

A NEW SPECIES OF *ACANTHOCOCCUS*
(HOMOPTERA; COCCOIDEA; ERIOCOCCIDAE)
FROM SUNDEW (*DROSERA*) WITH A KEY TO THE
INSTARS OF *ACANTHOCOCCUS*

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Abstract.—This paper describes the first U.S. species of *Acanthococcus* that possesses dome-shaped setae and lacks a denticle on the claw. The adult male also is unusual in that it has clear areas on the scutum, a character that occurs in the Coccidae and Margarodidae.

Key Words: Scale insect, eriococcin, felt scale, systematics

The Eriococcidae (felt scales or eriococcins) comprises about 54 species in the United States and 450 species in the World (Miller 1991a). Predominant hosts in the U.S. include woody shrubs, trees, and grasses. Several species are serious pests of ornamentals and grass crops.

The purpose of this research is to provide information on the separation of the immature stages of eriococcids and to describe a new species that occurs in boggy situations in Georgia and Florida. Although specimens of this species have been collected on several plants in this habitat, the predominant host is *Drosera*, sundew. This insectivorous group of plants has never been reported as a host of an eriococcid, and plays an unlikely role in this regard because most eriococcids occur in dry habitats. The new eriococcid species is described to make a name available for inclusion in a larger publication on the Eriococcidae of the eastern United States.

METHODS

Terminology follows that of Miller (1984, 1991b) for the adult female and immatures,

and that of Afifi (1968) for the adult male. Abdominal segmentation designations have been changed so that the first visible ventral segment is I. Measurements and numbers are from 10 specimens, when available, and are given as a range with an average in parentheses.

Depositories of specimens are: The Natural History Museum, London (BM); California Department of Food and Agriculture, Sacramento (CDA); Florida State Collection of Arthropods, Gainesville (FSCA); University of California, Davis (UCD); University of Georgia, Griffin (UG); National Museum of Natural History, Washington, D.C. (USNM); Virginia Polytechnic Institute and State University, Blacksburg (VPI).

RESULTS

The composite illustration given in Fig. 1 provides a graphic representation of the first and second instars of *Acanthococcus eriogoni* (Ehrhorn). Although the first instar, second-instar male, and second-instar female are consistently distinct within *Acanthococcus*, the differences have not been

