SELECTED SCALE INSECT GROUPS (HEMIPTERA: COCCOIDEA) IN THE SOUTHERN REGION OF THE UNITED STATES

Author: Miller, Douglass R.

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SELECTED SCALE INSECT GROUPS (HEMIPTERA: COCCOIDEA)
IN THE SOUTHERN REGION OF THE UNITED STATES

DOUGLASS R. MILLER
Systematic Entomology Laboratory, PSI, Agricultural Research Service, U.S. Department of Agriculture
Room 137, Building 005, BARC-West, 10300 Baltimore Avenue, Beltsville, MD 20705

ABSTRACT
This publication includes general discussions on the Conchaspididae, Diaspididae, Eriococcidae, Ortheziidae, Pseudococcidae, and Putoidae. Keys are presented for genera in the families Eriococcidae, Ortheziidae, and Pseudococcidae. Material for each family include introduction, field appearance, diagnosis, life history, important references, illustration of a slide-mounted adult female, and a checklist of the species occurring in the Southern Region of the United States and their distribution by state.

Key Words: scales, identification, southeastern United States

RESUMEN
Esta publicación incluye un discusión general de los Conchaspididae, Diaspididae, Eriococcidae, Ortheziidae, Pseudococcidae, y Putoidae. Las secciones para cada familia incluye una introducción, su apariencia en el campo, su diagnosis, la tabla de vida, referencias importantes, una ilustración de la hembra adulta montada en laminas de microscopio, una lista de las especies que ocurren en la Región sureste de los Estados Unidos y su distribución en cada Estado. Se incluye claves para los Eriococcidae, Ortheziidae, y Pseudococcidae.

Scale insects are phytophagous, feeding by sucking plant juices through a set of stylets. Individual species infest one or more or leaves, fruit, branches, main stems, trunks, or roots. They are widely distributed throughout the world with the exception of the cold extremes of the Arctic and Antarctic. They are found on a wide diversity or vascular plants, but only a few species are found on ferns and mosses. There is some debate about their rank in the classification system but they are considered by many authors to be part of the Order Hemiptera, Suborder Sternorrhyncha, Superfamily Coccoidea (Gullan 2001). The group includes about 7,300 species, 1,050 genera (Ben-Dov et al. 2002), and 20 or more families (especially if the margarodoids are divided into separate family units).

Scale insects are generally small, cryptic creatures that cause major problems in agricultural and ornamental ecosystems. They are commonly transported on plant materials and because of their small size and habit of feeding in concealed areas are frequent invasive species (Miller et al. 2005) causing billions of dollars in damage annually (Kosztarab 1990). Scales are characterized by having a single claw, neotenic adult females, winged but non-feeding adult males, and an unusual form of metamorphosis that normally includes a prepupa and pupa in the adult male (Miller & Kosztarab 1979). Generally there are 3 or 4 instars in the female and 5 instars in the male. Most scale insects produce some kind of wax covering that may entail a mealy substance over the body or elaborate waxy structures that are attached to the body of the insect or are formed as domicile-like structures.

A list of families that occur in the Southern Region of the United States is given below. This, the splitters view of the Coccoidea, is becoming increasingly accepted in the discipline (Koteja 1974). Distribution records are those listed in ScaleNet (Ben-Dov et al. 2005) and have been supplemented with data from the Florida State Collection of Arthropods, Gainesville, FL and National Museum of Natural History, Beltsville, MD. Distribution records include established outdoor and greenhouse infestations, but do not include records of material taken in quarantine and destroyed.

1. Aclerididae (Flat grass scales)—small-sized family, worldwide 57 species
2. Asterolecaniidae (Pit scales)—moderate-sized family, worldwide 223 species
3. Cerococcidae (Ornate pit scales)—moderate-sized family, worldwide 72 species
4. Coccidae (Soft scales)—large-sized family, worldwide 1,130 species
5. Conchaspididae (False armored scales)—small-sized family, worldwide 29 species
6. Dactylopiidae (Cochineal scales)—small-sized family, native to new world 10 species
7. Diaspididae (Armored scales)—largest-scale family, worldwide 2,300 species
False armored scales occur in all zoogeographic regions but probably are introduced in the Australasian and Palearctic regions. Madagascar seems to have the greatest diversity of species. There are 29 species in 4 genera worldwide; in the United States and in the Southern Region there are 3 species in 2 genera (Ben-Dov et al. 2002). Conchaspis angraeci Cockerell is widespread and may be introduced into the US, but Asceloconchaspis milleri Williams appears to be native to southern Florida.

Field Characters: Body hidden under thick wax cover similar to armored scale cover except exuviae not incorporated. Cover not attached to body, often volcano shaped with ridges radiating from scale apex; round or oval in outline. Some covers without conical top, but usually with ridges. Cover of most species white or dirty white. Female body usually white (Mamet 1954) deep red or purple in Conchaspis cordiae (F. William Howard, pers. comm., May 2005).

Diagnosis: Posterior abdominal segments coalesced into pygidium; legs present in all but 1 species; trochanter and femur fused; tibia and tarsus fused; antennae 3- to 5-segmented; ocellar spot on head; 2 genera with metathoracic sclerotizations near hind coxae.

Hosts: Conchaspidids are frequently collected on trees and woody perennials, but they also are found on orchids, euphorbias, and palms.

Life History: False armored scales have 4 female instars and 5 in the male (Miller 1991b). First instars settle on the host but do not produce a cover until the first molt. They usually settle on the leaves or branches of the host.

Important references: Ben-Dov (1974); Ben-Dov (1981); Mamet (1954); Mamet (1959); Williams (1985a); Williams (1992).

Checklist of false armored scales of the Southern Region (asterisk signifies a commonly collected species)

Asceloconchaspis milleri Williams FL
*Conchaspis angraeci Cockerell FL, PR
Conchaspis cordiae Mamet FL, PR.

Diaspididae or Armored Scale Insects (Figs. 2, 3)

Armored scales are the most speciose family of scale insects including about 2,369 species in 380 genera (Ben-Dov et al. 2002). Although there are several classifications of the Diaspididae, there are two groups that contain a majority of the species and are relatively easy to recognize. They often are used as informal groups and are referred to as diaspidines and aspidiotines; they are based on two of the major subfamilies of armored scales, the Diaspidinae and Aspidiotinae (Ferris 1942). There are no obvious characters that separate these groups all of the time, but most species are consistent with the following combination of characters. Diaspidines produce an elongate scale cover and have two-barred macroducts, more than one seta on each antenna, gland spines between the pygidial lobes, bilobed second lobes, and pores near the spiracles. Aspidiotines produce an oval or round cover and have one-barred macroducts, one seta on each antenna, plates between the pygidial lobes, simple second lobes, and no pores near the spiracles.

