

UPDATED LIST OF MEALYBUGS AND PUTOIDS FROM COLOMBIA (HEMIPTERA: PSEUDOCOCCIDAE AND PUTOIDAE)

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RESUMEN

Se proveen localidades de colecta, hospederos y hormigas asociadas de 34 especies de cochinillas harinosas (incluyendo putoides) (Hemiptera: Coccoidea: Pseudococcidae y Putoidae) en Colombia colectadas durante el periodo 1995–2008. Se dan notas breves sobre la biología, taxonomía y distribución geográfica de cada especie. Once cochinillas harinosas, *Dysmicoccus* sp., *Ferrisia* sp., *Maconellicoccus hirsutus* (Green), *Nipaeococcus* sp. 1, *Nipaeococcus* sp. 2, *Phenacoccus solani* Ferris, *Ph. solenopsis* Tinsley, *Planococcus halli* Ezzat & McConnell, *Prorhizoecus* sp., *Pseudococcus calceolariae* (Maskell) y *Rhizoecus mayanus* (Hambleton) se reportan como nuevos registros para Colombia. Se provee una lista actualizada de 78 cochinillas harinosas de Colombia.

Palabras clave: hormigas, cochinillas harinosas, listado de especies, *Sternorrhyncha*, nuevos registros.

SUMMARY

Collecting localities, plant hosts and associated ants of 34 species of mealybugs and putoids (Hemiptera: Coccoidea: Pseudococcidae and Putoidae) in Colombia collected during 1995–2008 are provided. Brief notes on their biology, taxonomy and distribution are given. Eleven species, *Dysmicoccus* sp., *Ferrisia* sp., *Maconellicoccus hirsutus* (Green), *Nipaeococcus* sp. 1, *Nipaeococcus* sp. 2, *Phenacoccus solani* Ferris, *Ph. solenopsis* Tinsley, *Planococcus halli* Ezzat & McConnell, *Prorhizoecus* sp., *Pseudococcus calceolariae* (Maskell), and *Rhizoecus mayanus* (Hambleton) are newly recorded from Colombia. An updated list of 78 mealybug species from Colombia is given.

Key words: ants, scale insects, species list, *Sternorrhyncha*, new records.

INTRODUCTION

The mealybug and putoid (Hemiptera: Coccoidea: Pseudococcidae and Putoidae) fauna of Colombia has been little studied. In a compilation of the limited literature on scale insects of Colombia, Kondo (2001) listed 63 species of mealybugs. Ramos Portilla & Serna Cardona (2004) indicated that there are 70 species of mealybugs in Colombia, but they listed only 39 species in their

study. The scale insect database ScaleNet (Ben-Dov et al. 2006), currently lists 66 mealybug species recorded from Colombia. An additional species (*Macroepicoccus loranthi* Morrison), is not listed in ScaleNet, but is recorded from Colombia (Gallego & Velez 1992), bringing the total number of recorded mealybug species in Colombia to 67. Mealybugs in Colombia have been studied mainly by Figueroa-Potes (1946, 1952), Balachowsky (1957, 1959), Kondo (2001),

Ramos Portilla & Serna Cardona (2004), and Williams & Granara de Willink (1992), who described seven new species from Colombia. Kondo & Gullan (2008) recently synonymized the New World genus *Plotococcus* Miller & Denno with the tropical Asian genus *Leptococcus* Reyne and described a new pest species from Colombia, *Leptococcus rodmani* Kondo & Gullan (Figure 1F), on *Guarea guidonia* (Meliaceae).

The objective of the present study is to provide an updated list of mealybugs in Colombia. Thirty-four mealybug species were collected in this study, out of which eleven have never been recorded from Colombia. We provide the first Colombian record of six well-known mealybug pests: *Maconellicoccus hirsutus* (Green), *Phenacoccus solani* Ferris, *Ph. solenopsis* Tinsley, *Planococcus halli* Ezzat & McConnell, *Pseudococcus calceolariae* (Maskell), and *Rhizoecus mayanus* (Hambleton). We were unable to identify five species to the species level, *Dysmicoccus* sp. (1 sp.), *Ferrisia* sp. (1 sp.), *Nipaeococcus* sp. (2 spp.), and *Prorhizoecus* sp. (1 sp.), and these species are probably new to science.

MATERIALS AND METHODS

Mealybugs were collected by the authors and other collectors from 1995–2008. Species collected by the first author are part of a faunistic project on Coccoidea of Colombia, and the second author collected mealybugs of some major crops in Colombia, including banana (*Musa paradisiaca*), cacao (*Theobroma cacao*), coffee (*Coffea arabica*), orange (*Citrus sinensis*), plantain (*Musa* sp.), and sugarcane (*Saccharum officinarum*). Mealybugs and associated ants were preserved in 70% ethanol, and scale insects were later slide-mounted using the method explained by Williams & Granara de Willink (1992). Specimens were identified using the keys to the mealybugs of Central and South America by Williams & Granara de Willink (1992). Identifications of mealybugs belonging to the genus *Planococcus* Ferris were carried out using the keys by Cox (1989). Keys by Kawai (1980), Williams (2004), and Williams & Watson (1988) were used to identify *Maconellicoccus hirsutus*. The third author identified all the associated ants except those collected by the first author. Ants collected by the first author were kindly identified by Dr. Alex Wild (University of Arizona,

Department of Entomology). Collecting data are given as detailed as possible and consist of locality, including longitude, latitude and altitude, date, collector, host and tending ants.

Under material studied, species that are not listed in ScaleNet (Ben-Dov et al. 2006) as present in Colombia (not including *Macrocepicoccus loranthi*) are marked with an asterisk (*). Species listed in ScaleNet are all records to the species level, thus species recorded at the generic level in this study will have an asterisk. Material studied is listed as the number of glass slides with the total number of specimens and the growth stage in parentheses, e.g., one slide with two specimens, of which one is an adult female and one is a second-instar male, is represented as follows: 1 (2: 1 adult female + 1 second-instar male). The growth stage is not specified when all specimens on the slide(s) are adult females. Specimens of all mealybugs collected by T. Kondo until 2007 are deposited at the Auburn University Coccoidea Collection, Department of Entomology and Plant Pathology, Auburn, Alabama (AUCC), the Bohart Museum of Entomology, Department of Entomology, University of California, Davis, California, USA (BME), the United States National Museum, Beltsville, Maryland, USA (USNM), and specimens collected in 2008 are deposited at the insect collection of the Department of Entomology, Universidad del Valle, Cali, Colombia. Specimens collected by other collectors are deposited at the Instituto Colombiano Agropecuario, Grupo Protección y Regulación Agrícola Seccional Caldas (ICA) unless otherwise stated. Voucher specimens of the tending ants are deposited in Colección de Insectos, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá D.C., Colombia (UNCB) and ICA.

RESULTS

Family: PSEUDOCOCCIDAE

***Dysmicoccus boninsis* (Kuwana) (Figure 1A):**
COLOMBIA: Antioquia: Barbosa, 06°30'19"N, 75°15'49"W, 1148 m, 19.v.2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *Ectatoma ruidum*; Cisneros, La Queibra, La Leyenda, 06°32'10"N, 75°26'45"W, 1579 m, 19.v.2005, A. A. Ramos-P., 4(4), ex sugarcane, tended by *Brachymyrmex* sp. Santo Domingo, Cantallú, 06°32'00"N, 75°03'13"W, 941 m, 19.v.2005, A. A. Ramos-P., 2(2), ex sugarcane, tended by *Linepithema* sp. and

E. ruidum; Támesis, La Matilde, Mis Abuelos, 05°38'34"N, 75°42'49"W, 1699 m, 13.x.2005, A. A. Ramos-P., 4(4), ex sugarcane, tended by *Brachymyrmex* sp., *Solenopsis* sp., *Paratrechina* sp., and *Pheidole* sp. **Caldas:** Anserma, Cambia,

El Dance, 05°12'05"N, 75°46'44"W, 1350 m, 21.ix.2005, Jorge Iván Rodríguez, 3(3), ex sugarcane; Belalcázar, La Habana, 04°59'44"N, 75°48'57"W, 1600 m, 4.iv.-2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *Myrmelachysta* sp.;

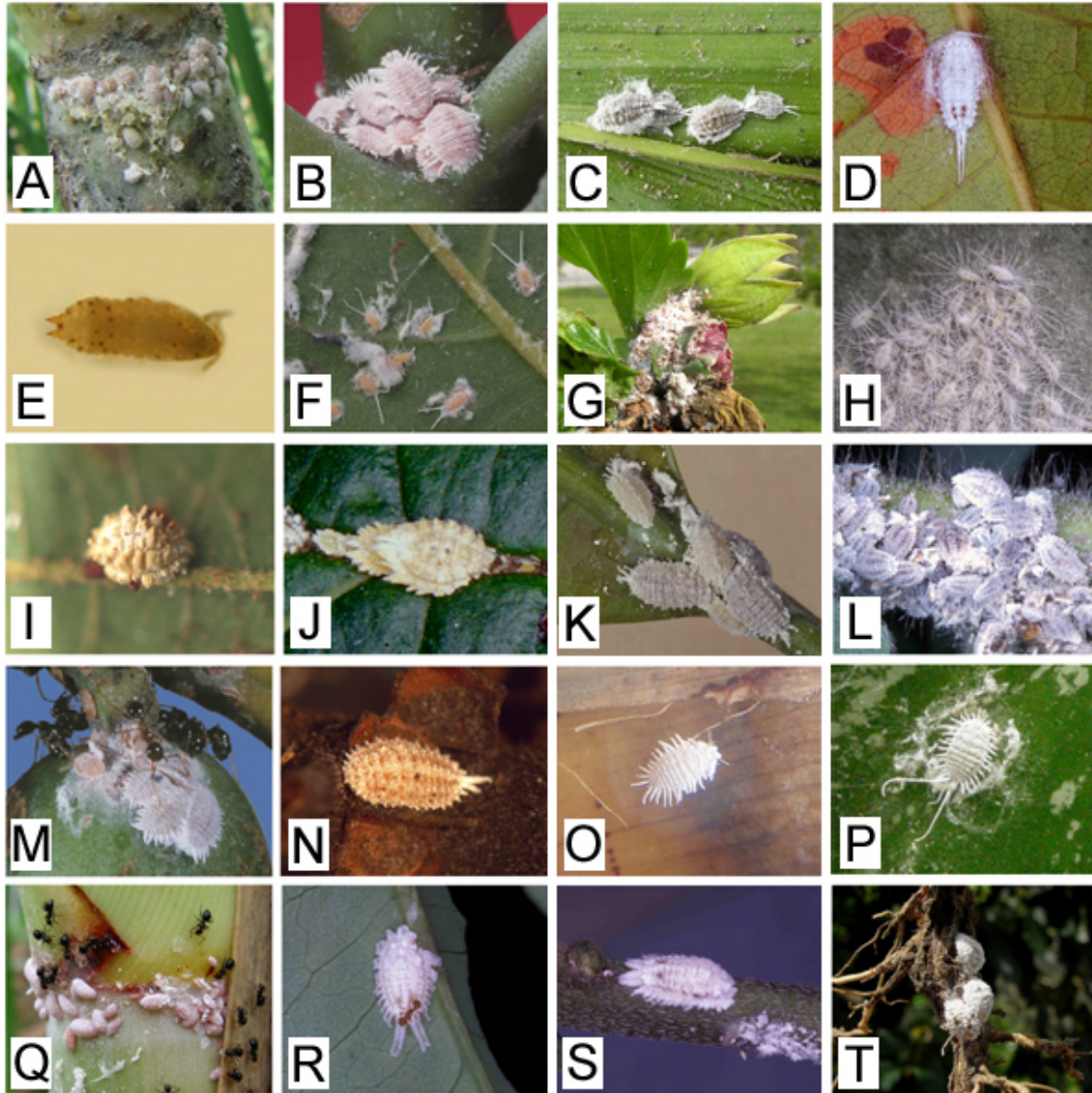


Figure 1. Mealybugs in Colombia: Pseudococcidae. A, *Dysmicoccus boninsis*, adult female on sugarcane; B, *D. brevipes*, adult female on mango; C, *Ferrisia virgata*, adult female on *Elaeis guineensis*; D, *Ferrisia* sp. on mango; E, *Geococcus coffeae*, adult female; F, *Leptococcus rodmani*, adult females and male puparia on *Guarea guidonia*; G, *Maconellicoccus hirsutus* on *Hibiscus rosa-sinensis*; H, *Macrocepicooccus loranthei*, adult females on Lorantheae; I, *Nipaecoccus guazumae*, adult female on *Guazuma ulmifolia*; J, *Nipaecoccus nipae*, adult females on guava; K, *Phenacoccus madeirensis*, adult females on mango; L, *Phenacoccus solani*, adult females on leguminous plant; M, *Planococcus citri*, adult females on coffee berry, tended by *Crematogaster* sp.; N, *Pseudococcus calceolariae*, adult female on *Ficus andicola* ; O, *P. jackbeardsleyi*, adult female on banana pseudo-stem; P, *P. longispinus* on orchid leaf; Q, *Saccharicoccus sacchari*, adult female on sugarcane. **Putoidae.** *Puto barberi*: R, young adult female on leaf of *Amyris pinnata*; S, matured adult female on twig of *A. pinnata*; T, adult females on root of *Coffea arabica*. (Photos: A, N, O, Q by A. A. Ramos Portilla, B–M, P, R–T by T. Kondo; photos B, G, K, L, M, & P were not taken in Colombia).

Manizales, El Rosario, 05°02'19"N, 75°34'26"W, 1152 m, 10.v.2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *Solenopsis* sp.; Manizales, El Rosario, La Juliana, 05°02'38"N, 75°32'50"W, 1300 m, 4.x.2005, Jorge Iván Rodríguez, 4(4), ex sugarcane, tended by *Pheidole* sp.; Neira, La Armenia, 05°11'24"N, 75°55'12"W, 1400 m, 23.viii.2005, Jorge Iván Rodríguez, 3(3), sugarcane; Neira, La Isla, El Guineo, 05°11'08"N, 75°32'04"W, 1600 m, 20.viii.-2005, Jorge Iván Rodríguez, 3(3), ex sugarcane; Neira, 05°11'52"N, 75°34'59"W, 1410 m, 23.viii.-2005, Jorge Iván Rodríguez, 7(7), ex sugarcane, tended by *Solenopsis* sp.; Neira, 05°22'14"N, 75°29'29"W, 1768 m, Germán Agudelo, 5(5), ex sugarcane; Pensilvania, Barrio El Mirador, 05°22'58"N, 75°09'59"W, 2161 m, 10.xii.2005, Jorge Iván Rodríguez, 5(5), ex sugarcane; San José, El Pacífico, 5°06'54"N, 75°48'33"W, 1199 m, 25.vii.2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *Wasmannia auropunctata*; San José, Morroazul; 05°06'54"N, 75°48'33"W, 1199 m, 23.iv.2005, A. A. Ramos-P., 5(5), ex sugarcane. **Cauca:** El Tambo, El Tablón, 02°26'47"N, 76°47'36"W, 1800 m, 23.xi.2005, A. A. Ramos-P., 4(4), ex sugarcane, tended by *Linepithema* sp.; El Tambo, Barrio El Cementerio, 02°27'18"N, 76°48'43"W, 1786 m, 23.xi.2005, A. A. Ramos-P., 5(5), ex sugarcane, stem; Timbío, El Altillito Alto, La Aurora, 02°20'16"N, 76°40'42"W, 1873 m, 21.xi.2005, A. A. Ramos-P., 5(5), sugarcane; Timbío, San Pedrito, La Rinconada, 02°20'50"N, 76°42'53"W, 1773 m, 21.xi.2005, A. A. Ramos-P., 5(5), ex sugarcane. **Nariño:** Buesaco, Sumapaz, 01°23'38"N, 77°08'52"W, 1960 m, 29.vi.-2004, A. A. Ramos-P., 2(2), ex sugarcane; Consacá, Bomboná, 01°12'20"N, 77°27'50"W, 1645 m, 03.vii.2004, A. A. Ramos-P., 7(7), sugarcane, tended by *Linepithema* sp.; Consacá, San Rafael, 01°12'20"N, 77°27'50"W, 1645 m, 28.vii.2004, A. A. Ramos-P., 3(3), ex sugarcane, stem; Consacá, Santa Inés, El Salto, 01°12'20"N, 77°27'50"W, 1645 m, 03.vii.2004, A. A. Ramos-P., 1(1), ex sugarcane; Sandoná, Barrio Hernando Gómez, 3(3), 01°17'17"N, 77°28'26"W, 1800 m, 1.vii.2004, A. A. Ramos-P., ex sugarcane. **Norte de Santander:** Pamplonita, La Argentina, 07°33'31"N, 72°38'14"W, 150 m, 06.v.2004, Oscar Durán, 10(10), ex sugarcane. **Quindío:** Filandia, El Placer, 04°37'42"N, 75°43'44"W, 1497 m, 23.vi.-2005, A. A. Ramos-P., 4(4), ex sugarcane, tended by *Crematogaster* sp.; Filandia, Los Tanques, La Esperanza, 04°38'08"N, 75°42'12"W, 1544 m, 23.vi.2005, A. A. Ramos-P., 5(5), ex sugarcane. **Santander:** Piedecuesta, 06°59'18"N,

73°03'12"W, 1100 m, 3.vi.2004, Laurentino Anaya, 9(9), ex sugarcane. **Tolima:** Ibagué, Tres Esquinas, La Granjita, 04°28'37"N, 75°16'58"W, 1427 m, 13.xii.2005, A. A. Ramos-P., 3(3), ex sugarcane; Ibagué, San Francisco, 04°23'57"N, 75°17'18"W, 1158 m, 13.xii.2005, A. A. Ramos-P., 3(3), ex sugarcane. **Valle del Cauca:** Buga la Grande, Mestizal, La Judith, 04°13'49"N, 76°09'35"W, 973 m, 9.vi.2005, A. A. Ramos-P., 5(5), ex sugarcane; Caicedonia, Limones, El Bosque, 04°20'45"N, 75°52'24"W, 1230 m, 23.vi.2005, A. A. Ramos-P., 4(4), ex sugarcane, tended by *W. auropunctata*; Sevilla, Sabanazo, Los Quingos, 04°24'26"N, 75°52'28"W, 1075 m, 11.vi.2005, A. A. Ramos-P., 2(2), ex sugarcane; Sevilla, Sabanazo, Los Quingos, 04°24'26"N, 75°52'28"W, 1075 m, 9.vi.2005, A. A. Ramos-P., 3(3), ex sugarcane, *Solenopsis* sp.; Zarzal, La Uribe, 04°16'16"N, 76°06'35"W, 961 m, 10.vi.2005, A. A. Ramos-P., 3(3), ex sugarcane, tended by *W. auropunctata*.