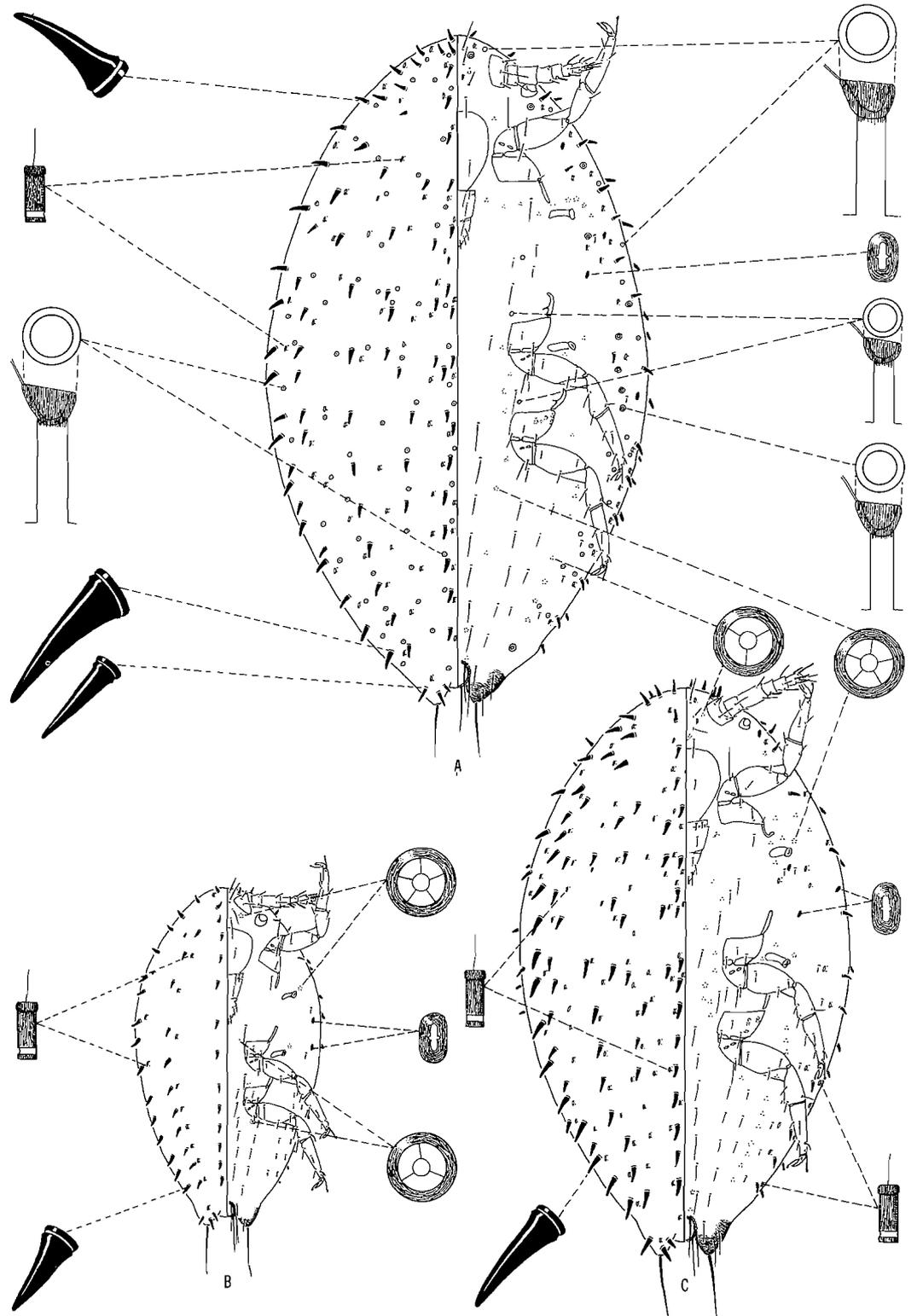


Fig. 1. *Acanthococcus eriogoni* (Ehrhorn). 35 mi. S. Tucson, Santa Rita Range, Pima Co., Arizona, on *Eriogonum wrightii*, H. S. Haskell: A) Second instar male; B) First instar (sexes indistinguishable); C) Second instar female.

clarified in any detail previously. In order to facilitate recognition of the various immature instars, a key is provided.

KEY TO INSTARS OF *ACANTHOCOCCUS* AND MOST ERIOCOCCIDAE

- | | | |
|-------|--|--|
| 1. | Meso- and metathorax without wings or wing pads | 2 |
| - | Meso- and metathorax with wings or wing pads | 5 |
| 2(1). | Macrotubular ducts present | 3 |
| - | Macrotubular ducts absent | 4 |
| 3(2). | Vulva present; abdominal segment V usually with 15 or more dorsal setae (fig. 2) .. | |
| | third-instar female (adult) | |
| - | Vulva absent; abdominal segment V with less than 15 dorsal setae (figs. 1a & 5) .. | |
| | second-instar male | |
| 4(2). | With at least 8 dorsal setae on abdominal segment V (figs. 1c & 3) .. | second-instar female |
| - | With less than 8 dorsal setae on abdominal segment V (figs. 1b & 6) .. | first instar (sexes indistinguishable) |
| 5(1). | Wings well developed; genital capsule heavily sclerotized, with aedeagus (fig. 4) .. | fifth-instar male (adult) |
| - | Wings in form of pads; genital capsule unsclerotized and without aedeagus .. | 6 |
| 6(5). | Wing pads less than 30 μ long; ocular sclerites absent, unsclerotized (not illustrated) .. | third-instar male |
| - | Wing pads more than 40 μ long; ocular sclerites lightly sclerotized (not illustrated) .. | fourth-instar male |

TREATMENT OF SPECIES

Acanthococcus droserae
Miller, Liu, and Howell
NEW SPECIES
Sundew eriococcin

Type material.—Adult female holotype (1 specimen on slide). Right label “HHT-382-72/On Drosera sp./Ware Co., Ga./VIII-16-72/Coll. R. Beshear,” left label “Acanthococcus/droserae/Miller Liu & Howell / HOLOTYPE” (USNM). In addition there are 52 paratypes listed in the “Specimens Examined” section.

Field characteristics.—Occurring at the base of leaves near the main stem of the plant. The body is pink; adult females form white ovisacs.

Adult female (Fig. 2).—*Recognition char-*

acters: Adult female holotype. Mounted 1.1 mm long (paratypes 1.0–1.6(1.2) mm), 0.7 mm wide (paratypes 0.6–0.8(0.7) mm). Anal lobes weakly sclerotized on venter and dorsum; each lobe dorsally with 3 enlarged setae, conical, apices rounded (lateral longest, posteromedial shortest), with 1 or 2 microtubular ducts (paratypes with 1–2(1) duct); each lobe ventrally with 2 slender body setae and 3 sessile pores (paratypes with 3–5(4) pores).

Dorsum with enlarged setae of 2 sizes: Larger size present along body margin, usually with 2 present on margin of each abdominal segment, and on medial areas of abdominal segment IV through head; smaller size restricted to medial and sublateral areas except on posterior abdominal segment where present medially. Largest lateral seta 27 μ long (paratypes 27–30(29) μ), largest medial seta 22 μ long (paratypes 22–24(22) 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). Lateral enlarged setae straight with rounded apices, medial setae with blunt apices dome shaped; small setae cylindrical with blunt or truncate apices. Enlarged setae few, e.g. abdominal segment V with 13 setae (paratypes 11–14(13) setae), with large-sized setae arranged in 2 pairs of longitudinal lines (medial, lateral). Macrotubular ducts of large size, scattered over surface. Microtubular ducts 5 μ long (paratypes 4–5(5) μ), with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, about equal to remaining sclerotized portion; total sclerotized area about 2 times as long as 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 27 μ long (paratypes 27–37(33) μ), on segment III 15 μ long (paratypes 9–15(14) μ); longest posterior anal-lobe seta 110 μ long (paratypes 109–116(111) μ). Enlarged setae present on submargin from segment VI forward to head, with setae on head

