NEW INFORMATION ON THE RHIZOECUS OF FLORIDA INCLUDING DESCRIPTIONS OF FOUR NEW SPECIES

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ABSTRACT

Four new species of Rhizoeus from Florida are described and illustrated: keysensis, ladoniae, pseudocaucianus and spiculus. Rhizoeus leucosomus (Cockerell) and R. mexicanus (Hambleton) are reported for the first time from Florida. Rhizoeus palestinae (Hambleton), an introduced species, is redescribed and a lectotype is designated. A revised key is presented to the Florida species of Rhizoeus.

The addition of 6 mealybugs (4 of them new species) to the Rhizoeus fauna of Florida brings the total to 15 species for the State. This number includes Rhizoeus leucosomus (Cockerell) and R. mexicanus (Hambleton), here reported for the first time from Florida, and R. palestinae (Hambleton), an introduced species recorded by Dekle (1974). A revision of Hambleton's (1973) key is presented to facilitate identification of these species new to Florida.

Rhizoeus keysensis Hambleton, new species
Figs. 1-6

Adult female: Oval elongate. Length, 0.87-1.35 mm; width, 0.38-0.67 mm. Antennae 6-segmented, rather stout, average length of segments in μ: I, 26; II, 16; III, 29; IV, 14; V, 18; VI, 40; apical segment less than twice as long as wide, with 3 elongate, moderately stout, bluntly tapered sensory setae and 1 spinelike sensory seta; segment V with 1 short, narrow sensory seta. Interantennal space equal to length of antennal segment VI. Eyes hemispherical, 5-6μ wide. Rostrum elongate, 65μ long, 40μ wide; rostral loop extending to insertion of 2nd coxae. Cephalic plate irregularly triangulate, 30μ long, 35μ wide, with 2 vacuoles near center and 4 body setae on or near borders. Dorsal ostiolen inconspicuous, weakly sclerotized.

Legs well developed, length of segments of hind pair in μ: trochanter, 37; femur, 87; tibia, 77; tarsus, 50; claw, 18; claw digitules slender, weakly dilated at tips, extending to end of acute claws.

Circus conical, about 22μ at base, orifice reticulate. Anal lobes unsclerotized, each lobe area with 3 subequal, elongate setae, longest about 55μ, few short body setae, few pores and 1 or 2 cerores. Anal ring about 56μ wide, its 6 slender setae averaging 80μ long, stouter than largest anal-lobe seta; outer portion of anal ring with 25-28 oval or irregularly rounded cells, some with minute spicules, the cells nearly touching end-to-end; inner portion of

1Homoptera: Pseudococcidae.
2Mail Address: 2140 Worthington Dr., Washington, D. C. 20014.
anal ring with 14 large variform cells adjacent to darkened cellular area. Tritubular cerores small, their ducts about 7μ long, 40-48 uniformly distributed on both surfaces, more common submarginally. Multilocular disk pores absent. Tubular ducts 4-5μ long, widely distributed but not abundant on either surface. Trilocular pores sparse across intersegmental areas, elsewhere nearly evenly distributed. Body setae inconspicuous, mostly short, slender.

**Holotype Adult Female—**Florida: Middle Torch Key, 20-X-1972, W. H. Pierce, on *Erithalis fruticosa* (Rubiaceae), in USNM. **Paratypes, 6**, one taken with holotype, 2 from Upper Sugarloaf Key, 19-X-1972, on *Eugenia myrtoides* (Myrtaceae), in Florida State Collection of Arthropods (FSCA); 3 from Key Largo, 5-IV-1974, R. F. Denno and D. R. Miller, on *Morinda roioe* (Rubiaceae), in USNM.

*Rhizoecus keyensis* closely resembles *R. simplex* (Hambleton) but may be readily distinguished by its larger appendages and more elongate anal-ring and anal-lobe setae. In *keyensis* a few oval cells of the outer anal ring contain abbreviated spicules but in most cells they are absent.