Notes. *Dysmicoccus boninsis* is a common mealybug species on sugarcane in Colombia. It is generally found on the stem under the leaf blades and tended by various ant species. *Dysmicoccus boninsis* is known as the gray sugarcane mealybug (Zimmerman 1948; Bartlett 1978). Beardsley (1964) reported grey and white forms in Hawaii. *Dysmicoccus boninsis* is common probably wherever sugarcane is grown, and is found often on other grasses and other monocotyledons (Williams & Granara de Willink 1992).

***Dysmicoccus brevipes* (Cockerell) (Figure 1B):**

COLOMBIA: Antioquia: La Pintada, Parcelación Tunez Grande, Lote 26, 05°46'15"N, 75°37'60"W, 694 m, 26.v.2004, Armando Botero, 1(1), ex orange, leaf; Maceo, Brisas, Pascuitas, 06°32'52"N, 74°39'38"W, 654 m, 20.v.2005, A. A. Ramos-P., 5(5), ex plantain, root, tended by *Solenopsis* sp.; Maceo, Brisas, Santa Bárbara, 06°32'38"N, 74°39'38"W, 511 m, 20.v.2005, A. A. Ramos-P., 2(2), ex cacao, fruit; San Jerónimo, Granja Rafael Rivera-FEDECACAO, 06°26'48"N, 05°43'17"W, 740 m, 27.v.2004, A. Botero, 3(3), ex cacao, leaf; Támesis, Palermo, Nacional de Chocolates, 05°43'03"N, 75°41'27"W, 1168 m, 11.x.2005, A. A. Ramos-P., 4(4), ex cacao, fruit, tended by *Crematogaster* sp. and *W. auropunctata*; Támesis, San Pedro, 05°38'38"N, 75°41'60"W, 1383 m, 14.x.2005, A. A. Ramos-P., 4(4), ex cacao, fruit. **Caldas:** Belalcázar, La Habana, Santa Cruz, 04°59'44"N, 75°48'57"W, 1600 m, 13.v.2005, A. A. Ramos-P., 1(1), ex coffee, fruit; Belalcázar, La Sainera, La

Española; 05°01'27"N, 75°49'11"W, 1207 m, 14.vi.2005, A. A. Ramos-P., 4(4), ex cacao, fruit, tended by *W. auropunctata* and *Crematogaster* sp.; Belalcázar, Monteredondo, Tochecito, 04°59'38"N, 75°48'02"W, 1236 m, 16.xi.2005, A. A. Ramos-P., 3(3), ex cacao, fruit, tended by *Crematogaster* sp.; Palestina, El Higuieron, Teyuna, 05°01'07"N, 75°40'30"W, 1330m, 30.v.2005, A. A. Ramos-P., 5(5), ex cacao, fruit, tended by *W. auropunctata*; Palestina, La Inquisición, La Margarita, 05°01'60"N, 75°36'24"W, 1350 m, 11.iii.2005, A. A. Ramos-P., 3(3), ex cacao, fruit, tended by *Pheidole* sp.; Palestina, Santaguada, Montelindo, 05°04'53"N, 75°41'02"W, 1100 m, 10.x.2005, A. A. Ramos-P., 4(4), ex plantain; Palestina, Santaguada, Granja Casa Luker, 05°05'N, 75°41'W, 1020 m, 7.ix.2005, A. A. Ramos-P., 5(5), ex cacao, fruit, tended by *Solenopsis* sp.; San José, 05°06'54"N, 75°48'33"W, 1199 m, 24.vi.2005, A. A. Ramos-P., 3(3), ex coffee; San José, El Cairo, El Cairo, 05°06'57"N, 75°48'33"W, 1199 m, 26.vi.2005, A. A. Ramos-P., 5(5), ex cacao, fruit, tended by *W. auropunctata*; Victoria, Canaan, 05°19'09"N, 74°56'04"W, 924 m, 27.x.2005, A. A. Ramos-P., 5(5), ex cacao, fruit, tended by *Solenopsis* sp. **Cauca:** Santander de Quilichao, Mandivá, El Arca, 02°58'10"N, 76°31'24"W, 1096 m, 24.xi.2005, A. A. Ramos-P., 2(2), ex cacao, fruit, tended by *Solenopsis* sp.; El Tambo, El Tablón, 02°26'47"N, 76°47'36"W, 1800 m, 23.xi.2005, A. A. Ramos-P., 3(3), plantain, root. **Nariño:** Tumaco, 01°32'59"N, 78°41'55"W, 16 m, 1.i.2006, T. Kondo, 4(adult ♀ + nymphs), ex *Elaeis guineensis*, leaf shoots, tended by *Solenopsis* sp.; Tumaco, 01°44'01"N, 78°46'52"W, 10 m, 12.i.2006, T. Kondo, 4(4), ex *Cecropia* sp., ex hollow stem, tended by *Azteca* sp., found together with coccids. **Norte de Santander:** Arboledas, Guayabito, 07°37'06"N, 72°52'40"W, 1200 m, 23.vi.2004, Rafael Silva, 3(3), ex coffee; Cúcuta, Londres, Centro de Investigación El Zulia, 08°11'10"N, 72°31'34"W, 180 m, 28.iv.2004, Alessandra Alterio, 8(8), ex plantain, leaf shoots; Cúcuta, Monte Verde, 6(6), 08°11'05"N, 72°31'33"W, 150 m, 3.v.2004, Alessandra Alterio, ex cacao, terminal shoots. **Quindío:** Armenia, El Caimo, Santa Inés, 04°25'53"N, 75°44'50"W, 1250 m, Ana Bejarano, 4(4), ex banana; Armenia, El Caimo, Santa Inés, 04°25'53"N, 75°44'50"W, 1250 m, Ana Bejarano, 3(3), ex banana; Calarcá, La Granja, La Siria, 04°29'06"N, 75°41'50"W, 1371 m, 24.vi.2005, A. A. Ramos-P., 3(3), ex plantain, root; Calarcá, La Granja, La Siria, 04°29'06"N, 75°41'50"W, 1371

m, 24.vi.2005, A. A. Ramos-P., 4(4), ex *Coffea arabica* var. Caturra, fruit, tended by *Solenopsis* sp.; Calarcá, La Granja, La Siria, 04°29'06"N, 75°41'50"W, 1371m, 24.vi.2005, A. A. Ramos-P., 2(2), ex plantain, root, tended by *Solenopsis* sp.; Montenegro, El Gigante, La Nubia, 04°34'13"N, 75°45'11"W, 1500 m, 26.v.2005, Carlos Robledo, 5(5), ex plantain root; Quimbaya, El Laurel, El Palmar, 04°37'18"N, 75°47'40"W, 1250 m, 27.ix.2005, Leonardo Orozco, 5(5), ex plantain, root; Quimbaya, Kerman, 04°37'18"N, 75°47'40"W, 1250 m, 23.vi.2005, A. A. Ramos-P., 3(3), ex *Coffea arabica* var. Caturra, fruit; 04°25'53"N, 75°44'50"W, 1250 m, 1.viii.2005, Ana Bejarano, 4(4), ex plantain, pseudo-stem, tended by *Crematogaster* sp. **Risaralda:** Pereira, Rocío Alto, El Rocío, 04°49'02"N, 75°41'54"W, 1450 m, 1.iii.2004, Arnoldo Osorio, 2(2), ex coffee, branches. **Tolima:** Alvarado, Guayabos, 04°40'13"N, 74°59'45"W, 1030 m, 14.xii.2005, A. A. Ramos-P., 1(1), ex *Musa* sp. (a plant locally known as cachaco), root; Chaparral, Helechales, El Agrado, 03°43'39"N, 75°55'16"W, 854 m, 31.x.2004, A. A. Ramos-P., 1(1), ex cacao, stem; Chaparral, Helechales, El Agrado, 03°43'39"N, 75°55'16"W, 854 m, 31.x.2004, A. A. Ramos-P., 5(5), ex cacao, stem; Ibagué, Tres Esquinas, 04°28'37"N, 75°16'58"W, 1427 m, 13.xii.2005, A. A. Ramos-P., 2(2), ex coffee, fruit, tended by *Crematogaster* sp.; Ibagué, Tres Esquinas, La Granjita, 04°28'37"N, 75°16'58"W, 1427 m, 13.xii.2005, A. A. Ramos-P., 1(1), ex coffee, fruit; Libano, Delicias del Convenio, Macondo, 04°57'30"N, 75°00'38"W, 1349 m, 14.xii.2005, A. A. Ramos-P., 2(2), ex plantain, root; Libano, El Paraíso, Granja La Unión (CENICAFÉ), 04°54'56"N, 75°02'55"W, 1531 m, 14.xii.2005, A. A. Ramos-P., 1(1), ex coffee, fruit; Mariquita, La Parroquia, Los Mangos, 05°11'56"N, 74°56'08"W, 863 m, 15.xii.2005, A. A. Ramos-P., 3(3), ex cacao, fruit, tended by *Solenopsis* sp.; Mariquita, La Parroquia, Los Mangos, 05°11'56"N, 74°56'08"W, 863 m, 15.xii.-2005, A. A. Ramos-P., 6(6), ex plantain, root; Mariquita, Las Lomas, Casa Loma, 05°12'40"N, 74°55'21"W, 753 m, 15.xii.2005, A. A. Ramos-P., 3(3), ex plantain, root; Mariquita, Las Lomas, Casa Loma, 05°12'38"N, 74°55'21"W, 753 m, 15.xii.2005, A. A. Ramos-P., 2(2), ex plantain, pseudo-stem. **Valle del Cauca:** Buga la Grande, Mestizal, La Judith, 04°13'49"N, 76°09'36"W, 973 m, 10.vi.2005, A. A. Ramos-P., 2(2), ex cacao, fruit, tended by *W. auropunctata*; Caicedonia, La Camelia, 04°20'37"N, 75°50'53"W, 1135 m, 9.vi.2005, A. A. Ramos-P., 4(4), ex coffee,

roots, tended by *Prionopelta* sp.; Caicedonia, 04°20'37"N, 75°50'53"W, 1129 m, 9.vi.2005, A. A. Ramos-P., 3(3), ex coffee, fruit, tended by *Solenopsis* sp.; Cali, Universidad del Valle campus, 8.xii.2001, T. Kondo, 6(6), ex undetermined tree with large thorns; Cali, Chorro de Plata, 28.xii.2005, T. Kondo, 5(10), ex *Cecropia* sp., leaves, tended by ants; Cali, Chorro de Plata, 28.xii.2005, T. Kondo, 3(3), ex *Cecropia* sp., in hollow stem, tended by ants; Cali, road to Cristo Rey, 16.i.2006, T. Kondo, 4(4), ex *Cecropia* sp., inside hollow stem, tended by *Azteca* sp.; Ginebra, 4.i.2005, T. Kondo, 2(2), ex Musaceae, leaf; Parque Nacional Los Farallones, near Cali, 03°25'58"N, 76°36'20"W, 1661 m, 19.i.2006, T. Kondo, 3(3), ex *Cecropia* sp., ex hollow stem, tended by ants.

Notes. *Dysmicoccus brevipes* is probably one of the most widespread and polyphagous mealybug species (Ben-Dov et al. 2006). It has been associated with pineapples and pineapple wilt disease of pineapples (Jahn et al. 2003; Sether 2002; Williams 2004). In the present study, we found *D. brevipes* frequently on many hosts and often associated with various species of tending ants.

***Dysmicoccus grassii* (Leonardi): COLOMBIA:**
Cauca: El Tambo, Hospital Santa María, 02°27'07"N, 76°48'23"W, 1783 m, 23.xi.2005, A. A. Ramos-P., 1(1), ex coffee, roots. **Tolima:** Líbano, El Paraíso, Granja La Unión (CENICAFÉ), 04°54'56"N, 75°02'55"W, 1531 m, 14.xii.2005, A. A. Ramos-P., 2(2), ex plantain, roots; Líbano, El Paraíso, Granja La Unión (CENICAFÉ), 04°54'56"N, 75°02'55"W, 1531 m, 14.xii.2005, A. A. Ramos-P., 2(2), ex coffee, roots; Mariquita, La Parroquia, Los Mangos, 05°11'56"N, 74°56'08"W, 863 m, 15.xii.2005, A. A. Ramos-P., 3(3), ex cacao, fruit, tended by ants; Ibagué, Tres Esquinas, La Granjita, 04°28'37"N, 75°16'58"W, 1427 m, 13.xii.2005, A. A. Ramos-P., 2(2), ex coffee, roots.

Notes. Marotta (1992) synonymized *D. alazon* with *D. grassii*. According to Williams & Granara de Willink (1992), *D. grassii* (as *D. alazon*) is endemic to the New World as suggested by Beardsley (1965). Williams & Granara de Willink (1992) recorded the mealybug from the Bahamas, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Honduras, Mexico, Panama, Peru, Puerto Rico and Trinidad. Culik et al. (2006) reported this species for the first time from Brazil as a pest of papaya and coffee. They also noted that a closely related species, *D. texensis* Tinsley

had been recorded on coffee roots, but that they never observed *D. grassii* on the roots. This differs from our data; we observed *D. grassii* not only on the roots of coffee, but also on the roots of plantain and cacao fruit.

***Dysmicoccus neobrevipes* Beardsley: COLOMBIA: Antioquia:** 2004, E.V. Vergara-N., 1(1), ex *Musa* sp., pseudo-stem, tended by *Solenopsis* sp.

Notes. According to Williams & Granara de Willink (1992), *D. neobrevipes* probably originated in the Neotropical region, although it was described originally from Hawaii. They recorded the mealybug on *Coffea arabica* in Colombia, but we did not find this species on coffee despite intensive sampling.

***Dysmicoccus texensis* (Tinsley): COLOMBIA: Antioquia:** 2004, E.V. Vergara-N., 2(2), ex *Musa* sp., pseudo-stem, tended by *Pheidole* sp.; La Pintada, finca Villa Clarita, Lote El Triángulo, 05°45'10"N, 75°36'37"W, 728 m, 10.x.2005, A. A. Ramos-P., 8(8), ex orange, leaves and fruit; Támesis, Hogar Juvenil, 05°39'45"N, 75°42'54"W, 1630 m, 13.x.2005, A. A. Ramos-P., 1(1), ex coffee, fruit; **Caldas:** Anserma, Risaralda, 05°08'41"N, 75°44'32"W, 1096 m, 9.xii.2005, A. A. Ramos-P., 4(4), ex coffee, roots; Belalcázar, Monteredondo, Tochechito, 04°59'38"N, 75°48'02"W, 1236 m, 16.xi.2005, A. A. Ramos-P., 3(3), ex cacao, fruit, tended by *Crematogaster* sp.; Chinchiná, El Edén, crosspoint to Palestina, 04°59'49"N, 75°36'58"W, 1299 m, 13.iii.2005, A. A. Ramos-P., 1(1), ex coffee, fruit, tended by *Paratrechina* sp.; Palestina, El Higuierón, Teyuna, 05°01'07"N, 75°40'30"W, 1330 m, 30.iii.2005, A. A. Ramos-P., 2(2), ex coffee, roots; Supía, El Descanso, Ulises Valencia, 05°25'13"N, 75°38'53"W, 1136 m, 21.x.2005, A. A. Ramos-P., 4(4), ex coffee, fruit, tended by *Paratrechina* sp. **Cauca:** El Tambo, Hospital Santa María, 02°27'07"N, 76°48'23"W, 1783 m, 23.xi.2005, A. A. Ramos-P., 2(2), ex coffee, fruit, tended by *Linepithema* sp.; El Tambo, Hospital Santa María, 02°27'07"N, 76°48'23"W, 1783 m, 23.xi.2005, A. A. Ramos-P., 2(2), ex coffee, roots; Santander de Quilichao, Alegrías, El Arazá, 02°59'09"N, 76°30'00"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 2(2), ex plantain, pseudo-stem; Santander de Quilichao, Alegrías, El Arazá, 02°59'09"N, 76°30'00"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 4(4), ex plantain, roots. **Norte de Santander:** Bochalema, El Trapiche, 07°36'08"N, 72°37'53"W, 1000 m, 17.vii.2004, R. Silva, 1(1), ex coffee. **Quindío:** Armenia, Avenida Cen-

tenario, 04°32'12"N, 75°39'47"W, 1526 m, 22.vi.2005, A. A. Ramos-P., 4(4), ex coffee, roots.

Risaralda: Pereira, Rocío Alto, El Rocío, 04°49'02"N, 75°41'54"W, 1450 m, 1.iii.2004, A. Osorio, 1(1), ex coffee, twigs. **Tolima:** Libano, Delicias del Convenio, Macondo, 04°57'30"N, 75°00'38"W, 1349 m, 14.xii.2005, A. A. Ramos-P., 4(4), ex coffee, roots.