Field Characters: Wax covering domicile-like, not attached to body; wax covering with exuviae of 1 or 2 immature instars incorporated and usually visible; cover formed of wax manipulated by pygidium, of solid consistency, not filamentous or powdery; often with ventral cover; body elongate or oval; body color white, yellow, purple, red, or orange; occurring on nearly any part of plant, rare on roots and rootlets; some species become buried under plant epidermis.

Diagnosis: Posterior abdominal segments coalesced into wax-forming structure called pygidium; generally with lobes and plates or gland spines on pygidium; legs absent or represented by small sclerotized area; antennae represented by unsegmented knob; labium 1-segmented.
Host plants: Armored scales occur on a variety of host plants encompassing more than 1,380 plant genera in 182 plant families (compiled from Borchsenius 1966). The most prevalent host families are: Fabaceae with about 230 species of armored scales, Poaceae with about 150 species, and...
Euphorbiaceae with 145 species. Armored scales usually are pests on plants that survive for more than a single year including fruit and nut crops, forest trees, and ornamentals such as landscape perennials, shrubs, shade trees, and greenhouse plants. Miller and Davidson (1990) compiled a list of 199 species that are considered pests in at least some part of the world. This figure is only about 8% of the total number of described species and their economic impact is quite significant.

Life History: Diaspidids have 3 female instars and 5 male instars (Miller 1991b). Life histories are quite diverse; there can be from 1 to 6 or more generations each year and overwintering can be in any instar except the third, fourth, or adult male. Second instars and mated adult females are probably the most common. In many species, the number of generations and overwintering stages can vary depending on the climate. Eggs or first instars (=crawlers) are laid under the scale cover and a small slit is present at the posterior end of the cover that allows the crawlers egress to the outside. Scale cover formation is an interesting process that usually involves the incorporation of the crawler and second-instar exuviae. Several groups are pupillarial, i.e., the adult female remains inside of the hardened second instar exuviae. Dispersal is undertaken by the first-instar crawler either passively by air movement or actively by crawling. The first instar is the only life stage that has legs with the exception of the third, fourth, and adult male. Males only incorporate the shed skin of the crawler into their cover; the exuviae of the other instars are kicked posteriorly in the cover (Miller & Davidson 2005).

Important references: Balachowsky (1948, 1950, 1955, 1954); Ben-Dov & German (2003); Borchsenius (1966); Danzig (1993); Ferris, Miller and Howard (1990) compiled a list of 199 species that are considered pests in at least some part of the world. This figure is only about 8% of the total number of described species and their economic impact is quite significant.

Checklist of Armored Scales of the Southern Region (asterisk signifies a frequently collected species)

**Abgrallaspis colorata** (Cockerell) FL, NC, SC, TX
*Abgrallaspis cyanophylli* (Signoret) FL, GA, LA, MS, PR, TX
**Abgrallaspis ithace** (Ferris) GA, TN, VA
Abgrallaspis liriodendri Miller and Howard LA
Abgrallaspis perseae Davidson GA, TX
Acutaspis agavis (Townsend and Cockerell) FL, TX
Acutaspis albopicta (Cockerell) TX
Acutaspis aliena (Newstead) FL, PR
*Acutaspis morrisonorum* Kosztarab AL, AR, FL, GA, LA, NC, PR, TN, VA
Acutaspis perseae (Comstock) AL, FL, GA, LA, MS, SC, TN, TX
Acutaspis schutiformis (Cockerell) TX
Acephaspis tridentata (Ferris) TX
Andaspis hawaiensis (Maskell) FL
Andaspis mackieana (McKenzie) FL
Andaspis punicea (Laing) FL
Annulaspis polygona Ferris TX
Aonidia atlantica Ferris AL, FL, GA
Aonidia shastae (Coleman) TX
*Aonidiella aurantii* (Maskell) FL, LA, MS, PR, TX
*Aonidiella citrina* (Coquillett) FL, TX
Aonidiella coniferi McKenzie PR
Aonidiella inornata McKenzie PR, TX
Aonidiella orientalis (Newstead) FL, PR
*Aonidiella taxus* Leonard AL, FL, GA, LA
*Aonidomyutilus albus* (Cockerell) FL, PR
Aonidomyutilus concolor (Cockerell) TX
Aonidomyutilus crooki (Ferris) FL, GA, VA
*Aonidomyutilus hyperici* Ferris GA, FL, GA, MS, NC, VA
Aonidomyutilus peninsularis (Ferris) TX
Aonidomyutilus sabatius Tippins AL, GA
*Aonidomyutilus solidaginis* (Hoke) AL, FL, GA, LA, MS, SC, TN, VA
Aspidaspis gainesi McDaniel TX
Aspidiella hartii (Cockerell) PR
*Aspidiella sacchari* (Cockerell) FL, PR, TX
*Aspidiotus destructor* Signoret FL, GA, PR
Aspidiotus exciscus Green FL, PR
Aspidiotus marsiaci AL, FL, GA
*Aspidiotus nerii* Bouché AL, FL, GA, LA, MS, PR, TX
*Aulacaspis rosae* Bouché AL, FL, GA, LA, PR, SC, VA
*Aulacaspis tubercularis* Newstead FL, PR
*Aulacaspis yasumatsui* Takagi FL, PR
*Carulasia juniperi* Bouché GA, VA
*Carulasia minima* (Signoret) AL, FL, GA, LA, NC, TN, TX, VA
Chionaspis acercola Hollinger GA, NC, TX
*Chionaspis americana* Johnson FL, GA, LA, MS, TN, TX, VA
Chionaspis caraya Cooley FL, LA, NC, VA
Chionaspis corni Cooley LA, VA
Chionaspis etrusca Leonardi TX
Chionaspis floridensis Takagi FL
*Chionaspis furfura* (Fitch) FL, GA, KY, LA, MS, NC, TN, TX, VA
*Chionaspis gleditsiae* Sanders FL, LA, MS, NC, TN, TX, VA
Chionaspis hamoni Liu and Kosztarab FL
*Chionaspis heterophyllae* Cooley AL, FL, GA, LA, MS, NC, TN
*Chionaspis kosztarabi* Takagi and Kawai FL, GA, MS, NC, SC, TN, VA
Chionaspis lintneri Comstock FL, LA, TX
Chionaspis longiloba Cooley AL, AR, FL, LA, TX
Chionaspis nyssae Comstock AL, FL, GA, LA, MS, NC, SC, TX, VA
*Chionaspis pinifoliae* (Fitch) AL, FL, GA, LA, TN, TX, VA
Chionaspis platanii Cooley LA, NC, TX, VA
*Chionaspis salicis* (Linnaeus) AL, AR, FL, LA, MS, NC, TN, TX, VA
Chionaspis styracis Liu and Kosztarab FL, GA, MS
Chionaspis triformis Tippins and Beshar FL, GA
Chortinaspis cotanni McDaniel TX
Chortinaspis divaricata Ferris FL, GA
Chortinaspis frankliniana Ferris TX
Chortinaspis graminella (Cockerell) FL, GA, TX
Chortinaspis subhorntina (Laing) FL, MS, TX
*Chrysomphalus aonidium* (Linnaeus) AL, FL, GA, LA, MS, PR, TX
*Chrysomphalus bifasciculatus* Ferris AL, GA, LA, NC, SC, TX, VA
*Chrysomphalus dictyospermi* (Morgan) FL, GA, LA, MS, PR, TX
Fig. 2. Diaspidinae—*Lepidosaphes pallida* (Maskell): Unpublished illustration by Davidson.
Ferrisidea magna

