

INSECTS OF MICRONESIA

Homoptera: Coccoidea^{1,2}

By JOHN W. BEARDSLEY, JR.

UNIVERSITY OF HAWAII, HONOLULU, HAWAII

INTRODUCTION

This paper is primarily a systematic treatment of the Micronesian representatives of the homopterous superfamily Coccoidea, a large and important group of phytophagous insects containing many species of economically important pests.

Collectively, the Coccoidea are usually termed "scale insects" as the body is frequently scalelike in form or covered by a scalelike shield. In certain important groups such as the Margarodidae and the Pseudococcidae, however, the body is normally saclike and without a scale covering. For want of a better common name, the term "scale insects" is applied to the superfamily as a whole in this paper.

One hundred forty-five species, representing six families of Coccoidea (Margarodidae, Ortheziidae, Pseudococcidae, Coccidae, Asterolecaniidae, and Diaspididae), are treated here. Of these, 135 species were represented in material available for study, and 10 were recorded previously but not represented in Micronesian collections which I have seen. It is possible that several of the latter may represent earlier misidentifications. Five new genera and 26 new species are proposed in this report.

For the purposes of this study the geographic limits of Micronesia proposed by Gressitt (1954: 6) have been accepted. By this definition, Micronesia includes the Bonin, Volcano, Mariana, Caroline, Marshall, and Gilbert Island groups, plus a few relatively small outliers such as Wake Atoll, Nauru Island, and Ocean Island. For details of the physical and biotic environment of the various Micronesian islands and island groups see Gressitt (1954).

¹ This represents, in part, Results of Professor T. Esaki's Micronesian Expeditions (1936-1940), No. 127.

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HISTORICAL BACKGROUND

Very little was known of the Micronesian Coccoidea prior to the Japanese administration of the islands. One important coconut pest, *Furcaspis oceanica*, was described by Lindinger (1909)³ from material collected at Jaluit, Marshall Islands, and the same species was redescribed and figured by Green (1910) from specimens obtained on Yap. In 1909, S. I. Kuwana published a list of 23 scale insects from the Bonin Islands, including descriptions of seven new species. Several of the latter have been shown to be synonyms of previously described species (Takahashi, 1955). Unfortunately, Kuwana's descriptions, when judged by modern standards, are of inferior quality. As authentic material of one of his species has been unavailable, the status of that species remains in doubt.

Small collections of scale insects were made by various economic entomologists working on Guam, beginning with D. T. Fullaway in 1911, and a few records were published in reports of the Guam Department of Agriculture (Vandenburg 1926–1933).

Following World War I, the Japanese were mandated the former German possessions in Micronesia, giving them control of all the major island groups included within the scope of this study, with the exception of the Gilberts, Guam, and a few outliers such as Wake. During the latter part of the Japanese administration, in the years 1936–1940, Professor T. Esaki made several expeditions to various of the Mariana, Caroline, and Marshall Islands to collect and study economic insects. Dr. R. Takahashi, then with the Imperial College of Agriculture, Taipei, Taiwan, published a series of four papers (1936, 1939, 1941, 1942) dealing with the scale insects, whiteflies, and aphids of the Micronesian islands then under mandate to Japan. These papers were based primarily upon specimens collected by Esaki. In addition to listing previously described forms, Takahashi described 11 new species of Coccoidea from Micronesia. Fortunately, Takahashi's descriptions are of superior caliber, and as type material of most of his species has been available it has been possible to treat all of his species in a satisfactory manner.

Since the end of World War II, a small amount of information concerning Micronesian scale insects has been published, largely in reports of various economic entomologists working in the area (Beardsley, 1955; Oakley, 1946; Townes, 1946). Most of the identifications cited in these papers were made by the late Dr. Harold Morrison of the Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C. Fullaway (1946a) published a list of scale insects known from reports on prewar collections from Guam, but unfortunately the list contains several apparent mis-

³ Dates in parentheses refer to Literature Cited, p. 559, or to *Insects of Micronesia*, volume 2, **Bibliography**.

identifications and a number of incomplete determinations, and is of but limited value.

ACKNOWLEDGEMENTS

I am grateful to many persons and institutions who have assisted in various ways during the course of this study. I am particularly indebted to the late Dr. Harold Morrison, formerly with the U.S. Department of Agriculture, Agricultural Research Service. During the latter part of 1957, I was privileged to spend twelve weeks in Washington, D.C., working under Dr. Morrison's direction on the initial phases of this study. At that time Dr. Morrison was in charge of the U.S. National Coccid Collection, probably the most complete collection of scale insects in existence. Through recourse to this collection and to the nearly complete library of publications dealing with the systematics of the Coccoidea available there, it was possible to identify much of the Micronesian scale insect material then at hand. Subsequently, through correspondence, Dr. Morrison continued to give generously of his time, making comparisons of slides sent him with material in the national collection, and offering helpful comments and opinions, to within a few months of his death in March 1963. I am grateful to the Division of Insect Identification and Parasite Introduction of the U.S. Department of Agriculture, Agricultural Research Service, for the use of their facilities in Washington. Funds for transportation and living expenses while in Washington were made available through a grant from the McNerny Foundation of Honolulu, and I wish to express my sincere appreciation to that institution for making this research possible. I am also indebted to Bernice P. Bishop Museum of Honolulu, particularly to Dr. J. L. Gressitt of the Entomology Department, which sponsored this research and made available for my use a binocular compound microscope. To my former employers, the Experiment Station, Hawaiian Sugar Planters' Association, I am grateful for office, library, and laboratory facilities. To my wife, Lynn, who typed this manuscript, I am especially grateful.

I am indebted for assistance in clearing up various points concerning the identity of several species which has been received from Professor Howard McKenzie, University of California, Davis; Dr. D. J. Williams, Commonwealth Institute of Entomology, London; and Dr. Sadao Takagi of Hokkaido University, Sapporo, Japan. Miss Louise M. Russell, U.S. Department of Agriculture, Agricultural Research Service in Washington, D.C., made determinations of many specimens of Asterolecaniidae before I took over the work on the Micronesian scale insects in 1957, and she subsequently assisted in clearing up certain problems involving this group. I wish also to express my thanks to Mr. B. McDaniel of the Texas College of Arts and Industries, who generously allowed me to include his valuable collection of scale insects from Yap and Palau Islands in this study.

The United States Office of Naval Research, the Pacific Science Board (National Research Council), the National Science Foundation, and Bernice P. Bishop Museum have made this survey and publication of the results possible. Field research was aided by a contract between the Office of Naval Research, Department of the Navy, and the National Academy of Sciences, NR 160-175.

MATERIALS AND METHODS

COLLECTIONS EXAMINED

Approximately 1700 slides, bearing about 5,000 individual specimens of Coccoidea from Micronesia, were examined during this study. The specimens were derived from several sources and represent the efforts of numerous collectors. The four largest collections were: (1) those of Henry Townes and R. G. Oakley, made in 1946, under the auspices of the U.S. Commercial Company (a U.S. owned corporation set up to deal with post-war trade and agricultural problems in the Pacific); (2) those made by several entomologists (P. A. Adams, J. F. G. Clarke, H. S. Dybas, R. J. Goss, J. L. Gressitt, N. L. H. Krauss, Ira La Rivers, R. W. L. Potts, R. L. Usinger, and possibly others) who worked for the Bishop Museum Micronesian Insect Survey (1948–1954), financed by the Office of Naval Research through the Pacific Science Board; (3) survey collections made by entomologists of the U.S. Department of Agriculture, Division of Plant Quarantine (K. L. Maehler and M. M. Ross), during 1947–1949; and (4) collections by entomologists employed by the U.S. Trust Territory of the Pacific Islands under the U.S. Department of Interior during 1949–1958 (J. W. Beardsley, D. B. Langford, R. P. Owen, and N. Tellei).

A smaller but valuable collection was made by B. McDaniel in Palau and Yap during 1956, under the auspices of the George Vanderbilt Foundation.

Other lots of specimens of particular importance include a portion of Kuwana's unmounted material from the Bonin Islands, obtained from Kyushu University; slides and unmounted material collected by T. Esaki during 1936–1940, including types of Takahashi's Micronesian species, loaned by the Taiwan Agricultural Research Institute, Taipei, Taiwan; and slides from the U.S. National Coccid Collection and from the State Department of Agriculture, Hawaii, representing a portion of the prewar Guam collections of D. T. Fullaway, R. G. Oakley, O. H. Swezey, R. L. Usinger and others. Several additional collections of limited geographic scope have been received during the past several years from various entomologists employed by the U.S. Navy, the Government of Guam, and the U.S. Public Health Service and others (E. S. Brown, C. F. Clagg, W. W. Cantelo, E. J. Ford, Jr., C. R. Joyce, N. L. H. Krauss, A. A. La Plante, and W. C. Mitchell).

The collections from the various islands and island groups are not equally representative, as relatively very little material has been available from certain areas included within the scope of this study. The Bonin and Volcano Islands, unfortunately, are very poorly represented, as are the Northern Mariana Islands. No material whatsoever is available from the outliers Marcus Island and Nauru Island, or from several of the atolls, mostly uninhabited, in the Caroline and Marshall Islands. Kusaie collections are disappointing in that only a single species peculiar to that island is included. Only three atolls are represented in the collections of E. S. Brown and N. L. H. Krauss from the Gilbert Islands.

METHOD OF STUDY

This study is based almost entirely upon slide-mounted specimens of adult females. Limiting the treatment largely to slide preparations is justified for several reasons. Firstly, the diagnostic characters employed in modern systematic studies of the Coccoidea are nearly all of such a minute character that carefully made microscope preparations are necessary for their proper evaluation. Secondly, a sizable portion of the material studied was already mounted on slides when received, and most of the material available in an unmounted condition was preserved in alcohol, which often alters the color and form of the external secretory products which frequently cover the living insects. I have not seen *in situ* material of several of the species treated here. References to external characters, such as shape and color of scale coverings, or wax tests, are intended only to supplement the use of proper slide preparations, as such features as scale coverings and wax secretions often appear nearly identical in two or more quite distinct species.

The limiting of systematic treatments to the last instar females (often referred to both here and elsewhere as the "adult female" although these insects appear to be neotenic in the female sex) has been a practice followed by many recent students of the Coccoidea. Although immature stages and adult males have been shown to possess characters of definite taxonomic value in some groups such as the Margarodidae (Morrison, 1928), the Asterolecaniidae (Russell, 1941), and the Pseudococcidae (Beardsley, 1960), it has been necessary to limit this study to mature females as, for the majority of the species treated, satisfactory material of other stages has not been available.

Of the approximately 1700 slide preparations examined, nearly 1,000 were made available from the U.S. National Coccid Collection and from various other sources. The remaining 700 or so slide mounts were prepared from material in alcohol which had been collected by me during 1952–1954, and by various other persons during the years since 1954. For certain

critical comparisons it was also necessary in a number of instances to remove and restrain previously mounted specimens which had faded badly.

DRAWINGS

I have attempted to illustrate adequately all of the new species described in this paper. The Coccoidea lend themselves well to this type of graphic presentation as, when mounted on slides, they are reduced essentially to parallel dorsal and ventral surfaces. Balachowsky, Ferris, McKenzie, Williams, and others have emphasized the use of semidiagrammatic drawings as a satisfactory and convenient way to present descriptive data on species of scale insects. The type of presentation popularized by Ferris in his monumental Atlas of the Scale Insects of North America (1937–1955) has been largely adopted here. The figures were executed with aid of a squared ocular reticule and are semidiagrammatic in that nonstructural irregularities of shape due to accidents in mounting, and other causes, have been ignored, appendages have been drawn in more or less standardized positions, and, where necessary for proper illustration of salient morphological characters, more than one specimen has been utilized in preparing a drawing of a given species. In certain groups, particularly the Pseudococcidae, it has been necessary to exaggerate the sizes of certain dermal structures (pores and ducts) in drawings of the whole insects to compensate for reduction of figures to page size. The drawings should be considered an essential part of the description of each new species.

Drawings of certain previously described species are also included. Two of these are type species of new genera proposed here; the others are either inadequately illustrated elsewhere, or serve to clarify certain structural differences between closely similar forms, or are of species described elsewhere during the time this paper was in preparation.

CITATION OF COLLECTION DATA AND LITERATURE

Host records cited with collection data have been taken directly from specimen labels. Except for corrections of obvious errors in spelling, these are cited as given and, without information to the contrary, host determinations are assumed to represent the opinion of the collector alone.

In citing collection localities I have adhered to spellings used in the gazetteer of Micronesian localities presented by Gressitt (1954) in the Introduction to the Insects of Micronesia series. Minor differences in spelling have been corrected to agree with Gressitt's interpretation without further note. Where the name used by the collector and that accepted as correct by Gressitt differ markedly, the former is given in parentheses following the latter.

The following abbreviations have been used to denote institutions where type specimens are deposited: BISHOP (B. P. Bishop Museum), BM (British Museum), UH (University of Hawaii), US (United States National Museum).

The citations of literature references to genera and species have been largely limited to original descriptions, references to synonyms, homonyms, and misidentifications recorded from Micronesia, and to the most important redescriptions, particularly those where species have been adequately figured. For many of the widespread pestiferous species which occur in Micronesia, an attempt to cite all recorded synonymy and literature references would be extremely laborious and of relatively little value, as much of the work would be merely a recapitulation of information already available in the Fernald Catalog (1903), its supplements (Sanders, 1906 and 1909; Sasser, 1911, 1912, 1915) and elsewhere.

ZOOGEOGRAPHY

From the viewpoint of zoogeography, the Coccoidea are a difficult group. Most of the species common on cultivated plants became widely distributed on food and propagative material before plant quarantines restricted the movement of such material. Many species are continuing to spread into previously uninfested areas, although less rapidly, in spite of quarantine regulations. Several instances of spread of economically important species within Micronesia, with serious consequences to local agriculture, have been recorded during the past thirty years or so. The small size and cryptic habits of scale insects in general make their presence difficult to detect, particularly when but a few individuals are present. Parthenogenetic or hermaphroditic reproduction is characteristic of a number of widespread pest species, and in such cases a single individual inadvertently transported to a new area on a bit of vegetation is potentially capable of giving rise, within a few months, to a flourishing infestation.

Thorough revisionary studies have been made of a few genera of scale insects which contain widespread pest species, such as those on *Aonidiella* (McKenzie, 1938), *Aspidiotus* (Ferris, 1941a), and *Chrysomphalus* (McKenzie, 1939). In such groups the existence of concentrations of species within certain geographic areas provide some indication of the general region of origin. In a few other groups, such as *Aulacaspis*, *Icerya*, and *Lepidosaphes*, which are less thoroughly known, enough information is available to permit some tentative conclusions concerning origin. However, many of the important genera of Coccoidea are as yet rather poorly understood and not very clearly defined, for example, *Pseudococcus*, *Dysmicoccus*, *Trionymus*, *Coccus*, and *Pulvinaria*. Numerous species from widely scattered geographic areas have been assigned to such groups, and although at times it is possible

to make an educated guess concerning the geographical area of origin of a particular species, in many cases even this is not feasible.

The distributions of the known Micronesian scale insects are summarized in Table 1. The term "widespread," which appears frequently, indicates that the species is known, outside of Micronesia, from a number of localities in both the Eastern and Western Hemispheres. A question mark in any given locality column indicates a literature record of the species from that area, although no specimens were included in material which I studied. The letter "q" denotes that the species is known from the area only from quarantine interceptions made elsewhere, usually outside of Micronesia, which are labeled as originating from the area indicated. From this table and from what is known about the probable origins of genera such as *Aonidiella*, *Aspidiotus*, *Aulacaspis*, *Chrysomphalus*, *Icerya*, and *Lepidosaphes*, it is evident that the Micronesian scale insect fauna has its strongest affinities with the Oriental and Australian major zoogeographical realms. Four species are known, outside of Micronesia, only from New Guinea and (or) the Solomon Islands; four species from the Philippines only; one from Fiji and Polynesia only; one from Fiji and the Solomons only; and one from Taiwan only. About 37 more widely dispersed species are either restricted to the Australian, Oriental, and eastern Palaearctic Regions, or if widely distributed, apparently are of Old World origin.

Eight of the species known from outside Micronesia appear to be Neotropical in origin. Their presence in Micronesia probably is due to the importation of plant material from the Americas which perhaps began at the time of the Spanish explorers, about 400 years ago. The species are *Dysmicoccus brevipes* (Cockerell), *D. neobrevipes* Beardsley, *Phenacoccus solani* Ferris, *Ceroplastes cirripediformis* Comstock, *Pulvinaria urbicola* Cockerell, *Diaspis boisduvalii* Signoret, *D. bromeliae* (Kerner), and *Melanaspis bromeliae* (Leonardi). It is of interest that five of these species have been taken in Micronesia or elsewhere on pineapple, a plant of Neotropical origin. One new species of mealybug described in this paper, *Pseudococcus neomaritimus*, also appears to be of Neotropical origin, although it is as yet not known outside of Micronesia. *Phenacoccus solani* and *Ceroplastes cirripediformis* are almost certainly recent introductions which became established in Micronesia during or following World War II. Both are confined to the easternmost portion of Micronesia as yet.

Five genera and 37 species of Coccoidea are now known only from Micronesia. Some may be endemic to the area, while others may eventually be found in adjacent areas of the Pacific. So imperfect is our knowledge of the scale insect faunas of New Guinea, the Philippines, the Solomons and other South Pacific islands or island groups that it would be useless to speculate further as to the probable zoogeographic affinities of these forms.

TABLE 1.—Distribution of Micronesian Coccoidea

	Micronesian Island Groups												Other Localities	
	Bonin	Volcano	N. Mariana	S. Mariana	Caroline						Wake	Marshall		Gilbert
					Palau	Yap	Caroline Atolls	Truk	Ponape	Kusale				
MARGARODIDAE														
1. <i>Drosicha littorea</i> *					×		×							
2. <i>Crypticerya jacobsoni</i>				?	?	?								Philippines, Java, India, Burma
3. <i>Icerya aegyptiaca</i>			×	×	×	×	×	×		×	×	×	×	Old World tropics
4. <i>I. purchasi</i>				G†						×	×	×	×	Widespread, Hawaii
5. <i>I. seychellarum</i>					?	×	×							Old World tropics, Tahiti, Samoa, Ocean I.
6. <i>Steatococcus samaraius</i>					×	×								New Guinea, Solomon Is.
ORTHEZIIDAE														
7. <i>Nipponorthezia guadalcanalia</i>					×	×		×		×				Solomon Is., Hawaii
PSEUDOCOCCIDAE														
8. <i>Antonina graminis</i>				×	×			×		×	×			Widespread, Hawaii, Johnston Island
9. <i>Chaetococcus bambusae</i>				S†	×	×								Oriental and Ethiopian regions, Hawaii
10. <i>Dysmicoccus boninsis</i>	?			×	×		×	×	×					Widespread, Hawaii
11. <i>D. brevipes</i>	?			×	×	×		×	×			×	?	Widespread, Hawaii
12. <i>D. neobrevipes</i>				×									×	Jamaica, Mexico, Hawaii, Philippines (?), Fiji
13. <i>D. saipanensis</i>			×	×		×	×	×	×	×		×		Japan, N. America, England
14. <i>D. wistariae</i>													×	Widespread, Hawaii
15. <i>Ferrisia virgata</i>			?	×	×	×		×	×		×	×	×	Widespread, Hawaii
16. <i>Geococcus coffeae</i>					?			×		×				Widespread, Hawaii
17. <i>Laminicoccus pandani</i>							×	×	×			×	×	Tahiti, Fiji, Marquesas Is., Hawaii
18. <i>L. sp.</i>					×									
19. <i>Neoripersia ogasawarensis</i>	×													
20. <i>Neosimmondsia esakii</i>									×					

* Described as new.

† G=Guam only; S=Saipan only.

TABLE 1.—Distribution of Micronesian Coccoidea

	Micronesian Island Groups												Other Localities		
	Bonin	Volcano	N. Mariana	S. Mariana	Caroline						Wake	Marshall		Gilbert	
					Palau	Yap	Caroline Atolls	Truk	Ponape	Kusaie					
21. <i>Palauococcus gressitti</i> *					X										
22. <i>Palmicultor guamensis</i> *				G											
23. <i>P. palmarum</i>					X	X	X	X	X	X		X	X	Malaya, Philip-pines (?), Hawaii, Canton I.	
24. <i>Pandanicola esakii</i>					X										
25. <i>P. pandani</i>									X						
26. <i>Paraputo leverii</i>							T†							Solomon Is. Fiji, New Guinea	
27. <i>Phenacoccus solani</i>												X	X	Puerto Rico, conti-nental U.S., Hawaii	
28. <i>Planococcus citri</i>				X	X	X	X	X	X			X	X	Widespread, Hawaii	
29. <i>P. lilacinus</i>				G			X							Madagascar, Mauri-tius, India, Ceylon, Java, Philippines	
30. <i>Pseudococcus adonidum</i>									?					Widespread, Hawaii	
31. <i>P. casuarinae</i>					X										
32. <i>P. citriculus</i>					X					X				Ceylon, Hawaii	
33. <i>P. comstocki</i>				?						?				Japan, Continental U.S.	
34. <i>P. dybasi</i> *					X										
35. <i>P. gilbertensis</i> *													X		
36. <i>P. kusaiensis</i> *										X					
37. <i>P. macrocirculus</i> *					X	X	X				X				
38. <i>P. marshallensis</i> *										X		X			
39. <i>P. microadonidum</i> *								X	X			X	X		
40. <i>P. multiductus</i> *					X										
41. <i>P. neomaritimus</i> *				X	X		X	X							
42. <i>P. orchidicola</i>				X		X	X			X		X	X		
43. <i>P. pandanicola</i>					X										
44. <i>P. solomonensis</i>					X	X	X	X						Solomon Is.	
45. <i>P. trukensis</i> *						X	X	X							
46. <i>P. yapensis</i> *						X									
47. <i>Rhizoecus advenus</i> *								X						Hawaii	
48. <i>R. carolinensis</i> *								X		X					
49. <i>Saccharicoccus sacchari</i>				X	X	X	X	X						Widespread, Hawaii	
50. <i>Trionymus palauensis</i> *					X									New Guinea	
51. <i>T. townesi</i> *				T††											
52. <i>Turbinococcus pandanicola</i>					X										

† T=Tobi Island only.

†† T=Tinian only.

TABLE 1.—Distribution of Micronesian Coccoidea

	Micronesian Island Groups												Other Localities		
	Bonin	Volcano	N. Mariana	S. Mariana	Caroline						Wake	Marshall		Gilbert	
					Palau	Yap	Caroline Atolls	Truk	Ponape	Kusaie					
COCCIDAE															
53. <i>Ceroplastes cirripediformis</i>													×	×	West Indies, southern U.S., Mexico, Hawaii
54. <i>C. floridensis</i>	?			?G	×										Widespread
55. <i>C. pseudoceriferus</i>					×										Japan, India, Ceylon
56. <i>C. rubens</i>				×	×										Widespread, Hawaii
57. <i>Coccus acuminatus</i>				×	×										Widespread, Hawaii
58. <i>C. elongatus</i>	×			×	×	×								×	? Widespread, Hawaii
59. <i>C. hesperidum</i>				×	×	q	×	?						×	Widespread, Hawaii
60. <i>C. mangiferae</i>				×	×										Widespread, Hawaii
61. <i>C. moestus</i>				G	×	×	×	×							Africa
62. <i>C. viridis</i>				×	×	×		×	×						Widespread, Hawaii
63. <i>Eucalymnatus tessellatus</i>				?S	×			×	×	×					Widespread, Hawaii
64. <i>Paralecanium carolinensis*</i>							×	×							
65. <i>Pulvinaria aurantii</i>	?							×	×						Japan
66. <i>P. psidii</i>	×	×		×	×			×	×	×				×	Widespread, Hawaii
67. <i>P. thespesiae?</i>								×							Ceylon
68. <i>P. urbicola</i>				×				×							Jamaica, Barbados, Trinidad, Hawaii
69. <i>Saissetia coffeae</i>	?			?×	×	×		?	?					×	Widespread, Hawaii
70. <i>S. nigra</i>	×	×		?×	×	×		×		×					Widespread, Hawaii
71. <i>S. oleae</i>				?×	×			×						×	Widespread, Hawaii
72. <i>Vinsonia stellifera</i>					×				×						Widespread
ASTEROLECANIIDAE															
73. <i>Asterolecanium bambusae</i>				×	×										Widespread, Hawaii
74. <i>A. coronatum</i>					×										Ceylon, Taiwan
75. <i>A. miliaris</i>				×	×					×					Widespread, Hawaii
76. <i>A. pseudo-lanceolatum</i>										?					Taiwan
77. <i>A. pseudomiliaris</i>				×	?					×					Widespread
78. <i>A. pustulans</i>				G	×			×						×	Widespread, Hawaii
79. <i>A. robustum</i>				G	×					×					Widespread
80. <i>A. sp.</i>								?W†							
DIASPIDIDAE															
81. <i>Africonidia macdanieli*</i>					×										
82. <i>Anastomoderma palauensis*</i>					×										
83. <i>Aonidiella aurantii</i>	?			?	?			?						?	Widespread
84. <i>A. comperei</i>				×	×	×	×	×						×	India, Australia (?)

† W=Woleai only.

TABLE 1.—Distribution of Micronesian Coccoidea

	Micronesian Island Groups											Other Localities		
	Bonin	Volcano	N. Mariana	S. Mariana	Caroline						Wake		Marshall	Gilbert
					Falau	Yap	Caroline Atolls	Truk	Ponape	Kusaie				
85. <i>A. eremocitri</i>				X										Australia
86. <i>A. inornata</i>				G	X	X	X	X	X	X	X	X		Philippines, Hong Kong, Hawaii
87. <i>A. orientalis</i>				X	X									Widespread
88. <i>Aspidiella hartii</i>				?G										West Indies
89. <i>A. sacchari</i>				X	X							X		West Indies, S. America, Florida, Ceylon
90. <i>Aspidiotus destructor</i>				X	X	X	?	X	X					Widespread
91. <i>A. excisus</i>				X	X	X	?	X	X					Ceylon, Fiji, Formosa
92. <i>A. spinosus</i>					X									Widespread, Hawaii
93. <i>Chrysomphalus dictyospermi</i>	X			X	X			X				X		Widespread, Hawaii
94. <i>C. ficus</i>	?								X					Widespread, Hawaii
95. <i>Duplaspidiotus claviger</i>				G										Widespread, Hawaii
96. <i>D. tesseratus</i>				?G										Widespread, Hawaii
97. <i>Furcaspis oceanica</i>				S	X	X	X	X	X	X		X		
98. <i>Hemiberlesia cyanophylli</i>												X		Widespread, Hawaii
99. <i>H. lataniae</i>	X	X	?	X	X	X		X	X	q	X	X	X	Widespread, Hawaii
100. <i>H. palmae</i>				S _q	X	X		?	X	X			?	Widespread
101. <i>H. rapax</i>	?				X	X								Widespread, Hawaii
102. <i>Melanaspis bromeliae</i>				G					X					Widespread, Hawaii
103. <i>Octaspidiotus araucariae</i>									X					New Caledonia, Hawaii
104. <i>Pseudaonidia manilensis</i>					X									Philippines
105. <i>Semelaspidus mangiferae</i>					X									Philippines
106. <i>Odonaspis morrisoni*</i>						X		X						Philippines
107. <i>O. penicillata</i>					X									Widespread, Hawaii
108. <i>O. saccharicaulis</i>					X									Java, India, Philippines, Cuba
109. <i>O. secreta</i>	?													Japan, U.S.
110. <i>Andaspis punicae</i>				G	X									Africa, Hawaii (?)
111. <i>Aulacaspis madiunensis</i>					X									Africa, Java, Queensland, Taiwan, China (?)
112. <i>A. rosae</i>	X													Widespread, Hawaii
113. <i>A. tegalensis</i>					X									Java, Taiwan, Philippines, Mauritius

TABLE 1.—Distribution of Micronesian Coccoidea

	Micronesian Island Groups										Other Localities		
	Bonin	Volcano	N. Mariana	S. Mariana	Caroline					Wake		Marshall	Gilbert
					Palau	Yap	Caroline Atolls	Truk	Ponape				
114. <i>Diaspis boisduvalii</i>				X									Widespread, Hawaii
115. <i>D. bromeliae</i>									X				Widespread, Hawaii
116. <i>Fiorinia fioriniae</i>	?			?S									Widespread, Hawaii
117. <i>F. nephelii</i>													China, Taiwan, Queensland, Hawaii
118. <i>F. japonica?</i>	X												Japan, Taiwan, Philippines
119. <i>Howardia biclavus</i>	X			X			?						Widespread, Hawaii
120. <i>Ischnaspis longirostris</i>	X			X	X								Widespread, Hawaii
121. <i>Lepidosaphes arii</i>	X												
122. <i>L. beckii</i>				G			?	X				q	Widespread, Hawaii
123. <i>L. bladhaie?</i>				X	X			X		X			Formosa, Philippines
124. <i>L. carolinensis*</i>				X	X								
125. <i>L. esakii</i>			X	X		X	X	X	X			X	
126. <i>L. gloverii</i>	X			S			X	X	X				Widespread, Hawaii
127. <i>L. micronesiensis</i>													
128. <i>L. palauensis*</i>					X								
129. <i>L. spinulosa*</i>				G	X								
130. <i>L. tokionis</i>				X	X	X		?					Widespread, Hawaii
131. <i>L. ulapa*</i>					X								
132. <i>Palauaspis* multiductus*</i>					X								
133. <i>Parlatoria cinerea</i>				X	X				X				Widespread
134. <i>P. crotonis</i>				X				X					Widespread, Hawaii
135. <i>P. pergandii</i>	X							X	?				Widespread, Hawaii
136. <i>P. proteus</i>	?			G	X	X	X	X	X	X			Widespread, Hawaii
137. <i>P. zizyphus</i>					X			X					Widespread, Hawaii
138. <i>Phenacaspis cockerelli</i>	X												Widespread, Hawaii
139. <i>P. inday</i>				?G	X	?							Philippines
140. <i>Pinnaspis aspidistrae</i>					X				?				Widespread, Hawaii
141. <i>P. buxi</i>				G					X				Widespread, Hawaii
142. <i>P. strachani</i>				X	X	X	X	X	?	X	X	X	Widespread, Hawaii
143. <i>Pseudaulacaspis pentagona</i>				X	X		X	X					
144. <i>Radionaspis indica</i>					X								Widespread India, Florida, Puerto Rico, Hawaii
145. <i>Unaspis citri</i>									X				Widespread

HOST RECORDS

From the host records which accompany the Micronesian collections, it is evident that the greatest emphasis has been placed upon collecting Coccoidea associated with crop plants, cultivated ornamentals, and widespread weeds. Several of the species which occur in Micronesia have been responsible for serious damage to crop plants on one or more islands. Such pest species include *Icerya aegyptiaca*, *I. purchasi*, and *I. seychellarum* (Beardsley, 1955), and *Aspidiotus destructor* and *Furcaspis oceanica* (Gressitt, 1954: 177–178). Recent unpublished reports from entomologists working in the area indicate that several additional species may be becoming increasingly important (for example, *Pseudaulacaspis pentagona* on cassava). Since many collectors of scale insects in Micronesia have been concerned primarily with economic entomology it is understandable that the bulk of the material at hand is from cultivated plants. For the convenience of those concerned with the control of crop pests, I have listed in Table 2 some of the more important agricultural plants grown in Micronesia with the scale insects which have been found associated with them. A "T" in any column of the table indicates that the species was reported by Takahashi (1936–1942) but is not represented from that host in material at hand.