Notes. Miller and Polavarapu (1997) synonymized the species *Dysmicoccus bispinosus* Beardsley (recorded from Colombia and many other Neotropical countries) with *D. texensis*. This mealybug is a common species in Colombia on coffee and plantain.

***Dysmicoccus sp.: COLOMBIA: Antioquia:** Támesis, Palermo, Finca Nacional de Chocolates, 05°43'03"N, 75°41'27"W, 1168 m, 11.x.2005, A. A. Ramos-P., 1(1), ex cacao, fruit, tended by ants.

Quindío: Armenia, El Caimo, vereda Primavera, 04°25'53"N, 75°44'50"W, 1220 m, 24.vi.2005, A. A. Ramos-P., 1(1), ex orange, fruit, tended by *Crematogaster* sp.; Calarcá, La Granja, La Siria, Alba Lucía Sosa, 04°29'06"N, 75°41'50"W, 1371 m, 24.vi.2005, A. A. Ramos-P., 1(1), ex coffee, fruit, tended by *Solenopsis* sp. **Valle del Cauca:** Cali, 3.i.2005, T. Kondo, 6(8), ex *Croton gossypifolius*, tended by *Linepithema piliferum* ant det. Alex Wild; Cali, 17.i.2006, T. Kondo, 2(2), ex *Carica papaya*, leaf.

Notes. This undescribed species closely resembles *D. hurdi* McKenzie, but it differs from *D. hurdi* in having more conical setae on each cerarii. All cerarii in *D. hurdi* are composed of 2 setae, except for cerarii on the head, where each may possess 3–7 conical setae (Williams & Granara de Willink 1992). The cerarii of *Dysmicoccus* sp. are composed of 2 or 3 conical setae, with the ocular cerarii composed of 4 setae. *Dysmicoccus hurdi* is known only from Mexico, where a single specimen was collected on an undetermined host (Ben-Dov 1994; McKenzie 1962, Williams & Granara de Willink 1992).

Ferrisia virgata (Cockerell) (Figure 1C): COLOMBIA: Caldas: Neira, Planes, El Cuervo, Inversiones Agromundo, 05°14'22"N, 75°39'06"W, 759 m, 2.iii.2005, A. A. Ramos-P., 2(2), *Citrus* sp. (Tahiti lime), leaf. **Cauca:** El Tambo, El Tablón de Omaira Zúñiga, 02°26'47"N, 76°47'36"W, 1800 m, 23.xi.2005, A. A. Ramos-P., 2(2), ex plantain, leaf. **Nariño:** Tumaco, 01°32'59"N, 78°41'55"W, 16 m, 11.i.2006, T. Kondo, 4(4), ex *Elaeis guineensis* (oil palm), leaf of seedling.

Notes. *Ferrisia virgata* is probably widespread throughout Central and South America on numerous hosts (Williams & Granara de Willink 1992). Williams & Granara de Willink (1992) recorded the mealybug in Colombia on *Acalypha* sp., *Coffea* sp., *Croton* sp., *Herrania nitida*, *Manihot carthaginensis*, *M. esculenta*, *Theobroma cacao*, *T. subincanum*, and an unknown host. We collected *F. virgata* on Tahiti lime and oil palm. Five *Ferrisia* Fullaway species have been recorded from the Neotropical region (Ben-Dov 1994), but only *F. virgata* has been recorded from Colombia. According to Williams & Granara de Willink (1992), the complex of specimens presently identified as *F. virgata* may include more than one species. Indeed, many previous records of *F. virgata* in Colombia may be misidentifications of a closely related species (see notes under *Ferrisia* sp.).

***Ferrisia sp. (Figure 1D): COLOMBIA: Antioquia:** El Jardín, vereda San Bartolo, finca El Clavel, 05°37'36"N, 75°51'25"W, 1674 m, 14.v.2004, A. Botero, 1(1), ex coffee, leaf. **Caldas:** Anserma, Cambía, Cuernavaca, 05°08'59"N, 75°42'56"W, 993 m, 26.viii.2005, A. A. Ramos-P., 2(2), ex Valencia orange, fruit; Neira, Guacaica, 05°08'39"N, 75°29'36"W, 1718 m, 29.ix.2005, A. A. Ramos-P., 1(1), ex plantain, leaf; Belalcazar, Montere-dondo, Tohecito de Ramón Osorio, 04°59'38"N, 75°48'02"W, 1236 m, 16.xi.2005, A. A. Ramos-P., 1(1), No. 238, ex plantain, leaf; Palestina, La Inquisición, La Margarita, 05°01'60"N, 75°36'26"W, 1355 m, 11.iii.2005, A. A. Ramos-P., 2(2), ex plantain, leaf, tended by ants; San José, Arrayanes, 05°06'54"N, 75°48'33"W, 1199 m, 13.v.2005, A. A. Ramos-P., 1(1), coffee, fruit, tended by *W. auropunctata*. **Cauca:** Caldono, El Descanso de Bernardo Tamayo, 02°49'04"N, 76°32'32"W, 1532 m, 24.xi.2005, A. A. Ramos-P., 1(1), No. 247, ex coffee, fruit; Caldono, Pescador, La Manga de Emilio Benachi, 02°47'58"N, 76°33'07"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 1(1), No. 240, ex *Musa* sp.; El Tambo, Barrio El Cementerio, 02°27'18"N, 76°48'43"W, 1786 m, 23.xi.2005, A. A. Ramos-P., 4(4), plantain, leaf; El Tambo, El Tablón de Omaira, Zúñiga, 02°26'47"N, 76°47'36"W, 1800 m, 23.xi.2005, A. A. Ramos-P., 1(1), No. 253, ex *Musa* sp.; Santander de Quilichao, Alegrías, El Arazá, 02°59'09"N, 76°30'00"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 1(1), ex *Musa* sp., leaf; Tibio, San Pedrito, La Rinconada, 02°20'50"N, 76°42'53"W, 1773 m, 21.xi.2005, A. A. Ramos-P., 1(1), No. 227, ex coffee, fruit. **Quindío:** Armenia, El Caimo, vereda

Primavera, 04°25'53"N, 75°44'50"W, 1220 m, 24.vi.2005, A. A. Ramos-P., 1(1), ex orange, fruit, tended by *Crematogaster* sp.; Calarcá, La Granja, La Siria, 04°29'06"N, 75°41'50"W, 1372 m, 25.vi.2005, A. A. Ramos-P., 1(1), ex coffee, fruit; Filandia, Fachadas, 04°38'33"N, 75°41'03"W, 1713 m, 23.vi.2005, A. A. Ramos-P., 1(1), ex coffee, fruit; Parque Nacional del Café, 30.xii.2004, T. Kondo, 4(4), ex *Heliconia* sp. on bract of inflorescence. **Risaralda:** Pereira, 04°48'10"N, 75°41'40"W, 1424 m, 7.i.2006, T. Kondo, 3(3), ex *Codiaeum variegatum*, leaf. **Santander:** Florida Blanca, 19.vi.2006, E.V. Vergara-N., No. 689, 2(2), ex *Ixora* sp. (*Ixora coral*). **Tolima:** Ibagué, 28.i.1995, T. Kondo, ex *Mangifera indica*, 1(1), AUCC-179-2000. **Valle del Cauca:** Cali, 5.i.2002, T. Kondo; 1(1), ex Moraceae; Cali, 5.i.2002, T. Kondo, 4(4), ex *Mangifera indica*, leaf; Cali, 14.i.2006, T. Kondo, 4(4), ex *Ficus* sp.; Caicedonia, El Brillante, Venecia 1, 04°19'48"N, 75°50'08"W, 1185 m, 9.vi.2005, A. A. Ramos-P., 1(1), ex *Citrus* sp. (Mandarina Oneco), fruit and twigs, tended by *W. auropunctata*; Palmira, 15.xii.2003, T. Kondo, 1 (1 ♀ nymph), ex undetermined.

Notes. This polyphagous species, although closely related to *F. virgata*, is being described as a new species in a revisionary study of the genus *Ferrisia* (Penny Gullan, University of California, Davis, personal communication). Its hosts include many plants of economic importance and it has the potential to become a pest.

***Geococcus coffeae* Green (Figure 1E): COLOMBIA:** **Caldas:** Palestina, El Higuérón, Teyuna de José de Jesús Idárraga, 05°01'07"N, 75°40'30"W, 1330 m, 30.iii.2005, A. A. Ramos-P., 4(4), ex plantain, root, tended by *Acropyga* sp. **Cauca:** El Tambo, Barrio El Cementerio, 02°27'18"N, 76°48'43"W, 1786 m, 23.xi.2005, A. A. Ramos-P., 5(5), plantain, root; El Tambo, El Tablón de Omaira Zúñiga, 02°26'47"N, 76°47'36"W, 1800 m, 23.xi.2005, A. A. Ramos-P., 5(5), plantain, root; Timbío, El Altillito Alto, La Aurora, 02°20'16"N, 76°40'42"W, 1873 m, 21.xi.-2005, A. A. Ramos-P., 4(4), ex coffee, roots. **Tolima:** Alvarado, Guayabos, 04°40'13"N, 74°59'45"W, 1030 m, 14.xii.2005, 2(2), ex *Musa* sp. (cachaco), root; Libano, Delicias del Convenio, Macondo, 04°57'30"N, 75°00'38"W, 1349 m, 14.xii.2005, A. A. Ramos-P., 1(1), ex plantain, roots; Libano, El Paraíso, Granja La Unión (CENICAFÉ), 04°54'56"N, 75°02'55"W, 1531 m, 14.xii.2005, A. A. Ramos-P., 1(1), ex coffee, roots; Mariquita, Las Lomas, Casa Loma,

05°12'40"N, 74°55'21"W, 753 m, 15.xii.2005, A. A. Ramos-P., 6(6), ex plantain, root.

Notes: *Geococcus coffeae*, also known as the coffee root mealybug, is common throughout the tropics, and is probably common in most of the Neotropical region, where it is always found on roots of plants, and often causing damage (Williams & Granara de Willink 1992).

***Leptococcus neotropicus* (Williams & Granara de Willink): COLOMBIA: Tolima:** Honda, Vereda Bremer, finca San Ignacio, 242 m, 9.v.2006, F. Gómez, 3(3), ex *Carica papaya*, leaves; Melgar, 04°20'63"N, 74°63'41"W, 365 m, 5.x.2006, W. King, 3(3), ex *Sciacassia siamea* (locally known as "acacio amarillo").

Notes. Kondo & Gullan (2007) recently synonymized the genus *Plotococcus* Miller & Denno with *Leptococcus* Reyne, and transferred all species hitherto included in *Plotococcus* to *Leptococcus*, including *Plotococcus neotropicus*. This polyphagous species was described originally from Colombia. Williams & Granara de Willink (1992) reported it also from Guyana, Panama and Trinidad, and predicted that the species will be found probably in Central America and much of northern South America.

***Leptococcus rodmani* Kondo (Figure 1F): COLOMBIA: Valle del Cauca:** Cali, Club Campestre Comfandi, 03°18'22.7"N, 76°32'-12.3"W, 1021 m, 23.iii.2008, T. Kondo, ex *Guarea guidonia* (L.) Sleumer, (Meliaceae), 3(3), (CORPOICA).

Notes. Specimens were collected on the type locality on the type host. In the original description, Kondo & Gullan (2008) described the species as occurring on the underside of the leaves, however, in the present study, mealybugs were found on both sides of the leaves. *Leptococcus rodmani* generally prefers the underside of the leaves, but may also infest the topside of shaded leaves. Seven mealybug mummies were observed; in five of them the parasitoid had already emerged by removing half of the posterior part of the abdomen. No mummies had holes in the head region. Live *L. rodmani* mealybugs will readily raise the tip of their abdomens together with their pair of long waxy filaments when disturbed, and will move around the leaves far from their original feeding site. No ant attendance was observed (T. Kondo personal observation).

****Maconellicoccus hirsutus* (Green) (Figure 1G): COLOMBIA: Atlántico: Barranquilla,**

12.iii.2007, N. Rodríguez, 2(2), ex *Hibiscus* sp.; Malambo, Caracolí, Colegio Agropecuario, 22.viii.2006, N. Rodríguez, 2(2), ex *Citrus* sp. (Limón rugoso); Puerto Colombia, El Peaje, 10°96'72"N, 74°95'77"W, 8.xi.2006, N. Rodríguez, 3(3), ex *Hibiscus* sp.; Tubará, El Autódromo, 12.iii.2007, N. Rodríguez, 3(3), ex *Hibiscus* sp.; Tubará, El Autódromo, 10°91'53"N, 75°02'48"W, 8.xi.2006, N. Rodríguez, 2(2), ex *Hibiscus* sp.; Tubará, El Reposo, 10°96'35"N, 74°99'89"W, 8.xi.2006, N. Rodríguez, 3(3), ex *Hibiscus* sp.; Tubará, Repelón, Kiosko el Migue, 12.iii.2007, N. Rodríguez, 2(2), ex *Hibiscus* sp. **Cesar:** Valledupar, 27.vi.2006, J. Morales, 3(3), ex *Annona* sp. Guajira: Riohacha, 16.v.2006, A. Saibis, 2(2), ex *Hibiscus* sp., stem; Riohacha, 18.v.2006, A. Saibis, 3(3), ex *Psidium guajava*, terminal shoots; Riohacha, 18.v.2006, A. Saibis, 2(2), ex *Annona* sp., fruit. **Magdalena:** Santa Marta, Parque las Américas, Matamoro, exit to La Guajira, 31.iii.2006, A. Espeleta, 3(3), ex *Hibiscus* sp.

Notes. The spread of the pink hibiscus mealybug, *M. hirsutus*, into the New World is well documented. According to Michaud & Evans (2000), *M. hirsutus* was first recorded from Grenada in 1993 (Persad 1995), Trinidad in August, 1995 (Jones 1996), St. Kitts in October, 1995 (Thomas & Thomas 1996), sixteen islands of the Lesser Antilles in August, 1997 (Meyerdirk 1997), the island of Vieques (Puerto Rico) in the summer of 1997, mainland Puerto Rico in October 1997, Isla Margarita (Venezuela) in 1999, mainland Venezuela in 2000 (Cermeli et al. 2002), and California in 1999, and Florida, U.S.A. in 2002 (Hodges & Hodges 2006). Our collections of *M. hirsutus* are all dated 2006 or 2007, but judging by the records of the mealybug in neighboring Venezuela in 2000, and by its presence in four Departments along the Caribbean coast of Colombia, it is likely that the introduction of the pink hibiscus mealybug into Colombia occurred sometime in the early 2000's, about the same time or soon after it was introduced into Venezuela. According to Ramos Portilla & Serna Cardona (2004), there was a phytosanitary surveillance program by ICA in 2003 and *M. hirsutus* was not found in Colombia in 2004, thus the mealybug was likely introduced into Colombia after 2004. Williams (1996) described the biology and relationships of two other species of *Maconellicoccus*, and indicated that the key parasitoid of *M. hirsutus* is *Anagyrus kamali* Moursi (Hymenoptera: Encyrtidae), a species presumed to be of Asian origin.

Macrocepicoccus loranthei Morrison (Figure 1H): COLOMBIA: Valle del Cauca: Palmira, Corporación Colombiana de Investigación Agropecuaria (CORPOICA), Centro de Investigación Palmira, 03°30'51.8"N, 76°19'00.2"W, 1009 m, 31.iii.2008, T. Kondo, 4(10), ex leaves of a mistletoe, *Oryctanthus amplexicaulis* (Kunth) Eichler (Loranthaceae) on avocado, *Persea americana* (Lauraceae); same collecting data, except, 03°30'49.7"N, 76°19'01.3"W, 1014 m, 4(12), ex leaves of a mistletoe, *O. amplexicaulis* on *Caryodendron orinocense* H. Karst. (Euphorbiaceae), a "native tree known as "inchi"; other names include Takay and cacay nogal; same collecting data, except, 03°30'49.6"N, 76°18'58.7"W, 1013 m, 5(18), ex leaves of a mistletoe, *Phthirusa pyrifolia* (Kunth) Eichler on *Terminalia catappa* L. (Combretaceae).

Notes. Many *M. loranthei* specimens were parasitized by a parasitoid wasp (probably an encyrtid) and formed mummies, some of which had exit holes in the posterior end of the abdomen with none of them with exit holes on the head region (similar observation made on mummies of *L. rodmani*). The mummies consisted of dried-up and swollen mealybugs which were three or more times the size of the non-parasitized mealybugs. On specimens on mistletoes on avocado, there were chrysopid eggs just next to the mealybug colonies and on specimens collected on mistletoes on *C. orinocense* there were also a syrphid fly larva and an adult *Scymnus* sp. coccinellid feeding on the mealybugs, suggesting that there are a number of natural enemies associated with them. The mealybugs are active when disturbed and will readily drop off the leaves, apparently floating in a similar manner to what Miller & Denno (1977) described for *Leptococcus eugeniae* (Miller & Denno). While feeding, *M. loranthei* keep the lateral waxy filaments low and in contact with the leaf surface, but will raise the lateral waxy filaments at about 5 to 10 degree angles when walking about the leaves. The mealybugs are ovoviviparous, and form colonies in the center portion of the leaves; the crawlers are found generally under the body of the adult females or in their proximity. *Macrocepicoccus loranthei* does not produce honeydew; perhaps for this reason there was no sooty mould associated with the mealybugs and no ant attendance was observed (T. Kondo personal observations).