Fiorinia externa

Epidiaspis tillandsiae

Dynaspidiotus californicus

Dynaspidiotus britannicus

Duplaspidiotus claviger

Diaspis texensis

Diaspis radicicola

Diaspis toumeyi

Duplaspidiotus tesseratus

Duplaspidiotus fossor

Duplachionaspis divergens

Fiorinia pinicola Maskell GA

Fiorinia theae Green AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, TX, VA

Fissuraspis ulmi (Hoke) AR, FL, GA, MS, TX

Froaggatiella penicillata (Green) AL, FL, GA, LA, MS, PR, TX

Furcaspis biiformis (Cockerell) FL, PR

Geodiaspis arundinariae Tippins and Howell GA

Gymnaspidioidea aechmeae Newstead AL, FL, LA, PR

Haliaspis arecibo Howell PR

Haliaspis asymmetrica (Ferris) FL, GA, NC

Haliaspis litoralis (Ferris) TX

Haliaspis mackenziei (McDaniel) TX

Haliaspis nakaharai Howell PR

Haliaspis pennsularis Howell FL

Haliaspis spartinae (Comstock) FL, GA, SC, TX, VA

Haliaspis texana Liu and Howell TX

Haliaspis unioele Takagi FL, GA, LA, SC

*Hemiberlesia lataniae (Signoret) AL, FL, GA, LA, MS, NC, SC, TN, TX

*Hemiberlesia populare (Marlatt) TX

*Hemiberlesia rapax (Comstock) AL, FL, GA, LA, MS, PR, SC, TX, VA

Hemigymnaspidioidea eugeniae (Lindinger) PR

Hovardia bicalvis (Comstock) LA, PR

*Ischnaspis longirostris (Signoret) FL, GA, LA, PR

Kuwansapis hokasai (Kuwana) FL, GA

Kuwansapis hovardi (Cooley) FL, GA, LA

Kuwansapis linearis (Green) PR

*Kuwansapis pseudoleucus (Kuwana) AL, FL, GA, LA, SC

Kuwansapis verniformis (Takahashi) FL

Lapazia obscura Howell and Beeshear TX

Lepidosaphes beckii (Newman) FL, GA, LA, MS, PR, TN, TX

Lepidosaphes boguschi McDaniell TX

Lepidosaphes camelliae (Hoke) AL, FL, GA, LA, MS, SC, TX, VA

Lepidosaphes conchiformis (Gmelin) PR

Lepidosaphes conchiformis (Gmelin) PR

Lepidosaphes neusteadii (Sulci) FL, MS

Lepidosaphes palida (Maskell) FL, GA, LA, MS, VA

Lepidosaphes pinnaformis (Bouché) FL

Lepidosaphes rubrovestita Cockerell PR

Lepidosaphes tokionis (Kuwana) MS, PR

Lepidosaphes ulmi (Linnaeus) FL, GA, LA, MS, NC, SC, TN, VA

Lepidosaphes vermilionus (Beeshear) TX

Lepidosaphes yananica Kuwana GA, TN, VA

Lopholeucaspis cockerelli (Grandpre and Charmoy) FL, PR

Lingaspidius floridanus Ferris FL

Lophosticaspis japonica (Cockerell) VA

Melanaspis arundinariae Deitz and Davidson SC

Melanaspis bromelis (Leonardi) FL, PR

Melanaspis coccoloba (Ferris) FL, PR

Melanaspis deliquecens Ferris TX

Melanaspis delicata Ferris TX

Melanaspis leucaspis Ferris TX

Melanaspis elegans McKenzie LA, TX

Melanaspis jamacana (Ferris) FL

Melanaspis latistygia Ferris TX

Melanaspis lilacinata (Cockerell) TX

Melanaspis marlattii (Parrott) FL, GA, TX
Melanaspis mimosa (Comstock) FL
Melanaspis nigropunctata (Cockerell) PR, TX, VA
*Melanaspis obscura (Comstock) AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, TX, VA
Melanaspis odontoglossi (Cockerell) FL, PR
Melanaspis pseudoponderosa Deitz and Davidson FL
Melanaspis smilacis (Comstock) FL, GA, LA, MS, NC, SC, TX, VA
Melanaspis texana McKenzie FL, PR
*Melanaspis tenebricosa (Comstock) AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, TX, VA
*Morganella cuereonis (Cockerell) FL, GA, LA, MS, SC, TX
Morganella longispina (Morgan) FL, PR
Myctetasapis apicata (Newstead) TX
Myctetasapis defectopalpus Ferris FL, TX
Myctetasapis personata (Comstock) FL, PR
Myctetasapis sphaerioides (Cockerell) LA
Neopinnaspis harperi McKenzie FL, GA
Niveaspis ilicis (Hoike) GA, MS, TX
Oceanaspisidiotus araucariae (Adachi and Fullaway) FL, PR
*Oceanaspisidiotus spinosus (Comstock) AL, FL, GA, LA, MS, PR, TX
Odonaspidiotus benardi Balachowsky TX
Odonaspidiotus floridanus Ben-Dov FL
Odonaspidiotus litorosa Ferris TX
Odonaspidiotus minima Howell and Tippins GA
*Odonaspidiotus ruthae Kotinsky AL, AR, FL, GA, LA, MS, NC, PR, SC, TX
Odonaspidiotus saccharicuicis (Zehntner) AL, FL, PR, TX
Odonaspidiotus secreta (Cockerell) LA
Odonaspidiotus texana Ben-Dov TX
Opuntiaspis carinata (Cockerell) FL
Opuntiaspis javanensis Green FL
Palpinaspis quohogiformis (Merrill) FL, PR
Parlatoriaspis chinenis (Marlatt) FL
*Parlatoria camelliae Comstock AL, FL, GA, LA, MS, NC, SC, TX, VA
Parlatoria cinerea Hadden PR
Parlatoria crotonis Douglass FL, LA, PR
*Parlatoria perguniand Comstock AL, FL, GA, LA, MS, NC, PR, SC, TX, VA
*Parlatoria proteus (Curtis) FL, GA, LA, MS, PR, TN, TX
Parlatoria pseudaspidiotus Lindinger FL, PR, TN
Parlatoria theae Cockerell GA, NC, TX, VA
Parlatoria zizipe (Lucas) FL, PR
Pelliculaspis celtis McDaniel TX
*Pinnaspis apodiformis (Signore) AL, AR, FL, GA, KY, LA, MS, NC, PR, SC, TN, TX, VA
Pinnaspis buxi (Bouché) FL, PR
*Pinnaspis strachani (Cooley) AL, FL, GA, LA, MS, PR, TX
Praecocaspis diversa Ferris FL
Protodiaspis emoryi Ferris TX
