Coccidae, Pseudococcidae, Ortheziidae, and Monophlebidae (Hemiptera: Coccoidea) of Espírito Santo, Brazil

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Abstract

Culik, M.P., Martins, D.S., Ventura, J.A., Peronti, A.L.B.G., Gullan, P.Y. & Kondo, T. **Coccidae, Pseudococcidae, Ortheziidae, and Monophlebidae (Hemiptera: Coccoidea) of Espírito Santo, Brazil.** *Biota Neotrop*. Sep/Dez 2007 vol. 7, no. 3 http://www.biotaneotropica.org.br/v7n3/pt/abstract?article+bn00507032007. ISSN 1676-0603.

New plant hosts are recorded for nine scale insect species recently collected in Espírito Santo, Brazil, and eleven scale insect species are recorded for the first time from the state: *Ceroplastes floridensis* Comstock, *Coccus longulus* (Douglas), *Coccus viridis* (Green), *Eucalymnatus tesselatus* (Signoret), *Pseudokermes* sp., *Saissetia coffeae* (Walker), *Phenacoccus madeirensis* Green, *Pseudococcus jackbeardsleyi* Gimpel & Miller, *Pseudococcus longispinus* (Targioni Tozzetti), *Icerya purchasi* Maskell, and *Icerya genistae* Hempel. This is also the first record of *Co. longulus* in Brazil. Information on the host plants and geographic distribution of the 26 species of scale insects of the families Coccidae, Pseudococcidae, Ortheziidae, and Monophlebidae, currently known from Espírito Santo is provided.

Keywords: *scale insects, invasive species, Icerya genistae, biodiversity, biogeography.*

Resumo

Culik, M.P., Martins, D.S., Ventura, J.A., Peronti, A.L.B.G., Gullan, P.Y. & Kondo, T. **Coccidae, Pseudococcidae, Ortheziidae, e Monophlebidae (Hemiptera: Coccoidea) do Espírito Santo, Brasil**. *Biota Neotrop*. Sep/Dez 2007 vol. 7, no. 3 http://www.biotaneotropica.org.br/v7n3/pt/abstract?article+bn00507032007. ISSN 1676-0603.

Novas plantas hospedeiras foram registradas para nove espécies de cochonilhas coletadas recentemente no Estado do Espírito Santo, Brasil, e onze espécies de cochonilhas são registradas pela primeira vez no Estado: *Ceroplastes floridensis* Comstock, *Coccus longulus* (Douglas), *Coccus viridis* (Green), *Eucalymnatus tesselatus* (Signoret), *Pseudokermes* sp., *Saissetia coffeae* (Walker), *Phenacoccus madeirensis* Green, *Pseudococcus jackbeardsleyi* Gimpel & Miller, *Pseudococcus longispinus* (Targioni Tozzetti), *Icerya purchasi* Maskell, e *Icerya genistae* Hempel. *Co. longulus* é registrada pela primeira vez no Brasil. É disponibilizada a informação das plantas hospedeiras e a distribuição geográfica de 26 espécies de cochonilhas das famílias Coccidae, Pseudococcidae, Ortheziidae, e Monophlebidae atualmente conhecidas no Estado do Espírito Santo.

Palavras-chave: *cochonilhas, espécies invasoras, Icerya genistae, biodiversidade, biogeografia.*