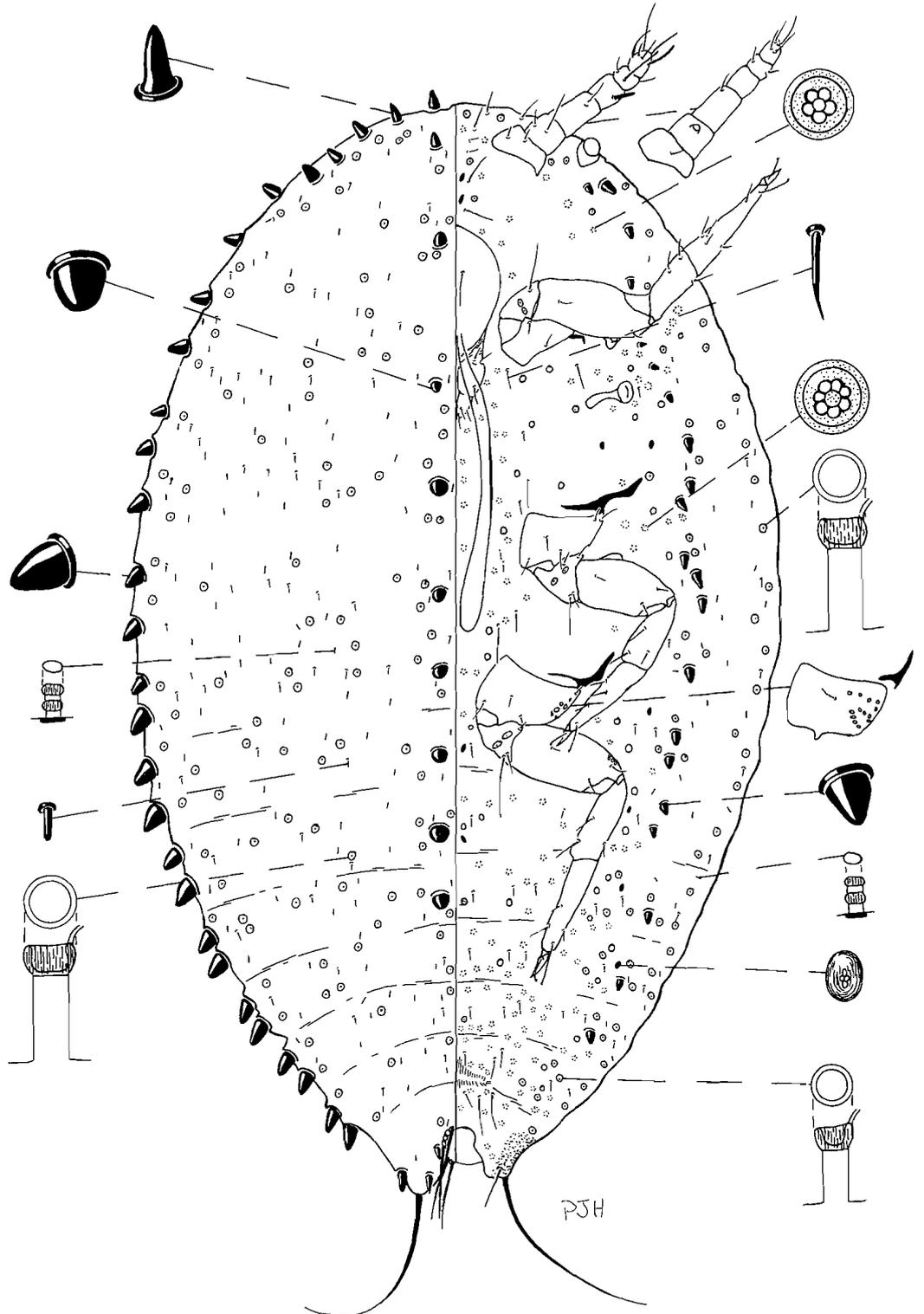


Fig. 2. Adult female (third instar)—*Acanthococcus droserae* Miller, Liu, and Howell. East of Fargo on Highway 177, Ware Co., Georgia, VIII-5-72, on mixture of hosts, R. J. Beshear.

slightly smaller than those on abdomen. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size present on sublateral and medial areas. Microtubular ducts present near body margin. Multilocular pores of 4 kinds: Quinqueloculars present over surface, most abundant on posterior abdominal segments; triloculars, septeloculars, and noneloculars uncommon. Cruciform pores present on sublateral areas of abdominal segment V through head; with 4 pores between antennae and anterior margin of clypeolabral shield (paratypes with 2–5(4) pores).

Legs with translucent pores about $2\ \mu$ long; hind coxae dorsally with 21 and 18 pores (paratypes with 7–32(18) pores), ventrally with 5 (paratypes with 2–5(4) pores); hind femora dorsally with 6 pores (paratypes with 4–8(6) pores) in a cluster near distal apex, 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 as outer apical setae; inner, apical tibial setae slightly more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.77 (paratype 0.75–0.77(0.76))); claws without denticle. Antennae 6-segmented, third segment longest. Segment 6 with 4 or 5 sensory setae; segment 5 with 1 larger than single sensory seta on segment 4.