Protodiaspis lobata Ferris TX
Protodiaspis varia Hoke AR, MS, TN, TX
*Pseudaonidia duplex (Cockerell) AL, FL, GA, LA, MS, TX, VA
*Pseudaonidia paeniae (Cockerell) AL, AR, FL, GA, LA, MS, NC, SC, TX, VA
Pseudaonidia trilobitiformis (Green) FL, PR
*Pseudoparlatoria cockerellii (Cooley) AL, GA, LA, SC, TX, VA
*Pseudoparlatoria pentagona (Targioni Tozzetti) AL, FL, GA, LA, MS, NC, PR, SC, TN, TX, VA
*Pseudoparlatoria prunicina (Maskell) AL, FL, LA, MS, NC, VA

Pseudischnaspis boweryi (Cockerell) FL, PR
Pseudoparlatoria oestreata Cockerell FL, PR
*Pseudoparlatoria parlatorioides (Comstock) AL, FL, GA, PR, SC, TX
Pseudoparlatoria tillandsiae Tippins FL, GA, SC
Quernaspidiotus insularis Howell AR, FL, GA, LA, TX
Quernaspidiotus quercica Tippins and Beshear GA
*Quernaspidiotus quercus (Comstock) LA, FL, GA, TX
Radionaspis indica (Marlatt) FL, PR
*Rhizaspidiotus dearnessi (Cockerell) AL, FL, GA, NC, SC, TX, VA
Rutherfordia major (Cockerell) FL, PR
Selenaspidus artuculatus (Morgan) FL, PR
Situlaspis condalacia (Ferris) TX
Situlaspis yuccae (Cockerell) FL, TX
Stramenaspis kellogii (Coleman) TX
Tugionia bigeloviae (Cockerell) TX
Tugionia yuccarum (Cockerell) TX
Thysanofootoria nepheii (Maskell) FL
*Unaspis citri (Comstock) FL, GA, LA, MS, PR, VA
*Unaspis euonymi (Comstock) AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, TX, VA
Velataspis asterias Ferris TX
Velataspis dentata (Hoike) AL, FL, GA, LA, MS, TN, TX
Velataspis mimosarum (Cockerell) TX
Vinculas virgata (Ferris) PR
Xerophilaspis prosopidis (Cockerell) TX

Eriococcidae or Felt Scales (Fig. 4)

Felt scales occur in all zoogeographic regions but have very poor representation in the Afrotrropical and Oriental regions and are very abundant in New Zealand and Australia. There are 542 species in 69 genera; in the United States there are 80 species in 10 genera; in the Southern Region including Puerto Rico there are 49 species in 7 genera (Ben-Dov et al. 2002). Several species are occasional pests in the Southern Region including Eriococcus azalea on azaleas, E. coccineus on cactus especially Mammillaria, E. quercus on oaks, and E. spurius on elms.

Field Characters: Felt scales are very diverse and comprise a number of apparently unrelated groups (Cook et al. 2002). The most common eriococids in the U.S. are those of the Eriococcus type. They produce a white, gray, or yellowish ovisac that encloses the pyriform body of the adult female. Body color varies from pink or red to purple, green, or brown. The posterior end of the sac has a small opening that allows the first instars to escape. Other eriococids occur under the bark of the host, produce little or no ovisac secretion and often are pink or red. Many species produce galls including one of the most interesting genera Apiomorpha which induces very ornate structures on various species of eucalyptus (Cook & Gullan 2002).

Diagnosis: Because of the great diversity and lack of monophyly of this family (Cook et al. 2002) there is no single diagnostic character. Characters that are often found in felt scales include: microtubular ducts; strongly protruding anal lobes; conical setae; cruciform pores; translucent pores on hind legs (Miller & McKenzie 1967).
Hosts: Eriococcids occur on a wide diversity of hosts including trees, shrubs, and even grasses. They are found on all parts of the host with the possible exception of small diameter rootlets. The greatest diversity in the southern hemisphere is on older families such as the Myrtaceae whereas...
in the northern hemisphere they are most diverse on more advanced plant groups such as the Asteraceae (Hoy 1962; Miller 1969).

Life History: Felt scales have 3 instars in the female and 5 in the male (Miller 1991b). Most eriococcus-type species have 1 or 2 generations each.
year. The overwintering stage usually is the adult female or egg in the ovisac. First instars appear in early spring and settling often occurs within hours of emergence from the ovisac. Second-instar males feed for a short period then produce a narrow felt sac that encloses the body. Development of the prepupa, pupa, and adult male occurs within this sac. Soon after molting, the adult female mates and produces the ovisac several days later. Usually 50 to 100 eggs are laid. Some eriococcids have very unusual life histories. One example is the gall-inducing genus *Apionomorpha* which can have females that live for a year or more and produce separate male galls that often are induced on the gall of the female (Cook 2001; Cook & Gullan 2002). Important references: Cook (2001); Cook et al. (2002); Ferris (1955); Gill (1993); Gullan (1984); Hoy (1962, 1963); Miller & Gimpel (2000).