Gallego & Velez (1992) previously recorded this species in Colombia on *Loranthus* sp. (Loranthaceae) and *Moringa* sp. (Moringaceae). Unfortunately, there are no voucher specimens of

M. loranthi studied by Gallego & Velez (1992) to confirm these records. Williams & Granara de Willink (1992) listed *M. loranthi* in Guyana on 'bird vine', *Loranthus* sp., and in Panama on a mistletoe on *Moringa* sp. and on a parasitic plant on *Citrus* sp. In our study, we found fairly abundant populations of *M. loranthi* on mistletoe plants parasitizing *Caryodendron orinocense*, *Persea americana* and *Terminalia catappa*. The record of Gallego & Velez (1992) of *M. loranthi* on *Moringa* sp. may be well be referring to specimens collected on a mistletoe on *Moringa* sp. or to specimens that had fallen off a mistletoe on *Moringa* sp., but not to specimens directly feeding on *Moringa* sp. The mealybug populations collected in the present study were all found on mistletoes (*O. amplexicaulis* and *P. pyrifolia*) found on three different hosts in three different plant families, i.e., Combretaceae, Lauraceae and Euphorbiaceae, but *M. loranthi* was found only on the leaves of the mistletoe and not on the host of the mistletoe suggesting that *M. loranthi* specializes on Loranthaceae.

***Nipaecoccus guazumae* (Balachowsky) (Figure 1I): COLOMBIA: Antioquia:** San Jerónimo, Granja Rafael Rivera-FEDECACAO, 06°26'48"N, 75°43'17"W, 740 m, 27.v.2004, A. Botero, 2(2), ex cacao, leaf. **Norte de Santander:** Cúcuta, Monte Verde, 08°15'45"N, 72°29'41"W, 150 m, 03.v.2004, A. Alterio, 6(6), ex cacao, terminal shoots. **Tolima:** Chaparral, Helechales, El Agrado, 03°43'39"N, 75°55'16"W, 854 m, 31.x.2004, A. A. Ramos-P., 7(7), ex cacao, branch; Chaparral, Helechales, El Agrado, 03°43'39"N, 75°55'16"W, 854 m, 31.x.2004, A. A. Ramos-P., 10(10), ex cacao, branch. **Valle del Cauca:** Cali, 03°22'49"N, 76°32'23"W, 1000 m, 1.i.2006, T. Kondo, ex *Guazuma ulmifolia*, inside ant cartons of *Azteca* sp.

Notes. This is a common species found on *Guazuma ulmifolia* and cacao in Colombia. The species occurs on numerous hosts, and Williams & Granara de Willink (1992) recorded it in neighboring Panama and Venezuela.

***Nipaecoccus neogaeus* Williams & Granara de Willink: COLOMBIA: Norte de Santander:** Cúcuta, Monte Verde, 08°15'32"N, 72°29'38"W, 150 m, 03.v.2004, A. Alterio, 7(7), ex cacao, flower shoots; Cúcuta, Monte Verde, 08°15'32"N, 72°29'38"W, 150 m, 03.v.2004, A. Alterio, 6(6), ex cacao, flower shoots. **Valle del Cauca:** Buga la Grande, Mestizal, La Judith, 04°13'49"N, 76°09'36"W, 973 m, 10.vi.2005, A. A. Ramos-P.,

2(2), ex cacao, fruit, tended by *W. auropunctata*.

Notes. Williams & Granara de Willink (1992) described this species from specimens collected in Trinidad on *Clidemia hirta*, and also examined specimens collected from Brazil (on *Theobroma cacao*), Colombia (on *Inga* sp., *T. bicolor*, *T. cacao*, and unidentified Melastomaceae sp.) and Mexico (on *Climedia hirta*).

***Nipaecoccus nipae* (Maskell) (Figure 1J):**

COLOMBIA: Antioquia: Maceo, Brisas, Pascuitas, 06°32'52"N, 74°39'38"W, 654 m, 20.v.2005, A. A. Ramos-P., 1(1), ex plantain, leaf. **Caldas:** Neira, El Descanso, 05°11'08"N, 75°32'56"W, 1537 m, 19.iii.2005, A. A. Ramos-P., 2(2), plantain, leaf; Palestina, El Higuerón, Teyuna, 05°01'07"N, 75°40'30"W, 1331 m, 30.iii.2005, A. A. Ramos-P., 5(5), plantain, leaf. **Cauca:** El Tambo, Barrio El Cementerio, 02°27'18"N, 76°48'43"W, 1786 m, 23.xi.2005, A. A. Ramos-P., 3(3), ex plantain, leaf; Santander de Quilichao, Alegrías, El Arazá, 02°59'09"N, 76°30'00"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 2(2), ex plantain, leaf. **Tolima:** Chaparral, Helechales, El Agrado, 03°43'39"N, 75°55'16"W, 854 m, 31.x.2004, A. A. Ramos-P., 3(3), ex cacao, leaf, tended by *Paratrechina* sp.; Chaparral, Helechales, El Agrado, 03°43'39"N, 75°55'16"W, 854 m, 31.x.2005, A. A. Ramos-P., 4(4), ex plantain, leaf; Chaparral, Helechales, El Agrado, 03°43'39"N, 75°55'16"W, 854 m, 31.x.2005, A. A. Ramos-P., 5(5), ex plantain, leaf; Mariquita, Las Lomas, Casa Loma, 05°12'40"N, 74°55'21"W, 753 m, 15.xii.2005, A. A. Ramos-P., 1(1), plantain, leaf. **Valle del Cauca:** Caicedonia, Limones, El Bosque, 04°20'45"N, 75°52'24"W, 1230 m, 23.vi.2005, A. A. Ramos-P., 1(1), ex plantain, leaf; Cali, 29.viii.1999, T. Kondo, ex *Psidium gaujava*, leaf, 13(13), AUCC-151-2000, Cali, 20.vii.2000, D.P. Moreno, 4(7), ex undet. plant; Buga la Grande, Mestizal, La Judith, 04°13'49"N, 76°09'36"W, 973 m, 10.vi.2005, A. A. Ramos-P., 5(5), ex plantain, leaf, tended by *Brachymyrmex* sp.

Notes. According to Zimmerman (1948), there exists a white wax form and yellow wax form of this species. The white wax forms have been identified often as *N. nipae* and the yellow form as *N. pseudonipae* (Cockerell), but no morphological features have been found yet to separate the two forms in the adult female stage (Williams & Granara de Willink 1992). Beardsley (2001) reported the presence of at least two species belonging to the *Nipaecoccus nipae*-species complex in Hawaii, one with white wax and the

other with buff wax. Besides giving morphological features to separate the two species, Beardsley (2001) pointed out that the most important feature that separates the two species is that the encyrtid parasitoid *Pseudaphycus utilis* Timberlake is only known to parasitize the white-wax species. Beardsley (2001) also indicated the nomenclatural problems surrounding the *Nipaeococcus nipae*-species complex, and concluded that the buff-wax species is *Nipaeococcus nipae* (Maskell) and that *N. pseudonipae* (Cockerell) is its junior synonym. Beardsley (2001) then described the white-wax species from Hawaii as *Nipaeococcus paranipae* Beardsley and another species from Florida as *Nipaeococcus floridensis* Beardsley.

****Nipaeococcus* sp. 1: COLOMBIA: Valle del Cauca:** Cali, 28.xii.2005, T. Kondo, 5(5), ex *Calliandra pittieri* Standl. (Fabaceae).

Notes. Although specimens of *Nipaeococcus* sp. 1 key out to *N. coffeae*, they slightly differ from Williams & Granara de Willink's (1992) description as follows (character states of *N. coffeae* given by Williams & Granara de Willink in parenthesis): (i) translucent pores present on hind coxae (absent); and (ii) two sizes of dorsal tubular ducts (one size only). These features of *Dysmicoccus* sp. 1 are shared with the closely related *N. percerosus* (Leonardi), but *Dysmicoccus* sp. 1 shares the following important features with *N. coffeae* (features of *N. percerosus* in parenthesis): (i) anal lobe cerarii with 3 large conical setae (only 2); (ii) 8 pairs of cerarii (4 or 5 pairs); and (iii) few or no multilocular disc pores around body margin (numerous). In addition to the translucent pores on the hind coxae, *Dysmicoccus* sp. 1 also have translucent pores on each the femur and tarsus, another feature not shared with *N. coffeae* or with *N. percerosus*.

****Nipaeococcus* sp. 2: COLOMBIA: Caldas:** Palestina, La Inquisición, La Margarita, 05°01'60"N, 75°36'26"W, 1355 m, 11.iii.2005, A. A. Ramos-P., 4(4), ex plantain leaf, tended by *Brachymyrmex* sp. **Cauca:** El Tambo, finca Hospital Santa María, 02°27'07"N, 76°48'23"W, 1783 m, 23.xi.2005, A. A. Ramos-P., 1(1), ex coffee, fruit, tended by *Linepithema* sp. **Valle del Cauca:** Cali, 03°20'50"N, 76°34'15"W, 975 m, 27.xii.2005, T. Kondo, 5(5), ex Zingiberaceae, leaves; Cali, Chorro de Plata, 28.xii.2005, T. Kondo, 1(1), undetermined tree, leaf.

Notes. This species fits well into the mealybug genus *Nipaeococcus* Šulc. It was not possible,

however, to assign it to any species known from the Neotropical region. It approaches *N. brasiliensis* Williams & Granara de Willink, but differs from this species in the presence of clusters of ventral tubular ducts around the body margin anterior to the abdomen (absent in *N. brasiliensis*). In this respect, it may be closer to *N. neogaeus* Williams & Granara de Willink, but it differs from that species by the absence of multilocular pores anterior to the abdomen (present in *N. neogaeus*). Further studies are needed to identify this species.

***Paraputo ingranti* (Balachowsky): COLOMBIA: Valle del Cauca:** Cali, road to Cristo Rey, 16.i.2006, T. Kondo, 4(4), ex *Cecropia* sp., inside hollow stem, tended by *Azteca* sp.

Notes. According to Williams & Granara de Willink (1992), the number of ventral tubular ducts of *P. ingranti* (as *Cataenococcus ingranti*) varies considerably and they were not certain whether this character alone can separate this species from the closely related *P. olivaceus* (as *C. olivaceus*). The specimens listed above were identified as *P. ingranti*, but they differ from Williams & Granara de Willink's (1992) description of that species in the absence of ventral tubular ducts in the thoracic margins (present in their description).

***Phenacoccus herreni* Cox & Williams: COLOMBIA: Valle del Cauca:** Palmira, Corporación Colombiana de Investigación Agropecuaria (CORPOICA), Centro de Investigación Palmira, 03°30'45.3"N, 76°19'13.8"W, 992 m, 7.iv.2008, T. Kondo, 1(1), ex leaf of *Manihot esculenta*.

Notes. *Ph. herreni* has previously been misidentified as *Ph. manihoti* in Colombia (see comments of *Ph. manihoti* under Discussion section).

****Phenacoccus solani* Ferris (Figure 1L): COLOMBIA: Magdalena:** Santa Marta, 2005, N. Rodríguez, 3(3), ex undetermined host.

Notes. This new record of *Ph. solani* in Colombia is unsurprising as it has been reported already from neighboring countries. Williams & Granara de Willink (1992) reported it from Brazil, Curaçao, Ecuador, Guatemala, Mexico, Trinidad and Venezuela. *Phenacoccus solani* is a widespread and polyphagous mealybug pest known to cause serious damage to potatoes stored as tubers or for experimental work (Flanders 1944), to tobacco in Zimbabwe (Williams et al. 1985), ornamental plants in the U.S.A. (Hamlen 1974) and green peppers in greenhouses in Japan

(Okabayashi 2003). According to Williams (2004), since *Ph. solani* was first described from North America, it has reached Central and South America (Williams & Granara de Willink 1992), South Africa (De Lotto 1974), Zimbabwe (Williams et al. 1985), Micronesia (Beardsley 1966), Kiribati (Williams & Watson 1988) and Hawaii (Zimmerman 1948). In recent years, *Ph. solani* has also spread into various other countries, such as Iran (Moghaddam et al. 2004), Israel (Ben-Dov 2005), Italy (Mazzeo et al. 1999), Japan (Kawai 2003), and Taiwan (Chen et al. 2002).

***Phenacoccus solenopsis Tinsley: COLOMBIA: Norte de Santander:** Cúcuta, 2005, A. Alterio, 3(3), ex *Hibiscus* sp. **THAILAND:** Kanchanaburi, Kwai Riverside Resort, 2.vi.2007, coll. T. Kondo, 14(14) (USNM).

Notes. Records of *Ph. solenopsis* in the Neotropical region are from Cuba, Dominican Republic, Ecuador, Mexico and Panama (Williams & Granara de Willink 1992). Outside of the Neotropical Region, this species has been collected in both eastern and western United States (McKenzie 1967; Kosztarab 1996). *Phenacoccus solenopsis* has been recorded recently from Argentina (Granara de Willink 2003), from Chile as a pest of *Solanum muricatum* (Larain 2002), the Galapagos Islands, Ecuador (Causton et al. 2006), and from Brazil, where it was found infesting tomato plants (Culik & Gullan 2005). Williams & Granara de Willink (1992) discussed specimens from Mexico and Colombia that resemble *Ph. solenopsis* in many respects, but that differ from *Ph. solenopsis* in the presence of small marginal groups of multilocular disc pores on the venter as far forward as abdominal segment I. In June 2007, the first author collected this latter form in Thailand, where it was common on *Hibiscus rosa-sinensis*. Specimens from Colombia collected in the present study, match the description of the typical *Ph. solenopsis* given by Williams & Granara de Willink (1992).

Planococcus citri (Risso) (Figure 1M): COLOMBIA: Antioquia: El Jardín, San Bartolo, Las Margaritas, 05°37'45"N, 75°51'22"W, 1642 m, 14.v.2004, A. Botero, 9(9), ex coffee, leaf; Medellín, Universidad Nacional, 06°20'24"N, 75°34'00"W, 1495 m, 1.iv.2004, E. E.V. Vergara-N., 6(6), ex cacao, fruit; Támesis, La Argentina, La Negrita, 05°38'22"N, 75°42'06"W, 1320 m, 14.x.2005, A. A. Ramos-P., 2(2), ex plantain, pseudo-stem, tended by ants. **Caldas:** Anserma,

Cambía, Cuernavaca, 05°08'59"N, 75°42'56"W, 993 m, 26.viii.2005, A. A. Ramos-P., 1(1), ex Valencia orange, fruit; Aranzazu, Varsovia, La Cascada, 05°15'13"N, 75°32'26"W, 1400 m, 19.iii.-2005, A. A. Ramos-P., 9(9), ex coffee, flowers, tended by *Pheidole* sp.; Chinchiná, El Edén, Lago Balsora, 04°59'49"N, 75°36'58"W, 1299 m, 13.iii.2005, A. A. Ramos-P., 5(5), ex orange, tended by *Paratrechina* sp.; Chinchiná, El Edén, cross point to Palestina, 04°59'49"N, 75°36'58"W, 1299 m, 13.iii.2005, A. A. Ramos-P., 3(3), ex coffee, fruit, tended by *Paratrechina* sp.; Manzanares, Callao, El Guayacán de Silvio Cortés, 05°13'60"N, 75°05'06"W, 1291 m, 9.iii.2005, A. A. Ramos-P., 4(4), ex *Citrus* sp. (common mandarine), one mealybug colony tended by *Pheidole* sp. and the other by *Linepithema* sp.; Neira, Tapias, La Paila de Stella Echeverry, 05°13'56"N, 75°38'43"W, 809 m, 2.iii.2005, A. A. Ramos-P., 7(7), ex *Citrus* sp., fruit, tended by *Solenopsis geminata*; San José, Arrayanes, 05°06'54"N, 75°48'33"W, 1199 m, 13.v.2005, A. A. Ramos-P., 2(2), ex coffee, fruit, tended by *W. auropunctata*; Viterbo, 05°03'49"N, 75°52'31"W, 975 m, 23.iv.2005, A. A. Ramos-P., 1(1), ex plantain, leaf, tended by *Brachymyrmex* sp. **Cauca:** Caldon, Pescador, La Manga de Emilio Benachí, 02°47'58"N, 76°33'07"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 1(1), ex plantain, leaf, tended by *Linepithema* sp.; El Tambo, El Tablón de Omaira Zúñiga, 02°26'47"N, 76°47'36"W, 1800 m, 23.xi.2005, A. A. Ramos-P., 1(1), ex plantain, leaf; Piendamó, Tunia vereda Quebradagrande, Villayaque de Arcadio Chávez, 02°39'57"N, 76°32'06"W, 1746 m, 24.xi.2005, A. A. Ramos-P., 3(3), ex coffee, fruit, tended by *Linepithema* sp.; Timbío, El Altillo Alto, La Aurora, 02°20'16"N, 76°40'42"W, 1873 m, 21.xi.2005, A. A. Ramos-P., 1(1), ex coffee, roots; Timbío, San Pedrito, Rubiela Cajas, 02°20'50"N, 76°42'53"W, 1773 m, 21.xi.2005, A. A. Ramos-P., 1(1), ex coffee, fruit, tended by *Linepithema* sp.; Timbío, San Pedrito, San Antonio, 02°20'50"N, 76°42'53"W, 1773 m, 21.xi.2005, A. A. Ramos-P., 2(2), ex coffee, fruit. **Quindío:** Armenia, El Caimo, vereda Primavera, 04°25'53"N, 75°44'50"W, 1220 m, 24.vi.2005, A. A. Ramos-P., 4(4), ex orange, fruit, tended by *Crematogaster* sp.; Calarcá, La Granja, La Siria, Alba Lucía Sosa, 04°29'06"N, 75°41'50"W, 1372 m, 25.vi.2005, A. A. Ramos-P., 1(1), ex *Coffea arabica* var. Caturra, fruit; Quimbaya, Kerman, Panaca, 04°36'29"N, 75°49'08"W, 1214 m, 23.vi.2005, A. A. Ramos-P., 1(1), ex orange. **Risaralda:** Marsella, San José, Cachipay,