**Rhizoecus ladoniae** Hambleton, New Species

Figs. 7-14

**Adult Female:** Ovate. Length, 0.90-1.22 mm; width, 0.59-0.82 mm. Antennae 6-segmented, widely separated, average length of segments in μ: 1, 25; II, 21; III, 26; IV, 18; V, 21; VI, 46; apical segment approximately twice as long as wide, with 3 elongate, tapered sensory setae and 1 shorter, spinelike sensory seta; segment V with 1 small, elongate seta. Interantennal space equal to combined length of segments V-VI. Eyes absent. Rostrum short, stout, 66μ long, 57μ wide; rostral loop extending to or slightly beyond insertion of 2nd coxae. Cephalic plate irregular in outline, weakly sclerotized, sometimes difficult to discern. Dorsal ostioli apparently absent.

Legs robust, average length of segments of hind pair in μ: trochanter, 48; femur, 98; tibia, 78; tarsus, 52; claw, 28; claw digitules elongate, capititate, extending beyond apex of claws.

Circulus small, conical, faveolate, about 14μ wide at base. Anal lobes simple, unsclerotized, without elongate setae. Anal ring conspicuous, averaging 79μ wide, sometimes appearing angulate in outline, its setae averaging 100μ long; outer portion of anal ring with 32-33 large irregularly quadrate, rounded or triangular, rather loosely arranged cells, most bearing individual spicules; inner portion of anal ring with 18-24 large, mostly irregularly triangular cells adjacent to darkened area; cells surrounding posterior anal-ring setae more elongate, crowded. Tritubular cerores of medium size, about 5μ at base, their ducts 6-7μ long, tapered, strongly divaricated, 150-200 widely distributed over derm, more abundant ventrally. Multilocular disk pores absent. Tubular ducts short, stout, with broad collars, their diameter about equal to that of trilocular pore, present on both surfaces, more common on abdominal area. Trilocular pores fairly numerous, evenly distributed. Body setae short, 4-5μ long, stout, mostly bristlelike, uniformly distributed.

**Holotype Adult Female—**Florida: 4 m at Ozello, Citrus Co., 14-IV-1974, D. R. Miller and R. F. Denno, on Gramineae, in USNM. **Paratypes, 6**, 3 taken with holotype, in USNM; 1 Gainesville, 31-X-1965, in *Quercus duff*, Ladonia O’Berry, in Florida State Collection of Arthropods; 1, 4 m SE
Figs. 1–6. *Rhizoecus keyacensis* n. sp., ♂. 1, Anal-ring, right half. 2, Terminal segments of antenna. 3, Rostrum. 4, Cephalic plate. 5, Hind claw. 6, Circulus. Figs. 7–14. *Rhizoecus ludoniae* n. sp., ♀. 7, Tubular duct. 8, Tritubular ceroris, lateral. 9, Terminal segments of antenna. 10, Anal-ring, right half. 11, Rostrum. 12, Circulus, lateral. 13, Hind claw. 14, Body setae, ceroris and trilocular pores on anal lobe.


The absence of elongate anal-lobe setae and presence of short, bristlelike body setae separate this unique species from any known member of
Hambleton: Florida Rhizoeus

*Rhizoeus*. The oval body shape, size and structure of anal ring and large number of ceroses are also distinguishing characters.

I take great pleasure in naming this interesting mealybug in honor of Ladonia O'Berry of the Florida Department of Agriculture who first collected it in 1966.

*Rhizoeus leucosomus* (Cockerell)

This widely distributed species was collected for the first time in Florida 1 mi N. of Southbend, Lower Matecumbe Key, Monroe Co., 6-IV-1974, R. F. Denno and D. R. Miller on unknown grass. Additional records include: Center of Grassy Key, Hwy #1, 7-IV-1974, R. F. Denno and D. R. Miller, on *Dietichio* sp. (Gramineae); Sugar Loaf Key, Route 939, 7-IV-1974, D. R. Miller and R. F. Denno, on grass; Everglades National Park, near Pineland Trail, 9-IV-1974, D. R. Miller and R. F. Denno, on *Muhlenbergia* sp. (Gramineae); Cedar Key, Levy Co., 25-IV-1975, D. R. Miller and R. F. Denno, on *Spartina patens* (Gramineae); 2 mi S. Corkscrew Swamp Sanctuary, Collier Co., 30-IV-1975, R. F. Denno, D. R. Miller and J. A. Davidson, on *Juncus* sp. (Juncaceae).

