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ERIOCOCCIDAE OF THE EASTERN UNITED STATES (HOMOPTERA)

By

Douglass R. Miller and Gary L. Miller

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Eriococcidae of the Eastern United States

Douglass R. Miller and Gary L. Miller

Systematic Entomology Laboratory, PSI, USDA,
Agricultural Research Service, Beltsville, MD, USA 20705

Abstract. This paper is the first detailed treatment of the Eriococcidae of the eastern United States. Keys, descriptions, and illustrations are given for 37 species in 6 genera including 16 new species.

Introduction

Prior to this study the felt scales or eriococcids of the eastern United States were poorly known, particularly in the southeastern region. The fruition of this work is due in part to the concentrated collecting efforts of R. J. Beshear and H. H. Tippins throughout the coastal plains of Georgia and Florida. For the purposes of this study, eastern is defined as all states east of the eastern borders of North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. The paper treats 37 species of eriococcids in six genera. Sixteen of the species are new. The species *"Eriococcus" gillettei* Tinsley has not been included in this study because it belongs in the family Kermesidae (Miller 1983).

Adult Female Field Characteristics. When alive, eriococcid body color is quite variable. This variability appears dependent upon the season and on the time of development of the eggs. In species that overwinter as adult females, body color changes from purple to dark red as winter progresses. In the spring, as the plant host begins to produce new growth, the body color of the eriococcid changes back to purple. Similar color changes have been recorded in aphids (Markkula and Pulliarinen 1965, Markkula and Rautapaa 1967). These authors suggest that light intensity, photoperiod, and temperature affect aphid body color. It seems possible the chemical changes that occur in senescent plants may also be a factor in this color change.

Waxy secretions are often associated with eriococcids. There are two types of wax secretions -- mealy and filamentous. The mealy secretion is always restricted to the venter and is commonly seen on the host substrate, the medial areas of the abdomen, and the eggs. The filamentous secretion produced form the dorsum forms the ovisac; whereas, the same secretion produced form the ventromedial areas is intermixed with the eggs.

Another secretion is produced primarily on the dorsum. This substance is utilized in the production of the long tubular structures referred to as "crystalline rods". The enlarged setae, common on many species of *Acanthococcus*, serve as basal structures of the support of these rods. Setal shape appears to be correlated with the shape of the rods. The function of these rods is purely conjecture. Presence of the rods superficially resembles the glandular hairs or tufted seeds of host plants. Species that have general host preferences are usually more variable in the structure of their enlarged setae. A more comprehensive knowledge of the function of these rods could lead to a better understanding of the wide range of intraspecific variation exhibited in the shape and size of the enlarged setae. This is important since these structure are frequently used as diagnostic characters of species.

The felted ovisac produced by members of *Acanthococcus* is characteristic. It

completely encloses the female and all of her eggs. A small hole is present at the posterior apex of the sac which allows first instars access to the outside. The exit hole is present before the eggs hatch within the ovisac and is apparently produced by the adult female. In *Gossyparia*, an ovisac only partially encloses the adult female. The lateral margins are covered with a felt-like wax while the dorsum is exposed.

Body form of the Eriococcidae ranges from pyriform to elongate. The elongate form is restricted to species that infest grasses. Pyriform body shape is most common.

Eriococcids are found on three areas of their hosts. Early instars of grass infesting species inhabit leaf sheaths; as adults they are found exposed on leaf blades near the juncture of the sheath and the stem. Other species are found on the aerial portions of the plant or on the roots. The aerial species are found on leaves, branches, or under the bark. Subterranean species may be present on the main roots or crown, but have never been found on small rootlets. No matter where the eriococcids occur, they have a proclivity for confined, protected areas.

External Morphology of Slide Mounted Females. The derm of newly formed adult females is frequently covered with many small folds. These folds apparently allow for abdominal expansion when the body is filled with the eggs. Dermal structures include setae, tubular ducts, and pores.

Setal types and distributions are characteristic for species. Shape ranges from conical (Fig. 1a) to dome shaped (Fig. 11a) to lanceolate (Fig. 1e) and differs from the dorsum to the venter. Conical enlarged setae are usually present dorsally and are often of two distinct sizes (i.e. large-sized enlarged (Fig. 1a) and small-sized enlarged (Fig. 1c) setae). Large-sized enlarged setae often form longitudinal lines that are located laterally, sublaterally, and medially or laterally only. Setal sizes are relative intraspecifically. Because of the great variation of the setal sizes, the differentiation of the large-sized enlarged and small-sized enlarged setal sizes is not used in interspecific comparisons.

Tubular ducts consist of either macrotubular or microtubular varieties. Macrotubular ducts, though most abundant on the dorsum, are scattered over both body surfaces and are of 2 sizes. Those on the dorsum and lateral margins of the venter are the largest (Fig. 1b); those on the medial and sublateral areas of the venter are the smallest (Fig. 1g). The large ducts produce a filamentous secretion that forms the felted ovisac, the smaller ducts produce the same type of secretion, but it is apparently intermixed with the eggs. Microtubular ducts are numerous on the dorsum, rare or absent on the ventral regions of the abdomen, and uncommon on the ventral thorax and head. On the venter, these pores are most abundant along the lateral margins. Microtubular ducts are of 3 general kinds. Those found on most eriococcids are short with the vestibule divided into 2 sclerotized parts and with a simple dermal orifice (Fig. 1d). The second type is elongate with the vestibule undivided and with a simple dermal orifice (Fig. 30a). The third type is also elongate with an undivided vestibule, but the dermal orifice is bifurcate (Fig. 32a).

Pores with varying numbers of loculi are also present on the derm. Pore distribution varies between genera. Multilocular pores may have 3-10 loculi (Fig. 1k) and the relative numbers of pores with 5, 7, or more loculi may be an important taxonomic tool. Cruciform pores (Fig. 1j) are also present along the ventral body margin and their distribution exhibits much intraspecific variation.

In addition to the dermal structures, 6-segmented (and rarely 7-segmented) antennae (Fig. 1e), 3-segmented labium, clypeal labral shield, and eyes delineate the head region. The legs are the prominent structures of the thorax (although legs may be represented by vestiges or may be entirely absent in *Cryptococcus*). Setal patterns on the legs are quite significant. The numbers of setae present on the tibiae are important specific diagnostic characters. Most species have 5 setae on each tibia: 2 on the inner distal margin, 2 on the outer distal margin, and 1 on the inner margin of the middle of the segment. The hind coxae and femora frequently have numerous small pores (Fig. 1i). The size, shape, and numbers of these pores show much intraspecific variation, although they may occasionally be used as secondary taxonomic characters. Their function has not been determined. The denticle on the claw (Fig. 1h) is somewhat variable. Spiracles of the included genera do not have pores in their atria.

The anal ring and anal lobes are structures of the abdomen. Prominent protruding anal lobes are present in *Acanthococcus*, *Oregmopyga*, and *Gossyparia* but are lacking in *Cryptococcus*, *Hypericicoccus,* and *Ovaticoccus*.. Numbers of enlarged setae on anal lobes are important taxonomic characters. The anal ring is either dorsal or ventral (Fig.1l). It is composed of crescent shaped bars which surround the anal opening. Lanceolate setae and a single row of pores are usually associated with the ring.

Methods

The terminology used in this paper is that of Miller and McKenzie (1967) and Miller (1984). Segmentation numbers are slightly different than mentioned in the 1967 paper in that the first visible segment is considered to be segment I, not segment II. We are, in effect, renumbering each segment by 1 unit. Leg measurements are taken on the outer surface of each segment. Counts of enlarged setae on segment V include all enlarged setae on the segment including those on the venter. In the genus *Acanthococcus* all dorsal setae are considered to be enlarged; whereas, on *Oregmopyga* only those that are definitely swollen are considered enlarged. Measurements and numbers are taken from 10 specimens when available and are given as follows: (range) small number-large number (mean). Specimens were studied using a Wild, phase contrast compound microscope at magnifications of 140, 400, and 1000X.

Depositories of specimens are as follows: Australian National Insect Collection, Canberra (ANIC); Auburn University, Auburn, Alabama (AU); British Museum (Natural History), London (BM); California Department of Food and Agriculture, Sacramento (CDA); Florida State Collection of Arthropods, Gainesville (FSCA); The Volcani Center, Bet Dagan, Israel (ICV); Institute of Zoology, Academia Sinica, Beijing, Peoples Republic of China (IZAS); Museo de Historia Natural de la Ciudad de Mexico, Mexico, D.F.(MCM); Museum National d'Histoire Naturelle, Paris (MNHP); Shanghai Institute of Entomology, Academia Sinica, Peoples Republic of China (SIE); University of California, Davis (UCD); University of Georgia, Griffin (UG); University of Hawaii, Honolulu (UH); National Museum of Natural History, Washington, D.C. (USNM); The University of Tennessee, Knoxville (UT); Virginia Polytechnic Institute and State University, Blacksburg (VPI); Zoological Institute, Academy of Sciences, St. Petersburg, Russia (ZAS).

Key to Genera of Eriococcidae of the Eastern U.S.

Adult Females

1. Legs present.....2
   Legs absent or represented by vestiges.....*Cryptococcus* Douglas
2(1). Anal lobes present.....4
   Anal lobes absent.....3
3(2). Macrotubular ducts present; without conspicuous dermal projections along body margin.....*Ovaticoccus* Kloet
   Only eastern species: *O. agavium* (Douglas)
   Macrotubular ducts absent; with conspicuous dermal projections along body margin.....*Hypericicoccus* Williams
   Monotypic genus: *H. hyperici* (Ferris)
4(3). Macrotubular ducts present over dorsal surface.....5
   Macrotubular ducts absent from dorsomedial area of thorax.....*Gossyparia* Signoret
   Only U.S. species: *G. spuria* (Modeer)
5(4). Anal lobes sclerotized, with enlarged setae; anal ring with 4 pairs of setae.....*Acanthococcus* Signoret
   Anal lobes unsclerotized, without enlarged setae; anal ring with 3 pairs of setae.....*Oregmopyga* Hoy

Genus *Acanthococcus* Signoret

Synonymy: *Acanthococcus* Signoret, 1875:35. Type species: *Acanthococcus aceris* Signoret, 1875:35, by monotypy.
Rhizococcus Signoret, 1875:36. Type species: *Rhizococcus gnidii* Signoret, 1875:37, by monotypy.
Greenisca Borchsenius, 1948:502. Type species: *Eriococcus inermis* Green, 1915:176, by original designation.
Anophococcus Balachowsky, 1954:61. Type species: *Eriococcus inermis* Green, 1915:176, by original designation.
Kaweckia Koteja and Zak-Ogaza, 1981:501. Type species: *Eriococcus glyceriae* Green, 1921:146, by original designation.

Diagnosis. Adult female: Dorsal surface covered with macrotubular ducts; ovisac covering all of body; anal lobes protruding from body, with enlarged setae; microtubular ducts present; multilocular pores present on venter and occasionally on dorsum; cruciform pores present; appendages well developed.

Note. All U.S. species previously treated as members of *Eriococcus* should now be considered members of the genus *Acanthococcus*. For further discussion of this synonymy, see Miller (1991) and Miller and Miller (1992).

Key to Species of *Acanthococcus* Signoret of the Eastern U.S.

Adult Females

1. With 5 setae on hind tibia....2
   With 4 setae or fewer on hind tibia....19
2(1). Pores near vulva predominantly with 5 loculi....4
   Pores near vulva predominantly with 7 or more loculi....3
3(2). Largest dorsal sublateral or medial enlarged seta on posterior 3 abdominal segments 1.3-1.5 times length of longest dorsal lateral enlarged seta....*carolinae* (Williams)
   Largest dorsal sublateral or medial enlarged seta on posterior 3 abdominal segments 2.8-3.5 times length of longest dorsal lateral enlarged seta....*insignis* (Newstead)
4(2). Anal lobes each with 3 enlarged setae....6
   Anal lobes each with 4 enlarged setae....5
5(4). Dorsal enlarged setae arranged in more than 1 transverse row on sublateral and medial areas of abdominal segments....*tosotrichus* D. Miller & G. Miller
   Dorsal enlarged setae arranged in 1 transverse row on sublateral and medial areas of abdominal segments V and VII....*howelli* D. Miller & G. Miller
6(4). Dorsal large-sized enlarged setae present on medial area of abdomen....10
   Dorsal large-sized enlarged setae absent from medial area of abdomen....7
7(6). Tibia + tarsus less than 225 μ long....9
   Tibia + tarsus more than 275 μ long....8
8(7). Pores on dorsal surface of hind coxa only; large-sized medial and sublateral enlarged setae restricted to thorax on dorsum....*coccineus* (Cockerell)
   Pores on dorsal and ventral surfaces of hind coxa; large-sized medial and sublateral enlarged setae absent or present on abdomen, thorax, and head on dorsum....*euphorbiae* (Ferris), in part
9(7). With 3 enlarged setae on lateral margin of most abdominal segments; pores on hind coxa large (about 3 μ long)....*megaporus* D. Miller & G. Miller
   With 2 enlarged setae on lateral margin of most abdominal segments; pores on hind coxa small (about 1 μ long)....*leptoporus* D. Miller & G. Miller
10(6). Hind tarsus equal to or slightly longer than hind tibia; not on oak....11
   Hind tarsus about half length of hind tibia; occurring on oak....*quercus* (Comstock)
11(10). Abdominal segment V with less than 26 enlarged setae....14
   Abdominal segment V with 26 or more enlarged setae....12
12(11). Dorsal enlarged setae of large size not arranged in conspicuous longitudinal line....13
   Dorsal enlarged setae of large size forming 3 conspicuous longitudinal lines in lateral, sublateral, and medial areas....*dubius* (Cockerell), in part
13(12). Enlarged setae with acute apices....*chilos* D. Miller & G. Miller
   Enlarged setae with rounded apices....*eriogoni* (Ehrhorn)
14(11). Dorsal sublateral area of abdominal segments VI and VII with small-sized enlarged setae....16

Dorsal sublateral area of abdominal segments VI and VII with large-sized enlarged seta 15

15(14). Abdominal segment V with 23-25 enlarged setae..... *dubius* (Cockerell) in part
Abdominal segment V with less than 23 enlarged setae..... *euphorbiae* (Ferris) in part

16(14). Dorsal enlarged medial setae conical, straight or slightly curved, with rounded or acute apices..... 17
Dorsal enlarged medial setae dome shaped with blunt apices..... *droserae* Miller, Liu, & Howell

17(16). Dorsal enlarged sublateral seta on abdominal segment VII conical..... 18
Dorsal enlarged sublateral seta on abdominal segment VII parallel sided..... *mesotrichus* D. Miller & G. Miller

18(17). Dorsal enlarged sublateral seta on abdominal segment VII conspicuously different in size and shape compared with medial enlarged setae on segments II-IV..... *missourii* (Hollinger)
Dorsal enlarged sublateral seta on abdominal segment VII of same size and shape as medial enlarged setae on segments II-IV..... *euphorbiae* (Ferris), in part

19(1). Front tibia with 5 setae..... 23
Front tibia with 4 or 2 setae..... 20

20(19). Front tibia with 4 setae..... 21
Front tibia with 2 setae..... *oligotrichus* D. Miller & G. Miller

21(20). Tarsus longer than or equal in length to tibia; anal lobewith 3 enlarged setae..... 22
Tarsus about half as long as tibia; anal lobe with 4 enlarged setae..... *stellatus* (McDaniel)

22(21). Large-sized enlarged setae present over entire dorsum; dorsal multilocular pores absent..... *arenariae* D. Miller & G. Miller
Large-sized enlarged setae absent from dorsomedial area; dorsal multilocular pores present at least on posterior portion of abdomen..... *dennoi* D. Miller & G. Miller

23(19). Large-sized setae absent from dorsal sublateral and medial areas of abdominal segments III to VII..... 24
Large-sized setae present in dorsal sublateral and medial areas of abdominal segments III to VII..... *azaleae* (Comstock)

24(23). Large-sized lateral setae straight on abdominal segment VII..... 26
Large-sized lateral setae conspicuously curved on abdominal segment VII..... 25

25(24). Multilocular pores near vulva predominantly with more than 5 loculi; fringe of lateral setae interrupted on thorax..... *kemptoni* (Parrott)
Multilocular pores near vulva predominantly with 5 loculi; fringe of lateral setae complete around body..... *beshearae* D. Miller & G. Miller

26(24). Multilocular pores near vulva predominantly with 5 loculi..... 28
Multilocular pores near vulva predominantly with more than 5 loculi..... 27

27(26). Dorsal multilocular pores present..... *davidsoni* D. Miller & G. Miller
Dorsal multilocular pores absent..... *smithi* (Lobdell)

28(26). With more than 1 large-sized enlarged seta on each lateral margin of abdominal segment VII; outer enlarged seta on anal lobe longer than or equal to length

of other anal-lobe setae.....29
With 1 large-sized enlarged seta on each lateral margin of abdominal segment VII; usually with outer enlarged seta on anal lobe less than half of length of other anal-lobe setae.....*monotrichus* D. Miller & G. Miller
29(28). Large-sized enlarged setae present around entire body margin.....30
Large-sized enlarged setae present on body margin on posterior abdomen and head only.....*ophius* D. Miller & G. Miller
30(29). Largest lateral enlarged seta about 50 μ long; microtubular ducts absent or less than 3 μ long.....*actius* D. Miller & G. Miller
Largest lateral enlarged seta about 30 μ long; microtubular ducts about 8 μ long.....*araucariae* (Maskell)

Acanthococcus actius D. Miller and G. Miller, n. sp.

Seashore eriococcin
Fig. 1

Type Material. Adult female holotype (1 specimen on slide) with right label "HHT-272-72 on A grass Cumberland I. Camden Co., Ga. VI-6-72 Coll. R. Beshear."; left label "*Acanthococcus actius* D.R. Miller & G.L. Miller Holotype"(USNM). The specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 2.5 mm long (paratypes 1.8-2.4(2.0) mm), 0.7 mm wide (paratypes 0.5-1.0(0.7) mm). Anal lobes sclerotized on venter and medial margin of dorsum; each lobe dorsally with 3 enlarged setae all of approximately same shape (seta on outer margin longest, anteromedial seta shortest), with 0 and 1 microtubular ducts (paratypes with 0-3(1) ducts); each lobe ventrally with 3 slender body setae and 2 sessile pores (paratypes 0-2(1) pores).

DORSUM with enlarged setae of 2 sizes: Larger size present along entire body margin, with 4, occasionally 3 setae on margin of each abdominal segment; smaller size restricted to medial and sublateral areas, about same size over surface. Largest lateral seta 49 μ long (paratypes 47-67(56) μ), largest medial seta 9 μ (paratypes 8-9(9) μ); on abdominal segments II to VIII longest lateral seta 5.4 times longer than longest medial seta (paratypes 5.2-7.7(6.3) times). Lateral setae straight, parallel sided, with blunt apices; medial setae straight, cylindrical, with blunt apices. Enlarged setae few, e.g. abdominal segment V with 20 (paratypes 21-24(23) setae), without longitudinal pattern except on body margin. Macrotubular ducts of large size, scattered over surface. Microtubular ducts absent except on anal lobes; too small to measure, with area farthest from dermal orifice sclerotized and undivided; total sclerotized area about same length as unsclerotized area; dermal orifice unsclerotized. Multilocular pores absent.

Anal ring dorsal, with 4 or 5 pairs of setae.

VENTER with longest seta on abdominal segment VIII 23 μ long (paratypes 23-41(31) μ), on segment III 55 (paratypes 52-55(54) μ); longest posterior anal-lobe seta 233 μ long (paratypes 247-265(257) μ). Enlarged setae present on head only, large size. Macrotubular

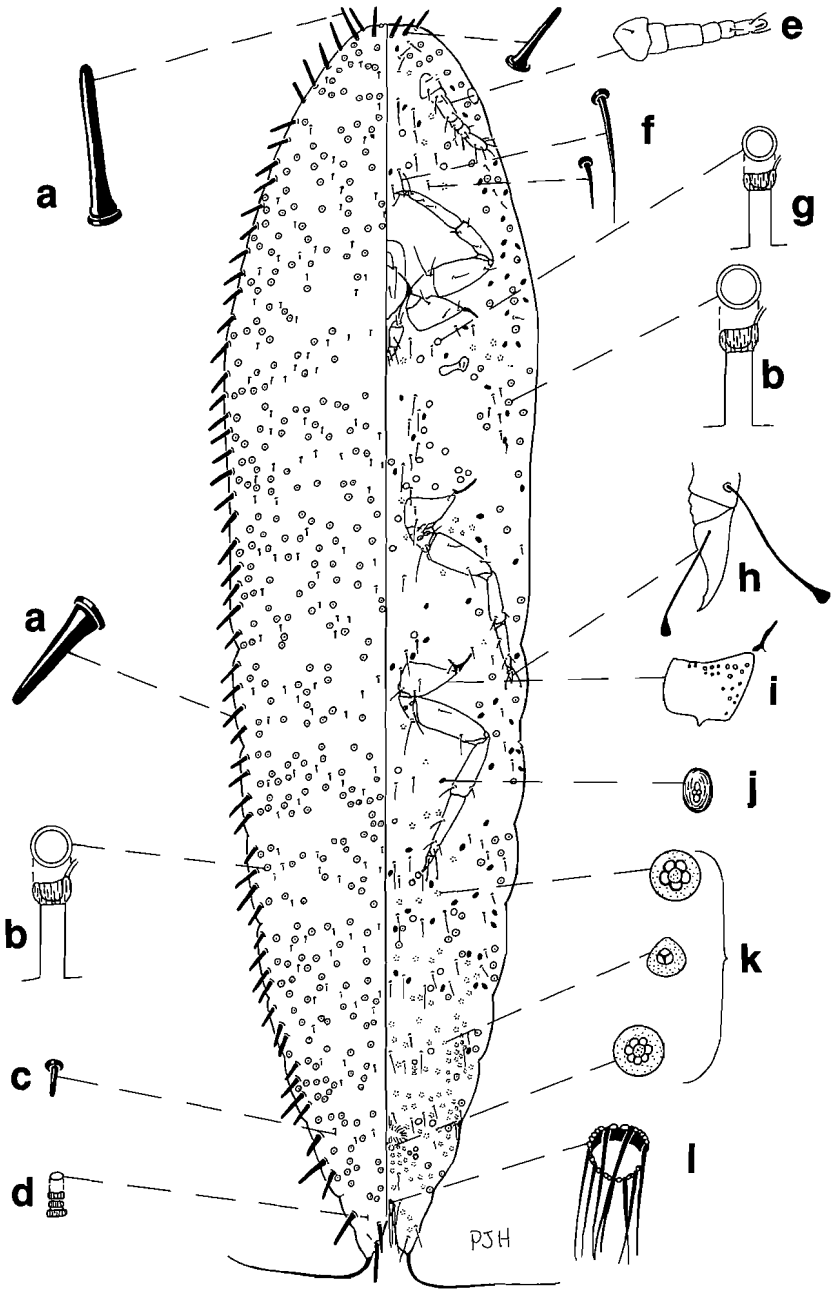

Fig. 1. *Acanthococcus actius* D. Miller & G. Miller. a. conical large-sized enlarged setae; b. large macrotubular duct; c. small-sized enlarged seta; d. microtubular duct; e. antenna; f. lanceolate setae; g. small macrotubular duct; h. tarsal claw with denticle; i. coxal pores; j. cruciform pore; k. multilocular pores; l. anal ring.

ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size in sublateral and medial areas. Multilocular pores of 3 kinds: Quinqueloculars present over entire surface, most abundant on posterior abdominal segments; triloculars and septeloculars unusual. Cruciform pores present on sublateral areas of abdominal segments VII and VI, present on medial, sublateral, and lateral areas of segments V through head; with 10 pores between antennae and anterior margin of clypeolabral shield (paratypes with 10-13(11) pores).

Legs with translucent pores about 2 μ long; hind coxae dorsally with 27 and 20 pores (paratypes with 8-24(16) pores), ventrally with 0 and 5 pores (paratypes with 0-10(5) pores); hind femora without pores; femora with 5 setae; tibiae with 4 setae on each of hind 2 pairs of legs, 5 setae on front pair; middle seta on front tibia located off of inner margin of tibia, approximately equal to outer apical setae; inner, apical tibial setae slightly more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.87)(paratypes 0.77-0.84(0.80)); claws with small denticle near tip. Antennae 6-segmented on 1 side 7 on other, third segment longest when 6-segmented. Segment 6 with 3 sensory setae; segment 5 with 1 larger than single sensory seta on segment 4.

Variation. All specimens examined had 6-segmented antennae on 1 side and 7 on the other.

Notes. *Acanthococcus actius* is most similar to *A. smithi* but has predominantly quinquelocular pores near the vulva; *A. smithi* has multilocular pores predominantly with 7 or more loculi in the area of the vulva.

Specific Epithet. The name *actius*, from the Greek akte, meaning "seashore", refers to habit of this species occurring along the coast of the southeastern U.S.

Specimens Examined. FLORIDA, St. Lucie Co.: Ft. Pierce, V-1-33, on grass, G. H. Baker (2 ad. ♀) FSCA. Martin Co.: Hobe Sound, X-4-78, on *Aristida purpurascene*, E. W. Campbell (2 ad. ♀ on 2 sl.) FSCA. Dade Co.: Miami, XI-12-67, on *Aristida gyrans*, C. E. Stegmaier and F. D. Matthews (1 ad. ♀) FSCA.

GEORGIA, Camden Co.: Cumberland Island, VI-6-72 (HHT-272-72), on grass, R. J. Beshear (2 ad. ♀ on 2 sl.) UG, USNM. Glynn Co.: Jekyll Island, III-23-76 (HHT-94-76), on *Andropogon* sp., R. J. Beshear (1 ad. ♀) USNM. Chatham Co.: Savannah, XII-9-44, on *Ammophila* sp., Mallia (1 ad. ♀) UG.

Acanthococcus araucariae (Maskell)

Norfolk Island pine eriococcin

Fig. 2

This species was treated in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992).

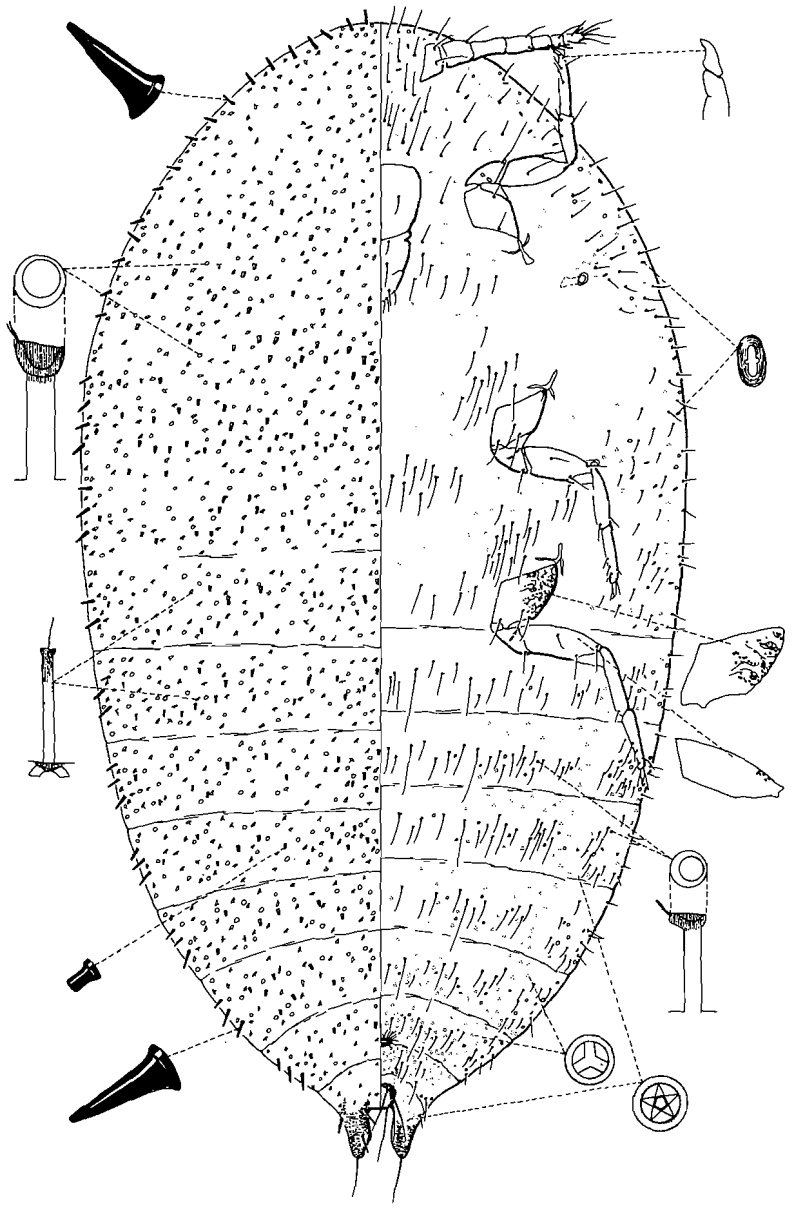

Fig. 2. *Acanthococcus araucariae* (Maskell)

***Acanthococcus arenariae* D. Miller and G. Miller, n. sp.**
Arenaria eriococcin
Fig. 3

Type Material. Adult female holotype (1 specimen on slide) with right label "HHT-52-77 *Arenaria caroliniana* Between Bamberg and Aiken on Highway 78 Bamberg Co., S.C. X-20-77 Coll. R J. Beshear"; left label "HOLOTYPE *Acanthococcus arenariae* D.R. Miller & G.L. Miller " (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 1.9 mm long (paratypes 1.5-2.0(1.7) mm), 1.2 mm wide (paratypes 0.9-1.4(1.1) mm). Anal lobes sclerotized on venter and on medial margin of dorsum; each lobe dorsally with 3 enlarged setae, anteromedial seta conspicuously short, with truncate apex, remaining setae conical with blunt or truncate apex (outer seta and posteromedial seta about equal in size, anteromedial seta less than half as long as other lobe setae), with 3 microtubular ducts (paratypes with 2-4(3) ducts; each lobe ventrally with 3 slender body setae and 0 sessile pores (paratypes with 0-1(0) pores).

DORSUM with enlarged setae of 1 size: Larger size present over surface, with cluster of 2-6 setae (1 larger) near lateral margin of each abdominal segment. Largest lateral seta 53 μ long (paratypes 47-60(54) μ), largest medial seta 49 μ (paratypes 44-60(51) μ); on abdominal segments II to VIII longest lateral seta 1.1 times longer than longest medial seta (paratypes 1.0-1.2(1.1) times). Lateral setae straight or slightly curved, conical, with blunt or truncate apices posteriorly, rounded apices anteriorly; medial setae of same shape as lateral setae usually curved, with blunt or rounded apices, largest setae on abdomen. Enlarged setae few, e.g. abdominal segment V with 18 setae (paratypes with 15-20(14) setae), with larger setae forming longitudinal lines in lateral and sublateral areas of abdomen; segments III-VII with setae arranged in 1 transverse row. Macrotubular ducts of large size, scattered over surface. Microtubular ducts 5 μ long (paratypes 5-6(6) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, approximately half as long as remaining sclerotized portion; total sclerotized area about 3 times longer than unsclerotized area; dermal orifice sclerotized. Microtubular ducts scattered over surface. Multilocular pores absent.

Anal ring apical, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 33 μ long (paratypes 24-35(28) μ), on segment III 44 μ long (paratypes 24-44(35) μ); longest posterior anal-lobe seta 274 μ long (paratypes 233-311(271) μ). Enlarged setae present on submargin from segment VII forward to head, with setae on surface smaller than those on dorsum. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size, distributed throughout sublateral and medial areas. Microtubular ducts present along body margin. Multilocular pores of 2 kinds: Quinqueloculars abundant over surface; triloculars most abundant on thorax and anterior abdominal segments. Cruciform pores present on sublateral areas of abdominal segment V through head and in medial areas near legs; with 8 pores between antennae and anterior margin of clypeolabral shield (paratypes with 3-9(6)

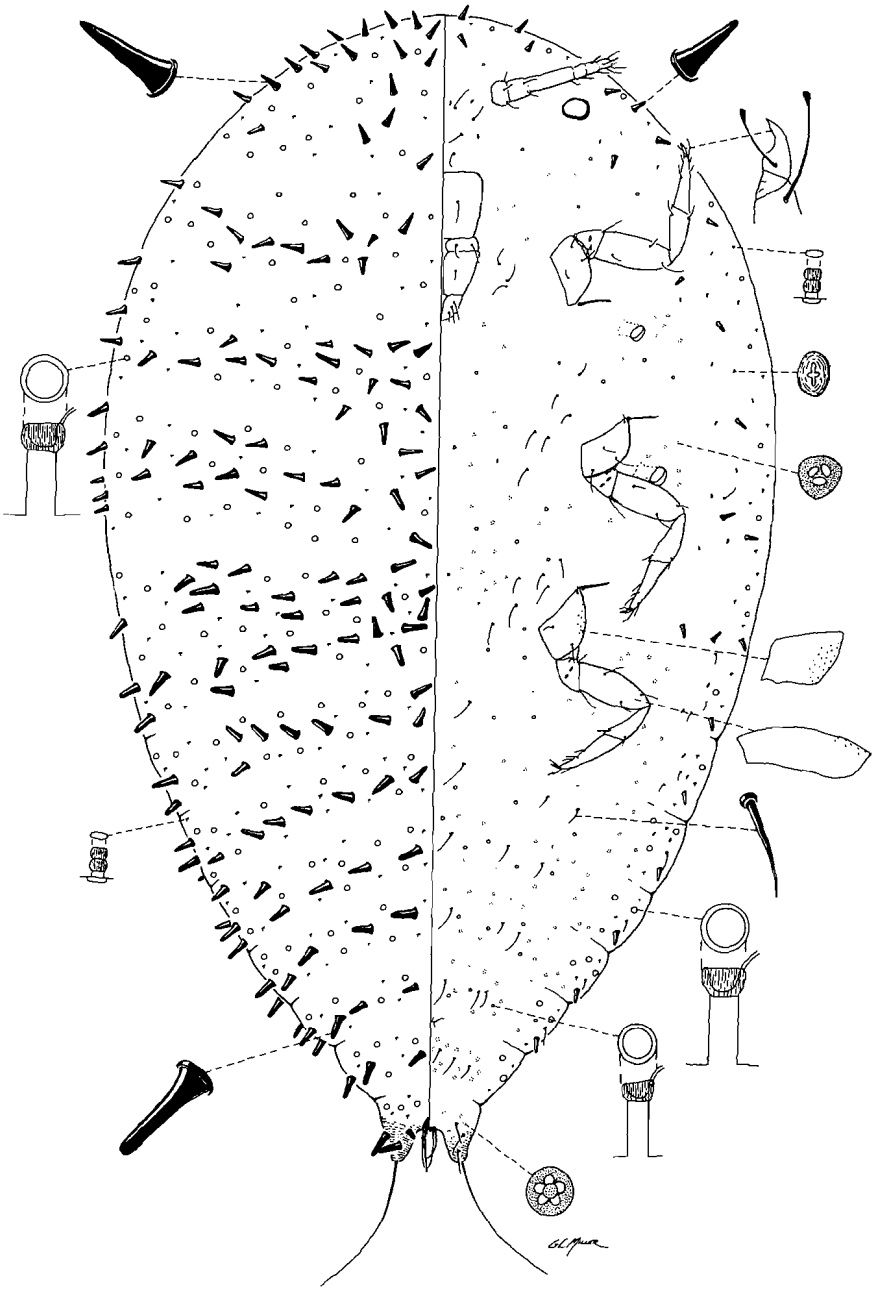

Fig. 3. *Acanthococcus arenariae* D. Miller & G. Miller

pores).