04°56'32"N, 75°44'47"W, 1300 m, 15.v.2004, A. Ramírez, 8(8), ex *Citrus* sp. (Tahiti lime), fruit. **Tolima:** Fresno, El Espejo, 05°09'59"N, 75°01'18"W, 1342 m, 15.xii.2005, A. A. Ramos-P., 1(1), ex coffee, fruit. **Valle del Cauca:** Caicedonia, El Brillante, Venecia, 1(1), 04°19'48"N, 75°50'08"W, 1185 m, 9.vi.2005, A. A. Ramos-P., 1(1), ex *Citrus* sp. (Tahiti lime), fruit and branches, tended by *W. auropunctata*; Caicedonia, El Brillante, Venecia 1, 04°19'48"N, 75°50'08"W, 1185 m, 9.vi.2005, A. A. Ramos-P., 1(1), ex *Citrus* sp. (Oneco mandarine), fruit and branches, tended by *W. auropunctata*; Caicedonia, La Camelia, Germán Rincón, 04°20'39"N, 75°50'52"W, 1134 m, 9.vi.2005, A. A. Ramos-P., 9(9), ex coffee, fruit, tended by *Linepithema* sp.; Caicedonia, La Camelia, Vivero Frutos Tropicales, 04°20'39"N, 75°51'05"W, 1135 m, 9.vi.2005, A. A. Ramos-P., 4(4), ex *Citrus* sp. (Tahiti lime), fruit and branches, tended by *Pheidole* sp. and *Cardiocondyla* sp.; Caicedonia, La Camelia, Vivero Frutos Tropicales, 04°20'39"N, 75°51'05"W, 1135 m, 9.vi.2005, A. A. Ramos-P., 4(4), ex *Citrus* sp. (Arrayana mandarine), fruit and leaf, tended by *Pheidole* sp. and *Cardiocondyla* sp.; Caicedonia, La Camelia, Vivero Frutos Tropicales, 04°20'39"N, 75°51'05"W, 1135 m, 9.vi.2005, A. A. Ramos-P., 4(4), ex *Citrus sinensis* (Valencia orange), fruit and leaf, tended by *Pheidole* sp. and *Cardiocondyla* sp.; Pradera, Finca Varrahonda, 03°27'20.4"N, 76°14'21.5"W, 1097 m, 11.iv.2008, T. Kondo, 3(5), ex *Annona muricata* L.; Toro, Bohío, Agronilo, lote 1, 04°36'42"N, 76°04'53"W, 958 m, 8.vi.2005, A. A. Ramos-P., 5(5), ex *Citrus* sp. (Tahiti lime).

Notes. *Planococcus citri* is a polyphagous species, often found as a citrus pest, and is common probably throughout the Neotropical region (Williams & Granara de Willink 1992). Many of the *P. citri* specimens listed here keyed out to the closely-related species, *P. minor* (Maskell) when using the keys by Williams & Granara de Willink (1992), but these were identified as *P. citri* when using Cox's (1989) table to separate *P. citri* from *P. minor*. Identification of *Planococcus* species is complicated by the morphological variation that results from different rearing environments (Cox 1989). Although *P. citri* and *P. minor* are very similar, Cox (1981, 1983) conducted rearing experiments and established them as two distinct species. The overlapping morphological features of the two species led Cox (1989) to devise a table for scoring morphological differences between the two species, which allowed the user to

differentiate between the two species based on score points. Recent studies using two molecular markers, the mitochondrial gene, cytochrome oxidase I (COI) and the nuclear gene, elongation factor 1 α (EF-1 α), have indicated that *P. citri* is misidentified sometimes as *P. minor* when using currently available taxonomic keys (Williams & Granara de Willink 1992, Williams & Watson 1988) and even with Cox's (1989) score-based table (Rung et al. 2008). A polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) has been developed based on the 3' prime end of the COI gene that can readily differentiate *P. citri* from *P. minor* (Rung & Miller, unpublished data). Molecular studies are needed to test whether or not the specimens of *P. citri* in Colombia might actually be *P. minor*. Latest recommendations are that if a single specimen in a colony is identified as *P. citri*, then the colony should be identified as *P. citri* (Douglas J. Williams personal communication).

***Planococcus halli Ezzat & McConnell: COLOMBIA: Caldas:** Anserma, La Isla, finca Jamaica, 05°08'35"N, 75°49'42"W, 1085 m, 24.vi.2005, A. A. Ramos-P., 1(1), ex *Citrus* sp., fruit; Palestina, La Inquisición, finca La Margarita, 05°01'60"N, 05°36'24"W, 1350, 11.iii.2005, A. A. Ramos-P., 2(2), ex coffee, leaves. **Cauca:** Caldono, Pescador, finca La Manga, 02°47'58"N, 76°33'07"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 4(4), ex coffee, fruit, tended by *Linepithema* sp. **Notes.** Williams & Granara de Willink (1992) reported this species from Barbados, Bermuda, Brazil, Cayman Islands, Cuba, Dominican Republic, Guatemala, Guyana, Jamaica, Nevis, Panama, St. Kitts, St. Lucia and Trinidad. According to Cox (1989), *P. halli* looks very similar to *Planococcus ficus* (Signoret) and it may be impossible to identify with confidence some specimens with intermediate characters. Williams & Granara de Willink (1992) believed that both species are distinct. *Planococcus halli* is found frequently on yams, although it may occur on numerous other plants (Williams & Granara de Willink 1992).

***Prorhizococcus sp.: COLOMBIA: Caldas:** Palestina, El Higuérón, finca Teyuna, 05°01'07"N, 75°40'30"W, 1330 m, 30.iii.2005, A. A. Ramos-P., 1(1), ex plantain, roots, tended by *Acropyga* sp. **Notes.** The genus *Prorhizococcus* Miller & McKenzie includes a single species, *P. atopoporus* Miller & McKenzie, described from Mexico. This is the first record of this genus from

South America. The undescribed species from Colombia differs from *P. atopoporus* mainly in the number of antennal segments. The Colombian specimen has 7 segments, and *P. atopoporus* has 4 or 5 segments. No other discernable differences were found.

****Pseudococcus calceolariae* (Maskell) (Figure 1N): COLOMBIA: Risaralda:** Santa Rosa de Cabal, 23.xii.2001, T. Kondo, 4(4), ex *Cassia siamea* Lam. (Fabaceae). **Valle del Cauca:** Buenaventura, 7.iii.2008, coll. Carlos H. Gomez, 1(1), ex intercepted on apple fruit shipment originating from Chile.

Notes. *Pseudococcus calceolariae*, also known as the citrophilus mealybug, is a cosmopolitan and polyphagous pest that probably originated in Australia (Williams & Granara de Willink 1992). In the Neotropical region, the mealybug has been recorded only from Mexico and Chile (Williams & Granara de Willink 1992), where González (2003) identified it as a common pest of pome fruits. *Cassia siamea* is a new host record for this species. Although there are no official reports found in the scientific literature, the species has been reported previously occurring in Colombia. Pinzón Florián (2002) and Ramos Portilla et al. (2004) have reported *P. calceolariae* as a common pest of *Ficus andicola* in the city of Bogotá. Pinzón Florián (2002) noted this species is more abundant in the environmentally contaminated areas of rural Bogotá.

***Pseudococcus jackbeardsleyi* Gimpel & Miller (Figure 1O): COLOMBIA: Antioquia:** Maceo, Brisas, Pascuitas, 06°32'52"N, 74°39'38"W, 654 m, 20.v.2005, A. A. Ramos-P., 1(1), ex cacao, fruit, tended by *Brachymyrmex* sp.; Támesis, Hogar Juvenil, 05°39'45"N, 75°42'54"W, 1630 m, 13.x.2005, A. A. Ramos-P., 3(3), ex plantain, pseudo-stem, tended by *Crematogaster* sp.; Támesis, La Argentina, La Negrita, 05°38'22"N, 75°42'06"W, 1320 m, 14.x.2005, A. A. Ramos-P., 2(2), ex plantain, pseudo-stem, tended by ants; Támesis, San Pedro, Félix Ruíz, 05°38'38"N, 75°41'60"W, 1383 m, 14.x.2005, A. A. Ramos-P., 3(3), ex plantain, underground portion of pseudo-stem; Turbo, Currulao, El Paraíso, 08°05'53"N, 76°43'54"W, 1 m, 15.ix.2004, O. Munar, 5(5), ex banana var. AAA Gran Enano, tended by ants. **Caldas:** Anserma, Cambía, Cuernavaca, 05°08'59"N, 75°42'56"W, 993 m, 26.viii.2005, A. A. Ramos-P., 4(4), ex Valencia orange, fruits; Anserma, La Isla, Jamaica, 05°08'35"N, 75°49'42"W, 1085 m, 24.vi.2005, A. A. Ramos-P., 1(1),

ex *Citrus* sp., fruit; Anserma, La Isla, Jamaica de Antonio Corrales, 05°08'35"N, 75°49'42"W, 1085 m, 24.vi.2005, A. A. Ramos-P., 1(1), ex *Citrus* sp., fruit; Anserma, Maraprá, La Moralba, 05°08'35"N, 75°49'42"W, 1085 m, 11.x.2005, A. A. Ramos-P., 3(3), ex plantain, pseudo-stem, tended by *Brachymyrmex* sp.; Belalcázar, La Sainera, La Española, 05°01'27"N, 75°49'11"W, 1207 m, 14.vi.2005, A. A. Ramos-P., 4(4), ex plantain, tended by *Linepithema* sp. on pseudo-stem and by *Acropyga* sp. on roots; Chinchiná, El Reposo, La Siberia-Mejía, 04°58'36"N, 75°39'24"W, 1386 m, 22.ix.2005, A. A. Ramos-P., 2(2), ex plantain, pseudo-stem, tended by *Brachymyrmex* sp.; Chinchiná, El Reposo, La Siberia-Mejía, 04°58'36"N, 75°39'24"W, 1386 m, 22.ix.2005, A. A. Ramos-P., 4(4), ex plantain, pseudo-stem; Chinchiná, El Trébol, Buenavista, 04°58'43"N, 75°42'03"W, 1300 m, 19.v.2005, J. I. Rodríguez, 2(2), ex cacao, tended by *W. auropunctata*; Chinchiná, El Trébol, Buenavista, 04°58'43"N, 75°42'03"W, 1300 m, 19.v.2005, J. I. Rodríguez, 1(1), ex cacao; Chinchiná, La Cachucha, Terranova, 04°59'28"N, 75°41'23"W, 1286 m, 7.iv.2005, J. I. Rodríguez, 2(2), ex plantain, leaf, tended by ants; Palestina, Cartagena, La Sonadora, 05°05'N, 75°41'W, 1020 m, A. A. Ramos-P., 2(2), ex coffee, tended by *Paratrechina* sp.; Palestina, Cartagena, La Sonadora, 05°05'N, 75°41'W, 1020 m, A. A. Ramos-P., 2(2), ex plantain, tended by *Paratrechina* sp.; Palestina, La Inquisición, La Margarita, 05°01'60"N, 75°36'26"W, 1355 m, 11.iii.2005, A. A. Ramos-P., 1(1), ex plantain, leaf, tended by ants; Palestina, Santa Águeda, La Rochela, centro recreacional COMFAMILIARES, 05°04'53"N, 75°41'02"W, 1050 m, 1.v.2005, A. A. Ramos-P., 6(6), ex banana, leaf, tended by *Brachymyrmex* sp.; Palestina, Santaguada, Granja Casa Luker, 05°05'N, 75°41'W, 1020 m, 7.ix.2005, A. A. Ramos-P., 5(5), ex plantain, pseudo-stem, tended by *Brachymyrmex* sp.; Palestina, Santaguada, Montelindo, 05°4'53"N, 75°41'02"W, 1050 m, 1.ix.2005, Luisa Pinilla, 2(2), ex plantain, pseudo-stem; Palestina, Santaguada, Montelindo, 05°04'53"N, 75°41'02"W, 1100 m, 1.ix.2005, L. Pinilla, 2(2), ex plantain, pseudo-stem, tended by ants; Palestina, Santaguada, Montelindo, 05°04'53"N, 75°41'02"W, 100 m, 10.x.2005, A. A. Ramos-P., 5(5), ex plantain, pseudo-stem; San José, El Cairo, 05°06'45"N, 75°48'10"W, 1342 m, 24.vi.2005, A. A. Ramos-P., 3(3), ex plantain, pseudo-stem; San José, El Cairo, 05°06'45"N, 75°48'10"W, 1342 m, 25.vi.2005, A. A. Ramos-P., 4(4), ex plantain,

root; Victoria, Canaan, Hamburgo, 05°18'58"N, 74°55'16"W, 825 m, 25.x.2005, A. A. Ramos-P., 6(6), ex plantain, pseudo-stem, tended by *S. geminata*; Victoria, Canaan, Hamburgo, 05°18'58"N, 74°55'16"W, 825 m, 25.x.2005, A. A. Ramos-P., 3(3), ex plantain, root, tended by *Acropyga* sp.; Victoria, 05°19'02"N, 74°54'44"W, 761 m, 25.x.2005, A. A. Ramos-P., 2(2), ex plantain, pseudo-stem; Viterbo, La Merced, 05°04'54"N, 75°53'12"W, 1042 m, 6.xii.2005, A. A. Ramos-P., 1(1), ex plantain, pseudo-stem. **Cauca:** Caldono, El Descanso de Bernardo Camayo, 02°49'04"N, 76°32'32"W, 1532 m, 24.xi.2005, A. A. Ramos-P., 1(1), ex coffee, fruit; Caldono, Pescador, La Manga, 02°47'58"N, 76°33'07"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 3(3), ex plantain, pseudo-stem, tended by *Linepithema* sp.; Caldono, Pescador, La Manga de Emilio Benachí, 02°47'58"N, 76°33'07"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 2(2), ex plantain, leaf, tended by *Linepithema* sp.; El Tambo, El Tablón de Omaira Zúñiga, 02°26'47"N, 76°47'36"W, 1800 m, 23.xi.2005, A. A. Ramos-P., 6(6), ex plantain, pseudo-stem; Santander de Quilichao, Alegrias, El Arazá, 02°59'09"N, 76°30'00"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 2(2), ex *Citrus* sp. (mandarine), leaf and fruit. **Magdalena:** Santa Marta, Don Diego, 11°15'03"N, 73°44'36"W, 3 m, 17.iv.2004, A. Espeletia, 3(3), ex *Musa* sp. var. AAA, leaf sheath; Santa Marta, Los Linderos, Cancún, 11°15'03"N, 73°44'36"W, 3 m, 16.vi.2004, V. Meza, 5(5), ex banana, fruit. **Quindío:** Armenia, El Caimo, Santa Inés, 04°25'53"N, 75°44'50"W, 1250 m, A. Bejarano, 1(1), ex banana; Armenia, El Caimo, vereda Primavera, 04°25'53"N, 75°44'50"W, 1184 m, 23.vi.2004, A. A. Ramos-P., 5(5), ex banana, pseudo-stem, tended by *Brachymyrmex* sp.; Filandia, Fachadas, 04°38'33"N, 75°41'03"W, 1713 m, 23.vi.2005, A. A. Ramos-P., 1(1), ex coffee; Filandia, Fachadas, 04°38'33"N, 75°41'03"W, 1713 m, 23.vi.2005, A. A. Ramos-P., 1(1), ex coffee, fruit; Quimbaya, Kerman, 04°37'18"N, 75°47'40"W, 1250 m, 23.vi.2005, A. A. Ramos-P., 5(5), ex plantain, pseudo-stem, tended by *Brachymyrmex* sp.; Calarcá, La Granja, La Siria, Alba Lucía Sosa, 04°29'06"N, 75°41'50"W, 1371 m, 24.vi.2005, A. A. Ramos-P., 2(2), ex plantain, root, tended by *Solenopsis* sp.; Calarcá, La Granja, La Siria, Alba Lucía Sosa, 04°29'06"N, 75°41'50"W, 1372 m, 25.vi.2005, A. A. Ramos-P., 4(4), ex coffee, fruit; Calarcá, La Granja, La Siria, Alba Lucía Sosa, 04°29'06"N, 75°41'50"W, 1372 m, 25.vi.2005, A. A. Ramos-P., 2(2), ex plantain, leaf. **Tolima:**

Mariquita, Las Lomas, Casa Loma, 05°12'40"N, 74°55'21"W, 753 m, 15.xii.2005, A. A. Ramos-P., 1(1), ex plantain, root; Mariquita, Las Lomas, Casa Loma, 05°12'38"N, 74°55'21"W, 753 m, 15.xii.2005, A. A. Ramos-P., 1(1), ex plantain, pseudo-stem; Lérida, Padilla, Los Mangos, 04°57'10"N, 74°57'54"W, 1154 m, 14.xii.2005, A. A. Ramos-P., 3(3), ex plantain, pseudo-stem; Lérida, Padilla, Los Mangos, 04°57'10"N, 74°57'54"W, 1154 m, 14.xii.2005, A. A. Ramos-P., 1(1), ex cacao, fruit; Chaparral, Helechales, El Agrado, 03°43'39"N, 75°55'16"W, 854 m, 31.x.2004, A. A. Ramos-P., 1(1), ex cacao, stem; Fresno, Palenque de Pastor Tabares, 05°10'45"N, 74°59'09"W, 1106 m, 15.xii.2005, A. A. Ramos-P., 2(2), ex cacao, fruit; Alvarado, Guayabos, 04°40'13"N, 74°59'45"W, 1030 m, 14.xii.2005, A. A. Ramos-P., 4(4), ex *Musa* sp. (cachaco), root; Cajamarca, Curalito, 04°25'03"N, 75°21'43"W, 1522 m, 13.xii.2005, A. A. Ramos-P., 3(3), ex coffee, roots. **Valle del Cauca:** Caicedonia, Limones, El Bosque, 04°20'45"N, 75°52'24"W, 1230 m, 23.vi.2005, A. A. Ramos-P., 3(3), plantain, pseudo-stem.