Variation: Some specimens have large-sized enlarged setae medially on segment V. The relative sizes of the setae on the anal lobes may vary from lateral longest and posteriomedial shortest to lateral longest and anteromedial shortest.

Specimens examined: The above description is based on 49 specimens from 7 localities.

Second-instar female (Fig. 3).—*Recognition characters:* mounted, 0.6–0.7(0.7) mm

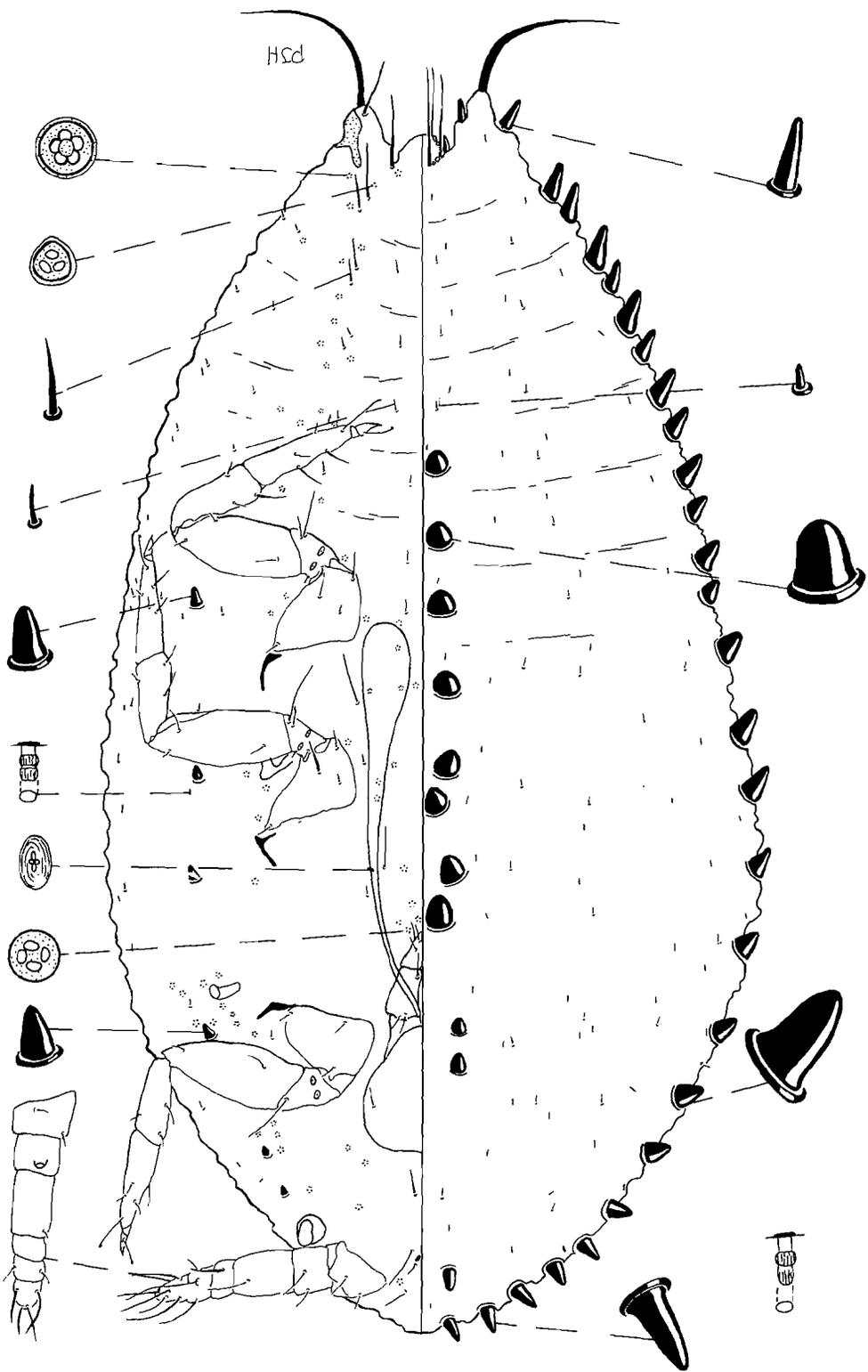
long, 0.4 mm wide. Anal lobes distinctly sclerotized ventrally; each lobe dorsally with 3 enlarged setae, conical, apices rounded (lateral longest, anteromedial shortest), with 1 microtubular duct; each lobe ventrally with 2 slender body setae, without sessile pores.

Dorsum with enlarged setae of 2 sizes: Larger size present along body margin, usually with 2 present on margin of each abdominal segment, and on medial areas of abdominal segment IV or III through head; smaller size restricted to medial and sublateral areas except on posterior abdominal segment where present medially. Largest lateral seta 25–30(27) μ long, largest medial seta 17–20(18) μ long; on abdominal segment II to VIII longest lateral seta 1.2–1.8(1.5) times longer than longest medial seta. Lateral setae straight with rounded apices, medial large-sized setae with blunt apices; small setae cylindrical with blunt apices. Enlarged setae few, e.g. abdominal segment V with 8 setae, large-sized setae arranged in 2 pairs of longitudinal lines (medial, lateral). Macrotubular ducts absent. Microtubular ducts 4–5(4) μ long, with area farthest from dermal orifice sclerotized and divided into 2 parts, apical portion rounded, about equal to remaining sclerotized portion; total sclerotized area about 2 times as long as unsclerotized area; dermal orifice sclerotized. Microtubular ducts loosely associated with both sizes of enlarged setae. Sessile pores absent.