Legs with translucent pores about 2 μ long; hind coxae dorsally with 42 and 36 pores (paratypes with 12-35(25) pores), ventrally with 17 and 20 pores (paratypes with 3-16(10) pores); hind femora dorsally with 8 and 9 pores (paratypes with 2-10(7) pores), ventrally without pores (paratypes with 0-3(0) pores); tibiae with 4 setae (of 54 legs examined, 4 had legs with 5 setae); middle seta on front tibia located on inner margin of tibia, about same size or slightly more robust than outer apical setae, apical tibial setae slightly more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.79 and 0.85) (paratypes 0.81-0.90(0.85)); claws with conspicuous denticle near tip. Antennae 6-segmented, third segment longest. Segment 6 with 4 sensory setae; segment 5 with 1 longer than single sensory seta on segment 4.

Notes. *Acanthococcus arenariae* is similar to *A. euphorbiae* but has tibiae with 4 setae, posterior enlarged setae with blunt or truncate apices, and an anteromedial enlarged seta on anal lobe less than half as long as other anal-lobe setae; *A. euphorbiae* has tibiae with 5 setae, posterior enlarged setae with rounded or acute apices, and an anteromedial enlarged seta on anal lobe longer than half of length of other lobe setae.

Specific Epithet. The name *arenariae*, is in reference to the host.

Specimens Examined. SOUTH CAROLINA, Aiken Co.: Near Windsor, IV-1-79 (HHT-31-79), on ?, R. J. Beshear (1 ad. ♀) UG. Bamberg Co.: Between Bamberg and Aiken on Highway 78, X-20-77 (HHT-52-77), on *Arenaria caroliniana*, R. J. Beshear (13 ad. ♀ and 6 1st on 13 sl.) BM, FSCA, UCD, UG, USNM.

Acanthococcus azaleae (Comstock)

Azalea bark scale

Fig. 4

This species was treated in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992).

Acanthococcus beshearae D. Miller and G. Miller, n. sp.

Beshear eriococcin

Fig. 5

Type Material. Adult female holotype (1 specimen on slide) with right label "HHT-96-75 *Aristida* Archer, Fla. V-29-75 Coll. R. J. Beshear."; left label "Holotype *Acanthococcus beshearae* D.R. Miller & G.L. Miller" (USNM). The specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 1.4 mm long (paratypes 1.3-2.9(1.8) mm), 0.7 mm wide (paratypes 0.6-0.9(0.8) mm). Anal lobes sclerotized on venter and dorsum; each lobe dorsally with 3 enlarged setae of approximately same shape and size, with 1 microtubular duct (paratypes with 0-2(1) ducts); each lobe ventrally with 3 slender body setae and 2 sessile pores (paratypes 0-2(1) pores).

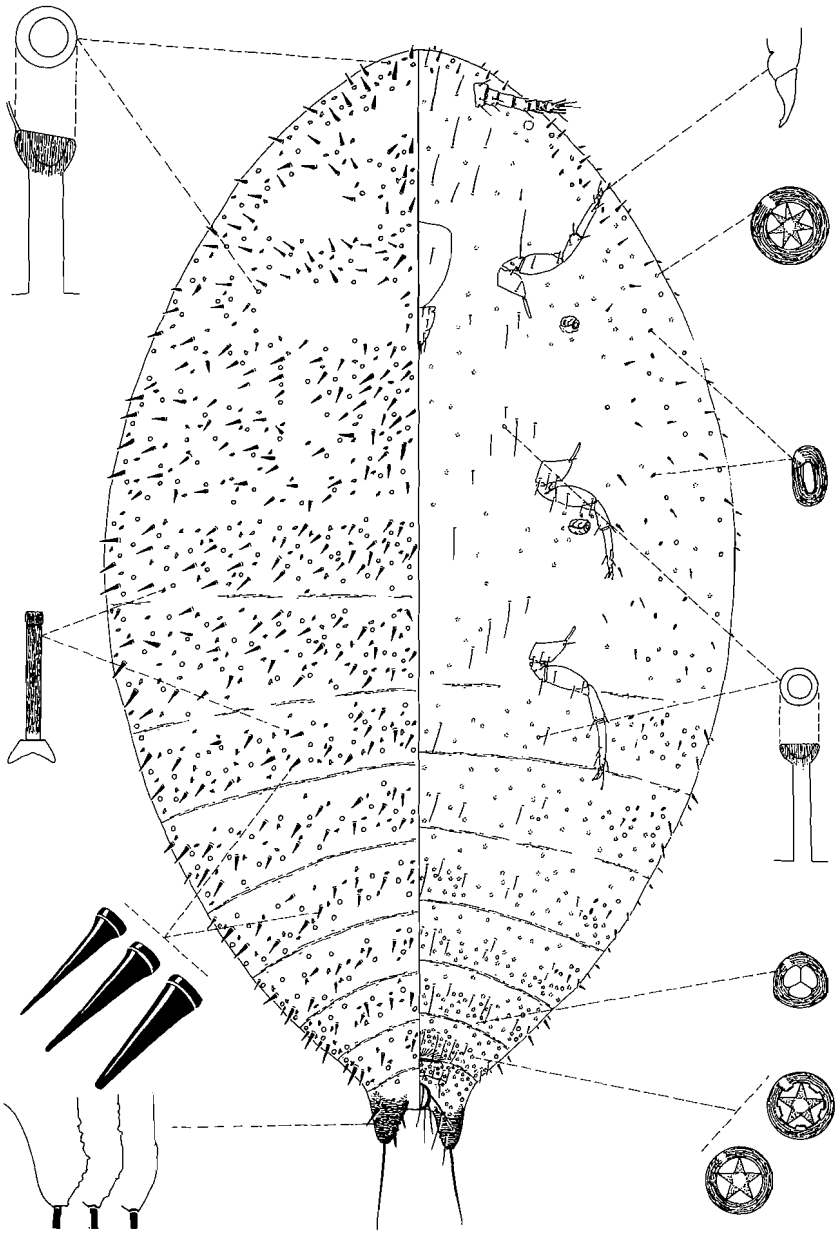

Fig. 4. *Acanthococcus azaleae* (Comstock)

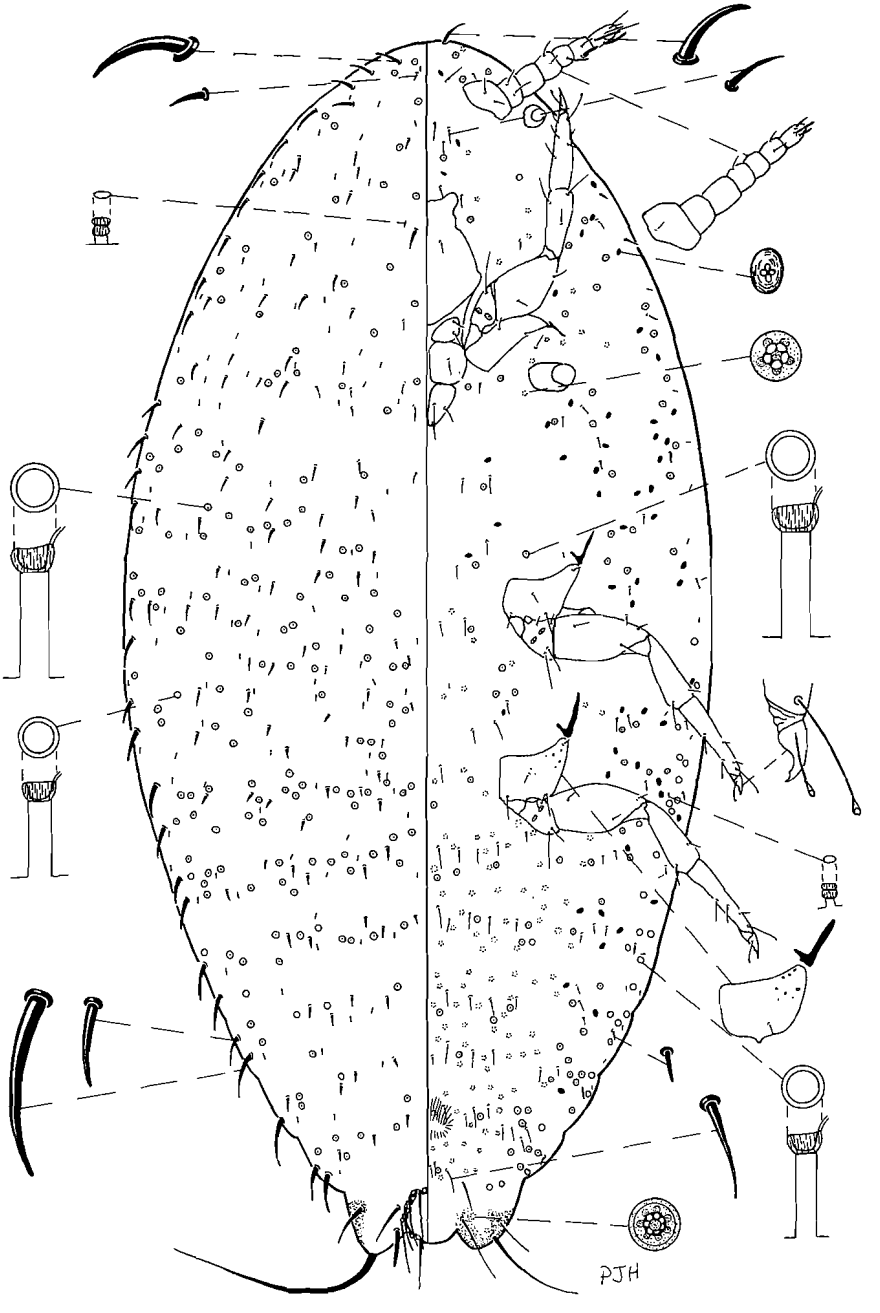

Fig. 5. *Acanthococcus beshearae* D. Miller & G. Miller

DORSUM with enlarged setae of 2 sizes: Larger size present along entire body margin, with 2, occasionally 1 or 3, setae present on margin of each abdominal segment; smaller size restricted to medial and sublateral areas, increasing in size anteriorly. Largest lateral seta 52 μ long (paratypes 41-51(48) μ), largest medial seta 22 μ (paratypes 20-21(21) μ); on abdominal segments II to VIII longest lateral seta 2.4 times longer than longest medial seta (paratypes 2.2-2.6(2.4) times). Lateral setae curved, long, slender, with rounded or acute apices; medial setae curved, slender, with rounded or acute apices. Enlarged setae few, e.g. abdominal segment V with 14 (paratypes with 12-15(13) setae), with no longitudinal pattern except on body margin. Macrotubular ducts of 2 sizes, scattered over surface. Microtubular ducts frequently difficult to discern, about 3 μ long, with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, approximately equal in length to remaining sclerotized portion; total sclerotized area about four times as long as unsclerotized area; dermal orifice unsclerotized. Microtubular ducts scattered over surface. Multilocular pores absent.

Anal ring apical, with 4 or 5 pairs of setae.

VENTER with longest seta on abdominal segment VIII 41 μ long (paratypes 38-52(45) μ), on segment III 20 (paratypes 17-20(18) μ); longest posterior anal-lobe seta 233 μ long (paratypes 218-256(238) μ). Enlarged setae absent. Macrotubular ducts of 2 kinds: Larger size scattered over surface; smaller size relatively abundant, distributed throughout sublateral and medial areas. Multilocular pores of 2 kinds: Quinqueloculars present over entire surface, most abundant on posterior abdominal segments; septeloculars unusual. Cruciform pores present on sublateral areas of abdominal segments VI, present on medial, sublateral, and lateral areas of metathorax through head; with 6 pores between antennae and anterior margin of clypeolabral shield (paratypes with 6-11(10) pores).

Legs with translucent pores about 2 μ long; hind coxae dorsally with 8 and 3 pores (paratypes with 9-19(13) pores), ventrally with 1 and 3 pores (paratypes with 1-6(3) pores); hind femora without pores; femora with 5 setae; tibiae with 4 setae on each of hind 2 pairs of legs, 5 setae on front pair; middle seta on front tibia located off of inner margin of tibia, approximately equal to outer apical setae; inner, apical tibial setae slightly more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.83) (paratypes 0.81-0.83(0.82)); claws with small denticle near tip. Antennae 6-segmented on 1 side 7 on other (paratypes with 7-segmented antennae), third and fourth segments equal in length when 7-segmented. Segment 7 with 3 sensory setae; segment 6 with 1 longer than single sensory seta on segment 5.

Notes. *Acanthococcus beshearae* is most similar to *A. kemptoni*, but has marginal setae in a continuous band around the body, medial and sublateral dorsal setae increasing in size anteriorly cylindrical posteriorly and conical anteriorly, multilocular pores near vulva primarily with 5 loculi, and 14 enlarged setae on segment V; *A. kemptoni* has marginal enlarged setae restricted to posterior abdominal segments and the head, medial and sublateral dorsal setae about the same size and shape over entire dorsal surface, multilocular pores near vulva primarily with 7 or more loculi, and 23-28 enlarged setae on segment V.

For a comparison of *A. beshearae* with *A. davidsoni* see the "Notes" section of the latter species.

Specific Epithet. *Acanthococcus beshearae* is named in honor of Ms. Ramona J.

Beshear, who collected this and many other interesting species of eriococcids in the Georgia-Florida area of the southeast. Her dedication to collecting has added significantly to our increased knowledge of the scale insects of this poorly known area of the U.S.

Specimens Examined. FLORIDA, Alachua Co.: Archer, V-29-75 (HHT-96-75), *Aristida* sp., R. J. Beshear (1 ad. ♀) UG.

GEORGIA, Bulloch Co.: Locality unknown, V-26-83 (HHT-55-83), *Aristida* sp., R. J. Beshear (2 ad. ♀ on 2 sl.) BM, USNM. Tattnall Co.: Near Reidsville on State Route 280, VIII-14-79 (HHT-27-79), VIII-14-79 (HHT-21-79) and V-25-80 (HHT-10-80), *Aristida* sp., R. J. Beshear (4 ad. ♀ on 4 sl.) UCD, UG, USNM.

SOUTH CAROLINA, Orangeburg Co.: South of Branchville on US Highway 21, X-28-75 (HHT-239-75), on *Aristida* sp., R. J. Beshear (3 ad. ♀ on 3 sl.) FSCA, UG, USNM.

Acanthococcus carolinae (Williams), n. comb.

Carolina eriococcin

Fig. 6

Synonymy: *Eriococcus carolinae* Williams, 1969:90.

Type Material. Adult female holotype (single specimen on slide) with left label "U.S.A. N. Carolina Manteo *Ammophila breviligulata* D. A. Mount Aug 17 1965 U.S.D.A. 65-17193 C.I.E. B.M 196"; right label "*Eriococcus carolinae* Williams HOLOTYPE" (USNM). In addition, we have examined 15 paratypes (USNM); there are 10 paratypes at the British Museum (Natural History).

Field Features. Adult female pale yellow; turning white prior to ovisac formation. Ovisac elongate, white; may contain 21-124 yellow eggs. Body margin lined with long crystalline rods.

Acanthococcus carolinae has 2 generations per year with eggs in the ovisac serving as the overwintering stage. First generation crawlers begin to appear in April and second generation crawlers are present in late June or July. Adult females of the second generation complete egg laying in late September or early October. Males are common. This species occurs on the upper surface of blades of beach grass and can be very destructive to the host if left unchecked for several years. This information has been compiled from Fuzy (1969), Cambell (1971) and personal observations (DRM).

Diagnosis. Dorsal enlarged setae of 2 sizes, larger size (longest large size 52-67(60) μ long) restricted to body margin, shape straight or slightly curved, conical, those on last 4 or 5 segments with truncate apices, remaining large setae with rounded apices; smallest size (longest small size 26-44(34) μ long) scattered over remainder of surface, shape straight or curved, conical, with truncate or rounded apices; on segment V longest large seta 1.3 to 2.2(1.8) times longer than longest small seta. Enlarged setae few (abdominal segment V with 11-19(16) setae), setae arranged in 3 pairs of longitudinal lines (medial, sublateral, lateral). Microtubular ducts scattered over dorsum, 3-6(4) μ long), with area farthest from dermal orifice divided into 2 parts, sclerotized, total sclerotized area about 2 times longer than unsclerotized area, dermal orifice without protruding tubes. Anal lobes with 3 setae, partially sclerotized, without medial teeth. Sessile pores near vulva predominantly with 7 or more

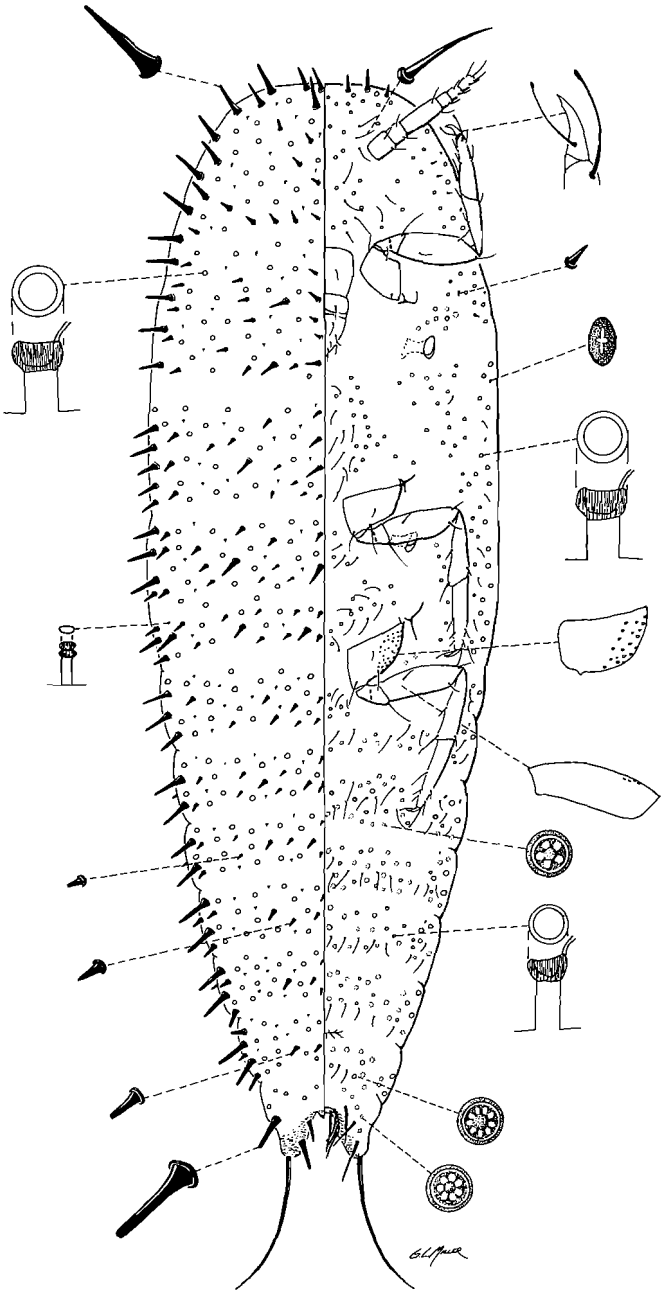

Fig. 6. *Acanthococcus carolinae* (Williams)

loculi. Tibiae each with 5 setae, hind tibiae rarely with 4; hind tarsus longer than tibia.

Host and Distribution. Recorded from *Ammophila breviligulata* in coastal dunes. Eastern U.S. distribution: Delaware, Maryland, New Jersey, North Carolina, and Virginia. Western U.S. distribution: None.

Acanthococcus chilos D. Miller and G. Miller, n. sp.

Grass eriococcin

Fig. 7

Synonymy: *Eriococcus diaboli* Ferris, 1955:122, misidentification.

Type Material. Adult female holotype (upper right specimen of 4 on slide) with right label "*Eriococcus* On grass Saratoga Spgs., N.Y. Aug. 1938 G. Rau Stanford University National History Museum"; left label "*Acanthococcus chilos* D.R. Miller & G.L. Miller HOLOTYPE PARATYPES" includes a map giving the location of the holotype on the slide (UCD). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 1.9 mm long (paratypes 1.8-2.5(2.0) mm), 0.9 mm wide (paratypes 0.8-1.5(1.1) mm). Anal lobes lightly sclerotized on lateral and medial margins ventrally, and on medial margin dorsally; each lobe dorsally with 3 enlarged setae all conical, with acute apices (posteromedial seta longest, anteromedial seta shortest), with 2 microtubular ducts (paratypes with 2-3(2) ducts); each lobe ventrally with 3 slender body setae and 2 or 3 sessile pores (paratypes with 1-6(3) pores).

DORSUM with enlarged setae of 1 variable size: Present over entire dorsum, usually with cluster of 4-6 setae on margin and submargin of each abdominal segment. Largest lateral seta 67 μ long (paratypes 70-81(78) μ), largest medial seta 54 μ (paratypes 55-64(60) μ); on abdominal segments II to VIII longest lateral seta 1.2 times longer than longest medial seta (paratypes 1.2-1.4(1.3) times). Enlarged setae straight, with acute apices. Enlarged setae in moderate numbers, e.g. abdominal segment V with 29 (paratypes 29-35(32) setae), with no longitudinal pattern except on body margin. Macrotubular ducts of large size, scattered over surface. Microtubular ducts 6 μ long (paratypes 4-8(6) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion lightly sclerotized, rounded, approximately half as long as remaining sclerotized portion; total sclerotized area about 3 times as long as unsclerotized area; dermal orifice sclerotized. Microtubular ducts scattered over surface. Multilocular pores absent.

Anal ring ventral, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 29 μ long (paratypes 29-35(32) μ), on segment III 67 (paratypes 64-87(76) μ); longest posterior anal-lobe seta 250 μ long (paratypes 274-306(285) μ). Enlarged setae present on submargin from segment V forward to head, with setae on head at least 2 times longer than others on venter. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size, distributed throughout sublateral and medial areas. Microtubular ducts present along body margin. Multilocular pores of 3 kinds: Quinqueloculars present over entire surface, most abundant on posterior abdominal segments; triloculars and septeloculars uncommon. Cru-

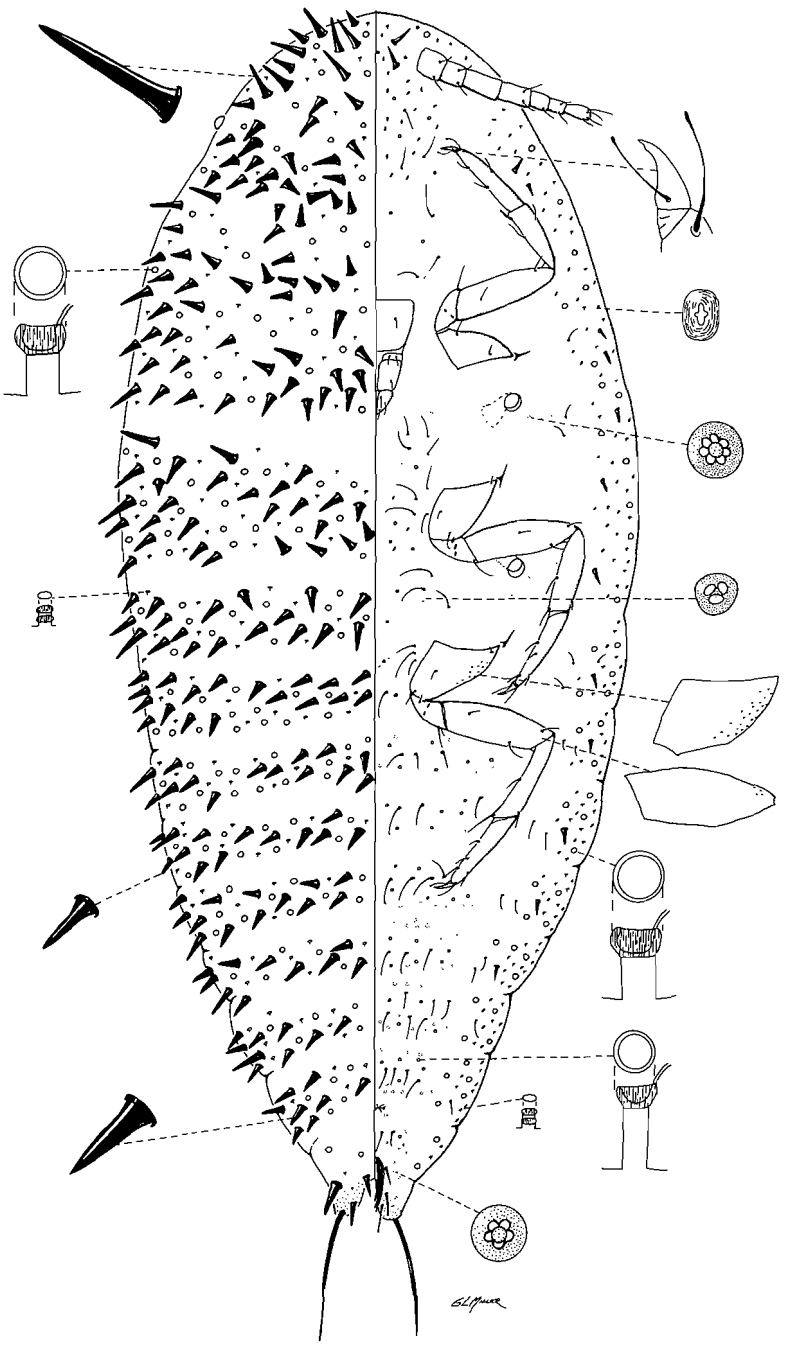

Fig. 7. *Acanthococcus chilos* D. Miller & G. Miller

ciform pores present on sublateral areas of abdominal segment VI through head; with 30 pores between antennae and anterior margin of clypeolabral shield (paratypes with 28-51(38) pores).

Legs with translucent pores about 3 μ long with most pores about 2 μ long; hind coxae dorsally with 21 and 26 pores (paratypes with 14-27(18) pores), ventrally with 8 and 15 pores (paratypes with 0-12(6) pores); hind femora dorsally with 1 pore (paratypes with 1-7(4) pores), ventrally without pores; femora with 5 setae; tibiae with 5 setae; middle seta on front tibia located on inner margin of tibia, about same size or slightly more robust than outer apical setae; inner, apical tibial setae slightly more robust than other leg setae; tarsi about same length as tibiae (hind tibia/tarsus 1.05 and 1.07(0.93)); claws with conspicuous denticle near tip. Antennae 6-segmented, third segment longest. Segment 6 with 3 sensory setae; segment 5 with 1 longer than single sensory seta on segment 4.

Variation. This species is relatively homogeneous morphologically, varying slightly in the relative sizes of the dorsal enlarged setae. In some specimens, a slight indication of longitudinal lines can be seen on the abdomen with 1 pair of sublateral and medial setae slightly larger than surrounding setae.

Notes. This species was treated as *Eriococcus* (=*Acanthococcus*) *diaboli* by Ferris (1955); but after examining types and a series of specimens from other western localities of *A. diaboli*, it is obvious that Ferris misidentified the New York specimens.

Acanthococcus chilos is similar to *A. diaboli*, but has 1 size of enlarged seta and more than 20 cruciform pores between the antennae and the clypeolabral shield; *A. diaboli* has large sized enlarged setae in a transverse row on the middle of each abdominal segment and has small sized setae in transverse rows on the anterior and posterior margins of each segment and has less than 10 cruciform pores between the antennae and the clypeolabral shield.

Specific Epithet. The name *chilos*, from the Greek chilos meaning "grass", refers to the habit of this species of feeding on grass.

Specimens Examined. NEW YORK, Saratoga Co.: Saratoga Springs, VIII-?-38, on grass, G. Rau (17 ad. ♀ on 11 sl.) BM, UCD, USNM. VIRGINIA, Bland Co.: Chestnut Ridge (3,000 ft.), VIII-10-86, on grass, M. Kosztarab, G-Z. Jiang, T-X. Liu (12 ad. ♀ on 3 sl.) VPI, USNM.

Acanthococcus coccineus (Cockerell)

Cactus eriococcin

Fig. 8

This species was treated in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992).

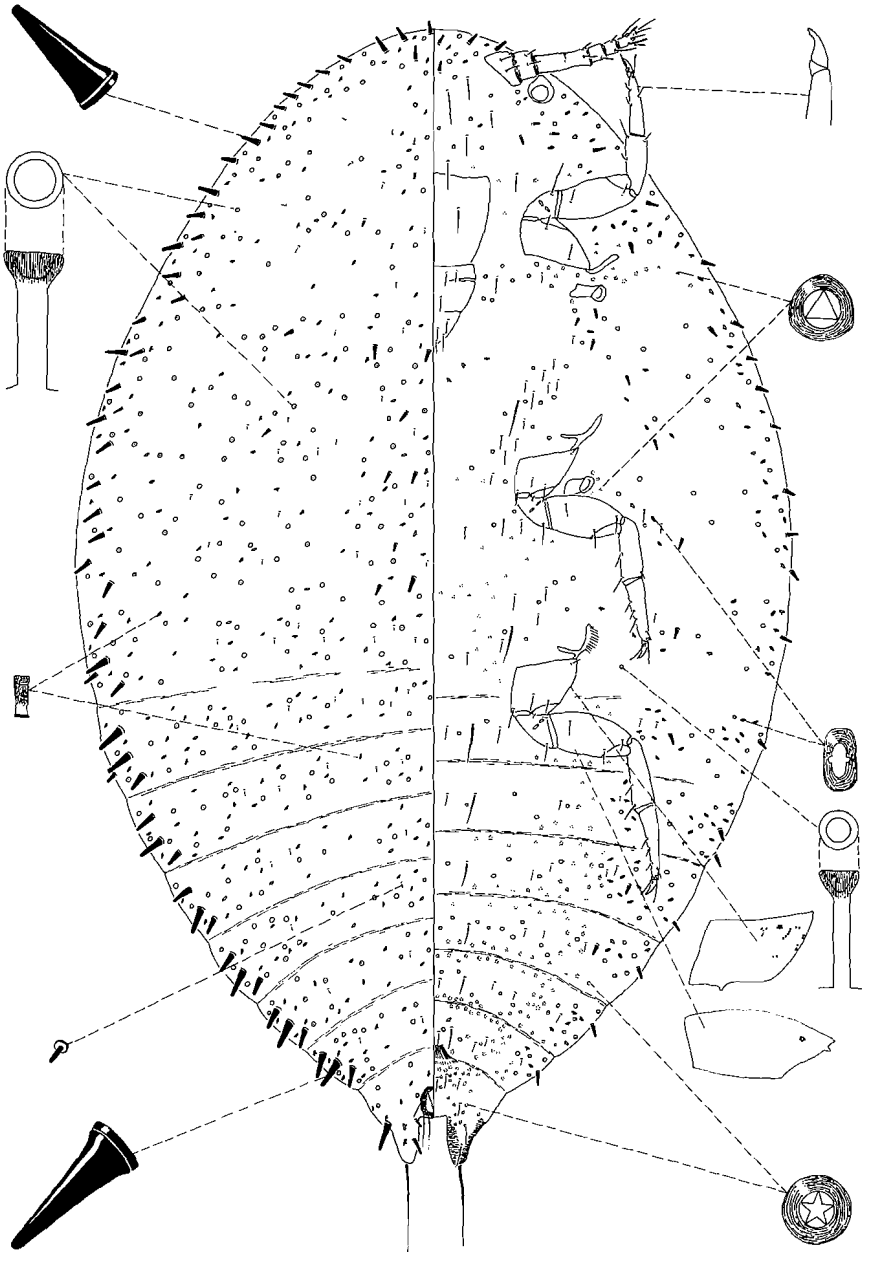

Fig. 8. *Acanthococcus coccineus* (Cockerell)

***Acanthococcus davidsoni* D. Miller and G. Miller, n. sp.**
Davidson eriococcin
Fig. 9

Type Material. Adult female holotype (single specimen on slide) with left label "*Greenisca* n. sp. On *Panicum* Archbold Research Sta. Highlands, Fla. IV-28-1975 R. F. Denno J. A. Davidson D. R. Miller #2831"; right label "HOLOTYPE *Acanthococcus davidsoni* D.R. Miller & G.L. Miller" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 2.6 mm long (paratypes 2.4-2.9(2.7) mm), 0.9 mm wide (paratypes 0.7-1.1(0.9) mm). Anal lobes sclerotized on venter and on medial margin of dorsum; each lobe dorsally with 3 enlarged setae, anal-lobe setae about same shape, nearly parallel sided with blunt apex (setae about same length), with 1 microtubular duct (paratypes with 0-2(1); each lobe ventrally with 3 slender body setae and without sessile pores.