Several interesting new species of scales described here are from among the relatively small number of samples from uncultivated plants native to Micronesia. Without doubt, many more such new species await discovery. Much additional collecting, with particular attention to the native flora, remains to be done in Micronesia as well as in surrounding areas of the Pacific if we are ever to achieve a clear idea of the nature and extent of the scale insect faunas endemic to these areas. In this regard it is of interest that *Pandanus*, various species and varieties of which are native to Micronesia as well as being of economic importance, has in this region a known scale insect fauna of 16 species, of which 11 are not yet known outside the area.

SYSTEMATICS

KEY TO FAMILIES OF COCCOIDEA KNOWN FROM MICRONESIA
(in part after Zimmerman, 1948)

ADULT FEMALES

1. Two or more pairs of abdominal spiracles present..... 2
Abdominal spiracles absent..... 3
2. Anal ring well developed, with a band of small cells on each side and bearing six setae..... **Ortheziidae**
Without such a cellular, setigerous anal ring..... **Margarodidae**

3. Anal opening covered dorsally by a pair of sclerotized plates which form an operculum..... **Coccidae**
Anal opening without such an operculum..... 4
4. Lateral margins of body with row or band of 8-shaped (geminate) wax pores.....
..... **Asterolecaniidae**
Without such marginal geminate pores..... 5
5. Posterior abdominal segments fused into a sclerotized pygidium; without a cellular or setigerous anal ring; normally enclosed within a thin scale formed from nymphal exuviae incorporated with wax..... **Diaspididae**
Posterior abdominal segments not fused into a sclerotized pygidium; anal ring cellular and setigerous; not enclosed within such a scale..... **Pseudococcidae**

The sequence of presentation of the families of Micronesian Coccoidea employed here reflects currently accepted views on the phylogenetic relationships within the superfamily. The more primitive Margarodidae and Ortheziidae are considered first, followed by the "lecanoid" families Pseudococcidae, Coccidae, and Asterolecaniidae, and ending with the more highly specialized Diaspididae. This sequence is based upon cytogenetic as well as morphological evidence. For recent discussions of scale insect phylogeny see Brown (1959) and Brown and McKenzie (1962). Within each family, genera and species are arranged alphabetically, except in the Diaspididae, where the Diaspidinae, the only subfamily represented, is first subdivided into three relatively well defined and widely accepted tribes.

FAMILY MARGARODIDAE

Available Micronesian material contains specimens of five species of Margarodidae, subfamily Monophlebinae Maskell. Three are widely distributed species of *Icerya* Signoret which produced infestations of economic importance in Micronesia, as elsewhere, until controlled by the introduction and spread of coccinellid beetles of the genus *Rodolia* (Beardsley, 1955).

For a thorough treatment of morphology and systematics of this important group of relatively primitive Coccoidea, see Morrison (1928).

KEY TO TRIBES AND GENERA OF KNOWN MICRONESIAN MONOPHLEBINAE

ADULT FEMALES

1. With 7 pairs of abdominal spiracles; ventral abdominal band of ovisac-forming pores absent; antennae 8- or possibly 9-segmented; Drosichini..... **Drosicha**
With not more than 4 pairs of abdominal spiracles (3 pairs in known Micronesian forms); antennae normally 10- or 11-segmented; Iceryini..... 2
2. With a distinct band of ovisac-forming pores on venter of abdomen..... 3
Without such a ventral band of ovisac-forming pores..... **Crypticerya**
3. Mature female with a definite invaginated, pouchlike marsupium; without a definite ovisac extending behind..... **Steatococcus**
Without such an internal marsupium; mature female forming a definite ovisac... **Icerya**

TABLE 2.—Micronesian Scale Insect Records
From Plants of Economic Importance

Species of Scale Insect (in order of treatment in text)	HOST PLANT												
	Banana	Breadfruit	Cacao	Cassava	Citrus	Coconut	Coffee	Mango	Pandanus*	Papaya	Pineapple	Sugar Cane	Taro**
MARGARODIDAE													
<i>Icerya aegyptiaca</i>	X	X			X	X							X
<i>I. purchasi</i>		X			X	X							
<i>I. seychellarum</i>					X	X							
<i>Steatococcus samaraius</i>	X					X							X
PSEUDOCOCCIDAE													
<i>Dysmicoccus boninsis</i>												X	
<i>D. brevipipes</i>						X	X				X	X	
<i>D. neobrevipes</i>	X		X						X				
<i>D. saipanensis</i>						X							
<i>D. wistariae</i>		X											
<i>Ferrisia virgata</i>		X		T	X	X	T	X			X		X
<i>Laminicoccus pandani</i>													
<i>L. sp.</i>									X				
<i>Neosimmondsia esakii</i>									X				
<i>Palmiculator guamensis</i>						X							
<i>P. palmarum</i>						X							
<i>Pandanicola esakii</i>									X				
<i>P. pandani</i>									X				
<i>Paraputo leverii</i>						X							
<i>Planococcus citri</i>			X				X						
<i>P. lilacinus</i>		X			X								X
<i>Pseudococcus citriculus</i>					X								
<i>P. macrocirculus</i>													X
<i>P. marshallensis</i>		X											
<i>P. microadonidum</i>	X					X			X				
<i>P. orchidicola</i>	X								X				X
<i>P. pandanicola</i>									X				
<i>P. solomonensis</i>									X				
<i>P. trukensis</i>		X			X								X
<i>Saccharicoccus sacchari</i>											X		
<i>Turbinococcus pandani</i>									X				
COCCIDAE													
<i>Ceroplastes floridensis</i>								T					
<i>C. rubens</i>						X		X					
<i>Coccus acuminatus</i>								T					
<i>C. elongatus</i>					T	X							
<i>C. hesperidum</i>	X	X			X	X				T			X
<i>C. mangiferae</i>													
<i>C. moestus</i>		X							X				
<i>C. viridis</i>					X				X				
<i>Eucalymnatus tessellatus</i>						X	T						
<i>Paralecanium carolinensis</i>													
<i>Pulvinaria psidii</i>							X						

* Several species and varieties of *Pandanus* occur in Micronesia, but not all can be considered as cultivated plants.

** Includes giant taros such as *Cyrtosperma* spp. and *Alocasia* spp. as well as *Colocasia esculenta*.

TRIBE DROSICHINI

Genus *Drosicha* Walker

Drosicha Walker, 1858, List Homopt. Ins. Coll. Brit. Mus. pt. 4, suppl.:

306.—Morrison, 1928, U.S. Dept. Agric. Tech. Bull. 52: 163.

Warajicoccus Kuwana, 1922, [Japan] Dept. Agric. and Com. Imp. Plant Quar. Sta., Bull. 1: 7.

Type of genus: *Drosicha contrahens* Walker.

1. *Drosicha littorea* Beardsley, n. sp. (fig. 1).

Adult female (fig. 1, *a*): Length of slide-mounted specimen about 7.0 mm. Body roughly oval, about 4.0 mm. maximum width in type. Antennae 8-segmented, about 1.1 mm. over-all length; segment 8 longest, about 225 μ in length; basal segment short and very broad, about 120 μ long by about 280 μ wide. Antennae moderately densely clothed with slender setae about 160 μ maximum length; apical segment bearing 2 curved thicker digitiform setae 65–75 μ long. Legs moderately large and stout; hind femora about 600 μ long by about 300 μ maximum width; hind tibiae about 700 μ long. Hind tarsal claw about 120 μ long, unguis acute, not attaining apex of claw. Legs moderately densely clothed with rather short setae, mostly 90 μ or less in length. Rostrum 3-segmented, about 480 μ long. Eyes well developed, strongly sclerotized, about 120 μ diameter. Anal opening dorsal, situated at anterior apex of an equilateral triangle formed with the two posterior abdominal spiracles; about 110 μ wide, simple, apparently with a very narrow sclerotized rim at or just within orifice. Thoracic spiracles large, with a slight concentration of 7 to 12 disc pores on ventral derm near orifice, but these absent within tube. Abdominal spiracles about 30–35 μ diameter at orifice, anterior pairs slightly wider than posterior pairs; simple, with 1 or 2 disc pores on margin of orifice; situated on dorsal aspect, a short distance mesad of the marginal band of very long setae, in the only available specimen. Vulvar opening somewhat invaginated in available specimen; apparently with 3 oval ventral cicatrices on posterior margin of vulva, the median cicatrix largest, about 90 μ long, lateral cicatrices mostly obscured in available specimen.

Dorsum and venter of body densely clothed with simple, usually somewhat curved, slender setae; dorsal setae mostly 30–60 μ long, a few longer setae, up to about 120 μ maximum length, and borne on small conical tubercles evenly scattered among the smaller setae. Margin of body with a sparse, sometimes interrupted fringe of much longer setae, mostly 250–400 μ long. Setae of venter slightly longer than on dorsum, mostly 40–90 μ in length, with scattered longer setae up to about 190 μ maximum length. Simple circular or subquadrangular disc pores, 7–9 μ diameter, each with 4 to 7 peripheral loculi, moderately sparsely scattered over dorsum and venter.

Third instar female: Similar in shape to adult female, maximum length about 7 mm. Appendages somewhat smaller than adult; antennae 7-segmented, 0.90–0.95 mm. long; hind femora about 550 μ long by 290 μ maximum width, hind tibiae about 660 μ long. Body setae similar to those of adult; shorter dorsal setae about 25–40 μ long; longer dorsal setae about 105 μ maximum length, shorter ventral setae 30–75 μ long; longer ventral setae about 150 μ maximum, long marginal fringe setae about 380 μ maximum length. Venter of abdomen with 3 well-defined oval cicatrices (fig. 1, *b*).

Male: Unknown.

Holotype, adult female (US 67966), Ulithi, Asor I., Caroline Atolls, Oct. 6, 1952, Krauss, on *Scaevola*. Palau Is., Ngaiangl (Kayangel), Aug. 1956, McDaniel, on "rirs"; Koror, limestone ridge, Nov. 1947, Dybas, beating vegetation. Caroline Atolls: Ulithi, Asor I., Oct. 1952, Krauss, on *Scaevola*;

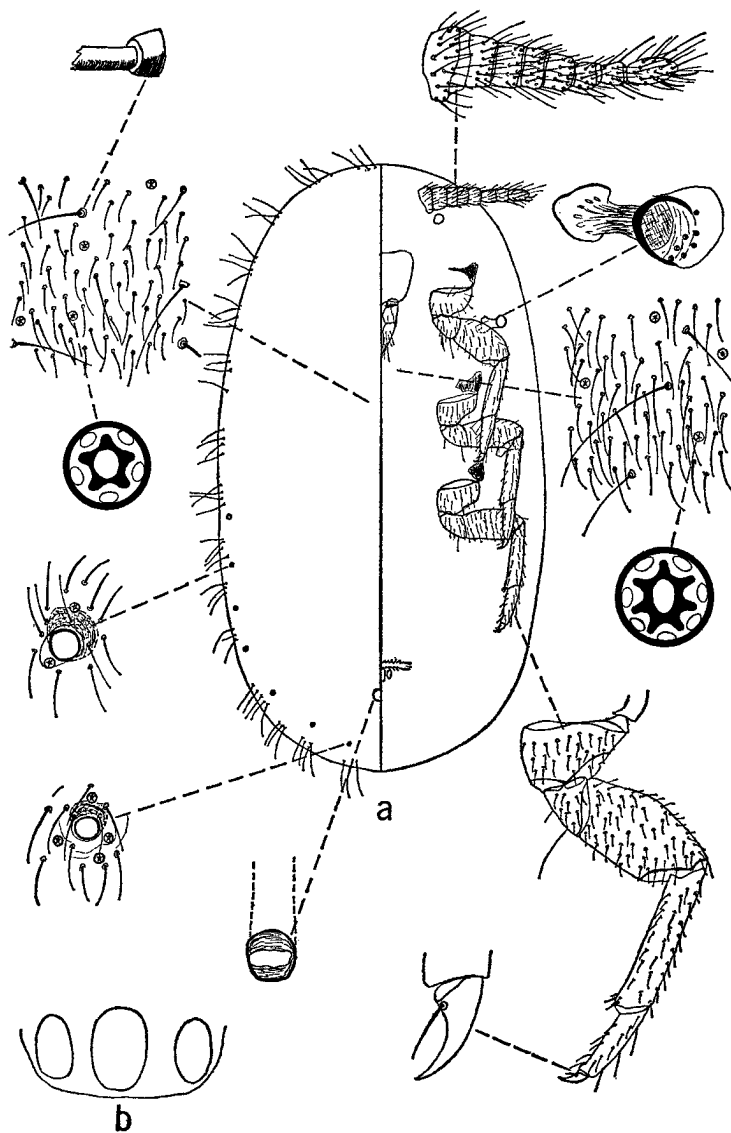


FIGURE 1.—*Drosicha littorea*: a, adult female, dorsal and ventral aspects (body setae and pores omitted) and details; b, third instar female, ventral abdominal cicatrices.

Ngulu, Ngulu I., Oct. 1952, Krauss, on *Scaevola*; Sorol, Sorol I., Oct. 1952, Krauss, on *Scaevola*; Satawal, Sept. 1952, Krauss, on *Messerschmidia* (*Tournefortia*).

DISTRIBUTION: Caroline Is. (Palau, Caroline Atolls).

HOSTS: *Scaevola*, *Messerschmidia*. These are common strand shrubs found throughout Micronesia. That it has been collected only on these hosts suggests that *D. littorea* may be confined largely to strand areas.

The holotype specimen, the only adult female available, has been compared with adult specimens of the following species in the U.S. National Coccid Collection in Washington, D.C.: *D. contrahens* (Walker)? from China; *D. corpulenta* (Kuwana), *D. howardi* (Kuwana), and *D. pinicola* (Kuwana) from Japan; *D. townsendi* (Cockerell) from the Philippines; *D. stebbingii* (Stebbing), *D. dalbergiae* (Stebbing) and *D. mangiferae* (Green) from India. *D. littorea* differs from all the above in having shorter, smaller appendages. The Indian species are much larger, with the hind tibiae measuring 1.3 to 1.4 mm. in length, vs. 0.7 mm. in *littorea*. *D. contrahens*? specimens from China have hind tibiae about 1.0 mm. in length, and differ also in that the body setae are relatively uniform in size on both dorsum and venter; the dorsal setae measuring 52 to 62 μ long and ventral setae 64 to 87 μ long. The smallest setae of both surfaces are considerably longer than those of *D. littorea*, and the latter species possesses conspicuously longer setae scattered on both dorsum and venter. The Philippine and Japanese species have appendages slightly to considerably longer than those of *D. littorea* (the hind tibiae measuring about 0.8 mm. to 1.1 mm. long in these forms), and the body setae are generally longer with very few or none of the conspicuously longer setae found on both surfaces of *D. littorea*.

The collections listed above, except for the Ulithi record, contain only immature females of the second or third larval instar. The absence of adult individuals in these collections probably reflects the habits of the mature mated females. In other species of the genus *Drosicha*, mated females leave the host plant and secrete themselves in ground litter prior to formation of the ovisac (Kuwana, 1922). It seems likely that *D. littorea* may have a similar habit. The fact that the single adult female specimen available is of no greater size than the larger third-instar nymphs, and that it contains no discernible embryos, suggest that this may have been an unmated individual, and that mature females distended with embryos are likely to be considerably larger than the holotype.

Takahashi (1941: 213) reported a *Drosicha* sp., immature individuals only, from "Enderdy: Polwat," presumably Puluwat [or Enderby] Atoll in the Western Carolines, on *Scaevola frutescens*. This is probably the same as the species described above.

TRIBE ICERYINI

Genus **Crypticerya** Cockerell

Crypticerya Cockerell, 1895, Psyche 7, Suppl. 1 : 15.—Morrison, 1928, U.S. Dept. Agric., Tech. Bull. 52 : 200.

Type of genus: *Icerya rosae* Riley and Howard.

2. **Crypticerya jacobsoni** (Green).

Icerya jacobsoni Green, 1912, Tijdschr. Ent. 55 : 316.

Crypticerya jacobsoni: Morrison, 1928, U.S. Dept. Agric., Tech. Bull. 52 : 203.—Rao, 1950, Indian Jour. Ent. 12 (2) : 146, pl. 18.

DISTRIBUTION: Java (type locality), China, Philippine Is., India, Burma, Micronesia (?).

HOSTS: Recorded from *Leucaena leucocephala* (*L. glauca*) and *Macaranga carolinensis* in Micronesia, and a number of other plants elsewhere.

Takahashi reports this species from Saipan (1936 : 115), Palau (1939 : 238), and Yap (1941 : 214), but no specimens were found in material available for this study.

Genus **Icerya** Signoret

Icerya Signoret, 1875, Soc. Ent. France, Ann. V, 5 : 351.—Morrison, 1928, U.S. Dept. Agric., Tech. Bull. 52 : 203.—Rao, 1950, Indian Jour. Ent. 12 (1) : 39 and 12 (2) : 127, figs.

Type of genus: *Coccus sacchari* Guerin (= *Dorthisia seychellarum* Westwood ?).

For redescriptions and figure of the species discussed below see treatment of Oriental Iceryini by V. P. Rao (1950).

KEY TO SPECIES OF ICERYA REPORTED FROM MICRONESIA

1. With 2 pairs of abdominal spiracles; body thickly clothed with long black setae, forming large conspicuous tufts on lateral margins of abdominal segments; ovisac elongate, normally longer than body of female when fully developed, with a series of well-defined longitudinal flutes. **purchasi**
- With 3 pairs of abdominal spiracles; body less densely clothed with setae, marginal setae present but relatively sparse and not forming conspicuous tufts; ovisac less strongly developed, usually shorter than body of female, longitudinal fluting less well defined. 2
2. Dorsum with large disc-shaped open center pores, around 16–20 μ diameter, in addition to usual multilocular pores (10–12 μ diameter); with 3 round or oval ventral cicatrices; wax covering of female partly yellowish in life. **seychellarum**
- Dorsum without such large open center disc pores in addition to usual multiloculars; with a single, roughly circular, ventral cicatrix; wax covering of females entirely white. **aegyptiaca**

3. *Icerya aegyptiaca* (Douglas).

Crossotosoma aegyptiaca Douglas, 1890, Ent. Mo. Mag. **27** : 79.

Icerya aegyptiacum: Riley and Howard, 1890, Ins. Life **2** : 256.

Icerya aegyptiaca: Newstead, 1893, Ent. Mo. Mag. **29** : 167.—Rao, 1950, Indian Jour. Ent. **12**(1) : 51, pl. iv.

Icerya tangalla Green, 1897, Indian Mus. Notes **4** : 7.

DISTRIBUTION: Widespread in Old World tropics, including oceanic islands (type locality: Egypt).

N. MARIANA IS. PAGAN: Feb. 1959, Cantelo, on coconut. ANATAHAN: July 1951, R. Bohart, on banana; Feb. 1959, Cantelo, on breadfruit.

S. MARIANA IS. TINIAN: Camp Chuco, June 1946, Oakley, on *Ficus*. AGIGUAN: south side, June 1952, Kondo, on native plant. ROTA: near Sabana, June 1946, Townes, on *Laportea*. GUAM: Jan.–Apr. 1945, R. H. Baker; Pilgo River, May 1945, Bohart and Gressitt; Ritidian Point, June 1945, Bohart and Gressitt; Mt. Alifan, Apr. 1946, Krauss; Mt. Alutom, June 1946, Townes, on *Blechnum pyramidalum* and *Flagellaria indica*; Talofofo, Dec. 1947, Maehler, on croton; Com. Mar. Hill (near Agana), Jan.–Feb. 1949, Maehler, on croton; Aug. 1953, Liming, on croton; Jan. 1954, Liming, on *Artocarpus incisus* (= *A. altilis*); Cocos I., Feb. 1954, Beardsley, on *Scaevola*.

PALAU. KOROR: Mar. 1948, Maehler, on unidentified plant, July 1953, Beardsley, on breadfruit, and *Casuarina*. NGERKABESANG (Arakabesan): July 1956, McDaniel. PELELIU: Sept. 1945, Baker; Jan. 1948, Dybas, sweeping. ANGAUR: May 1954, Beardsley.

YAP. YAP: July 1946, Oakley, on *Macaranga*; Guror, Mar. 1949, Maehler, on unidentified plant; Dugor, Mar. 1949, Maehler, on *Artocarpus altilis*; S. Keng, Aug. 1950, Goss, on *Artocarpus*; hill behind Kolonia, Nov. 1952, Gressitt; Dugor to Rumung, Nov. 1952, Gressitt; near Keng, Apr. 1954, Beardsley, on *Macaranga*. MAP: Oct. 1952, Krauss, on *Ficus*.

CAROLINE ATOLLS. ULITHI: Fassarai I., July 1946, Oakley, on *Artocarpus altilis* and *Ficus*; Fassarai I., July 1946, Townes, on *Artocarpus altilis*; Mogmog I., July 1946, on *Artocarpus altilis* and taro; Pontangeras I., Nov. 1947, Dybas; Asor I., Oct. 1952, Krauss, on *Scaevola*; Falalop I., Apr. 1954, Beardsley, on breadfruit. FAIS: Oct. 1952, Krauss, on banana; Apr. 1954, Beardsley, on breadfruit, banana, citrus, and *Calophyllum inophyllum*. NOMWIN: May 1946, Oakley, on *Euphorbia*; Nomwin I., Feb. 1954, Beardsley, on breadfruit, citrus, and papaya; Fananu I., Feb. 1954, Beardsley, on breadfruit and *Scaevola*. E. FAYU: Oct. 1952, Beardsley, on *Scaevola*.

TRUK. WENA (Moen): Feb. 1948, Maehler, on breadfruit; Mar. 1949, Potts; Oct. 1952, Beardsley, on *Vigna marina*. TONOAS (Dublon): Oct. 1952, Beardsley on croton. TON (Tol): Mt. Unibot, Jan. 1953, Gressitt. PIS:

June 1946, Townes on various hosts; Feb. 1954, Beardsley, on breadfruit.

PONAPE. Colonia, Mar. 1948, Dybas, on inflorescence of *Hyophorbe verschaffeltii*; Nanipil, Net District, 300 m., Mar. 1948, Dybas; Colonia, Nov. 1953, Beardsley, on *Glochidion* sp.; Colonia, Feb. 1962, Gordon.

WAKE. Nov. 1959, Ford, on *Scaevola frutescens*.

MARSHALL IS. KWAJALEIN: Apr. 1948, Maehler, on *Scaevola*; Eru I., Apr. 1948, Maehler, on *Wedelia biflora*; Nov. 1952, G. Howe, on breadfruit; Oct. 1953, Beardsley, on breadfruit; Ebeye I., Oct. 1953, Beardsley, on young coconut; Kwajalein I., Oct. 1953, Beardsley, on *Ochrosia*; Apr. 1960, Clagg, on croton; Ebeye I. Apr. 1958, on Euphorbiaceae, Gressitt, Dec. 1958, Krauss. LAE: Lae I., Oct. 1953, Beardsley, on breadfruit. AILINGLAPALAP: Bikajela I. Aug. 1946, Oakley, on breadfruit and banana; June 1949, d'Laubenfels, on breadfruit. JALUIT: Jabor I., Aug. 1946, Oakley, on *Artocarpus altilis* and "cucurbita"; Pinlep I., Oct. 1953, Beardsley, on breadfruit. LIKIEP: Likiep I., Aug. 1946, Oakley, on breadfruit; Mar. 1950, Langford; June 1958, Umhoefer, on breadfruit and *Casuarina* leaves. MAJURO: Uliga I., June 1958, Owen, on *Codiaeum* leaves.

GILBERT IS. BUTARITARI: Butaritari I., Dec. 1957, Krauss, on leaves of *Pluchea odorata*, and *Scaevola*. TARAWA: Betio I., Nov. 1957, Krauss, on breadfruit leaves. Hall (1954) reported outbreaks of this species on breadfruit on Butaritari (Makin) Atoll during August, 1953.

HOSTS: Bananas, breadfruit, citrus, coconut, taro, and a number of ornamental and uncultivated plants. Takahashi (1936-1942) reports this species from Saipan, Palau, Truk, and Jaluit on avocado, breadfruit, *Casuarina*, cotton, croton, and *Euphorbia*.

This species has been a serious economic pest in several parts of Micronesia, particularly on breadfruit. A coccinellid beetle, *Rodolia pumila* Weise, has been introduced and spread in Micronesia to combat this margarodid, and has given satisfactory control in most areas where it is known to be established (Beardsley, 1955). Hall (1954) states that *R. cardinalis* (Mulsant) was introduced into Butaritari to combat this pest.

4. *Icerya purchasi* Maskell.

Icerya purchasi Maskell, 1878, New Zealand Inst. Trans. II: 221.—Rao 1950, Indian Jour. Ent. 12(2): 132, pl. 12.

DISTRIBUTION: Widespread (type locality: New Zealand).

S. MARIANA IS. GUAM: June 1937, Oakley, on lime; Marine Barracks, Nov. 1938, Oakley, on orange; Mt. Lamlam, Dec. 1958, Krauss, on *Casuarina* twig.

WAKE. Nov. 1957, Krauss, on *Casuarina*; Nov. 1959, Ford, on *Scaevola frutescens*.

MARSHALL IS. ENIWETOK: "Nan" I., July 1957, Tuthill, on *Casuarina*.

KWAJALEIN: Kwajalein I., May 1958, Owen, on *Casuarina*; May 1960, Clagg, on *Casuarina*. MAJURO: Uliga I., May 1958, Owen, on *Casuarina*.

GILBERT IS. TARAWA: Bairiki I., Dec. 1957, Krauss, on branches of *Casuarina*.

HOSTS: Reported from *Casuarina*, citrus, and *Scaevola* in Micronesia; recorded from numerous other hosts elsewhere.

The history of the economic importance and biological control of this species is well known. Of the several infestations discovered in the Marshall Islands within the past few years, attempts at eradication have been made at Eniwetok and Majuro, and these may have been successful. On Guam the species is controlled by *Rodolia cardinalis* (Mulsant). This coccinellid has been introduced also to Kwajalein and Eniwetok, but has not been found established.

5. *Icerya seychellarum* (Westwood).

Dorthisia seychellarum Westwood, 1855, Gardener's Chronicle, 830 (not seen).

Coccus sacchari Guerin, 1867, Rev. Mag. Zool. II, 9: 451 (not seen).

Icerya seychellarum: Maskell, 1897, New Zealand Inst., Trans. 29: 329.—
Morrison, 1928, U.S. Dept. Agric., Tech. Bull. 52: 203, figs. 109–111.
— Rao, 1950, Indian Jour. Ent. 12 (2): 135, pl. 13.

DISTRIBUTION: Widespread in Old World tropics and subtropics (type locality: Seychelles Islands).

PALAU. Takahashi (1936: 116) records this species from Angaur, Palau Is. I have not seen specimens of this species from Palau.

YAP. YAP: July 1946, Oakley, on citrus; near Kolonia, Mar. 1954, Beardsley, on citrus leaves.

CAROLINE ATOLLS. ULITHI: Dec. 1944, Hensell, on breadfruit; Mogmog I., July 1946, Oakley, on *Eugenia* and coconut; July 1946, Townes, on *Achyranthes aspera*; Fassarai I., July 1946, Oakley, on *Citrus*; Falalop I., Dec. 1952, Krauss, on coconut; Apr. 1954, Beardsley, on breadfruit and *Eugenia* sp.

OCEAN I. (Banaba): Dec. 1957, Krauss, on unidentified plant.

HOSTS: Recorded hosts in Micronesia include breadfruit, coconut, citrus, and several other plants of less economic importance. *I. seychellarum* has been reported elsewhere as a pest of sugar cane, but most if not all of these records may apply actually to *I. pilosa* Green. The latter species was usually considered to be a synonym of *I. seychellarum* until recently, but Rao (1950: 127) considers *I. pilosa* a valid species. The latter is apparently restricted principally to graminaceous hosts, whereas *I. seychellarum* seems to occur only on non-graminaceous plants. These facts raise a question as to the designation of the proper type species of *Icerya*. It seems possible that *Coccus sacchari* Guerin, published as a *nomen nudum*, may have been

the same as *I. pilosa*, rather than *I. seychellarum*. The solution of this problem is beyond the scope of this paper.

Icerya seychellarum has been a serious pest of breadfruit in Samoa. At Ulithi in 1954, apparently in the absence of any effective predators, *I. seychellarum* and *I. aegyptiaca* were found in heavy, often mixed infestations on breadfruit.

Genus **Steatococcus** Ferris

Steatococcus Ferris, 1921, Stanford Univ. Ser. Biol. Sci. **1** (2) : 69.—Morrison, 1928, U.S. Dept. Agric., Tech. Bull. **52** : 214.

Type of genus: *Palaeococcus morrilli* Cockerell.

6. **Steatococcus samaraius** Morrison.

Steatococcus samaraius Morrison, 1927, Biol. Soc. Washington, Proc. **40** : 109.

DISTRIBUTION: New Guinea (type locality), Solomon Islands, Caroline Islands.

PALAU. BABELTHUAP: Ngerehelong, Dec. 1947, Dybas; Ulimang, Dec. 1947, Dybas. KOROR: July 1946, Oakley, on *Acacia*; Nov. 1947, on large leaf taro; Mar. 1948, Maehler, on citrus, *Hibiscus tiliaceus*, malvaceous plant, *Psidium guajava*, and unidentified plant; Apr. 1949, Langford; Feb.–July 1953, Beardsley, on *Acalypha* spp., banana, *Casuarina*, coconut, *Erythrina* sp., and rose; July 1958, Owen, on *Casuarina*.

YAP. YAP: Balabat, Dec. 1963, Owen, on banana.

HOSTS: Found in Palau on a variety of hosts including banana, coconut, giant taro, guava, and various ornamental and wild plants.

In Palau, *S. samaraius* is preyed upon by a coccinellid beetle, *Rodolia pumila*, and apparently has not become a pest of major importance.