**Checklist of Felt Scales of the Southern Region**

(asterisk signifies a frequently collected species)

- **Apizoccocus idastes** Ferris TX
- **Cornoculus cornutus** Ferris TX
- **Cryptococcus fagusuga** Lindinger TN, VA
- **Cryptococcus williamsi** Kosstarab VA
- **Eriococcus acius** (Miller and Miller) FL, GA
- **Eriococcus araucariae** Maskell FL, TX, PR
- **Eriococcus arenariae** (Miller and Miller) SC
- **Eriococcus arenosus** Cockerell TX
- **Eriococcus azalea** Comstock AL, FL, GA, LA, MS, NC, SC, TN, TX, VA
- **Eriococcus besheareae** (Miller and Miller) FL, GA, SC
- **Eriococcus boguschi** McDaniel TX
- **Eriococcus carolinae** Williams NC, VA
- **Eriococcus chilos** (Miller and Miller) VA
- **Eriococcus coccineus** Cockerell FL, TX, VA
- **Eriococcus cryptus** Cockerell TX
- **Eriococcus davidsoni** (Miller and Miller) FL
- **Eriococcus dennoi** (Miller and Miller) AL, FL, GA, SC, VA
- **Eriococcus droraeae** (Miller, Liu, and Howell) FL, GA
- **Eriococcus dubius** Cockerell AL, TX
- **Eriococcus eoriogoni** Ehrhorn FL
- **Eriococcus euphoriae** Ferris TX
- **Eriococcus herbergi** McDaniel TX
- **Eriococcus houelli** (Miller and Miller) FL, GA, SC, VA
- **Eriococcus hoyi** (Miller and Miller) TX
- **Eriococcus kemptoni** Parrott AL, GA, MS, TX, VA
- **Eriococcus larreae** Parrott and Cockerell TX
- **Eriococcus leptopus** (Miller and Miller) GA
- **Eriococcus megapurus** (Miller and Miller) FL, GA, SC, VA
- **Eriococcus mesotrichus** (Miller and Miller) FL, GA, LA, SC
- **Eriococcus microtrichus** (Miller and Miller) TX
- **Eriococcus missouri** Hollinger GA, LA, MS, VA
- **Eriococcus monotrichus** (Miller and Miller) FL, GA
- **Eriococcus nudulus** (Ferris) TX
- **Eriococcus oligotrichus** (Miller and Miller) GA
- **Eriococcus ophius** (Miller and Miller) FL, GA
- **Eriococcus quercus** (Comstock) AL, FL, GA, LA, MS, TX, VA
- **Eriococcus smithi** Lobdell FL, GA, LA, MS, SC, TX
- **Eriococcus sparius** (Modeer) AL, AR, LA, TN, TX, VA
- **Eriococcus stellatus** McDaniel TX, VA
- **Eriococcus texanus** King TX
- **Eriococcus tinsleyi** TX
- **Eriococcus tosotrichus** (Miller and Miller) GA
- **Hypericicoccus hyperici** (Ferris) AL, FL, GA, TN
- **Ovaticoccus neglecta** (Cockerell) TX
- **Ovaticoccus parvispina** (Chaffin) FL, TX
- **Ovaticoccus strongyla** Miller and Miller GA
- **Ovaticoccus tippi** Milller and Miller AL, FL, GA, MS
- **Ovaticoccus adoxus** Miller and Miller TX
- **Ovaticoccus agavium** (Douglas) TX

**Ortheziidae or Ensign Scales (Fig. 5)**

Ensign scales occur in all zoogeographic regions of the world. There are 198 species and 20 genera worldwide; in the United States there are about 30 species in 7 genera; and in the Southern Region there are 17 species in 6 genera (Ben-Dov et al. 2002).

**Field Characters:** Adult females with a thick wax ovisac that is attached to the abdomen and not the host; body adorned with patches of thick wax giving an ornate, elegant appearance; legs and antennae large and dark (Kozár 2004).

**Diagnosis:** Anal ring on dermal surface, with pores and setae; apex of antenna with thick terminal seta; abdominal spiracles present; eyes stalked; predominant pore type quadrilocular; usually with ovisac band around perimeter of ventral abdomen (Kozár 2004).
Hosts: Ortheziids occur on a broad diversity of host plants ranging from mosses and fungi to grasses and woody shrubs, even on small herbaceous plants (Morrison 1925, 1952).

Life History: Ensign scales have 4 instars in the female and most likely 5 instars in the male (Miller 1991b). It is unknown if the prepupa is mobile like most margarodoid groups or is seden-
tary like other scale insects. The life history of these scales is not well described. In the greenhouse on coleus, *Orthezia insignis* (Brown) could complete a complete life cycle in 30 days and reproduction was strictly parthenogenetic. Offspring were deposited over 24 days and from 80-102 nymphs were produced per female (Shivakumar & Lakshmikantha 2001). Normally feeding on the foliage of the host.

Important References: Kozár (2004); Miller et al. (2005); Morrison (1925, 1952).

Notes: In 2004, a book was completed on the Ortheziidae of the world by Ferenc Kozár. Many new genera and species are included from most areas of the world. The *Orthezia* species groups used by Morrison (1952) are now treated as genera, e.g., the graminis species group is now *Graminorthelia*, so the number of described genera has nearly doubled.

**KEY TO ENSIGN SCALE GENERA IN THE SOUTHERN REGION**

1. Tibiae and tarsi separate .......................................................... 3
   Tibiae and tarsi fused .......................................................... 2

2(1). Antennae 3- or 4-segmented; first 2 segments smaller or equal to other segments .............................................. *Newsteadia*
   Antennae 6- or 7-segmented; first 2 segments largest .......................................................... *Insignorthezia*

3(1). With rows of setae inside of ovisac band .......................................................... 4
   Without rows of setae inside of ovisac band. .......................................................... *Praelongorthezia*

4(3). Head without dorsal sclerotized plates .......................................................... 5
   Head with dorsal sclerotized plates. .......................................................... *Graminorthelia*

5(4). 7 or fewer pairs of abdominal spiracles .......................................................... 8
   8 pairs of abdominal spiracles. .......................................................... *Orthezia*

Pseudococcidae or Mealybugs (Fig. 6)

Mealybugs occur in all zoogeographic regions of the world and are abundant in most ecosystems. There are 1,989 species and 271 genera worldwide; in the United States there are 351 species in 48 genera; and in the Southern Region there are 155 species and 37 genera (Ben-Dov et al. 2002).