DORSUM with enlarged setae of 2 sizes: Larger size present along entire body margin, with 3 or 4 present on margin of each abdominal segment; smaller size restricted to medial and sublateral areas. Largest lateral seta 38 μ long (paratypes 44-49(46) μ), largest medial seta 15 μ (paratypes 12-14(13) μ); on abdominal segments II to VIII longest lateral seta 2.6 times longer than longest medial seta (paratypes 3.1-3.8(35) times). Lateral setae straight or slightly curved, with parallel sides and blunt apices; medial setae straight or slightly curved, short, cylindrical, with rounded or blunt apices. Enlarged setae in moderate numbers, e.g. abdominal segment V with 22 (paratypes with 18-24(21) setae), with no longitudinal pattern except on body margin. Macrotubular ducts of large size, scattered over surface. Microtubular ducts difficult to see, small, 1 μ long, represented by sclerotized undivided duct; dermal orifice unsclerotized. Microtubular ducts scattered over surface. Multilocular pores predominantly with 7 and 9 loculi, rarely with 5, 6, and 11 loculi; scattered over surface.

Anal ring ventral, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 38 μ long (paratypes 41-44(42) μ), on segment III 29 μ long (paratypes 29-32(31) μ); longest posterior anal-lobe seta 265 μ long (paratypes 290 μ). Enlarged setae present on head. Macrotubular ducts of 1 kind, present over surface. Microtubular ducts apparently absent. Multilocular pores of same kinds and distribution as on dorsum. Cruciform pores present on sublateral areas of abdominal segment VII through head and in medial areas near legs; with 1 pore between antennae and anterior edge of clypeolabral shield (paratypes with 2-4(3) pores).

Legs with largest translucent pores about 2 μ long with most pores about 1 μ long; hind coxae dorsally with 9 and 13 pores (paratypes with 9-11(10) pores), ventrally with 3 and 2 pores (paratypes with 2 pores); hind femora without pores; femora with 5 setae; tibiae with 4 setae on each of hind 2 pairs of legs, 5 setae on front pair; middle seta on front tibia located off of inner margin of tibia, approximately equal to outer apical setae; inner, apical tibial setae slightly more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.75 and 0.78) (paratypes 0.75-0.81(0.78)); claws with denticle near tip. Antennae 7-segmented, third

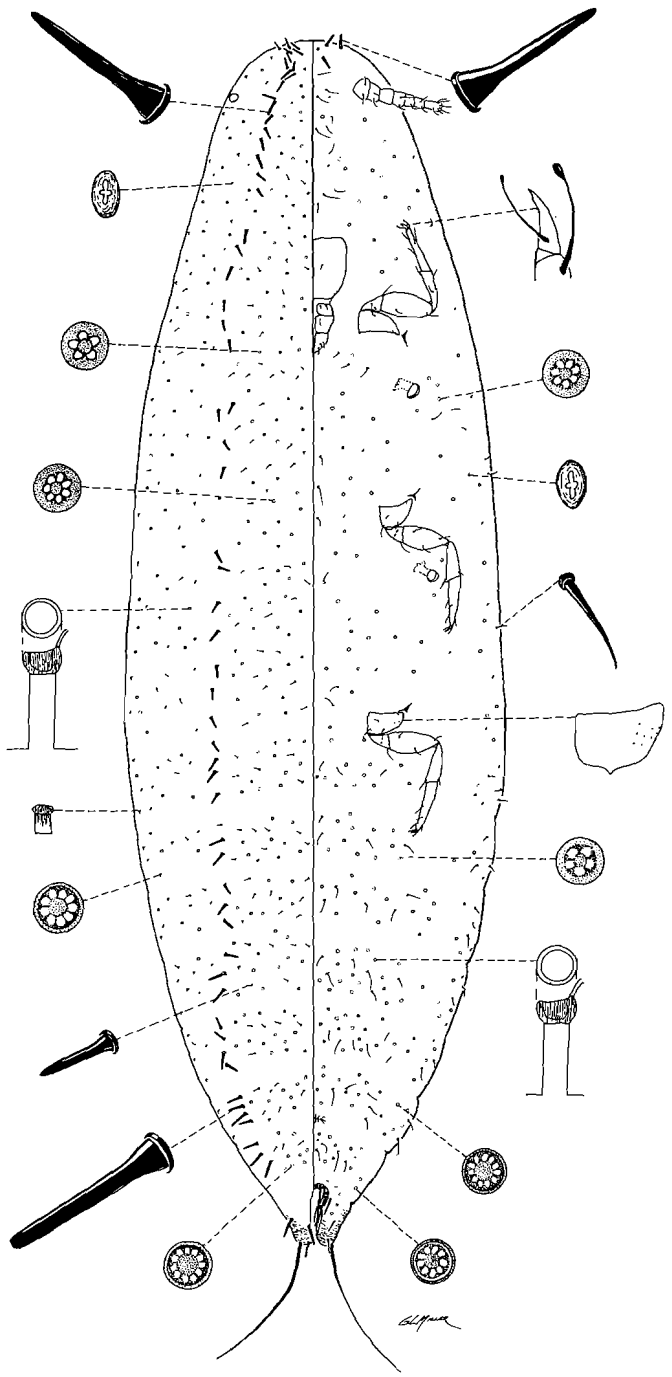

Fig. 9. *Acanthococcus davidsoni* D. Miller & G. Miller

and fourth segments longest. Segment 7 with 4 sensory setae; segment 6 with 1 about equal in length to single sensory seta on segment 5.

Variation. The number of setae on the margin of each abdominal segment is highly variable, ranging from 1-4.

Notes. *Acanthococcus davidsoni* is similar to *A. beshearae* but has dorsal multilocular pores, undivided microtubular ducts, and 7-segmented antennae; *A. beshearae* has no dorsal multilocular pores, divided microtubular ducts, and 6-segmented antennae.

Specific Epithet. *Acanthococcus davidsoni* is named in honor of John A. Davidson, Department of Entomology, University of Maryland, College Park, who not only collected this and other scale insects, but also has made significant contributions to Coccoidea systematics over the past 25 years.

Specimens Examined. FLORIDA, Highlands Co.: Archbold Research Station, IV-28-75, on *Panicum* sp., R. F. Denno, J. A. Davidson, D. R. Miller (3 ad. ♀ on 2 sl.) BM, USNM.

Acanthococcus dennoi D. Miller and G. Miller, n. sp.

Denno eriococcin

Fig. 10

Type Material. Adult female holotype (right specimen of 3 on slide) with left label "*Greenisca* On *Spartina patens* Ocean Co. N.J. 2 mi. E. of Manahawkin off Stafford Ave. July 17, 1974 R. F. Denno colr."; right label "*Acanthococcus dennoi* D.R. Miller & G.L. Miller Holotype Paratypes" includes a map giving location of holotype (USNM). Specimens listed in the "Specimens Examined" section are paratypes; those in the "Other Specimens Examined" section are excluded from the type series.

Field Features. Ovisacs produced on *Spartina* leaf blades.

Based on the fact that Bob Denno found adult males in July only, it is assumed that this species has a single generation each year in New Jersey.

Recognition Characters. Adult female holotype, mounted, 1.6 mm long (paratypes 1.4-3.4(2.2) mm), 0.5 mm wide 0.5-1.3(1.0) mm). Anal lobes sclerotized on lateral and medial margins ventrally, and on medial margin dorsally; each lobe dorsally with 3 enlarged setae, medial setae with parallel margins, outer seta conical (posteromedial seta longest, anteromedial seta shortest), with 0 or 1 microtubular duct (paratypes with 0-1(1) duct); each lobe ventrally with 3 slender body setae and 2 or 1 sessile pores (paratypes with 0-3(2) pores).

DORSUM with enlarged setae of 2 sizes: Larger size present along entire body margin, usually with 2 present on margin of each abdominal segment, occasionally with 1 additional smaller seta present on some segments; smaller size restricted to medial and sublateral areas. Largest lateral seta 41 μ long (paratypes 35-48(41) μ), largest medial seta 12 μ (paratypes 10-21(14) μ); on abdominal segments II to VIII longest lateral seta 2.7 times longer than longest medial seta (paratypes 1.7-3.0(2.4) times). Lateral setae straight or slightly curved, with blunt or rounded apices on posterior abdominal segments, with acute apices on thorax and head; medial setae straight, cylindrical, with blunt apices. Enlarged setae few, e.g. abdominal segment V with 15 (paratypes 10-17(15) setae), with no longitudinal pattern except on body margin. Macrotubular ducts of large size, scattered over surface.

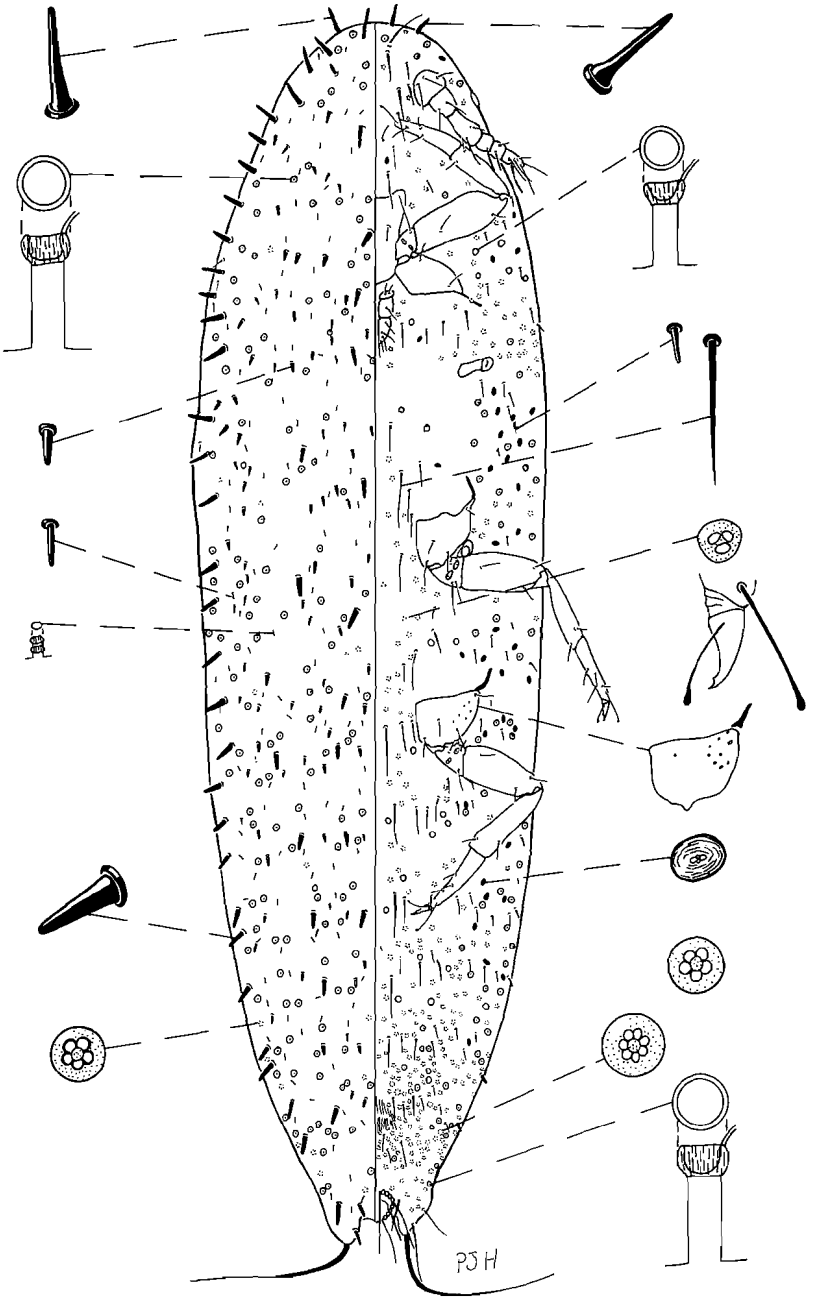

Fig. 10. *Acanthococcus dennoi* D. Miller & G. Miller

Microtubular ducts 3 μ long (paratypes 3-4(3) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, approximately half as long as remaining sclerotized portion (paratypes usually about equal in length to remaining sclerotized portion); total sclerotized area about 2 times as long as unsclerotized area; dermal orifice unsclerotized. Microtubular ducts scattered over surface. Multilocular pores scattered over surface, predominantly quinquelocular.

Anal ring ventral, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 32 μ long (paratypes 29-52(33) μ), on segment III 58 (paratypes 52-77(66) μ)); longest posterior anal-lobe seta 265 μ long (paratypes 247-340(283) μ). Enlarged setae restricted to margin of head, of large size only. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size, distributed throughout sublateral and medial areas. Multilocular pores of 3 kinds: Quinqueloculars present over entire surface, most abundant on posterior abdominal segments; triloculars and septeloculars uncommon. Cruciform pores present on sublateral areas of abdominal segment VI or V through head; with 1 pore between antennae and anterior margin of clypeolabral shield (paratypes with 0-3(2) pores).

Legs with translucent pores about 2 μ long with most pores about 1 μ long; hind coxae dorsally with 10 and 11 pores (paratypes with 8-20(16) pores), ventrally with 2 and 5 pores (paratypes with 2-16(7) pores); hind femora without pores; femora with 5 setae; tibiae with 4 setae; middle seta on front tibia absent; inner, apical tibial setae slightly more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.82)(paratypes 0.77-0.93(0.84)); claws with inconspicuous denticle near tip. Antennae 6-segmented, third segment longest. Segment 6 with 3 sensory setae; segment 5 with 1 equal in size to single sensory seta on segment 4.

Variation. This species is quite variable. The most conspicuous variation is in the relative sizes and distribution of the enlarged setae, the shape of the enlarged setae, and the number of dorsal multilocular pores. In the northern ranges of the species (New Jersey) the large sized enlarged setae are restricted to the body margin, the remaining dorsal setae are small and cylindrical; the posterior marginal setae have broad apices that are nearly truncate, and the marginal setae form a complete fringe around the body; the dorsal quinquelocular pores are relatively abundant over the surface (25-68 pores). Specimens collected from the coast of Virginia tend to have the marginal enlarged setae on the posterior abdomen and thorax reduced so that the fringe does not completely enclose the body; the apices of the marginal enlarged setae on the posterior abdominal segments tend to be narrow with a rounded apex; and there are fewer dorsal quinquelocular pores (4-10 pores). Specimens collected from the coast of South Carolina and northern Georgia tend to have some sublateral and medial enlarged setae of the larger size that form sublateral and medial lines of setae; these specimens also have the smaller sized setae predominantly conical in shape and have few or no dorsal quinquelocular pores. Specimens collected from Florida tend to be without dorsal quinquelocular pores, but they can have almost any arrangement of enlarged setae.

In several instances, specimens collected from the same host specimen on the same date had few or no dorsal quinquelocular pores and sublateral and medial setae either of the large or small size. Because of this variation, we have decided to treat this taxon as a single highly variable species and concur with Williams that *Greenisca* should be considered as a

junior synonym of *Eriococcus* (=*Acanthococcus*).

Notes. *Acanthococcus dennoi* is distinguished from other North American species of *Acanthococcus* by 2 large sized enlarged setae on the margin of each abdominal segment, enlarged setae on the posterior abdominal segments with blunt or rounded apices and the setae on the anterior thorax with acute apices, 4 setae on each tibia, and medial enlarged setae on the anal lobes cylindrical and of a different shape than the outer anal-lobe seta.

Specific Epithet. *Acanthococcus dennoi* is named in honor of Robert F. Denno, Department of Entomology, University of Maryland, College Park, Maryland, USA, who collected this species and many other unusual scale insects in joint field research endeavors.

Paratypes Examined: ALABAMA, Mobile Co.: Little Dauphin Island, V-13-78, on grass, C. H. Ray, Jr., M. L. Williams (21 ad. ♀, 5 2nd ♂, 1 3rd ♂ on 20 sl.) AU.

FLORIDA, Franklin Co.: 10 mi. N.E. Eastpoint, V-12-75, on *Spartina* sp., J. A. Davidson, R. F. Denno, D. R. Miller (1 ad. ♀) USNM. Gulf Co.: Indian Pass Beach, V-12-75, on *Spartina* sp., J. A. Davidson, R. F. Denno, D. R. Miller (1 ad. ♀) USNM; Cape San Blas, VIII-8-70 (HHT-149-70), H. H. Tippins (5 ad. ♀, 1 2nd ♀, on 6 sl.) UG, USNM. Lee Co: Pine Island, XI-24-72 (HHT-448-68), on *Spartina patens*, R. J. Beshear (1 ad. ♀) USNM. Pasco Co.: Hudson, IX-15-73, S. Nakahara (12 ad. ♀ on 4 sl.) CDA, FSCA, UCD, USNM. St. Lucie Co.: 10 mi. N. of Ft. Pierce, XI-29-70, host unknown, S. Nakahara (12 ad. ♀, 1 2nd ♀, 1 2nd ♂, 7 1st, 1 4th ♂, 2 ad ♂ on 10 sl.) BM, UG, USNM, VPI, ZAS; Ft. Pierce, II-11-78, on *Spartina patens*, E. W. Campbell (5 ad. ♀, 5 2nd ♀, 2 2nd ♂ on 12 sl.) FSCA, USNM; Ft. Pierce, IV-30-87, on *Distichlis spicata*, G. Johnson and E. W. Campbell (3 ad. ♀ on 3 sl.) FSCA.

GEORGIA, Bryan Co.: Richmond Hill State Park, IX-17-74 (HHT-193-74), on *Spartina patens*, R. J. Beshear (2 ad. ♀ on 2 sl.) UG, USNM. Camden Co.: Cumberland Island, III-15-68 (HHT-100-68), III-20-69 (HHT-42-69), XII-8-72 (HHT-455-72), on *Spartina* sp., R. J. Beshear (3 ad. ♀ on 3 sl.) UG, USNM.

NEW JERSEY, Ocean Co: 2 mi. E. of Manahawkin off Stafford Ave., VII-17-74, on *Spartina patens*, R. F. Denno (3 ad. ♀, 1 2nd ♀, 5 2nd ♂, 7 ad. ♂ on 5 sl.) SIE, USNM; marsh nr. Manahawken, VII-19-74, on *Spartina patens*, R. F. Denno, D. R. Miller (4 ad. ♀, 9 2nd. ♀, 5 2nd. ♂, 1 1st, 1 4th ♂, 2 ad. ♂ on 5 sl.) IZAS, USNM; Tuckerton, VII-7-76, on *Spartina patens*, S. Nakahara, R. F. Denno, D. R. Miller (1 2nd ♀) USNM; VIII-78, on *Spartina* grass in greenhouse, R. F. Denno (3 ad. ♀ on 2 sl.) USNM.

SOUTH CAROLINA, Charleston Co.: Isle of Palms, IX-15-23, on *Spartina* sp., J. T. Rogers (13 ad. ♀, 2 2nd ♀, 37 1st, 1 ad ♂ on 7 sl.) BM, MCM, USNM; Charleston, IX-15-23, on *Spartina patens*, J. T. Rogers (5 ad. ♀) USNM. Georgetown Co.: Pawleys Island, XI-16-74 (HHT-226-74), on *Spartina* sp., R. J. Beshear (3 ad. ♀ on 3 sl.) UG, USNM.

VIRGINIA, Princess Anne Co: Norfolk, VI-23-45, on grass, G. Rau (6 ad. ♀ on 2 sl.) USNM.

Other Specimens Examined. FLORIDA, Gulf Co.: Cape San Blas, VIII-8-70 (HHT-149-70), H. H. Tippins (2 2nd ♂ on 2 sl.) USNM. Lee Co: Pine Island, XI-24-72 (HHT-448-72), XI-26-76 (HHT-353-76), on *Spartina patens*, R. J. Beshear (4 ad. ♀, 2 2nd ♀ on 6 sl.) UG.

GEORGIA, Bryan Co.: Richmond Hill State Park, IX-17-74 (HHT-193-74), on *Spartina patens*, R. J. Beshear (11 ad. ♀, 3 1st, 1 2nd ♂ on 15 sl.) UG, USNM. Glynn Co.:

Jekyll Island, III-19-75 (HHT-48-75), III-23-76 (HHT-107-76), III-16-78 (HHT-56-78), on *Spartina patens*, R. J. Beshear, H. H. Tippins (3 ad. ♀, 2 1st on 5 sl.) UG, USNM. McIntosh Co.: Sapelo Island, (reared in Greenhouse), II-28-75, on *Spartina alterniflora*, J. Everest (5 ad. ♀, 2 2nd ♀, 6 1st, 1 2nd ♂ on 8 sl.) AU, UG, USNM.

SOUTH CAROLINA, Georgetown Co.: Huntington Beach, III-10-83, on *Spartina* sp., R. J. Beshear (1 ad. ♀) UG; Pawleys Island, XI-16-74 (HHT-226-74), on *Spartina* sp., R. J. Beshear (3 ad. ♀ on 3 sl.) UG.

Acanthococcus droserae Miller, Liu, and Howell

Sundew eriococcin

Fig. 11

This species was treated in a recently submitted paper and will not be redescribed here (see Miller, Liu, and Howell 1992).

Acanthococcus dubius (Cockerell)

Uncertain eriococcin

Fig. 12

This species was treated in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992). The illustration chosen for the current publication represents the typical form of *A. dubius*. An additional varient of this species is illustrated in Miller and Miller (1992).

Acanthococcus eriogoni (Ehrhorn)

Eriogonum eriococcin

Fig. 13

This species was treated in a recent paper on the *Acanthococcus* species that occur in the western United States on *Atriplex* and will not be redescribed here (see Miller 1991)

Acanthococcus euphorbiae (Ferris)

Euphorbia eriococcin

Fig. 14

This species was treated in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992). The illustration chosen for the current publication represents the typical form of *A. euphorbiae*. An additional varient of this species is illustrated in Miller and Miller (1992).

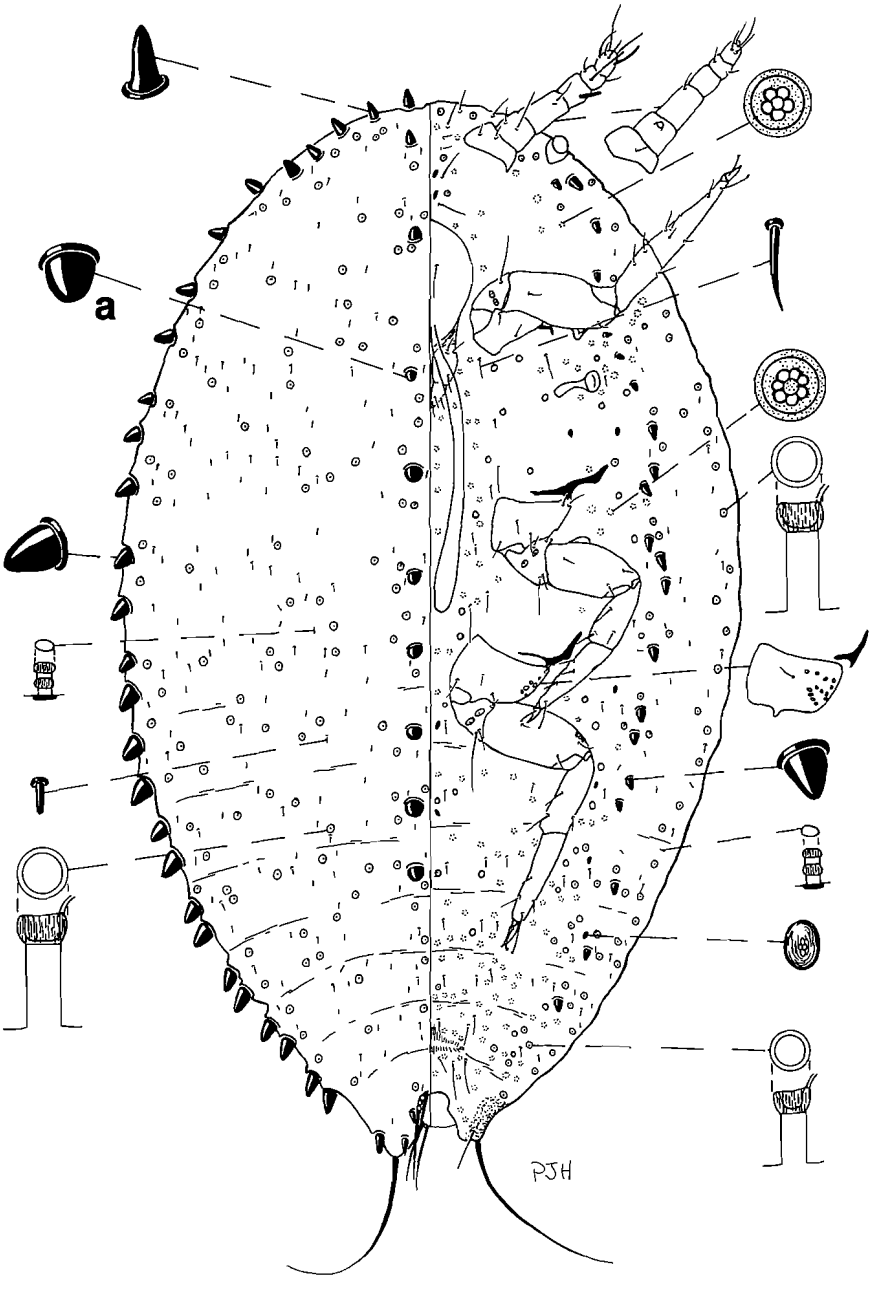

Fig. 11. *Acanthococcus droserae* Miller, Liu, & Howell. a. dome-shaped enlarged seta

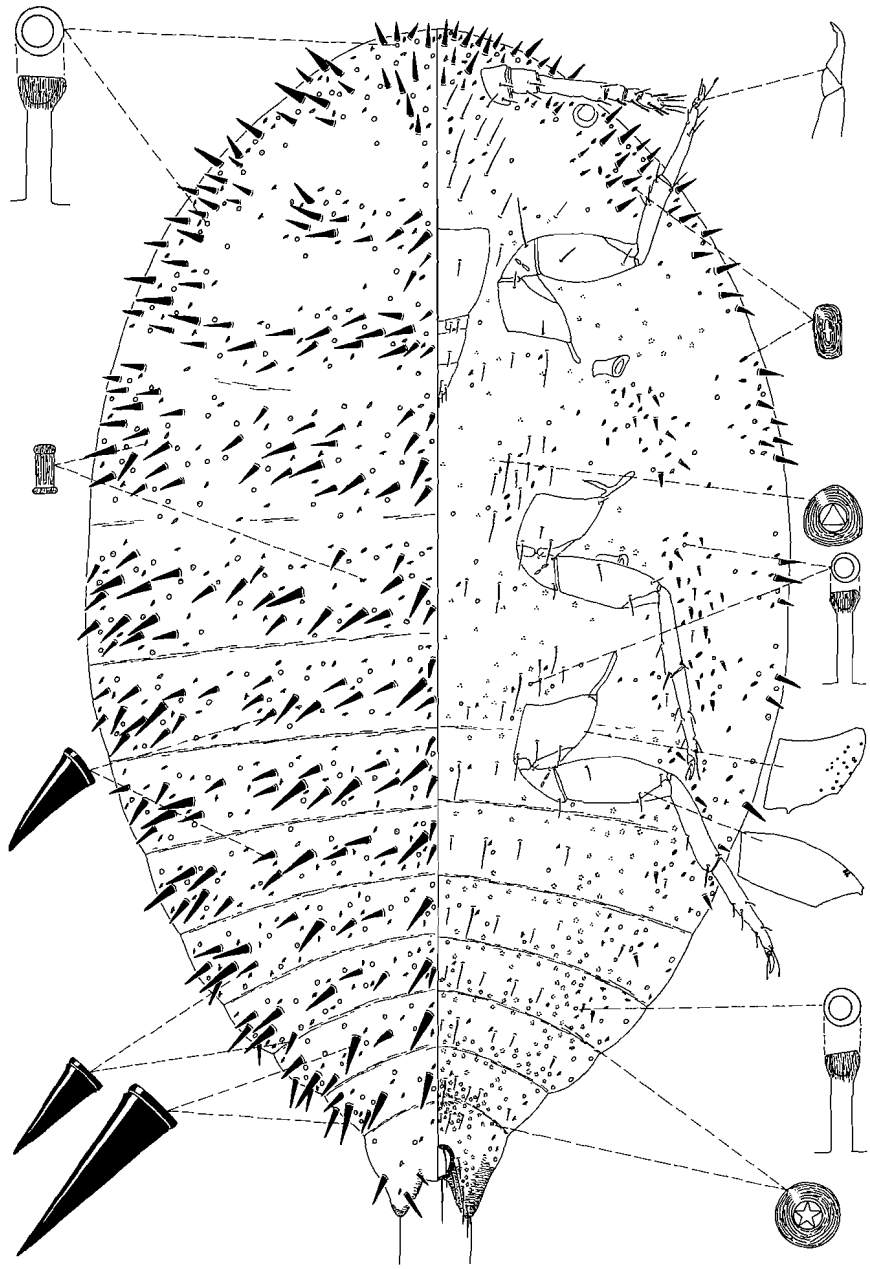

Fig. 12. *Acanthococcus dubius* (Cockerell)

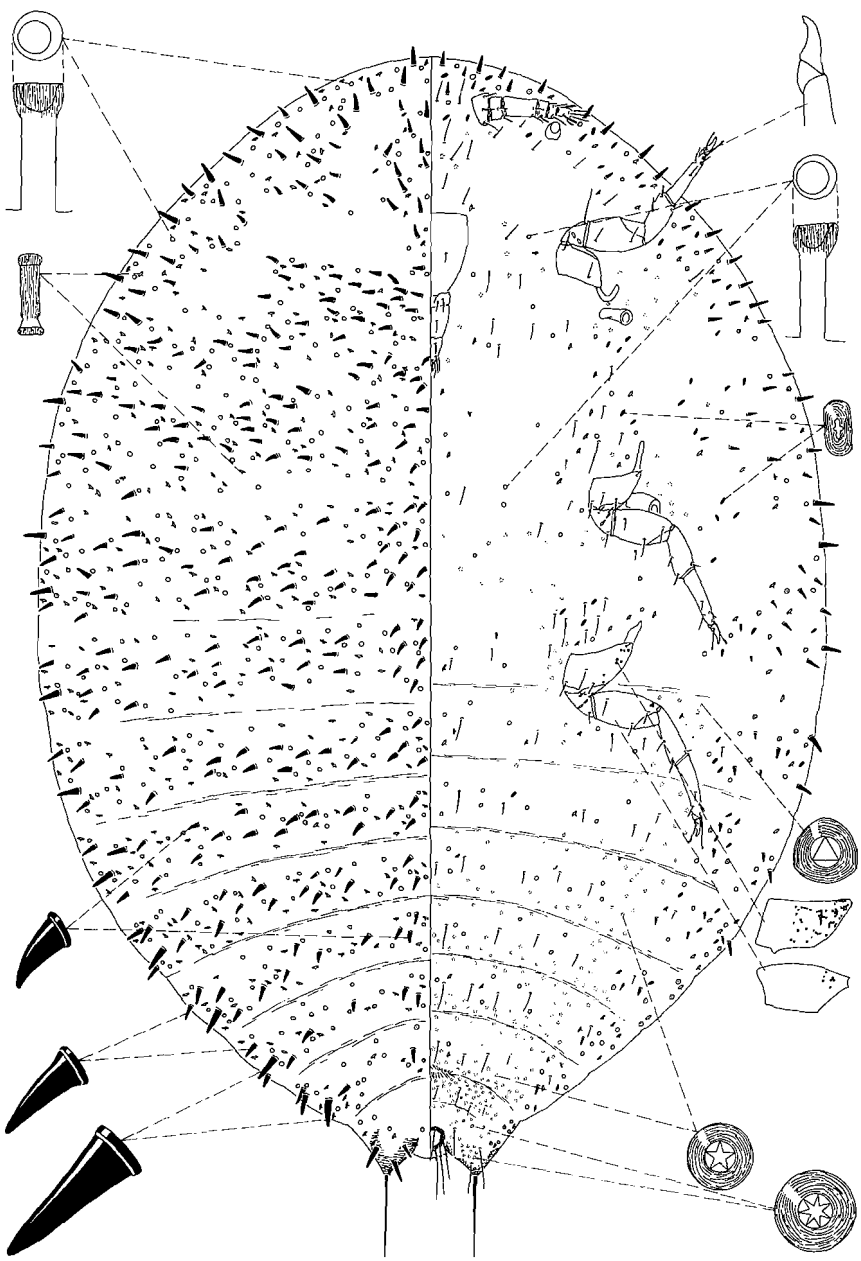

Fig. 13. *Acanthococcus eriogoni* (Ehrhorn)

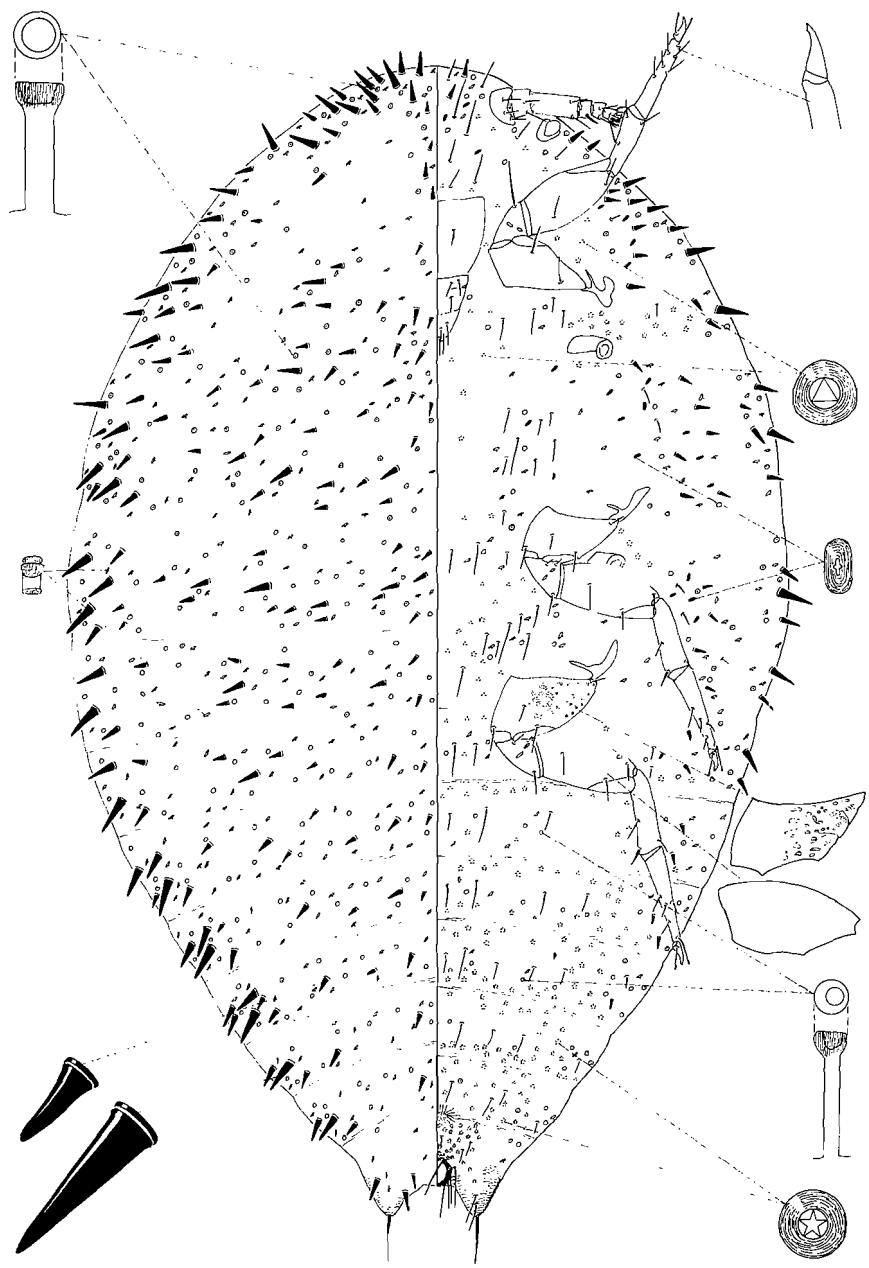

Fig. 14. *Acanthococcus euphorbiae* (Ferris)

Acanthococcus howelli D. Miller and G. Miller, n. sp.