Specimens of *S. samaraius* are also at hand from the following localities in the Solomon Islands: Guadalcanal, Nov. 1954, Brown; and Malaita, June 1954, Brown. This species has not been reported previously from the Solomons.

FAMILY ORTHEZIIDAE

A single species belonging to this relatively small and well-defined group of coccids has been identified from Micronesia. The entire family has been admirably treated in monographs by Morrison (1925; 1952).

Genus **Nipponorthezia** Kuwana

Nipponorthezia Kuwana, 1916, Annot. Zool. Japon. **9** : 150 (not seen).—

Morrison, 1925, Jour. Agric. Res. **30** (2) : 153.

Ortheziella Silvestri, 1924, Roy. Soc. Espan. Hist. Nat., Bol. **24** : 170.

Type of genus: *Nipponorthezia ardisiae* Kuwana.

7. *Nipponorthezia guadalcanalia* Morrison.

Nipponorthezia guadalcanalia Morrison, 1952, U.S. Dept. Agric., Tech. Bull. **1052**: 73.

DISTRIBUTION: Solomon Is. (type locality: Guadalcanal I.), Micronesia, Hawaii.

PALAU. BABELTHUAP: Ngatpang, 65 m., Dec. 1952, Gressitt.

YAP. YAP: North Yap, July–Aug. 1950, Goss, ex Berlese funnel; Mt. Tabiwol (Mt. Gillifitz), 150 m., Nov. 1952, Gressitt, ex Berlese funnel; hill behind Kolonia (Yaptown), Dec. 1952, Gressitt, ex Berlese funnel.

TRUK. TON (Tol): Mt. Unibot, Jan. 1953, Gressitt, ex rotting banana stalk and ex Berlese funnel.

KUSAIE. "Hill 1575," 230 m., Feb. 1953, Clarke; "Hill 1515," Feb. 1953, Clarke, ex trash from forest floor; "Hill 1010," Feb. 1953, Clarke, ex tree below epiphyte; Mt. Matante, Mar. 1953, Clarke.

HOSTS: Unknown. The available specimens are all from Berlese funnel collections from ground litter, or otherwise indicated as probably from decaying vegetable matter. It is likely that this is a root-feeding form. The Micronesian specimens were compared with the holotype in Washington, D.C.

FAMILY PSEUDOCOCCIDAE

The mealybugs comprise one of the largest families of the Coccoidea. The group is of nearly worldwide distribution, and includes many important pests of plant crops. The Micronesian pseudococcid fauna contains a number of the common pest species which have been widely disseminated by man, as well as several presumably endemic elements. Some of the species as yet known only from Micronesia may be expected to turn up in other areas of the southwestern Pacific when the mealybug fauna of this vast region has been more thoroughly studied. Among the possibly endemic forms, the mealybug species associated with Pandanaceae (*Pandanus* and *Freycinetia*) are of particular interest. The relative wealth of species attached to these plants in Micronesia suggests that *Pandanus* and its relatives should prove a fertile source of pseudococcid species in other areas of the Pacific as well. The Micronesian material available from grasses, and from plant roots generally, although very limited in number of specimens, has yielded several new forms, suggesting that further collecting from such host sources will likely prove rewarding.

At present, the generic classification of the Pseudococcidae seems somewhat unsettled. Many new genera have been proposed in recent years as authors have attempted to devise workable classificatory arrangements (see Ferris, 1950, 1953; Borchsenius, 1949, McKenzie, 1960; Williams, 1960, 1962). Most of these new genera are described in faunistic studies which

treat limited geographical areas, and frequently those proposed for the fauna of a given region cannot be applied to other faunae without serious modification of generic definitions or the erection of still more new genera to accommodate intermediate forms. What is needed is a revisionary study of the Pseudococcidae of worldwide scope, and one which treats the male sex as well as the neotenic females. That the males can be useful in mealybug taxonomy has been shown elsewhere (Beardsley, 1960, 1962). As males appear to be relatively conservative structurally, they may eventually prove of value in delimiting supraspecific categories within the Pseudococcidae. For the great majority of mealybug species, however, the males remain unknown or undescribed.

Although I have accepted several recently proposed mealybug genera which are based upon species which occur in Micronesia, for example, *Laminicoccus* Williams, I have proposed new genera only for those species which obviously cannot be accommodated within current concepts of existing genera. In two genera, *Pseudococcus* Westwood and *Dysmicoccus* Ferris, species have been assigned which do not seem closely allied to the respective type species of these genera. As presently constituted, these two groups appear to be polyphyletic. However, in view of the present state of pseudococcid taxonomy, it seems unwise to propose additional new genera at this time.

For a general consideration of mealybug morphology and explanation of the terms employed here, the reader is referred to Ferris (1950) and McKenzie (1960). Recent workers have begun to utilize certain morphological characters in mealybug taxonomy which were largely ignored by Ferris in his monumental "Atlas." Among these are the number and distribution of micropores (tiny translucent spots or pores) which are often found on the legs, particularly those of the metathorax, and sometimes in the derm surrounding the bases of the hind legs; and the presence or absence and distribution of small discoidal pores (sieve pores of some authors) which differ distinctly from the usual multilocular disc pores. These discoidal pores are fairly numerous scattered over the body, particularly the dorsum, on some species assigned to *Dysmicoccus*, for example, *D. brevipes* (Cockerell) and *D. neobrevipes* Beardsley, and are present in some species of *Pseudococcus*, such as *P. obscurus* Essig, where they are reduced to a very few on the hind margins of the eyes and sometimes on the venter of the anal lobes. Proper study of these microscopic structures requires carefully prepared and well-stained specimens.

The size and shape of appendages have also been utilized to a limited extent in recent works dealing with mealybugs, as by McKenzie, 1960. The legs and antennae often vary considerably in length even among specimens from a single collection, and these measurements have been used only sparingly in the descriptions and keys which follow. The length of the

rostrum or "beak" appears to be subject to less intraspecific variation than are the lengths of other appendages, and this character has been used fairly frequently in the treatment of the Micronesian mealybugs which follows. Satisfactory measurement of the length of the rostrum requires specimens in which this structure lies parallel to the cover glass, which is not always the case. The length of this structure, as indicated in the accompanying figures, is measured from the anterior margin of the small baso-lateral sclerite (this generally bears three setae, but is not always distinctly separated from the next segment) to the apex of the distal segment. For a diagram which illustrates the morphological terms employed here see McKenzie (1960, fig. 1).⁴

KEY TO MICRONESIAN GENERA OF PSEUDOCOCCIDAE

ADULT FEMALES

1. Legs absent; antennae reduced to 1- or 2-segmented stubs; body in fully mature individuals relatively heavily sclerotized..... 2
 Legs present; antennae with 5 or more segments; body not heavily sclerotized at maturity..... 3
2. With a roughly circular depressed area containing numerous very small tubular ducts situated on venter behind each posterior spiracle; posterior abdominal segments differentiated, their lateral margins steplike in appearance... **Chaetococcus**
 Without such an area of very small tubular ducts behind posterior spiracle; posterior segments of abdomen less strongly differentiated; their lateral margins not steplike..... **Antonina**
3. Anal lobes strongly protuberant and sclerotized, each bearing at apex a single large spinelike process nearly as long as the lobe; living on roots of various plants..... **Geococcus**
 Anal lobes less protuberant, partly to completely unsclerotized, without such a large spinelike process..... 4
4. Body bearing conspicuous bi- or tritubular pores (fig. 22) in addition to other types; antennae 5- or 6-segmented, set close together on head; small root-inhabiting species..... **Rhizoecus**
 Without such bi- or tritubular pores; antennae 6- to 9-segmented, set farther apart on head..... 5
5. Cerarii limited to not more than 3 pairs, 1 each on last, penultimate, and sometimes antipenultimate abdominal segments, and without a continuous lateral fringe of long conical setae; cerarii sometimes wanting..... 6
 With 4 or more pairs of marginal cerarii, or with a more or less continuous lateral fringe of long conical setae..... 11
6. Dorsum bearing large tubular ducts with orifices each surrounded by a conspicuous sclerotized area from which 1 or more setae arise..... **Ferrisia**
 Dorsum without such tubular ducts..... 7

⁴ At the time this paper was written, I followed Ferris' interpretation of abdominal segmentation in the Pseudococcidae (Ferris 1950 : 5). Based on the position of the female vulvar opening, Ferris postulated that the anal lobes belong morphologically to abdominal segment 9, the dorsal ostioles to segment 7, and that the true first abdominal segment is not clearly discernible. The numbering of abdominal segments used in the present paper is based on this system. Since preparing this manuscript I have concluded, from evidence furnished by the adult males and from the opinions of other authors, that Ferris' interpretation of segmentation may not have been correct. In a paper written more recently, I have numbered the segments differently, referring to the first discernible segment as segment 1, etc. (Beardsley 1965 : 56, footnote.)

7. Circulus large, hourglass-shaped; last three abdominal segments each with a conspicuous long seta on each lateral margin **Saccharicoccus**
Circulus relatively small or absent; long setae present on anal lobes only 8
8. Venter of anal lobes each with a narrow elongate sclerotized area; typical cerarii bearing conical setae wanting; with a few oral-rim tubular ducts present on lateral margins of dorsum **Palauococcus**
Venter of anal lobes without such an elongate sclerotized area; with 1 to 3 pairs of cerarii bearing conical setae on posterior abdominal segments; oral-rim tubular ducts absent 9
9. Trilocular pores very few or wanting, if present then limited to a few associated with cerarii **Neoripersia**
Trilocular pores moderately plentiful, scattered over both dorsum and venter 10
10. Body of mature female decidedly turbinate in form; anal ring setae elongate, about three times as long as anal ring **Turbinococcus**
Body elongate or elongate-oval; anal ring setae shorter, less than twice as long as anal ring **Trionymus**
11. Micronesian species with a conspicuous unbroken fringe of elongate conical setae completely around lateral margin of body **Neosimmondsia**
Conical setae arranged in definite cerarii, without such an unbroken marginal fringe 12
12. Ventral derm surrounding attachment of hind coxae with a patch of minute tubular ducts **Palmicultor**
Ventral derm without such a patch of minute ducts near bases of hind coxae 13
13. Anal lobe cerarii each with more than 2 conical setae 14
Anal lobe cerarii each normally with but 2 conical setae 16
14. Body form at maturity rotund; anal ring located on dorsum, one-half its length or more from posterior margin of body; with 18 pairs of fairly distinct marginal cerarii **Paraputo**
Body form oval to elongate; anal ring with its hind margin at posterior apex of dorsum; with 17 or fewer pairs of distinct marginal cerarii 15
15. With 17 pairs of cerarii, each borne on a definite sclerotized plate **Laminicoccus**
With 17 or fewer pairs of cerarii, not borne on definite sclerotized plates, derm surrounding anal cerarii sometimes slightly sclerotized **Dysmicoccus** (in part)
16. Tarsal claws each with a minute tooth on inner face **Phenacoccus**
Tarsal claws without such a tooth on inner face 17
17. With 18 pairs of marginal cerarii; venter of anal lobes with a narrow, elongate, barlike sclerotized area extending anteriorly from anal lobe seta **Planococcus**
With 17 or fewer pairs of cerarii; venter of anal lobes without such a narrow barlike sclerotized area 18
18. Multilocular disc pores numerous, scattered on both dorsal and ventral surfaces; tubular ducts of an extremely shallow type, their depth no greater than diameter of orifice **Pandanicola**
Multilocular disc pores less numerous, largely restricted to venter of abdomen, occasionally with a few on venter of head and thorax, absent on dorsum; tubular ducts conspicuously deeper than diameter of orifice 19
19. One or more oral-rim tubular ducts usually present on dorsum; if wanting, then with multilocular disc pores confined to margin of vulva **Pseudococcus**
Without oral-rim tubular ducts; multilocular disc pores present on several abdominal segments anterior to vulva **Dysmicoccus** (in part)

Genus *Antonina* Signoret

Antonina Signoret, 1875, Soc. Ent. France, Ann. V, 5: 24.—Ferris, 1953, Atlas Scale Ins. North America 6: 269.

Type of genus: *Antonina purpurea* Signoret.

8. *Antonina graminis* (Maskell).

Sphaerococcus graminis Maskell, 1897, Ent. Mo. Mag. **11** (8) : 244.

Antonina graminis: Fernald, 1903, Cat. Coccidae of World, 121.—Zimmerman, 1948, Insects of Hawaii **5** : 156, fig. 91.

Antonina indica Green, 1908, Dept. Agric. India (Ent. Ser.) Mem. **2** : 27, pl. 3, fig. 11.—Takahashi, 1941, Tenthredo **3** (3) : 217.

Antonina boutelouae: Fullaway, 1946, B. P. Bishop Mus., Bull. **189** : 158 (not *A. boutelouae* Parrott, 1900).

DISTRIBUTION: Africa, China (type locality), Southwestern North America, Hawaii, Johnston Island, Micronesia.

S. MARIANA IS. GUAM: Piti, June 1911, Fullaway, on *Cynodon*; in quarantine at San Pedro, Oct. 1947, J. H. Michel, on Graminae. SAIPAN: Kalabera, no date, Esaki (?), on *Digitaria* grass. Takahashi (1941 : 217) records this species as *A. indica* from Saipan on grass.

PALAU. KOROR: June 1953, Beardsley, on large variegated grass.

TRUK. TONOAS (Dublon): Oct. 1952, Beardsley, on *Cynodon dactylon*.

WAKE. Nov. 1959, Ford, on lower stems of grass.

MARSHALL IS. KWAJALEIN: In quarantine at Hawaii, Nov. 1946, Jones, on *Cynodon dactylon*.

JOHNSTON I. May, 1946, Krauss.

HOSTS: Various grasses including *Cynodon dactylon* and *Digitaria* sp.

Adults of an encyrtid parasite, *Dusmetia sangwani* Rao, emerged from specimens collected on Wake Island by Ford.

This species has been adequately redescribed and figured by Ferris (1948). As Williams (1958 : 206) has previously pointed out, Ferris' later redescription and figure (1953 : 294, fig. 112) are misleading in that the presence of dorsal trilocular pores is not indicated. Furthermore, Ferris uses the supposed absence of these pores to separate the species from *A. crawii* Cockerell in his key to North American species. However, Dr. Harold Morrison informed me (personal communication) that dorsal trilocular pores are present in the *A. graminis* specimens studied by Ferris. Such pores are present in all Micronesian and Hawaiian specimens which I have examined.

The slides upon which Fullaway based his 1946 record of *A. boutelouae* Parrott from Guam were examined during this study and found to be *A. graminis*.

Genus **Chaetococcus** Maskell

Chaetococcus Maskell, 1898, New Zealand Inst., Trans. **30** : 249.—Morrison and Morrison 1922, U.S. Nat. Mus., Proc. **60** (12) : 55.

Type of genus: *Sphaerococcus bambusae* Maskell.

This genus is closely allied to the preceding, and was considered ques-

tionably distinct by Morrison (1922) and others. However, several recent workers apparently have accepted *Chaetococcus* as distinct from *Antonina* (Borchsenius, 1949; Williams, 1958).

9. *Chaetococcus bambusae* (Maskell).

Sphaerococcus bambusae Maskell, 1892, New Zealand Inst., Trans. **25** : 237.

Chaetococcus bambusae (Maskell), 1898, New Zealand Inst., Trans. **30** : 249.—Morrison and Morrison, 1922, U.S. Nat. Mus., Proc. **60** (12) : 56, fig. 18.—Williams, 1958, Brit. Mus. (Nat. Hist.) Ent. Bull. **6** (8) : 206, fig. 1.

Kermicus bambusae: Kirkaldy, 1902, Fauna Hawaiiensis **3** (2) : 104.

Antonina bambusae: Fullaway, 1923, Hawaiian Ent. Soc., Proc. **5** : 310.—Zimmerman, 1948, Insects of Hawaii **5** : 150.

DISTRIBUTION: Widespread in Oriental and Ethiopian regions, Hawaii (type locality), S. Mariana Is., Western Caroline Is.

S. MARIANA IS. SAIPAN: Civ. Ad. Center, Feb. 1946, Maehler, on bamboo; Japanese Expt. Sta. site, June 1946, Oakley, on bamboo. Takahashi (1939 : 261 and 1941 : 217) recorded this species from Saipan, on bamboo.

PALAU. KOROR: July 1946, Oakley, on bamboo.

YAP. YAP: Sept. 1956, McDaniel, on bamboo.

HOSTS: Bamboos.

Genus ***Dysmicoccus*** Ferris

Dysmicoccus Ferris, 1950, Atlas Scale Ins. North America **5** : 53.

Type of genus: *Dactylopius brevipes* Cockerell.

The species presently assigned to this genus do not appear to constitute a monophyletic group, and *Dysmicoccus* seems to have become a convenient receptacle for *Pseudococcus*-like species lacking dorsal oral-rim tubular ducts or other particularly distinguishing features. McKenzie (1960) has assigned to this genus such species having six or more pairs of marginal cerarii, while those with five or fewer pairs of cerarii are placed by him in *Trionymus*. When the world pseudococcid fauna becomes more adequately known it will almost certainly become necessary to define *Dysmicoccus* more strictly. The type species and certain others which are probably of Neotropical origin, for example *D. neobrevipes* Beardsley and *D. probrevipes* Morrison, possess certain features in common, such as the presence of small dorsal discoidal pores and multiple conical setae in all abdominal cerarii except those of the anal lobes, and the genus should perhaps be restricted to such forms. However, for the purposes of this paper I have accepted McKenzie's concept of the genus.

KEY TO MICRONESIAN SPECIES ASSIGNED TO DYSMICOCCUS

1. With 17 pairs of marginal cerarii 2
Normally with but 4 to 6 pairs of marginal abdominal cerarii, plus an interantennal pair **boninsis**
2. Body with scattered small dislike pores (discoidal pores), in addition to the usual larger multilocular disc pores, always evident on dorsum of posterior abdominal segments and frequently scattered elsewhere on body 3
Body without such small dislike pores 4
3. Sclerotized area on venter of anal lobes relatively elongate, at least twice as long as wide; dorsum of abdominal segment 9 without a median patch of conspicuous long setae **neobrevipes**
Sclerotized area on venter of anal lobe about as wide as long; dorsum of abdominal segment 9 with a median patch of conspicuously elongate setae, 45–80 μ long **brevipes**
4. Anal lobe cerarii normally with but 2 large conical setae borne on a distinctly sclerotized area; tubular ducts absent on dorsum **wistariae**
Anal lobe cerarii normally with more than 2 conical setae, the surrounding derm unsclerotized; tubular ducts present dorsally near almost every cerarius . **saipanensis**

10. *Dysmicoccus boninsis* (Kuwana).

Pseudococcus calceolariae Kirkaldy, 1902, Fauna Hawaiiensis **3** (2) : 103
(not *Dactylopius calceolariae* Maskell, 1879).

Dactylopius (Pseudococcus) boninsis Kuwana, 1909, New York Ent. Soc., Jour. **17** (4) : 161.

Trionymus calceolariae Fullaway, 1923, Hawaiian Ent. Soc., Proc. **5** (2) : 312 (not *Dactylopius calceolariae* Maskell, 1879).

Pseudococcus boninsis: Morrison, 1925, Jour. Agric. Res. **31** (5) : 489.—
Zimmerman, 1948, Insects of Hawaii **5** : 185, fig. 104.

Dysmicoccus boninsis: Ferris, 1950, Atlas Scale Ins. North America **5** : 57, fig. 18.—Beardsley, 1960, Hawaiian Ent. Soc., Proc. **17** (2) : 216, fig. 2, E (male).

DISTRIBUTION: Nearly pantropical, including Hawaii and Micronesia (type locality: Bonin Is.).

S. MARIANA IS. GUAM: Sept. 1911, Fullaway, on sugar cane; Com. Mar. Hill, Dec. 1948, Maehler, on sugar cane.

PALAU. BABELTHUAP: July 1946, Townes, on Jobs tears (*Coix lacryma-jobi*). KOROR: March 1948, Maehler, on *Coix lacryma-jobi*.

CAROLINE ATOLLS. FAIS: Jan. 1964, Bianchi, on sugar cane. WOLEAI: Utegal I., July 1946, Oakley, on sugar cane; Falalis I., Feb. 1953, Beardsley, on sugar cane. FARAULEP: Faraulep I., Jan. 1964, Owen, on sugar cane nodes.

TRUK. TON (Tol): May, 1946, Oakley, on sorghum.

PONAPE. Colonia, Feb. 1948, Dybas, on sugar cane.

HOSTS: Sugar cane, sorghum, Jobs tears. It probably occurs also on other large grasses.

Although the type locality of this species is the Bonin Islands, no specimens from these islands were present in the survey material studied. The whereabouts of Kuwana's type material is unknown.

Takahashi (1941: 215) records *Trionymus taiwanus* Takahashi from Saipan. In 1955, Dr. Morrison examined a slide, now in the Formosa Experiment Station, labeled "Mariana Isls/Saipan:/Tsukimijima/2. vii. 1939, T. Esaki, *Trionymus taiwanus* Takah., host: grass roots (Det. R. Takahashi)." The slide bore a single specimen which apparently was part of the material upon which Takahashi's record was based. Dr. Morrison concluded that the specimen was identical with *Dysmicoccus boninsis* (Kuwana). He also examined specimens of *T. taiwanus* from Formosa received from Takahashi, and noted that this material also appeared to be the same as *D. boninsis*. Therefore, it is probable that *T. taiwanus* is a synonym of *D. boninsis*, although, for confirmation, an examination of the type of the former should be made.

11. *Dysmicoccus brevipes* (Cockerell).

Coccus bromeliae Bouché, 1834, Naturgesch. Ins. 20 (not seen), preoccupied by *Coccus bromeliae* Kerner, 1778 (see Morrison, 1929: 34).

Pseudococcus bromeliae (Bouché), of authors.

Dactylopius brevipes Cockerell, 1893, Entomologist 26: 267.

Pseudococcus brevipes: Fernald, 1903, Cat. Coccidae of World, 98.—Zimmerman, 1948, Insects of Hawaii 5: 189, fig. 105.—Balachowsky, 1957, Rev. Path. Veg. Ent. Agric. France 36 (4): 189, fig.

Pseudococcus palauensis Kanda, 1933, Annot. Zool. Japon. 14: 135 (not seen; synonymy according to Takahashi, 1936: 109).

Dysmicoccus brevipes: Ferris, 1950, Atlas Scale Ins. North America 5: 59, fig. 19.

DISTRIBUTION: Most tropical and subtropical parts of the world (type locality: Jamaica) including Hawaii and Micronesia.

S. MARIANA IS. SAIPAN: June 1946, Townes, on pineapple and *Pandanus fragrans*. TINIAN: March 1945, E. Hagen; June 1946, Oakley, on pineapple. AGIGUAN: June 1952, Kondo. ROTA: Sabana, June 1946, Townes, on *Pandanus tectorius*. GUAM: Piti, June 1911, Fullaway, on pineapple and on *Annona muricata*; Dec. 1911, Fullaway, on coffee; Barrigada, April 1946, Krauss, on pineapple; Mt. Alifan, April 1946, Krauss; Yona, Oct. 1952, Krauss, on palm fruits.

PALAU. KOROR: Jan. 1938, Esaki (reported as *Formicococcus* sp. by Takahashi, 1939).

YAP. Aug. 1950, Goss, on sugar cane.

TRUK. UTOT (Udot): Jan. 1949, Langford. TON (Tol): Jan. 1949, Langford, on pineapple.

PONAPE. Colonia, Aug. 1946, Oakley, on pineapple; Mar. 1948, Dybas, ex unopened inflorescence of palm, *Hyophorbe* sp.; Agric. Expt. Station near Colonia, Jan. 1953, Gressitt, on woody composite.

MARSHALL IS. MAJURO: Uliga I., June 1950, La Rivers. JALUIT: Jabor I., Aug. 1946, Oakley, on sugar cane. EBON: Ebon I., Sept. 1953, Beardsley, on sugar cane.

GILBERT IS. TARAWA: Dr. D. J. Williams reports seeing specimens from Tarawa, on coconut (personal communication).

HOSTS: This species has been reported from a wide variety of hosts throughout its range. Among plants of agricultural importance in Micronesia, it has been found on pineapple, sugar cane, coconut, *Pandanus*, coffee, and soursop (*Annona muricata*). Takahashi (1936–1942) reported this species from Saipan, Yap, and Palau, on *Annona muricata*, betel palm, *Pandanus*, and pineapple.

Dactylopius (Pseudococcus) ananassae Kuwana (1909, New York Ent. Soc., Jour. 17: 162) described from the Bonin Islands, is very likely a synonym of *D. brevipes*. Unfortunately, no specimens of Kuwana's species have been available for study and the whereabouts of the type specimens is unknown.

Takahashi (1939: 254) reported on a single specimen from Koror which he assigned to *Formicococcus* Takahashi, but did not name because of its poor condition. This specimen was made available to me and has been restained and remounted to facilitate critical study. It appears to be a poor, possibly aberrant specimen of *Dysmicoccus brevipes*. The characteristic discoidal pores are readily discernible, and the ventral sclerotized areas of the anal lobes are short and broad as in *D. brevipes*; certainly not narrow and barlike as in *F. cinnamoni* Takahashi, the type of the genus *Formicococcus*. The anal ring of this specimen has been pushed forward so that the posterior part of the dorsum lies over it, and it appears that some, if not all, of the supernumerary anal ring setae seen by Takahashi, which prompted him to place the specimen in *Formicococcus*, are actually the long dorsal setae of the ninth abdominal segment which are characteristic of *D. brevipes*.

Balachowsky (1957) has satisfactorily redescribed and figured the pineapple mealybug, pointing out several morphological characters, such as the discoidal pores, which were overlooked in earlier descriptions by Ferris (1948 and 1950).

12. *Dysmicoccus neobrevipes* Beardsley.

Dysmicoccus neobrevipes Beardsley, 1959, Hawaiian Ent. Soc., Proc. 17 (1): 31, figs. 1–2; 1960, *ibid.* 17 (2): 217, fig. 2, F (male).

DISTRIBUTION: Hawaii (type locality), S. Mariana Is., Gilbert Is., Jamaica.

S. MARIANA IS. ROTA: Angiano, June 1946, Oakley, on *Theobroma cacao*; June 1946, Townes, on *Agave sisalana*. GUAM: Agana Swamp, June 1936, Swezey, on *Crescentia alata* fruit; Feb. 1938, Oakley, on *Barringtonia speciosa*; Mar. 1938, Oakley, on tuberose; Dec. 1953, Liming, on *Pipturus argenteus*.

GILBERT IS. TARAWA: Aug. 1956, Brown, on banana; Bairiki I., Nov. 1957, Krauss, on *Guettarda*.

HOSTS: In Hawaii, it has been reported from a variety of plants including pineapple, but not yet on grasses (see Beardsley, 1959). Reported hosts of agricultural importance in Micronesia include banana, cacao, and agave.

This species and *D. brevipes* are closely related and both are probably of Neotropical origin. In Hawaii, *D. neobrevipes* is bisexual whereas *D. brevipes* appears to be entirely parthenogenetic.

13. *Dysmicoccus saipanensis* (Shiraiwa), new combination (figs. 2; 21, a).

Pseudococcus saipanensis Shiraiwa, 1933, Yokohamazeikwan Zigyogairyo, 8–10 (in Japanese; original not seen).

Pseudococcus cocotis: Takahashi, 1939, Tenthredo 2 (3) : 239.—Fullaway 1946, B. P. Bishop Mus., Bull. 189 : 157.

DISTRIBUTION: Micronesia (type locality: Saipan).

N. MARIANA IS. PAGAN: Feb. 1959, Cantelo, on coconut. ALAMAGAN: Aug. 1948, Doutt, on coconut.

S. MARIANA IS. SAIPAN: Ants Valley, June 1946, Oakley, on coconut. GUAM: Oct. 1908, Evans, on coconut; Dec. 1908, Castenoble, on coconut; Piti, June 1911, Fullaway, on coconut; Inarajan, May 1936, Usinger, on coconut; Sinajana, Sept. 1938, Oakley, coconut trunks; Oca Pt., May 1945, Dybas, on dead coconut frond; Tumon Bay, April 1946, Krauss; 1.6 km. S. E. Asan, Nov. 1947, Dybas, on coconut; Com. Mar. Hill, April 1948, Maehler, on coconut; in quarantine at Honolulu, Mar. 1953, H. Makino, on coconut.

YAP. MAP: July–Aug. 1950, Goss, on coconut palm. YAP: Guror (Goror), March 1949, Maehler, on coconut; June 1956, McDaniel, on coconut.

CAROLINE ATOLLS. LAMOTREK: Feb. 1950, Langford, on coconut. FARAULEP: Faraulep I., Jan. 1964, Owen, on coconut spike. WOLEAI: Utegal I., July 1946, Oakley, on coconut; Utegal I., Feb. 1953, Beardsley, on coconut. IFALUK: Ifaluk I., Feb. 1953, Beardsley, and Aug. 1953, Bates, on coconut. NUKUORU: Nukuoru I., Aug. 1946, Oakley, *Cocos nucifera*; Shenukdei I., Aug. 1946, Oakley, on coconut. NOMWIN: Nomwin I., Feb. 1954, Beardsley, on coconut. NAMA: Oct. 1952, Beardsley, on coconut.

TRUK. FEFAN: May 1946, Oakley, coconut. PIS: June 1946, Oakley, coconut; Feb. 1954, Beardsley, coconut foliage.

PONAPE. Colonia, Aug. 1946, Oakley, on *Cocos nucifera*.