Anal ring dorsal, with 3 pairs of setae.

Venter with longest seta on abdominal segment VIII 27–32(30) μ long, on segment III 7–10(9) μ long; longest posterior anal-lobe seta 104–106(105) μ long. Enlarged setae present on submargin from segment II or mesothorax forward to prothorax, absent from head. Macrotubular ducts absent. Microtubular ducts present near body margin.

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Fig. 3. Second-instar female—*Acanthococcus droserae* Miller, Liu, and Howell. On county road off of Highway 94 between Fargo and Statenville (Bethel Primitive Baptist Church), Echols Co., Georgia, V-18-68, on *Aletris lutea* (?), R. J. Beshear (HHT-170-68).



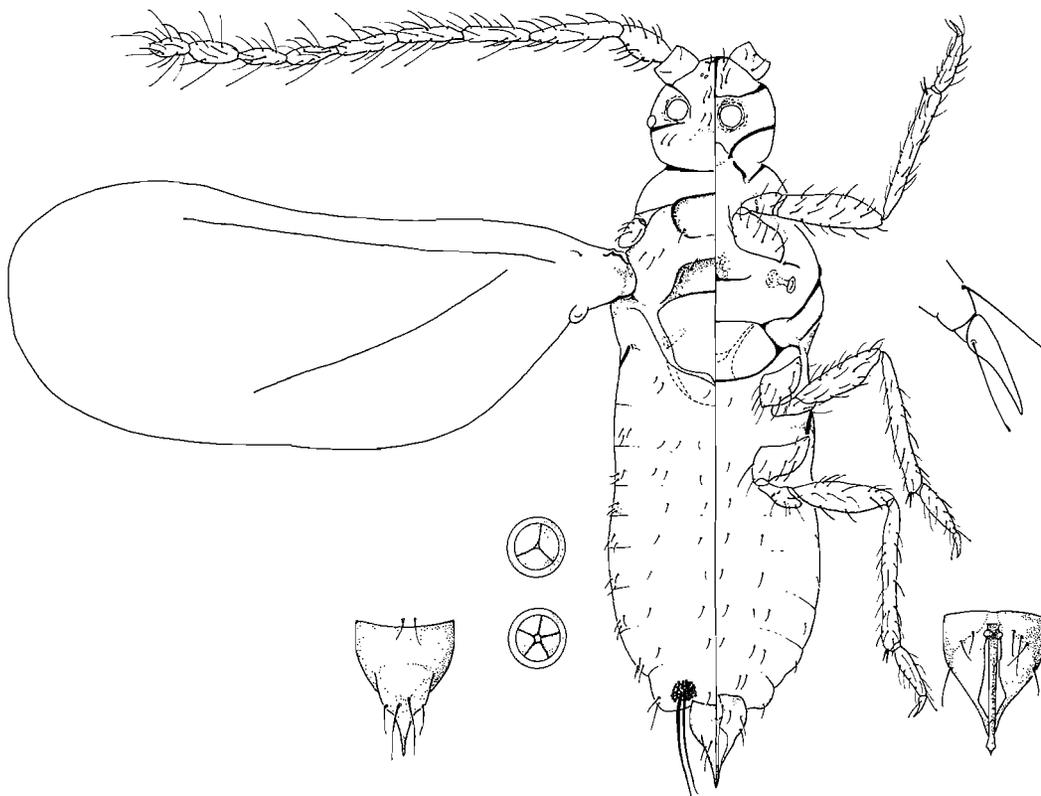


Fig. 4. Adult male (fifth instar)—*Acanthococcus droserae* Miller, Liu, and Howell. East of Fargo on Highway 94, Clinch Co., Georgia, X-13-87, mixture of hosts, R. J. Beshear.

Multilocular pores of 2 kinds: Quinqueloculars present medially and sublaterally on thorax and head, restricted to sublateral areas on abdomen; trilocular pores rare. Cruciform pores uncommon, usually present on head and on metathorax; with 1-2(2) pores between antennae and anterior margin of clypeolabral shield.

Legs without translucent pores; femora with 5 setae; tibiae with 5 setae; tarsi longer than tibiae (hind tibia/tarsus 0.69-0.75(72)); claws without denticle or with very small denticle in 1 specimen. Antennae 6-segmented.

Specimens examined: The description is based on 4 specimens from 2 localities.

Fifth-instar male (adult) (Fig. 4).—*Recognition characters:* Mounted, 0.9-1.1(1.0) mm long, 0.3-0.4(0.3) mm wide. Abdom-

inal segment VIII slightly produced laterally, giving weak lobular appearance.