Introduction

Scale insects (Hemiptera: Coccoidea) are sap feeding pests of many agricultural crops and ornamental plants (Miller et al. 2005) but relatively little is known of the scale insect fauna of Espírito Santo, Brazil (Silva et al. 1968, Ben-Dov et al. 2006). Scale insects are difficult to identify and it is likely that the lack of knowledge of scale insects in this area is because there are few people in South America with the taxonomic expertise to identify these insects. Accurate identifications of scale insects requires the preparation of high quality microscope slide-mounts; careful examination of specimens using a compound microscope and high magnification; familiarity with a relatively great variety of morphological structures unique to this group of insects; and access to the widely dispersed taxonomic literature, and especially keys, essential for such identifications. Lack of knowledge of scale insects in this area may also be because these insects have been generally unnoticed (and of little interest) because natural enemies have been effective in maintaining populations at low levels, or they have been tolerated because control has not been economically justified. And, there is a danger that current changes in agriculture in Brazil (Alves 2003), and similar areas, may lead to greater problems caused by scale insects due to destruction of natural enemies or other factors associated with such changes. The objective of our studies of scale insects in Espírito Santo (Martins et al. 2004, Culik & Gullan 2005, Kondo et al. 2005, Culik et al. 2006) is to address the lack of knowledge of these insects in this area and specifically, this study was conducted as part of our efforts to identify the scale insect pests of papaya, pineapple and other economically important plants in this state.

Materials and Methods

Scale insects (Coccidae, Pseudococcidae, Ortheziidae, and Monophlebidae) were collected during surveys of the insect fauna of papaya and pineapple and when noticed on plants during field work or other activities in Espírito Santo during 2004 to 2006. Samples of plants or plant parts (fruits, leaves, stems) infested with scale insects were collected from various locations in the state ranging from municipalities of Pedro Canário in the north (18° 17' 24" S and 39° 57' 36" W) to Marataízes in the south (21° 01' 48" S and 40° 49' 48" W) and Vitória on the coast (20° 19' 12" S and 40° 21' 00" W) to Cachoeiro de Itapemirim (20° 49' 48" S and 41° 11' 24" W) in the interior of the state. The samples were transported to the Espírito Santo research and rural extension institute INCAPER (Instituto Capixaba de Pesquisa, Assistência Técnica e Extensão Rural) headquarters in Vitória for photographing and preservation of the scale insects and representative specimens were sent to taxonomic specialists for confirmation of identifications. Taxonomists responsible for confirming the identifications of the insects were T. Kondo: Coccidae, Pseudococcidae; A. Peronti: Coccidae, Pseudococcidae, Ortheziidae; G. Evans: Pseudococcidae; M. Kaydan: Pseudococcidae; P. Gullan: Ortheziidae, Monophlebidae; and C.Unruh: Monophlebidae. Voucher specimens of the insects collected are deposited in the arthropod collections of INCAPER, Vitória, Espírito Santo, the Bohart Museum of Entomology, University of California, Davis, and the Coleção Entomológica do Departamento de Ecologia e Biologia Evolutiva, Universidade Federal de São Carlos – UFSCar, São Paulo.

Results and Discussion

Eighteen scale insect species were newly identified from Espírito Santo in this study of which eleven are recorded here for the first time from the state: *Ceroplastes floridensis* Comstock, *Coccus longulus* (Douglas), *Coccus viridis* (Green), *Eucalymnatus tesselatus* (Signoret), *Pseudokermes* sp., *Saissetia coffeae* (Walker), *Phenacoccus madeirensis* Green, *Pseudococcus jackbeardsleyi* Gimpel & Miller, *Pseudococcus longispinus* (Targioni Tozzetti), *Icerya purchasi* Maskell, and *Icerya genistae* Hempel (Table 1). These records almost double the total number of scale insects of the families Coccidae, Pseudococcidae, Ortheziidae, and Monophlebidae known from this state to 26 species. This is also the first record of *C. longulus* in Brazil, which is of significance because this species, probably of Oriental origin (Miller et al. 2005), is a potential pest of many economically important crops (Ben-Dov 2006a).

Although most of these scale insects are known to be polyphagous (Ben-Dov 2006a, Ben-Dov 2006b, Ben-Dov 2006c, Miller & Gimpel 2006), results of this study are also of note because new host plants are recorded for several of the species, including *Phenacoccus solenopsis* Tinsley, recorded here for the first time from the host plant families Amaranthaceae and Caricaceae. *Ph. solenopsis* is very common in Espírito Santo and has been previously noted here as a pest of tomato (Culik & Gullan 2005).