Field Characters: Adult females are often characterized by a white, mealy or powdery secretion that covers the body. Species that occur in concealed habitats such as grass sheaths either lack this secretion or have only small amounts of it. Frequently marginal areas of the body have a series of protruding lateral wax filaments. These filaments may be absent, confined to the posterior 1 or 2 abdominal segments, or occur around the entire body perimeter. A filamentous secretion is often produced that encloses the eggs and at least part of the body (McKenzie 1967).

Diagnosis: Look for the following combination of characters; none are present in all species. With ostioles; cerarii, when present, usually present at least on anal lobe; 1 or more circuli; swirled-type trilocular pores; translucent pores on hind legs; 2 pores on each surface of trochanter; without basal denticle on claw. Other characters to consider are: trochanter pores parallel to front edge of femur, not oriented transversely; 3 labial segments; usually 3 pairs of anal-ring setae; more than 4 setae on tibia; tubular ducts without invagination (Williams 2004; Miller et al. 2005).

Notes: No single character can be used to determine a specimen as a pseudococcid. Mealybugs are a large and diverse group and exceptions occur for every character. There are species without ostioles, cerarii, circuli, trilocular pores, and translucent pores. Although the family is distinct, the only way that it can be diagnosed is by using a combination of characters (Danzig 1986).

Hosts: Based on an analysis of the host information in the mealybug catalogue by Ben-Dov (1994), mealybugs occur on species in about 250 families of host plants. The most common host family is Poaceae with 585 species. The Asteraceae is a distant second with 250 species. The top ten most common host families are Fabaceae 225; Rosaceae 116; Rubiaceae 101; Euphorbiaceae 97; Myrtaceae 94; Labiatae 85; Moraceae 82; Cyperaceae 75. It is interesting that grasses and composites are such...
important hosts of mealybugs, but are far less common as hosts of armored scales. This might be explained by the tendency for mealybugs to occur on herbaceous plants rather than woody plants. There are surprisingly few mealybugs on families such as Salicaceae, Pinaceae, and Betulaceae.

Fig. 6. *Pseudococcus maritimus* (Ehrhorn): Illustration from Miller, Gill, and Williams (1984).
Life History: Mealybugs have 4 female instars and 5 instars in the male (Miller 1991b). Mealybugs have a diverse array of life history strategies from occurring in grass blade sheaths, to feeding on rootlets, to occurring exposed on leaves. Thus any generalized life history will have many exceptions. Many mealybugs overwinter as second instars, although adults, first instars, and eggs also can play this role. Eggs or first instars are laid by the adult female. Eggs are normally laid in an ovisac that can enclose all or part of the body of the female. Most species that lay first instars rather than eggs lack any substantial ovisac. Even though the majority of species have legs in all instars, most mealybugs remain relatively stationary throughout their life; a few species such as members of the genus Phenacoccus, move to different areas of the host for overwintering, feeding, oviposition, and molting. Most species have 1 or 2 generations a year, although some are reported to have as many as 8 generations in the greenhouse. Both parthenogenetic and sexual species are common (McKenzie 1967).

Important references: Ben-Dov (1994); Ben-Dov & German (2005); Danzig (1986); Ferris (1950, 1953); Tang (1992); Williams & Watson (1988); Williams & Granara de Willink (1992); Williams (1985b, 2004).

### Key to Slide-Mounted Adult Female Mealybug Genera in the Southern Region

1. Trilocular pores abundant
   - Trilocular pores absent or rare ................................................. 6
   - Trilocular pores absent ......................................................... 2

2(1). Quinquelocular pores present
   - Quinquelocular pores absent ................................................... 3

3(2). With a few trilocular pores near spiracles
   - Without trilocular pores ......................................................... Heterococcus

4(2). Posterodorsal setae filamentous, not enlarged
   - Some posterodorsal setae enlarged, similar in shape to cerarian setae  Hypoecoccus

5(4). Pores in spiracular atria
   - Pores absent from spiracular atria ........................................ Miscanthicoccus

6(1). Legs present
   - Legs absent ........................................................................... 9

7(6). Small pores or ducts in cluster posterior of hind spiracle
   - Small pores absent from area posterior of hind spiracle................... Antonina

8(7). Anal ring at end of invaginated tube; anal ring setae longer than diameter of anal ring
   - Anal ring on dorsal surface, not in a tube; anal ring setae shorter than diameter of ring  Paludicoccus

9(6). Antennae not geniculate or elbowed; normally not on rootlets of host
   - Antennae geniculate; usually on rootlets of host .......................... 10

10(9). Apex of body with 2 spines; head also with 2 spines
   - Apex of body and head without spines ........................................... Geococcus

11(9). Legs well developed, longer that clypeolabral shield plus labium
   - Legs small; front legs about same length or shorter than clypeolabral shield plus labium  15

12(11). Without circuli
   - With circuli ............................................................................. 13

13(12). Hind coxae not enlarged, without translucent pores
   - Hind coxae greatly enlarged, with numerous translucent pores  Pseudantonina

14(13). Anal ring without pores
   - Anal ring with pores ................................................................. 16

15(11). Anal ring with pores
   - Anal ring without pores ............................................................. Humococcus

16(15). Claw without a denticle
   - Claw with a denticle ................................................................ 20

17(16). Dorsal tubular ducts without a sclerotized orifice
   - Some dorsal tubular ducts protruding and with sclerotized orifices  Heliococcus