Howell eriococcin

Fig. 15

Synonymy: *Eriococcus kemptoni* Parrott; Trimble 1928:43, misidentification

Type Material. Adult female holotype (left specimen of 2 on slide) with right label "*Acanthococcus howelli* D.R. Miller & G.L. Miller Holotype Paratype" and includes a map giving location of holotype; left label "*Eriococcus* On *Andropogon virginicus* Woodmont, Conn. Rau colr. Sept. 20, 1944 Spec. Survey 19661" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 2.7 mm long (paratypes 1.4-3.2(1.9) mm), 1.3 mm wide (paratypes 0.5-1.3(0.9). Anal lobes lightly sclerotized on lateral and medial margins ventrally and dorsally; each lobe dorsally with 4 enlarged setae, anteromedial seta more slender than other lobe setae with rounded apex, remaining setae conical with acute apex (posterior seta on outer margin longest, anterior seta on outer margin shortest), with 4 or 5 microtubular ducts (paratypes with 2-5(4) ducts); each lobe ventrally with 3 slender body setae and 3 and 1 sessile pores (paratypes with 1-3(2) pores).

DORSUM with enlarged setae of 1 variable size: Present over entire dorsum, usually with cluster of 2 slightly larger setae accompanied by 2 or 3 smaller setae on margin and submargin of each abdominal segment. Largest lateral seta 77 μ long (paratypes 49-79(65) μ), largest medial seta 61 μ (paratypes 35-58(47) μ); on abdominal segments II to VIII longest lateral seta 1.3 times longer than longest medial seta (paratypes 1.2-1.6(1.4) times). Enlarged setae straight, conical, with acute apices. Enlarged setae in small to moderate numbers, e.g. abdominal segment V with 22 (paratypes with 15-24(19) setae), with pattern of longitudinal lines on abdomen on medial, sublateral, and lateral areas formed by largest setae; segments III-VII with setae arranged in single transverse row. Macrotubular ducts of large size, scattered over surface. Microtubular ducts 4 μ long (paratypes 3-5(4) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, approximately equal in length to remaining sclerotized portion; total sclerotized area slightly longer than unsclerotized area; dermal orifice weakly sclerotized. Microtubular ducts scattered over surface. Multilocular pores absent.

Anal ring ventral, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 26 μ long (paratypes 20-35(28) μ), on segment III 70 μ long (paratypes 47-93(60) μ); longest posterior anal-lobe seta 317 μ long (paratypes 239-314(282) μ). Enlarged setae present on submargin from segment VII forward to head, with setae on surface smaller than those on dorsum. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size, distributed throughout sublateral and medial areas. Microtubular ducts present along body margin. Multilocular pores of 2 kinds: Quinqueloculars abundant on abdomen; triloculars abundant on thorax near legs. Cruciform pores present on sublateral areas of abdominal segment VI through head; with 11 pores between antennae and anterior margin of clypeolabral shield (paratypes with 6-38(13) pores).

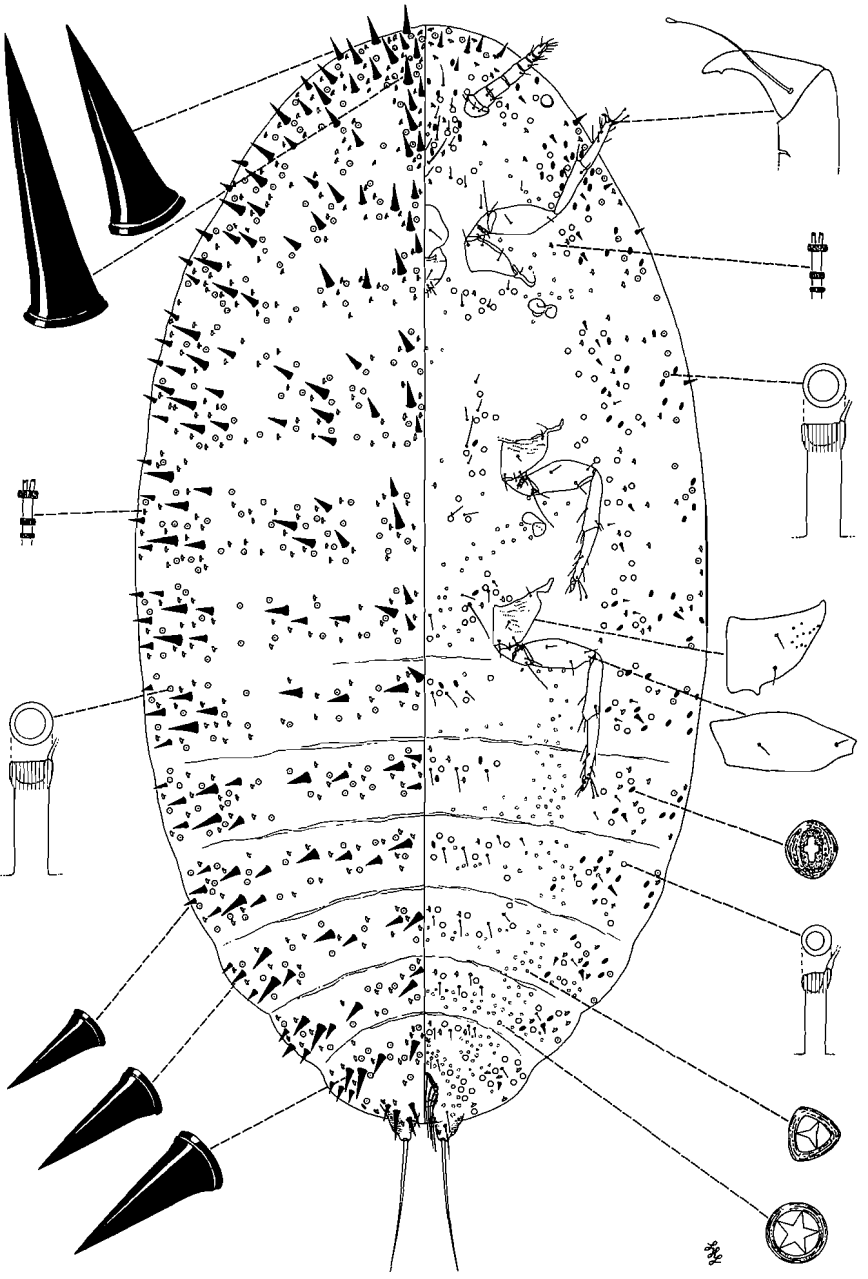

Fig. 15. *Acanthococcus howelli* D. Miller & G. Miller

Legs with largest translucent pores about 3 μ long with most pores about 2 μ long; hind coxae dorsally with 8 and 9 pores (paratypes with 8-39(15) pores), ventrally with 3 and 4 pores (paratypes with 2-34(9) pores); hind femora dorsally with 0 and 1 pore (paratypes with 0-3(2) pores), ventrally without pores; femora with 5 setae; tibiae with 5 setae; middle seta on front tibia located on inner margin of tibia, about same size or slightly more robust than outer apical setae; inner, apical tibial setae conspicuously more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.94)(paratypes 0.78-0.98(0.89)); claws with inconspicuous denticle near tip. Antennae with 4th segment partially divided forming seven segments, third and fourth segments longest. Segment 7 with 3 sensory setae; segment 6 with 1 longer than single sensory seta on segment 5.

Variation. Anteromedial seta on anal lobe often smallest lobe seta; anal lobes with 2-5 microtubular ducts and 0-3 sessile pores. Marginal area of abdominal segments with up to 5 slightly smaller setae associated with 2 larger setae. Multilocular pores sometimes of 3 kinds: Septeloculars rarely found on posterior abdominal segments. Most specimens have 6-segmented antennae.

Notes. *Acanthococcus howelli* is similar to *Eriococcus cantium* Williams, but has 2 enlarged setae on the medial margin of each anal lobe and 2 setae on the lateral margin; *E. cantium* has 1 enlarged setae on the medial margin of each anal lobe and 3 setae on the lateral margin.

For a comparison of *A. howelli* and *A. tosotrichus* see the "Notes" section of the latter species.

Specific Epithet. *Acanthococcus howelli* is named after James O. Howell, Department of Entomology, University of Georgia, Athens, who collected specimens of this species and has made significant contributions to the field of coccidology in many areas.

Specimens Examined. CONNECTICUT: New Haven Co.: Woodmont, IX-20-44, on *Andropogon virginicus*, G. Rau (3 ad. ♀ on 2 sl.) USNM.

FLORIDA, Alachua Co.: Archer, V-23-84, on *Pinus elliottii*, R. Banard (1 ad. ♀) FSCA. Hernando Co.: Bayport, VII-10-70 (HHT-133-70), on grass, R. J.Beshear (1 ad. ♀) UG. Leon Co.: Tall Timbers Research Station, VII-23-70 (HHT-143-70), on *Andropogon* sp., H. H. Tippins (1 ad. ♀) BM; Tall Timbers Research Station, V-12-75, on *Andropogon virginicus*, D. R. Miller, R. F. Denno, J. A. Davidson (2 ad. ♀) USNM. Okaloosa Co.: Shalimar, IV-3-72 (HHT-131-73), on *Aristida* sp., H. H. Tippins (1 ad. ♀) UCD.

GEORGIA: Crawford Co.: Between Knoxville and Byron on Highway 42, XI-14-80 (HHT-71-80), on grass, R. J. Beshear, Smith (1 ad. ♀) USNM. Glynn Co.: Jekyll Island, III-16-72 (HHT-126-72), on grass, J. O. Howell (1 ad. ♀) CDA; Jekyll Island, III-23-76 (HHT-76-76), on *Andropogon* sp., R. J. Beshear (3 ad. ♀ on 3 sl.) MNHP, UG, UT. Marion Co.: On Bartram Trail, IV-29-75 (HHT-62-75), on *Panicum* sp., R. J. Beshear (2 ad. ♀ on 2 sl.) UG, ZAS.

PENNSYLVANIA, Erie Co.: Presque Isle, IX-8-20, on *Ammophila breviligulata*, J. G. Sanders (2 ad. ♀ on 2 sl.) USNM.

SOUTH CAROLINA, Aiken Co.: South of Aiken, near Windsor, on Highway 78, XI-22-74 (HHT-253-74), on *Aristida* sp., R. J. Beshear (7 ad. ♀ on 7 sl.) IZAS, MCM, UG, USNM, VPI; South of Aiken, near Windsor, on Highway 78, XI-22-74, X-14-74 (HHT-239-74), on dead oak leaf of *Quercus stellata*, R. J. Beshear (3 ad. ♀ on 3 sl.) UG, USNM.

Georgetown Co: Georgetown, V-24-72 (HHT-264-72), on grass, R. J. Beshear (1 ad. ♀) FSCA.

VIRGINIA, Princess Anne Co: Seashore State Park, V-8-71, on *Andropogon* sp., D. R. Miller, W. F. Gimpel, Jr., R. Knipscher (1 ad. ♀, 1 2nd ♀, 2 2nd ♂, 1 1st on 2 sl.) USNM.

Acanthococcus hoyi D. Miller and G. Miller

Hoy eriococcin

Fig. 16

This species was described in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992). The illustration chosen for the current publication represents the typical form of *A. hoyi*. An additional varient of this species is illustrated in Miller and Miller (1992).

Acanthococcus insignis (Newstead)

Remarkable eriococcin

Fig. 17

This species was treated in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992).

Acanthococcus kemptoni (Parrott)

Kempton eriococcin

Fig. 18

This species was treated in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992).

Acanthococcus leptoporus D. Miller and G. Miller, n. sp.

Small pore eriococcin

Fig. 19

Type Material. Adult female holotype (1 specimen on slide) with right label "HHT-80-67 On A composite Crawford Co. Ga. 5-3-67 Coll. HHT"; left label "*Acanthococcus leptoporus* D.R. Miller & G.L. Miller Holotype" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 1.6 mm long (paratypes 1.1-1.6(1.3)mm), 1.1 mm wide (paratypes 0.7-1.1(0.9)mm). Anal lobes lightly sclerotized on venter and dorsum; each lobe dorsally with 3 enlarged setae, anteromedial and posteromedial setae more slender than other lobe seta with acute apices, remaining seta conical with round apex (seta on outer margin longest, anteromedial seta shortest), with 1 microtubular duct

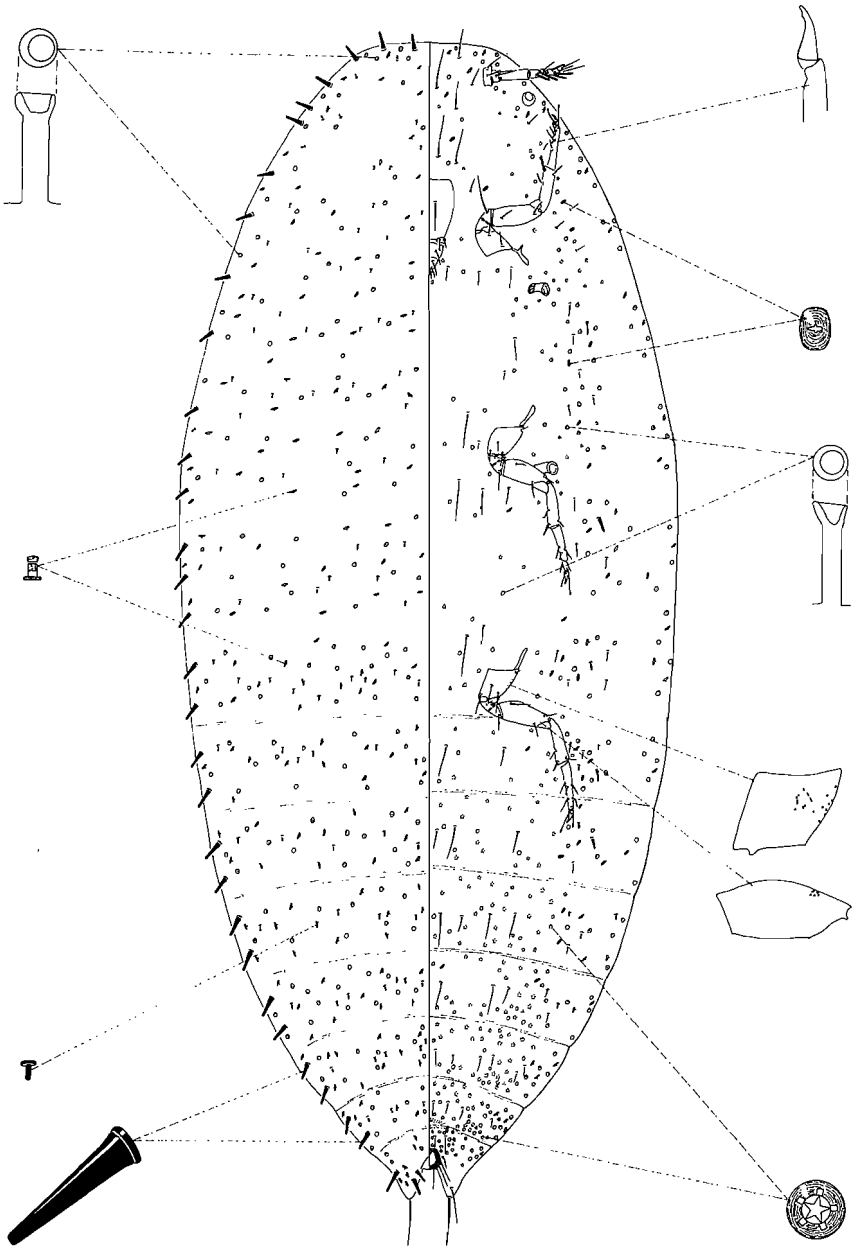

Fig. 16. *Acanthococcus hoyi* D. Miller & G. Miller

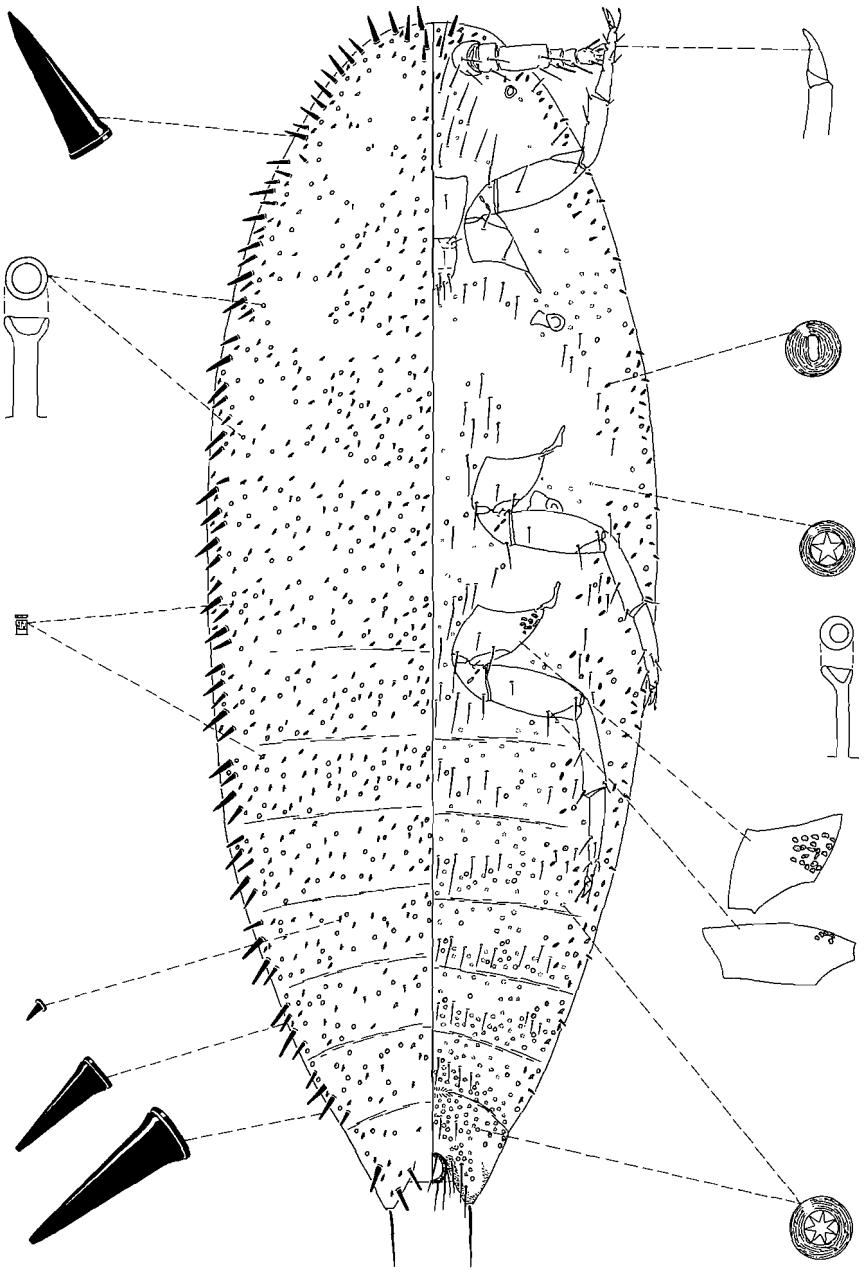

Fig. 17. *Acanthococcus insignis* (Newstead)

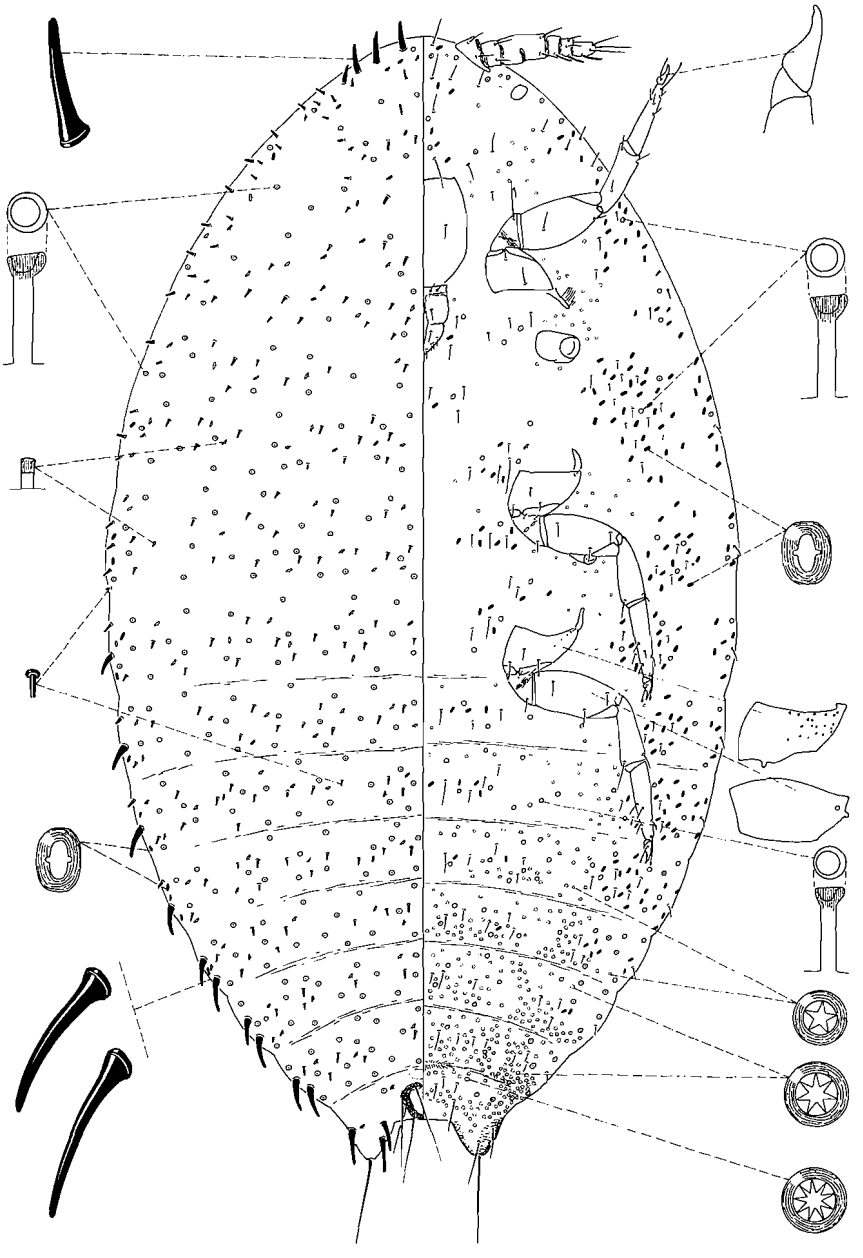

Fig. 18. *Acanthococcus kemptoni* (Parrott)

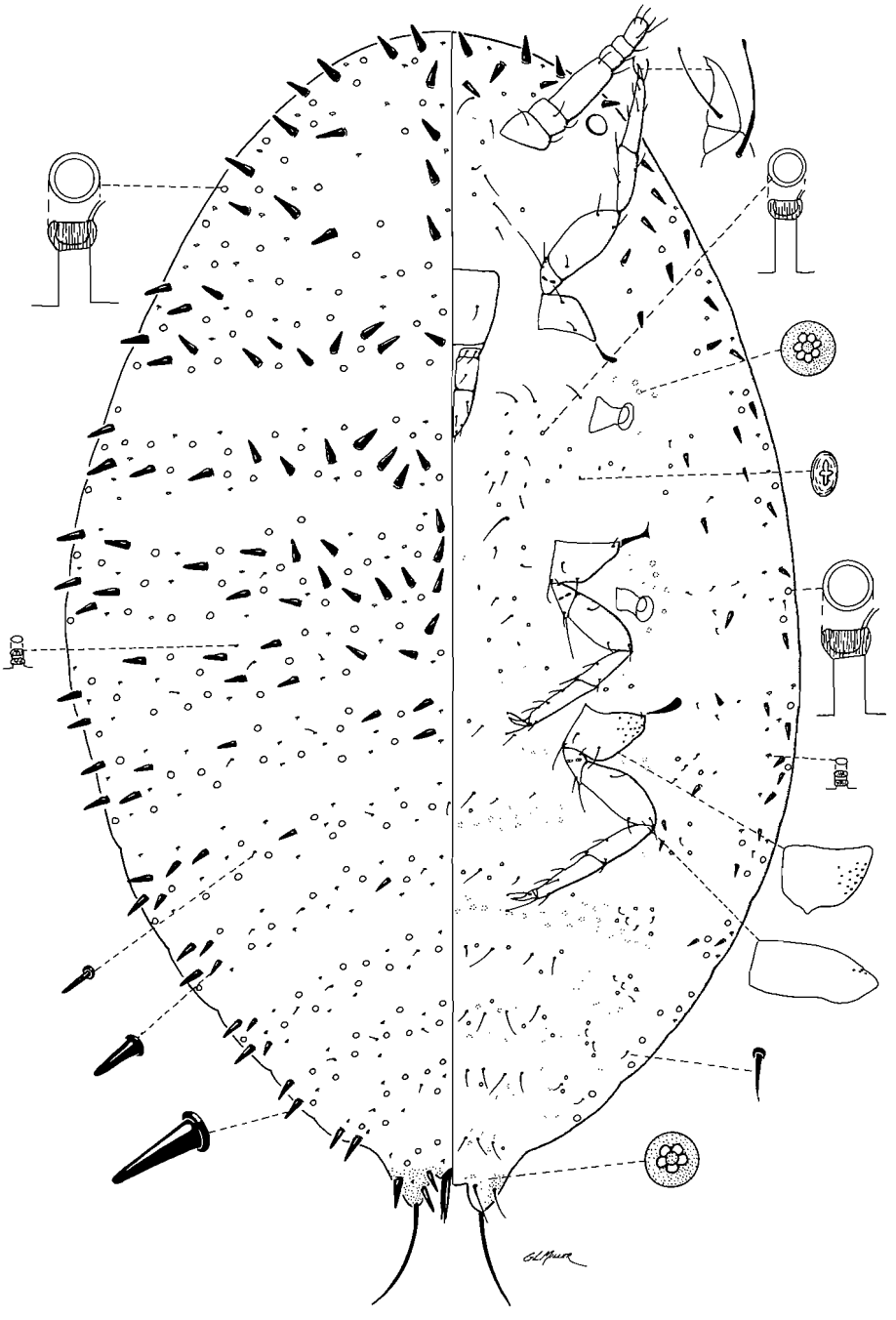

Fig. 19. *Acanthococcus leptoporus* D. Miller & G. Miller

(paratypes with 1-3(1) setae); each lobe ventrally with 3 slender body setae and 1 sessile pore (paratypes with 0-2(1) pores).

DORSUM with enlarged setae of 2 sizes: Larger size present along entire body margin, usually with 2 present on margin of each abdominal segment, occasionally with 1 on posterior segments and 3 on anterior segments; some paratypes with large size setae on anterior abdominal segments, thorax, and head; smaller size restricted to medial and sublateral areas; some paratypes with smaller size restricted to abdominal segments. Largest lateral seta 31 μ long (paratypes 26-36(32) μ), largest medial seta 20 μ (paratypes 12-29(21) μ); on abdominal segments II to VIII longest lateral seta 2.8 times longer than longest medial seta (paratypes 1.3-3.0(1.9) times). Lateral setae straight, conical, with rounded apices; medial setae curved, those on abdomen with nearly parallel sides and acute apices, some on anterior abdominal segments and thorax conical with rounded apices, largest setae on thorax. Enlarged setae few, e.g. abdominal segment V with 11 setae (paratypes with 11-16(13) setae), with lateral setae forming longitudinal line around body, with small setae forming longitudinal lines on posterior 3 or 4 segments of abdomen on medial and sublateral areas; segments III-VII with setae arranged in 1 transverse row. Macrotubular ducts of large size, scattered over surface. Microtubular ducts 6 μ long (paratypes 4-7(6) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, approximately half as long as remaining sclerotized portion; total sclerotized area about 3 times longer than unsclerotized area; dermal orifice sclerotized. Microtubular ducts scattered over surface. Multilocular pores absent.

Anal ring dorsal, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 29 μ long (paratypes 17-29(23) μ), on segment III 26 μ long (paratypes 20-44(32) μ); longest posterior anal-lobe seta 183 μ long (paratypes 148-186(172) μ). Enlarged setae present on submargin from segment VII forward to head, with setae on surface smaller than those on dorsum. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size, distributed throughout sublateral and medial areas. Microtubular ducts present along body margin, with 1 or 2 in submedial areas near legs. Multilocular pores of 2 kinds: Quinqueloculars abundant over surface; septeloculars most abundant near spiracles. Cruciform pores present on medial and sublateral areas of thorax and head, occasionally on thorax near legs; with 2 pores between antennae and anterior margin of clypeolabral shield (paratypes with 0-1(0) pores).

Legs with translucent pores about 1 μ long; hind coxae dorsally with 14 and 25 pores (paratypes with 6-45(33) pores), ventrally with 14 and 10 pores (paratypes with 13-38(28) pores); hind femora dorsally with 3 and 4 pores (paratypes with 2-10(6) pores), ventrally without pores (paratypes with 0-2(0) pores); tibiae with 5 setae; middle seta on front tibia located on inner margin of tibia, about same size or slightly more robust than outer apical setae; inner, apical tibial setae slightly more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.80 and 0.85) (paratypes 0.72-0.88(0.80)); claws with denticle near tip. Antennae 6-segmented, third segment longest. Segment 6 with 3 sensory setae; segment 5 with 1 longer than single sensory seta on segment 4.

Variation. This species is variable in the relative sizes of the dorsal enlarged setae. Specimens collected in Florida have the large sized setae over the thorax and head and have

a few such setae on the abdomen on any or all of segments II, III, IV, or V. Specimens from Georgia also vary in the extent of development of the small sized enlarged setae. Two specimens have a few sublateral setae on abdominal segments II and III that are conical and are about half as long as the lateral setae. Two other specimens have these setae with parallel sides and about one fourth as long as the lateral setae. Enlarged setae on medial margin of the anal lobes sometimes have rounded apices

Notes. *Acanthococcus leptoporus* is similar to *A. mesotrichus*, but has parallel sided enlarged setae more abundant than conical setae on medial and sublateral areas of abdomen, hind tarsus shorter than 110 μ, and longest anal-lobe seta less than 200 μ long; *A. mesotrichus* has conical enlarged setae more abundant than parallel sided setae on medial and sublateral areas of abdomen, hind tarsus longer than 110 μ, and longest anal-lobe seta more than 200 μ long.

For a comparison of *Acanthococcus leptoporus* with *A. megaporus* refer to the notes section of the latter species.

Specific Epithet. The name *leptoporus*, from the Greek leptos, meaning "small", and poros, meaning "hole or passage", refers to the small pores on the hind coxae and femora.

Specimens Examined. FLORIDA: Volusia Co.: DeLand, XI-2-70, on *Chrysopsis floridana*, C. R. Roberts (3 ad. ♀ on 3 sl.) FSCA.

GEORGIA: Crawford Co.: Between Knoxville and Byron on Highway 42, IV-12-67 (HHT-63-67) and V-3-67 (HHT-80-67), on composite, H. H. Tippins (3 ad. ♀ on 3 sl.) BM, UG, USNM.

Acanthococcus megaporus D. Miller and G. Miller, n. sp.

Large pore eriococcin
Fig. 20

Type Material. Adult female holotype (1 specimen on slide) with left label "HHT-21-67 On A composite Crawford Co. Ga. 2-23-67 Coll. HHT"; right label "*Acanthococcus megaporus* D.R. Miller & G.L. Miller Holotype" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 1.1 mm long (paratypes 1.1-2.1(1.4)mm), 0.8 mm wide (paratypes 0.7-1.4(0.9)mm). Anal lobes lightly sclerotized on venter; each lobe dorsally with 3 enlarged setae, anteromedial seta more slender than other lobe setae with acute apex, remaining setae conical with blunt apex (seta on outer margin longest, posteromedial seta shortest), with 2 and 1 microtubular ducts (paratypes with 1-4(2) ducts); each lobe ventrally with 3 slender body setae and 0 and 1 sessile pores (paratypes with 0-3(2) pores).