*Rhizoeus mexicanus* (Hambleton)

This species, identified and recorded as a new State record by Avas B. Hamon (personal communication), was collected at a nursery in Seffner, Hillsborough Co., 5-VII-1978, by C. W. Hale, on roots of *Mammillaria leucocentra* (Cactaceae). It was later collected at Middleburg, Clay Co., 20-VII-1978, by C. B. Lieberman, on leaves of Christmas cactus, *Zygocactus truncatus*. The latter unusual habitat is not characteristic of *Rhizoeus*. Another departure from the root-feeding habitat is that of *R. palestineae* (Hambleton) first reported by Dekle (1974) on narcissus bulbs in storage.

*Rhizoeus palestineae* (Hambleton)

Figs. 15-20


Adult female—Oval elongate. Length, 1.40-2.14 mm; width, 0.62-0.96 mm. Antennae 6-segmented, widely separated, average length of segments in μ: I, 36; II, 22; III, 41; IV, 20; V, 21; VI, 48; apical segment twice as long as wide, with 3 rather narrow, elongate, tapered sensory setae and 1 slender, spinelike sensory seta; segment V with 1 short sensory seta. Interantennal space about equal to combined length of segments I-III. Eyes protuberant, pigmented. Rostrum 77μ long, 61μ wide; rostral loop extending to or slightly beyond insertion of 2nd coxae. Cephalic plate relatively small, irregular in outline, about 23μ long, 19μ wide, with 2 large vacuoles, 3-4 setae on its borders. Dorsal ostiolar with narrow, weakly sclerotized rims.

Legs well developed, of moderate size; average length of segments of hind pair in μ: trochanter, 44; femur, 113; tibia, 97; tarsus, 68; claw, 15; hind tibiae each with 2 large vacuoles; claw digitules elongate, capitate, extending beyond tip of short, stout claws.
Normally 2 conical circuli present on segments III and IV, occasionally a third on V, the large one 30-36 μ wide at base. Anal-lobes unsclerotized, with 3 slender setae, the longest averaging 60 μ long. Anal-ring about 48 μ wide, its setae averaging 68 μ long, slightly stouter than other setae; outer portion of anal-ring with 12-14 narrow, elongate cells, each with a spicule; inner portion of ring with 12 large, irregularly elongate cells adjacent to clouded area of rounded triangular cells. Bitubular ceroses small, their individual ducts 9-10 μ long, 23-25 on head and thorax, 33-36 on abdomen, widely distributed but more common dorsally along median line and submarginal borders. Multilocular disk pores numerous ventrally, approximately 150 on abdominal segments VI-IX, few on V, scattered on head opposite mouth parts, dorsally few on posterior abdominal area. Tubular ducts smaller in diameter than trilocular pore, scattered over entire derm, more common ventrally. Trilocular pores more numerous on head, sparse in ventral thoracic area, elsewhere evenly distributed. Body setae mostly short, fine, inconspicuous.

LECTOTYPE ADULT FEMALE—From the syntypes, I have selected and marked as “lectotype” a slide containing 1 specimen labelled as follows: “In Iris varium, Palestine at D. C., Limber, Colr., Nov. 2, 1937, E. Q. A. 43646”.

PARALECTOTYPES, 19, 3 taken with lectotype mounted on separate slide; 16 from Palestine intercepted at Washington, D. C. as follows: 5 on Arum palacinum (Araceae), 10-X-33, H. Y. Gouldman; 2 on Colchicum decaisnei (Liliaceae), 2-XI-1937, D. P. Limber; 4 on Sternbergia clusiana (Amaryllidaceae), 27-VIII-1934, C. E. Prince, Jr.; 5 on Arum dioscorides, Iris sp., Sternbergia sp., 6-X-1934, D. P. Limber. All in USNM.