Dorsum with 1 pair of tail-forming pore clusters; each cluster with 2 elongate, capitate setae, longest seta 141-153(149) μ long; with 33-43(37) multilocular pores in cluster. Multilocular pores in tail-forming pore clusters only, with 3-7 loculi, quinqueloculars most common. X type dermal pores present near dorsal arm of midcranial ridge. Body setae apically acute, slightly shorter than those on venter, in clusters of 3 near each margin of abdominal segment VIII to I, also in transverse rows on abdominal segments VII to II, with 1 seta in medial area and 1 or 2 setae in mediolateral areas, 1 seta medially on segment VIII; setae present on meta- and mesothorax, absent from prothorax; head setae posterior of postocular

ridge and posterior and lateral of dorsal arm of midcranial ridge. Abdominal sclerotization restricted to basal areas surrounding marginal clusters of setae, abdominal tergites unsclerotized. Metapostnotal ridge absent. Scutellar ridge present, not heavily sclerotized. Scutum with oval clear areas anterior of scutellum. Prescutum rectangular, prescutal suture weakly developed. Pronotal ridges well developed; pronotal sclerites absent. Hamolohalterae absent. Mesothoracic wings 862–942(889) μ long, each with 1 seta near base. Postoccipital ridge weakly sclerotized, lateral end bifurcate. Dorsal arm of midcranial ridge thin, extending toward postoccipital ridge. Dorsomedial sclerite unsclerotized. Dorsal eye 20–30(28) μ in diameter. Lateral ocellus 12–15(14) μ in diameter, touching postocular ridge. Ocular sclerite sclerotized near eyes.

Penial sheath 124–140(128) μ long, 86–99(91) μ wide; length/width ratio 1.3–1.5(1.4). Style in lateral view straight, apically acute. Anal opening 17–30(23) μ in diameter. Aedeagus 79–91(87) μ long; apex inflated. Dorsally 2 setae on each side of style; ventrally 3–5(4) setae.

Venter with setae present medially, mediolaterally, and laterally on segments VII to IV, with 1 or 2 setae present on segments VIII, III, and II. Thoracic setae absent; head setae near anterior portion of ventral arm of midcranial ridge. Abdominal sclerotization restricted to sternite VIII. Metathoracic precoxal ridge lightly sclerotized. Prosternum with distinctive pattern of sclerotization, oval or triangular. Mouth tubercle inconspicuous. Preoral ridge heavily sclerotized. Cranial apophysis inconspicuous, or absent. Ocular sclerite unsclerotized except near ventral eye. Ventral eye 27–30(28) μ in diameter.

Pro- and mesothoracic legs about equal in size, metathoracic legs longest. Hind tibia 178–217(202) μ long; hind tarsus 77–89(84) μ long; tibia/tarsus 2.3–2.5(2.4). Slender fleshy setae present on legs and antennae;

capitate setae present on antennal segments 4 to 10. Antennae 10-segmented, 651–787(740) μ long; segment 3 longest, 116–133(124) μ long; segment 10, 52–62(57) μ long, barrel shaped; segment 3/10 1.9–2.5(2.2).

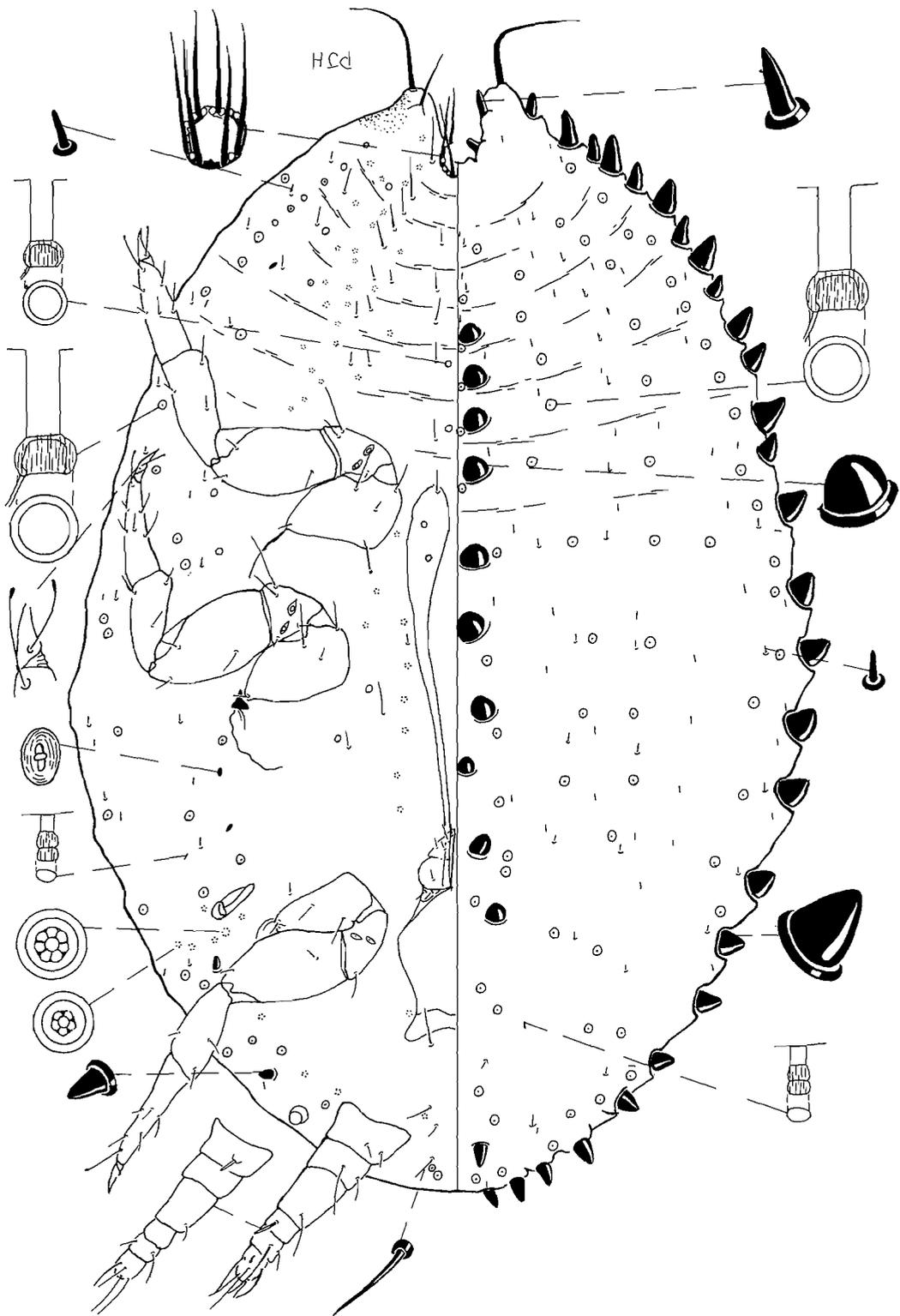
Specimens examined: The above description is based on 7 specimens from 1 locality.