DORSUM with enlarged setae of 2 sizes: Larger size present along entire body margin, usually with 3 present on margin of each abdominal segment, occasionally with 2 especially on posterior 1 or 2 segments; smaller size restricted to medial and sublateral areas. Largest lateral seta 32 μ long (paratypes 32-49(40) μ), largest medial seta 9 μ (paratypes 8-30(15) μ); on abdominal segments II to VIII longest lateral seta 3.7 times longer than longest medial seta (paratypes 3.7-5.4(4.4) times). Lateral setae straight, conical, with blunt or

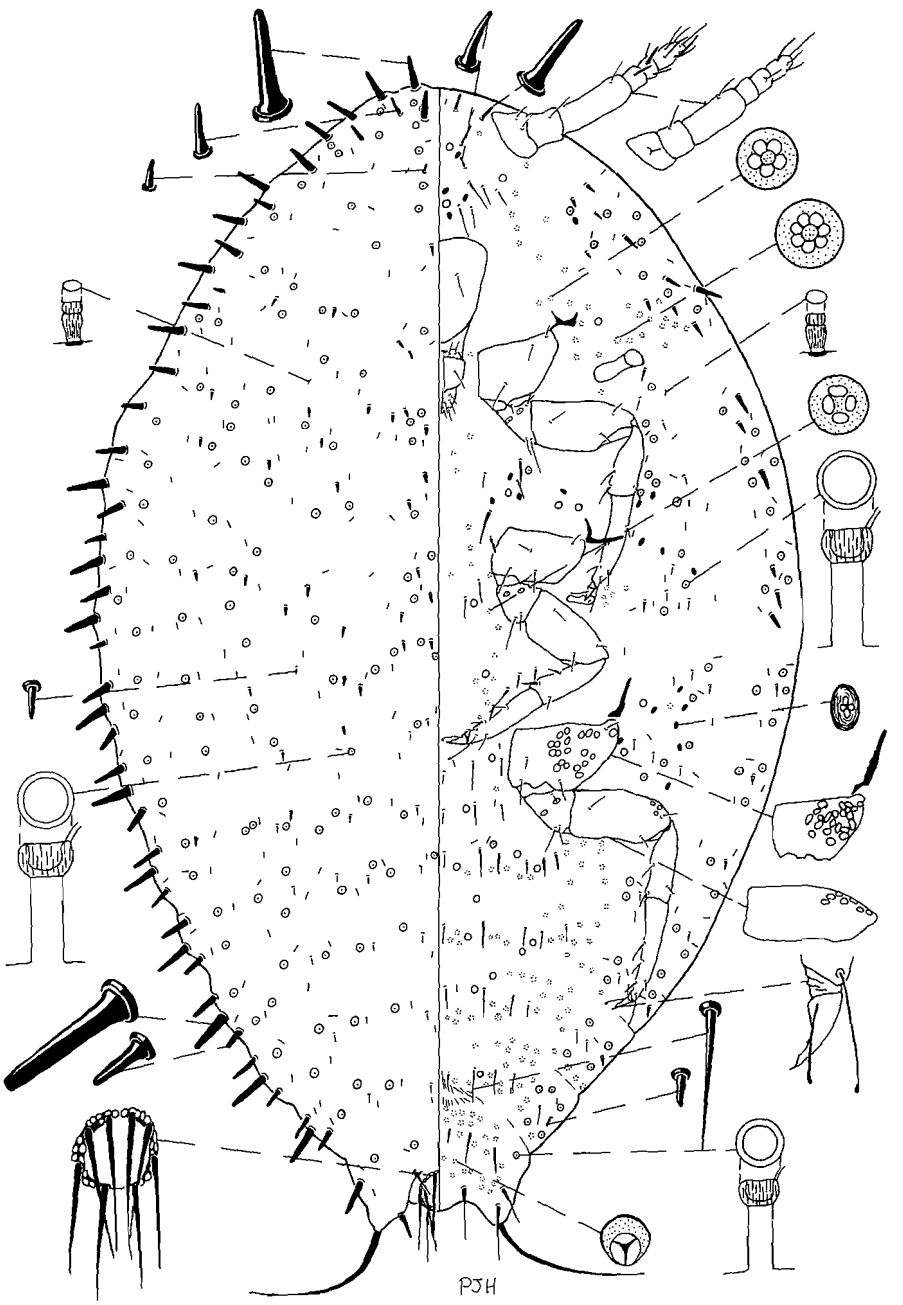

Fig. 20. *Acanthococcus megaporus* D. Miller & G. Miller

rounded apices; medial setae curved or straight, those on abdomen with nearly parallel sides and acute apices, some on thorax and head conical with rounded apices, largest setae on thorax. Enlarged setae few, e.g. abdominal segment V with 13 setae (paratypes with 11-15(13) setae), with lateral setae forming longitudinal line around body, with small setae forming longitudinal lines on posterior 3 or 4 segments of abdomen on medial and sublateral areas; segments III-VII with setae arranged in 1 transverse row. Macrotubular ducts of large size, scattered over surface. Microtubular ducts 5 μ long (paratypes 4-6(5) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, approximately half as long as remaining sclerotized portion; total sclerotized area about 3 times longer than unsclerotized area; dermal orifice sclerotized. Microtubular ducts scattered over surface. Multilocular pores absent.

Anal ring dorsal, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 20 μ long (paratypes 20-29(25) μ), on segment III 23 μ long (paratypes 20-35(26) μ); longest posterior anal-lobe seta 189 μ long (paratypes 189-239(205) μ). Enlarged setae present on submargin from segment VII forward to head, with setae on surface smaller than those on dorsum. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size, distributed throughout sublateral and medial areas. Microtubular ducts present along body margin. Multilocular pores of 3 kinds: Quinqueloculars abundant over surface; septeloculars and triloculars rare. Cruciform pores present on medial and sublateral areas of thorax and head, occasionally on thorax near legs; with 2 pores between antennae (paratypes with 0-7(4) pores).

Legs with largest translucent pores about 5 μ long with most pores about 3 μ long; hind coxae dorsally with 48 and 53 pores (paratypes with 17-59(42) pores), ventrally with 47 and 35 pores (paratypes with 19-50(35) pores); hind femora dorsally with 10 and 7 pores (paratypes with 6-20(10) pores), ventrally with 0 and 1 pore (paratypes with 0-6(3) pores); femora with 5 setae; tibiae with 5 setae; middle seta on front tibia located on inner margin of tibia, about same size or slightly more robust than outer apical setae; inner, apical tibial setae conspicuously more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.84) (paratypes 0.82-0.96(0.88)); claws with denticle near tip. Antennae 7-segmented, third segment longest. Segment 7 with 3 sensory setae; segment 6 with 1 longer than single sensory seta on segment 5.

Variation. This species is relatively homogeneous. There is some variation in the relative sizes of the small sized enlarged setae on the medial areas of the thorax. Material from South Carolina and Florida has these setae up to 30 μ long, whereas specimens from Georgia have these setae are about 10 μ long. The shape of the apices of the lateral setae vary from truncate to rounded on the posterior abdominal segments. The enlarged seta on the anteromedial area of the anal lobe is thinner than the remaining lobe setae and usually has an acute apex, but several specimens have been studied that have this seta with a narrowly rounded apex. Of the 19 antennae studied, 14 were 7-segmented and 5 were 6-segmented. The anal ring may be dorsal, ventral, or apical.

Notes. *Acanthococcus megaporus* is similar to *A. leptoporus*, but has the largest lateral setae on the abdomen with either truncate or blunt apices, most abdominal segments with 3 large sized setae on lateral body margin, and large pores on hind coxae (about 5 μ long);

A. leptoporus has the largest lateral setae on the abdomen with either acute or rounded apices, most abdominal segments with 2 large sized setae on lateral body margin, and small pores on hind coxae (about 1 μ long).

Specific Epithet. The name *megaporus*, from the Greek megas, meaning "large", and poros, meaning "hole or passage", refers to the large pores on the hind coxae and femora.

Specimens Examined. FLORIDA: Citrus Co.: Citrus Springs, II-7-80, on *Heterotheca subaxillaris*, R. H. Phillips (2 ad. ♀ on 2 sl.) FSCA. Clay Co.: Near Orange Park, V-28-76 (HHT-164-76), on *Chrysopsis* sp., R. J. Beshear (1 ad. ♀) UG. Levy Co.: West of Archer on State Hwy 24, VI-4-74 (HHT-96-74), on *Chrysopsis* sp., R. J. Beshear (2 ad. ♀ on 2 sl.) USNM, VPI. Volusia Co.: De Land, XI-2-70, on *Chrysopsis floridana*, C. R. Roberts (1 ad. ♀) FSCA.

GEORGIA: Atkinson Co.: Willachoochee, XI-16-77 (HHT-94-77), on *Chrysopsis* sp., R. J. Beshear (1 ad. ♀) USNM. Crawford Co.: Between Knoxville and Byron on Highway 42, II-23-67 (HHT-21-67) and V-3-67 (HHT-80-67), on composite, H. H. Tippins (3 ad. ♀ on 3 sl.) BM, UG, USNM. Emanuel Co.: Near Oak Park, XII-1-71 (HHT-243-71), on composite, R. J. Beshear (2 ad. ♀ on 2 sl.) UG. Rabun Co.: Tallulah Gorge, X-31-71 (HHT-206-71), on composite, R. J. Beshear (2 ad. ♀ on 2 sl.) UG, USNM. Taylor Co.: Near Howard West of Butler on State Highway 96, I-17-86 (HHT-8-86), on *Chrysopsis* sp., R. J. Beshear (2 ad. ♀ on 2 sl.) UG, USNM.

SOUTH CAROLINA: Aiken Co.: South of Aiken, near Windsor on Highway 78, XI-22-74 (HHT-254-74), on *Chrysopsis* sp., R. J. Beshear (26 ad. ♀, 1 2nd ♀, 1 1st on 28 sl.) ANIC, AUA, CDA, FSCA, ICV, IZAS, NCM, MNHP, SIE, UCD, UG, USNM, UT, ZAS. Lexington Co.: Near Pelion on Highway 178, VIII-11-74 (HHT-157-74), XI-22-74 (HHT-252-74), on *Chrysopsis* sp. and *Panicum* sp., R. J. Beshear (4 ad. ♀ on 4 sl.) UG, USNM.

VIRGINIA: Montgomery Co.: Blacksburg, date ?, on *Rosa* sp., A. M. Woodside, (1 ad. ♀) VPI.

Acanthococcus mesotrichus D. Miller and G. Miller, n. sp.

Middle seta eriococcin

Fig. 21

Type Material. Adult female holotype (1 specimen on slide) with left label "On Clewiston Airport Florida Dec. 10, 1970 S. Nakahara colr."; right label "*Acanthococcus mesotrichus* D.R. Miller & G.L. Miller Holotype" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 2.3 mm long (paratypes 0.9-2.5(1.7) mm), 1.3 mm wide (paratypes 0.6-1.9(1.1) mm). Anal lobes lightly sclerotized on venter and dorsum; each lobe dorsally with 3 enlarged setae, anal-lobe setae about same shape, conical with round apex (seta on outer margin longest, anteromedial seta shortest), with 4 and 2 microtubular ducts; each lobe ventrally with 3 slender body setae and 0 and 4 sessile pores (paratypes with 0-1(1) pores).

DORSUM with enlarged setae of 2 sizes: Larger size present over surface except on sublateral and medial areas of posterior abdominal segments, with cluster of 3-6 setae (2

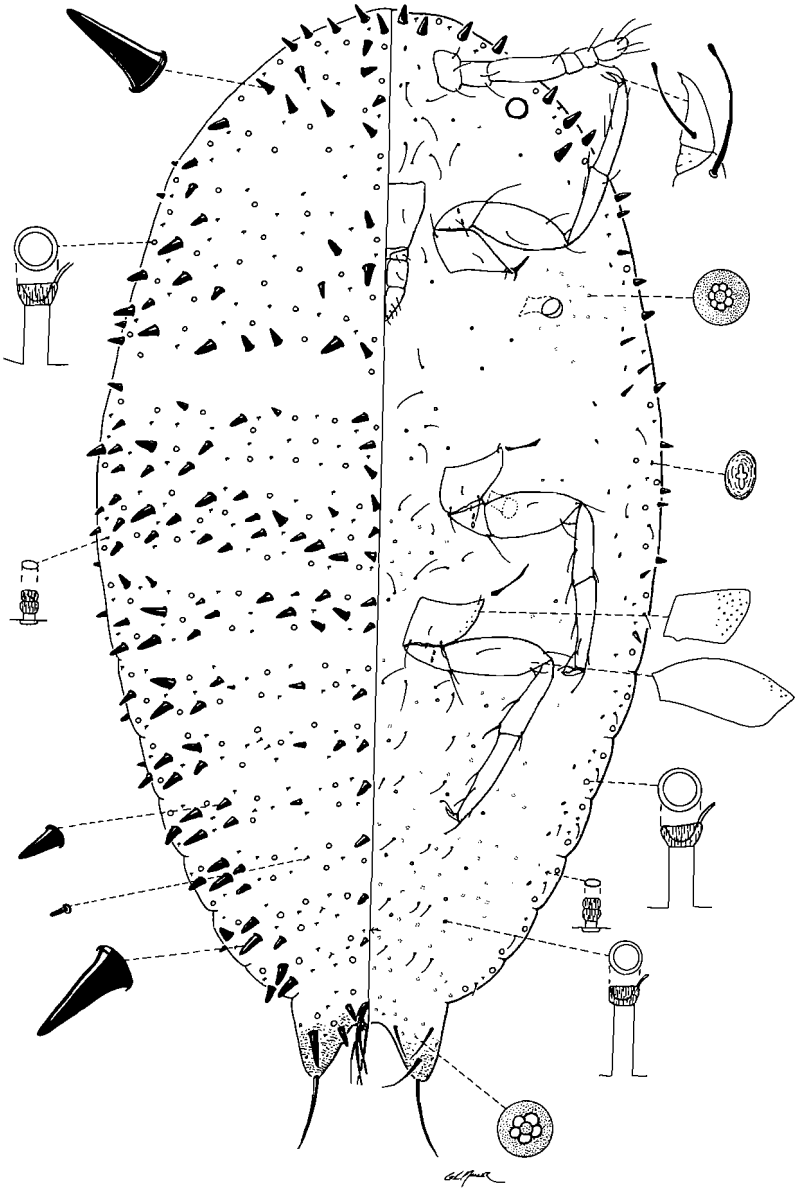

Fig. 21. *Acanthococcus mesotrichus* D. Miller & G. Miller

larger) near lateral margin of each abdominal segment; smaller size restricted to medial and sublateral areas of segments V-VII. Largest lateral seta 55 μ long (paratypes 33-73(54) μ), largest medial seta 47 μ (paratypes 31-64(45) μ); on abdominal segments II to VIII longest lateral seta 1.2 times longer than longest medial seta (paratypes 1.1-1.3(1.2) times). Lateral setae straight or slightly curved, conical, with rounded or acute apices; medial setae primarily of same shape as lateral setae, small setae on posterior abdominal segments curved, with parallel sides and blunt or rounded apices, largest setae on thorax. Enlarged setae few, e.g. abdominal segment V with 16 setae (paratypes with 10-18(14) setae), with larger setae forming longitudinal lines in lateral, sublateral, and medial areas of abdomen; segments III-VII with setae arranged in 1 transverse row. Macrotubular ducts of large size, scattered over surface. Microtubular ducts 6 μ long (paratypes 4-6(5) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, approximately half as long as remaining sclerotized portion; total sclerotized area about 3 times longer than unsclerotized area; dermal orifice sclerotized. Microtubular ducts scattered over surface. Multilocular pores absent.

Anal ring dorsal, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 44 μ long (paratypes 25-48(39) μ), on segment III 51 μ long (paratypes 29-63(46) μ); longest posterior anal-lobe seta 224 μ long (paratypes 210-262(234) μ). Enlarged setae present on submargin from segment VI forward to head, with setae on surface smaller than those on dorsum. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size, distributed throughout sublateral and medial areas. Microtubular ducts present along body margin. Multilocular pores of 2 kinds: Quinqueloculars abundant over surface; septeloculars most abundant near spiracles. Cruciform pores present on sublateral areas of abdominal segment VI through head and in medial areas near legs; with 4 pores between antennae and anterior margin of clypeolabral shield (paratypes with 1-6(4) pores).

Legs with translucent pores about 1 μ long; hind coxae dorsally with 25 and 24 pores (paratypes with 8-30(22) pores), ventrally with 0 and 9 pores (paratypes with 0-20(7) pores); hind femora dorsally with 9 and 10 pores (paratypes with 1-9(6) pores), ventrally without pores; tibiae with 5 setae; middle seta on front tibia located on inner margin of tibia, about same size or slightly more robust than outer apical setae, apical tibial setae slightly more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.89 and 0.91) (paratypes 0.75-0.99(0.85)); claws with denticle near tip. Antennae 6-segmented, third segment longest. Segment 6 with 3 sensory setae; segment 5 with 1 longer than single sensory seta on segment 4.

Variation. This species is relatively homogeneous. There is some variation in the distribution of the small sized enlarged setae which may not occur in the medial area or may be present on segments VI and VII; on the sublateral areas these setae may be present on segments IV to VII. The anal ring can be located on the dorsum or venter.

Notes. *Acanthococcus mesotrichus* is similar to *A. missourii*, but has small-sized setae slender with parallel sides on posterior abdominal segments, no trilocular pores, pores on legs about 1 μ long, antennae 6-segmented, and longest anal-lobe seta 210-262(234) μ long; *A. missouri* has small-sized setae conical with converging sides on posterior abdominal segments, many trilocular pores especially on anterior abdomen, thorax, and head, pores on

legs about 5 μ long, antennae 7-segmented, and longest anal-lobe seta 239-349(302) μ long.

Specific Epithet. The name *mesotrichus*, from the Greek mesos, meaning "middle", and trichus, meaning "hair", refers to the line of enlarged setae in the middle of the abdomen.

Specimens Examined. FLORIDA, Hendry Co.: Clewiston Airport, XII-10-70, on unknown host, S. Nakahara (3 ad. ♀) USNM. Gulf Co.: Indian Pass Beach, V-12-75, on Liliaceae, J. A. Davidson, R. F. Denno, D. R. Miller (1 ad. ♀) USNM. Indian River Co.: Oslo, I-10-80, on *Pterocaulon pycnostachyum*, E. W. Campbell (1 ad. ♀) FSCA; Vero Beach, VIII-3-82, on *Liatris* sp., E. W. Campbell (5 ad. ♀ on 5 sl.) FSCA. Martin Co.: Stuart, IV-6-78, on *Pluchea imbricata*, E. W. Campbell (5 ad. ♀, 4 ad ♂ on 9 sl.) FSCA. Munroe Co.: Big Pine Key, III-8-71, on *Pluchea* sp., W. H. Pierce (10 ad. ♀ on 10 sl.) FSCA. Palm Beach Co.: Lake Worth, VIII-12-82, on *Satureja rigida*, S. P. Beidler (1 ad. ♀) FSCA. Pasco Co.: Zephyrhills, IX-23-59, on *Eupatorium* sp., L. B. Hill, W. T. Walsh (8 ad. ♀ on 2 sl.) USNM. St. Johns Co.: Near Switzerland on State Route 13, V-3-75 (HHT-70-75), on *Aristida* sp., R. J. Beshear (1 ad. ♀) USNM. St. Lucie Co.: Port St. Lucie, VI-26-79, on *Polypremum procumbens*, E. W. Campbell (1 ad. ♀) FSCA; White City, V-2-80, on *Gnaphalium obtusifolium*, E. W. Campbell (1 ad. ♀) FSCA.

GEORGIA, Clinch Co.: Fargo, V-18-68 (HHT-167-68), on *Lantana* sp., R. J. Beshear (1 ad. ♀) UG. Echols Co.: West of Fargo off of State Highway 94, XI-11-72, on *Hieracium* sp., R. J. Beshear (1 ad. ♀) BM; locality unknown, VIII-1-70, on *Eupatorium* sp., R. Brown (2 ad. ♀ on 2 sl.) VPI, USNM. Emanuel Co.: Near Oak Park, I-5-70 (HHT-4-70), V-1-70 (HHT-224-70), on woody evergreen composite, H. H. Tippins (8 ad. ♀ on 4 sl.) UG, UCD, USNM, VPI, ZAS; Near Oak Park, I-4-71 (HHT-2-71), on *Salvia* sp., H. H. Tippins (2 ad. ♀ on 2 sl.) MNM, UG. Rabun Co.: On Warwoman Road, IX-3-74 (HHT-181-74), on *Helenium amarum*, R. J. Beshear (1 ad. ♀) USNM. Tattnall Co.: Ohoopee River on State Highway 292, IV-12-74 (HHT-77-74), on *Salvia* sp., R. J. Beshear (1 ad. ♀) UG.

LOUISIANA, Orleans Parish: New Orleans, IX-24-24, on *Solidago* sp., H. K. Plank (2 ad. ♀) USNM.

MARYLAND, Prince Georges Co.: College Park, IX-18-41 and IX-21-41, on *Aster* sp., H. S. McConnell (2 ad. ♀ on 2 sl.) IZAS, USNM.

SOUTH CAROLINA, Charleston Co.: Bull's Island, VIII-11-44, on *Erechtites hieracifolia*, Mallia (10 ad. ♀, 3 2nd ♀, 7 2nd ♂ on 4 sl.) UG, USNM.

Acanthococcus missourii (Hollinger), n. comb.

Missourii eriococcin

Fig. 22

Synonymy: *Eriococcus missourii* Hollinger, 1917:270.

Eriococcus pilosus Lobdell, 1929:763. New synonymy.

Type Material. Two slides are present in the collection (USNM) that are considered syntypes. One slide is labeled "*Eriococcus missourii* sp. novo. *Ambrosia trifida.*" We believe that it is from the type series since it is labeled sp. novo, was collected on one of the type hosts, and apparently is written in Hollinger's handwriting. The slide contains a single adult female that is designated as the lectotype and is so marked. A second slide, that contains

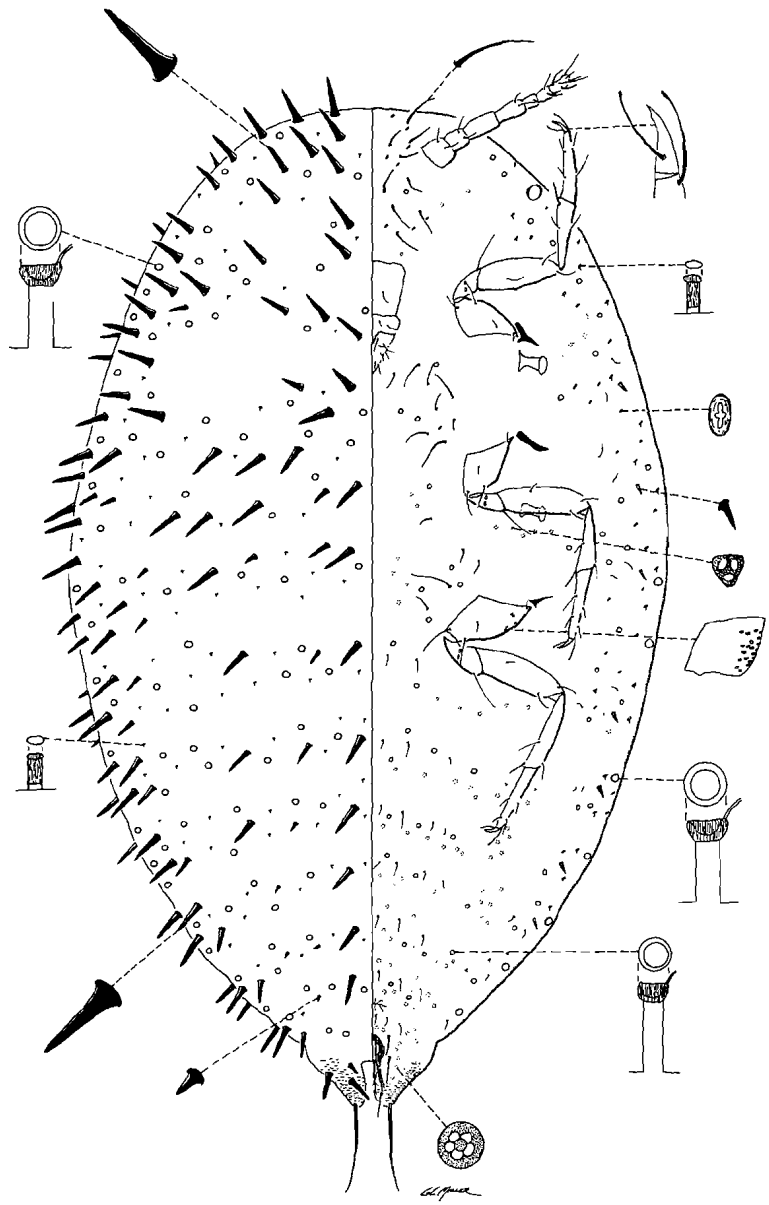

Fig. 22. *Acanthococcus missourii* (Hollinger)

a single adult female that also is written in Hollinger's handwriting is labeled: "*Eriococcus missourii* sp. novo. *Cersium altissimum.*" This specimen is considered to be a paralectotype (USNM).

After a comparison of the original description of *Eriococcus pilosus* Lobdell (1929) with type material of *A. missourii*, we have concluded that *E. pilosus* is a junior, subjective synonym of *A. missourii*. Unfortunately, we have been unable to locate type specimens of *E. pilosus* for direct comparison, but the illustration of the species that accompanied the description depicts the diagnostic characteristics of the species sufficiently to allow little doubt that the two species are synonymous. It also is of interest that both species were originally collected on *Cirsium.*

Field Features. Newly molted adult females cream to grayish-white with darker mottling in sublateral areas forming 2 longitudinal lines; older females straw colored; early instars deep purplish-red. Medial areas of dorsum adorned with short crystalline rods; those in other areas are longer and are curved toward the body margin. White ovisac produced in late September in Missouri; ovisac usually not on host itself but found on dry leaves or inanimate objects. Fawn colored eggs laid in ovisac in late September and October and probably serve as the overwintering stage. This information has been compiled from Hollinger (1923).

Diagnosis. Dorsal enlarged setae of 2 sizes, larger size (longest large size 55-67(60) μ long) present over most of surface, absent from sublateral areas of segments V, VI, and VII, shape curved, conical, with rounded apices; smallest size (longest small size 23-29(26) μ long) present on abdomen on sublateral areas of posterior 3-5 segments, absent from medial areas or present on posterior 1-5 segments, shape curved, conical, with rounded apices; on segment V longest large seta 2.2 to 2.9(2.6) times longer than longest small seta. Enlarged setae few (abdominal segment V with 13-18(16) setae), setae arranged in 3 pairs of longitudinal lines (medial, sublateral, lateral) with sublateral line represented by small setae on posterior abdominal segments. Microtubular ducts scattered over dorsum, 5-6(5) μ long), with area farthest from dermal orifice divided into 2 parts, weakly sclerotized, total sclerotized area about 4 times longer than unsclerotized area, dermal orifice without protruding tubes. Anal lobes with 3 setae, partially sclerotized, without medial teeth. Sessile pores near vulva predominantly with 5 loculi. Tibiae each with 5 setae; hind tarsus equal to or longer than tibia.

Notes. This species superficially appears to be very similar to several European species of this genus. Until types of these species are studied, it seems best to use *A. missourii* as the name of this taxon.

The handwriting on the lectotype slide of *Eriococcus missourii* was determined to be that of Hollinger by comparing this label with the labels of other species described as new by Hollinger including: *Phenacoccus celtisifoliae*, *Pseudococcus morrisoni*, *P. mcdanieli*, and *P. shaferi.* All were labeled in the same handwriting and all contained the designation "sp. novo". Based on correspondence in the file associated with the collection (USNM), the specimens mentioned above were sent to Ferris by Hollinger and they in turn were sent to Morrison and are deposited in the USNM.

Hosts and Distribution. Recorded from *Ambrosia*, *Cirsium*, *Helianthus*, *Panicum*, and *Vitis*. We suspect that *Panicum* is an incidental host. Based on the field key in Hollinger

(1923), it appears that this species occurs on a number of "annual and perennial hosts" in Missouri. Unfortunately, Hollinger only mentioned *Ambrosia* in the description and we have 1 slide from *Cirsium*.

Eastern U.S. Distribution. Georgia, Massachusetts, Mississippi, Missouri, and Virginia. Western U.S. distribution: None. The record from Maryland reported by Hoy (1963) is based on a misidentification of *A. dubius*.

Acanthococcus monotrichus D. Miller and G. Miller, n. sp.

Single seta eriococcin

Fig. 23

Type Material. Adult female holotype (1 specimen on slide) with right label "HHT-374-72 On *Aristida* sp. Nassau Co. Fla. VIII-5-72 Coll. R. Beshear."; left label "*Acanthococcus monotrichus* D.R. Miller & G.L. Miller Holotype" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 2.4 mm long (paratypes 1.8-2.4(2.1) mm), 1.0 mm wide (paratypes 0.6-0.8(0.8) mm). Anal lobes sclerotized on venter and dorsum; each lobe dorsally with 3 enlarged setae, outer seta inconspicuous, of small size, with truncate apex, remaining setae conical with blunt or rounded apex (setae on medial margin about equal in size, outer seta shortest), with 1 and 2 microtubular ducts (paratypes with 1-2(1) ducts); each lobe ventrally with 3 slender body setae and 0 and 1 sessile pore (paratypes with 0-1(0) pores).

DORSUM with enlarged setae of 2 sizes: Larger size present along entire body margin, with 1 present on margin of each abdominal segment; smaller size restricted to medial and sublateral areas. Largest lateral seta 26 μ long (paratypes 26-31(28) μ), largest medial seta 6 μ (paratypes 6-9(7) μ); on abdominal segments II to VIII longest lateral seta 4.3 times longer than longest medial seta (paratypes 3.4-5.1(4.4) times). Lateral setae straight, long, slender, with blunt or rounded apices; medial setae straight, short, cylindrical, with truncate apices. Enlarged setae few, e.g. abdominal segment V with 21 setae (paratypes with 17-21(20) setae), with no longitudinal pattern except on body margin. Macrotubular ducts of large size, scattered over surface. Microtubular ducts difficult to see, small, 2 μ long, with area farthest from dermal orifice sclerotized and undivided, apical portion rounded; total sclerotized area about equal to length of unsclerotized area; dermal orifice unsclerotized. Microtubular ducts scattered over surface. Multilocular pores absent.

Anal ring ventral, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 10 μ long (paratypes 7-19(11) μ), on segment III 55 μ long (paratypes 38-76(54)u); longest posterior anal-lobe seta 203 μ long (paratypes 151-198(189) μ). Enlarged setae present on submargin of thorax and head, with setae on surface smaller than those on dorsum. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size, distributed throughout sublateral and medial areas. Microtubular ducts absent. Multilocular pores of 2 kinds: Quinqueloculars abundant over surface; septeloculars rarely present on abdomen. Cruciform pores present on medial and sublateral areas of abdominal segment VI through head,

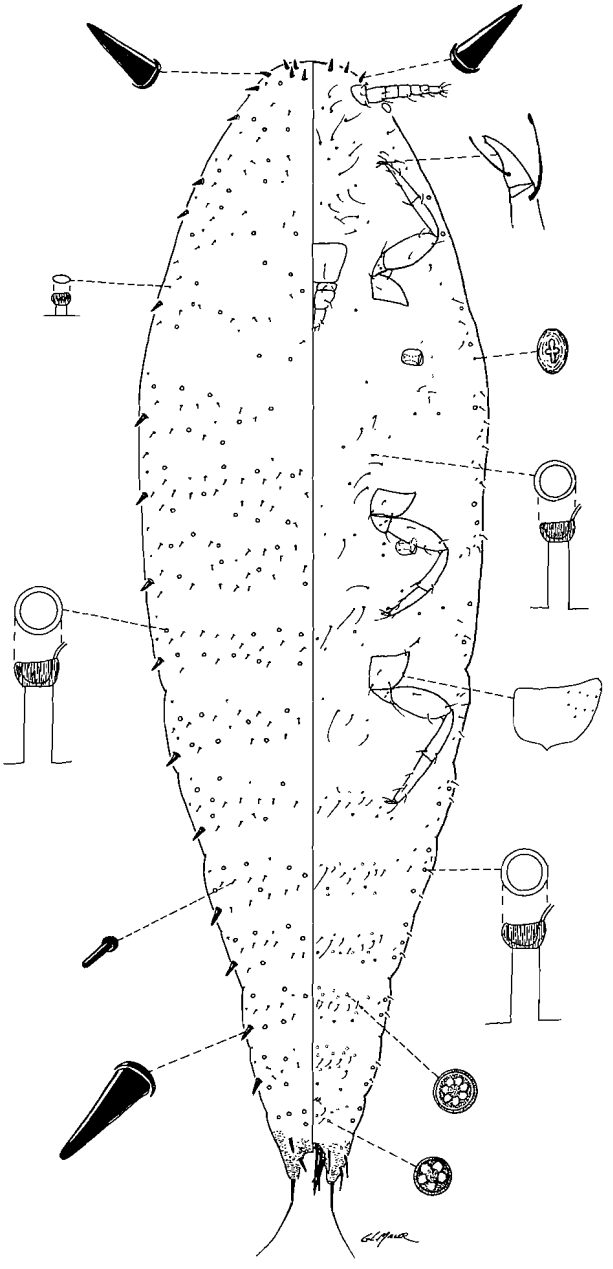

Fig. 23. *Acanthococcus monotrichus* D. Miller & G. Miller

abundant on thorax near legs; with 1 pore between antennae and anterior margin of clypeolabral shield (paratypes with 0-4(2)).

Legs with largest translucent pores about 2 μ long with most pores about 1.5 μ long; hind coxae dorsally with 9 and 11 pores (paratypes with 5-14(10) pores), ventrally with 0 and 1 pore (paratypes with 0-3(1) pores); hind femora without pores; femora with 5 setae; tibiae with 4 setae on each of hind 2 pairs of legs, 5 setae on front pair; middle seta on front tibia located off of inner margin of tibia, approximately equal to outer apical setae; inner apical tibial setae conspicuously more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.79 and 0.80) (paratypes 0.76-0.84(0.81)); claws with denticle near tip. Antennae 6-segmented on 1 side, 7 on other with third segment partially divided, third segment longest on 6-segmented antenna. Segment 6 with 3 sensory setae; segment 5 with 1 longer than single sensory seta on segment 4.