Notes. Williams & Granara de Willink (1992) misidentified *Pseudococcus jackbeardsleyi* as *P. elisae* Borchsenius (Gimpel & Miller 1996). They reported *P. jackbeardsleyi* (as *P. elisae*) as a common polyphagous species throughout the Neotropical Region (Williams & Granara de Willink 1992), including Colombia.

***Pseudococcus longispinus* (Targioni Tozzetti) (Figure 1P): COLOMBIA: Valle del Cauca:** Cali, 30.i.1995, T. Kondo, ex *Mangifera indica*, fruit, 1(1), AUCC-180-2000; Palmira, Corporación Colombiana de Investigación Agropecuaria (CORPOICA), Centro de Investigación Palmira, Glass house, 03°30'39.0"N, 76°18'55.8.2"W, 988 m, 1.iv.2008, T. Kondo, 3(9), ex leaves of guava, *Psidium guajava*.

Notes. *Pseudococcus longispinus*, also known as the long-tailed mealybug, probably is distributed widely throughout the Neotropical Region on numerous plants (Williams & Granara de Willink 1992).

***Pseudococcus sociabilis* Hambleton: COLOMBIA: Valle del Cauca:** Caicedonia, 04°20'37"N, 75°50'53"W, 1129 m, 9.vi.2005, A. A. Ramos-P., 4(4), ex coffee, fruit; Tunia, 30.xii.5, T. Kondo, 1(1), ex coffee, fruit.

Notes. This species is known from Brazil, Colombia and Peru, and probably has a wide

distribution in South America (Williams & Granara de Willink 1992).

****Rhizoecus mayanus* (Hambleton):**

COLOMBIA: Caldas: Palestina, El Higuerón, Teyuna, 05°01'07"N, 75°40'30"W, 1330 m, 30.iii.2005, A. A. Ramos-P., 1(1), ex plantain, roots; Victoria, Canaan, Hamburgo, 05°18'58"N, 74°55'16"W, 825 m, 25.x.2005, A. A. Ramos-P., 2(2), ex plantain, roots; Palestina, Santagueda, finca Granja Casa Luker, 05°05'N, 75°41'W, 1020 m, 9.xii.2005, A. A. Ramos-P., 3(3), ex coffee, roots. **Tolima:** Líbano, Delicias del Convenio, Macondo, 04°57'30"N, 75°00'38"W, 1349 m, 14.xii.-2005, A. A. Ramos-P., 1(1), ex plantain, root.

Notes. The specimens listed above differ slightly from Williams & Granara de Willink's (1992) description of *R. mayanus* in having abundant trilobular pores, a feature described by them as "not numerous" in this species.

***Rhizoecus setosus* (Hambleton): COLOMBIA:**

Tolima: Cajamarca, Curalito, 04°25'03"N, 75°21'43"W, 1522 m, 13.xii.2005, A. A. Ramos-P., 5(5), coffee, roots, tended by *Acropyga* sp.; Cajamarca, Curalito, 04°25'03"N, 75°21'43"W, 1522 m, 13.xii.2005, A. A. Ramos-P., 3(3), ex plantain, root; Líbano, Delicias del Convenio, Macondo, 04°57'30"N, 75°00'38"W, 1349 m, 14.xii.2005, A. A. Ramos-P., 1(1), plantain, root; Líbano, El Paraíso, Granja La Unión (CENICAFÉ), 04°54'56"N, 75°02'55"W, 1531 m, 14.xii.2005, A. A. Ramos-P., 4(4), ex plantain, root.

Notes. *Rhizoecus setosus* is known from Colombia, Ecuador and Peru, and is recorded from *Coffea arabica*, Piperaceae, *Heliconia* sp., Poacea, and an unknown host (Williams & Granara de Willink 1992). This is the first record of this species on plantain.

***Rhizoecus variabilis* (Hambleton): COLOMBIA:**

Tolima: Líbano, Delicias del Convenio, finca Macondo, 04°57'30"N, 75°00'38"W, 1349 m, 14.xii.2005, A. A. Ramos-P., 2(2), ex plantain, roots.

Notes. This species is only known from Colombia, and was collected originally on *Agave* sp. (Williams & Granara de Willink 1992). This is the first record of *R. variabilis* on plantain.

***Saccharicoccus sacchari* (Cockerell): COLOMBIA**

(Figure 1Q): Antioquia: Barbosa, 06°30'19"N, 75°15'49"W, 1148 m, 19.v.2005, A.

A. Ramos-P., 4(4), ex sugarcane; Bello, Niquía, Vivero secretaria de Agricultura, 06°20'24"N, 75°34'00"W, 1495 m, xi.1999, J. Ramírez, 2(2), ex sugarcane; Bello, Niquía, Vivero secretaria de Agricultura, 06°20'24"N, 75°34'00"W, 1495 m, xi.1999, J. Ramírez, 1(1), ex sugarcane; Bello, Niquía, Vivero secretaria de Agricultura, 06°20'24"N, 75°34'00"W, 1495 m, xi.1999, J. Ramírez, 4(4), ex sugarcane; Bello, Niquía, Vivero secretaria de Agricultura, 06°20'24"N, 75°34'00"W, 1495 m, xi.2000, J. Ramírez, 2(2), ex sugarcane; Cisneros, El Limón, Los Rosales, 06°32'25"N, 75°07'21"W, 1371 m, 19.v.2005, A. A. Ramos-P., 4(4), ex sugarcane, tended by *Ectatomma ruidum* and *W. auropunctata*; Maceo, Brisas, Pascuitas, 06°32'52"N, 74°39'38"W, 654 m, 20.v.2005, A. A. Ramos-P., 3(3), ex sugarcane, tended by *Brachymyrmex* sp.; Medellín, Universidad Nacional, Núcleo El Volador, 06°15'20"N, 75°33'52"W, 1486 m, 14.x.2004, E.V. Vergara-N., 2(2), ex sugarcane, tended by *Linepithema* sp.; Santo Domingo, Cantallú, 06°32'00"N, 75°03'13"W, 941 m, 19.v.2005, A. A. Ramos-P., 1(1), ex sugarcane, tended by *Linepithema* sp. and *E. ruidum*; Támesis, San Pedro, Félix Ruíz, 05°38'38"N, 75°41'60"W, 1383 m, 14.x.2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *Crematogaster* sp. **Caldas:** Aranzazu, Puerto Samaria, 05°16'25"N, 75°29'37"W, 1875 m, 19.iii.2005, A. A. Ramos-P., 4(4), ex sugarcane, tended by *Brachymyrmex* sp.; Aranzazu, Varsovia, San Rafael, 05°15'19"N, 75°32'45"W, 1374 m, 10.iii.2005, A. A. Ramos-P., 4(4), ex sugarcane, tended by *Brachymyrmex* sp., *Crematogaster* sp. and *Camponotus lindigi*; Chinchiná, La Cachucha, Terranova, 04°59'28"N, 75°41'23"W, 1286 m, 7.iv.2005, J. I. Rodríguez, 4(4), ex sugarcane, tended by *S. geminata*; Filadelfia, Tareas, 05°12'18"N, 75°30'42"W, 1283 m, 29.ix.2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *Brachymyrmex* sp.; Manizales, El 41, El Indial, 05°09'28"N, 75°39'44"W, 859 m, 2.iii.2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *W. auropunctata* and *Monomorium* sp.; Manizales, Callao, Eduardo Vélez, 05°14'18"N, 75°04'59"W, 1305 m, 8.iii.2005, A. A. Ramos-P., 4(4), ex sugarcane, tended by *Linepithema* sp. and *Paratrechina* sp.; Neira, Aguacatal, Korea, 05°11'45"N, 75°34'09"W, 1407 m, 23.viii.2005, J. I. Rodríguez, 4(4), ex sugarcane, tended by *S. geminata* and *W. auropunctata*; Neira, La Isla, El Guineo, 05°11'08"N, 75°32'04"W, 1600 m, 20.viii.2005, J. I. Rodríguez, 1(1), ex sugarcane; Neira, Tapias, La Paila, 05°13'56"N, 75°38'40"W,

- 830 m, 20.ix.2005, J. I. Rodríguez, 3(3), ex sugarcane, tended by *S. geminata*; Neira, Tapias, Las Palomas, 05°13'49"N, 75°38'53"W, 820 m, 6.x.2005, J. I. Rodríguez, 5(5), ex sugarcane, tended by *Crematogaster* sp.; Salamina, La Selva, 05°14'45"N, 75°39'09"W, 800 m, 6.vi.2005, A. A. Ramos-P., 7(7), ex sugarcane, tended by *Brachymyrmex* sp.; Supía, El Descanso, Ulises Valencia, 05°25'13"N, 75°38'53"W, 1136 m, 21.x.2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *Paratrechina* sp.; Supía, Las Vegas, Miguel Castañeda, 05°25'33"N, 75°38'16"W, 1352 m, 31.x.2005, A. A. Ramos-P., 7(7), ex sugarcane, tended by *Paratrechina* sp.; Supía, Las Vegas, 05°25'58"N, 75°39'50"W, 1236 m, 31.x.2005, A. A. Ramos-P., 6(6), ex sugarcane, tended by *Brachymyrmex* sp.; Supía, Mudarra, Altobonito, 05°25'20"N, 75°38'30"W, 1312 m, 20.x.2005, J. J. Peláez, 4(4), ex sugarcane; Supía, Mudarra, Farley Posada, 05°25'25"N, 75°38'35"W, 1270 m, 21.x.2005, A. A. Ramos-P., 6(6), ex sugarcane, tended by *Paratrechina* sp.; Supía, Mudarra, René Posada, 05°25'28"N, 75°38'33"W, 1259 m, 21.x.2005, A. A. Ramos-P., 7(7), ex sugarcane, tended by *Paratrechina* sp.; Supía, San Cayetano, 05°27'06"N, 75°40'36"W, 1492 m, 31.x.2005, Alejandra Bastidas, 4(4), ex sugarcane, tended by *Pheidole* sp.; Victoria, La Italia, El Cafetal, 05°18'50"N, 74°57'32"W, 1103 m, 27.x.2005, A. A. Ramos-P., 6(6), ex sugarcane, tended by ants; Viterbo, La Tesalia, 05°06'45"N, 75°01'33"W, 1090 m, 24.vi.2005, A. A. Ramos-P., 4(4), ex sugarcane. **Cauca:** Rosas, La Florida, Alegrías, 02°15'47"N, 76°44'40"W, 1200 m, 22.xi.2005, O. M. Plaza, 6(6), ex sugarcane, tended by *W. auropunctata*; Rosas, Pinzón, Alegrías, 02°15'47"N, 76°44'40"W, 1200 m, 12.xii.2005, A. A. Ramos-P., 6(6), ex sugarcane, tended by *Linepithema* sp.; Santander de Quilichao, Alegrías, El Arazá, 02°59'09"N, 76°30'00"W, 1550 m, 24.xi.2005, A. A. Ramos-P., 3(3), ex sugarcane; Santander de Quilichao, Mandivá, El Arca de Héctor Gómez, 02°58'10"N, 76°31'24"W, 1096 m, 24.xi.2005, A. A. Ramos-P., 6(6), ex sugarcane. **Nariño:** Ancuya, Barrio Camilo Torres, Darío Caicedo, 01°15'56"N, 77°31'63"W, 1350 m, 30.vi.2004, A. A. Ramos-P., 6(6), ex sugarcane, tended by *W. auropunctata* and *Linepithema* sp.; Buesaco, Sumapaz, Oswaldo Cabrera, 01°23'38"N, 77°08'52"W, 1960 m, 29.vi.2004, A. A. Ramos-P., 3(3), ex sugarcane. **Norte de Santander:** Abrego, Los Naranjos, 08°03'52"N, 73°12'57"W, 1400 m, 11.v.2004, Henry Cárdenas, 4(4), ex sugarcane; Arboledas, Villa Rosa, 07°36'58"N, 72°50'16"W, 1300 m, 23.vi.2004, R. Silva, 1(1), ex sugarcane; Cucutilla, San Sivan, 07°36'06"N, 72°46'26"W, 1000 m, 23.vi.2004, R. Silva, 1(1), ex sugarcane; Convención, Santa Rita, 08°10'50"N, 73°19'02"W, 1313 m, 18.v.2004, H. Cárdenas, 4(4), ex sugarcane, tended by *Crematogaster* sp.; Chinacota, La Granadina, 07°37'35"N, 72°34'06"W, 1250 m, 17.v.2004, R. Silva, 4(4), ex sugarcane, tended by *Pheidole* sp.; Abrego, Los Naranjos, 08°03'52"N, 73°12'57"W, 1400 m, 11.v.2004, H. Cárdenas, 4(4), ex sugarcane. **Risaralda:** La Virginia, 05°01'07"N, 75°51'35"W, 951 m, 24.vi.2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *Pheidole* sp.; La Virginia, 04°53'56"N, 75°53'07"W, 900 m, 8.iii.2005, A. A. Ramos-P., 6(6), ex sugarcane, tended by ants; Mistrató, Manuel Taborda-Pueblo Nuevo, El Hoyo, 05°18'58"N, 75°52'00"W, 900 m, 07.vi.-2004, María Marín, 4(4), ex sugarcane; 04°53'56"N, 75°53'07"W, 900 m, 1.v.2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *Paratrechina* sp. **Santander:** Rionegro, La Suiza, 07°16'05"N, 73°10'02"W, 600 m, 29.ix.2004, L. Velandia, 3(3), ex sugarcane; Suaitá, Efrain, Altamira, 06°06'44"N, 73°27'45"W, 1300 m, 30.vi.2004, G.R. Prada, 1(1), ex sugarcane; Vélez, El Rogero, San Andrés, 06°00'56"N, 73°40'29"W, 1400 m, 16.iv.2004, G.R. Prada, 3(3), ex sugarcane. **Tolima:** Alvarado, Guayabos, 04°40'13"N, 74°59'45"W, 1030 m, 14.xii.2005, A. A. Ramos-P., 6(6), ex sugarcane, tended by *Crematogaster* sp.; Cajamarca, Curalito, 04°25'03"N, 75°21'43"W, 1522 m, 13.xii.2005, A. A. Ramos-P., 6(6), ex sugarcane; Chaparral, Helechales, Susana Chauguala Camacho, 03°43'39"N, 75°55'16"W, 854 m, 30.x.2005, A. A. Ramos-P., 12(12), ex sugarcane; Lérida, Padilla, 04°57'24"N, 74°58'25"W, 1248 m, 14.xii.2005, A. A. Ramos-P., 5(5), ex sugarcane, tended by *Solenopsis* sp.; Líbano, El Descanso, 04°57'11"N, 74°59'25"W, 1318 m, 14.xii.2005, A. A. Ramos-P., 5(5), ex sugarcane; Mariquita, La Parroquia, Los Mangos, 05°11'53"N, 74°56'09"W, 866 m, 15.xii.2005, A. A. Ramos-P., 5(5), ex sugarcane; Venadillo, Verracruz, 04°40'21"N, 75°00'34"W, 1232 m, 14.xii.2005, A. A. Ramos-P., 6(6), ex sugarcane. **Valle del Cauca:** El Cerrito, 03°47'N, 76°16'W, 2002, M. Ramirez, 7(7), AUCC-057-059-2002; Florida, San Antonio de los Caballeros, CENICANÁ, 03°19'45"N, 76°14'00"W, 1000 m, 21.iv.2004, C.E. Gómez, 2(2), ex sugarcane, tended by *W. auropunctata*; Roldanillo, La Seca, Gilberto Valderrama, 04°26'32"N, 76°08'33"W, 1074 m, 9.vi.2005, A. A. Ramos-P., 3(3), ex sugarcane, tended by *Paratrechina* sp. and *Solenopsis* sp.; Sevilla, Sabanazo, José Gaviria, hacienda

Los Quingos, 04°24'26"N, 75°52'28"W, 1075 m, 9.vi.2005, A. A. Ramos-P., 1(1), ex sugarcane; Toro, Bohío, Tarritos, 04°26'32"N, 77°08'33"W, 930 m, 8.vi.2005, A. A. Ramos-P., 5(5), ex sugarcane; Uribe, Punto Rojo, 6.i.2006, T. Kondo, 6(6), ex sugarcane; Zarzal, La Uribe, 04°16'16"N, 76°06'35"W, 961 m, 10.vi.2005, A. A. Ramos-P., 1(1), ex sugarcane.

Notes. This species feeds on grasses and is found on sugarcane almost wherever it is grown (Williams 2004). It is found commonly on sugarcane in Colombia.