Second-instar male (Fig. 5).—*Recognition characters:* Mounted 0.7–0.8(0.8) mm long, 0.4–0.5(0.5) mm wide. Anal lobes sclerotized ventrally, unsclerotized dorsally; each lobe dorsally with 3 enlarged setae, about same shape, conical, with rounded apices (seta on outer margin longest, anteromedial seta shortest), with 1 microtubular duct; each lobe ventrally with 2 body setae and 1 or 2 sessile pores.

Dorsum with enlarged setae of 2 sizes: Larger size along body margin, usually with 2 on margin of each abdominal segment, and in medial areas of abdominal segment V or IV to head; smaller size in sublateral line and in medial areas of abdominal segments VII to VI or V. Largest lateral seta 22–23(22) μ long, largest medial seta 17 μ long; on abdominal segments II to VIII, longest lateral seta 1.3–1.4(1.4) times longer than longest medial seta. Lateral setae straight or slightly curved, conical, with slightly rounded apices; medial setae of larger size straight, dome shaped, smaller size cylindrical with truncate or blunt apex. Enlarged setae few, e.g. abdominal segment V with 7–8(8) setae, with 2 pair of longitudinal lines of large-sized setae on lateral and medial areas. Macrotubular ducts of large size, scattered over surface. Microtubular ducts 4 μ long, 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 equal to unsclerotized area. Multilocular pores absent.

Anal ring dorsal, with 3 setae.

Venter with longest seta on segment VIII 32 μ long, on segment III 12–14(13) μ long;



longest posterior anal-lobe seta 101–104(102) μ long. Enlarged setae restricted to margin of anterior thorax and sometimes head. Macrotubular ducts of 2 kinds: Larger size same as on dorsum, present along lateral margins; smaller size restricted to posterior 2 or 3 abdominal segments or sublateral areas. Microtubular ducts present along body margin. Multilocular pores of 3 kinds: Quinqueloculars scattered over thorax and head, restricted to sublateral band on abdomen; triloculars and septeloculars rare. Cruciform pores on sublateral areas of head and thorax, 1 specimen with 1 pore present on each side of abdominal segments VII to II; with 1–3(2) pores between antennae and anterior margin of clypeolabral shield.

Legs without translucent pores; femora and tibiae each with 5 setae; inner apical tibial seta more robust than other leg setae; tarsi longer than tibiae (hind tibia/tarsus 0.73–0.76(0.74)); claws without denticle. Antennae 6-segmented, third segment longest. Segment 6 with 5 sensory setae; segment 5 with 1 seta conspicuously longer than single sensory seta on segment 4.

Specimens examined: The description is based on 2 specimens from 1 locality.

First instar (Fig. 6).—*Recognition characters:* Mounted 0.1 mm long, 0.1 mm wide. Anal lobes without sclerotization; each lobe dorsally with 3 enlarged setae, about same shape, conical, with acute apices (seta on outer margin longest, anteromedial seta shortest), without macrotubular ducts; each lobe ventrally with 1 body seta, without sessile pores.

Dorsum with enlarged setae of 2 sizes: Larger size along body margin, with 1 seta on margin of each abdominal segment; smaller size in sublateral and medial lines.