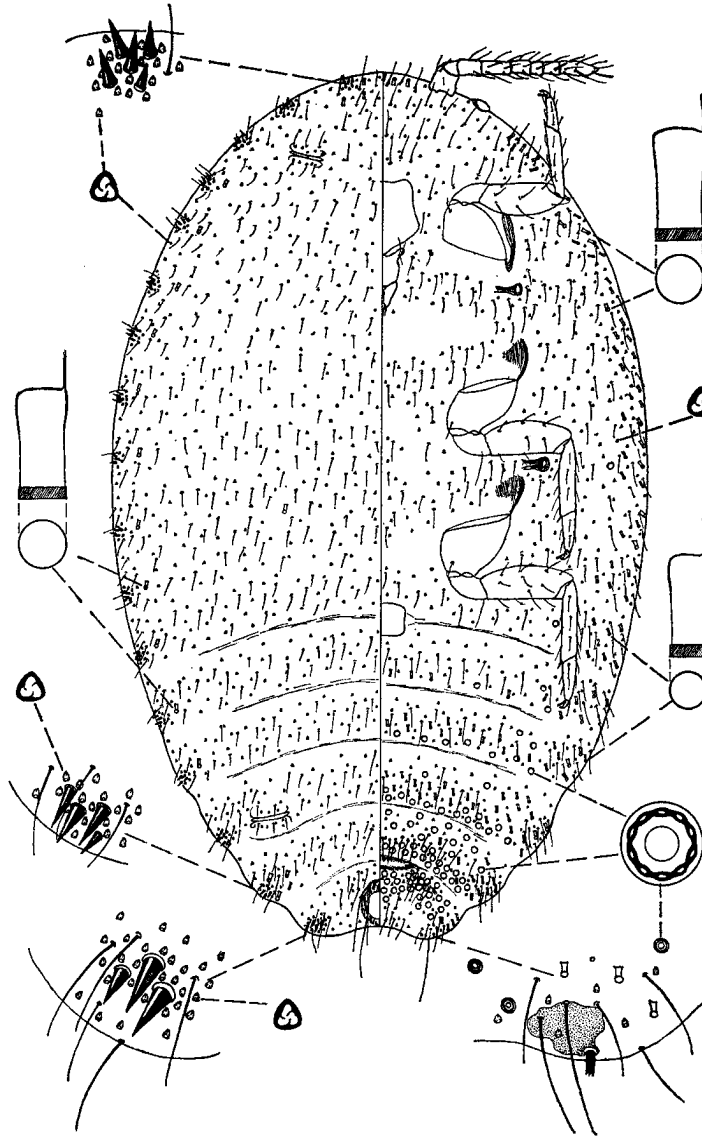


FIGURE 2.—*Dysmicoccus saipanensis*, adult female, dorsal and ventral aspects and details.

KUSAIE. Malem, Feb. 1953, Clarke, on *Cocos nucifera*.

MARSHALL IS. LAE: Lae I., Oct. 1953, Beardsley, on coconut foliage. AILINGLAPALAP: Ailinglapalap I., Aug. 1946, Oakley, on *Cocos nucifera*; Bikajela (Bigatyelang) I., Aug. 1946, on *Cocos nucifera*. MAJURO: Majuro I., Aug. 1946, Oakley, on coconut; and Sept. 1953, Beardsley, on coconut; Uliga I., June 1950, La Rivers; Jaroj (Darrit) I., June 1958, Owen, on unopened coconut spike. JALUIT: Jabwar I., Aug. 1946, Oakley, on coconut; Mejetto (Medyado) I., Aug. 1946, Oakley, on *Cocos nucifera*; Majurirok I., May 1958, Gressitt.

HOST: Coconut (*Cocos nucifera*). Takahashi (1936–1942) lists this species from coconut on Saipan, Rota, Yap, Woleai, Truk, and Jaluit.

Eventually, this may prove to be identical with *Dactylopius cocotis* Maskell. The specimens at hand from Micronesia agree fairly well with Cottier's description (1936) of what he considered to represent *D. cocotis*. However, Maskell's type specimens remain unlocated. Furthermore, specimens from the Maskell collection now in Washington, D.C. and presumably from Fiji, the type locality of *cocotis*, differ in minor respects from Micronesian *D. saipanensis*; for example, most possess several small conical setae on the dorsum of the posterior abdominal segments, usually two each on segments 6 and (or) 7 which are not present on any of the Micronesian specimens of *saipanensis*. Until Maskell's type can be located, or at least until additional Fijian and South Pacific material has been studied, it seems wise to apply Shiraiwa's name to the Micronesian specimens.

14. *Dysmicoccus wistariae* (Green).

Pseudococcus wistariae Green, 1923, Ent. Mo. Mag. **59**: 218.

Pseudococcus piricola Shiraiwa, 1935, Kontyu **9**: 69.

Pseudococcus cuspidatae Rau, 1937, Brooklyn Ent. Soc., Bull. **32**: 195.

Dysmicoccus cuspidatae: Ferris, 1950, Atlas Scale Ins. North America **5**: 61, fig. 20.

Dysmicoccus piricola: Takahashi, 1957, Osaka Prefecture, Bull. (B)7: 3.

Dysmicoccus wistariae: Williams, 1962, Brit. Mus. (Nat. Hist.) Ent. Bull. **12** (1): 23.

DISTRIBUTION: England (in glasshouses; type locality), United States, Japan, Gilbert Is.

GILBERT IS. BUTARITARI: Butaritari I., Dec. 1957, Krauss, on breadfruit.

HOSTS: Recorded from breadfruit in Micronesia. Elsewhere it has been taken on *Wisteria* (type host), *Taxus*, and pear.

Genus **Ferrisia** Fullaway

Ferrisia Fullaway, 1923, Hawaiian Ent. Soc., Proc. **5** (2) : 311.

Ferrisiana Takahashi, 1929, Nat. Hist. Soc. Formosa, Trans. **19** (104) : 429.

Type of genus: *Dactylopius virgatus* Cockerell.

Takahashi proposed *Ferrisiana* to replace *Ferrisia* Fullaway as he considered the latter to constitute a homonym of *Ferrissia* Walker, 1903 (Mollusca). As McKenzie (1962 : 638, footnote) has recently pointed out, Article 56a of the International Code of Zoological Nomenclature adopted by the XV International Congress of Zoology, published in 1961, specifically states that generic names differing in even one letter shall not be considered homonyms, hence the valid name is *Ferrisia*.

15. Ferrisia virgata (Cockerell).

Dactylopius virgatus Cockerell, 1893, Entomologist **26** : 178.

Pseudococcus virgatus: Ferris, 1919, Jour. Econ. Ent. **12** (4) : 297.

Ferrisia virgata: Fullaway, 1923, Hawaiian Ent. Soc., Proc. **5** (2) : 308.

Ferrisiana virgata: Takahashi, 1929, Nat. Hist. Soc. Formosa, Trans. **19** (104) : 429.—Zimmerman, 1948, Insects of Hawaii **5** : 271, fig. 144.—Ferris, 1950, Atlas Scale Ins. North America **5** : 93, fig. 35.—Beardsley, 1960, Hawaiian Ent. Soc., Proc. **17** (2) : 218, fig. 2, G (male).

DISTRIBUTION: Widespread in tropical and subtropical areas of the world (type locality: Jamaica), including Hawaii and Micronesia.

S. MARIANA IS. SAIPAN: Afenia (Afetna) Pt., June 1946, Townes, on *Alternanthera versicolor*; Experiment Station site, June 1946, Oakley, egg-plant. TINIAN: Lake Hagoi (Hagoya), June 1946, Oakley, tomato; Camp Chulo (Churo), June 1946, Oakley, squash. GUAM: Piti, June 1911, Fullaway, *Annona muricata*; Mar. 1924, coconut leaves; April 1924, Evans, *Alocasia*; June 1937, Oakley, on mango; Talofolo, July 1937, Oakley on taro and cotton; Jan. 1938, Oakley, on *Leucaena glauca*; Dec. 1938, Oakley, on tomato vine; Feb. 1939, Oakley on *Pithecellobium dulce* pods; Inarajan, Feb. 1939, Oakley, on honeydew melon vine; Inarajan, March 1939, Oakley, on watermelon leaves; April 1939, Oakley, on *Leucaena glauca*; Northern Guam, April 1946, Krauss; Mt. Alifan, April 1946, Krauss, *Leucaena glauca*; Barrigada, April 1946, Krauss, on pineapple; Mt. Alifan, June 1946, Oakley, on *Caesalpinia*; Com. Mar. Hill, April 1948, Maehler, on *Plumeria acutifolia*; June 1957, Liming, on tomato.

PALAU. KOROR: March 1948, Maehler, on *Leucaena glauca*; Sept. 1952, Krauss, on *Leucaena glauca*; Feb. 1953, Beardsley, on *Leucaena glauca* and *Acalypha indica*.

YAP. YAP I.: Sept. 1948, Doutt; Dugor, Mar. 1949, Maehler, on

malvaceous plant; Kolonia, Mar. 1949, Maehler, on *Leucaena glauca*; April 1950, Langford; Kolonia, Mar. 1954, Beardsley, leaves of shower tree, *Cassia* sp.

TRUK. WENA (Moen): June 1946, Townes, on *Indigofera hirsuta*. TONOAS (Dublon): May 1946, Oakley, cotton. PIS: June 1946, Townes, *Plumeria acuminata*. TOTIU (Param): Mar. 1949, Potts, on soybean leaf.

PONAPE. Colonia, Aug. 1946, Oakley, *Annona muricata*; Colonia, Nov. 1953, Beardsley, dryland taro; Madolenihm, Nov. 1953, Beardsley, breadfruit leaves.

MARSHALL IS. AILINGLAPALAP: Bikajela (Bigatyelang) I., Aug. 1946, Townes, *Guettarda speciosa*. UJELANG: Ujelang I., Oct. 1953, Beardsley, on breadfruit leaves. RONGELAP: Rongelap I., Mar. 1963, Nishida, on squash. MAJURO: June 1950, Usinger; Uliga I., May 1950, Owen, and Oct. 1953, Beardsley, on *Acalypha* leaves. KWAJALEIN: April 1948, Maehler, on weed.

WAKE. PEALE I.: July 1940, T. Lyons, on *Diffenbachia*, tomato, and *Coccolobis uvifera*; 1938–39, Hadden, on *Coccolobis* leaves.

GILBERT IS. TARAWA: Aug. 1956, Brown, *Portulaca* roots; Banraeaba I., Nov. 1957, Krauss, *Lantana camara* leaves; Taborio I., Nov. 1957, Krauss, on *Morinda citrifolia* leaf.

HOSTS: *F. virgata* occurs on a wide variety of crop plants, ornamentals, and weeds. Breadfruit, coconut, mango, pineapple, taro, tomato, melons, squash, eggplant, and *Leucaena glauca* (= *L. leucocephala*) are among the more important reported hosts in Micronesia.

Takahashi (1936–1942) lists this species from Pagan, Saipan, Truk, and Wotje Atoll, on avocado, breadfruit, cassava, coffee, *Colocasia*, cotton, *Punica granatum*, and *Terminalia*.

Genus *Geococcus* Green

Geococcus Green, 1902, Ent. Mo. Mag. II, 13: 262.

Type of genus: *Geococcus radicum* Green.

16. *Geococcus coffeae* Green.

Geococcus coffeae Green, 1933, Stylops 2: 54.—Williams, 1958, Brit. Mus. (Nat. Hist.), Ent. Bull. 6 (8): 225, fig. 7.

Geococcus radicum: Fullaway, 1910, Hawaiian Ent. Soc., Proc. 2 (3): 108.—Zimmerman, 1948, Insects of Hawaii 5: 158 (not *G. radicum* Green 1902).

DISTRIBUTION: Apparently widespread in tropical and subtropical areas of the world. It has been reported from Dutch Guiana (type locality), Ceylon, various locations in Africa, Hawaii, and Caroline Is.

PALAU. KOROR: July 1937, T. Yoshino, ex *Canna* roots.

TRUK. TON (Tol): Mt. Unibot, Jan. 1953, Gressitt, ex Berlese funnel.

KUSAIE. Mt. Matante, 580 m., Feb. 1953, Clarke, ex duff from forest floor; Yela Cave, Mar. 1953, Clarke, floor of cave near entrance.

HOSTS: In Hawaii, *G. coffeae* has been found infesting roots of a number of hosts, including mango, coffee, pineapple, croton, *Caladium*, ferns, palms, and *Indigofera*. The only Micronesian host recorded is *Canna*, on roots.

This widespread hypogaecic species has been redescribed in detail and figured by Williams (1958 : 225, fig. 7), who also made a careful comparison between this species and the type material of *G. radicum* Green. Hawaiian records of *G. radicum* appear to represent misidentifications of *G. coffeae* as all Hawaiian *Geococcus* specimens which have been examined in the light of William's findings have proved to be *G. coffeae* (Beardsley, 1959).

Genus *Laminicoccus* Williams

Laminicoccus Williams, 1960, Brit. Mus. (Nat. Hist.), Ent. Bull. **8** (10) : 402.

Type of genus: *Tylococcus giffardi* Ehrhorn.

Two species of *Laminicoccus* are known from Micronesia. Unfortunately, one of these is represented in material at hand by but two fragmentary specimens, and it cannot be accurately placed at present.

KEY TO MICRONESIAN SPECIES OF LAMINICOCCUS

Circulus absent.....**pandani**
 Circulus present.....**L. species**

17. *Laminicoccus pandani* (Cockerell), new combination.

Dactylopius pandani Cockerell, 1895, Psyche **7**, suppl. 1 : 16.

Pseudococcus pandani: Fernald, 1903, Cat. Coccidae of World, 107.

Tylococcus giffardi Ehrhorn, 1916, Hawaiian Ent. Soc., Proc. **3** (3) : 243, new synonymy.

Pseudococcus giffardi: Zimmerman, 1948, Insects of Hawaii **5** : 219, fig. 122.

Pseudococcus carolinensis Takahashi, 1939, Tenthredo **2** (3) : 245, new synonymy.

Laminicoccus giffardi: Williams, 1960, Brit. Mus. (Nat. Hist.), Ent. Bull. **8** (10) : 402.—Beardsley, 1960, Hawaiian Ent. Soc., Proc. **17** (2) : 229, fig. 3, ♀ (male).

DISTRIBUTION: Originally described from material from Washington I. (Uahuka), Marquesas group; the present known distribution also includes Tahiti, Fiji, Hawaii, and Micronesia (Gilbert, Marshall, and Caroline Islands).

CAROLINE ATOLLS. EAURIPIK: June 1958, N. Tellei, on *Pandanus*.

WOLEAI: Falalis I., Feb. 1953, Beardsley, and June 1958, N. Tellei, on *Pandanus*; Utegal I., July 1946, Oakley, on *Pandanus*. NOMWIN: Nomwin I., Feb. 1954, Beardsley, on *Pandanus*. LOSAP: Pis I., Oct. 1952, Beardsley, on *Pandanus*. KAPINGAMARANGI: Touhou I., July 1954, Niering, *Pandanus* leaf; Werua I., July–Aug. 1954, Niering, on *Pandanus*; Hare I., Aug. 1946, Oakley, on *Pandanus*. NUKUORO: Aug. 1946, Townes, on *Pandanus*.

TRUK. PIS: June 1946, Oakley, on *Pandanus tectorius*. WENA (Moen): Mar. 1949, Langford, on *Pandanus*.

PONAPE. Paliker-Colonia, Jan. 1938, Esaki, on *Pandanus*; Nanipil-Nanpohnmal, 65 m., Jan. 1953, Gressitt, on *Pandanus*; Nanpohnmal, Jan. 1953, Gressitt, on *Pandanus*.

MARSHALL IS. UJELANG: Ujelang I., Oct. 1953, Beardsley, on *Pandanus*. TARAWA: Taborio I., Nov. 1957, Krauss, on *Pandanus*; Abaokoro I., Oct. 1953, Beardsley, on *Pandanus*. KWAJALEIN: April 1948, Maehler, on *Pandanus*; May 1958, Gressitt, on *Pandanus*. LIKIEP: Likiep I., Aug. 1946, Oakley, on *Pandanus tectorius*.

GILBERT IS. BUTARITARI: Butaritari I., Dec. 1957, Krauss, on *Pandanus*. TARAWA: Taborio I., Nov. 1957, Krauss, on *Pandanus*; Abaokoro I., Dec. 1957, Krauss, on *Pandanus* leaves.

HOSTS: The only reported host of this mealybug in Micronesia is *Pandanus*. In Hawaii it has also been found infesting the climbing pandanus, *Freycinetia*.

The new synonymy cited above is the result of my examination of Cockerell's type of *Dactylopius pandani* which is now in the U.S. National Coccid Collection in Washington, D.C.; cotypes of Takahashi's *Pseudococcus carolinensis*; and material from Fiji, Hawaii, and Tahiti; in addition to the Micronesian collections cited above. Ehrhorn's type of *Tylococcus giffardi*, from Honolulu, apparently is lost. However, his description and the absence of any similar species in Hawaii leave little doubt as to the identity of his species.

The pandanus mealybug, a common name suggested by Zimmerman (1948: 219) and now even more suitable in view of the above synonymy, has been redescribed and figured by Ferris (*In* Zimmerman 1948: 219, fig. 122) under the name *P. giffardi*.

18. *Laminicoccus* sp.

DISTRIBUTION: Caroline Is. (Palau).

PALAU. KOROR: July 1956, McDaniel.

HOST: *Pandanus*.

Two fragmentary specimens are at hand from Koror, one on *Pandanus* and the second without host designation. The presence of a definite circulus in these specimens suggests that they may be allied to *L. vitiensis* (Green and Laing) and *L. cocois* Williams.

Genus *Neoripersia* Kanda

Neoripersia Kanda, 1943, Kansai Ent. Soc., Trans. 12: 49.

Type of genus: *Ripersia ogasawarensis* of Kanda (= *R. japonica* Kuwana, not *R. agasawarensis* Kuwana).

This genus is separated from *Trionymus* by Takahashi in his key to Japanese mealybug genera (1957: 4) primarily on the basis of the structure of the hind coxae, which are "not thickened at the basal margin, with a plate extending to the venter of the body which is with many translucent pores; antennae and legs much reduced in size." According to Takahashi, Kanda's original description is based not on *R. ogasawarensis* Kuwana, the stated type of genus, but on material from the Ryukyu Islands (Amami-Oshima) which is identical with a species reported by Kuwana (Zool. Mag. Tokyo 43: 163, 1931) as *Ripersia japonica*. Takahashi indicates (1957: 7) that he examined specimens of Kuwana's *R. ogasawarensis* (presumably from type material) and has assigned the species to *Neoripersia* Kanda.

Kanda's original description of *Neoripersia* indicates that the genus is characterized by complete absence of trilocular pores, although at least two species assigned to it by Takahashi (*Ripersia ogasawarensis* Kuwana and *Trionymus miscanthicola* Takahashi) have a few such pores associated with the cerarii. Other important characters of *Neoripersia* mentioned by Kanda are: antennae 6- or 7-segmented, usually 7-segmented; derm with large circular pores (multilocular disc pores) and small tubular ducts; at least two pairs of cerarii present with conical spines but without pores; ventral cicatrices (circuli) usually present (number not indicated), oval in shape. Kanda states that the genus "differs from *Trionymus* or *Erium* by absence of trilocular pores." He does not, however, mention the unusual condition of the hind coxae which is stressed by Takahashi. What appears to be a similar condition of the posterior coxae occurs in a new species from Palau here assigned to *Trionymus* on the basis of other characters. Borchsenius' figures of his *Kiritshenkella fushanensis* and *Cannococcus cannicola* (1960: 932, figs. 14 and 16) suggest a very similar condition of the hind coxae in those species. *Neoripersia* appears closely allied to *Kiritshenkella* Borchsenius, and quite possibly the latter should fall as a synonym. Unfortunately, it has not been possible for me to examine specimens of *Ripersia japonica* Kuwana, the type of *Neoripersia*, and the problem therefore remains unsettled.

19. *Neoripersia ogasawarensis* (Kuwana) (fig. 3).

Ripersia ogasawarensis Kuwana, 1909, New York Ent. Soc., Jour. 17: 161, pl. 10, figs. 1-3.

Neoripersia ogasawarensis: Takahashi, 1957, Univ. Osaka Pref., Bull. (ser. B) 7: 7.

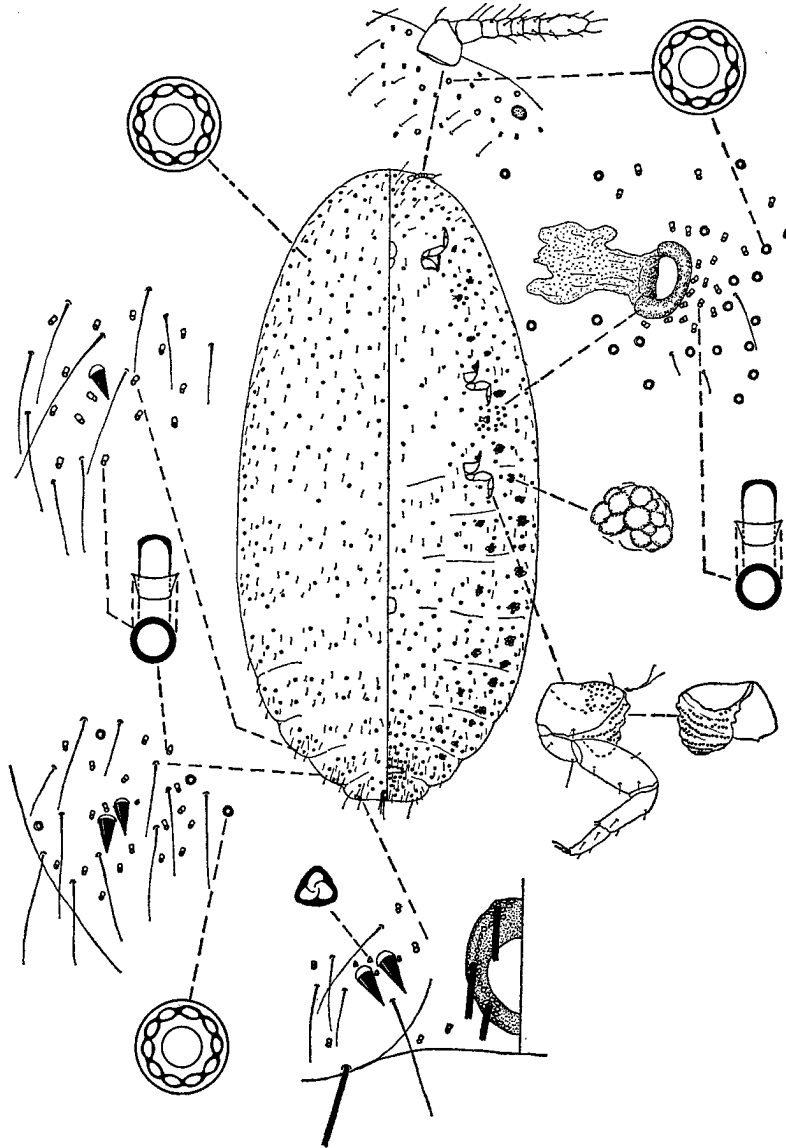


FIGURE 3.—*Neoripersia ogasawarensis*, dorsal and ventral aspects and details.

Adult female. Body elongate; maximum length of slide-mounted specimens about 5.0 mm. Anal lobes not appreciably protuberant. Antennae 7-segmented, very short, about 190 μ over all. Legs small; hind femur about 120 μ long, hind tibia about 90 μ long, hind tarsus about 52 μ long, hind tarsal claw 25 μ long. Hind coxae each with 35 to 50 translucent spots or micropores in lower (anterior) surface; upper or posterior basal margin confluent with an irregular, wrinkled, sclerotized area of ventral derm containing numerous (around 70 to 90) micropores similar to those of coxae. Remaining segments of hind legs without discernible micropores. Rostrum small, about 90 μ long. Dorsal ostioles not discernible; a single well-defined ventral circulus present; extending across fold between abdominal segments 4 and 5, about 120 μ long by 110 μ wide. Eyes small, about 20 μ diameter, without a sclerotized ocular cone.

With three pairs of lateral abdominal cerarii; anal lobe cerarii each with 2 conical setae about 22 μ long plus several elongate slender accessory setae about 75 μ maximum length; 3 or 4 trilocular pores present around bases of conical setae; the surrounding derm not noticeably sclerotized. Penultimate cerarii each with 2 conical setae about 20 μ maximum length plus several rather widely scattered slender accessory setae about 60 μ maximum length; trilocular pores absent, or not more than one or two discernible, around bases of conical setae; a few small shallow tubular ducts, of the type scattered over derm, present around bases of conical setae. Antipenultimate cerarii each represented by a single conical seta about 18–20 μ long, plus several scattered long slender setae, and scattered small tubular ducts. Venter of anal lobes without discernible sclerotized area; anal lobe seta about 150 μ long.

Small, shallow oral collar type tubular ducts, about 3 μ oral diameter by about 5–6 μ deep, scattered over both dorsum and venter, most numerous along lateral margins, relatively sparsely distributed on mid-dorsal and mid-ventral regions. Multilocular disc pores of usual type scattered over dorsum and venter, somewhat more concentrated on posterior part of venter around vulva, around spiracles, and along lateral margins. Trilocular pores absent, except for few associated with cerarii. Body clothed with scattered fine setae mostly 20–40 μ long; somewhat longer setae, up to about 75 μ in length, present around vulva and on venter of head anterior to mouthparts. Ventral derm with a longitudinal series of small areolate areas sublaterally on each side, extending from the anterior part of thorax to about abdominal segment 8; 2 to 4 such areolate areas usually discernible on each side of each segment, each area composed of an irregular group of around 10 to 15 small areolae.

DISTRIBUTION: Bonin Islands (type locality).

HOST: Recorded by Kuwana from *Miscanthus* sp.

This species is not represented in the available postwar collections.

Five adult female specimens, recently restained, which comprise the type series of *N. ogasawarensis*, were loaned for study by the National Institute of Agricultural Science, Nishigahara, Tokyo, Japan. All five are large, fully distended females which are either torn, badly wrinkled, or otherwise distorted or damaged. In view of the very incomplete nature of Kuwana's original description, a redescription and figure of this species are presented here, based upon the type series. The best of the five specimens has been designated a lectotype.

Takahashi's emendation is accepted as the proper transliteration, as the Japanese name for the Bonin Islands is "Ogasawara."

Genus *Neosimmondsia* Laing

Neosimmondsia Laing, 1930, Bull. Ent. Research 21: 19.

Type of genus: *Neosimmondsia hirsuta* Laing.

20. Neosimmondsia esakii Takahashi.

Neosimmondsia esakii Takahashi, 1939, *Tenthredo* 2 (3) : 254, fig. 8.

DISTRIBUTION: Caroline Is. (Ponape). Endemic?

PONAPE. Nanipil-Nahnalaud (Nampil-Nanalaun), Jan. 1938, Esaki, on *Pandanus* (type material); Mt. Dolen Nankep (Dolennanlap), 240 m., Aug. 1946, Fosberg, on *Ponapea ledermanniana*; Ngihneni (Ninani), Aug. 1950, Adams.

HOSTS: *Pandanus* and native palm (*Ponapea*).

This species differs from the type of the genus in that it possesses a continuous fringe of very long conical setae entirely around the lateral margins of the body. No definite cerarii are present, however. The rotund body shape, the 6-segmented antennae, and the relatively large coxae, particularly those of the posterior pair of legs, appear to relate this species to *N. hirsuta*, although the latter lacks both cerarii and the conspicuous marginal fringe of long conical spines characteristic of *N. esakii*.

Genus Palaucoccus, new genus

Type of genus: *Palaucoccus gressitti*, new species.

Recognition characters: Body elongate-oval; anal lobes not strongly developed. Antennae 7-segmented in known species. Legs normally developed, of moderate size, tarsal claw without a denticle on inner face. Anal ring at posterior apex of dorsum cellular, bearing 6 relatively short setae, shorter than ring. Spiracles normal. Two pairs of dorsal ostioles present; circulus absent in known species. Without definite cerarii; dorsum of anal lobes entirely membranous, with a few moderately long, slender setae, but without conical setae or a concentration of trilocular pores. Venter of anal lobe with a narrow, elongate area of sclerotization extending anteriorly from base of anal-lobe seta. Dorsum with a few oral-rim tubular ducts; venter with multilocular disc pores and oral-collar ducts; trilocular pores moderately numerous on both dorsum and venter; without paraocular discoidal pores or microducts associated with bases of hind coxae.

With regard to its affinities with other genera, *Palaucoccus* is something of an enigma. On one hand, the barlike scleriosis on the venter of the anal lobes suggests a possible relationship to *Planococcus* Ferris and its allies, except that all known genera of this group have well-developed cerarii (see Ezzat and McConnell, 1956). On the other hand, the complete absence of cerarii and the presence of a few oral-rim tubular ducts on the dorsum suggests a similarity to *Chorizococcus* McKenzie. *Palaucoccus* also shows some similarity to species placed in the genus *Atrococcus* Goux by Williams (1962), particularly in the possession of a small group of oral-collar ducts and multilocular disc pores on the lateral margins of the prothorax in the type species. However, species assigned to *Atrococcus* all have numerous oral-rim tubular ducts and at least one pair of cerarii. It is hoped that the eventual discovery of additional species allied to the type of *Palaucoccus* will shed light on its relationship to other genera.

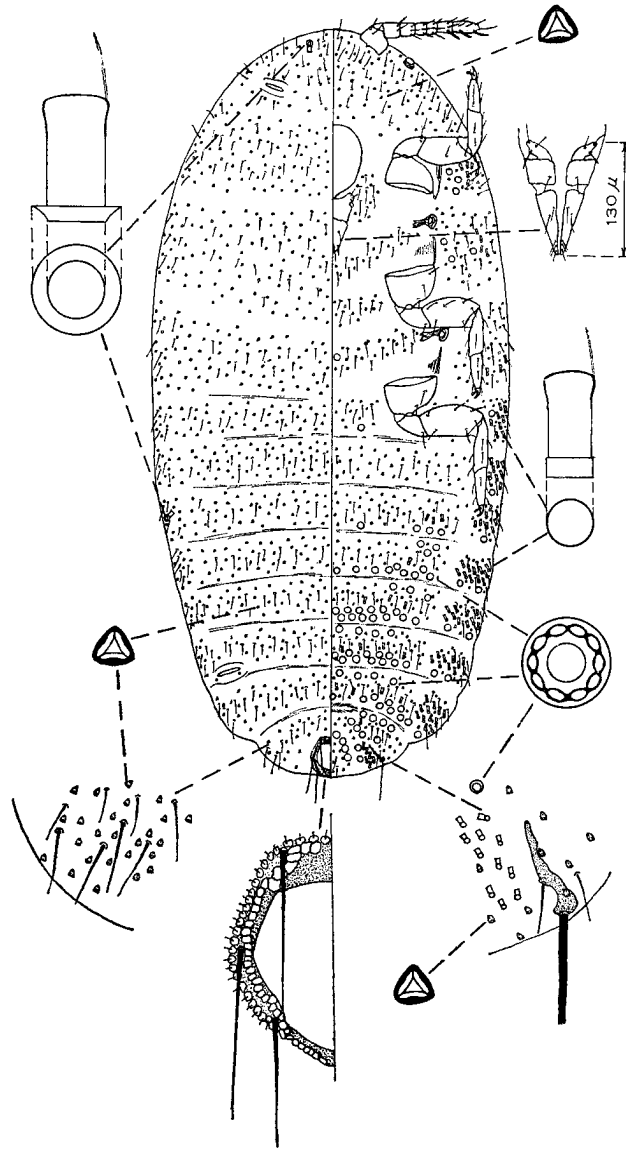


FIGURE 4.—*Palauococcus gressitti*, adult female, dorsal and ventral aspects and details.