Family: PUTOIDAE

Puto barberi (Cockerell) (Figure 1R, S, T): COLOMBIA: Antioquia: Medellín, 06°20'24"N, 75°34'00"W, 1495 m, 11.vi.2005, E.V. Vergara-N., 6(6), ex Valencia orange, fruit. **Caldas:** Anserma, Risaralda, 05°08'41"N, 75°44'32"W, 1096 m, 9.xii.2005, A. A. Ramos-P., 6(6), ex coffee, roots; Manzanares, Callao, El Guayacán, 05°13'60"N, 75°05'06"W, 1291 m, 19.iii.2005, A. A. Ramos-P., 1(1), ex *Citrus* sp. (common mandarine), leaf; Palestina, La Inquisición, Taparcal, 05°03'13"N, 75°36'30"W, 1134 m, 2.iii.2005, A. A. Ramos-P., 2(2), ex Valencia orange, fruit; Viterbo, 05°03'49"N, 75°52'31"W, 975 m, 23.iv.2005, A. A. Ramos-P., 2(2), ex *Coffea arabica* var. Colombia, roots. **Norte de Santander:** Bochalema, El Trapiche, 07°36'08"N, 72°37'53"W, 1000 m, 17.vii.2004, R. Silva, 5(5), ex coffee. **Santander:** Girón, Peñas, La Sabana, 07°04'15"N, 73°10'20"W, 900 m, 7.x.2004, L. Velandia, 1(1), ex Valencia orange. **Tolima:** Fresno, El Espejo, 05°09'59"N, 75°01'18"W, 1342 m, 15.xii.2005, A. A. Ramos-P., 6(6), ex coffee, leaf; Ibagué, Tres Esquinas, La Granjita, 04°28'37"N, 75°16'58"W, 1427 m, 13.xii.2005, A.

A. Ramos-P., 3(3), ex coffee, roots; Ibagué, 28.i.1995, T. Kondo, 8(3 adult females + 5 immatures), AUCC-003-2000; Líbano, El Paraíso, Granja La Unión (CENICAFÉ), 04°54'56"N, 75°02'55"W, 1531 m, 14.xii.2005, A. A. Ramos-P., 1(1), ex coffee, roots. **Quindío:** Calarcá, Cebo-llal-La línea, 04°37'32"N, 75°37'15"W, 1702 m, 13.xii.2005, A. A. Ramos-P., 5(5), ex coffee, roots; Calarcá, La Granja, La Siria, Alba Lucía Sosa, 04°29'06"N, 75°41'50"W, 1371 m, 24.vi.2005, A. A. Ramos-P., 9(9), ex coffee. **Valle del Cauca:** Buga, Bosque del Vinculo, 18.vii.2005, T. Kondo, 2(2), ex *Coffea* sp., roots; Cali, Univ. del Valle, 20.xii.2001, T. Kondo, ex *Hibiscus rosa-sinensis*, twigs, flowers, 4(4), AUCC-015-2002; Cali, 5.i.2002, T. Kondo, ex *Schefflera* sp., 2(2), AUCC-16-2002; Cali, 1.i.2002, T. Kondo, ex *Spathodea campanulata*, 8(3 adult females + 5 immatures), AUCC-017-2002; Cali, 5.i.2002, T. Kondo, ex *Nandina domestica*, 3(3), AUCC-020-2002; Cali, 5.i.2002, T. Kondo, ex undet. host, 7(7), AUCC-022-2002; Cali, 7.i.2002, T. Kondo, ex *Swinglea glutinosa*, 4(4), AUCC-023-2002; Cali, 7.i.2002, T. Kondo, ex *Bauhinia purpurea*, 1(1), AUCC-024-2002; Ginebra, 4.i.2005, T. Kondo, 6(6), ex *Amyris pinnata*; Palmira, 20.viii.1999, T. Kondo, ex on trunk of undetermined tree, 6(2 adult females + 4 crawlers), AUCC-042-2000; Palmira, 21.xii.2001, T. Kondo, ex *Schefflera* sp., 7(4 adult females + 3 immatures), AUCC-014-2002; Palmira, 19.xii.-2001, T. Kondo, ex cycad, leaf, 2(2), AUCC-026-2002; Villa la Gorgona, 6.i.2002, T. Kondo, ex *Thumbergia* sp., 7(7), AUCC-021-2002.

Notes. As reported by Williams & Granara de Willink (1992), *P. barberi* is polyphagous and is probably the commonest species of *Puto* in the Neotropics.

Table 1. An updated list of mealybugs and putoids (Pseudococcidae and Putoidae) from Colombia.

FAMILY	VALIDATION SOURCE	HOSTS
PSEUDOCOCCIDAE		
<i>Antonina graminis</i> (Maskell)	3, 4, 6–9, 17, 21, 24, 25	Cyperaceae; Poaceae (sugar cane)
<i>Capitisetella migrans</i> (Green)	3, 4, 14, 17, 22, 25	Rubiaceae (coffee); Poaceae
<i>Coccidella poensis</i> (Hambleton)	3, 4, 17, 21, 22, 25	Poaceae (<i>Poa annua</i>)
<i>Colombiacoccus paramosarum</i> (Balachowsky)	2, 3, 4, 17, 25	Poaceae (<i>Calamagrostis effata</i>)
<i>Dysmicoccus boninsis</i> (Kuwana) (Figure 1)	3, 4, 9, 17, 21, 25	[P] Poaceae (sugar cane)

Table 1. Continuation.

<i>Dysmicoccus brevipes</i> (Cockerell) (Figure 1B)	3, 4, 7, 8, 9, 17, 21, 22, 25	[P] Bromeliaceae (pineapple)
<i>Dysmicoccus grassii</i> (Leonardi)	3, 4, 17, 21, 25	[P] Plantain; cacao; coffee
<i>Dysmicoccus neobrevipes</i> Beardsley	3, 4, 17, 25	[P] Bromeliaceae (pineapple)
<i>Dysmicoccus texensis</i> (Tinsley)	3, 4, 17, 25	[P] Rubiaceae (coffee)
<i>Dysmicoccus</i> sp.	*	[P] Cacao; coffee; orange; papaya
<i>Ferrisia virgata</i> (Cockerell) (Figure 1C)	3, 4, 5, 9, 17, 21, 22, 25	[P] Oil palm; plantain; Tahiti lime
<i>Ferrisia</i> sp. (Figure 1D)	*	[P] Coffee; orange; heliconia, plantain
<i>Geococcus coffeae</i> Green (Figure 1E)	3, 4, 11, 17, 22, 25	[P] Coffee, plantain
<i>Leptococcus neotropicus</i> (Williams & Granara de Willink)	3, 4, 17, 22, 25	[P] Papaya; Fabaceae (<i>Sciacassia siamea</i>)
<i>Leptococcus rodmani</i> Kondo (Figure 1F)	18	Meliaceae (<i>Guarea guidonia</i>)
<i>Maconellicoccus hirsutus</i> (Green) (Figure 1G)	*	[P] <i>Citrus</i> sp.; guava; hibiscus
<i>Macroepicoccus loranthei</i> Morrison (Figure 1H)	9	Loranthaceae
<i>Mammicoccus murilloi</i> Balachowsky	2, 3, 4, 17, 25	Lamiaceae
<i>Neochavesia caldasiae</i> (Balachowsky)	1, 3, 4, 9, 17, 21, 22, 25	Rubiaceae (coffee); Musaceae (<i>Musa</i> sp.)
<i>Neochavesia eversi</i> (Beardsley)	3, 4, 17, 22, 25	Rubiaceae (coffee); Musaceae (<i>Musa</i> sp.)
<i>Neochavesia trinidadensis</i> (Beardsley)	3, 4, 17, 22, 25	Rubiaceae (coffee); Sterculiaceae (cacao)
<i>Nipaecoccus guazumae</i> (Balachowsky) (Figure 1I)	2, 3, 4, 17, 22, 25	[P] Sterculiaceae (<i>Guazuma ulmifolia</i>)
<i>Nipaecoccus jonmartini</i> Williams & Granara de Willink	3, 4, 17, 25	[P] Avocado; cacao; <i>Cecropia</i> sp.; <i>Citrus</i> sp.; <i>Costus</i> sp.; <i>Heliconia</i> sp.; <i>Inga</i> sp.
<i>Nipaecoccus kuduyaricus</i> Williams & Granara de Willink	3, 4, 17, 22, 25	Sterculiaceae (<i>Theobroma cacao</i> , <i>T. subincanum</i>)
<i>Nipaecoccus mituensis</i> Williams & Granara de Willink	3, 4, 17, 22, 25	Melastomataceae
<i>Nipaecoccus neogaeus</i> Williams & Granara de Willink	3, 4, 17, 22, 25	<i>Cacao</i> ; <i>Clidemia hirta</i> ; <i>Inga</i> sp.
<i>Nipaecoccus nipae</i> (Maskell) (Figure 1J)	3, 4, 7, 8, 9, 21, 22, 25	[P] Myrtaceae (<i>Psidium guajava</i>)
<i>Nipaecoccus</i> sp. 1	*	Fabaceae (<i>Calliandra pittieri</i> Standl.)
<i>Nipaecoccus</i> sp. 2	*	Banana, coffee, Zingiberaceae
<i>Paracoccus herreni</i> Williams & Granara de Willink	3, 4, 17, 22, 25	<i>Acalypha</i> sp.; cassava; <i>Lantana camara</i>
<i>Paraputo colombiensis</i> (Williams & Granara de Willink)	3, 4, 17, 22, 25	Melastomataceae; Rubiaceae
<i>Paraputo guatemalensis</i> (Ferris)	3, 4, 17, 22, 25	Orchidaceae
<i>Paraputo ingrandi</i> (Balachowsky)	2, 3, 4, 17, 22, 25	[P] <i>Capparis</i> sp.; <i>Cecropia</i> sp.; Fabaceae, <i>Musa</i> sp.
<i>Paraputo larai</i> (Williams)	3, 4, 17, 22, 25	<i>Beaucarnea recurvata</i> ; <i>Musa</i> sp.
<i>Paraputo olivaceus</i> (Cockerell)	3, 4, 17, 21	[P] Cactaceae; <i>Ficus</i> sp.; <i>Platanus</i> sp.; <i>Yucca baccata</i>
<i>Paraputo taylori</i> (Williams & Granara de Willink)	3, 4, 17, 22, 25	<i>Clusia</i> sp.; <i>Theobroma subincanum</i>
<i>Paraputo theobromicola</i> (Williams & Granara de Willink)	3, 4, 17, 22, 25	Sterculiaceae (<i>Theobroma subincanum</i>)
<i>Phenacoccus gossypii</i> Townsend & Cockerell	9, 19, 21, 22	[DR]; [P] [See Discussion]
<i>Phenacoccus herreni</i> Cox & Williams	3, 4, 5, 9, 17, 22, 25	Euphorbiaceae (<i>Manihot esculenta</i>)
<i>Phenacoccus madeirensis</i> Green (Figure 1K)	3, 4, 5, 17, 25	[P] <i>Acalypha</i> sp.; cassava; <i>Solanum esculentum</i>
<i>Phenacoccus manihoti</i> Matile-Ferrero	17, 21	[DR] <i>Manihot</i> spp. [See Discussion]
<i>Phenacoccus solani</i> Ferris (Figure 1L)	*	[P]
<i>Phenacoccus solenopsis</i> Tinsley	*	[P] Malvaceae (<i>Hibiscus</i> sp.)
<i>Planococcus citri</i> (Risso) (Figure 1M)	3, 4, 9, 17, 21, 22, 25	[P] Banana; <i>Citrus</i> spp.; coffee

Table 1. Continuation.

<i>Planococcus halli</i> Ezzat & McConnell	*	[P] <i>Citrus</i> spp.; <i>Coffea arabica</i>
<i>Planococcus lilacinus</i> (Cockerell)	9, 21	[P]
<i>Planococcus minor</i> (Maskell)	3, 4, 17, 25	[P] [See notes under <i>P. citri</i>]
<i>Prorhizoecus</i> sp.	*	Banana
<i>Pseudococcus calceolariae</i> (Maskell) (Figure 1N)	*	[P] Fabaceae (<i>Cassia siamea</i> Lam.)
<i>Pseudococcus comstocki</i> (Kuwana)	3, 4, 8	[P]
<i>Pseudococcus elisae</i> Borchsenius	3, 4, 10, 17, 25	[P]
<i>Pseudococcus espeletiae</i> Williams & Granara de Willink	3, 4, 17, 25	Compositae (<i>Espeletia grandiflora</i>)
<i>Pseudococcus importatus</i> McKenzie	3, 4, 9, 10, 17, 21	Orchidaceae
<i>Pseudococcus jackbearsleyi</i> Gimpel & Miller (Figure 1O)	3, 4, 10, 17	[P] Cacao; banana; coffee; plantain
<i>Pseudococcus landoi</i> (Balachowsky)	2, 3, 4, 10, 17, 21, 25	[P] <i>Musa</i> sp.; cacao; coffee
<i>Pseudococcus longispinus</i> (Targioni Tozzetti) (Figure 1P)	3, 4, 7, 8, 9, 21, 23, 25	[P] mango, guava
<i>Pseudococcus maritimus</i> (Ehrhorn)	8, 17	[DR]; [P]
<i>Pseudococcus microcirculus</i> McKenzie	3, 4, 10, 17, 25	Orchidaceae
<i>Pseudococcus peregrinabundus</i> Borchsenius	3, 4, 10, 17, 25	Musaceae (<i>Musa</i> sp.)
<i>Pseudococcus sociabilis</i> Hambleton	3, 4, 17, 25	[P] Fabaceae (<i>Mimosa nigra</i>)
<i>Pseudorhizoecus proximus</i> Green	3, 4, 14, 17, 25	[P] Cacao; <i>Coffea</i> spp.; <i>Musa</i> spp.
<i>Rhizoecus americanus</i> (Hambleton)	3, 4, 12, 17, 21, 25	[P] <i>Chrysanthemum</i> sp.; coffee
<i>Rhizoecus arabicus</i> Hambleton	3, 4, 13, 17, 22, 25	[P] Rubiaceae (<i>Coffea arabica</i>)
<i>Rhizoecus cacticans</i> (Hambleton)	3, 4, 17, 21, 22, 25	[P] <i>Agave</i> sp.; <i>Fragaria</i> sp.
<i>Rhizoecus caladii</i> Green	3, 4, 17, 22, 25	[P] <i>Andropogon</i> sp.; <i>Brachiaria</i> sp.
<i>Rhizoecus coffeae</i> Laing	3, 4, 9, 11, 22	[P] coffee; <i>Cyperus</i> spp.; <i>Poa</i> sp.
<i>Rhizoecus compotor</i> Williams & Granara de Willink	3, 4, 17, 22, 25	Rubiaceae (<i>Coffea arabica</i>)
<i>Rhizoecus latus</i> (Hambleton)	3, 4, 17, 22, 25	[P] <i>Agave</i> sp.; Poaceae
<i>Rhizoecus mayanus</i> (Hambleton)	*	[P] Banana; coffee
<i>Rhizoecus setosus</i> (Hambleton)	3, 4, 17, 21, 25	[P] Banana; coffee
<i>Rhizoecus variabilis</i> (Hambleton)	3, 4, 16, 17, 22, 25	Agavaceae (<i>Agave</i> sp.)
<i>Ripersiella andensis</i> (Hambleton)	2, 3, 4, 12, 21, 22, 25	<i>Coffea arabica</i> ; <i>Coffea</i> sp.; <i>Musa</i> sp.
<i>Ripersiella colombiensis</i> (Hambleton)	3, 4, 12, 15, 17, 22, 25	Undetermined host
<i>Saccharicoccus sacchari</i> (Cockerell) (Figure 1Q)	3, 4, 7, 8, 9, 21, 22, 25	Poaceae (<i>Saccharum officinarum</i>)
<i>Trionymus radicolica</i> (Morrison)	3, 4, 8, 17, 22	Poaceae
PUTOIDAE		
<i>Puto antioquiensis</i> (Murillo)	3, 4, 9, 17, 20, 21, 22, 25	<i>Coffea arabica</i> ; <i>Coffea</i> sp.
<i>Puto barberi</i> (Cockerell) (Figs 1R,S,T)	3, 4, 9, 17, 21, 22, 25	[P] Coffee; hibiscus; orange; schefflera
<i>Puto yuccae</i> (Coquillett)	9, 17, 21, 22	[P]

Table notes. Mealybugs collected in this study are in bold letters, and new distribution records for Colombia are indicated by an asterisk (*) under the validation source column. Abbreviations: [DR] and [P] stand for “doubtful record” and “polyphagous” respectively. Validation sources are numbered as follows: (1) Balachowsky (1957); (2) Balachowsky (1959); (3) Ben-Dov (1994); (4) Ben-Dov et al. (2006); (5) Castillo & Bellotti (1990); (6) Chada & Wood (1960); (7) Figueroa Potes (1946); (8) Figueroa-Potes (1952); (9) Gallego & Velez (1992); (10) Gimpel & Miller (1996); (11) Gonzales (1956); (12) Hambleton (1946); (13) Hambleton (1976); (14) Hambleton (1977a); (15) Hambleton (1977b); (16) Hambleton (1978); (17) Kondo (2001); (18) Kondo & Gullan (2008); (19) Lozano (1981); (20) Murillo (1931); (21) Ochoa Lázaro (1989); (22) Ramos Portilla & Serna-Cardona (2004); (23) Gallego & Velez (1992); (24) Williams (1970); (25) Williams & Granara de Willink (1992).

DISCUSSION

We have compiled an updated list of mealybugs based on new collections and from the available literature. There are erroneous and doubtful mealybug records in the literature, which are discussed herein. Waller et al. (2007) reported *Pseudococcus cryptus* Hempel to be present in Colombia. There is no evidence, however, that this species occurs in Colombia. Waller et al. (2007) cite Cárdenas & Posada (2001) as a validation source for the presence of *P. cryptus* in Colombia. However, Cárdenas & Posada (2001) do not cite *P. cryptus*, but instead *Dysmicoccus cryptus* Hempel (misspelled as *D. criptus* in several places). According to Williams & Granara de Willink (1992), *D. cryptus* is a misidentification of *D. texensis* (Tinsley), a species that is widespread in the Neotropical Region.

Mealybug records of *Phenacoccus gossypii*, *Ph. manihoti* and *Pseudococcus maritimus* in Colombia are doubtful. Although *P. maritimus* has been recorded in Colombia (e.g., Figueroa Potes 1952), previous records of *P. maritimus* included misidentifications of several closely related species of the *P. maritimus* complex (Gimpel & Miller 1996; Kondo 2001). There are no voucher specimens of Figueroa Potes' (1952) specimens, thus it is not possible to verify the record of *P. maritimus* in Colombia.