In addition, these are the first records of *Planococcus citri* (Risso) and *Ps. jackbeardsleyi* from *Coffea canephora*, and *Dysmicoccus brevipes* (Cockerell) was also identified from rosettes of this economically important crop. In Espírito Santo mealybugs that infest the inflorescences of coffee plants are major pests of coffee (Fornazier 2006) commonly referred to simply as the "cochonilha da roseta" (rosette mealybug) but information regarding the species that actually occur on coffee in this region is lacking (Santa-Cecília et al. 2002). Results of this study provide additional evidence that in fact a complex of mealybug species may attack inflorescences of *C. canephora* and indicate the need for further research to determine the extent to which these various mealybug species contribute to reductions in coffee yields in Espírito Santo so these insects can be managed with greater effectiveness.

The monophlebid species *Icerya genistae* was described from Brazil in 1912 (Hempel 1912) but remained relatively unnoticed until recently when it was found in the Caribbean and Florida (Ben-Dov 2006b, Hodges 2006). The species is polyphagous and has been noted to be a serious pest of vegetable crops in Barbados (Hodges 2006). Thus, additional information on the species, such as its natural enemies in its area of origin, may be needed for management of this pest in the future.

Accurate knowledge of the insects present in an area is essential as a basis for development of integrated pest management. Thus, the information on scale insects and their associated host plants in Espírito Santo obtained in the present study should enable researchers and producers to more effectively develop and utilize integrated pest management methods for production of crops in this state. Results of this study also confirm that a diverse variety of scale insect species are present in Espírito Santo and indicate the need for researchers and producers to develop and utilize integrated pest management methods to avoid practices that may favor the development of these potential pests in the future. Information obtained in this study is also likely to be of interest in other regions in unfortunate instances of the introduction of pest species into new areas (as appears to have happened with *I. genistae*), and as a contribution to a more complete understanding of the host plants and geographical distribution of scale insects in general.

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Table 1. Coccidae, Pseudococcidae, Ortheziidae, and Monophlebidae of Espírito Santo (ES), Brazil: this study (2004 - 2006) and previous records.
Tabela 1. Coccidae, Pseudococcidae, Ortheziidae e Monophlebidae do Espírito Santo (ES), Brasil.