Several immature females were also intercepted from Palestine on Cyclamen sp. (Primulaceae) in 1936 and from Iris sofarana from Syria in 1938. One interception was made at Washington, D. C. on lily bulbs from Greece, 12-IX-1937.

Dekle (1974) first recorded R. palestineae in the United States near Doctor’s Inlet, Clay Co., Florida. Its Florida hosts include Narcissus tagetta var. papraceus (Amaryllidaceae), Narcissus sp., Paspalum urvillei and Sporobolus poiretii (Gramineae), Rumex crispus (Polygonaceae), Sonchus oleraceus (Compositae), and unknown grasses.

Rhizoecus palestineae is a fairly large species distinguished by its multiple circuli, small bitubular ceroses and narrow, elongate, spiculate cells in the outer portion of the anal-ring. Some measurements of Florida specimens are larger than specimens received from the Middle East, but morphologically the series are identical. R. palestineae, R. mexicanus (Hambleton) and R. epistatus Hambleton, new species, are the only Florida species with bitubular ceroses. Diagnostic characters for separating the 3 species are given in the key below.

Rhizoecus pseudocaticans Hambleton, NEW SPECIES

Figs. 21-6


ADULT FEMALE: Ovate elongate. Length, 1.85-2.53 mm; width, 0.61-1.20 mm. Antennae 6-segmented, widely separated; average length of segments in μ: I, 38; II, 22; III, 38; IV, 19; V, 22; VI, 50; apical segment twice as long as
wide, with 3 slender, elongate conical setae, and 1 spinelike sensory seta near distal extremity; segment V with 1 narrow, elongate sensory seta. Inter-antennal space less than combined length of segments I-III. Eyes fairly prominent, wider than long. Rostrum of medium size, averaging 79 μ long, 52 μ wide; rostral loop reaching to or slightly beyond halfway to 2nd coxae. Cephalic plate irregularly triangulate, 51 μ wide at base, central area with 2 vacuoles, 6 short setae on or near its borders. Dorsal ostioles with thin rims, lightly sclerotized.

Legs relatively short, stout, average length of segments of hind pair in \( \mu \): trochanter, 40; femur, 102; tibia, 91; tarsus, 57; claw, 18; claw digitules elongate, dilated at tips, extending beyond stout, weakly curved claws.

Circlulus conical, broader than long, about 31\( \mu \) at base, orifice narrow, 7-8\( \mu \) wide. Anal lobes unsclerotized, each with 1 elongate seta about 72\( \mu \) long, 2 shorter setae. Anal-ring prominent, average width 65\( \mu \), its setae about 78\( \mu \) long, longer and stouter than anal-lobe setae; outer portion of anal-ring with 30-33 diversiform cells of various sizes, poorly arranged; inner portion of ring with 10-16 large irregularly elongate cells bordered by an indistinct darkened area. Tritubular cerores small, uniformly distributed, 5 on head, 15-17 on thorax, 25-27 on abdomen, more common dorsally, those on venter occurring submarginally. Multilocular disk pores absent. Tubular ducts minute, 5-6\( \mu \) long, narrower than trilocular pores, confined to abdomen, more common ventrally. Trilocular pores numerous, evenly distributed. Body setae mostly short, fine, inconspicuous.


The first specimens of \( K. \) pseudocacticans collected on Kalanchoe tomentosa erroneously were identified as \( R. \) cacticans (Hambleton) (1976). \( Rhizoecus \) pseudocacticans is closely related to \( R. \) cacticans but is smaller, has shorter appendages, fewer tritubular cerores, smaller rostrum and anal ring. Moreover, the cellular structure of the outer portion of the anal ring consists of diversiform cells. In contrast, \( R. \) cacticans has more numerous, larger subtriangulate to quadrate cells in the anal ring.