Variation. One specimen has 3 large sized setae on 1 lobe and 2 on the other. In 1 instance the anal ring possesses only 3 pairs of setae.

Notes. *Acanthococcus monotrichus* is similar to *A. beshearae*, but the largest lateral seta is 26-31 μ long, has 1 large-sized seta on each margin of abdominal segment V, lateral setae are straight, and usually have only 2 large sized setae on anal lobe; *A. beshearae* has the largest lateral seta 52 μ long, 2 large sized setae on each margin of abdominal segment V, lateral setae curved, and 3 large sized setae on anal lobe.

For a comparison of *A. monotrichus* with *A. ophius* see the notes section of the latter species.

Specific Epithet. The name *monotrichus*, from the Greek monos, meaning "one", and trichos, meaning "hair", refers to the single enlarged seta on the margin of each abdominal segment.

Specimens Examined. FLORIDA: Martin Co.: Jensen Beach, III-14-78, on *Aristida* sp., E. W. Campbell (5 ad. ♀ on 5 sl.) FSCA. Nassau Co.: Between Switzerland and Greencove Springs on Highway 13, III-4-72 (HHT-181-72), VIII-5-72 (HHT-374-72), VIII-16-72 (HHT-384-72), II-17-73 (HHT-32-73), and I-25-75 (HHT-16-75), on *Aristida* sp., R. J. Beshear (15 ad. ♀, 1 1st on 16 sl.) FSCA, MNHP, UG, USNM, ZAS.

GEORGIA: Atkinson Co.: Satilla River, V-28-75 (HHT-110-75), on *Aristida* sp., R. J. Beshear (1 ad. ♀) UG. Echols Co.: South of Fargo on US Highway 441, XI-11-72 (HHT-222-76), on *Aristida* sp., R. J. Beshear (3 ad. ♀ on 3 sl.) UCD, UG. Emanuel Co.: Near Oak Park, I-17-74 (HHT-17-74), *Aristida* sp., R. J. Beshear (2 ad. ♀ on 2 sl.) UG. Irwin Co.: Near Irwinville, (Crystal Lake), on Highway 32, IX-18-73 (HHT-227-73), IX-27-73 (HHT-273-73), and VII-9-74 (HHT-139-74), on *Aristida* sp., R. J. Beshear (8 ad. ♀ on 8 sl.) AU, CDA, BM, MCM, UG, USNM. Tattnall Co.: Near Collins on State Highway 292, V-24-79 (HHT-6-79), *Aristida* sp., L. Beshear (1 ad. ♀) USNM. Ware Co.: Satilla River, I-19-74 (HHT-12-74), *Aristida* sp., R. J. Beshear (1 ad. ♀).

***Acanthococcus oligotrichus* D. Miller and G. Miller, n. sp.**
Few setae eriococcin
Fig. 24

Type Material. Adult female holotype (1 specimen on slide) with right label "HHT-405-72 *Polygonella americana* Richmond Co. Ga. X-18-72 Coll. R. Beshear"; left label "*Acanthococcus oligotrichus* D.R. Miller & G.L. Miller Holotype" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 1.2 mm long (paratypes 1.1-1.9(1.5) mm), 0.7 mm wide (paratypes 0.7-1.4(0.9) mm). Anal lobes lightly sclerotized on venter and dorsum; each lobe dorsally with 3 enlarged setae of approximately same shape, conical with blunt apex (seta on outer margin longest, anteromedial seta shortest), with 3 microtubular ducts; each lobe ventrally with 3 slender body setae and without sessile pores.

DORSUM with enlarged setae of 2 sizes: Larger size present along entire body margin except on head, becoming increasingly smaller anteriorly, usually with 2 present on margin of each posterior abdominal segment, with 3 or 4 on some anterior segments; smaller size restricted to medial and sublateral areas. Largest lateral seta 39 μ long (paratypes 35-40(36) μ), largest medial seta 13 μ (paratypes 10-15(12) μ); on abdominal segments II to VIII longest lateral seta 3.6 times longer than longest medial seta (paratypes 3.4-5.6(4.3) times). Lateral setae straight, conical, with blunt or rounded apices; medial setae curved, with nearly parallel sides and acute or rounded apices, largest setae on thorax. Enlarged setae few, e.g. abdominal segment V with 13 setae (paratypes with 12-16(14) setae), with lateral setae forming longitudinal line around body, with small setae forming longitudinal lines on posterior 3 or 4 segments of abdomen on medial and sublateral areas; segments III-VII with setae arranged in 1 transverse row. Macrotubular ducts of large size, scattered over surface. Microtubular ducts 5 μ long (paratypes 5-6(5) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, approximately half as long as remaining sclerotized portion; total sclerotized area about 3 times longer than unsclerotized area; dermal orifice sclerotized. Microtubular ducts scattered over surface. Multilocular pores in 3 transverse rows on thorax; with 5 loculi.

Anal ring ventral, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 19 μ long (paratypes 10-25(14) μ), on segment III 35 μ long (paratypes 28-38(32) μ); longest posterior anal-lobe seta 137 μ long (paratypes 146-178(160) μ). Enlarged setae present on submargin from segment VII forward to head, with setae on surface smaller than those on dorsum. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size, distributed throughout sublateral and medial areas. Microtubular ducts present along body margin. Multilocular pores of normally of 1 kind: Quinqueloculars abundant over surface; septeloculars and triloculars usually absent. Cruciform pores present on sublateral areas of abdominal segment VI through head, in small numbers in medial areas of anterior abdominal segments and near legs, with 7 pores between antennae and anterior margin of clypeolabral shield (paratypes with 4-13(8) pores).

Legs with translucent pores about 1 μ long; hind coxae dorsally with 3 pores

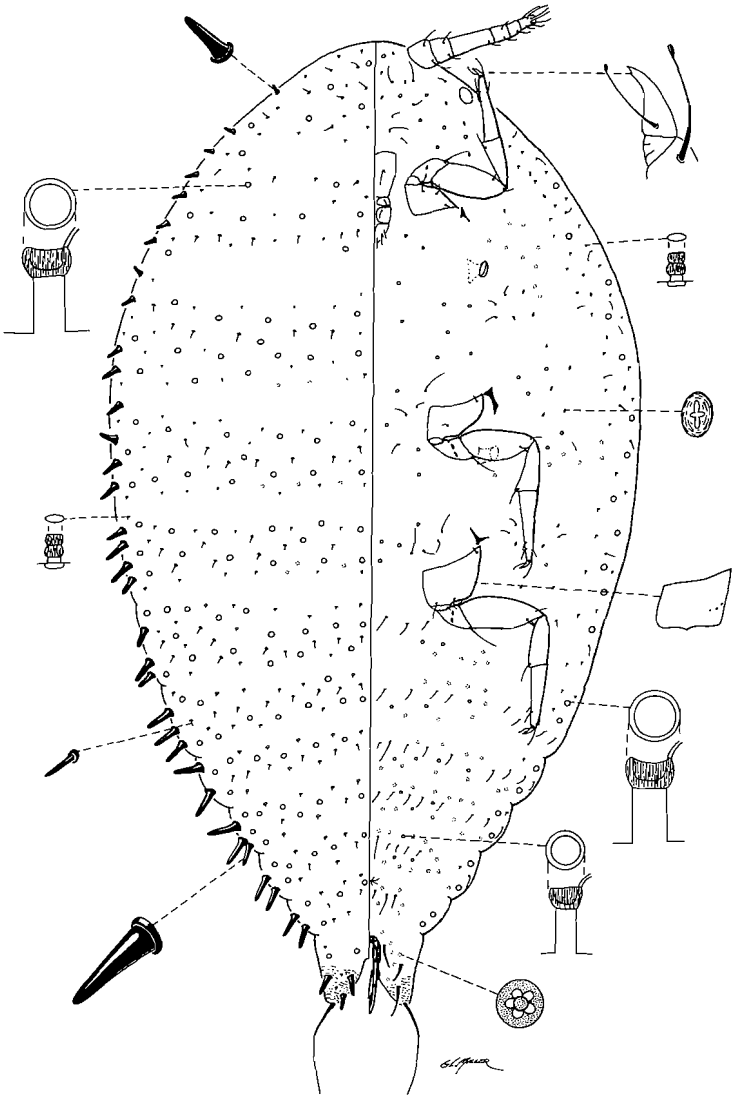

Fig. 24. *Acanthococcus oligotrichus* D. Miller & G. Miller

(paratypes with 6-12(8) pores), ventrally without pores (paratypes with 0-2(1) pores); hind femora dorsally without pores (paratypes with 0-4(1) pores), ventrally without pores; tibiae with 2 setae; middle seta on front tibia absent; inner apical tibial setae only setae present; femora with 3 setae; tarsi longer than tibiae (hind tibia/tarsus 0.80) (paratypes 0.67-0.89(0.73)); claws with denticle near tip. Antennae 6-segmented, third segment longest. Segment 6 with 3 sensory setae; segment 5 with 1 longer than single sensory seta on segment 4.

Variation. This species is relatively homogeneous. There is some variation in the distribution of the large-sized setae on the head. On 2 specimens, including the holotype, the large-sized setae do not occur on the head. On other specimens, a few small such setae occur in lateral areas of the head. In some specimens, there may be a large space near the apex of the head that is without large sized enlarged setae. The anal ring may be dorsal, ventral, or apical.

Notes. *Acanthococcus oligotrichus* is distinguished from all other North American species of *Acanthococcus* by having only 2 setae on each tibia, 3 setae on each femur, and dorsal quinquelocular pores on the thorax.

Specific Epithet. The name *oligotrichus*, from the Greek oligos, meaning "few or scanty", and trichos, meaning "hair", refers to the reduced number of setae on the hind tibiae and femora.

Specimens Examined. GEORGIA: Emanuel Co.: Near Oak Park, XI-5-70 (HHT-215-70), on unidentified shrub, R. J. Beshear (3 ad. ♀ on 3 sl.) BM, UG, USNM. Irwin Co.: Near Irwinville, (Crystal Lake), on Highway 32, III-8-73 (HHT-51-73), on *Polygonella* sp., R. J. Beshear (1 ad. ♀) UG. Richmond Co.: Between Harlem and Augusta, near Ft. Gordon, on Highway 278, VI-22-69 (HHT-77-69), X-18-72 (HHT-405-72), and VII-23-74 (HHT-146-74) on *Polygonella americana*, R. J. Beshear (6 ad. ♀ on 6 sl.) UCD, UG, USNM.

Acanthococcus ophius D. Miller and G. Miller, n. sp.

Snake-like eriococcin

Fig. 25

Type Material. Adult female holotype (1 specimen on slide) with right label "HHT-264-73 On *Aristida* sp. Irwin Co. Ga. XI-27-73 Coll. R. J. Beshear."; left label "HOLOTYPE *Acanthococcus ophius* D.R. Miller & G.L. Miller" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 2.4 mm long (paratypes 2.8-3.2(3.0) mm), 0.5 mm wide (paratypes 0.6-0.7(0.7) mm). Anal lobes sclerotized on venter and dorsum; each lobe dorsally with 3 enlarged setae, anal-lobe setae about same shape, nearly parallel sided with blunt apex (posteromedial seta longest, outer seta shortest), without microtubular ducts; each lobe ventrally with 3 slender body setae and without sessile pores.

DORSUM with enlarged setae of 2 sizes: Larger size present on anal lobes, abdominal segment VII, and anterior margin of head, with 16 setae on head (paratypes with 14-19(17) setae), with 2 present on margin of abdominal segment VII; smaller size restricted

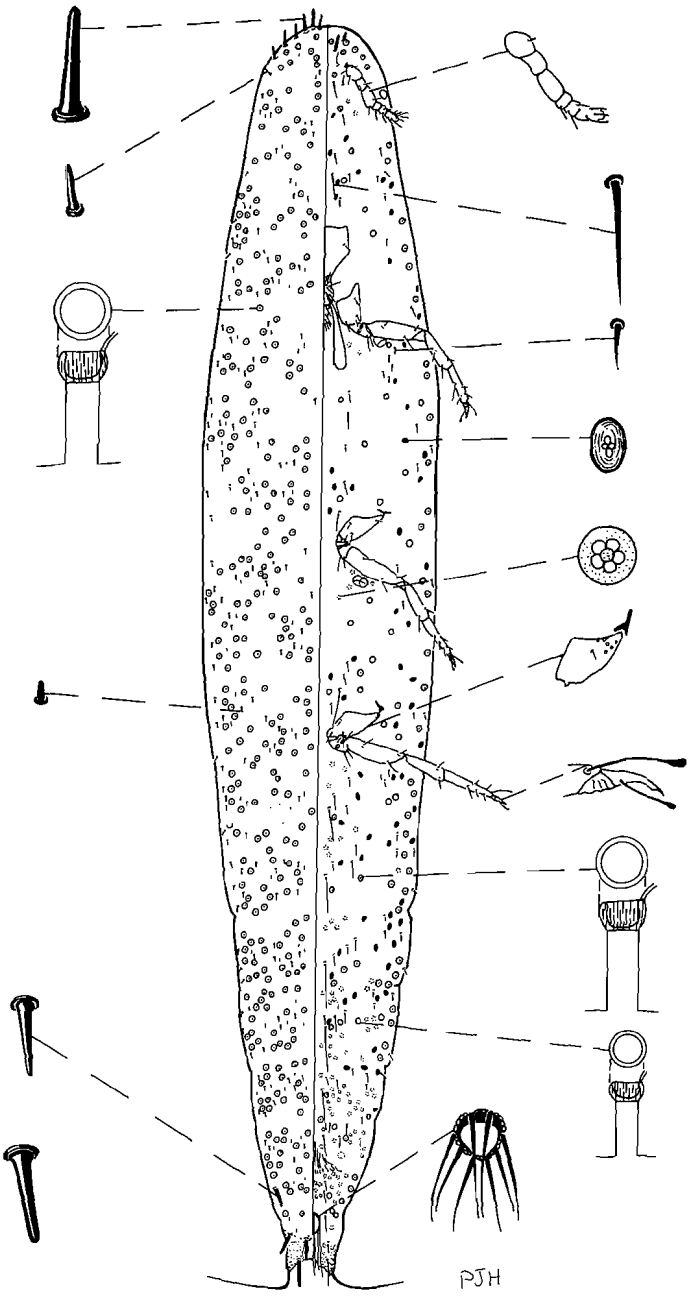

Fig. 25. *Acanthococcus ophius* D. Miller & G. Miller

to medial and sublateral areas. Largest lateral seta 40 μ long (paratypes 38-44(41) μ), largest medial seta 6 μ (paratypes 6-9(7) μ); on abdominal segments II to VIII longest lateral seta 4.3 times longer than longest medial seta (paratypes 3.8-5.8(4.7) times). Lateral setae straight or slightly curved, with parallel sides, with blunt, truncate, or rounded apices; medial setae straight, cylindrical, with parallel sides and truncate apices. Enlarged setae few, e.g. abdominal segment V with 17 setae (paratypes with 17-20(18) setae), with no longitudinal pattern. Macrotubular ducts of large size, scattered over surface. Microtubular ducts apparently absent. Multilocular pores absent.

Anal ring ventral, with 4 pairs of setae.

VENTER with body setae short (longest seta on abdominal segment VIII 19 μ long (paratypes 17-22 μ), on segment III 49 μ long (paratypes 55-64(60) μ); longest posterior anal-lobe seta 151 μ long (paratypes 131-151(144) μ). Enlarged setae present on submargin of head. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size in medial areas of abdomen. Multilocular pores of 1 kind: Quinqueloculars abundant over surface. Cruciform pores present on medial and sublateral areas of abdominal segment VI through head, abundant on thorax near legs; with 10 pores between antennae and anterior margin of clypeolabral shield (paratypes with 10-11(10) pores).

Legs with largest translucent pores about 2 μ long with most pores about 1.5 μ long; hind coxae dorsally with 5 and 8 pores (paratypes with 7-13(10) pores), ventrally with 3 pores (paratypes with 1-6(3) pores); hind femora without pores (paratypes with 0-5(2) pores on dorsal surface and 0-6(2) pores on ventral surface; femora with 5 setae; tibiae with 4 setae on each of hind 2 pairs of legs, 5 setae on front pair; middle seta on front tibia located off of inner margin of tibia, approximately equal to outer apical setae; inner, apical tibial setae slightly more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.80 and 0.81) (paratypes 0.81-0.93(0.87)); claws with denticle near tip. Antennae 6-segmented, third segment longest. Segment 6 with 3 sensory setae; segment 5 with 1 longer than single sensory seta on segment 4.

Variation. This species varies in the number of large-sized lateral setae on the abdomen. One specimen lacks these setae completely; another has 3 on one side of the body and 4 on the other. There may be 2 or 3 setae on the lateral margin of segment VII.

Notes. *Acanthococcus ophius* is similar to *A. monotrichus*, but has large-sized lateral setae present on the posterior abdominal segments and the head, and the enlarged setae on the anal lobes are approximately the same size; *A. monotrichus* has large-sized lateral setae present around the entire body margin, and usually has the outer enlarged seta on the anal lobe less than half as long as the other lobe setae.

Specific Epithet. The name *ophius*, from the Greek ophios, meaning "snake", refers to the narrow, elongate appearance of this species.

Specimens Examined. FLORIDA: Nassau Co.: Between Switzerland and Green Cove Springs on Highway 13 on the St. John River, I-25-75 (HHT-15-75), on *Aristida* sp., R. Scott (1 ad. ♀) USNM.

GEORGIA: Atkinson Co.: Near Pearson, V-29-75 (HHT-136-75), on *Aristida* sp., R. J. Beshear (1 ad. ♀) USNM. Irwin Co.: Near Irwinville, (Crystal Lake), on Highway 32, XI-27-73(HHT-264-73) and II-13-75 (HHT-32-75), on *Aristida* sp., R.J. Beshear (1ad. ♀,

2 1st on 3 sl.) UG, USNM.

***Acanthococcus quercus* (Comstock)**
Oak eriococcin
Fig. 26

This species was treated in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992).

***Acanthococcus smithi* (Lobdell)**
Smith eriococcin
Fig. 27

This species was treated in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992).

***Acanthococcus stellatus* (McDaniel)**
Star eriococcin
Fig. 28

This species was treated in a recently submitted paper on the *Acanthococcus* species that occur in the western United States and will not be redescribed here (see Miller and Miller 1992).

***Acanthococcus tosotrichus* D. Miller and G. Miller, n. sp.**
Numerous setae eriococcin
Fig. 29

Type Material. Adult female holotype (1 specimen on slide) with right label "HHT-186-73 On *Panicum* sp. Chattooga Co. Ga. VIII-21-73 Coll. R. Beshear."; left label "HOLOTYPE *Acanthococcus tosotrichus* D.R. Miller & G.L.Miller" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 2.1 mm long (paratypes 1.5-2.6(2.1) mm), 0.9 mm wide (paratypes 0.6-1.4(1.0) mm). Anal lobes lightly sclerotized on venter; each lobe dorsally with 4 enlarged setae, anteromedial seta more slender than other lobe setae with rounded apex, remaining setae conical with acute apex (posterior seta on outer margin longest, anteromedial seta shortest), with 4 and 5 microtubular ducts (paratypes with 3-5(4) ducts); each lobe ventrally with 3 slender body setae and 1 sessile pore (paratypes with 1-2(1) pores).

DORSUM with enlarged setae of 1 variable size: Present over entire dorsum, usually with cluster of 2 slightly larger setae accompanied by 6 or 8 smaller setae on margin and

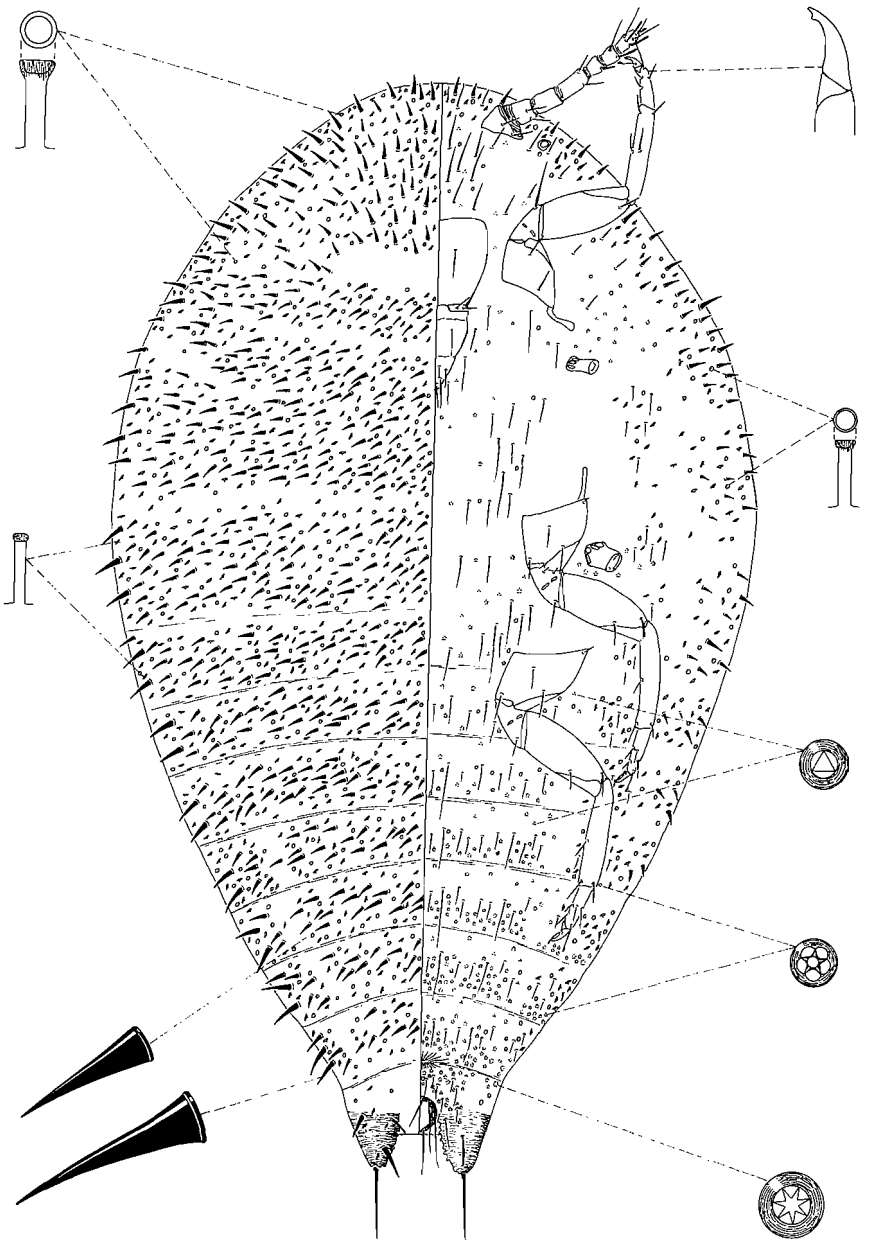

Fig. 26. *Acanthococcus quercus* (Comstock)

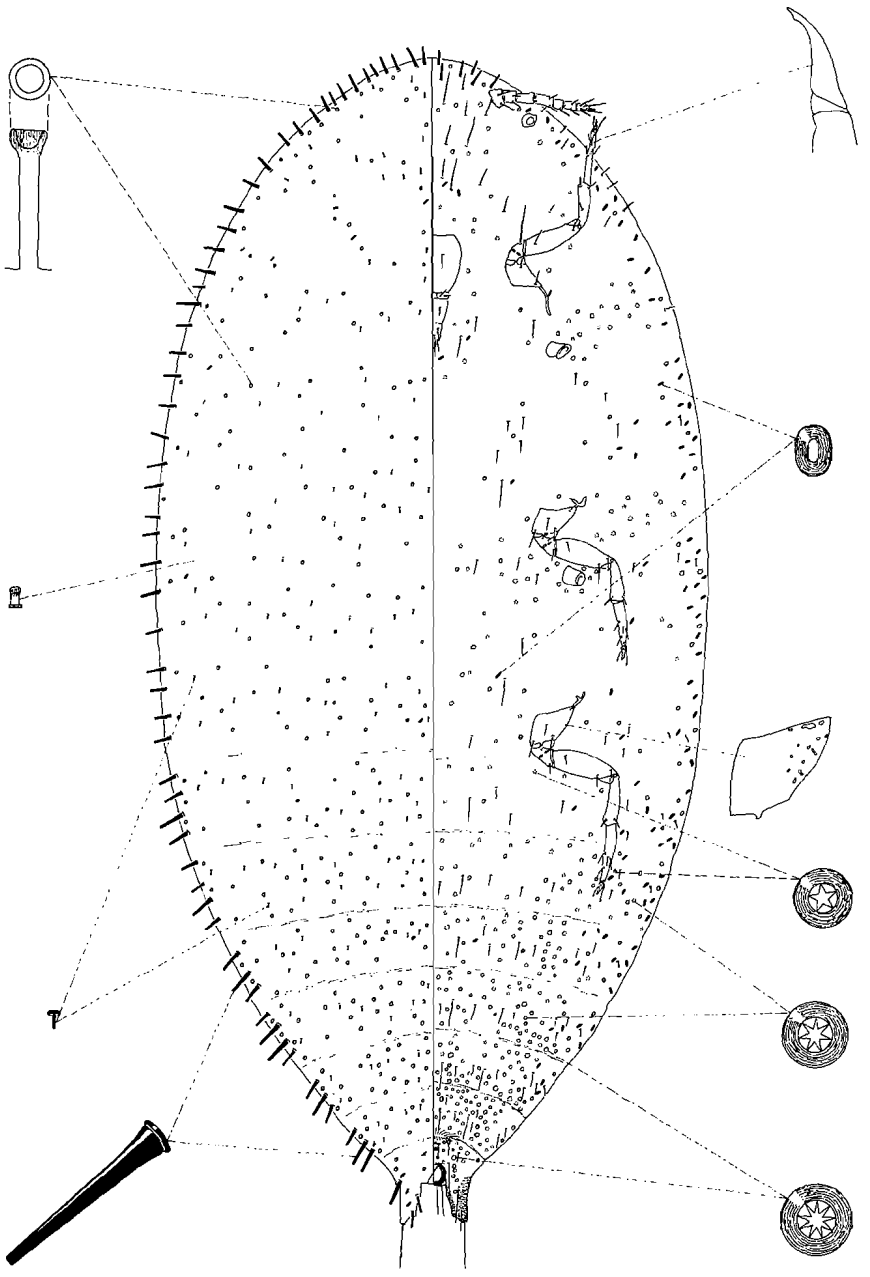

Fig. 27. *Acanthococcus smithi* (Lobdell)

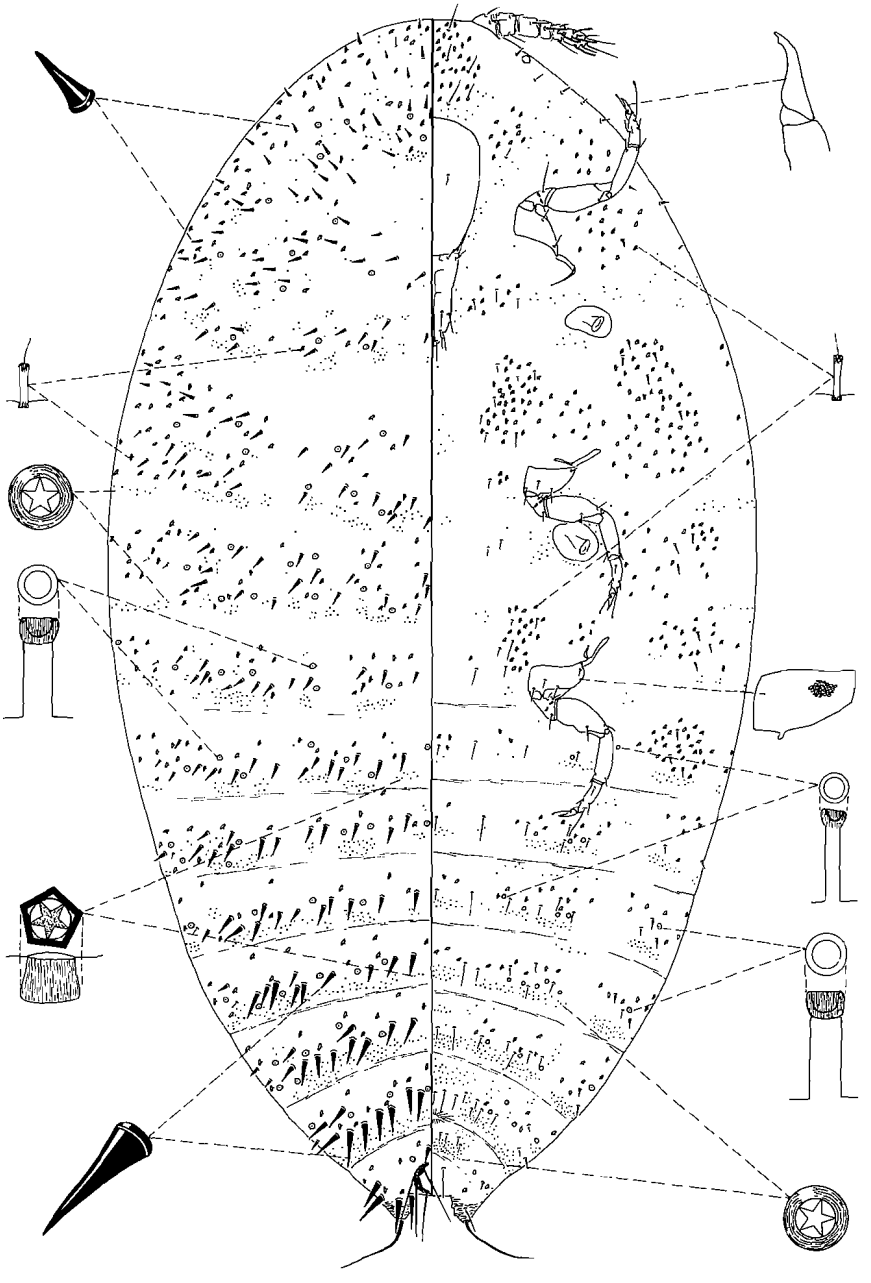

Fig. 28. *Acanthococcus stellatus* (McDaniel)

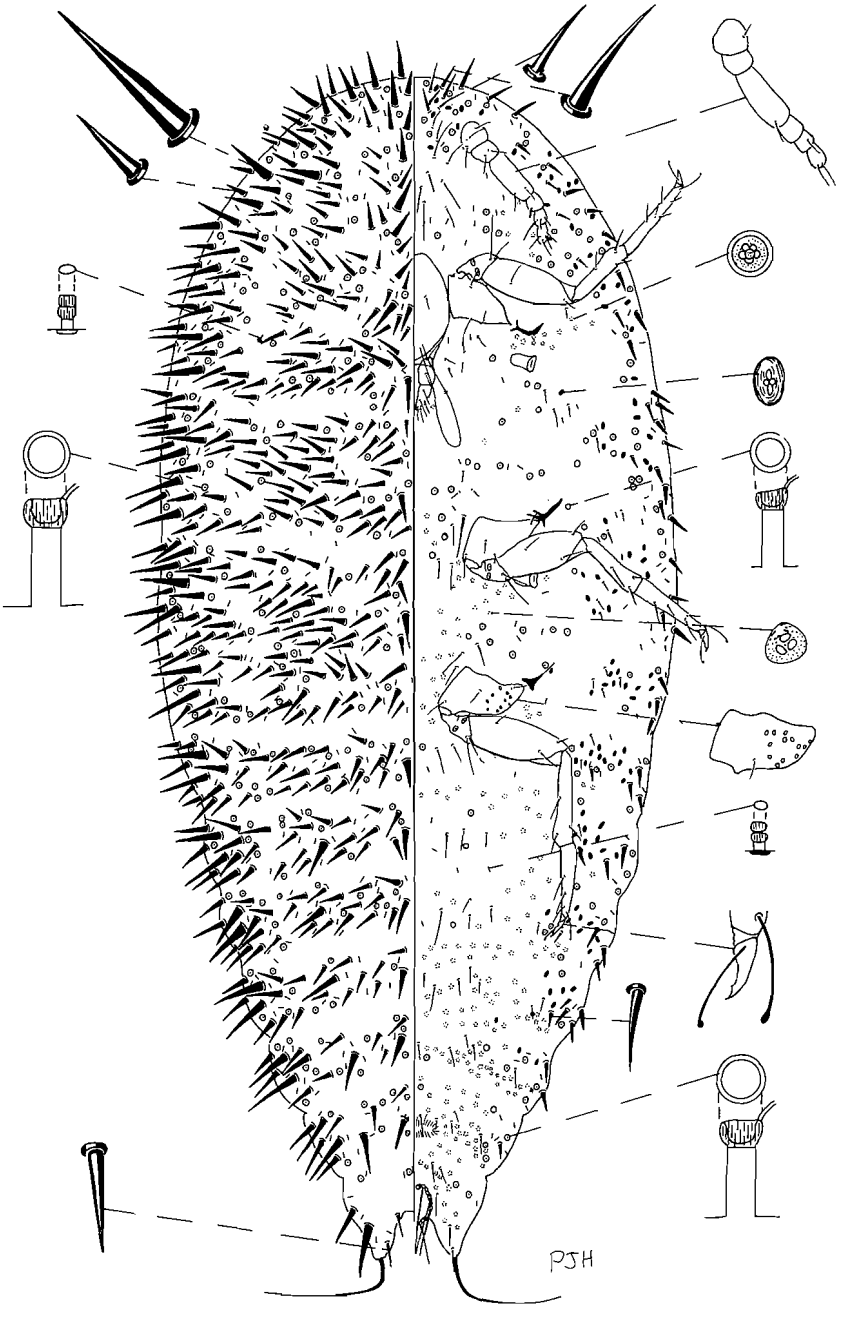

Fig. 29. *Acanthococcus tosotrichus* D. Miller & G. Miller

submargin of each abdominal segment. Largest lateral seta 102 μ long (paratypes 81-98(88) μ), largest medial seta 84 μ (paratypes 67-80(73) μ); on abdominal segments II to VIII longest lateral seta 1.2 times longer than longest medial seta (paratypes 1.1-1.3(1.2) times). Enlarged setae straight, conical, with acute apices. Enlarged setae abundant, e.g. abdominal segment V with 50 setae (paratypes with 31-46(40), with pattern of longitudinal lines on abdomen on medial, sublateral, and lateral areas formed by largest setae; segments III-VII with setae arranged in 2 or 3 transverse rows. Macrotubular ducts of large size, scattered over surface. Microtubular ducts 5 μ long (paratypes 5-6(5) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, approximately equal in length to remaining sclerotized portion; total sclerotized area 2 times longer than unsclerotized area; dermal orifice sclerotized. Microtubular ducts scattered over surface. Multilocular pores absent.