Largest lateral seta 17 μ long, largest medial seta 5 μ long; on abdominal segments II to VIII, longest lateral seta 3.4 times as long as longest medial seta. Lateral setae straight or slightly curved, conical, with acute or slightly rounded apices; medial setae cylindrical, with blunt apices. Enlarged setae few, e.g. abdominal segment V with 6 setae, with no longitudinal pattern of larger setae except on margin. Macrotubular ducts absent. Microtubular ducts 4 μ long, with area farthest from derm sclerotized and divided into 2 parts, apical portion rounded, about equal to length of remaining sclerotized portion; total sclerotized area about equal to unsclerotized area. Multilocular pores absent.

Anal ring dorsal, with 3 setae.

Venter with longest seta on segment VIII 22 μ long, on segment III 5 μ long; longest posterior anal-lobe seta 82 μ long. Enlarged setae, macrotubular ducts and microtubular ducts absent. Multilocular pores of 2 kinds: Quinqueloculars present on each side of body on sublateral areas of each segment from VII to II, on submedial areas of each thoracic segment and on head near posterior margin of clypeolabral shield; septelocular pores present laterad of each spiracle. Cruciform pores on sublateral area of mesothorax; without pores on head.

Legs without translucent pores; femora and tibiae each 5 setae; inner apical tibial seta more robust than other leg setae; tarsi considerably longer than tibiae (hind tibia/tarsus 0.49); claws with small denticle. Antennae 6-segmented, third segment longest. Segment 6 with 4 sensory setae; segment 5 with 1 conspicuously longer than single sensory seta on segment 4.

Specimens examined: This description is based on 1 specimen.

Material studied.—FLORIDA, Clay Co.:

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Fig. 5. Second-instar male—*Acanthococcus droserae* Miller, Liu, and Howell. On county road off of Highway 94 between Fargo and Statenville (Bethel Primitive Baptist Church), Echols Co., Georgia, V-18-68, on *Alettris lutea* (?), R. J. Beshear (HHT-170-68).

Near Green Cove Springs on Highway 17, V-28-76, host unknown, R. J. Beshear (HHT-131-76) (1 ad female) UG. Levy Co.: West of Otter Creek on Highway 24, IV-4-74, VI-4-74, on *Aletris farinosa*, R. J. Beshear (HHT-111-74 and HHT-94-74) (2 ad female on 2 sl) UG.

GEORGIA, Charlton Co.: East of Fargo on Highway 177, II-9-83, II-14-84, on *Drosera* sp., R. J. Beshear (HHT-8-83 and HHT-24-83) (19 ad female on 19 sl) UG, USNM; East of Fargo on Highway 177, II-14-84, on mixed plants including *Drosera* sp., R. J. Beshear (HHT-4-84) (3 ad female on 3 sl) UG. Clinch Co.: East of Fargo on Highway 94, X-13-87, mixture of hosts, R. J. Beshear (HHT-4-87) (4 ad female, 7 ad male, 2 second-instar female on 7 sl) UG. Echols Co.: On county road off of Highway 94 between Fargo and Statenville (Bethel Primitive Baptist Church), V-18-68, on *Aletris lutea* (?), R. J. Beshear (HHT-170-68) (2 second-instar males and 2 second-instar females on 2 sl) USNM. Ware Co.: East of Fargo on Highway 177, III-4-72, VIII-5-72, VIII-16-72, XI-11-72, IX-17-73, mixture of hosts, R. J. Beshear (HHT-111-72, HHT-379-72, HHT-382-72, HHT-462-72, HHT-225-73) (20 ad females, 4 ad males, 1 first instar on 25 sl) USNM, UG.

This species has been collected primarily by bringing bog samples into the Laboratory and placing them in a Berlese Funnel. In all instances, *Drosera* plants were present, but a mixture of other potential hosts also was included in the samples. Ms. Ramona J. Beshear examined *Drosera* specimens in bogs and found specimens of this species at the base of the leaves. She has collected a small number of specimens on *Aletris*, but believes that these were individuals that moved from the *Drosera* host to molt or lay eggs and were incidental.

Comparison with other species.—The adult female of *Acanthococcus droserae* is unique among the North American eriococcid fauna in possessing a medial row of dome-shaped enlarged setae and in lacking a denticle on the claw. The adult male also

is unique by possessing small clear areas on the scutum reminiscent of the well-developed, clear scutal area on soft scale males (Giliomee 1967). This structure has not been reported for any other eriococcid including those described by Afifi (1968) and Miller and González (1975).

ACKNOWLEDGMENTS

We are grateful to the following individuals for their criticisms and comments of this manuscript: Robert L. Smiley and James Pakaluk, Systematic Entomology Laboratory, ARS, USDA, Beltsville, Maryland; John A. Davidson, Department of Entomology, University of Maryland, College Park; Hamlin H. Tippins and Ramona J. Beshear, Department of Entomology, University of Georgia, Griffin. We also acknowledge the efforts of Pamela J. Hollyoak for helping illustrate the adult female, second-instar male and female, and the first instar. Gary Miller helped with the illustration of the adult male. Ramona J. Beshear and Hamlin H. Tippins, University of Georgia, Griffin, deserve special acknowledgement for their discovery of this interesting and unusual species of eriococcid.

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