18(17). Dorsal setae conical or filamentous
   - Some dorsal setae enlarged, often truncate, with cluster of basal trilocular pores  Stemmatomerinx
Fig. 7. *Puto kosztarabi* Miller and Miller: Illustration from Miller and Miller (1993).
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>19(18)</td>
<td>Dorsal tubular ducts without clusters of multilocular pores surrounding orifice. <strong>Phenacoccus</strong>&lt;br&gt;Dorsal tubular ducts with clusters of multilocular pores surrounding orifice. <strong>Peliococcus</strong></td>
</tr>
<tr>
<td>20(16)</td>
<td>Without oral-rim tubular ducts&lt;br&gt;With oral-rim tubular ducts</td>
</tr>
<tr>
<td>21(20)</td>
<td>With multilocular pores at least near vulva&lt;br&gt;Without multilocular pores. <strong>Distichillicoccus</strong></td>
</tr>
<tr>
<td>22(21)</td>
<td>With more than 6 pairs of cerarii&lt;br&gt;With 6 or fewer pairs of cerarii</td>
</tr>
<tr>
<td>23(22)</td>
<td>Oral-rim tubular ducts without associated setae, usually without sclerotization around rim <strong>Ferrisia</strong> (in part)&lt;br&gt;Oral-rim tubular ducts with associated setae and heavy sclerotization around rim <strong>Maconellicoccus</strong></td>
</tr>
</tbody>
</table>
| 24(23) | Anal bar present; dorsal setae nearly as long as ventral setae **Maconellicoccus**
Anal bar absent; dorsal setae conspicuously shorter than ventral setae. **Chorizococcus** |
| 25(22) | Anal bar present<br>Anal bar absent |
| 26(25) | 18 pairs of cerarii **Planococcus** (in part)<br>17 or fewer pairs of cerarii **Pareococcus** |
| 27(25) | Auxiliary setae present in cerarii other than anal-lobe pair **Pseudococcus**
Auxiliary setae absent from cerarii other than anal-lobe pair **Spilococcus** |
| 28(20) | Small discoidal pores absent from derm near hind coxae **Saccharicoccus**
Small discoidal pores present on derm near hind coxae **Miller**: Scale Insects of the Southern Region 497 |
| 29(28) | Anal lobe cerarius with more than 3 conical setae; without unusually long marginal setae on each of posterior 4 abdominal segments **Palmiculter**
Anal lobe cerarius with 2 conical setae; with unusually long marginal setae on each of posterior 4 abdominal segments **Saccharicoccus** |
| 30(28) | 6 or fewer pairs of cerarii **Peliococcus** (in part)<br>More than 6 pairs of cerarii |
| 31(30) | Cerarii anterior of anal lobe pair without auxiliary setae **Oracella** (in part)<br>Cerarii anterior of anal lobe pair with auxiliary setae |
| 32(31) | Antennae 9-segmented; legs unusually long, extending beyond posterior apex of body **Plotococcus**
Antennae with fewer than 9 segments; legs not usually extending beyond posterior apex of body **Dymicoccus** |
| 33(31) | Dorsal setae not conical, differently shaped than cerarian setae **Nipaeoccus**<br>Some dorsal setae conical, same shape as cerarian setae |
| 34(33) | Cerarii with 3 or fewer conical setae **Paraputo**
Cerarii with more than 3 conical setae. **Planococcus** (in part) **Oracella** (in part) |
| 35(34) | With more than 10 pairs of cerarii; with an anal bar **Planococcus** (in part)<br>With fewer that 10 pairs of cerarii; without an anal bar. **Oracella** (in part) |
| 36(30) | Dorsal tubular ducts absent or without associated setae, usually without sclerotization around orifice **Ferrisia** (in part)<br>Dorsal tubular ducts with associated setae and sclerotization around rim |
| 37(36) | Multilocular pores present, at least near vulva **Saccharicoccus**
Multilocular pores absent. **Paradoxococcus** |
| 38(37) | Without or with 1 circulus **Tridiscus**<br>With more than 1 circulus |
| 39(38) | Cerarii numbering more than 1 pair **Oracella** (in part)<br>Cerarii absent or restricted to anal lobe |
| 40(39) | On pines; body rotund **Oracella**<br>On grasses; normally slender, elongate. **Trionymus** (in part) |
| 41(39) | Not on grasses; body round or broadly oval **Trionymus** (in part)<br>Occurring on grasses; body often elongate or elongate oval **Trionymus** (in part) |
Checklist of Mealybugs of the Southern Region
(asterisk signifies a frequently collected species)

*Antonina nakaharai Williams and Miller (misidentification of A. crawii) LA
*Antonina graminis (Maskell) AL, FL, GA, LA, MS, PR, SC, TX
*Antonina pretiosa Ferris FL, GA, LA
Antonoides bouteoue (Parrott) TX
Antonoides nortoni (Parrott and Cockerell) FL, GA, NC, TX

Brevennia rehi (Lindinger) FL, PR, TX
*Chnaurococcus bambusae (Maskell) FL, PR
Chnaurococcus trifolii (Forbes) VA
Chorizococcus dentatus (Lobdell) MS, VA
Chorizococcus graysoni Brachman and Koszarab VA
Chorizococcus nakaharai Williams and Granara de Willink PR
Chorizococcus psoralae McKenzie TN
Chorizococcus rostellum (Lindell) LA, MS, VA
Chorizococcus shaferi (Hollinger) MS
Distichlicoccus taxodii Koszarab FL, GA, VA
Distichlicoccus alkalinus (Cockerell) TX
Distichlicoccus digitariae Williams and Granara de Willink PR

Distyllicoccus bipinnatus Beardsey PR
*Distyllicoccus bonisinos (Kuwana) WA, LA, MS, PR, SC, TX
*Distyllicoccus brevipes (Cockerell) FL, LA, PR
Distyllicoccus difficilis (Lobdell) MS, VA
Distyllicoccus diobum (McConnell) MS, SC, VA
*Distyllicoccus grassei (Leonardi) PR
Distyllicoccus junci (McConnell) VA
Distyllicoccus lasii (Cockerell) FL, VA
Distyllicoccus merrilli (Ferris) FL
Distyllicoccus milleri Koszarab AL, FL, GA, VA
Distyllicoccus morrisoni (Hollinger) AL, GA, LA, MS, VA
Distyllicoccus neobrevipes Beardsley FL, PR
Distyllicoccus obesus (Lobdell) AL, AR, GA, LA, MS, NC, SC, VA

Distyllicoccus texensis (Tinsley) TX
Distyllicoccus vaccinii Miller and Polavarapu NC
Distyllicoccus wistariae (Green) VA
Euryoccoccus blendiae (King and Cockerell) MS, VA
Euryoccoccus campbelli Koszarab VA
Euryoccoccus copallinae Ferris FL
Euryoccoccus yeuceae Ferris TX

Ferrisia claviseta (Lobdell) MS
Ferrisia floridana (Ferris) FL
Ferrisia quiniancii (Tinsley) FL
*Ferrisia malvastra (McDaniel) TX
*Ferrisia virgata (Cockerell) FL, LA, PR, TX, VA
Geococcus coffeae Green FL, PR
Heliococcus desertico Miller TX
Heliococcus insignis (Lobdell) LA, MS
Heliococcus osborni (Sanders) LA, TX, VA
Heliococcus stachyos (Ehrhorn) VA
Heliococcus wheeleri (King) TX
Heterococcus nudus (Green) VA
Heterococcus rauti Miller SC
Humococcus atriplicis Ferris TX
Humococcus dasycladoe (Ferris) TX
Humococcus hilariae (Ferris) TX

Hypogeococcus barbarae Rau VA
Hypogeococcus hamoni Miller FL
Hypogeococcus margaretae Miller FL
Hypogeococcus spinosus Ferris TX
*Macrolicoccus hirsutus (Green) FL, PR
*Macrophilus misancithi Takahashi VA
*Nipaeococcus nipae (Maskell) FL, LA, PR
*Oracella acuta (Lindell) FL, GA, KY, LA, MS, NC, TX, VA