Anal ring ventral, with 4 pairs of setae.

VENTER with longest seta on abdominal segment VIII 26 μ long (paratypes 23-29(26) μ), on segment III 64 μ long (paratypes 47-84(62) μ)); longest posterior anal-lobe seta 230 μ long (paratypes 186-207(196) μ). Enlarged setae present on submargin from segment VII forward to head, with setae on surface smaller than those on dorsum. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size, distributed throughout sublateral and medial areas. Microtubular ducts present along body margin. Multilocular pores of 3 kinds: Quinqueloculars abundant on abdomen; triloculars abundant on thorax near legs; septeloculars rarely present on abdomen. Cruciform pores present near legs and on sublateral areas of abdominal segment V or VI through head, with 9 pores between antennae and clypeolabral shield (paratypes with 2-8(5) pores.

Legs with largest translucent pores about 3 μ long with most pores about 2 μ long; hind coxae dorsally with 7 and 13 pores (paratypes with 13-27(21) pores), ventrally with 4 and 8 pores (paratypes with 10-22(17) pores); hind femora dorsally with 1 and 3 pores (paratypes with 3-6(5) pores), ventrally without pores; tibiae with 5 setae; middle seta on front tibia located on inner margin of tibia, about same size or slightly more robust than outer apical setae; inner, apical tibial setae conspicuously more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.92 and 0.90)(paratypes 0.89-0.94(0.92)); claws with denticle near tip. Antennae 6-segmented, third segment longest. Segment 6 with 3 sensory setae; segment 5 with 1 longer than single sensory seta on segment 4.

Variation. The number and absolute length of the dorsal enlarged setae tend to vary considerably, but the distinctive shape of these setae remains constant.

Notes. *Acanthococcus tosotrichus* is similar to *A. howelli* by possessing 4 setae on each anal lobe. *Acanthococcus tosotrichus* is distinguished by largest lateral seta 102 μ long and 50 enlarged setae on abdominal segment V; *A. howelli* has the largest lateral seta 49-79 μ long and 15-24 enlarged setae on abdominal segment V. *Acanthococcus tosotrichus* is also similar to *A. chilos*, but has 4 enlarged setae on each anal lobe, the largest lateral seta 102 μ long, and 50 enlarged setae on abdominal segment V; *A. chilos* has 3 enlarged setae on each anal lobe, the largest lateral seta 67-81 μ long, and 28-34 enlarged setae on abdominal segment V.

Specific Epithet. The name *tosotrichus*, from the Greek tosos, meaning "so many", and trichos, meaning "hair", refers to the abundant enlarged setae on the abdomen of this

species.

Specimens Examined. GEORGIA: Bulloch Co: near Statesboro, IX-17-74 (HHT-199-74), VI-1-83 (HHT-63-83), on *Panicum* sp., R. J. Beshear (2 ad. ♀ on 2 sl.) FSCA. Chattooga Co.: between Summerville and Menlo on Highway 48, VIII-21-73 (HHT-186-73) and IX-13-73 (HHT-218-73), on *Panicum* sp., R. J. Beshear (8 ad. ♀, 1 1st on 9 sl.) BM, UCD, UG, USNM. Echols Co: locality unknown, V-27-76, on grass, R. J. Beshear (1 ad. ♀) UG. Jasper Co: Ocmulgee River on State Highway 212, IV-18-74, on *Panicum* sp., R. J. Beshear (1 ad. ♀) USNM.

Genus *Cryptococcus* Douglas

Synonymy: *Cryptococcus* Douglas, 1890:155. Type species: *Coccus fagi* Baerensprung (=*Cryptococcus fagisuga* Lindinger), by monotypy.

Diagnosis. Adult female. Body rotund; anal lobes absent; enlarged setae absent; macrotubular ducts and microtubular ducts present on both body surfaces, microtubular ducts with area farthest from dermal orifice sclerotized and undivided; multilocular sessile pores present; cruciform pores absent; legs absent or reduced to small sclerotized area; antennae 1-, 2-, or 3-segmented; anal ring developed into broad plate with several associated robust body setae.

Key to Species of *Cryptococcus* Douglas of the Eastern U.S

Adult Females

1. Anal ring with small pores; multilocular pores absent from dorsum; macrotubular ducts of 2 sizes on venter; on *Fagus* spp. ..... *fagisuga* Lindinger
   Anal ring without pores; multilocular pores present on dorsum; macrotubular ducts of 1 size on venter; on *Acer* spp. ..... *williamsi* Kosztarab & Hale

Cryptococcus fagisuga Lindinger

Beech eriococcin

Fig. 30

Synonymy: *Coccus fagi* Baerensprung, 1849:174 (junior primary homonym of *C. fagi* Sulzer, 1776).
Coccus fagi Walker, 1852:1086 (junior primary homonym of *C. fagi* Sulzer, 1776).
Pseudococcus fagi (Baerensprung); Douglas, 1890:155.
Cryptococcus fagi (Baerensprung); Douglas, 1890:155.
Eriococcus fagi (Baerensprung); Perrier, 1926:122
Cryptococcus fagisuga Lindinger, 1936:444 (new name for *Coccus fagi* Baerensprung).

Type Material. The type series of this species was studied by Williams (1985) and a lectotype was selected (BM); there are 8 paralectotypes.

Field Features. Adult female bright yellow, enclosed in filamentous ovisac.

The life cycle of this species varies considerably, but the general pattern is as follows.

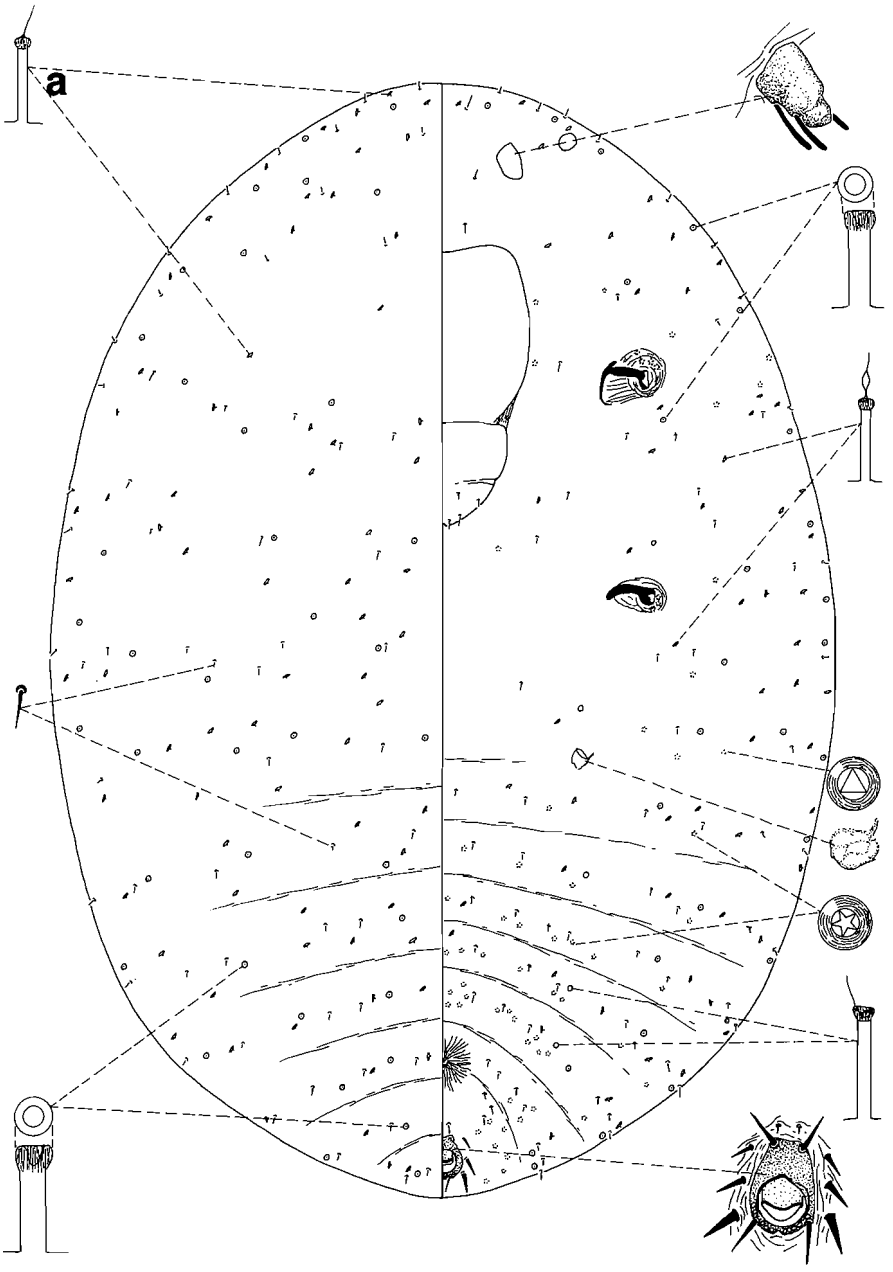

Fig. 30. *Cryptococcus fagisuga* Lindinger. a. microtubular duct.

Yellow eggs are laid in the spring or early summer within the ovisac. The eggs hatch in late summer and fall. Crawlers are quite mobile and may move some distance before settling on the bark. Preferred settling sites are in cracks or lenticle depressions. Soon after establishment, a filamentous secretion is produced that completely surrounds the crawler. The first instar is normally the overwintering stage, but in some areas both eggs and crawlers may be present in the winter. During the winter, yellow first instar nymphs change in body form from oval to rotund. During the spring, molting occurs and the apodous second instar is produced. This instar apparently is short lived. Adult females occur throughout the spring and summer. Males have never been collected even though they have been looked for extensively. This scale, in conjunction with a fungus, can cause extensive damage to the native beech trees in the northeastern U.S. This information has been compiled from Brown (1936), Ehrlich (1934), and Schmutterer (1952).

Diagnosis. Dorsal setae scattered over surface, largest seta (6-9(8) μ long); with several swollen setae on venter associated with anal ring. Microtubular ducts scattered over dorsum, 4-8(6) μ long, with area farthest from dermal orifice undivided, sclerotized, total sclerotized area much longer than unsclerotized area, dermal orifice without tubes. Macrotubular ducts scattered over dorsum, ducts of 2 sizes on venter. Sessile pores near vulva predominantly with 5 loculi. Legs represented by small sclerotized remnant.

Notes. For a discussion of the synonymy of this species refer to Williams (1985).

Host and Distribution. Recorded from *Fagus*. Eastern U.S. distribution: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Western U.S. distribution: None.

Cryptococcus williamsi Kosztarab and Hale

Williams eriococcin

Fig. 31

Synonymy: *Cryptococcus williamsi* Kosztarab and Hale,1968:7.

Type Material. The holotype adult female is labeled as follows "*Cryptococcus williamsi* Krb and Hale Holotype n. of Perry, Vermont 1-Nov.-1966 ex. *Acer* sp. coll. RLMurray" (USNM). In addition, we have studied 24 paratypes.

Field Features. Adult female salmon orange, enclosed in filamentous ovisac.

In spring and early summer, crawlers are either born as nymphs or hatch from eggs 10 to 15 minutes after being laid. Dissections of gravid females have produced from 20 to 30 eggs per female. The adult female apparently is the overwintering stage. A filamentous secretion encloses all stages, but may be worn off on some individuals. The life cycle is carried out in bark crevices of the maple host. It can be a pest on sugar maple trees. This information has been compiled from Kosztarab and Hale (1968).

Diagnosis. Dorsal setae scattered over surface, largest seta (3-5(4) μ long); with swollen setae on venter associated with anal ring. Microtubular ducts scattered over dorsum, 4-8(6) μ long, with area farthest from dermal orifice undivided, sclerotized, total sclerotized area much longer than unsclerotized area, dermal orifice without tubes. Macrotubular ducts scattered over dorsum, ducts on venter of 1 size. Sessile pores near vulva with 5 loculi,

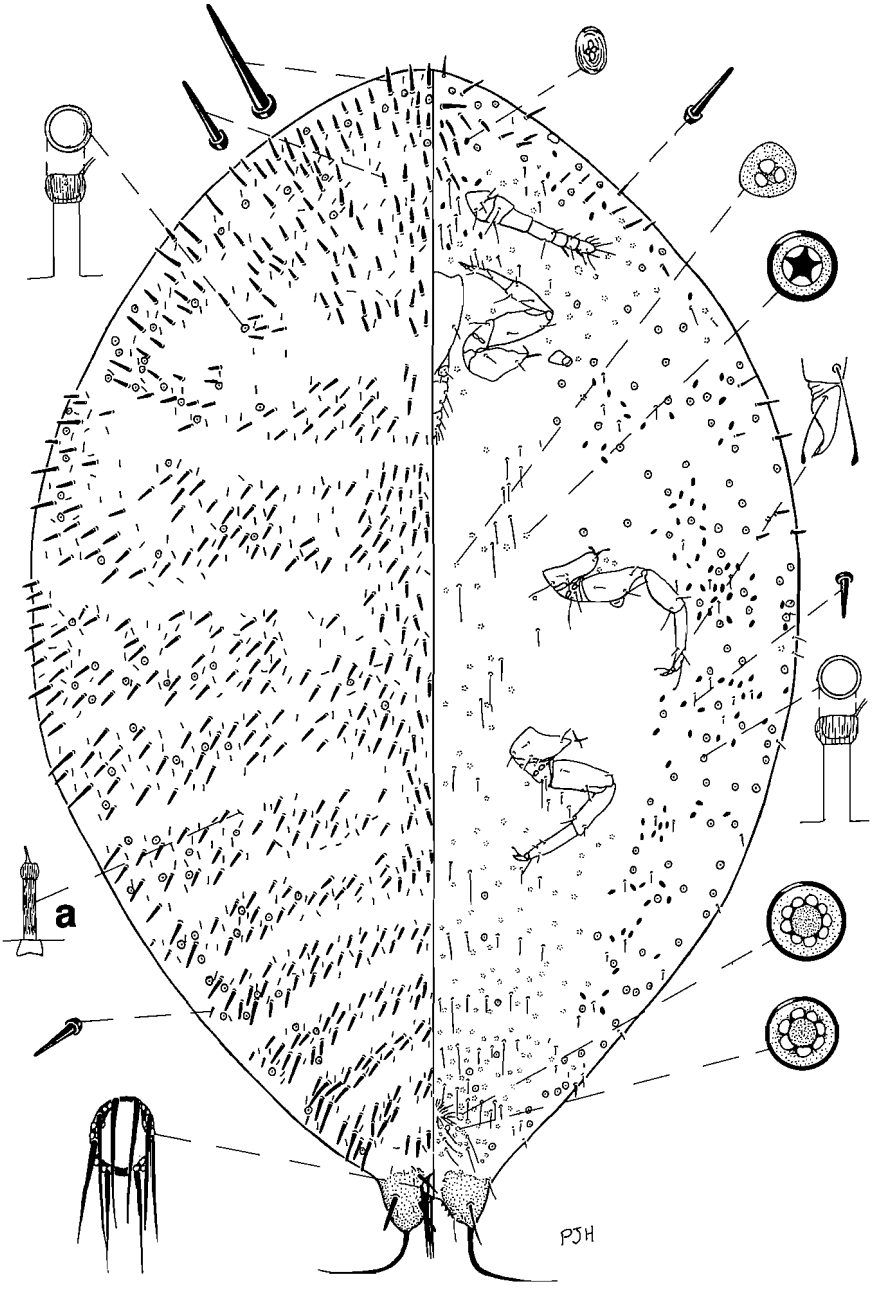

Fig. 32. *Gossyparia spuria* (Modeer). a. microtubular duct.

females molt to adults at about the time that fruit is on the elm trees. After molting, the adult females migrate from overwintering sites to the undersides of large branches where mating takes place. Ovisac formation begins prior to fruit drop. When the elm leaves are fully formed, the ovisac is complete and egg laying begins 2 or 3 weeks later. Eggs are laid from the end of May into August; a female may lay as many as 400 eggs. In many instances, the eggs hatch within an hour of being deposited. Crawlers feed primarily on the leaves near the main veins although some can be found on branches. Molting to second instar occurs about 6 weeks after hatching. Most of the second instars move back to the overwintering sites when the leaves of the elm begin to turn yellow. European elm scale is a serious pest of ornamental elms and can cause stunting of new growth, die back of branches, premature leaf drop, and in the case of small trees, death. Because trees often are heavily infested, large quantities of honeydew are produced that coat cars and pavement and generally make "life beneath the elm" unpleasant. This information has been compiled from personal observations (DRM) at Davis, California and from Herbert (1924).

Diagnosis. Dorsal enlarged setae of 2 variable sizes, larger size (longest large size 58-67(62) μ long) present on abdomen on marginal areas, shape straight, or slightly curved, with nearly parallel sides, with blunt or acute apices; smaller size (longest small size 27-34(31) μ long) scattered over remainder of surface, same shape as large-sized setae, with blunt or rounded apices; on segment V longest large seta 1.6-1.9 times longer than longest small seta. Enlarged setae in moderate to large numbers (abdominal segment V with 27-50(41) setae), not forming longitudinal pattern except on body margin; enlarged setae present on dorsum of segment VIII. Microtubular ducts scattered over dorsum, 9-12(10) μ long, with area farthest from dermal orifice weakly divided into 2 parts, sclerotized, total sclerotized area much longer than unsclerotized area, dermal orifice with 2 protruding tubes. Macrotubular ducts restricted to lateral and sublateral areas of dorsum, ducts of 2 sizes on venter. Anal lobes with 3 setae, sclerotized on both surfaces, with medial teeth. Sessile pores near vulva predominantly with 5 loculi. Tibiae each with 4 setae; hind tarsus longer than tibia.

Notes. For a detailed discussion of the synonymy of this species refer to Williams (1985).

Host and Distribution. Recorded from *Ulmus*. Eastern U.S. distribution: Alabama, Arkansas, Connecticut, District of Columbia, Illinois, Indiana, Iowa, Louisiana, Maine, Maryland, Massachusetts, Michigan, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Tennessee, Virginia, Vermont, West Virginia, and Wisconsin. Western U.S. distribution: Arizona, California, Colorado, Idaho, Kansas, Montana, New Mexico, Nevada, Oregon, Texas, Utah, Washington, and Wyoming.

Genus *Hyericicoccus* Williams

Synonymy: *Trachycoccus* Ferris, 1955:215. Type species: *Trachycoccus hyperici* Ferris, by original designation and monotypy. (Preoccupied by *Trachycoccus* Borchsenius, 1950)
Hypericicoccus Williams, 1961:93. Type species: *Trachycoccus hyperici* Ferris. Replacement name.

Diagnosis. Adult female: Derm along body margin beset with numerous small projections; anal lobes absent; enlarged setae with broad base; ventral body setae enlarged near anal ring; microtubular ducts present on both body surfaces; macrotubular ducts absent; multilocular pores present on both surfaces; cruciform pores present; anal ring with robust setae; appendages small and abortive.

Notes. *Hypericicoccus* is most similar to *Ovaticoccus*, but can be distinguished by the numerous small projection along the body margin and appendages that are abortive; *Ovaticoccus* has no dermal projections on the body margin and has completely developed legs and antennae.

Hypericicoccus hyperici (Ferris)
St. John's-wort eriococcin
Fig. 33

Synonymy: *Trachycoccus hyperici* Ferris, 1955:215.
Hypericicoccus hyperici (Ferris); Williams, 1961:93.

Type Material. We have not studied the type series of this species, but based on the detailed description and illustration of the species given by Ferris (1955), there is no doubt about the correct identity of the taxon. The type series is in the collection at the University of California at Davis and comprises 2 adult females.

Field Features. Adult female bright pink; flocculent ovisac encloses body.

This species occurs under the bark of the rock rose host.

Diagnosis. Dorsal enlarged setae of 1 size, largest seta (13-18(15) μ long), smallest seta about 7 μ long, present on lateral and sublateral areas with 1 or 2 in medial areas, becoming shorter medially, nipple shaped, recessed in dermal pocket, with truncate apices; on segment V longest lateral seta about 1.2 times longer than longest sublateral or medial seta. Enlarged setae few (abdominal segment V with 10-20(16) setae), setae not arranged in longitudinal pattern. Microtubular ducts scattered over dorsum, moderate in length (5-7(6) μ), with area farthest from dermal orifice divided into 2 parts, sclerotized, total sclerotized area about 2 times longer than unsclerotized area, dermal orifice without protruding tubes. Sessile pores near vulva with 5-11 loculi, present on dorsum and venter; with 1 kind of multilocular pore, sessile. Legs abortive, usually with tibia and tarsus fused.

Host and Distribution. Recorded from *Hypericum*. Eastern U.S. distribution: Alabama, Florida, Georgia, Indiana, and Tennessee. Western U.S. distribution: None.

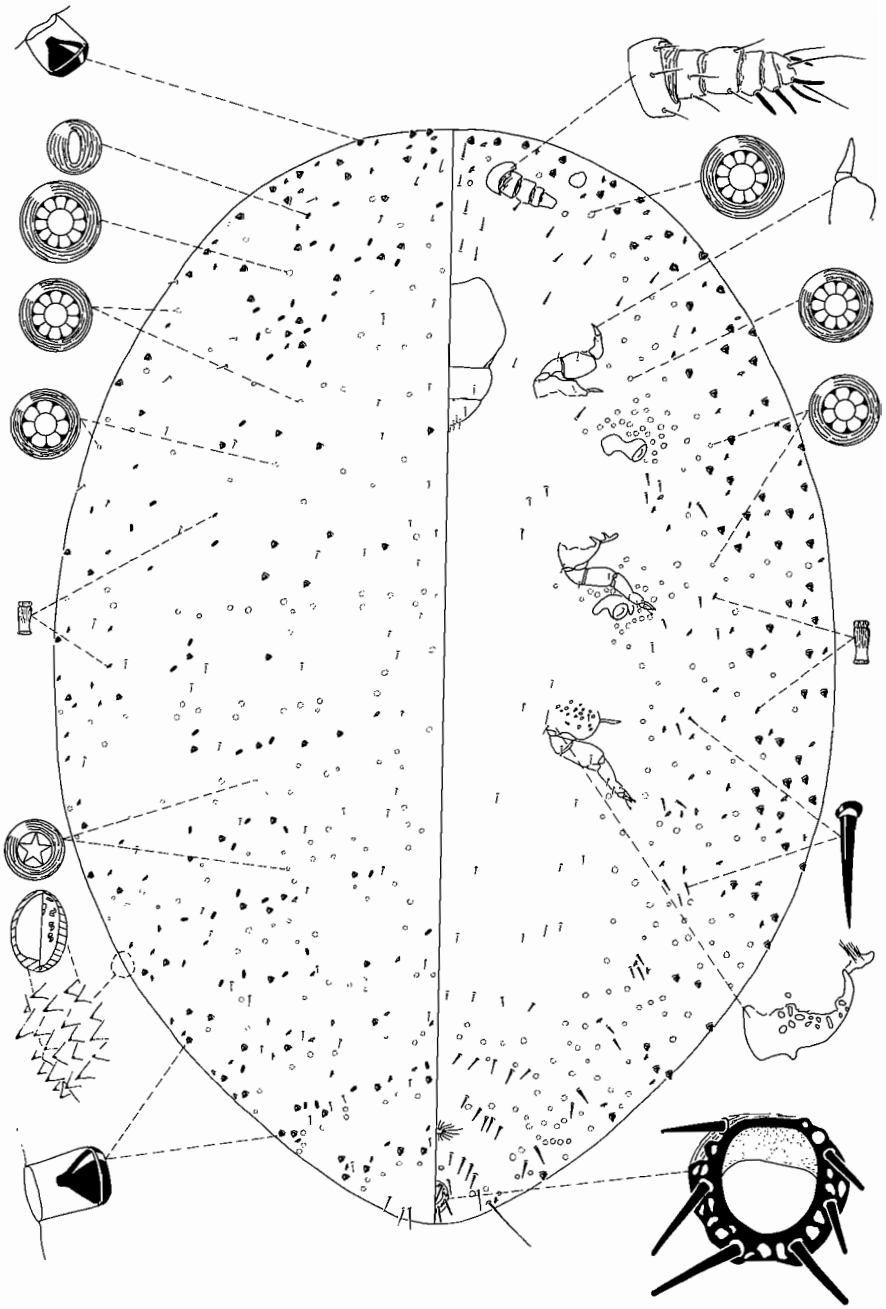

Fig. 33. *Hypericicoccus hyperici* (Ferris)

Genus *Oregmopyga* Hoy

Synonymy: *Onceropyga* Ferris, 1950:208. Type species: *Eriococcus neglectus* Cockerell, by original designation. (Preoccupied by *Onceropyga* Turner, 1906).
Oregmopyga Hoy, 1963:179. Type species: *Eriococcus neglectus* Cockerell. Replacement name.

Diagnosis. Adult female: Anal lobes present, unsclerotized; enlarged setae, when present, with broad base; anal ring with pores; microtubular ducts present; macrotubular ducts present; multilocular pores present on both surfaces; cruciform pores present; appendages well developed.

Notes. For a comparisons of *Ovaticoccus* with *Hypericicoccus* and *Oregmopyga* see the notes sections under the latter genera.

Key to Species of *Oregmopyga* Hoy of the Eastern U.S.

Adult Females

1. Enlarged setae longer than wide, conical.....2
   Enlarged setae wider than long, dome shaped.....*tippinsi* D. Miller & G. Miller
2. Multilocular pores primarily with 7 loculi.....*strongyla* D. Miller & G. Miller
   Multilocular pores primarily with 5 loculi.....*parvispina* (Chaffin)

Oregmopyga parvispina (Chaffin)

Small spine eriococcin
Fig. 34

Synonymy: *Eriococcus parvispinus* Chaffin, 1923:169.
Onceropyga parvispina (Chaffin); Ferris, 1955:213.
Oregmopyga parvispina (Chaffin); Hoy, 1963:180.

Type Material. From the syntypes we have chosen and marked as lectotype an adult female labeled "*Eriococcus parvispina* n. sp. Host-WILD LEGUME (*Galactia volubilis*) Lake Gem, Florida coll. Fogg, Harry W. 12-II-23 cotype 14947 desc. J. Chappin"; left label "cotype". A label has been placed on the back of the slide "*Eriococcus parvispina* Chaffin Lectotype desig. D.R. Miller & G.L. Miller" (USNM). The slide contains 1 adult female. There is 1 other slide containing 2 adult females that are paralectotypes (USNM). A topotype slide containing 2 adult females also has been studied.

Field Features. According to Chaffin (1923) the adult female is "Enclosed in smooth, light yellowish, flattened, ovoid, feltlike sac. Female, when removed from sac, is dark wine colored and devoid of any cottony secretion. Abdominal segments very distinct; legs of a lighter color..." He described the males as "small two-winged insect, body bright carmine in color, with four long, white, wax-like filaments."

The species apparently occurs on the roots of it host.

Diagnosis. Dorsal enlarged setae of 1 variable size, largest seta (13-15(14) μ long), smallest seta about 10 μ long, present over dorsal surface, becoming shorter anteriorly,

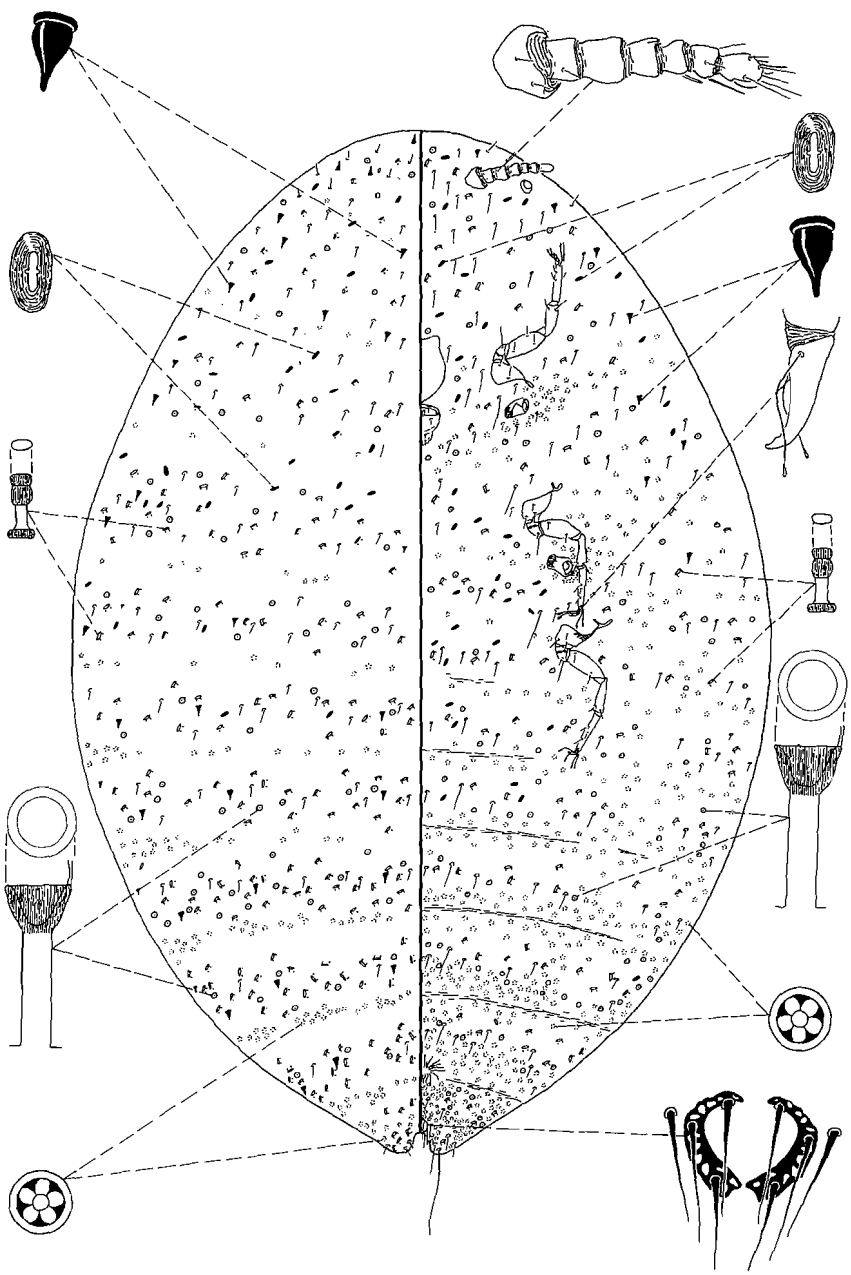

Fig. 34. *Oregmopyga parvispina* (Chaffin)

shaped like "plumber's friend", usually not recessed in dermal pocket, with rounded apices; on segment V longest lateral seta about same length as longest sublateral or medial seta. Enlarged setae few (abdominal segment V with 2-8(6) setae), when present, large setae arranged in 3 pairs of longitudinal lines (medial, sublateral, lateral). Microtubular ducts scattered over dorsum and venter, moderate in length (4-6(5) μ), with area farthest from dermal orifice divided into 2 parts, sclerotized, total sclerotized area about same length as unsclerotized area, dermal orifice with 1 protruding tube. Macrotubular ducts present over both body surfaces, ducts of 1 size on venter. Sessile pores near vulva primarily with 5 loculi, present on dorsum and venter. Tibiae each with 4 setae; femora with 5 setae; hind tarsus equal to or longer than tibia.

Notes. For a comparison of this species with *Oregmopyga strongyla* see the notes section of the latter species. Development of the dorsal enlarged setae seems to be quite variable. On most specimens the enlarged setae form 3 pairs of longitudinal lines, but in some instances the enlarged setae are replaced by slender setae.

Hosts and Distribution. This species has been collected on *Galactia, Tephosia,* and *Borrichia.* Eastern U.S.distribution: Florida. Western U.S. distribution: Texas.

Oregmopyga strongyla D. Miller and G. Miller, n. sp.

Rounded eriococcin

Fig. 35

Type Material. Adult female holotype (single specimen on slide) with right label "HHT-160-71 on *Eragrostis* sp. *capularis*? Emmanuel Co. Ga. IX-13-71 Coll. R. Beshear"; left label "HOLOTYPE *Oregmopyga strongyla* D.R. Miller & G.L. Miller" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Unknown.

Recognition Characters. Adult female holotype, mounted, 3.2 mm long (paratypes 2.2-3.2(2.7) mm long), 1.5 mm wide (paratypes 1.6-1.7(1.6) mm wide). Anal lobes without enlarged setae, with 2 and 3 microtubular ducts (paratypes with 1-3(2); each lobe ventrally with 3 slender body setae and 10 sessile pores (paratypes with 8-12(10).

DORSUM with enlarged setae of 1 variable size: Present along body margin from abdominal segment VII-II, usually with 1 or 2 setae on margin and submargin of each posterior abdominal segment (including ventral setae). Largest lateral seta 22 μ long (paratypes 15 μ). Enlarged setae conical, with rounded apices, not recessed in dermal pocket. Enlarged setae few, e.g. abdominal segment V with 5 (paratypes with 3-6(6) setae), without longitudinal pattern except on posterior segments. Macrotubular ducts of large size, scattered over surface. Microtubular ducts moderate in length, 4 μ long (paratypes 3-4(4) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, about equal to length of remaining sclerotized portion; total sclerotized area about 4 times as long as unsclerotized area; dermal orifice sclerotized. Microtubular ducts scattered over surface. Multilocular pores with 5-11 loculi; pores with 7 loculi most abundant; 9-loculi also common; other multilocular pore kinds uncommon; present over surface. Cruciform pores scattered over surface.

Anal ring ventral, with 3 pairs of setae.