\( Rhizoecus \) spicatus Hambleton, new species

Figs. 97-33

Adult female: Elongate ovate. Length, 1.88-1.88 mm; width, 0.58-0.78 mm. Antennae 6-segmented, moderately long, average length of segments in \( \mu \): I, 31; II, 19; III, 31; IV, 17; V, 20; VI, 45; opisthos segment less than twice as long as wide, with 3 slender sensory setae and 1 spinelike sensory seta near apex; segment V with 1 short, narrow sensory seta. Interantennal space comparable to length of segment VI. Eyes prominent, 11-14\( \mu \) wide. Rostrum elongate, 69\( \mu \) long, 45\( \mu \) wide; rostral loop extending halfway or more to insertion of 2nd coxae. Cephalic plate weakly sclerotized, irregular in outline, about 28\( \mu \) long, usually longer than wide, with 4 body setae along its periphery. Dorsal ostioles sclerotized, with some accumulation of pores and setae near rims.

Legs rather long, average length of segments of hind pair in \( \mu \): trochanter, 56; femur, 91; tibia, 84; tarsus, 65; claw, 17; claw digitules weakly dilated at extremities, extending beyond rather stout, acute claws.

Circlulus truncate, variable in size, about 12\( \mu \) wide across finely reticulate orifice. Anal lobes each with some sclerotization and 3 elongate setae, the longest about 52\( \mu \) long, and 4-5 trilocular pores at their base. Anal-ring
about 50 µ wide, its setae slightly stouter and longer than anal-lobe setae, averaging about 60 µ long; outer portion of anal-ring with 12-19 oval elongate cells, each with a spicule, anterior portion may be indistinct; inner portion of ring with approximately same number of larger, more irregular cells next to darkened area of subcircular cells. Bitubular cerores similar to those of *R. disjunctus* McKenzie but larger, about 11 µ long, appearing as conical, tapering spicules over entire body surface, distal portion of exposed ducts shorter than their basal inner structure, more numerous dorsally, scattered on head and thorax and occurring across abdominal segments. Multilocular disk pores on both surfaces, between 66 and 135 on abdominal segments VI-IX, few on dorsum, absent on head and thorax. Tubular ducts smaller in diameter than trilocular pores occurring dorsally and ventrally, more numerous across dorsum of abdominal segments, apparently absent on head and thorax. Few scattered, tiny, mushroomlike bodies on dorsum of head and thorax. Trilocular pores abundant on head, prothorax and posterior abdominal segments, elsewhere evenly distributed except for some poreless clear areas near legs and across intersegmental areas of abdomen. Body setae slender, mostly short, sparse.

**Holotype Adult Female—Florida:** St. Petersburg, Pinellas Co., 8-XI-1972, C. K. Hickman, on *Pleiospilos bolusii* (Aizoaceae), in USNM. **Paratypes,** 4, 1 taken with holotype in FSQA, 3 taken at same location, same host, 5-I-1973, C. K. Hickman, 2 in FSQA, 1 in USNM.

*Rhizoeus spicatus* may be mistaken for *R. disjunctus* McKenzie because their bitubular cerores are of similar shape. The major differences separating these 2 species are as follows: in the larger cerores of *R. spicatus*, the exposed portion of their ducts is shorter than the internal portion. In *R. disjunctus* the reverse of this condition exists. *R. spicatus* has about 3 times as many multilocular disk pores on the venter; its truncate circulus is reticulate, that of the conical circulus of *R. disjunctus* is simple. Also, the tubular ducts occur only on the abdomen in *R. spicatus*, whereas in *R. disjunctus* they are present over the entire body.

Figs. 27-33. *Rhizoeus spicatus* n. sp.,♀. 27, Anal-ring, right half. 28, Terminal segments of antenna. 29, Rostrum. 30, Hind claw. 31, Circulus, dorsal. 32, Bitubular ceroris, lateral. 33, Cephalic plate.
Rhizoecus spinipes (Hambleton)

One specimen of an aberrant female of this species was collected on an unidentified grass on Noname Key, Monroe Co. by D. R. Miller and R. F. Denno, 6-IV-1974. This species normally possesses 23-25 large tributular cerores. Of the 24 cerores present in this specimen, 21 are of the bitubular type, the remaining 3 are tributular. No other abnormalities were observed.