The record of *Ph. gossypii* in Colombia (e.g., Lozano 1981) is also questionable, as this species has been confused often with *Ph. madeirensis*. The misidentifications of *Ph. gossypii* with *Ph. madeirensis* have resulted from the use of descriptions and illustrations by Ferris (1950) and McKenzie (1967), a problem that Williams (1987) and Williams & Granara de Willink (1992) pointed out. This was the case in Japan, where previous records of *P. gossypii* were misidentifications of *P. madeirensis* (Kondo et al. 2002).

In the New World, *Ph. gossypii* has been reported only from Mexico, the Bahamas and southern United States, but in Central and South America, no specimens have been seen yet south of Mexico (Williams & Granara de Willink 1992). We consider that the record of *Ph. gossypii* in Colombia is a misidentification of *Ph. madeirensis*.

The records of the cassava mealybug, *Ph. manihoti*, in Colombia are likely misidentifications of the morphologically similar species, *Ph. herreni*, a species that has a wider distribution than *Ph. manihoti*. The two species are morphologically very similar, differentiated only by the higher number of multilocular pores anterior to the clypeolabral shield in *Ph. manihoti* (Williams & Granara de Willink 1992). According to Williams & Granara de Willink (1992), *Ph. herreni* occurs in Bolivia, Brazil, Colombia, French Guiana, Grenada, Guyana and Tobago, whereas *Ph. manihoti* is known only from Brazil, Bolivia and Paraguay. We have not seen any specimens of *Ph. manihoti* from Colombia.

Records of *Pl. minor* in Colombia need to be verified for reasons given under the 'Notes' section of *Pl. citri*. Additional studies using RFLPs and other molecular techniques, comparative studies of nymphal and male morphology, and rearing experiments may be needed to answer this taxonomic question.

As a result of this study, the total number of mealybug species recorded from Colombia is elevated to 78 species (75 Pseudococcidae + 3 Putoidae). Several species collected in the present study appear to be new to science, and should be described as new species in the near future. Considering that the family Pseudococcidae is the second most species rich family in the superfamily Coccoidea, and that the above mealybugs were collected from a limited number of plant hosts, the current list should be considered only a fraction of the actual number of species that may occur in Colombia.

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LITERATURE CITED

- Balachowsky, A. S. 1957. Sur un nouveau genre aberrant de cochenille radicole myrmécophile nuisable au caféier en Colombie. *Revue de Pathologie Végétale et d'Entomologie Agricole de France*, 36:157-164.
- Balachowsky, A. S. 1959. Nuevas cochinillas de Colombia. (In Spanish). *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales*, 10:337-361.
- Bartlett, B. R. 1978. Pseudococcidae. Pp. 137-170, in: *Introduced Parasites and Predators of Arthropod Pests and Weeds: a World Review* (C. P. Clausen, ed.). Agricultural Research Service, United States Department of Agriculture, Washington, D.C.
- Beardsley, J. W. 1964. Notes and exhibitions. *Proceedings of the Hawaiian Entomological Society*, 18:338-340.
- Beardsley, J. W. 1965. Notes on the pineapple mealybug complex, with descriptions of two new species (Homoptera: Pseudococcidae). *Proceedings of the Hawaiian Entomological Society*, 19:55-68.
- Beardsley, J.W. 1966. Homoptera: Coccoidea. *Insects of Micronesia*, 6:377-562.
- Beardsley, J. W. 2001. *Nipaecoccus nipae* (Maskell) and two apparently undescribed sibling species (Hemiptera: Coccoidea: Pseudococcidae). *Entomologica*, 33: 49-57.
- Ben-Dov, Y. 1994. A systematic catalogue of the mealybugs of the world (Insecta: Homoptera: Coccoidea: Pseudococcidae and Putoidae) with data on geographical distribution, host plants, biology and economic importance. Intercept Limited, Andover, U.K.
- Ben-Dov, Y. 2005. The Solanum mealybug, *Phenacoccus solani* Ferris (Hemiptera: Coccoidea: Pseudococcidae), extends its distribution range in the Mediterranean basin. *Phytoparasitica*, 33(1):15-16.
- Ben-Dov, Y., D. R. Miller & G. A. P. Gibson. 2006. ScaleNet: a Database of the Scale Insects of the World. Scales in a Region Query Results. <http://www.sel.barc.usda.gov/scalenet/query.htm> (accessed on 20/iii/2008).
- Cárdenas, M. R. & F. J. Posada. 2001. Los insectos y otros habitantes de cafetales y platanales. Centro Nacional de Investigaciones de Cafe, Colombia.
- Castillo, J. & A. Bellotti. 1990. Caracteres diagnósticos de cuatro especies de piojos harinosos (Pseudococcidae) en cultivos de yuca (*Manihot esculenta*) y observaciones sobre algunos de sus enemigos naturales. *Revista Colombiana de Entomología*, 16(2):33-43
- Causton, C. E., S. B. Peck, B. J. Sinclair, L. Roque-Albelo, C. J. Hodgson & B. Landry. 2006. Alien insects: threats and implications for conservation of Galápagos Islands. *Annals of the Entomological Society of America*, 99:121-143.
- Cermeli, M., P. Morales, F. Godoy, R. Romero & O. Cárdenas. 2002. Presencia de la cochinilla rosada de la cayena *Maconellicoccus hirsutus* (Green) (Hemiptera: Pseudococcidae) en Venezuela. *Entomotropica*, 17(1):103-105.
- Chada, H. L. & E. A. Wood. 1960. Biology and control of the Rhodesgrass scale. *Technical Bulletin of the United States Department of Agriculture*, 1221:1-21.
- Chen, S. P., C. N. Chen & C. Y. Wong. 2002. New record of a pest - *Phenacoccus solani* Ferris (Homoptera: Pseudococcidae) in Taiwan. *Journal of Agricultural Research of China*, 51(2):79-82.
- Cox, J. M. 1989. The mealybug genus *Planococcus* (Homoptera: Pseudococcidae). *Bulletin of the Natural History Museum. Entomology Series*, 58(1):1-78.
- Cox, J. M. 1981. Identification of *Planococcus citri* (Homoptera: Pseudococcidae) and the description of a new species. *Systematic Entomology*, 6:47-53.

- Cox, J. M. 1983. An experimental study of morphological variation in mealybugs (Homoptera: Coccoidea: Pseudococcidae). *Systematic Entomology*, 8:361-382.
- Culik, M. P., D. S. Martins & P. J. Gullan. 2006. First records of two mealybug species in Brazil and new potential pests of papaya and coffee. *Journal of Insect Science*, 6(23):1-6.
- Culik, M. P. & P. J. Gullan. 2005. A new pest of tomato and other records of mealybugs (Hemiptera: Pseudococcidae) from Espírito Santo, Brazil. *Zootaxa*, 964:1-8.
- De Lotto, G. 1974. On two genera of mealybugs (Homoptera: Coccoidea: Pseudococcidae). *Journal of the Entomological Society of Southern Africa*, 37:109-115.
- Ferris, G. F. 1950. Atlas of the scale insects of North America. Series V. The Pseudococcidae (Part I). Stanford University Press, Palo Alto, California, USA.
- Figuroa-Potes, A. 1946. Catalogación inicial de las cochinillas del Valle del Cauca (Homoptera - Coccoidea). *Revista Facultad de Agronomía, Montevideo Universidad*, 6:196-220.
- Figuroa-Potes, A. 1952. Catálogos de los artrópodos de las clases Arachnida e Insecta encontrados en el hombre, los animales y las plantas de la República de Colombia-II. *Acta Agronomica*, 2:199-223.
- Flanders, S. E. 1944. Biological control of the potato mealybug. *Journal of Economic Entomology*, 37:312.
- Gallego, F. L. & R. Vélez. 1992. Lista de insectos que afectan los principales cultivos, plantas forestales, animales domésticos y al hombre en Colombia. Medellín: Universidad Nacional de Colombia.
- Gimpel, W. F. & D. R. Miller. 1996. Systematic analysis of the mealybugs in the *Pseudococcus maritimus* complex (Homoptera: Pseudococcidae). *Contributions on Entomology, International*, 2(1):1-163.
- Gonzales, M. R. 1956. Plagas del cafetal en Colombia. *Agricultura Tropical*, 12:123-127.
- González, R. H. 2003. Quarantine management of pome fruit mealybugs in Chile (Hemiptera: Pseudococcidae). *Revista Frutícola*, 24(3):89-98.
- Granara de Willink, M. C. 2003. Nuevas citas y huéspedes de *Phenacoccus* para la Argentina (Hemiptera: Pseudococcidae). *Revista de la Sociedad Entomológica Argentina*, 62(3/4):80-82.
- Hambleton, E. J. 1946. Studies of hypogeic mealybugs. *Revista de Entomología*, 17:1-77.
- Hambleton, E. J. 1976. A revision of the new world mealybugs of the genus *Rhizoecus* (Homoptera: Pseudococcidae). United States Department of Agriculture Technical Bulletin, 1522:1-88.
- Hambleton, E. J. 1977a. A review of *Pseudorhizoecus* Green, with a description of a related new genus (Homoptera: Pseudococcidae). *Journal of the Washington Academy of Sciences*, 67:38-41.
- Hambleton, E. J. 1977b. Notes on the species of *Neorhizoecus* Hambleton, a synonym of *Rhizoecus* Künckel d'Hercule (Homoptera: Pseudococcidae). *Proceedings of the Entomological Society of Washington* 79:367-376.
- Hambleton, E. J. 1978. Three new Neotropical *Rhizoecus* (Homoptera: Pseudococcidae). *Proceedings of the Entomological Society of Washington*, 80:156-163.
- Hamlen, R. A. 1974. Populations of economically important insects and mites on Florida grown on tropical foliage crops. *Florida Foliage Grower*, 11(5):6-8.
- Hodges, A. & G. Hodges. 2006. Pink hibiscus mealybug identification. *Plant Health Progress*, 1-7.
- Jahn, G. C., J. W. Beardsley & H. Gonzalez-Hernandez. 2003. A review of the association of ants with mealybug wilt disease of pineapple. *Proceedings of the Hawaiian Entomological Society*, 36:9-28.
- Jones, M. T. 1996. Status of the Hibiscus mealybug *Maconellicoccus hirsutus* (Green) in Trinidad and Tobago. Regional Meeting of the Technical Advisory Committee, 4th October, 1995, Grenada. Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago.
- Kawai, S. 1980. Scale insects of Japan in colors. (In Japanese). National Agricultural Education Association, Tokyo.
- Kawai, S. 2003. *Phenacoccus solani* Ferris. (In Japanese). Pp. 263, in: Agricultural insect pests in Japan (K. Umeya & T. Okada, eds.). Zennoukyo, Tokyo.
- Kondo, T. 2001. Las cochinillas de Colombia (Hemiptera: Coccoidea). *Biota Colombiana*, 2:31-48.
- Kondo, T. & P. J. Gullan. 2008. Synonymy of *Plotococcus* Miller & Denno with *Leptococcus* Reyne, and description of a new species from Colombia (Hemiptera: Pseudococcidae). *Neotropical Entomology*, 37:51-57.
- Kondo, T., T. Uesato & S. Kawai. 2002. *Phenacoccus madeirensis* Green (Hemiptera: Pseudococcidae), a recently introduced exotic pest in Japan. *Bolletino di Zoologia Agraria e di Bachicoltura, Ser. II*, 33(3):337-341.
- Kosztarab, M. 1996. Scale insects of Northeastern North America. Identification, Biology, and Distribution. Virginia Museum of Natural History, Martinsburg, Virginia.

- Larrain, S. P. 2002. Incidencia de insectos y acaros plagas en pepino dulce (*Solanum muricatum* Ait.) cultivado en la IV Region, Chile. *Agricultura Técnica*, 62(1):15-26.
- Lozano, J. C. 1981. Field problems in Cassava. Centro Internacional de Agricultura Tropical, CIAT series, No. 07EC-1, Cali, Colombia.
- McKenzie, H. L. 1962. Third taxonomic study of California mealybugs, including additional species from North and South America (Homoptera: Coccoidea: Pseudococcidae). *Hilgardia*, 32:637-688.
- McKenzie, H. L. 1967. Mealybugs of California with taxonomy, biology, and control of North American species (Homoptera: Coccoidea: Pseudococcidae). Univ. Calif. Press, Berkeley.
- Marotta, S. 1992a. Ricerche su pseudococci (Homoptera: Coccoidea) dell'Italia centro-meridionale. (In Italian; Summary In English). *Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'*, 47:63-111.
- Mazzeo, G., A. Russo & P. Suma. 1999. *Phenacoccus solani* Ferris (Homoptera Coccoidea) on ornamental plants in Italy. (In English; summary in Italian). *Bollettino di Zoologia Agraria e di Bachicoltura*, 31(1):31-35.
- Meyerdirk, D. 1997. Status report on the pink hibiscus biological control program. USDA, APHIS, PPQ, (circular).
- Michaud, J. P. & G. A. Evans. 2000. Current status of pink hibiscus mealybug in Puerto Rico including a key to parasitoid species. *Florida Entomologist*, 83:97-101.
- Miller, D. R. & R. F. Denno. 1977. A new genus and species of mealybug with a consideration of morphological convergence in three arboreal species (Homoptera: Pseudococcidae). *Systematic Entomology*, 2:111-157.
- Miller, D. R. & S. Polavarapu. 1997. A new species of mealybug in the genus *Dysmicoccus* (Hemiptera: Coccoidea: Pseudococcidae) of importance in highbush blueberries (*Vaccinium corymbosum*, Ericaceae) in the eastern United States. *Proceedings of the Entomological Society of Washington*, 99:440-460.
- Moghaddam, M., B. Hatami, K. Zibaii & M. R. Sabzalian. 2004. Report of *Phenacoccus solani* (Hom.: Coccoidea: Pseudococcidae) from Iran. *Journal of Entomological Society of Iran*, 24(1):135-136.
- Murillo, L. M. 1931. Los parasitos de café en el Departamento de Antioquia. *Revista Cafetera de Colombia*, 3:943-949.
- Ochoa-Lázaro, P. 1989. Lista de insectos dañinos y otras plagas en Colombia. Cuarta Edición, Boletín Técnico No.43. Instituto Colombiano Agropecuario.
- Okabayashi, T. 2003. The development of the practical natural enemy use in the field and its extension. (In Japanese). *Plant Protection*, 57:530-534.
- Persad, C. 1995. Preliminary list of host plants of *Maconellicoccus hirsutus* (Green) hibiscus or pink mealy bug in Grenada. Caribbean Agricultural Research and Development Institute, Grenada.
- Pinzón-Florian, O. P. 2002. Entomofauna asociada a especies arbóreas ornamentales de Bogotá: *Ficus andicola* Standley y *Quercus humboldtii* Bonpland. Unpublished. Project report, 35-70.
- Ramos-Portilla, A. A., F. Rodriguez, F. J. Serna-Cardona & X. Huérfano. 2004. Caracterización morfológica de los estados inmaduros de la cochinilla harinosa *Pseudococcus calceolariae* (Hemiptera: Sternorrhyncha: Pseudococcidae). Abstracts of the XXXI Congress of Entomology of the Colombian Entomological Society, SOCOLEN.
- Ramos-Portilla, A. A. & F. J. Serna-Cardona. 2004. Coccoidea de Colombia, con énfasis en las cochinillas harinosas (Hemiptera: Pseudococcidae). *Revista Facultad Nacional de Agronomía, Medellín*, 57(2):2383-2412.
- Rung, A. Scheffer, S. J., Evans, G. & Miller D. 2008. Molecular identification of two closely related species of mealybugs of the Genus *Planococcus* (Homoptera: Pseudococcidae). *Annals of the Entomological Society of America*, 101(3): 525-532.
- Sether, D. M. 2002. Pineapple mealybug wilt-associated viruses: Vectors, impacts, and dynamics. Ph.D. Thesis. University of Hawaii.
- Thomas, E. & J. Thomas. 1996. The pink mealybug in St. Kitts. Proceedings of the Meeting of the Programme Coordinating Committee, St. Kitts-Nevis.
- Waller, J. M., M. Bigger & R. J. Hillocks. 2007. Coffee Pests, Diseases and their Management. CABI Publishing. CABI, Wallingford, UK.
- Williams, D. J. 1970. The mealybugs (Homoptera, Coccoidea, Pseudococcidae) of sugar-cane, rice and sorghum. *Bulletin of Entomological Research*, 60:109-188.

- Williams, D. J. 1996. A brief account of the hibiscus mealybug *Maconellicoccus hirsutus* (Hemiptera: Pseudococcidae), a pest of agriculture and horticulture, with descriptions of two related species from southern Asia. *Bulletin of Entomological Research*, 86:617-628.
- Williams, D. J. 2004. Mealybugs of Southern Asia. The Natural History Museum, Kuala Lumpur: Southdene SDN. BHD.
- Williams, D. J, B. W. Blair & S. Khasimuddin. 1985. *Phenacoccus solani* Ferris infesting tobacco in Zimbabwe (Homoptera, Coccoidea, Pseudococcidae). *Entomologist's Gazette*, 121:87.
- Williams, D. J. & C. Granara de Willink. 1992. Mealybugs of Central and South America. CAB International, London, England.
- Williams, D. J. & G. W. Watson. 1988. The scale insects of the tropical South Pacific Region. Pt. The mealybugs (Pseudococcidae). CAB International Institute of Entomology, London.
- Zimmerman, E. C. 1948. Homoptera: Sternorrhyncha. *Insects of Hawaii*, 5:1-464.