21. Palauococcus gressitti Beardsley, n. sp. (figs. 4; 26, *b*).

Female. Small; length of slide-mounted specimen about 1.7 mm.; body form elongate-oval; anal lobes hardly protuberant. Antennae 7-segmented, about 240 μ long. Legs moderately small; hind femora about 125 μ long; hind tibiae about 110 μ long; hind coxae with 25–30 micropores, other segments without discernible micropores (fig. 26, *b*). Rostrum about 130 μ long. Anal ring cellular, about 90 μ wide, bearing 6 short setae about 80 μ maximum length. Two pairs of dorsal ostioles, their lips unsclerotized. Circulus absent. Eyes small, about 16 μ diameter, with a moderately well-developed ocular cone; paraocular discoidal pores absent.

Cerarii completely wanting; dorsum of anal lobes with a few moderately slender setae about 30 μ in length, unsclerotized. Venter of anal lobe with a narrow, elongate sclerotized area extending anteriorly from base of anal lobe seta. Anal lobe seta about 80 μ long.

Dorsal oral-rim tubular ducts limited to 2 in the unique type, each about 7–8 μ diameter across rim; one on head, approximately over the base of one antenna; second laterally on margin of abdominal segment 4; position and number of dorsal tubular ducts probably variable. Venter with a marginal band of oral-collar tubular ducts, about 3–4 μ diameter, on each side; 8 to 20 such ducts on each side of abdominal segments 2 to 8; a few such ducts (6 to 8 in type) along posterior margin of venter of segment 9; a few additional oral-collar ducts on lateral margins of each segment of thorax; and forming a sparse transverse row on abdominal segments 6 to 8; plus a few sublaterally on segments 4 to 5. Multilocular disc pores confined to venter, distributed in transverse rows across posterior margins of abdominal segments 4 to 9; and on anterior margins of abdominal segments 5 to 9; a few scattered on venter of thorax and basal segment of abdomen; 3 or 4 on each side of pro- and mesothorax, associated with a few oral-collar ducts. Trilocular pores moderately densely scattered on dorsum and venter. Body sparsely clothed with fine setae; those of both dorsum and venter about the same length, around 30 μ maximum. Setae on venter of head anterior to mouthparts not appreciably longer.

Holotype, female (US 67967), E. Ngatpang, Babelthuap, Palau Is., 65 m., Dec. 1952, Gressitt.

DISTRIBUTION: Caroline Is. (Palau).

HOSTS: Unknown.

Genus *Palmicultor* Williams

Palmicultor Williams, 1963, Entomologist **96**: 100.

Palmicola Williams, 1960, Brit. Mus. (Nat. Hist.) Ent. Bull. **8** (10): 415 (preoccupied).

Type of genus: *Ripersia palmarum* Ehrhorn.

Two Micronesian species are here assigned to this genus; one of them is described as new.

KEY TO KNOWN MICRONESIAN SPECIES OF PALMicultor

- Antennae 7- or 8-segmented; anal lobe cerarii each with but two conical setae, borne on a moderately well-developed sclerotized area; very short, small tubular ducts scattered on dorsum and venter, particularly evident along lateral margins. **guamensis**
- Antennae 6-segmented; anal lobe cerarii usually with more than two conical setae, surrounding derm not discernibly sclerotized; tubular ducts of the type described above absent, although a few very small, more elongate ducts are present anterior to vulva, and a few somewhat larger ducts along lateral margins of head. . . **palmarum**

22. *Palmicultor guamensis* Beardsley, n. sp. (fig. 5).

Female. Body form moderately broadly oval; about 2 mm. long on slide. Antennae 7- or incompletely 8-segmented, 280 to 300 μ over-all length. Legs moderately small; hind femora about 170 μ long; hind tibiae about 125 μ long, the apical spines not strongly developed. Micropores of hind legs few, 6 to 10 discernible in upper surface of hind coxae, around 12 in upper surface of hind tibiae, apparently wanting in remaining segments. Numerous micropores in ventral derm surrounding attachment of metacoxae. Rostrum about 120 μ long. Anal ring cellular, about 87 μ wide, bearing 6 setae about 140 μ maximum length. Two pairs of dorsal ostioles present, rather small but with the lips moderately sclerotized as in other species of this genus. Circulus moderately large, extending across intersegmental line between abdominal segments 4 and 5. Eyes rather small, about 18 μ diameter; ocular cone weakly developed. With 17 pairs of marginal cerarii; most cerarii with 2 conical setae of about equal size; an occasional cerarius on head, thorax, or anterior part of abdomen with but 1 such conical seta or with 3; penultimate and other posterior cerarii sometimes with a third much smaller conical seta. Anal lobe cerarii each with 2 conical setae about 20 μ long, 5 or 6 slender accessory setae about 75 μ maximum length, plus a few trilocular pores, not strongly concentrated, and borne on an area of weak sclerotization. Penultimate cerarii each with 2 conical setae nearly as large as those of the anal lobe cerarii (about 18 μ long) plus usually 1 smaller conical seta about 12 μ long and a few slender accessory setae and a few trilocular pores; surrounding derm unsclerotized. Conical setae of anterior cerarii becoming slightly smaller anteriorly, mostly 14–18 μ long. Venter of anal lobes unsclerotized; anal lobe setae each about 150 μ long.

Tubular ducts of two types: a few very fine (oral diameter about 2 μ) elongate oral-collar type ducts midventrally on abdominal segments caudad of the circulus; larger diameter, extremely shallow oral-collar tubular ducts, about 4 μ diameter at orifice by about 3 μ deep, sparsely distributed over both dorsum and venter, particularly noticeable along lateral margins. Multilocular disc pores present on both dorsum and venter, present on all segments of the dorsum except sometimes on segment 9; slightly more concentrated around the vulva ventrally. Trilocular pores moderately densely distributed on dorsum and venter, relatively sparse on venter of posterior abdominal segments. Dorsum and venter moderately densely clothed with fine setae; those of dorsum mostly 35–55 μ long, with a few longer ones, up to about 65 μ long, near lateral margins of abdominal segments; ventral setae mostly 30–60 μ long, a few longer ones, up to about 80 μ long, around vulva.

Holotype, female (US 67968), and 2 paratypes on one slide, Merizo, Guam, S. Mariana Is.. June 1946, Oakley, on *Cocos nucifera*. Twelve paratypes (US, BISHOP) on 5 slides, same data as holotype.

DISTRIBUTION: S. Mariana Is. (Guam).

HOST: Coconut.

This species has fewer conical setae in the cerarii than does the related *P. palmarum*. The antennae of the latter species are consistently 6-segmented, whereas in *P. guamensis* they are 7- or incompletely 8-segmented, although additional specimens may show this character to be variable. *P. guamensis* differs from both *P. palmarum* and *P. browni* Williams, the only other species now assigned to *Palmicultor*, in having the anal lobe cerarii borne on somewhat sclerotized areas, and in the possession of peculiar small, shallow tubular ducts scattered over the body. These ducts resemble closely those present in species I have assigned to the new genus *Pandanicola*, suggesting a possible relationship between that genus and *Palmicultor*.

Palmicultor guamensis differs further from *P. palmarum* in the possession

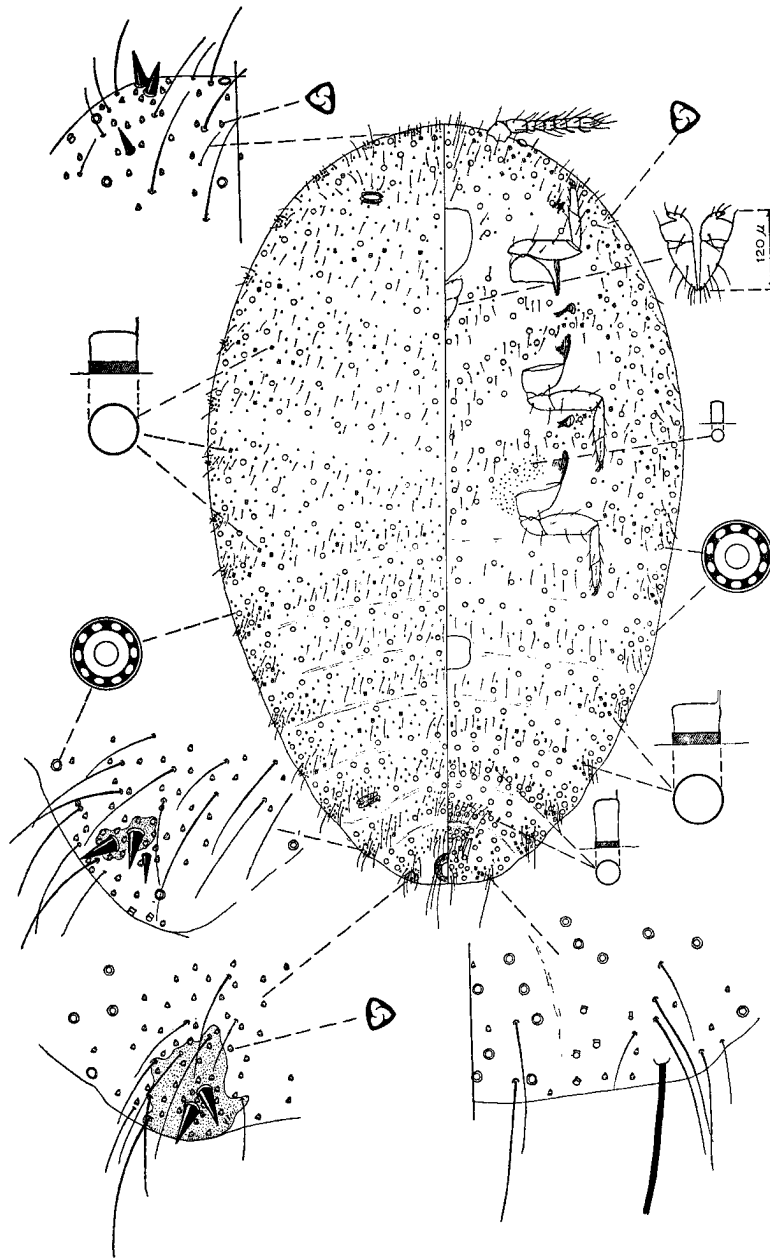


FIGURE 5.—*Palmicullator guamensis*, adult female, dorsal and ventral aspects and details.

of a greater number of dorsal multilocular disc pores, but in view of the variable number of such pores encountered in specimens assigned to *P. palmarum* (see below) this point should perhaps not be overemphasized.

23. *Palmicultor palmarum* (Ehrhorn).

Ripersia palmarum Ehrhorn, 1916, Hawaiian Ent. Soc., Proc. **3** (3) : 245.

Pseudococcus oceanicus Takahashi, 1939, Tenthredo **2** (3) : 239; new synonymy.

Pseudococcus oceanicus var. *kentiae* Takahashi, 1939, Tenthredo **2** (3) : 242; new synonymy.

Pseudococcus palmarum: Zimmerman, 1948, Insects of Hawaii **5**:235, fig. 130.

Palmicola palmarum: Williams, 1960, Brit. Mus. (Nat. Hist.) Ent. Bull. **8** (10) : 415.—Beardsley, 1960, Hawaiian Ent. Soc., Proc. **17** (2) : 232, fig. 3, J (male).

Palmicultor palmarum: Williams, 1963, Entomologist **96** : 100.

DISTRIBUTION: Hawaii (type locality), Canton I., Malaya (Williams, 1960), Philippines (?), Micronesia.

PALAU. KOROR: Aug. 1958, Tellei, on coconut leaves and flowers; Aug. 1958, Owen, on croton (host record questionable). NGERKABESANG (Arakabesan): Aug. 1953, Beardsley, on coconut. PELELIU: July 1946, Oakley, on coconut.

YAP. YAP: Aug. 1950, Goss, on coconut. E. MAP: Aug. 1950, Goss, on betel nut, *Areca catechu*.

CAROLINE ATOLLS. PULO ANNA: Sept. 1952, Krauss, on coconut leaf. NGULU: Ngulu I., Oct. 1952, Krauss, on coconut plant. ULITHI: Fassarai I., July 1946, Oakley, on *Cocos nucifera*. LAMOTREK: Lamotrek I., Feb. 1953, Beardsley, on *Cocos nucifera*. NOMWIN: May 1946, Townes, on *Cocos nucifera*. KAPINGAMARANGI: Hare I., Aug. 1946, Townes, on *Cocos nucifera*.

TRUK. WENA (Moen): June 1946, Townes, on *Cocos nucifera*. FEFAN: May 1946, Townes, on *Coelococcus amicarum*. TONOAS: Erin, Nov. 1937, Esaki, on coconut.

PONAPE. Madolenihm (Matalanum) Plantation, Dec. 1948, Langford, on coconut.

KUSAIE. Aug. 1946, Oakley, on coconut; Lele I., Aug. 1946, Oakley, on coconut.

MARSHALL IS. KWAJALEIN: Ebeye I., Mar. 1945, Wallace, coconut leaf. LIB: Lib I., Oct. 1953, Beardsley, on coconut leaf. AILINGLAPALAP: Ailinglapalap I., Aug. 1946, Oakley, on *Cocos nucifera*. JALUIT: Imroj I., Nov. 1937, Esaki, on coconut; Majurirok (Elizabeth) I., Sept. 1953, Beardsley, on coconut. NAMORIK: Namorik I., Sept. 1953, Beardsley, on coconut.

LIKIEP: Likiep I., Aug. 1946, Oakley, on coconut. MAJURO: Telap (Dalap) I., Aug. 1946, Townes, on *Cocos nucifera*; "Laura" I., Aug. 1946, Townes, on *Cocos nucifera*; Uliga I., Nov. 1953, Beardsley, on coconut foliage.

GILBERT IS. TARAWA: Aug. 1956, Brown, on coconut.

PHOENIX IS. CANTON I.: Sept. 1950, Krauss, on coconut.

HOSTS: Various palms; nearly all Micronesian records are from coconut. The record from Koror, on croton, will be considered doubtful until verified.

Takahashi (1939), in describing *P. oceanicus*, called attention to the numerous minute pores in the ventral derm around the bases of the hind coxae; and Williams (1960) stressed this character in his definition of the genus *Palmicola*. Although neither Ehrhorn nor Ferris (*In* Zimmerman, 1948: 235, fig. 130) mention these pores in their treatments of *P. palmarum*, they are present in all Hawaiian specimens which I have examined. Comparison of Hawaiian material with cotypes of Takahashi's *P. oceanicus* and its variety *kentiae* has resulted in the new synonymy cited above.

The number and distribution of multilocular disc pores seems quite variable in this species. In the specimens at hand, these pores are always present on the venter, scattered over the entire surface as indicated in Ferris' (1948) figure. Frequently multilocular disc pores are present also on the dorsum, particularly on the anterior part of the body. In the material studied the number of dorsal multiloculars ranges from none, to one or two discernible, to a few on head and thorax as in Takahashi's *P. oceanicus* material, to relatively numerous, although none of the specimens have as many dorsal multiloculars as do the available specimens of *P. guamensis*. The Hawaiian material which I have seen shows a similar range of variability in the number of dorsal multilocular pores present.

Ferris (1948) states that tubular ducts of any kind appear to be lacking in this species. Takahashi (1939) makes a similar statement concerning his *P. oceanicus*, here considered a synonym of *P. palmarum*. In all the material which I have examined, both Micronesian and Hawaiian, there are present a few very tiny (oral diameter about 2 μ) elongate tubular ducts on the venter just anterior to the vulva, and sometimes there are one or two slightly larger (oral diameter about 4 μ) tubular ducts associated with the cerarii of abdominal segments 5 to 7, and occasionally elsewhere along the lateral margins of the body, particularly near the eyes. The number of cerarii is also somewhat variable, there being between 14 and 17 discernible pairs in specimens at hand. Generally, one or more of the cerarii of the thorax and (or) head is either reduced to a single conical seta or is wanting.

Genus **Pandanicola**, new genus

Type of genus: *Trionymus pandani* Takahashi.

Recognition characters: Body form elongate oval; anal lobes weakly developed; antennae 6- or 7-segmented. Cerarii numbering 17 or fewer marginal pairs (6 to 17 pairs in known

species), anal lobe cerarii each with 2 conical setae, anterior cerarii each with 1 to 3 such setae, those of head and thorax sometimes reduced or wanting, most cerarii with from 1 to several slender accessory setae; derm surrounding all cerarii unsclerotized. Dorsal ostioles present or absent; circulus present or absent. Trilocular pores relatively few, usually present, laterally associated with cerarii, sometimes sparsely scattered over body. Multilocular disc pores numerous, scattered over both dorsum and venter. Tubular ducts of a peculiar small, very shallow form, present particularly along the lateral margins. Derm around bases of hind coxae without concentrations of minute tubular ducts. Legs moderately small; tarsal claws without a denticle on inner face; posterior legs without micropores in any of the segments. Anal ring at posterior apex of body, cellular, with 6 anal ring setae.

The distinctive features of this genus are the unusually shallow, small tubular ducts; the presence of multilocular disc pores scattered on both dorsum and venter, the reduced number of trilocular pores; and the absence of micropores in the hind legs. The shallow tubular ducts and the greater number of cerarii (6 or more pairs) will serve to separate *Pandanicola* from *Trionymus*, and the former character will separate it from *Dysmicoccus*. The absence of a concentration of minute tubular ducts in the ventral derm at the base of the hind coxae will distinguish *Pandanicola* from *Palmicultor*. The latter genus contains at least one species (*P. guamensis*) having shallow tubular ducts similar to those found in *Pandanicola*.

KEY TO KNOWN SPECIES OF PANDANICOLA

- Circulus and dorsal ostioles present; normally with 16 or 17 pairs of cerarii; with a few scattered trilocular pores on dorsum and venter; Palau..... **esakii**
 Circulus and dorsal ostioles absent, normally with 6–10 pairs of marginal cerarii; trilocular pores reduced to a very few along the lateral margins, mostly associated with cerarii; Ponape..... **pandani**

24. *Pandanicola esakii* (Takahashi), new combination.

Pseudococcus esakii Takahashi, 1942, *Tenthredo* 3 (4) : 340.

DISTRIBUTION: Caroline Is. Endemic?

PALAU. BABELTHUAP: Cacao Plantation near Imeliik, Aug. 1953, Beardsley, on *Freycinetia* sp.

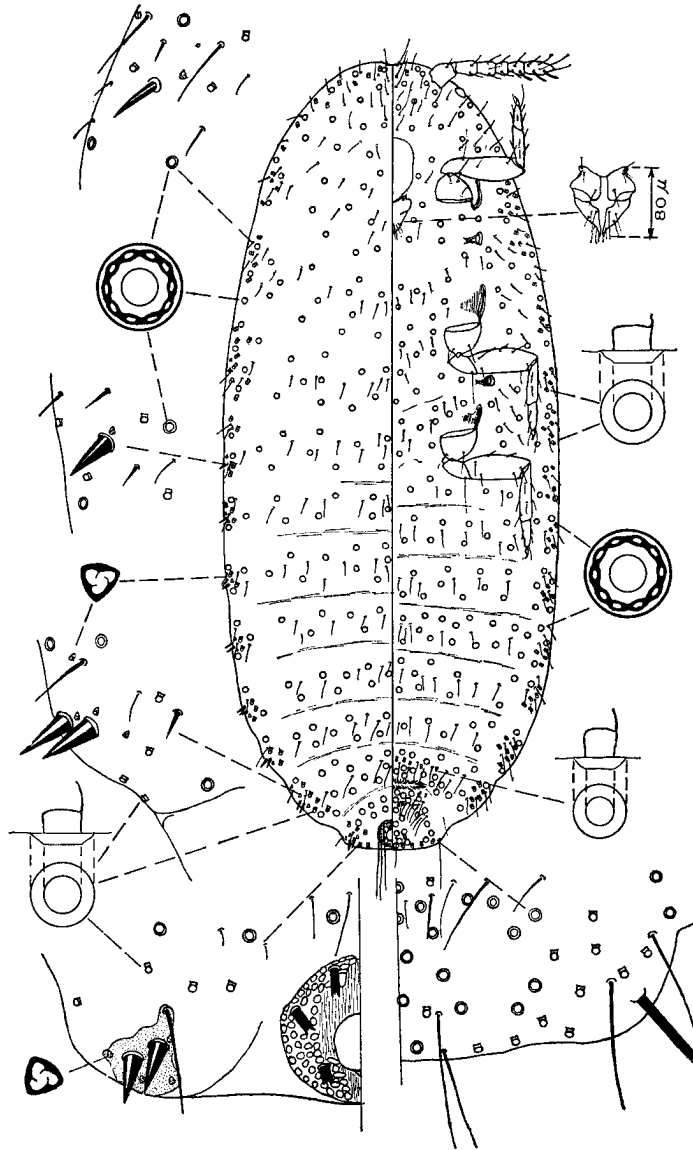
HOSTS: Pandanaceae (*Pandanus* and *Freycinetia*).

Takahashi's type material from Palau has not been available for study, but material at hand from the type locality agrees in most essential details with the original description, and is here placed as *P. esakii*.

Takahashi states that tubular ducts are absent in this species. However, all the specimens at hand possess small, very shallow, tubular ducts very similar to, but slightly larger than, those found in *P. pandani*, and it may safely be assumed that Takahashi overlooked these structures in *P. esakii* as he did in the former species. It is likely that the "larger nearly triangular pores present on lateral and posterior marginal areas" to which Takahashi refers are actually these tubular ducts, possibly viewed obliquely. The specimens available possess 16 or 17 pairs of cerarii, the pair just dorsad of the eyes frequently being reduced to one or two spinelike setae, or wanting.

25. *Pandanicola pandani* (Takahashi), new combination (figs. 6; 26, a).*Trionymus pandani* Takahashi, 1939, *Tenthredo* 2 (3) : 250.

DISTRIBUTION: Caroline Is. (Ponape). Endemic?

HOST: *Pandanus*.FIGURE 6.—*Pandanicola pandani*, adult female, dorsal and ventral aspects and details.

Takahashi's type material, obtained on loan from the Taiwan Agricultural Research Institute, consists of two slides each labeled "(Caroline Is.) Ponape: Nipit-ninoani, 13.i.1938, T. Esaki" on one label and "*Trionymus pandani* Takah. Host: Pandanus (cotypes)" on the other. These two slides contain a total of 24 specimens. To study the material critically, 15 specimens on one slide were removed, restained, and remounted on 6 slides. One specimen among these has been designated a lectotype, and the remaining 23 cotype specimens designated paratypes. This species is not represented in the post-World War II collections.

Most of Takahashi's specimens possess 8 to 10 recognizable cerarii; those of the anterior abdominal and thoracic segments frequently represented by a single conical seta or sometimes an elongate spinelike seta. Takahashi states that tubular ducts of any kind are wanting in this species, but he apparently failed to note the very small, shallow tubular ducts which are present both dorsally and ventrally along the lateral margins.

Genus **Paraputo** Laing

Paraputo Laing, 1929, Ann. Mag. Nat. Hist. X, 4: 473.

Type of genus: *Paraputo ritchiei* Laing (= *Ripersia anomala* Newstead).

26. Paraputo leveri (Green) (figs. 7; 21, b).

Pseudococcus leveri Green, 1934, Ann. Mag. Nat. Hist. X, 13: 473, fig.

Paraputo leveri: Williams, 1960, Brit. Mus. (Nat. Hist.) Ent. Bull. 8 (10): 421, fig. 16.

DISTRIBUTION: Fiji Is., Solomon Is., Caroline Is.

CAROLINE ATOLLS. TŌBI: Sept. 1952, Krauss, on injured coconut trunk.

HOST: Coconut.

The accompanying figure is based on Micronesian material. Williams' (1960) figure does not clearly indicate the long setae, up to about 110 μ in length, which surround the anal ring dorsally, or the micropores which are present in the hind femora and tibiae as well as the hind coxae (see fig. 21, b). However, Dr. Williams informs me (personal communication) that such pores are present on specimens of *P. leveri* in the British Museum. Dr. Williams kindly compared Micronesian specimens with authentic *P. leveri* specimens in the British Museum and has provided me with fresh material of this species from Fiji and the Solomon Is. We both agree that the Micronesian specimens should be placed as this species.

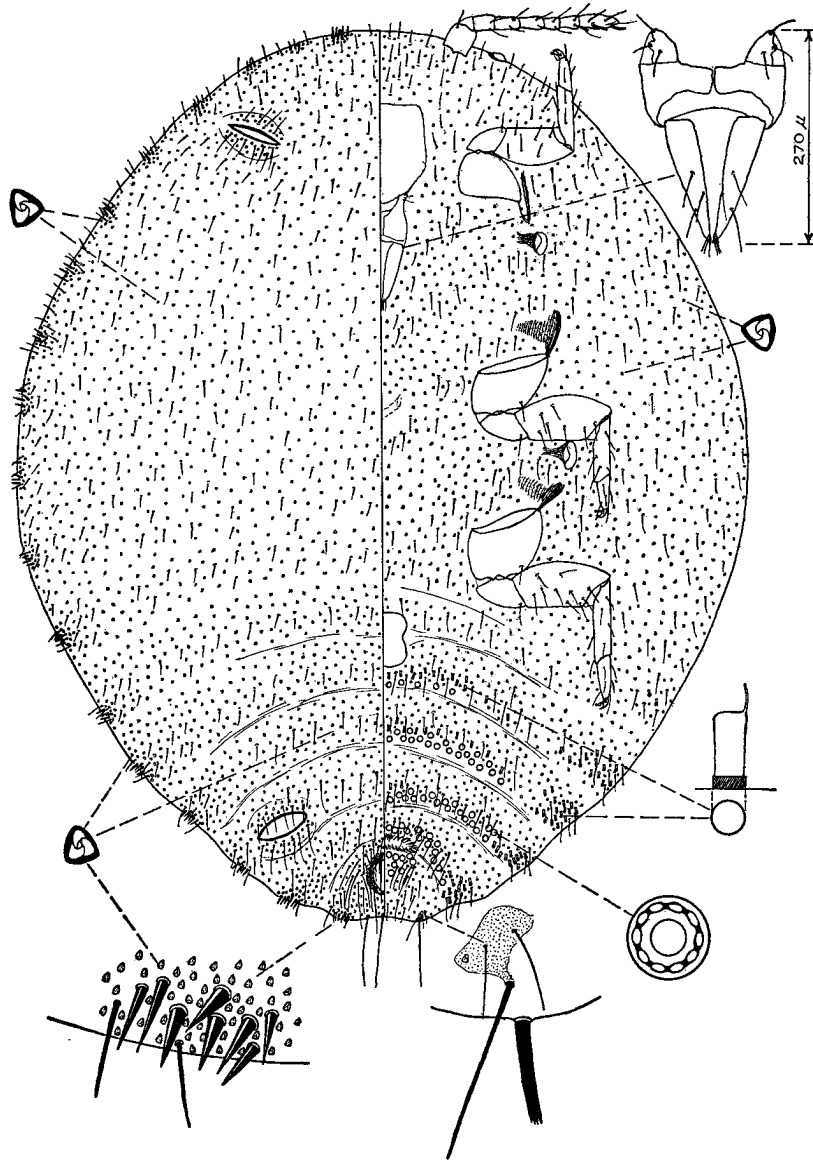


FIGURE 7.—*Paraputo leverii*, adult female, dorsal and ventral aspects and details.

Genus **Phenacoccus** Cockerell

Phenacoccus Cockerell, 1893, Ent. News 4: 318.

27. **Phenacoccus solani** Ferris.

Phenacoccus solani Ferris, 1918, Stanford Univ. Pub. (Univ. Series) 32: 60, pl. 2, fig. 22.—Zimmerman, 1948, Insects of Hawaii 5: 165, fig. 96.—Ferris, 1950, Atlas Scale Ins. North America 5: 158, fig. 61.

DISTRIBUTION: Puerto Rico, southern and western United States, Hawaii, Marshall Is., Gilbert Is.

MARSHALL IS. ENIWETOK: Enjebi (Engebi) I., May 1946, Townes, on *Wedelia biflora*. KWAJALEIN: Kwajalein I., Nov. 1957, Krauss, on *Messerschmidia*.

GILBERT IS. TARAWA: Aug. 1956, Brown, on *Portulaca* roots; Bairiki I., Nov. 1957, Krauss, on young leaves of *Messerschmidia*; Banraeaba I., Nov. 1957, Krauss, on *Scaevola* leaves.

HOSTS: Recorded from a long list of hosts in the United States. The Micronesian host records, *Wedelia*, *Messerschmidia*, *Portulaca*, and *Scaevola*, include no plants of economic importance.

It appears likely that this species was introduced accidentally into Micronesia from either Hawaii or the United States during or shortly after World War II. Extensions of its range in Micronesia are to be expected.

Genus **Planococcus** Ferris

Planococcus Ferris, 1950, Atlas Scale Ins. North America 5: 164.—Ezzat and McConnell, 1956, Univ. Maryland Agric. Expt. Sta., Bull. A-84: 60.

Type of genus: *Dorthisia citri* Risso.

KEY TO KNOWN MICRONESIAN SPECIES OF PLANOCOCCUS

Legs relatively slender, hind pair with less numerous, larger micropores on coxae and tibiae (fig. 8, *b*); cisanal setae never longer than anal ring setae (fig. 8, *a*) **citri**
 Legs relatively stout, hind pair with more numerous, smaller micropores on coxae and tibiae (fig. 8, *d*); cisanal setae longer than anal ring setae (fig. 8, *c*) **lilacinus**

28. **Planococcus citri** (Risso) (fig. 8, *a, b*).

Dorthisia citri Risso, 1813, Ann. Mus. Hist. Nat. Paris 30: 416 (not seen).

Dactylopius citri: Signoret, 1875, Ent. Soc. France, Ann. V, 5: 312.

Pseudococcus citri: Fernald, 1903, Cat. Coccidae of World, 99.—Zimmerman, 1948, Insects of Hawaii 5: 206, fig. 114.

Planococcus citri: Ferris, 1950, Atlas of Scale Ins. North America 5: 165.—Ezzat and McConnell, 1956, Univ. Maryland Agric. Expt. Sta. Bull. A-84: 65, fig. 21.—Beardsley, 1960, Hawaiian Ent. Soc., Proc. 17 (2): 224, fig. 3, *a* (male).

DISTRIBUTION: Nearly cosmopolitan (type locality: Southern France).

S. MARIANA IS. SAIPAN: June 1946, Oakley, on coffee and *Guamia*; "Magacienne Bay," Feb. 1949, Maehler, on *Eugenia stelechantha*; Chalan Kanoa, Feb. 1958, Krauss, croton leaves. GUAM: Nimitz Hill, Feb. 1958, Krauss, on guava leaves.