KEY TO THE FLORIDA SPECIES OF RHIZOEUS

1. Multilocular disk pores present .................................................. 2
1'. Multilocular disk pores absent .................................................. 8
2. Bitubular cerores present ......................................................... 3
2'. Tributular cerores present ........................................................ 5
3. Bitubular cerores similar to conical spicules, their ducts usually appearing fused ................................................................. spicatus, new species
3'. Bitubular cerores of usual design, their ducts divaricated ......... 4
4. With 1 truncate, faveolate circulus; cerores large, their ducts stout ................................................................. mexicanus (Hambleton)
4'. Normally with 2 conical, non-faveolate circuli, occasionally with 3; cerores small, their ducts slender .......... palestineae (Hambleton)
5. Antennae 5-segmented; eyes absent; anal lobes roundly protruding, each with 5-7 elongate setae ........... falcifer Künckel d'Herculais
5'. Antennae 6-segmented; eyes present; anal-lobes simple or only weakly protruding, each with less than 5 elongate setae ........... 6
6. Anal-ring setae short, stout, about 35μ long; tributular cerores large, of 1 size; multilocular disk pores mostly with 7 loculi ...... 6'. Anal-ring setae more elongate, 70-90μ long; tributular cerores of 2 or 3 sizes; multilocular disk pores mostly with 10 loculi .......... 7
7. Multilocular disk pores relatively sparse, occurring only ventrally near vulva; tributular cerores of 2 sizes; cephalic plate apparently absent ...................................................... pritchardi McKenzie
7'. Multilocular disk pores more numerous, occurring dorsally and ventrally over entire derm; tributular cerores of 3 sizes; cephalic plate present ........................................ americanus (Hambleton)
8. Eyes absent ................................................................................. 9
8'. Eyes present ................................................................................ 10
9. Anal-lobes without elongate setae; body setae short, stout, bristlelike ................................................................. ladonius, new species
9'. Anal-lobes each with 3 elongate setae; body setae of normal size and shape, not bristlelike ..................................................... floridanus Hambleton
10. Rostrum moderately short, between 50-65μ long, 35-40μ wide; outer portion of anal-ring containing 17-28 cells ......................... 11
10'. Rostrum stout, between 74-84μ long, 52-65μ wide; outer portion of anal-ring containing 28-40 cells ........................................... 12
11. Cells of outer portion of anal-ring mostly small, elongate oval, with spicules; anal ring averaging 46μ wide, its setae about 50μ long ................................................... simplex (Hambleton)
11'. Cells of outer portion of anal-ring larger, mostly ovate to roundly triangulate, usually without spicules; anal-ring av-
Hambleton: Florida Rhizoeus

eraging 50µ wide; its setae about 80µ long .................................................................. keyensis, new species

12. Claw digitules setose, at least 1/2 as long as claws; claws narrow, elongate, about 40µ long; anal ring averaging 87µ wide, its setae about as long as its width .............. maritimus (Cockerell)

12'. Claw digitules usually capitate and exceeding tip of claws; claws stout, averaging 18-25µ long; anal ring averaging 68µ wide, its setae longer than its width ................................................................. 13

13. Cells of outer portion of anal-ring subtriangular to quadrature, rather compactly arranged, in places forming double row; rostrum about 88µ long; with 50-55 tritubular ceroses ..............
.................................................................................................. cacticus (Hambleton)

13'. Cells of outer portion of anal-ring mostly oval, irregularly elongate rounded, more loosely arranged, not forming double row; rostrum 74-78µ long; with 24-48 tritubular ceroses ......................... 14

14. Rostrum elongate; rostral loop reaching to or slightly beyond 2nd coxae; cells of outer portion of anal-ring irregular shaped, mostly of small size, often isolated ..........................................................
.................................................................................................. pseudocacticus, new species

14'. Rostrum stout; rostral loop very short, seldom reaching 2nd coxae; cells of outer portion of anal-ring uniformly shaped, larger, often touching end to end .................. leucosomus (Cockerell)

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LITERATURE CITED