Palmicoccus brouni Williams and Watson FL
*Palmicoccus palmarum (Ehrhorn) FL
*Palmicoccus lumpensis (Takahashi) FL
Paludicoccus distichillum (Kuwana) TX
Paracoccus juniperi (Ehrhorn) TX
*Paracoccus marginatus Williams and Granara de Willink FL
Paracoccus townsendi (Cockerell) TX
Paradoxococcus meadieni McKenzie AL, FL, GA, MS, SC, TX, VA

Paraputo olivaceus (Cockerell) (=Catenaecoccus olivaceus) FL, TX
Peliucooccus flaveolus (Cockerell) VA
Peliucooccus serratus (Ferris) TN, VA
Phenacoccus acericola King KY, TN, VA
Phenacoccus coelestis Ehrhorn FL, PR
Phenacoccus dearnessi King TX, VA
Phenacoccus hodarshi McKenzie TX
*Phenacoccus madeirensis Green AL, FL, LA, MS, NC, PR, TX, VA
Phenacoccus minimus Tinsley VA
Phenacoccus parvus Morrison FL, PR
Phenacoccus rubivorus Cockerell NC, VA
*Phenacoccus solani Ferris FL, LA, PR, TX, VA
*Phenacoccus solenopsis Tinsley FL, MS, TX, VA
*Planococcus citri (Risso) AL, AR, FL, GA, KY, LA, MS, NC, PR

SC, TN, VA, TX
*Planococcus ficus (Signoret) AL, FL, GA, NC, SC, TX
Plotococcus eugeniae Miller and Denno FL
Pseudantonina arundinariae McConnell SC
Pseudantonina gigantoxa Lobdell FL, GA
Pseudantonina nakaharai Koszarab VA
Pseudantonina wilkeyi Koszarab VA
Pseudococcus bryberiae Ferris TX
Pseudococcus bryberiae Gimpel and Miller FL, GA, VA
Pseudococcus constocki (Kuwana) GA, LA, SC, VA
Pseudococcus dasyliriae Gimpel and Miller TX
Pseudococcus dolichomelos Gimpel and Miller FL, NC, SC, TX
Pseudococcus donrileyi Gimpel and Miller TX
*Pseudococcus elisae Borchesius FL
Pseudococcus importatus McKenzie FL
*Pseudococcus jackbeardsleyi Gimpel and Miller FL, PR, TX
*Pseudococcus longispinus (Targioni Tozzetti) AL, FL, NC, PR, TN, TX
*Pseudococcus maritimus (Ehrhorn) AR, FL, GA, TN, TX, VA
Pseudococcus microcerus McKenzie FL
Pseudococcus nakaharai Gimpel and Miller FL, TX

42(41). Anal lobe cerarii with large concentration of basal trilocular pores, 2 conical setae ........ Chnaurococcus
Anal lobe cerarii without a concentration of basal trilocular pores, often without conical setae ................................................................. Euryoccoccus
**Pseudococcus odermatti** Gimpel and Miller FL
**Pseudococcus pithecellobii** Gimpel and Miller TX
**Pseudococcus puertoricensis** Gimpel and Miller PR
**Pseudococcus sorgiellus** (Forbes) AR, FL, GA, LA, NC, SC, TN, VA
**Pseudococcus spanocera** Gimpel and Miller AR, FL, GA
*Pseudococcus viburni* (Signoret) AL, FL, GA, NC, SC, VA

**Rhizoecus americanus** (Hambleton) FL, PR
**Rhizoecus apizacus** Hambleton TX
**Rhizoecus caeticans** (Hambleton) FL
**Rhizoecus dianthi** Green FL
**Rhizoecus bicirculus** McKenzie TX
**Rhizoecus brevirostris** Hambleton TX
**Rhizoecus bituberculatus** McKenzie NC
**Rhizoecus distinctus** (Hambleton) TN, VA
**Rhizoecus falcifer** Kuncl d’Herculais FL
**Rhizoecus floridanus** Hambleton FL, GA
**Rhizoecus gracilis** McKenzie TX, VA
**Rhizoecus hibisci** Kuwana and Takagi FL, PR
**Rhizoecus kelloggi** (Ehrhorn and Cockerell) FL, TX
**Rhizoecus keyensis** Hambleton FL
**Rhizoecus ladonae** Hambleton FL
**Rhizoecus leucosomus** (Cockerell) FL, TX, VA
**Rhizoecus martitimus** (Cockerell) FL
**Rhizoecus mexicanus** (Hambleton) FL, TX
**Rhizoecus palestinae** (Hambleton) FL
**Rhizoecus pseudoacticans** Hambleton FL
**Rhizoecus simplex** (Hambleton) FL
**Rhizoecus spicatus** Hambleton FL
**Rhizoecus solani** (Hambleton) TX
**Rhizoecus spinipes** (Hambleton) AR, FL, GA
**Saccharicoccus sacchari** (Cockerell) PR
**Spilococcus eriogoni** (Ehrhorn) TX
**Spilococcus gutierrezae** (Cockerell) TX
**Spilococcus prosopidis** (Cockerell) TX
**Spilococcus steeli** (Cockerell and Townsend) TX
**Stemmatomerinx acircula** Howell and Miller FL
**Stemmatomerinx adenticulata** Howell and Miller GA
**Stemmatomerinx aristida** Howell and Miller GA
**Stemmatomerinx beshearae** Howell and Miller GA
**Stemmatomerinx decorata** Ferris TX
**Syrmococcus spirapuncta** (Lobdell) FL, MS
**Syrmococcus pecosensis** Ferris TX
**Tridiscus matilidae** Kosztarab SC
**Trionymus americanus** (Cockerell) MS
**Trionymus caricos** McConnell FL, GA, SC, TN, VA
**Trionymus clandestinis** McConnell VA
**Trionymus lowryi** Brachman and Kosztarab VA
**Trionymus mori** Lobdell MS
**Trionymus radicicola** (Morrison) PR
**Trionymus smithii** (Essig) VA

Giant Mealybugs (Putoideae) of the Southern Region (asterisk signifies a frequently collected species)

*Puto barberi* (Cockerell) PR
*Puto kostarabi* Miller and Miller VA
*Puto lasiorum* (Cockerell) TX
*Puto mexicanus* (Cockerell) TX
*Puto yuccae* (Coquillett) TX

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