PALAU. BABELTHUAP: July 1946, Oakley, on *Annona muricata*. KOROR: Mar. 1948, Maehler, on pomelo (*Citrus paradisi*) and soursop (*Annona muricata*); Jan. 1953, Beardsley, on *Gardenia* leaves, guava leaves, and

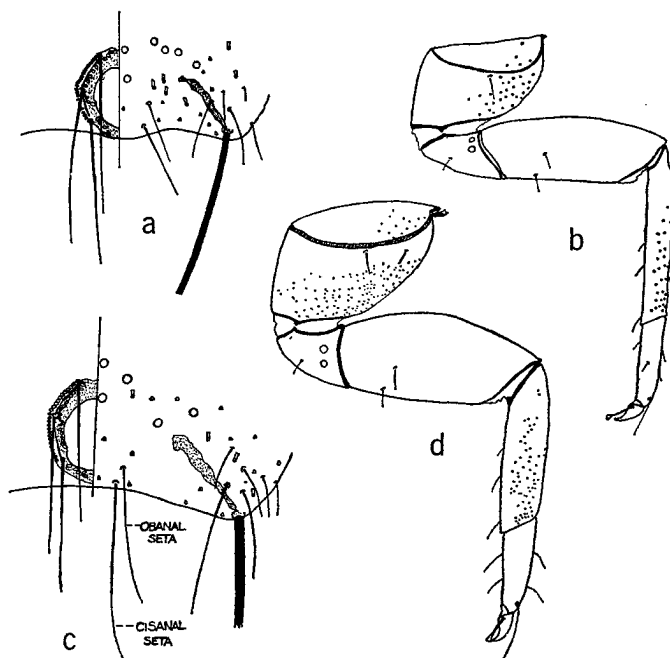


FIGURE 8.—a, b, *Planococcus citri*: a, dorsal and ventral aspects of posterior end of abdomen; b, upper surface of hind leg showing distribution of micropores. c, d, *P. lilacinus*: c, dorsal and ventral aspects of posterior end of abdomen; d, upper surface of hind leg showing distribution of micropores.

tomato foliage; July 1953, Beardsley, on soursop; Sept. 1953, Beardsley, on rose; Jan. 1954, Beardsley, on croton, *Mimosa pudica*, *Impatiens*, and *Jatropha gossypifolia*; Aug. 1958, Owen, on croton.

YAP. YAP: April 1950, Langford; Tomil Dist., July 1950, Goss; central portion, Aug. 1950, Goss, on soursop (*Annona muricata*); Sept. 1952, Krauss; Kolonia, Mar. 1954, Beardsley, on leaves of shower tree (*Cassia* sp.); May 1958, Tellei, on soursop fruit.

CAROLINE ATOLLS. ELATO: Elato I., Sept. 1953, Krauss, on unidentified shrub.

TRUK. WENA (Moen): May 1946, Townes, on *Nipa fruticans*; Civil Administration area, Mar. 1949, Potts, on breadfruit. TONOAS (Dublon): May 1946, Oakley, on cotton; Feb. 1948, Maehler, on *Annona muricata*. TON (Tol): May 1946, Oakley, on orange, lime fruit, and pumpkin leaves; Mt. Unibot, Feb. 1953, Gressitt.

PONAPE. Colonia, Aug. 1946, Oakley, on *Coffea robusta*; Feb. 1948, Dybas, on frangipani leaf (*Plumeria*); July 1949, Owen, on *Psidium* sp.; Experiment Station (near Colonia), Sept. 1950, Adams; in quarantine at Guam, Dec. 1952, Liming, on citrus; Mt. Temwetemwensekir (Tamata-mansakir), 180 m., Gressitt, on large ginger fruit; Palikir, Nov. 1953, Beardsley, on cacao fruit; Madolenihm, Nov. 1953, Beardsley, on *Derris*.

KUSAIE. Lele, Aug. 1946, Oakley, on orange; Malem, Feb. 1953, Clarke, on *Messerschmidia*.

MARSHALL IS. KWAJALEIN: Kwajalein I., June 1958, Owen, on *Aralia* leaves.

GILBERT IS. BUTARITARI: Butaritari I., Dec. 1957, Krauss, on breadfruit leaves. TARAWA: Bairiki I., Nov. 1957, Krauss, on breadfruit leaves.

HOSTS: The citrus mealybug has been reported from a great variety of host plants throughout its range. Among the economic plants of Micronesia it has been taken on breadfruit, cacao, various kinds of citrus, coffee, guava, pumpkin, soursop, and tomato. Takahashi (1936–1942) records *P. citri* from Saipan, Yap, Palau, Truk, and Ponape on *Annona*, betel palm, citrus, cotton, croton, and *Macaranga*.

29. *Planococcus lilacinus* (Cockerell) (fig. 8, *c, d*).

Pseudococcus lilacinus Cockerell, 1905, Davenport Acad. Sci., Proc. **10**: 128.

Planococcus lilacinus: Ezzat and McConnell, 1956, Univ. Maryland Bull. A-84: 89, fig. 32.

DISTRIBUTION: Madagascar, Mauritius, India, Ceylon, Java, Philippine Is. (type locality), Mariana Is., Caroline Is.

S. MARIANA IS. GUAM: Piti, June 1911, Fullaway, on orange; Sept. 1911, Fullaway, on citrus; Dec. 1911, Fullaway, on guava; Alifan, May 1936, Swezey, on seeded breadfruit; Mt. Alifan, June 1936, Swezey, on *Ficus*; Aug. 1937, Oakley, on *Premna gaudichaudi* and *Annona* sp.; Feb. 1938, Oakley, on orange; Agat, June 1938, Oakley on *Pandanus*; Inarajan, Sept. 1938, Oakley, on *Terminalia catappa*; Talofoto, April 1946, Krauss; Mt. Alutom, June 1946, Townes, on *Flagellaria indica*; 1 m. southeast of Asan, Nov. 1947, Dybas; Talofoto, Dec. 1947, Maehler, on *Bauhinia variegata*; Feb. 1948, Maehler, on unidentified plant; Umatac, Feb. 1948,

Maehler, on *Erythrina* sp.; Com. Mar. Hill, Dec. 1948, Maehler, on *Plumeria acutifolia*; Agana, Oct. 1952, Krauss, on *Ficus* stems and guava leaves; Nov. 1953, Liming, on *Bauhinia* sp.

CAROLINE ATOLLS. EAURIPIK: June 1958, Tellei, on *Cyrtosperma* and *Crataeva* fruit. IFALUK: June 1958, Tellei, on *Crataeva* tree.

HOSTS: *Annona*, breadfruit, citrus, guava, *Cyrtosperma*, and *Terminalia* are plants of economic importance in Micronesia which have been found infested with this mealybug. Takahashi (1939) recorded this species from Woleai Atoll, on *Plumeria*.

Genus *Pseudococcus* Westwood

Pseudococcus Westwood, 1840, An Introduction to the Modern Classification of Insects . . . Synopsis of the British Insects (at end of vol. 2), p. 118 (not seen).—Ferris, 1950, Atlas Scale Ins. North America 5: 170 (discussion of nomenclatural problems involving this genus).

Type of genus: *Coccus adonidum* L.

Ferris (1950: 172) redefined *Pseudococcus*, limiting the genus to species possessing dorsal oral-rim tubular ducts, usually 17 marginal pairs of cerarii, and certain other characteristics.

Elsewhere (Beardsley, 1962) I have pointed out the similarity in structure of the adult male penial sheath in *P. adonidum*, in certain endemic Hawaiian species, and in one new Micronesian species (*P. microadonidum*) which is described below. In other species which have females in many respects similar to those of *P. adonidum* (for example *P. orchidicola* Takahashi) the male penial sheath is of a different type. Furthermore, in *P. orchidicola* the spiral form of the sperm bundles differs from that found in males of *P. adonidum* and related species. A few females of two species for which males are unavailable (*P. solomonensis* Williams and *P. trukensis* n. sp.) were found to contain sperm bundles, and these are of the type occurring in *P. orchidicola*. This is of particular interest inasmuch as females of *P. trukensis*, in particular, more closely resemble females of *P. adonidum* than of *P. orchidicola*. It seems quite possible that the male sex will be found to hold the key to clarification of phylogenetic relationships in *Pseudococcus*, *Dysmicoccus*, and other such poorly understood genera which are now defined solely by characters of the females.

KEY TO MICRONESIAN SPECIES OF PSEUDOCOCCUS

1. All 17 pairs of cerarii borne on small sclerotized areas; venter of abdominal segment 8 with a row of 3 or 4 moderately large oral-rim tubular ducts on each side along posterior margin. **pandanicola**
With at most the two posterior pairs of cerarii borne on sclerotized areas; venter of abdominal segment 8 without such rows of oral-rim tubular ducts. 2

2. Ventral multilocular disc pores present on more than two segments anterior to vulva..... 3
 Ventral multilocular disc pores restricted to vulvar region, confined to abdominal segment 8 and occasionally to 7 anterior to vulva..... 10
3. Large dorsal oral-rim tubular ducts numerous, 90 to 100 present arranged in transverse rows of 8 to 20 ducts on thoracic and abdominal segments.... **casuarinae**
 Dorsal oral-rim tubular ducts less plentiful, a maximum of 6 on any segment of thorax or abdomen..... 4
4. Ventral side of anal lobes more strongly sclerotized than dorsal cerarial area; 1 to 4 small discoidal pores present along posterior margin of each eye, and 2 to 4 such pores on posterior portion of each ventral anal lobe sclerotized area....
 **neomaritimus**
 Ventral side of anal lobes not noticeably more strongly sclerotized than dorsal cerarial area; discoidal pores on margins of eyes and venter of anal lobes absent.... 5
5. Dorsal oral-rim tubular ducts relatively numerous, totaling 20 or more, 1 usually laterally near each of most abdominal and thoracic cerarii, plus a few mid-dorsally... 6
 Dorsal oral-rim tubular ducts relatively few, totaling not more than 10, and usually 6 or less..... 9
6. Metacoxae with numerous micropores, totaling 30 or more discernible..... 7
 Metacoxae with relatively few such micropores, about 2 to 10 discernible; conical setae of cerarii, except for those of anal lobes, very small, all of about equal size and about one-half as long as those of anal lobe cerarii..... **dybasi**
7. Appendages relatively long, rostrum about 175–180 μ in length; micropores of hind legs more numerous, hind tibiae each with around 70 or more discernible... **comstocki**
 Appendages shorter, rostrum about 120–130 μ long; micropores of hind legs less numerous, hind tibiae each with around 15 to 25 discernible..... 8
8. Circulus relatively large, length greater than that of hind coxa; multilocular disc pores more numerous, around 200 total..... **macrocirculus**
 Circulus smaller, length less than that of hind coxa; multilocular disc pores less numerous, around 80 total..... **gilbertensis**
9. Dorsal body setae elongate, about 90 μ maximum length; ventral tubular ducts less numerous, 10 to 20 along lateral margin of each of abdominal segments 6 to 8, at most a few scattered along margins of head and prothorax; usually with a few oral-rim tubular ducts ventrally along lateral margins of thorax
 **citriculus**
 Dorsal body setae shorter, about 50 μ maximum length; ventral tubular ducts more numerous, about 60 to 80 or more on lateral areas of each of abdominal segments 6 to 8, extending in a nearly continuous lateral band anteriorly to near eye..... **multiductus**
10. Normally with 1 large and 2 smaller oral-rim tubular ducts dorsally near each abdominal cerarius anterior to the antepenultimate, and near most thoracic cerarii, occasionally with but 1 large and 1 small oral-rim tubular duct near some cerarii; anal lobe and penultimate cerarii both strongly sclerotized, with trilobular pores strongly concentrated (fig. 13, *e, f*); hind tibiae normally with 60 to 80 discernible micropores..... **adonidum**
 With fewer oral-rim tubular ducts along lateral margins of dorsum, 2 or fewer such ducts associated with each cerarius, except occasionally 3 such ducts near one or two cerarii in some specimens of one species; sclerotization if present on penultimate cerarii usually noticeably weaker; trilobular pores of anal lobe cerarii less strongly concentrated; hind tibiae often with fewer micropores..... 11
11. Dorsal tubular ducts relatively few, not more than 8, usually of the oral-rim type, sometimes reduced to a single duct, or occasionally absent..... **solomonensis**
 Dorsal tubular ducts more numerous, 14 or more, usually of the oral-rim type, although these at times partially replaced by oral-collar ducts..... 12

12. With a conspicuous group of 5 to 7 tubular ducts around each inter-antennal cerarius; ventral tubular ducts relatively numerous along lateral margins of body, 3 to 5 located near most cerarii of abdomen and thorax. **orchidicola**
Usually with 4 or fewer tubular ducts associated with each inter-antennal cerarius; ventral tubular ducts less numerous along lateral margins of body, 2 or less associated with almost all cerarii, rarely 3. 13
13. Ventral multilocular disc pores reduced to a very few, not more than 4 on margins of vulva, sometimes wanting; rostrum large, about 175–180 μ long. **trukensis**
Ventral multilocular disc pores more numerous, usually 8 or more discernible; rostrum shorter, 155 μ or less in length. 14
14. Tubular ducts usually absent along lateral margins of venter, with at most 1 or 2 discernible. **yapensis**
Tubular ducts more plentiful along lateral margins of venter, 1 or more associated with most abdominal and thoracic cerarii. 15
15. Penultimate cerarii borne on a strongly sclerotized area which stains about as darkly as anal lobe cerarii; rostrum short, about 120 μ long. **microadonidum**
Penultimate cerarii borne on an unsclerotized or very weakly sclerotized area; if weakly sclerotized then rostrum is longer, about 140–150 μ 16
16. Larger species to 2.6 mm.; rostrum 140–150 μ long; antennae about 480 μ or more long; penultimate cerarii sometimes weakly sclerotized. **marshallensis**
Smaller species to 1.4 mm.; rostrum about 120 μ long; antennae about 400 μ long or less; penultimate cerarii unsclerotized. **kusaiensis**

30. *Pseudococcus adonidum* (Linnaeus) (fig. 13, e, f).

Coccus adonidum Linnaeus, 1758, Syst. Nat., ed. 10 : 455.

Dactylopius longispinus Targioni-Tozzetti, 1868, Soc. Ital. Sci. Nat. Atti. II : (not seen).

Pseudococcus longispinus: Fernald, 1903, Cat. Coccidae of World, 104.

Pseudococcus adonidum: Zimmerman, 1948, Insects of Hawaii 5 : 180, fig. 178.—Ferris, 1950, Atlas Scale Ins. North America 5 : 174, fig. 65.—Beardsley, 1960, Hawaiian Ent. Soc., Proc. 17 (2) : 201, figs. 1, 2 a–c (male).

DISTRIBUTION: Widespread (type locality: not specified), Hawaii, Micronesia (?).

HOSTS: Recorded from a wide variety of hosts throughout the world. Among plants which are of economic importance in Micronesia, it has been recorded elsewhere from avocado, breadfruit, citrus, coffee, mango, and pineapple.

This species, as it has been defined by recent workers, is not represented in the Micronesian survey material. Oakley (1946 : 38) reported *P. adonidum* from Ton (Tol) I., Truk, but I have not seen specimens. It has been included here and in the key to Micronesian species of *Pseudococcus* as it is a common widespread form which is likely to be present in Micronesia, and to differentiate it from several very similar forms which are represented in the material from Micronesia. In Hawaiian specimens which have been taken as representative of *P. adonidum*, both the anal lobe and penultimate cerarii are strongly sclerotized, and in both the trilocular pores are plentiful and

strongly concentrated about the bases of the conical setae (fig. 13, *e, f*). None of the Micronesian forms studied have the trilocular pores as numerous and strongly concentrated as in *P. adonidum*, although in one form, *P. microadonidum* n. sp., the penultimate cerarii are as strongly sclerotized as in *P. adonidum*, and in several other species the penultimate cerarii are moderately sclerotized. These characteristics of the 2 posterior pairs of cerarii, plus the presence of 3 oral-rim tubular ducts of different sizes dorsally near most of the cerarii, will distinguish *P. adonidum* from any of the several forms of similar appearance which are in Micronesia. The characteristic thickening near the mesal border of the ventral sclerotized area of the anal lobes is of little value in separating *P. adonidum* from related Micronesian forms as a similar thickening is quite well developed in several of these.

31. *Pseudococcus casuarinae* (Takahashi), new combination.

Ferrisiana casuarinae Takahashi, 1939, *Tenthredo* 2 (3) : 258, fig. 9.

DISTRIBUTION: Caroline Is. Endemic ?

PALAU. KOROR: Ngarmid (Arumizu), Jan. 1938, Esaki, on *Casuarina* (two specimens on 1 slide designated as cotypes by Takahashi); Jan. 1954, Beardsley, on *Casuarina* sp.

HOST: *Casuarina*.

There appears to be no justification for Takahashi's placement of this species in *Ferrisiana* (= *Ferrisia*). Except for the relatively abundant dorsal oral-rim tubular ducts, it seems to be a fairly typical *Pseudococcus* of the general type of *P. comstocki*, with 17 distinct pairs of cerarii, multilocular disc pores confined to venter, and so on. The type of *Ferrisia* (*F. virgata*) and other species placed there by Ferris have in common the possession of a single pair of cerarii (the anal lobe pair), and oral-collar ducts with mouths surrounded by small sclerotized areas bearing one or more setae. Such ducts are not present in *P. casuarinae*.

32. *Pseudococcus citriculus* Green.

Pseudococcus citriculus Green, 1922, *Coccidae of Ceylon* 5 : 377, pl. 154.—Zimmerman, 1948, *Insects of Hawaii* 5 : 210, fig. 117½.—Beardsley, 1960, *Hawaiian Ent. Soc., Proc.* 16 (2) : 226, fig. 3, *c* (male).

DISTRIBUTION: Ceylon (type locality), Hawaii, Caroline Is.

PALAU. KOROR: Sept. 1953, Beardsley, on *Citrus*.

PONAPE. Colonia, Administration Bldg., Aug. 1946, Oakley, on orange; Experiment Station (near Colonia), Aug. 1946, Oakley, on orange leaves; in quarantine at Honolulu, Ross, on *Citrus paradisi*.

HOSTS: Various kinds of citrus.

Pseudococcus citriculus has been redescribed and figured by Ferris (In Zimmerman, 1948 : 210, fig. 117½). Structurally it resembles *P. comstocki*, *P. dybasi*, and *P. macrocirculus*, but has relatively few dorsal oral-rim tubular ducts, and the dorsal body setae are conspicuously more elongate than in any of the above. It can be separated from *P. multiductus*, described below, by the relatively few oral-collar tubular ducts along the lateral margins of the venter and the longer dorsal body setae.

33. *Pseudococcus comstocki* (Kuwana).

Dactylopius comstocki Kuwana, 1902, Calif. Acad. Sci., Proc. **3** (3) : 52.

Pseudococcus comstocki: Fernald, 1903, Cat. Coccidae of World, 100.—

Ferris, 1950, Atlas Scale Ins. North America **5** : 177, fig. 66.—Wilkey and McKenzie, 1961, Dept. Agric. State Calif., Bull. **50** (4) : 248, fig. 3.—Beardsley, 1962, Hawaiian Ent. Soc., Proc. **18** (1) : 92, fig. 3, *i* (male).

DISTRIBUTION: Japan (typelocality), Continental U.S., Micronesia (?).

HOSTS: Reported by Takahashi on *Pandanus* in Micronesia, this species has been recorded elsewhere from a wide range of hosts.

Comstock's mealybug has been reported by Takahashi (1941 : 214) from Ponape and Saipan, on *Pandanus*. This species is not represented in the material which I have examined, although several apparently related species are present in Micronesia. It is possible that the Micronesian records of *P. comstocki* are misidentifications. Specimens from Japan and the United States were examined during this study, and the species has been included in the key to Micronesian *Pseudococcus* on the basis of these specimens. Ferris (1950 : 177, fig. 66) has redescribed and figured *P. comstocki*, and more recently Wilkey and McKenzie (1961 : 248) have discussed this species and have figured the hind legs to show the distribution of the micropores.

34. *Pseudococcus dybasi* Beardsley, n. sp. (fig. 9).

Female. Size moderately large, length of slide-mounted specimens about 2.1–2.6 mm.; body form elongate-oval; anal lobes moderately protuberant. Antennae 8-segmented, around 340–360 μ long, incompletely 8-segmented or 7-segmented in a few specimens. Legs moderately small; hind femora about 170 μ long; hind tibiae about 170 μ long. Hind legs with relatively few micropores, around 2 to 10 discernible in each hind coxa; 5 to 15 on each hind femur; and 5 to 12 on each hind tibia; absent on hind trochanters and tarsi. Rostrum moderately short, about 135 μ in length. Anal ring cellular, about 75 μ wide, bearing 6 setae about 105–110 μ maximum length. Two pairs of dorsal ostioles present, their lips unsclerotized. Circulus present, moderately small, about 60 μ long by 80–85 μ wide, extending across intersegmental membrane between abdominal segments 4 and 5. Eyes of moderate size, about 30 μ diameter, without appreciable development of ocular cone; paraocular discoidal pores wanting.

With 17 pairs of marginal cerarii. Anal lobe cerarii each with 2 conical setae about 18 μ long, 3 or 4 slender accessory setae about 27 μ maximum length, plus a concentration of around 25 to 30 trilocular pores, borne on an area of light to moderate sclerotization. Penultimate cerarii and anterior abdominal cerarii each with 2 small conical setae about

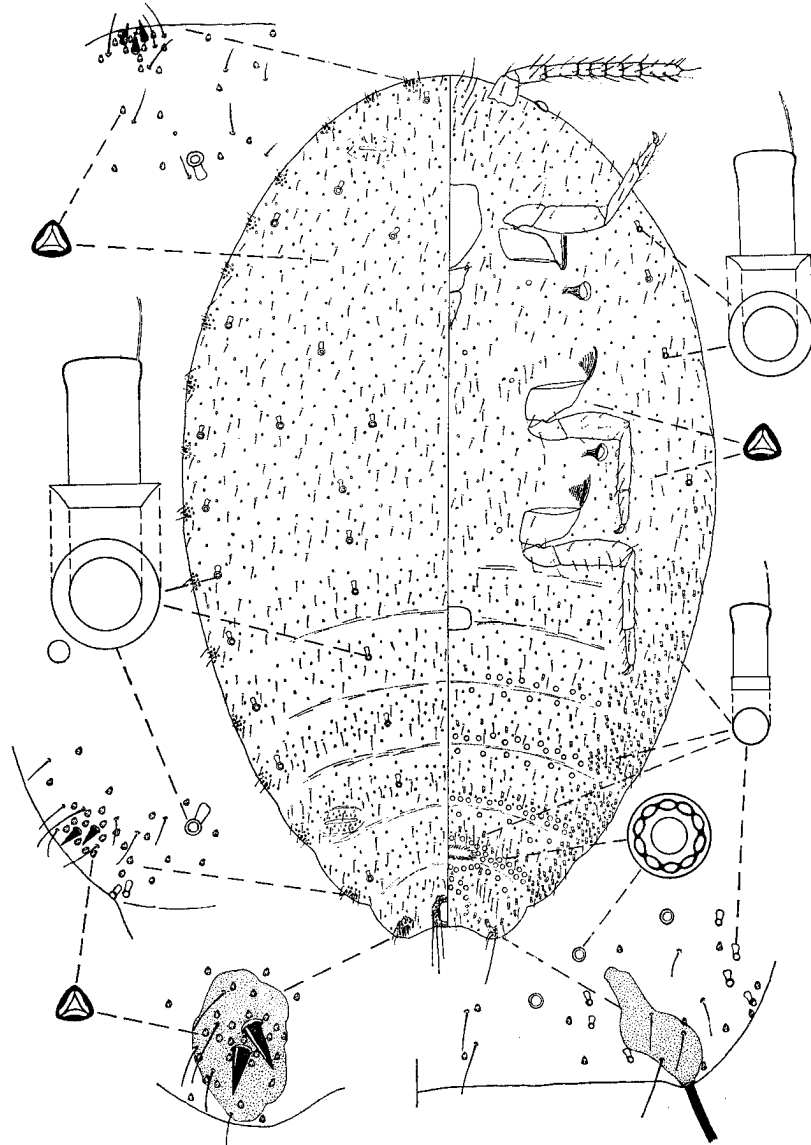


FIGURE 9.—*Pseudococcus dybasi*, adult female, dorsal and ventral aspects and details.

8–11 μ long, 3 to 5 slender accessory setae about 19 μ maximum length, plus a slight concentration of around 9 to 14 trilocular pores; the surrounding derm unsclerotized. Anterior thoracic and cephalic cerarii each with 2, 3, or occasionally 4 such small conical setae, otherwise similar. Venter of anal lobe with a small elongate area of weak sclerotization. Anal lobe seta rather short, about 85–90 μ maximum length.

Oral-rim tubular ducts, 9–10 μ diameter across rim, fairly numerous on dorsum; arranged in a marginal series of 1 near each of most abdominal cerarii, except those of segments 7 and 9, 1 just behind each interantennal cerarius on head, and 1 near each of several thoracic cerarii, there being 8 to 10 such ducts on each side; 2 to 4 such ducts in a transverse row on the central part of the dorsum on each abdominal segment anterior to segment 8 and on thoracic segments. Oral-rim ducts frequently with 1 or 2 very small (1.5–2 μ diameter) simple circular pores near rim. Venter with a few (2 to 5) oral-rim ducts along lateral margin of thorax on each side, plus numerous small oral-collar tubular ducts, 2–3 μ diameter at orifice, in a band along lateral margins of abdominal segments 3 to 8; a few such ducts on margins of segments 2 and 9; and in a transverse row across posterior part of abdominal segments 4 to 8. A few (usually 4 to 6) oral-rim ducts along lateral margin of venter of thorax on each side. Multilocular disc pores confined to venter, totaling around 150 to 160, a row along the posterior margin of abdominal segment 5, and rows on anterior and posterior margins of segments 6 to 8, plus a few behind vulva on segments 9 and 10. A very few multilocular pores scattered on venter of thorax and anterior abdominal segments. Trilocular pores moderately sparsely scattered on dorsum and venter. Body moderately sparsely clothed with short fine setae; those of dorsum mostly 16–24 μ long; those of venter mostly 10–21 μ long; setae around vulva up to about 30 μ long; longer setae on venter of head anterior to mouthparts up to about 52 μ long.

Holotype, female (US 67969) and 2 paratypes on 1 slide, Ulebsehel (Aurapushekaru), Palau Is., Jan. 1948, Dybas, under bark flakes on live tree tended by ants; 18 paratypes (BISHOP, UH, US) on 6 slides, same data.

DISTRIBUTION: Caroline Is. (Palau).

HOSTS: Under bark of unknown tree.

P. dybasi appears allied to *P. comstocki* and to *P. macrocirculus* n. sp. It differs from both species in possessing considerably fewer metacoxal micropores and in having the conical setae of the cerarii, anterior to those of the anal lobes, all relatively small (8–11 μ long vs. about 15 μ long in penultimate cerarii of *macrocirculus* and about 20 μ in available specimens of *comstocki*). The relatively much larger circulus of *macrocirculus* will also serve to distinguish it from *P. dybasi*.

35. *Pseudococcus gilbertensis* Beardsley, n. sp. (fig. 10).

Female. Size moderate, length of slide-mounted specimens 2.0 to 2.5 mm.; body form elongate-oval; anal lobes moderately protuberant. Antennae 8-segmented, about 450 μ long. Legs moderately slender; hind femora each about 250 μ long, hind tibiae about 250 μ long. Hind coxae each with around 30 to 50 translucent spots or micropores, mostly on upper (posterior) face, distributed as indicated in figure; hind femora each with about 15 to 20 such micropores on upper face; hind tibiae each around 20 to 25 such micropores. Rostrum about 125 μ long. Two pairs of dorsal ostioles present. Circulus present, moderately large, 105 μ wide by about 75 μ long, extending across intersegmental fold between abdominal segments 4 and 5. Eyes of moderate size, about 30 μ diameter with a moderately well-developed ocular cone; paraocular discoidal pores absent. Anal ring cellular, about 85 μ wide, bearing 6 setae about 160 μ maximum length.

With 17 pairs of marginal cerarii. Anal lobe cerarii each with 2 conical setae about 28–29 μ long, 6 to 8 slender accessory setae about 55 μ maximum length, plus a cluster of around 35 to 45 trilocular pores, borne on a well-defined sclerotized area. Penultimate

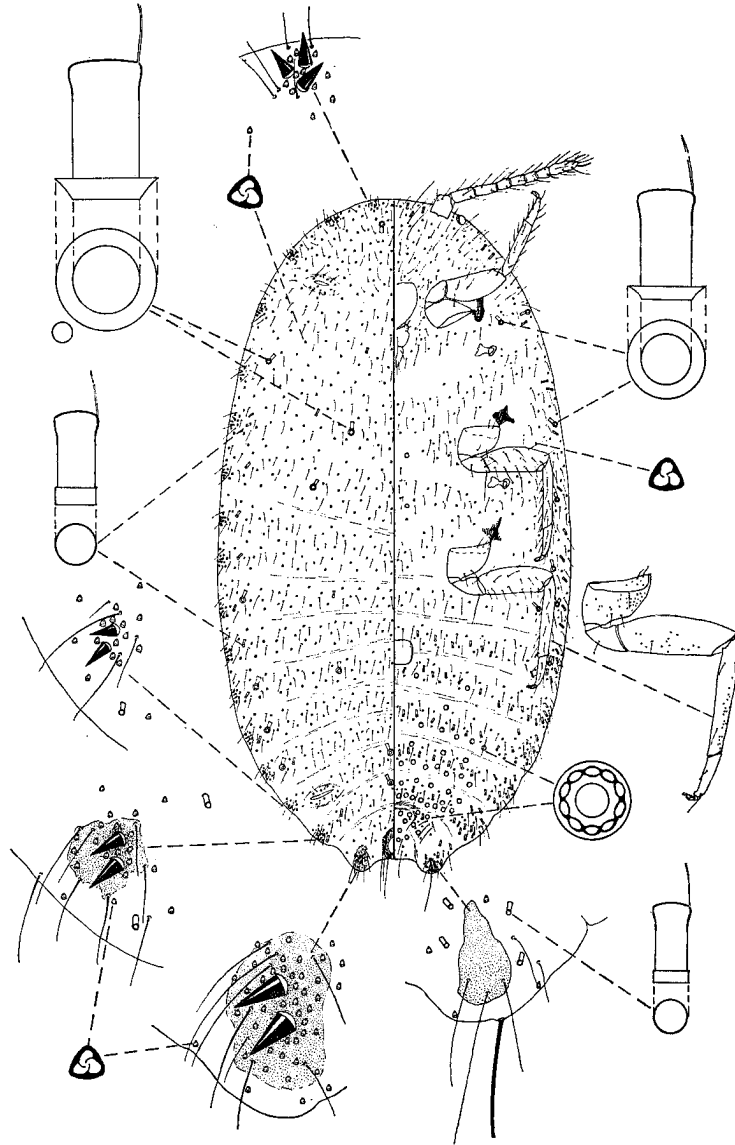


FIGURE 10.—*Pseudococcus gilbertensis*, dorsal and ventral aspects and details.

cerarii each with 2 conical setae about $18\ \mu$ maximum length plus 5 or 6 slender accessory setae about $35\ \mu$ maximum length and a small group of around 12 to 18 trilocular pores, borne on a small area of weak sclerotization. Anterior abdominal cerarii each with 2 conical setae, many of those on thorax and head with 3 or 4 conical setae, around $16\ \mu$ maximum length, accompanied by 2 to 5 slender accessory setae and a small concentration of around 10 to 12 trilocular pores; the surrounding derm unsclerotized. Venter of anal lobes each with a small, well-defined sclerotized patch. Anal lobe seta about $120\ \mu$ long.

