cribriform plates" running forward and outward from the anal plates occur in four groups on each side of the plates, instead of in three, thus resembling *cocophyllæ*, while the anal plates are stouter than in typical *expansum*, thus corresponding to var. *quadratum*, and also resembling *cocophyllæ* more closely. The color of the specimens examined is a dull yellow or light brown, thus suggesting a mean between that given by Green for *expansum* and that given by Banks for *cocophyllæ*, although small differences may be accounted for in a number of ways. The following material has been examined:



Morrison, H. 1920. "The nondiaspine Coccidae of the Philippine Islands, with descriptions of apparently new species." *The Philippine journal of science* 17, 147–202. <https://doi.org/10.5962/bhl.part.1485>.

View This Item Online: <https://www.biodiversitylibrary.org/item/1127>

DOI: <https://doi.org/10.5962/bhl.part.1485>

Permalink: <https://www.biodiversitylibrary.org/partpdf/1485>

Holding Institution

Missouri Botanical Garden, Peter H. Raven Library

Sponsored by

Missouri Botanical Garden

Copyright & Reuse

Copyright Status: Public domain. The BHL considers that this work is no longer under copyright protection.

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.