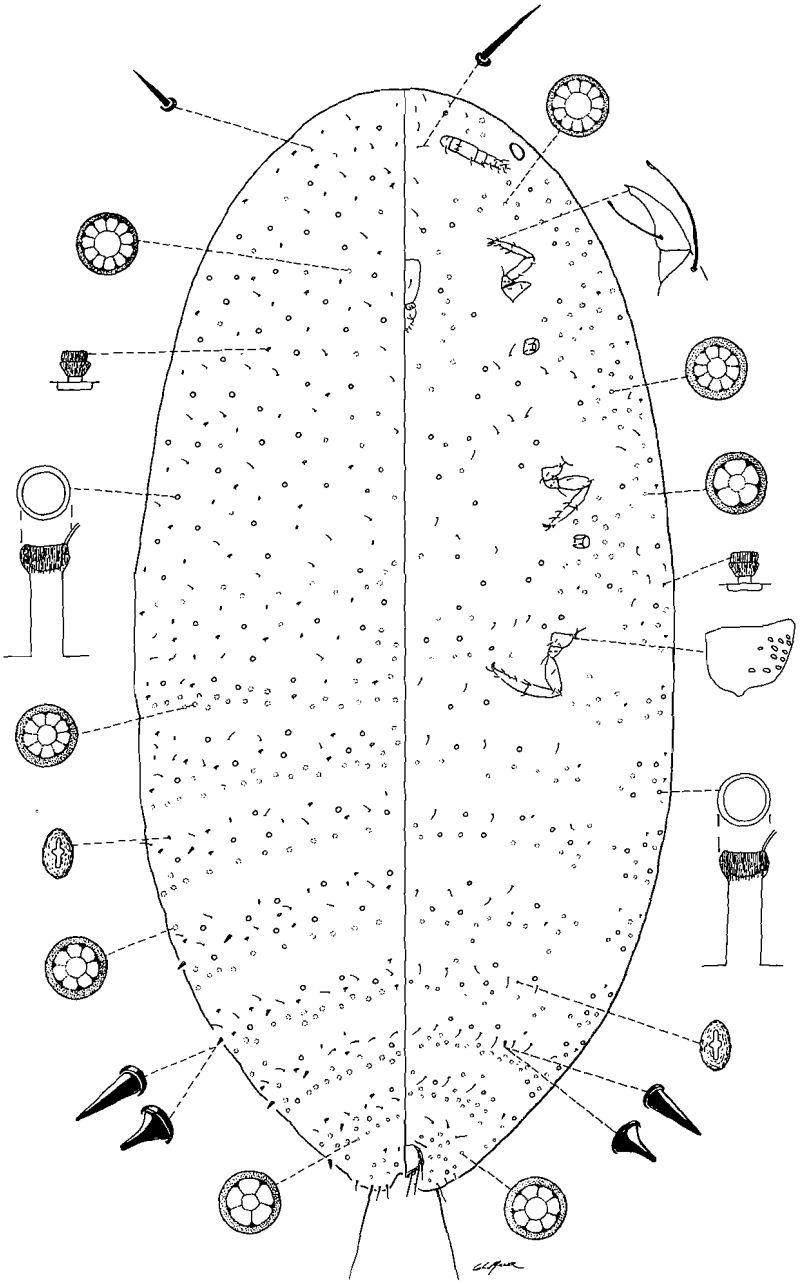

Fig. 35. *Oregmopyga strongyla* D. Miller & G. Miller

VENTER with longest seta on abdominal segment VIII 21 μ long (paratypes 17-24(20) μ), on segment III 27 (paratypes 23-26(24) μ); longest posterior anal-lobe seta 160 μ long (paratypes 140-169(154) μ). Enlarged setae present on submargin of segments VI and VII. Macrotubular ducts of same size as on dorsum, scattered over surface. Microtubular ducts present along body margin. Multilocular pores of same kinds, abundance, and distribution as on dorsum. Cruciform pores present in medial and sublateral areas of abdomen and thorax, without pores between antennae and anterior edge of clypeolabral shield.

Legs with largest translucent pores about 7 μ long with most pores about 5 μ long; hind coxae dorsally with 13 and 6 pores (paratypes with 15-23(19) pores), ventrally with 0 and 3 pores (paratypes without pores); hind femora without pores; femora with 5 setae; tibiae with 4 setae; inner apical tibial setae slightly more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.73 and 0.79)(paratypes 0.68-0.75(0.72)); claws with denticle near tip. Antennae 6-segmented, third segment longest. Segment 6 with 3 sensory setae; segment 5 with 1 longer than single sensory seta on segment 4.

Variation. The relative sizes of the enlarged setae tend to vary. In some specimens the large setae are restricted to the posterior 2 or 3 abdominal segments on 1 side of the body and are located as far forward as segment II on the other side of the body. The shape of the large sized enlarged setae also varies. On the holotype the setae are conical, but on the paratypes, these setae tend to be dome shaped like a "plumbers friend." A tarsus with 5 setae was found on 1 specimen.

Notes. *Oregmopyga strongyla* is similar to *O. parvispina*, but has multilocular pores predominantly with more than 5 loculi; *O. parvispina* has multilocular pores predominantly with 5 loculi.

Specific Epithet. The name *strongyla*, from the Greek strongylos, meaning "rounded", and refers to the rotund body shape of this species.

Specimens Examined. GEORGIA, Bulloch Co.: Hopeulikit, VI-1-83 (HHT-50-83), V-26-83 (HHT-51-83), on *Panicum* sp., R. J. Beshear (9 ad. ♀, 1 2nd ♀ on 10 sl.) UG, USNM. Emmanuel Co.: Near Oak Park, IX-13-71 (HHT-160-71), on *Eragrostis* sp., R. J. Beshear (2 ad. ♀, 1 2nd ♀ on 3 sl.) UG, USNM.

Oregmopyga tippinsi D. Miller and G. Miller, n. sp.

Tippins eriococcin

Fig. 36

Type Material. Adult female holotype (single specimen on slide) with left label "*Ovaticoccus* On *Aristida* sp. Big Pine Key, 2 mi. N.W. Big Pine on 940 Monroe Co., Fla. IV-7-74 R. F. Denno D. R. Miller #2520"; right label "HOLOTYPE *Oregmopyga tippinsi* D.R. Miller & G.L. Miller" (USNM). All specimens listed in the "Specimens Examined" section are paratypes.

Field Features. Occurring in the leaf sheaths of the grass host. Adult males are known.

Recognition Characters. Adult female holotype, mounted, 2.3 mm long (paratypes 2.0-5.5(2.8) mm long), 0.7 mm wide (paratypes 0.8-1.5(0.9) mm wide). Anal lobes

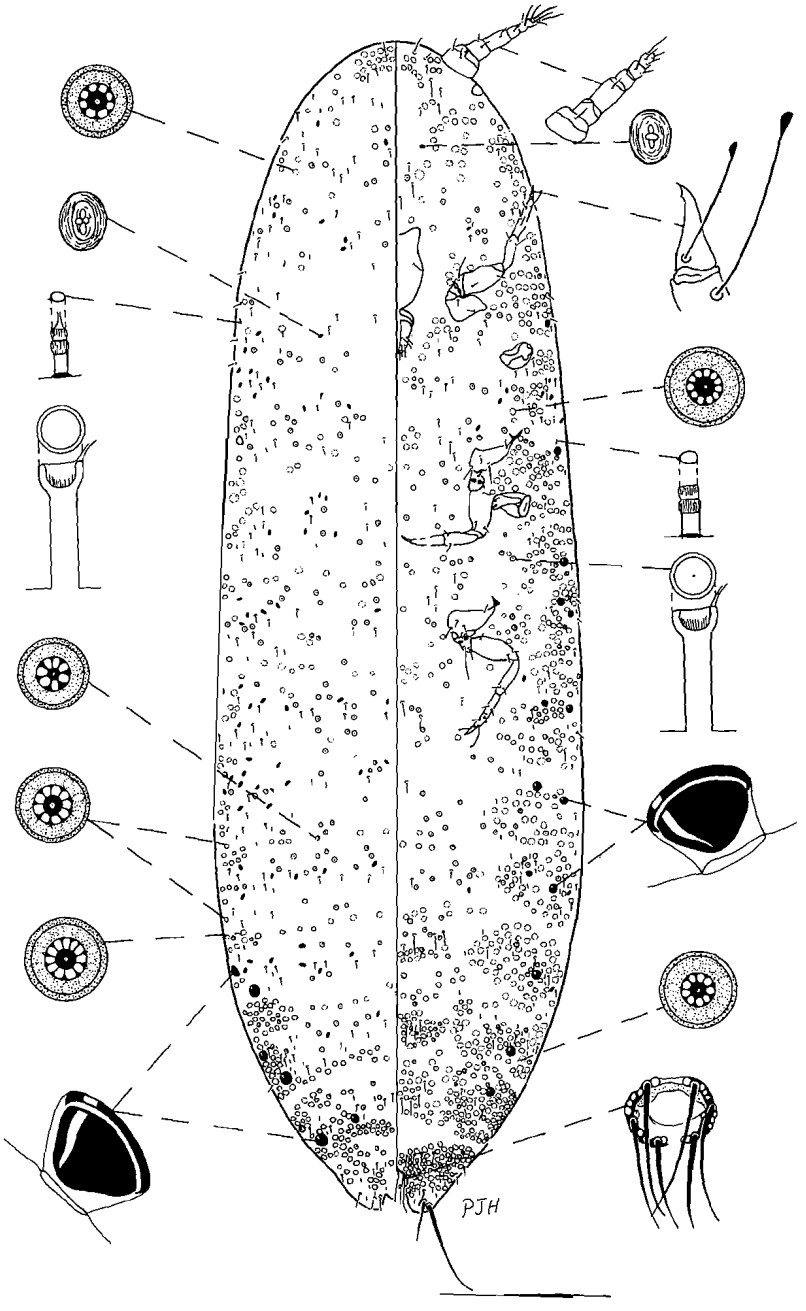

Fig. 36. *Oregmopyga tippinsi* D. Miller & G. Miller

protruding, broad; lobes without enlarged setae, with 3 and 4 microtubular ducts (paratypes with 2-4(3) ducts); each lobe ventrally with 3 slender body setae and 3 and 4 sessile pores (paratypes with 2-4(2) ducts).

DORSUM with enlarged setae of 1 variable size: Present along body margin from abdominal segment V-VII, usually with cluster of 2-4 setae on margin and submargin of each abdominal segment (including ventral setae). Largest lateral seta 18 μ long (paratypes 17-21(19) μ). Enlarged setae dome shaped, with diameter larger than height, recessed in small pocket in derm. Enlarged setae few, e.g. abdominal segment V with 6 (paratypes with 4-6(6) setae), without longitudinal pattern except near body margin. Macrotubular ducts of large size, scattered over surface. Microtubular ducts 4 μ long (paratypes 4-6(5) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, about equal to length of remaining sclerotized portion; total sclerotized area about 2 times as long as unsclerotized area; dermal orifice sclerotized. Microtubular ducts restricted to lateral and sublateral areas. Multilocular pores of 3 or 4 kinds; pores with 11 and 9 loculi most abundant; 7-loculi pores less numerous; scattered over surface, most abundant near body margin. Cruciform pores scattered over surface.

Anal ring ventral, with 3 pairs of setae.

VENTER with longest seta on abdominal segment VIII 23 μ long (paratypes 20-38(25) μ), on segment III 23 (paratypes 17-35(26) μ); longest posterior anal-lobe seta 192 μ long (paratypes 175-212(197) μ). Enlarged setae present on submargin from segment VII forward to marginal area laterad of anterior spiracle, with setae decreasing in size anteriorly. Macrotubular ducts of same size as on dorsum, scattered over surface. Microtubular ducts present along body margin. Multilocular pores of same kinds, abundance, and distribution as on dorsum. Cruciform pores present on sublateral areas of abdominal segment V through head, with 5 pores between antennae and anterior edge of clypeolabral shield (paratypes with 0-7(3) pores).

Legs short, slender; translucent pores absent, but hind coxae with faint indication of pores on dorsal surface; femora with 5 setae; tibiae with 4 setae; inner, apical tibial setae slightly more robust than other leg setae; tarsi about same length as tibiae or longer than tibiae (hind tibia/tarsus 1.10 and 1.02)(paratypes 0.92-1.03(0.98)); claws with denticle near tip. Antennae 6-segmented, third segment longest. Segment 6 with 3 sensory setae; segment 5 with 1 longer than single sensory seta on segment 4.

Variation. This species is relatively homogeneous morphologically. Some specimens have fewer multilocular pores on the dorsum than are shown in the illustration, especially in the medial area. Of the hundreds of sessile pores examined, only 1 quinquelocular was observed although a few specimens had several multilocular pores with 6 loculi. Paratypes varied in the distribution of the dorsal enlarged setae from 1 specimen that has them restricted to segment VII, to others that have them as far forward as segment III.

Notes. *Oregmopyga tippinsi* can be distinguished from all other members of the genus by having multilocular pores predominantly with 7, 9, and 11 loculi.

Specific Epithet. *Oregmopyga tippinsi* named in honor of H. H. Tippins, Department of Entomology, University of Georgia, Experiment, who devoted much of his career to gaining a comprehensive understanding of the Coccoidea of Georgia and the surrounding states.

Specimens Examined. ALABAMA, Baldwin Co.: Perdido, V-12-78, on *Muhlenbergia expansa*, C. H. Ray, Jr. (11 ad. ♀, 12 1st on 15 sl.) AU.

FLORIDA, Collier Co.: Collier Seminole State Park, Junction of 92 and 41, IV-11-74, on grass, R. F. Denno, D. R. Miller (2 ad. ♀, 4 2nd ♀ on 4 sl.) USNM. Dade Co.: East entrance of Everglades National Park, V-7-75, on grass, J. A. Davidson, R. F. Denno, D. R. Miller (3 ad. ♀, 1 2nd ♀ on 3 sl.) UG, USNM; Lake north of Mahogany Hammock, IV-9-74, on *Muhlenbergia* sp., R. F. Denno, D. R. Miller (3 2nd ♀, 1 1st on 3 sl.) USNM. Hernando Co.: Bayport, IX-27-70 (HHT-230-70), on grass, R. J. Beshear (4 ad. ♀, 1 2nd on 5 sl.) USNM; Bayport, VII-7-71 (HHT-169-71), on *Spartina patens*, R. J. Beshear (1 ad. ♀) USNM. Monroe Co: Big Pine Key, 2 mi. NW Big Pine, Hiway 940, IV-7-74, on *Aristida* sp., R. F. Denno, D. R. Miller (1 ad. ♀, 1 2nd ♀ on 2 sl.) USNM; Big Pine Key, near end of Hiway 940, IV-6-74, on grass, R. F. Denno, D. R. Miller (7 ad. ♀, 1 2nd ♀ on 4 sl.) FSCA, UG, USNM.

GEORGIA, Camden Co.: Cumberland Island, VI-16-71 (HHT-96-71), on *Spartina* sp., R. J. Beshear (30 ad. ♀, 3 2nd ♀, 1 2nd ♂, 6 ad. ♂ on 33 sl.) ANIC, AU, BM, CDA, FSCA, ICV, IZAS, MCM, MNHP, SIE, UCD, UG, UH, UT, USNM, VPI, ZAS.

SOUTH CAROLINA, Charleston Co.: Folly Beach, IX-18-44, on *Aristida* sp., G. Rau (8 ad. ♀ on 2 sl.) USNM.

Genus *Ovaticoccus* Kloet

Synonymy: *Gymnococcus* Douglas, 1888:150. Type species: *Coccus agavium* Douglas, by original designation and monotypy. (Preoccupied by *Gymnococcus* Zopf, 1887).

Ovaticoccus Kloet, 1944:86. Type species: *Coccus agavium* Douglas. Replacement name.

Diagnosis. Adult female: Anal lobes absent; enlarged setae, when present, with broad base; anal ring without pores; microtubular ducts present; macrotubular ducts present; multilocular pores present on both surfaces; cruciform pores present; appendages well developed.

Notes. For a comparison of *Ovaticoccus* with *Hypericicoccus* see the notes section under the latter genus.

Ovaticoccus is very similar to *Oregmopyga*, but differs by lacking anal lobes and pores in the anal ring; these structures are present, though small, on *Oregmopyga*.

The author of the junior homonym *Gymnococcus* has been treated in two ways. William (1985) considered Douglas (1888) to be the author based on his statement "At one time I thought it (*Coccus agavium*) might constitute the type of a new genus, under the name *Gymnococcus*, but in consideration of the important and leading characters of the antennae, we have concluded (for the present at least) that it is better to regard all the others as specific, and to refer the species to Signoret's genus *Coccus*." The International Code of Zoological Nomenclature indicates that a genus described conditionally is available from the date of the provisional description even though there are no included species. Therefore, the genus *Gymnococcus* was made available by Douglas (1888), not by Cockerell (1894b), as

suggested by Miller and McKenzie (1967),

***Ovaticoccus agavium* (Douglas)**
Agave eriococcin
Fig. 37

Synonymy: *Coccus agavium* Douglas, 1888:150.
Gymnococcus agavium (Douglas); Cockerell, 1893:1049.
Ripersia agavium (Douglas); Newstead, 1897:12.
Ovaticoccus agavium (Douglas); Kloet, 1944:86.
Pseudantonina agaves Chiaromonte; Boratynski, 1958.

Type Material. Boratynski (1958) indicated that he designated a lectotype and deposited it in the British Museum. Williams (1985) found no evidence of this specimen and believes that it is doubtful that Boratynski designated this type. Williams stated that the material used by Douglas for the description of the species probably has been lost. However, he examined other material collected by Douglas and indicated that there is no doubt of the correct identity of the species. We have studied specimens collected at the type locality and confirm Williams' conclusion.

Field Features. Adult females change from elongate oval to rotund as they mature and become gravid. Body pinkish-yellow, with clear areas on dorsum between segments; clear area arranged in longitudinal lines. Body covered with white bloom. A loose, poorly defined ovisac is produced that encloses the eggs. Females normally are concealed at the bases of the leaves, and males usually occur on the undersides of the leaves. This information has been compiled from personal observations (DRM) and Boratynski (1958).

Diagnosis. Dorsal enlarged setae of 2 variable sizes, largest seta (10-13(12) μ long), smallest seta about 6 μ long, present over dorsal surface, becoming shorter anteriorly, nipple shaped, not recessed in dermal pocket, with truncate apices; on segment V longest lateral seta about same length as longest sublateral or medial seta. Enlarged setae few (abdominal segment V with 11-16(13) setae), large setae arranged in 3 pairs of longitudinal lines (medial, sublateral, lateral). Microtubular ducts variable in distribution, either scattered over surface or restricted to posterior abdominal segments, moderate in length (4-7(5) μ), with area farthest from dermal orifice divided into 2 parts, sclerotized, total sclerotized area about same length as unsclerotized area, dermal orifice without protruding tubes. Macrotubular ducts restricted to posterior portion of body, ducts of 1 size. Sessile pores near vulva primarily with 5 loculi, present on dorsum and venter. Tibiae each with 4 setae; femora with 3 or 4 setae; hind tarsus equal to or longer than tibia.

Notes. This species is collected throughout the world in greenhouses wherever *Agave* is grown.

Hosts and Distribution. We have studied specimens collected on *Agave*, *Aloe*, and *Yucca*. Eastern U.S. distribution: Massachusetts, Missouri, and New York. Western U.S. distribution: Arizona, California, Texas, and Utah.

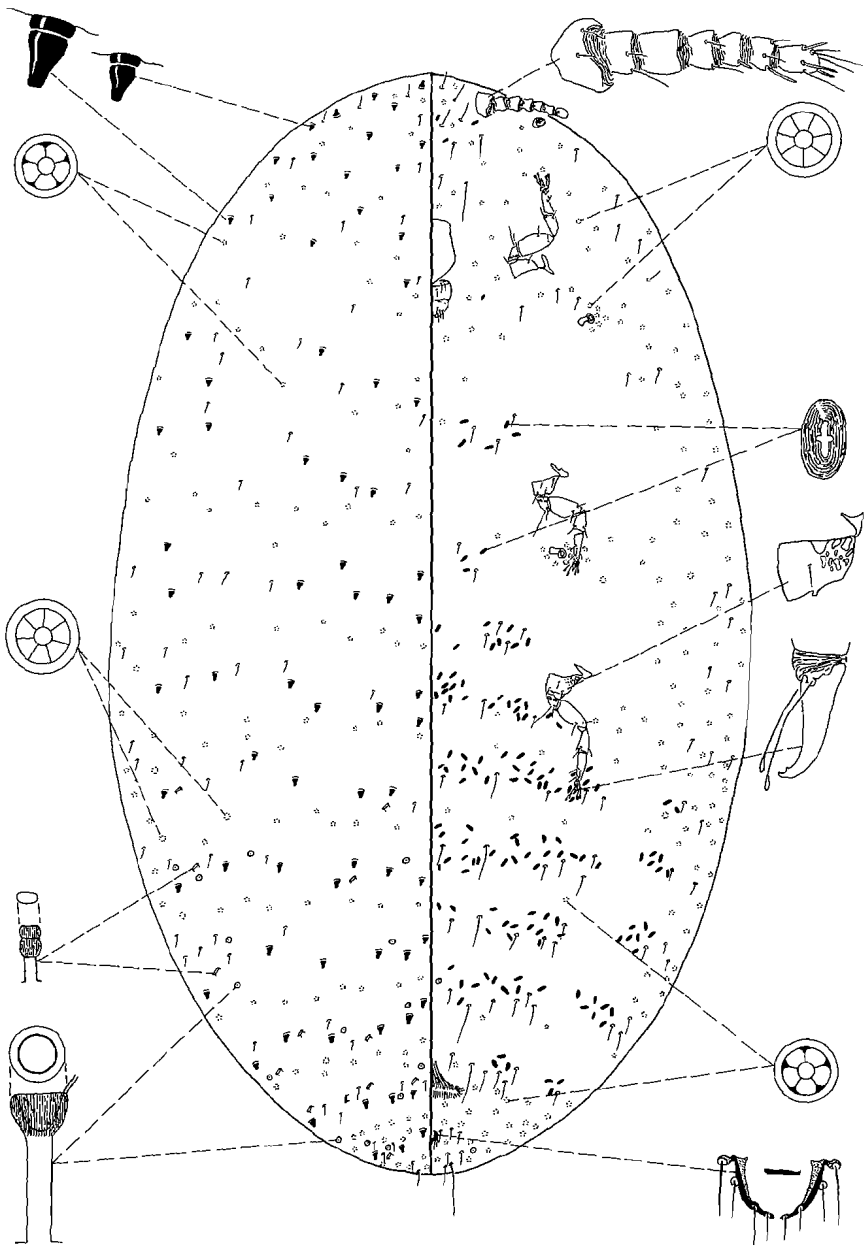

Fig. 37. *Ovaticoccus agavium* (Douglas)

Conclusions

This study reaffirms many of the eriococcid recognition characters used by Ferris (1955) and adds a number of other characters important for species identification. Important characters for species identification include: number of enlarged anal lobe setae; number and placement of femoral and tibial setae; number of loculi of multilocular pores near the vulva; relative size and position of enlarged setae on abdominal segments; setal shape and form of apices of the setae; leg pores; distribution of cruciform pores and shape of microtubular ducts.

The current study increases the number of described species of eriococcids occurring in the eastern United States from 18 to 37. This increase in faunal diversity is primarily due to concentrated collecting in sand ridge habitats of the southeastern United States coastal plains. The greatest species diversity (7 species) in the sand ridge areas occurs on three awn grass (*Aristida* spp.) with 6 of the species belonging to the genus *Acanthococcus*. Some interesting comparisons can be made between the species of *Acanthococcus* found in the western United States (Miller and Miller 1992) and species occurring in the eastern United States. While the number of described species are similar (33 species of western *Acanthococcus* versus 29 species of eastern *Acanthococcus*), host plants are very different. In the eastern United States, 15 species (45%) of *Acanthococcus* are grass infesting whereas only 9 species (27%) of western *Acanthococcus* are grass infesting. In the western United States, the greatest species diversity (7 species) of *Acanthococcus* occurs on saltbush (*Atriplex* spp.).

In addition to the sand ridge habitats, many of the eriococcids are also found on grasses in coastal habitats along the eastern seaboard. The presence of these eriococcids (e.g. *A. carolinae*) deserve special attention because the grasses they feed on are important plants in dune stabilization.

Acknowledgments

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Host Plants of the Eriococcidae of the Eastern United States

For additional hosts of those species of *Acanthococcus* also occurring in the western United States, see Miller (1991) and Miller and Miller (1992).

ACANTHOCEREUS SP.
Acanthococcus coccineus (Cockerell)
ACER SP.
Acanthococcus azaleae (Comstock)
Cryptococcus williamsi Kosztarab & Hale
ACER SACCHARUM Marsh.
Cryptococcus williamsi Kosztarab & Hale
AGAVE SP.
Ovaticoccus agavium (Douglas)
AGAVE NEGLECTA Small
Ovaticoccus agavium (Douglas)
AGROPYRON REPENS (L.) Beauv.
Acanthococcus insignis (Newstead)
ALETRIS SP.
Acanthococcus droserae Miller, Liu, & Howell
ALETRIS FARINOSA L.
Acanthococcus droserae Miller, Liu, & Howell
AMBROSIA SP.
Acanthococcus dubius (Cockerell)
AMBROSIA TRIFIDA L.
Acanthococcus missourii (Hollinger)
AMMOPHILA SP.
Acanthococcus actius D. Miller & G. Miller
AMMOPHILA BREVILIGULATA Fern.
Acanthococcus carolinae (Williams)
Acanthococcus howelli D. Miller & G. Miller
Acanthococcus smithi (Lobdell)
ANDROPOGON SP.
Acanthococcus actius D. Miller & G. Miller
Acanthococcus howelli D. Miller & G. Miller
Acanthococcus kemptoni (Parrott)
ANDROPOGON SCOPARIUS Michx.
Acanthococcus kemptoni (Parrott)
ANDROPOGON VIRGINICUS L.
Acanthococcus howelli D. Miller & G. Miller
Acanthococcus kemptoni (Parrott)
Acanthococcus smithi (Lobdell)
ARAUCARIA SP.
Acanthococcus araucariae (Maskell)
ARAUCARIA COOKII R. Br.
Acanthococcus araucariae (Maskell)
ARAUCARIA EXCELSA R. Br.
Acanthococcus araucariae (Maskell)
ARISTIDA SP.
Acanthococcus beshearae D. Miller & G. Miller
Acanthococcus howelli D. Miller & G. Miller
Acanthococcus mesotrichus D. Miller & G. Miller
Acanthococcus monotrichus D. Miller & G. Miller
Acanthococcus ophius D. Miller & G. Miller
Oregmopyga tippinsi D. Miller & G. Miller
ARISTIDA GYRANS Chapm.
Acanthococcus actius D. Miller & G. Miller
ARISTIDA PURPURASCENS Poir.
Acanthococcus actius D. Miller & G. Miller
ASTER SP.
Acanthococcus mesotrichus D. Miller & G. Miller
ARENARIA CAROLINIANA Walt.
Acanthococcus arenariae D. Miller & G. Miller
BORRICHIA FRUTESCENS (L.) DC
Oregmopyga parvispina (Chaffin)
CALLUNA SP.
Acanthococcus azaleae (Comstock)
CELASTRUS SCANDENS L.
Gossyparia spuria (Modeer)
CEREUS SP.
Acanthococcus coccineus (Cockerell)
CIRSIUM ALTISSIMUM (L.) Spreng.
Acanthococcus missourii (Hollinger)
CHRYSOPSIS SP.
Acanthococcus megaporus D. Miller & G. Miller
CHRYSOPSIS FLORIDANA Small
Acanthococcus leptoporus D. Miller & G. Miller
Acanthococcus megaporus D. Miller & G. Miller
CHRYSOPSIS TRICHOPHYLLA Nutt.
Acanthococcus dubius (Cockerell)
DISTICHLIS SPICATA (L.) Greene
Acanthococcus dennoi D. Miller & G. Miller
DROSERA SP.
Acanthococcus droserae Miller, Liu, & Howell
ECHINOCACTUS SP.
Acanthococcus coccineus (Cockerell)
ERAGROSTIS SP.
Oregmopyga strongyla D. Miller & G. Miller
ERECHTITES HIERACIFOLIA (L.) Raf.
Acanthococcus mesotrichus D. Miller & G. Miller
ERIGERON SP.
Acanthococcus missourii (Hollinger)
EUPATORIUM SP.
Acanthococcus mesotrichus D. Miller & G. Miller
EUPHORBIA CYATHOPHORA J. Murr
Acanthococcus euphorbiae (Ferris)
FAGUS SP.
Cryptococcus fagisuga Lindinger
FAGUS GRANDIFOLIA Ehrh.
Cryptococcus fagisuga Lindinger
GALACTIA ELLIOTTII Nutt.
Oregmopyga parvispina (Chaffin)
GALACTIA VOLUBILIS (L.) Britt.
Oregmopyga parvispina (Chaffin)
GNAPHALIUM OBTUSIFOLIUM L.
Acanthococcus mesotrichus D. Miller & G. Miller
HARRISIA SP.
Acanthococcus coccineus (Cockerell)

HELENIUM AMARUM (Raf.) Rock
Acanthococcus mesotrichus D. Miller & G. Miller
HELIANTHUS DECAPETALUS L.
Acanthococcus missourii (Hollinger)
HETEROTHECA SUBAXILLARIS (Lam.) Britt. & Rusb.
Acanthococcus megaporus D. Miller & G. Miller
HIERACIUM SP.
Acanthococcus mesotrichus D. Miller & G. Miller
HYPERICUM SP.
Hypericicoccus hyperici (Ferris)
LANTANA SP.
Acanthococcus mesotrichus D. Miller & G. Miller
MUHLENBERGIA SP.
Oregmopyga tippinsi D. Miller & G. Miller
MUHLENBERGIA EXPANSA (DC.) Trin.
Oregmopyga tippinsi D. Miller & G. Miller
OPUNTIA SP.
Acanthococcus coccineus (Cockerell)
Acanthococcus eriogoni (Ehrhorn)
PANICUM SP.
Acanthococcus davidsoni D. Miller & G. Miller
Acanthococcus megaporus D. Miller & G. Miller
Acanthococcus missourii (Hollinger)
Acanthococcus tosotrichus D. Miller & G. Miller
Oregmopyga strongyla D. Miller & G. Miller
PHLOX SUBULATA L.
Acanthococcus eriogoni (Ehrhorn)
PIERIS SP.
Acanthococcus azaleae (Comstock)
PIERIS JAPONICA (Thunb.) D. Don ex G. Don
Acanthococcus azaleae (Comstock)
PINUS ELLIOTTII Engelm.
Acanthococcus howelli D. Miller & G. Miller
PLUCHEA IMBRICATA Kearn.
Acanthococcus mesotrichus D. Miller & G. Miller
POLYGONELLA SP.
Acanthococcus oligotrichus D. Miller & G. Miller
Acanthococcus euphorbiae (Ferris)
POLYGONELLA AMERICANA (F. & M.) Small
Acanthococcus oligotrichus D. Miller & G. Miller
POLYPREMUM PROCUMBENS L.
Acanthococcus mesotrichus D. Miller & G. Miller
PTEROCAULON PYCNOSTACHYUM (Michx.) Ell.
Acanthococcus mesotrichus D. Miller & G. Miller
PYRUS SP.
Gossyparia spuria (Modeer)
QUERCUS SP.
Acanthococcus quercus (Comstock)
Acanthococcus stellatus (McDaniel)
QUERCUS AGRIFOLIA Nee
Acanthococcus quercus (Comstock)
QUERCUS ALBA L.
Acanthococcus quercus (Comstock)
QUERCUS CINEREA Michx.
Acanthococcus quercus (Comstock)
QUERCUS LAEVIS Walt.
Acanthococcus quercus (Comstock)
QUERCUS MYRTIFOLIA Willd.
Acanthococcus quercus (Comstock)
QUERCUS NIGRA L.
Acanthococcus quercus (Comstock)
QUERCUS PALUSTRIS Muenchh.
Acanthococcus quercus (Comstock)
QUERCUS RUBRA L.
Acanthococcus quercus (Comstock)
QUERCUS STELLATA Wang.
Acanthococcus howelli D. Miller & G. Miller
Acanthococcus quercus (Comstock)
QUERCUS VELUTINA Lam.
Acanthococcus quercus (Comstock)
QUERCUS VIRGINIANA Mill.
Acanthococcus quercus (Comstock)
RIBES SP.
Acanthococcus azaleae (Comstock)
RIBES ALPINUM L.
Acanthococcus azaleae (Comstock)
RHIPSALIS CRISPATA (Haw.) Pfeiff.
Acanthococcus coccineus (Cockerell)
RHODODENDRON SP.
Acanthococcus azaleae (Comstock)
RHODODENDRON CATAWBIENSE Michx.
Acanthococcus azaleae (Comstock)
RHODODENDRON INDICUM (L.) Sweet
Acanthococcus azaleae (Comstock)
RHODODENDRON MAXIMUM L.
Acanthococcus azaleae (Comstock)
ROSA SP.
Acanthococcus megaporus D. Miller & G. Miller
SALIX SP.
Acanthococcus quercus (Comstock)
Gossyparia spuria (Modeer)
SALVIA SP.
Acanthococcus mesotrichus D. Miller & G. Miller
SATUREJA RIGIDA Bartram ex Benth.
Acanthococcus mesotrichus D. Miller & G. Miller
SPARTINA SP.
Acanthococcus dennoi D. Miller & G. Miller
Oregmopyga tippinsi D. Miller & G. Miller
SPARTINA ALTERNIFLORA Loisel.
Acanthococcus dennoi D. Miller & G. Miller
SPARTINA PATENS (Ait.) Muhl.
Acanthococcus dennoi D. Miller & G. Miller
Oregmopyga tippinsi D. Miller & G. Miller
TEPHROSIA FLORIDA (Dietrich) C. E. Wood
Oregmopyga parvispina (Chaffin)
ULMUS SP.
Gossyparia spuria (Modeer)
ULMUS AMERICANA L.
Gossyparia spuria (Modeer)
ULMUS CAMPESTRIS L.
Gossyparia spuria (Modeer)
ULMUS RACEMOSA Thomas
Gossyparia spuria (Modeer)
VITIS SP.
Acanthococcus missourii (Hollinger)

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