Dorsum with around 18 to 25 oral-rim ducts, each about $10\text{--}11\ \mu$ diameter across rim, distributed in a lateral series of one near each of several abdominal and thoracic cerarii and one just behind each interantennal cerarius, plus one or two mid-dorsally on each of several thoracic and abdominal segments. Oral-rim ducts replaced by oral-collar tubular ducts about $4\text{--}5\ \mu$ diameter laterally near some cerarii; sometimes with one oral-rim and one oral-collar, or two oral-collar ducts near a few cerarii. A few oral-collar ducts usually present mid-dorsally on thorax and abdomen. One to 5 oral-rim tubular ducts about $9\ \mu$ diameter present on lateral margins of venter near each of several anterior abdominal and thoracic cerarii. Venter with moderately numerous oral-collar tubular ducts, $3\text{--}4\ \mu$ diameter, distributed along lateral margins of abdominal segments and in transverse rows across abdominal segments 4 to 9; a few such ducts scattered along lateral margins of venter of thorax and head. Multilocular disc pores confined to venter, a total of around 80 on abdominal segments behind circulus; a few discernible on venter of thorax in some specimens. Trilocular pores moderately sparsely scattered on dorsum and venter. Body moderately sparsely clothed with fine setae; those of dorsum mostly $12\text{--}40\ \mu$ in length; those of venter mostly $25\text{--}60\ \mu$ long; longer setae of venter of head, anterior to mouthparts, up to $160\ \mu$ in length.

Holotype, female (BM) and 2 paratypes on one slide, Gilbert Islands, Tarawa Atoll, Aug. 15, 1956, E. S. Brown, on *Calophyllum*; 20 paratypes (BISHOP, BM, US) on 10 slides, same data as type.

Pseudococcus gilbertensis belongs with the *P. comstocki* group of mealybug species represented in Micronesia by *P. dybasi*, *P. macrocirculus*, *P. citriculus*, and *P. multiductus*. It more closely resembles *P. comstocki* than any of the other species mentioned here. Direct comparison with Japanese and North American specimens, determined as *P. comstocki* by Dr. Harold Morrison, revealed the following differences: In *P. gilbertensis* the appendages are smaller, the rostrum, for example, measuring $125\ \mu$ long in *gilbertensis* vs. $175\text{--}180\ \mu$ in *P. comstocki*. The hind legs of *gilbertensis* have noticeably fewer of the small translucent spots or micropores than do those of *comstocki*, and the latter also possesses many more dorsal oral-rim tubular ducts and ventral multilocular pores than does *P. gilbertensis*.

The type material of this species was made available for study through the kindness of Dr. D. J. Williams, Commonwealth Institute of Entomology, London.

36. *Pseudococcus kusaiensis* Beardsley, n. sp. (fig. 11).

Female. Moderately small, length of slide-mounted specimens about 1.4 mm.; body form elongate-oval; anal lobes moderately protuberant. Antennae 8-segmented, about $390\ \mu$ long; legs moderately slender, hind femora about $200\ \mu$ long, hind tibiae about $215\ \mu$ long. Hind coxae without discernible micropores; hind femora with 20 to 55 micropores; hind tibiae with 20 to 45 micropores in available specimens. Rostrum relatively short, about $120\ \mu$ in length. Two pairs of dorsal ostioles, their lips unsclerotized. Circulus moderately small, extending across intersegmental fold between abdominal segments 4 and 5.

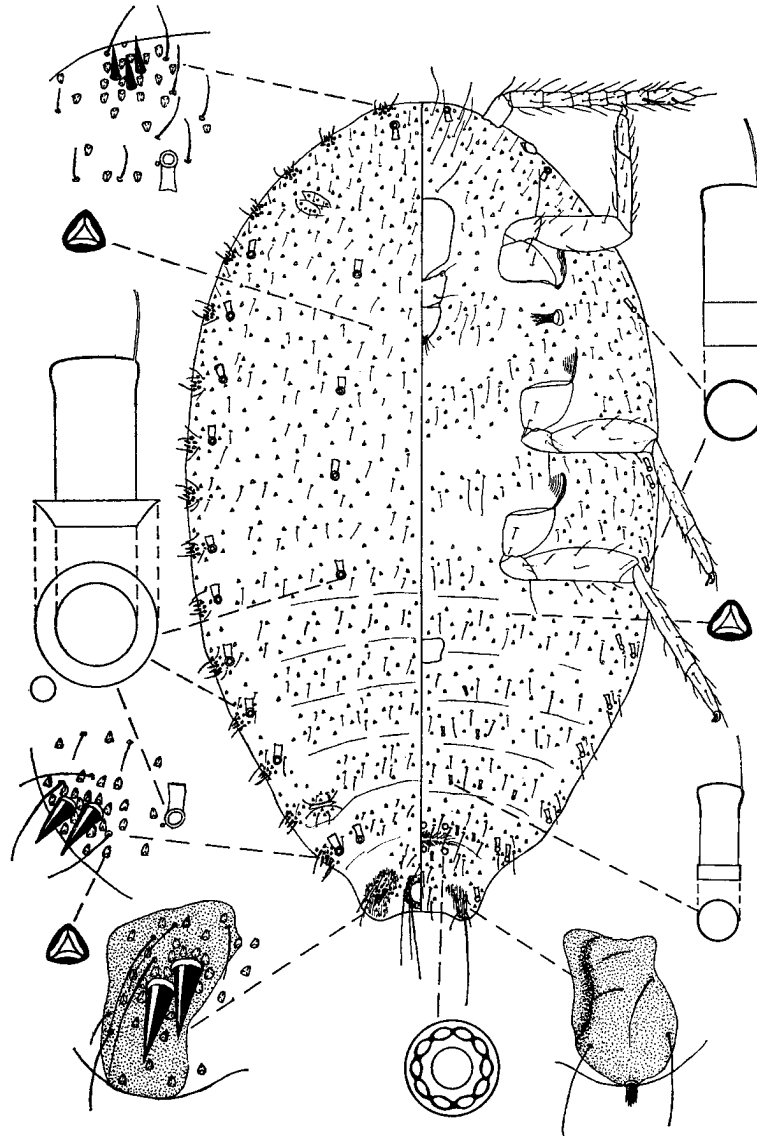


FIGURE 11.—*Pseudococcus kusaiensis*, adult female, dorsal and ventral aspects and details.

Eyes of moderate size, about $28\ \mu$ diameter, with a small ocular cone; paraocular discoidal pores absent.

With 17 pairs of marginal cerarii. Anal lobe cerarii each with 2 moderately large conical setae about $28\ \mu$ long, 5 or 6 slender accessory setae about $45\ \mu$ maximum length, and a small cluster of around 25–30 trilocular pores, borne on a well-defined sclerotized area. Penultimate cerarii each with 2 conical setae about $18\ \mu$ maximum length, plus 3 or 4 slender accessory setae and a cluster of around 20 trilocular pores. Anterior cerarii mostly with 2 conical setae 8–10 μ long, some on head and thorax with 3 such conical setae; plus 2 or 3 slender accessory setae about $25\ \mu$ maximum length and a slight concentration of around 10 to 15 trilocular pores. Venter of anal lobe with a well defined sclerotized area appearing slightly more heavily sclerotized in a narrow band near its mesal border. Anal lobe seta about $135\ \mu$ long.

Dorsum with fairly numerous oral-rim tubular ducts, about 8–9 μ diameter across rim; 1 or 2 laterally near each penultimate cerarius; 1 near each of most of the thoracic and abdominal cerarii anterior to the antipenultimate; 1 behind each interantennal cerarius on head; 6 to 8 or so on central part of dorsum on thoracic and anterior abdominal segments. Venter with a few small oral-collar tubular ducts, about 3 μ diameter at orifice, on posterior abdominal segments, around vulva, and along posterior margins of segments 5 to 7. A few larger oral-collar or oral-rim ducts present on lateral margins of venter, 1 or 2 associated with most of the abdominal and posterior thoracic cerarii, plus an occasional duct on ventral margin of head and anterior part of thorax. Multilocular disc pores very few, 6 to 8 present on margins of vulva. Trilocular pores evenly scattered on dorsum and venter. Body moderately sparsely clothed with short fine setae, those of dorsum about $30\ \mu$ maximum length, those of venter mostly $45\ \mu$ or less in length; longer setae of venter of head anterior to mouthparts about $100\ \mu$ maximum length.

Holotype, female (US 67970) and 2 paratypes on one slide, Kusaie, Aug. 1946, Oakley, on *Boehmeria*; 11 paratypes (BISHOP, US) on 4 slides, same data as holotype.

DISTRIBUTION: Caroline Is. (Kusaie).

HOST: *Boehmeria* sp.

This is a relatively small species somewhat similar to *P. microadonidum* n. sp., from which it may be distinguished by the absence of sclerotized areas around the penultimate cerarii, and by having all the dorsal oral-rim tubular ducts of one size, whereas there are two distinct sizes of these ducts in *P. microadonidum*. *P. kusaiensis* may be distinguished from *P. yapensis* n. sp. by the absence of tubular ducts along the ventral margins in the latter, and from the remaining Micronesian species of the general type of *P. adonidum* by its small size, short beak, and other characters.

37. *Pseudococcus macrocirculus* Beardsley, n. sp. (fig. 12).

Female. Moderately large, length of slide-mounted specimens 2.0–2.4 mm.; body form elongate-oval; anal lobes slightly protuberant. Antennae 8-segmented, about $480\ \mu$ long. Legs of moderate size; hind femora about $245\ \mu$ long; hind tibiae about $240\ \mu$ long. Micropores present in hind coxae, femora, and tibiae; absent in trochanters and tarsi; about 30 to 40 discernible in hind coxae, 25 to 35 in hind femora, and 15 to 20 on hind tibiae. Rostrum moderately short, about 120 – $125\ \mu$ long. Anal ring cellular, bearing 6 setae about $150\ \mu$ maximum length. Two pairs dorsal ostioles present, their lips not noticeably sclerotized. Circulus present, relatively very large, length when undistorted up to about $185\ \mu$, extending across intersegmental fold between abdominal segments 4 and 5. Eyes of moderate size, about $30\ \mu$ diameter, ocular cone weakly developed; paraocular discoidal pores absent.

With 17 pairs of marginal cerarii. Anal lobe cerarii each with 2 conical setae about $24\ \mu$ long, 3 to 5 slender accessory setae about $45\ \mu$ maximum length, plus a concentration

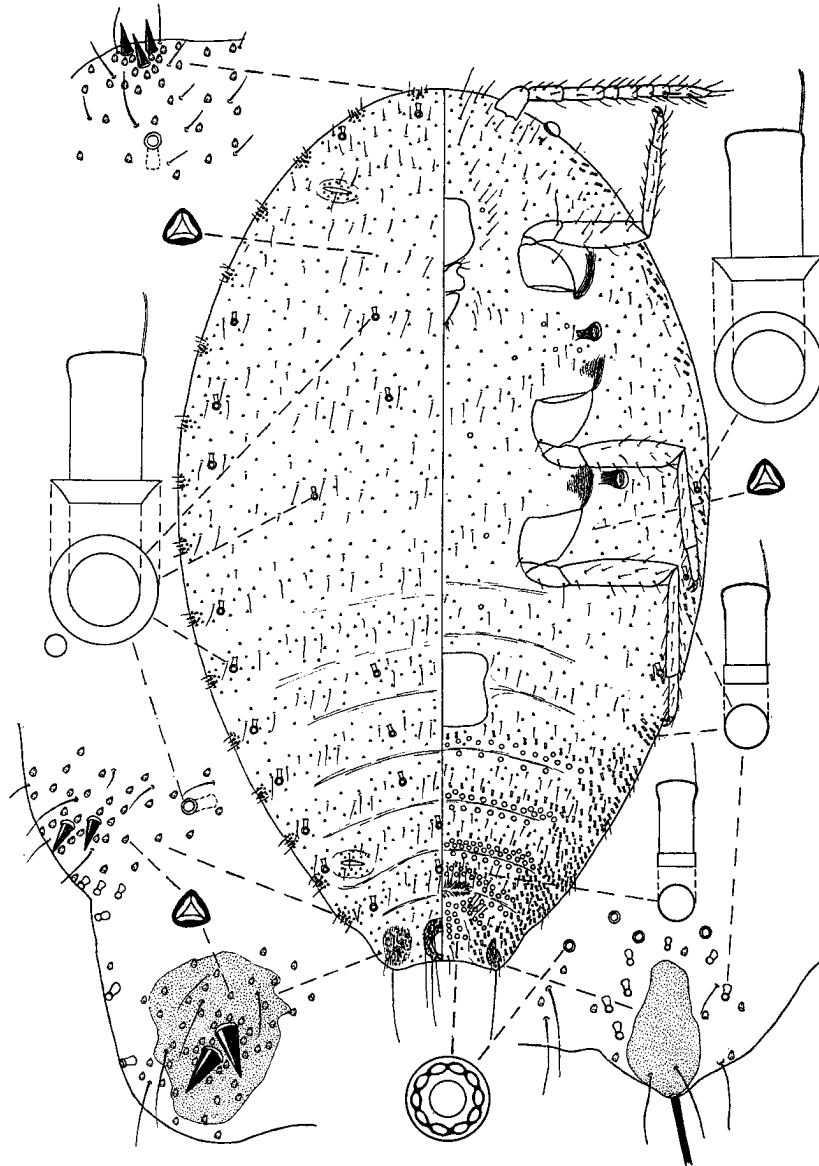


FIGURE 12.—*Pseudococcus macrocirculus*, adult female, dorsal and ventral aspects and details.

of around 50 trilocular pores, on a moderately well defined sclerotized area. Penultimate cerarii each with 2 conical setae 12–16 μ long, 2 or 3 slender accessory setae about 30 μ maximum length, plus a concentration of about 12 to 16 trilocular pores; the surrounding derm unsclerotized. Anterior cerarii mostly with 2 conical setae, about 15 μ long, those of head and anterior part of thorax occasionally with 3 such setae, each with 2 or 3 slender accessory setae about 30 μ maximum length, plus a concentration of a few (usually 10 to 15) trilocular pores. Venter of anal lobe with a small, elongate sclerotized area. Anal lobe seta about 160 μ long.

Oral-rim tubular ducts, about 9–10 μ diameter across rim, fairly plentiful on dorsum; 1 laterally near each cerarius on abdominal segments 2 to 8; 1 just behind each interantennal cerarius; and 1 near each of several of the remaining cephalic and thoracic cerarii; 1 or 2 on the central part of dorsum of each of several abdominal and thoracic segments; total on dorsum about 34 to 40. A few (1 to 3) small circular disc pores present near margins of many dorsal oral-rim ducts. Venter with numerous small oral-collar tubular ducts 3–4 μ diameter at orifice, in a band along lateral margins of abdominal segments 4 to 9, and less abundantly scattered along margins of posterior abdominal and thoracic segments and onto lateral margin of head behind eye. A submedian transverse row of oral-collar ducts extending across venter of abdominal segments 5 to 8. A few oral-rim ducts, usually 2 to 5 on each side, on lateral margins of anterior abdominal and thoracic segments. Multilocular disc pores confined to venter; fairly numerous on abdominal segments 5 to 10 behind circulus, a row on posterior margin of segment 5, and rows along both anterior and posterior margins of segments 6 to 9. A very few scattered multilocular pores on anterior abdominal and thoracic segments, particularly near anterior spiracles; sometimes 1 or 2 discernible on venter of head. Trilocular pores sparsely scattered on dorsum and venter. Body sparsely clothed with fine setae; those of the dorsum up to about 30 μ maximum length; those of venter about 60 or 70 μ maximum length; longer setae on venter of head anterior to mouth-parts about 95 μ maximum length.

Holotype, female (BISHOP 6140) and 2 paratypes on 1 slide, Ngerkabesang I., Palau Is., Feb. 1954, Beardsley, on *Barringtonia*; 5 paratypes (US, UH), on 2 slides, same data.

Palau Is., Babelthuap, Ulimang, Dec. 1947, Dybas, beating vegetation in lowland forest; Ngerkabesang, Feb. 1954, Beardsley, on *Barringtonia*; Ulebsehel (Aurapushekaru), Jan. 1948, Dybas, beating vegetation. Yap I., Yap, Ruul District, Aug. 1950, Goss, on *Sonneratia caseolaris*. Eauripik, Caroline Atolls, June 1958, Tellei, on *Cyrtosperma* leaves; Jan. 1964, Owen, on *Cyrtosperma*.

DISTRIBUTION: W. Caroline Is. (Palau, Yap, Eauripik).

HOSTS: *Cyrtosperma*, and several uncultivated plants.

This species resembles *P. comstocki* (Kuwana), from which it may be distinguished by its relatively large circulus, and the markedly fewer micropores in the hind legs. In addition, the beak is relatively short (about 120–125 μ) compared to that of *P. comstocki* (170–180 μ long in examples at hand).

38. *Pseudococcus marshallensis* Beardsley, n. sp. (fig. 13, a–d).

Female. Size moderate, length of slide-mounted specimens about 2.2 to 2.6 mm.; body elongate-oval; anal lobes moderately protuberant. Antennae 8-segmented, about 480 μ long. Legs moderately large; hind femora about 270 μ long; hind tibiae around 250–270 μ long. Hind coxae without micropores; hind femora with 20 to 30 micropores discernible; hind tibiae usually with 15 to 25 such pores. Rostrum 140–150 μ long. Anal ring cellular, about

85 μ wide, with 6 setae about 155 μ maximum length. Two pairs dorsal ostioles present, their lips unsclerotized. Circulus moderately large, extending across intersegmental fold between abdominal segments 4 and 5. Eyes moderately large, about 36 μ in diameter, with a moderately large ocular cone; paraocular discoidal pores absent.

With 17 pairs of marginal cerarii. Anal lobe cerarii (fig. 13, *d*) each with 2 large conical setae about 30 μ long, plus 4 or 5 slender accessory setae about 60 μ maximum length surrounded by a moderately dense concentration of around 50 trilobular pores, and borne on a well-defined sclerotized area. Penultimate cerarii (fig. 13, *c*) each with 2 conical setae about 18 μ long, plus 4 or 5 slender accessory setae and a concentration of around 30 trilobular pores, borne on an area of weak sclerotization. Anterior cerarii mostly with 2 conical

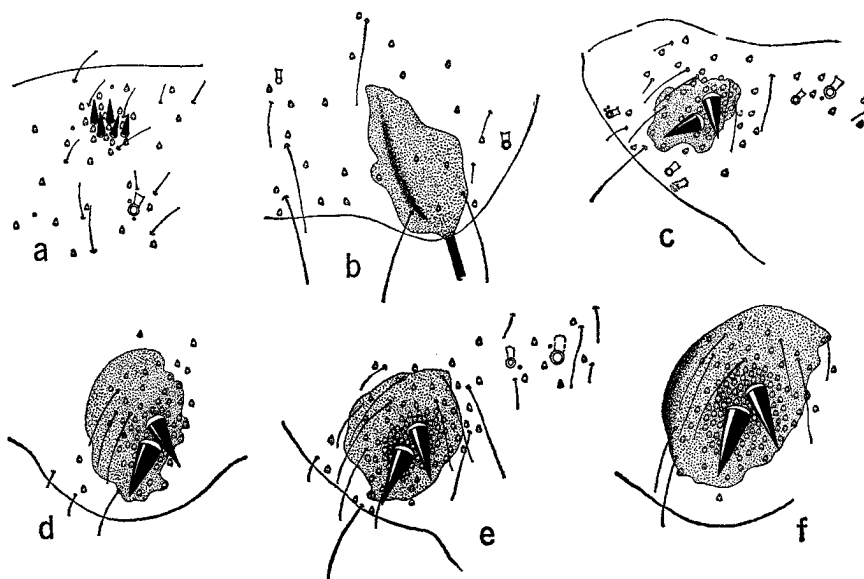


FIGURE 13.—*a-d*, *Pseudococcus marshallensis*: *a*, interantennal cerarius; *b*, venter of anal lobe; *c*, penultimate cerarius; *d*, anal lobe cerarius. *e, f*, *P. adonidum*: *e*, penultimate cerarius; *f*, anal lobe cerarius.

setae, except those of head and anterior part of thorax frequently with 3 to 6 such setae (fig. 13, *a*), mostly 15 μ or less in length, plus 1 to 3 slender accessory setae, and a concentration of about 10 to 20 trilobular pores, surrounding derm unsclerotized. Venter of anal lobe (fig. 13, *b*) with a well-developed elongate sclerotized area with a somewhat more heavily sclerotized strip near its mesal border. Anal lobe setae around 110–130 μ long.

Dorsal oral-rim tubular ducts fairly numerous, of two sizes, the larger 9–10 μ diameter across rim, the smaller 6–7 μ diameter across rim; usually 1 large and 1 small oral-rim duct laterally near most cerarii except those of anal lobes, the antipenultimate, and 2 or 3 pairs of head and thorax; an occasional cerarius with 1 large and 2 small oral-rim ducts, or a single large, or a single small such duct. A few larger type oral-rim ducts present on central portion of dorsum of 1 or more thoracic and anterior abdominal segments. Usually with 1 oral-rim duct, either large or small, on lateral margin of venter near each cerarius; occasionally 2 or 3 such ducts, particularly near penultimate and antipenultimate cerarii, these sometimes lacking well-developed oral rims. A few small oral-collar tubular ducts in transverse rows across venter of abdominal segments behind circulus, about 3–4 μ diameter

at orifice. Multilocular disc pores limited to a few around margin of vulva, 8 to 14 in available specimens. Trilocular pores evenly and fairly densely scattered on dorsum and venter. Body clothed with short, fine setae; those of dorsum about 27 μ maximum length, those of venter longer, about 50 μ maximum length.

Holotype, female (US 67971), Imroj (Imrodj) I., Jaluit Atoll, Marshall Is., Aug. 24, 1946, Oakley, on *Artocarpus altilis*; 9 paratypes on 3 slides (BISHOP, UH), same data. Additional specimens: Ailinglapalap I., Ailinglapalap Atoll, Marshall Is., Aug. 1946, Oakley, on *A. altilis*; Majurirok I., Jaluit Atoll, Sept. 1953, Beardsley, on breadfruit; Imroj (Imrodj) I., Jaluit, Aug. 1946, Oakley, on *Pipturus*. Lele, Kusaie, Caroline Is., Aug. 1946, Oakley, on breadfruit.

DISTRIBUTION: Marshall Is. (Ailinglapalap, Jaluit), Caroline Is. (Kusaie).

HOSTS: Breadfruit (*Artocarpus altilis*), *Pipturus*.

Pseudococcus marshallensis resembles *P. adonidum* in general appearance, but can be differentiated by the characters stressed in the key to Micronesian species of *Pseudococcus*, such as penultimate cerarii less strongly sclerotized; with less numerous and less concentrated groups of trilocular pores around conical setae of anal lobe and penultimate cerarii; and with fewer oral-rim tubular ducts dorsally, there being usually 2, only occasionally 3, near most cerarii in *marshallensis*, whereas *adonidum* usually has 3, only occasionally 2. Also, *P. marshallensis* appears to have somewhat fewer micropores in the hind femora and tibiae than does *adonidum*, there being around 20 to 30 in the femora (30 to 40 in *adonidum* specimens examined), and about 15 to 25 in the hind tibiae (40 to 60 in *adonidum*). *P. marshallensis* is also similar to *P. trukensis*, described below, but may be separated from the latter by its relatively short appendages (rostrum 140–150 μ long in *marshallensis*, 170–185 μ long in *trukensis*), more numerous dorsal oral-rim tubular ducts laterally near cerarii, and more numerous multilocular disc pores around vulva (8 to 14 in *marshallensis*, 0 to 4 in *trukensis*).

39. *Pseudococcus microadonidum* Beardsley, n. sp. (figs. 14; 21, c).

Female. Size moderately small, length of slide-mounted specimens about 2 mm. or a little over; body form elongate-oval; anal lobes only slightly protuberant. Antennae normally 8-segmented, occasionally 7- or incompletely 8-segmented; about 400–420 μ long. Legs of moderate size; hind femora about 230 μ long; hind tibiae about 220 μ long. Hind coxae without micropores; hind femora with 8 to 15 micropores usually discernible; hind tibiae with 12 to 18 such pores usually present (fig. 21, c). Rostrum rather short, about 120 μ in length. Anal ring cellular, about 75 μ wide, with 6 setae about 150 μ maximum length.

Two pairs of dorsal ostioles, small, their lips unsclerotized; circulus moderately large, extending across intersegmental line between abdominal segments 4 and 5. Eyes 28–30 μ in diameter; ocular cone small; paraocular discoidal pores absent.

Seventeen pairs of marginal cerarii present. Anal lobe cerarii each with 2 conical setae about 22–25 μ long, plus 5 or 6 slender accessory setae about 40 μ maximum length, surrounded by a moderate concentration of around 35 to 40 trilocular pores, and borne on a small sclerotized area. Penultimate cerarii each with 2 somewhat smaller conical setae about 15–18 μ long, plus 3 to 5 slender accessory setae, and a slight concentration of around

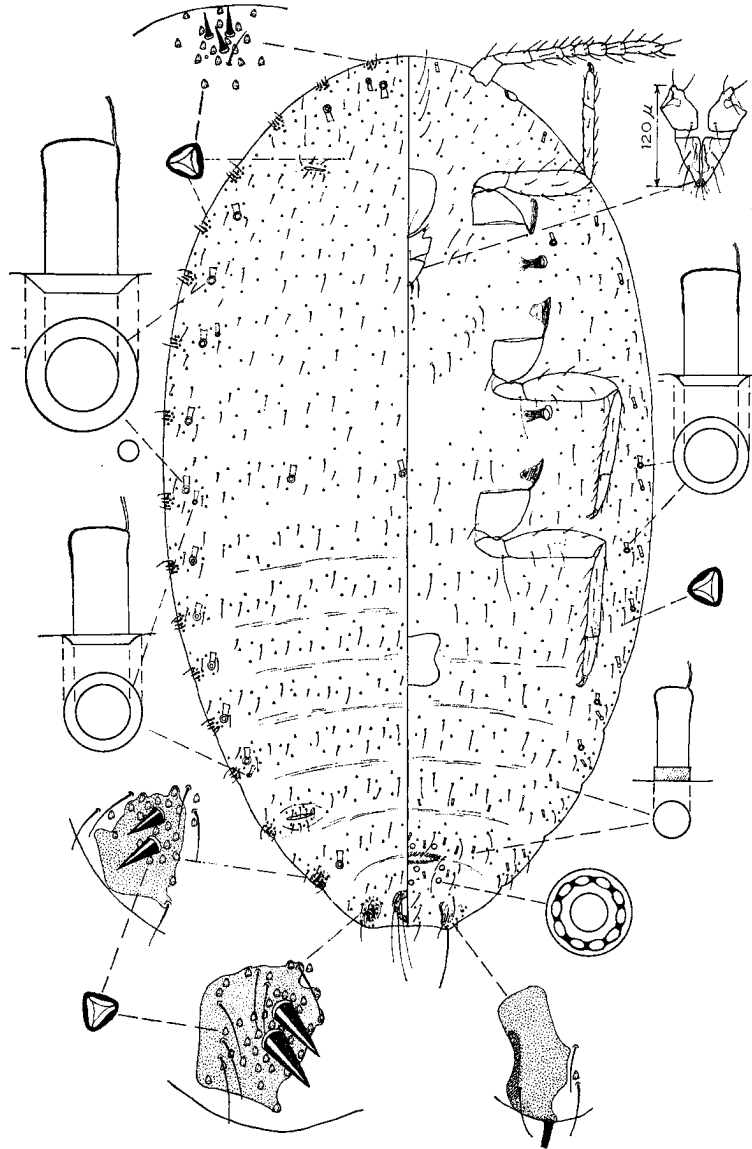


FIGURE 14.—*Pseudococcus microdonidum*, adult female, dorsal and ventral aspects and details.

20 trilocular pores, borne on a small but definite sclerotized area. Anterior cerarii with 2 small conical setae, occasionally 3 or 4 in those on anterior part of thorax and head, mostly 9 or 10 μ long, plus 1 or 2 slender accessory setae, and a small concentration of around 6 to 12 trilocular pores; surrounding derm unsclerotized. Venter of anal lobes with a definite elongate sclerotized area with a conspicuously more strongly sclerotized section along its mesal border. Anal lobe seta slightly shorter than anal ring setae, about 120 μ long.

Oral-rim tubular ducts of two sizes on dorsum, the larger ducts about 10–12 μ diameter across rim, the smaller about 6–7 μ diameter across rim. One large oral-rim duct laterally near most cerarii except those of anal lobes, antipenultimate segment, and 1 or 2 cerarii on anterior part of thorax and head; several cerarii, usually 3 to 6 pairs, with a small oral-rim duct present nearby. Several large oral-rim ducts usually present on central portion of anterior abdominal and/or thoracic segments. Tubular ducts present along lateral margins of venter near cerarii, 1 to 3 associated with most cerarii; these of oral-collar or oral-rim types, the latter usually smaller than the large dorsal oral-rim ducts. A few small oral-collar ducts on posterior abdominal segments of venter in vicinity of vulva, and along posterior margin of abdominal segment 7, about 3 μ diameter at orifice. Multilocular disc pores limited to a few around vulva, 6 to 14 or so in available specimens. Trilocular pores evenly, moderately sparsely scattered on dorsum and venter. Body sparsely clothed with short fine setae; those of dorsum about 25 μ maximum length; those of venter somewhat longer, about 60 μ maximum length. Long setae on venter of head anterior to mouthparts about 100 μ long.

Male. The single adult male specimen available (Colonia, Ponape, Nov. 1953, Beardsley, on coconut) is not in perfect condition and will not be designated an allotype. The important features of this specimen are: very similar to male of *P. adonidum*; antennae slightly shorter than in *adonidum*, about 550 μ long (about 700 μ in *adonidum*); segment 3 about 80 μ long (about 100 μ in *adonidum*); penial sheath very similar to *adonidum*, about 150 μ long, with well-developed median lobes; apex truncate, about 19 μ wide at tip. Other discernible features not appreciably different from *adonidum* male. Sperm bundles similar to those of *adonidum*, helical portion with a lead of about 1.5 μ .

Holotype, female (BISHOP 6141), and 2 paratypes (BISHOP) on 1 slide, Marakei Atoll, Gilbert Is., Dec. 1957, Krauss, on coconut. Three paratypes on 1 slide (US), same data as holotype. Additional specimens: Marshall Is., Engebi I., Eniwetok Atoll, May 1946, Townes, on *Cocos nucifera*; Wotho I., Wotho Atoll, Oct. 1953, Beardsley, on coconut foliage; Kwajalein Atoll, Aug. 1946, Oakley, on *Cocos nucifera*, Nov. 1958, Krauss, on coconut; Ailinglapalap I., Ailinglapalap Atoll, Aug. 1946, Oakley, on *Cocos nucifera*; Majurirok (Elizabeth) I., Jaluit Atoll, Sept. 1953, Beardsley, on banana; Likiep I., Likiep Atoll, Aug. 1946, Oakley, on *Cocos nucifera*; Telap (Dalap) I., Majuro Atoll, Aug. 1946, Oakley, on *Cocos nucifera*; Arno Atoll, July 1950, La Rivers, on banana plant. Marakei, Gilbert Is., Dec. 1957, Krauss, on coconut leaves (type material). Nukuoro I., Caroline Atolls, Aug. 1946, Oakley, on *Cocos nucifera*; Utot (Udot), Truk, May 1946, Oakley, on *Cocos nucifera*. Temwetemwensekir (Tamamatansakir), Ponape, July 1950, Adams; Nanipil-Nanpohnmal, 65 m., Jan. 1953, Gressitt, on *Pandanus*; Colonia, Nov. 1953, Beardsley, on coconut foliage.

DISTRIBUTION: Marshall Is. (Eniwetok, Wotho, Kwajalein, Ailinglapalap, Jaluit, Likiep, Majuro, Arno), Gilbert Is. (Marakei), Caroline Is. (Nukuoro, Truk, Ponape).

HOSTS: Banana, coconut, and *Pandanus*.

Although closely allied to *P. adonidum*, this species is clearly distinct. It may be separated readily from other species of the *P. adonidum* group by the smaller size of body and appendages. The length of the rostrum has been used in the key to species as this structure appears to be subject to less variation between individuals than the legs and antennae, and provides a convenient gauge to relative appendage sizes. The anal ring, conical setae of the posterior cerarii, the ventral sclerotized areas of the anal lobes and those surrounding the anal lobe and penultimate cerarii, are all correspondingly smaller in this species than in *adonidum* and other similar forms, except possibly *P. kusaiensis*. In the latter species, however, the penultimate cerarii are completely unsclerotized.

The great similarity of the male of *P. microadonidum* to that of *P. adonidum* suggests that these two species are more closely related than to some of the other Micronesian forms which are similar to *P. adonidum*. The form of the penial sheath of the male of *P. orchidicola*, the only other of this group for which males are available, is quite different, as is the form of the helical portion of the sperm bundles. The finding of sperm bundles similar to those of *orchidicola* in several of the other Micronesian forms in which the females resemble those of *P. adonidum* (such as *P. marshallensis* and *P. trukensis* n. sp.), leads to the speculation that such forms may be less closely allied to *P. adonidum* than the females suggest.

40. *Pseudococcus multiductus* Beardsley, n. sp. (fig. 15).

Female. Of moderate size, slide-mounted specimen about 1.9 mm. long; body moderately elongate-oval; anal lobes slightly protuberant. Antennae 8-segmented, about 390 μ long. Legs of moderate size; hind femora about 255 μ long; hind tibiae about 240 μ long. A few micropores on hind legs; hind coxae each with about 12 discernible, hind femora with about the same number, hind tibiae with around 18; micropores absent on trochanters and tarsi. Rostrum about 170 μ long. Anal ring cellular, about 120 μ wide; bearing 6 setae about 155 μ maximum length. Two pairs dorsal ostioles present, their lips unsclerotized. Circulus moderately large, extending across fold between abdominal segments 4 and 5. Eyes moderately large, about 36 μ diameter; with a small ocular cone; paraocular discoidal pores absent.

With 17 pairs of marginal cerarii. Anal lobe cerarii each with 2 conical setae about 25 μ long, 3 or 4 slender accessory setae about 65 μ maximum length, plus a concentration of around 40 to 45 trilocular pores, borne on a well-defined sclerotized area. Penultimate cerarii each with 2 slender conical setae about 16 μ maximum length, 2 or 3 slender accessory setae, plus a concentration of around 20 to 25 trilocular pores; surrounding derm not appreciably sclerotized. Anterior cerarii each usually with 2 slender conical setae about 15 μ long, some on anterior part of thorax, and those on head with 3 or 4 such conical setae; each with 2 to 4 slender accessory setae, plus a concentration of around 15–20 trilocular pores. Venter of anal lobe with an elongate area of light sclerotization; anal lobe seta about 185 μ long.

Dorsum with very few oral-rim tubular ducts, the unique holotype with but 1 such duct, about 10 μ diameter across rim, located on one side of mesothorax about midway between eighth cerarius and mediodorsal axis; specimen damaged at corresponding position on opposite side of body. Venter with a marginal band of numerous oral-collar ducts, mostly 4–5 μ diameter at orifice, extending from posterior apex of abdomen anteriorly to just behind eye, a few such ducts anterior to eye near base of antenna; these ducts most

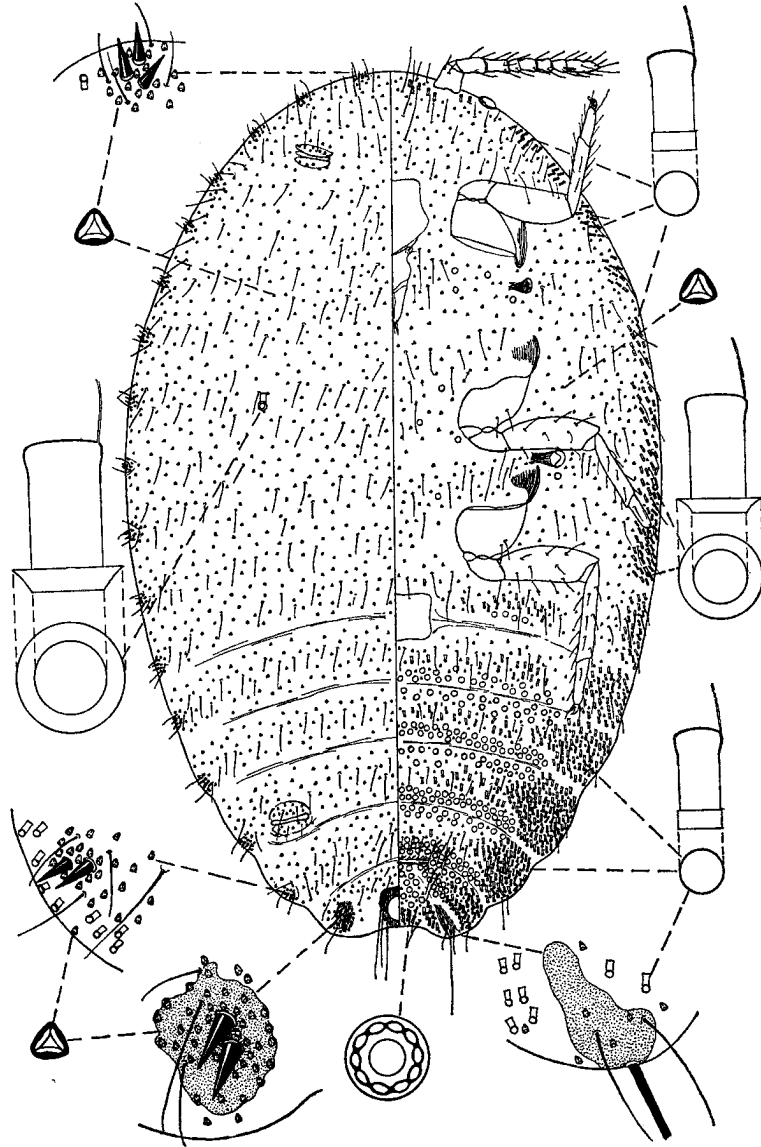


FIGURE 15.—*Pseudococcus multiductus*, adult female, dorsal and ventral aspects and details.

numerous on posterior abdominal segments, the band of ducts becoming narrower on segments anterior to circulus; a very few small rim tubular ducts, 7–8 μ diameter, located among oral-collar ducts on lateral margins of venter of metathorax. Abdominal segments 5 to 8 with sparse transverse bands of oral-collar ducts extending across each segment between bands of multilocular disc pores; abdominal segment 4 with a medially interrupted band of such ducts. Multilocular disc pores confined to venter, fairly numerous on abdominal segments 9 and 10, forming anterior and posterior marginal transverse bands on segments 6 to 8, a posterior marginal band on segment 5, and a short sublateral row on posterior margin of segment 4; a few multilocular pores scattered on venter of thorax. Trilocular pores moderately densely scattered on dorsum and venter. Body moderately sparsely clothed with fine setae; those of dorsum about 55 μ maximum length; those of venter somewhat longer, about 70 μ maximum length; long setae on venter of head anterior to mouthparts up to 100 μ long.

Holotype, female (US 67972), Ngerehelong, Babelthuap, Palau Is., Dec. 1947, Dybas.

DISTRIBUTION: Caroline Is. (Palau).

HOSTS: Unknown.

This species resembles *P. citriculus* in having relatively few dorsal oral-rim tubular ducts. It can be separated from *citriculus* by its more numerous oral-collar ducts which form a nearly continuous band along the lateral margins of the venter, and by the relatively short dorsal body setae.

41. *Pseudococcus neomaritimus* Beardsley, n. sp. (figs. 16; 21, *d*).

Pseudococcus comstocki: Fullaway 1946, B. P. Bishop Mus., Bull. 189 : 157 (misidentification).

Female. Moderately large; length of slide-mounted specimens about 2.2–2.8 mm.; anal lobes slightly protuberant. Antennae 8-segmented, about 450 μ long. Legs moderately long; hind femora about 250 μ in length; hind tibiae about 285 μ long, not appreciably swollen basally. Micropores apparently absent in hind coxae, trochanters, and femora, about 15 to 30 discernible on each hind tibia (fig. 21, *d*). Rostrum 150–160 μ long. Anal ring cellular, about 90 μ wide; bearing 6 setae, about 140 μ maximum length. Two pairs of dorsal ostioles present, their lips unsclerotized. Circulus of moderate size, extending across intersegmental fold between abdominal segments 4 and 5. Eyes of moderate size, about 28–30 μ diameter, with a weakly developed ocular cone; 2 to 5 small discoidal pores present along the posterior margin of each eye.

Normally with 17 pairs of marginal cerarii, 1 of the thoracic pairs occasionally wanting on one or both sides of the body in some specimens. Anal lobe cerarii each with 2 conical setae about 25 μ maximum length, 4 to 6 slender accessory setae about 45 μ maximum length, plus a concentration of around 40 trilocular pores, borne on an area of very weak sclerotization, definitely less strongly sclerotized than venter of anal lobes. Penultimate cerarii each with 2 small conical setae about 15 μ maximum length, 4 to 5 slender accessory setae, and a concentration of around 20 to 25 trilocular pores; surrounding derm unsclerotized. Anterior cerarii mostly with 2 conical setae about 12 μ long, those of head and anterior part of thorax usually with 3 or 4 such conical setae, 2 or 3 slender accessory setae and a slight concentration of about 12 to 15 trilocular pores. Venter of anal lobe with a well-developed, roughly triangular sclerotized area, bearing 3 or 4 small discoidal pores similar to those on margins of eyes in basal portion anterior to anal lobe seta; anal lobe seta about 130 μ long.

Oral-rim tubular ducts about 8–10 μ diameter across rim, fairly numerous on dorsum; usually 1 laterally near each cerarius on abdominal segments 4 to 8; 1 just behind each interantennal cerarius; and 1 near each of several of the anterior abdominal and thoracic cerarii; usually a total of about 8 to 12 in lateral series on each side; additional rim tubular

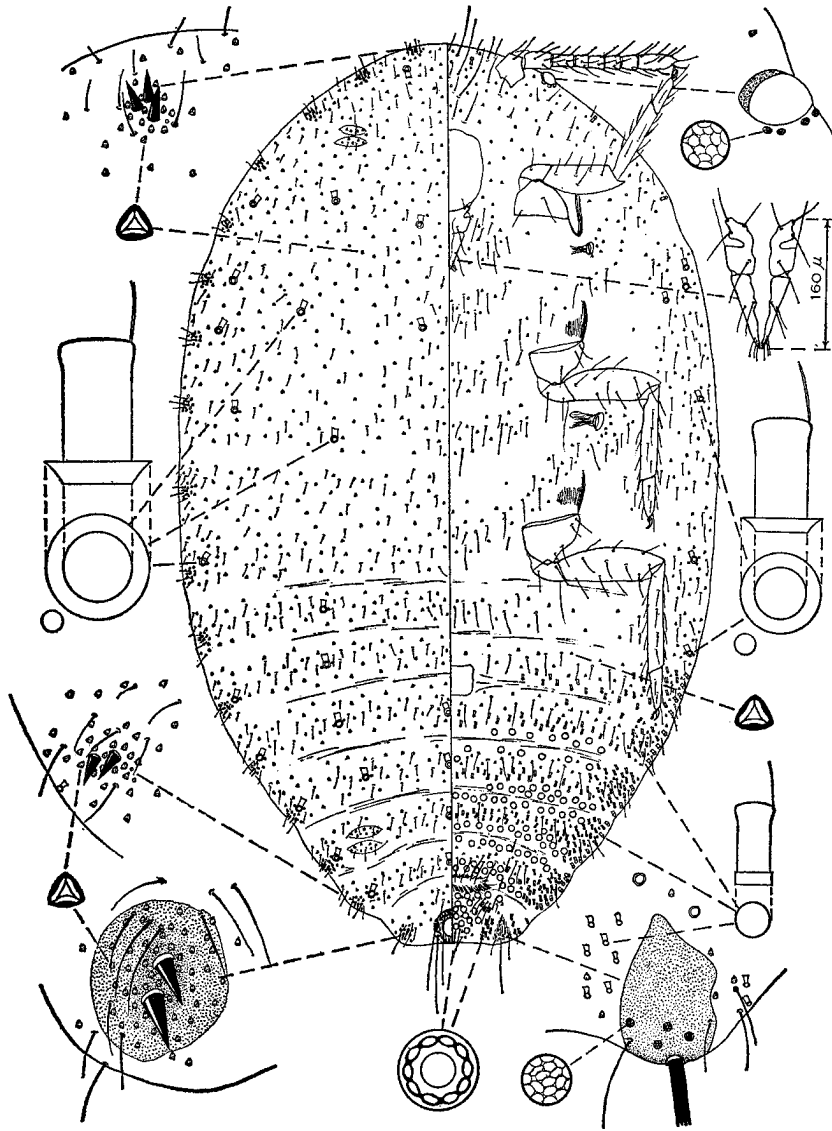


FIGURE 16.—*Pseudococcus neomaritimus*, adult female, dorsal and ventral aspects and details.

ducts on central region of thorax and abdomen as far caudad as abdominal segment 8; 1 to 5 such ducts per segment. Venter with a few oral-rim ducts along lateral margins on thorax and sometimes anterior abdominal segments. Small oral-collar ducts, 2–3 μ diameter at orifice, very numerous along lateral margins of venter, forming a band extending as far forward as abdominal segment 5; additional oral-collar ducts distributed in transverse bands across abdominal segments 5 to 8, and in a medially interrupted band on segment 4. Multilocular disc pores confined to venter, in transverse bands on posterior and anterior margins of abdominal segments 6 to 8, on posterior margin of segment 5, and behind vulva on segments 9 and 10; an occasional multilocular pore sometimes present on venter of anterior abdominal and thoracic segments. Trilocular pores moderately sparsely distributed on dorsum and venter. Body moderately sparsely clothed with fine setae; those of dorsum relatively short, about 15 μ maximum length; those of venter much longer, up to about 60 μ in length; longer setae on venter of head anterior to mouthparts up to about 150 μ long.

Holotype, female (US 67973), Yap Is. Yap, Aug. 24, 1950, Goss, on *Crotalaria incana*. Specimens from the following additional localities are designated as paratypes:

S. Mariana Is., Saipan, June 1946, Townes; Guam, Atao Beach, June 1936, Usinger, on cotton; Mt. Alutom, June 1946, Townes, on *Blechnum pyramidalum*; 1.6 km. s.e. Asan, alt. 180–240 m., Oct. 1947, Dybas; Barrigada, Nov. 1952, Gressitt, on *Hibiscus*; Jan. 1954, Liming. Yap, Yap Is., Aug. 1950, Goss, on *Crotalaria incana* (holotype). Wena (Moen), Truk, Oct. 1952, Beardsley, on *Acalypha indica*.

In addition, two slides are at hand from the Caroline Islands (locality unspecified), Sept. 1952, Krauss, on composite shrub.

DISTRIBUTION: S. Mariana Is. (Saipan, Guam), Caroline Is. (Yap, Truk).

HOSTS: Reported from *Acalypha*, *Blechnum*, cotton, *Crotalaria*, *Hibiscus*, and unidentified composite shrub.

Dr. Harold Morrison (personal communication) was of the opinion that forms such as *P. neomaritimus* which possess small sievelike discoidal pores on the margins of the eyes, and sometimes elsewhere on the body, are probably of Neotropical origin.

This mealybug is clearly allied to *P. maritimus* (Ehrhorn) and *P. obscurus* Essig, neither of which is represented among the Micronesian survey material studied. These two species recently were differentiated by Wilkey and McKenzie (1961: 245) who utilized characters such as the numbers of micropores in the hind femora and tibiae, the shape of the hind tibiae, and the presence or absence of discoidal pores on the margins of the eyes. I have compared *P. neomaritimus* specimens with specimens from Ehrhorn's type lot of *P. maritimus* (material received on loan through the kindness of Dr. Harold Morrison), and with material from California and from Hawaii which conforms closely to the Wilkey-McKenzie concept of *P. obscurus*. From examination of this material, it is obvious that Micronesian specimens cannot be assigned to either *maritimus* or *obscurus* as these species have been defined by Wilkey and McKenzie. The following

key for separation of these closely related forms has been prepared from a study of the specimens at hand and from information given by Wilkey and McKenzie (1961).

KEY TO SOME SPECIES OF THE PSEUDOCOCCUS MARITIMUS COMPLEX

1. Hind femora each with 50 or more micropores; hind tibiae each with 80 or more micropores, slightly swollen toward middle; rostrum relatively elongate, around 180–190 μ in length. **obscurus**
Hind femora each with 0 to 30 micropores; hind tibiae each with 15 to 30 micropores, not appreciably swollen toward middle; rostrum shorter, 160 μ or less. 2
2. Hind femora apparently without micropores; with at least 1, usually 2 to 5 discoidal pores discernible on posterior margin of each eye. **neomaritimus**
Hind femora with 12 to 30 micropores; discoidal pores on margin of eyes frequently wanting, 1 such pore occasionally discernible. **maritimus**

The presence of discoidal pores on the posterior margin of the eyes will serve to distinguish *P. neomaritimus* from all other known Micronesian forms here assigned to *Pseudococcus*. Similar pores occur on two species here placed in *Dysmicoccus* (*D. brevipes* and *D. neobrevipes*).

42. Pseudococcus orchidicola Takahashi (fig. 17).

Pseudococcus orchidicola Takahashi, 1939, *Tenthredo* 2 (3): 242, fig. 3.

DISTRIBUTION: S. Mariana Is. (type locality: Rota), Caroline Is., Marshall Is., Gilbert Is.

S. MARIANA IS. SAIPAN: Talofof Ridge, Jan. 1945, Dybas, beating vegetation; As Mahetog area, Jan. 1945, Dybas, beating vegetation; As Mahetog, Feb. 1945, Dybas, on decaying *Pandanus* leaf; Mar. 1945, Dybas, on *Pandanus*. TINIAN: Mar. 1945, E. Hagen. ROTA: Sabana, Nov. 1937, Esaki, on orchid (type series); Sabana, June 1946, Townes, on *Pandanus tectorius*.

CAROLINE ATOLLS. EAURIPIK: June 1958, Tellei, on *Cyrtosperma*. NUKUORO: Shenukdei I., Aug. 1946, Oakley, on *Cyrtosperma chamissonis*. SATAWAN: Satawan I., Nov. 1952, Beardsley.

TRUK. FEFAN: May 1946, Oakley, on taro.

KUSAIE. Lele, Aug. 1946, Oakley, on *Pandanus tectorius*.

MARSHALL IS. WOTHO: Wotho I., Feb. 1952, Fosberg (802), inhabiting *Pandanus* fruit. UJAE: Ebeju I., Mar. 1952, Fosberg (1021), in axils of *Pandanus* leaves. KWAJALEIN: Aug. 1946, Oakley, on *Pandanus tectorius*; in quarantine at Honolulu, Uyeda and Makino, Aug. 1949, on *Pandanus* sp. JALUIT: Jabwar (Jabor) I., May 1958, Gressitt, on *Pandanus*. NAMORIK: Namorik I., Sept. 1953, Beardsley, on *Pandanus* fruit. UTIRIK: Utirik I., Nov. 1951, Fosberg (128), in axils of dead lower leaves and green leaves just above them on *Pandanus*. AILUK: Ailuk I., Dec. 1951, Fosberg (493),

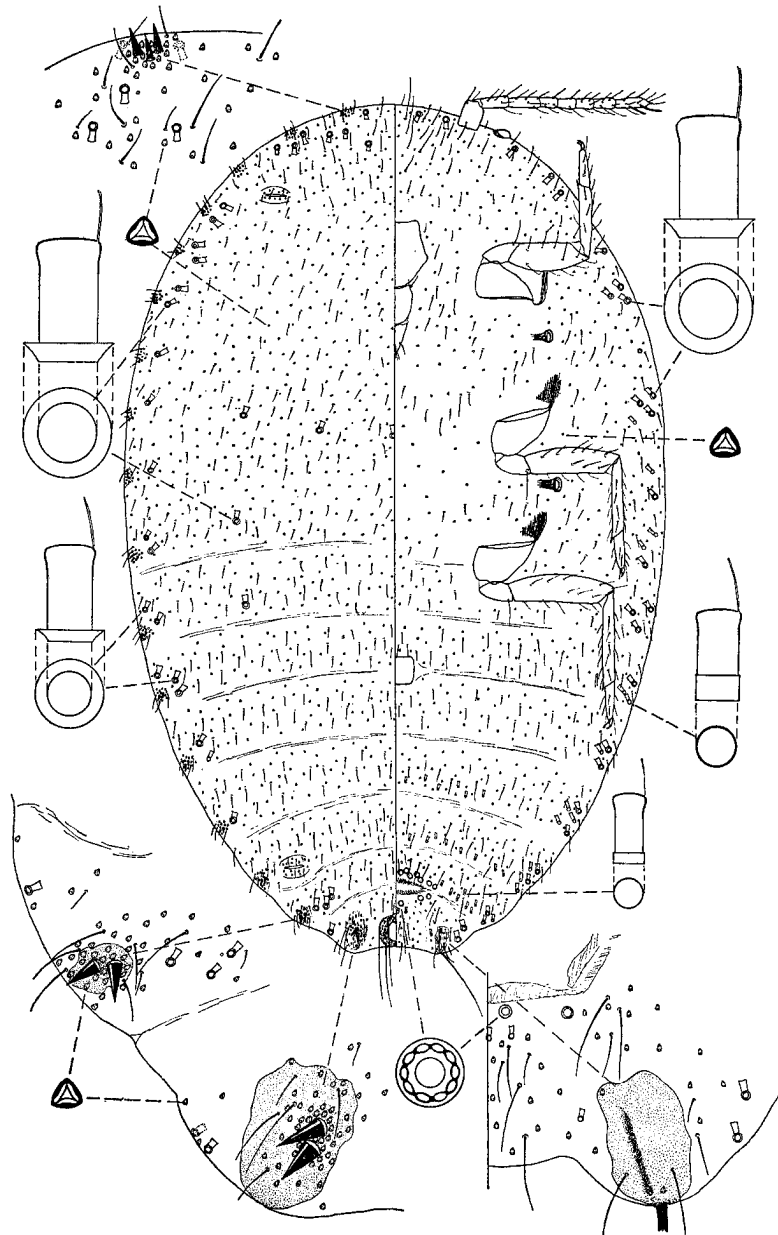


FIGURE 17.—*Pseudococcus orchidicola*, lectotype female, dorsal and ventral aspects and details.

coconut grove near center of island. LIKIEP: Likiep I., Aug. 1946, Oakley, on taro. MAJURO: Majuro I., Aug. 1946, Oakley, on *Pandanus tectorius*; Uliga I., Dec. 1955, Stone, on *Pandanus* fruit. ARNO: June 1950, La Rivers, in cracks on *Pandanus* and on *Pandanus*; July 1950, La Rivers, on banana plant; in quarantine at Honolulu, Sept. 1951, D. F. Chong, on *Pandanus* sp. MILI: Oct. 1953, Beardsley, on *Pandanus* fruit.

GILBERT IS. TARAWA: Aug. 1956, Brown, on *Cyrtosperma chamissonis*.

HOSTS: Banana, *Cyrtosperma chamissonis* (giant taro), orchid, *Pandanus*, taro.

In order to characterize this species properly, Takahashi's type material (5 specimens on one slide designated collectively as cotypes) was restained and remounted on four slides. One of Takahashi's specimens has been designated a lectotype, and the remaining four as paratypes.

Takahashi's description states that the "ventral cicatrix" or circulus is absent in this species; however, a circulus was found in all specimens of the type series upon restaining. Takahashi makes no mention of the presence of dorsal oral-rim tubular ducts or dorsal oral-collar ducts, although such ducts are present in the type material. Usually there are 1 to 3, occasionally 4, rim tubular ducts laterally on the dorsum near most of the abdominal and thoracic cerarii. In the type specimens there are generally 5 to 9 oral-rim tubular ducts of different sizes associated with each cerarius; some dorsal, some ventral, and some lateral with respect to a given cerarius. There are also a few oral-rim ducts on the central portions of the dorsum of the thorax and anterior abdominal segments. In some of the specimens which are here assigned to *P. orchidicola* the number of dorsal oral-rim ducts may be reduced to 1 or 2 per cerarius, or these may be replaced to some extent by large oral-collar ducts. With very few exceptions, all specimens have from 5 to 9 large tubular ducts, either oral-rim or oral-collar or both, grouped around each interantennal cerarius. This character, and the presence of relatively numerous tubular ducts along the lateral margins of the venter, will differentiate *P. orchidicola* from related forms such as *P. trukensis*, *P. marshallensis*, and *P. solomonensis*. In addition, the last named species has very few dorsal tubular ducts, not more than 8 in Micronesian specimens studied.

In many of the specimens here assigned to *P. orchidicola*, micropores are discernible on the mesofemora as well as on the metafemora and metatibiae. A few such mesofemoral micropores are present in specimens of the type series, and nearly all specimens from *Pandanus* and banana from the Marshall Islands possess an even greater number of mesofemoral micropores. One or two Marshall Islands specimens from *Pandanus*, and some from the Marianas, as well as several from taro or *Cyrtosperma* from the Marshalls, Gilberts, and Carolines, show very few such pores, or none. Other specimens from *Cyrtosperma* (for example, from Eauripik Atoll), possess about as

many mesofemoral micropores as do specimens of the type series. That the possession of mesofemoral micropores is not a constant character in this species is indicated by their occurrence in one mesofemur and not the other in at least one specimen. Micropores similar to those of the hind legs and mesofemora are present, scattered sparsely on the ventral derm, particularly of the thorax, in the type specimens and most others assigned here to *P. orchidicola*.

43. *Pseudococcus pandanicola* Takahashi.

Pseudococcus pandanicola Takahashi, 1939, *Tenthredo* 2 (3) : 248, fig. 5.

DISTRIBUTION: Caroline Is. Endemic?

PALAU. BABELTHUAP: Ngaremeskang (Ngarumisukan), Dec. 1952, Gressitt; Ulimang, Dec. 1947, Dybas, in axils of *Pandanus*; Cacao Plantation near Imeliik, Aug. 1953, Beardsley, on *Freycinetia* sp. KOROR: Jan. and Mar. 1954, Beardsley, on *Pandanus* leaves; July 1956, McDaniel, on *Pandanus*. "Southern Group": Aug. 1945, Dybas.

HOSTS: Pandanaceae (*Pandanus* and *Freycinetia*).

This species may be distinguished readily from other Micronesian species of *Pseudococcus* by the development of the cerarii. Each one of the 17 pairs of cerarii is borne on a moderately well defined sclerotized area. In addition, the basal segment of each antenna is incised or notched on its inner face near the base. Otherwise, the species appears to be a fairly typical *Pseudococcus*.

44. *Pseudococcus solomonensis* Williams (fig. 18).

Pseudococcus solomonensis Williams, 1960, *Brit. Mus. (Nat. Hist.) Ent. Bull.* 8 (10) : 426, fig. 18.

DISTRIBUTION: Solomon Islands (type locality), Caroline Is.

PALAU. BABELTHUAP: July 1946, Townes, on *Artocarpus integer* (= *A. heterophyllus*) and *Eugenia* (?); Ulimang, Dec. 1947, Dybas, in cut decaying crown of betel palm. KOROR: Nov. 1947, Dybas, on large leaf taro; June 1953, Beardsley, on *Macaranga* sp.; Feb. 1954, Beardsley, on fruit of *Eugenia* sp.

YAP. YAP: Oct. 1952, Krauss, on fruit of wild *Ficus*. RUMUNG: Aug. 1950, Goss. E. MAP: Aug. 1950, Goss.

TRUK. WENA (Moen): Feb. 1948, Maehler, on dead tree; Feb. 1949, Potts, on unidentified root. TONOAS (Dublon): May 1946, Townes, on *Randia carolinensis* or *Macaranga carolinensis*.

PONAPE. Nanpohnmal, 50 m., Jan. 1953, Gressitt.

HOSTS: Reported from cacao and wild bananas in the Solomon Is. (Williams 1960 : 426). In Micronesia it has been taken on jackfruit (*Artocarpus heterophyllus*), *Ficus*, *Eugenia*, *Macaranga*, betel palm, and "large leaf taro."