Species, common name	Collection municipality; No.[1]	Host plants in ES previous / present study	Geographic distribution	Reference, Note[2]
COCCIDAE				
Ceroplastes floridensis Comstock, Florida wax scale	Linhares	*Coffea canephora* (inflorescence)	Cosmopolitan	-
Coccus hesperidum Linnaeus, brown soft scale	Linhares, Sooretama, Vitória; 16	*Carica papaya* (stem) / *Carica papaya*, *Dietes bicolor*, *Solanum americanum*	Cosmopolitan	Martins et al. 2004 New host: *Solanum americanum*
Coccus longulus (Douglas), long brown scale	Vitória	*Spathiphyllum wallisi*	Cosmopolitan	New host: *Spathiphyllum wallisi*
Coccus viridis (Green), green scale	Aracruz, Linhares, Vitória; 3	*Coffea canephora* (inflorescence, stem), *Murraya paniculata*	Cosmopolitan	-
Eucalymnatus tesselatus (Signoret)	Vitória	*Dypsis lutescens*	Cosmopolitan	-
***Pseudokermes* sp.**	Vitória	unidentified plant		-
Saissetia coffeae (Walker), hemispherical scale	Domingos Martins, Linhares, Sooretama; 6	*Citrus* sp., *Coffea canephora* (inflorescence, trunk), *Bidens pilosa* (root)	Cosmopolitan	New host: *Bidens*
PSEUDOCOCCIDAE				
Antonina graminis (Maskell), Rhodesgrass mealybug	Serra	*Cynodon dactylon*	Cosmopolitan	Culik & Gullan 2005
Dysmicoccus boninsis (Kuwana), gray sugarcane mealybug	Serra	*Saccharum officinarum*	Widespread	Culik & Gullan 2005
Dysmicoccus brevipes (Cockerell), pineapple mealybug	Aracruz, Cachoeiro de Itapemirim, João Neiva, Linhares, Marataízes, Pedro Canário, Pinheiros, Serra, Sooretama, Vitória; 24	*Ananas comosus*, *Cucurbita pepo* / *A. comosus, Coffea canephora* (inflorescence), *Psidium guajava* (root)	Cosmopolitan	Culik & Gullan 2005
Dysmicoccus grassii (Leonardi)	Aracruz, Linhares	*Carica papaya* (fruit), *Coffea canephora* (inflorescence) / *Carica papaya*	Neotropical and few other areas	Culik et al. 2006
Ferrisia malvastra (McDaniel)	Linhares	*Bidens pilosa* (roots)	Widespread	Culik et al. 2006
Ferrisia virgata (Cockerell), striped mealybug	Linhares, Serra, Vitória; 3	weed cf. *Spermacoce* sp. (leaf, stem) / *Citrus* sp. (stem), *Ranunculus repens*, unidentified plant (root)	Cosmopolitan	Culik et al. 2006; New host: Ranunculaceae
***Phenacoccus* sp.**	Linhares, Sooretama; 5	*Bidens pilosa* (root), unidentified plant (root)	-	-
Phenacoccus madeirensis Green, madeira mealybug	Serra	weed cf. *Spermacoce* sp. (leaf/stem)	Cosmopolitan	-
Phenacoccus solenopsis Tinsley	Linhares, Serra, Vitória; 4	*Solanum lycopersicum*, weed cf. *Spermacoce* sp. / *Amaranthus flavus* (stem), *Bidens pilosa*, (stem), *Carica papaya* (trunk, fruit), *Emilia sonchifolia* (root)	Nearctic, Neotropical	Culik & Gullan 2005; New hosts: Amaranthaceae, *Bidens*, Caricaceae

Table 1. Continued...

Species, common name	Collection municipality; No.[1]	Host plants in ES previous / present study	Geographic distribution	Reference, Note[2]
Phenacoccus tucumanus Granara de Willink	Serra	*Citrus* sp. (leaf)	Neotropical	Culik et al. 2006
Planococcus citri (Risso), citrus mealybug	Aracruz, Linhares, Sooretama, Viana, Vitória; 23	*Bidens pilosa* (root), *Citrus* sp. (fruit), *Coffea canephora* (inflorescence, root, trunk, leaf), *Leea rubra, Lepidium virginicum* (root), unidentified plant	Cosmopolitan	Silva et al. 1968; New hosts: *Bidens*, *Coffea canephora, Leea, Lepidium*
Planococcus minor (Maskell)	Castelo, Linhares, Sooretama	*Bidens pilosa* (roots), *Coffea* sp.; *Coffea canephora* (inflorescence)	Widespread	Santa-Cecília et al. 2002, Culik et al. 2006
Plotococcus capixaba Kondo	Alfredo Chaves, Serra	*Eugenia* cf. *pitanga* (leaf), *Myrciaria jaboticaba* (leaf)	Brazil: ES, São Paulo	Kondo et al. 2005, Culik et al. 2006
***Pseudococcus* sp.**	Linhares, Sooretama; 2	*Coffea canephora* (root), *Carica papaya* (stem)	-	-
Pseudococcus elisae Borchsenius	Aracruz, Serra	*Coffea canephora* (inflorescence), unidentified weed	Nearctic, Neotropical	Culik et al. 2006
Pseudococcus jackbeardsleyi Gimpel & Miller	Aracruz, Cachoeiro de Itapemirim, Linhares, Marataízes, Serra; 9	*Ananas comosus, Coffea canephora*, (inflorescence), *Cucurbita pepo* (fruit), *Manihot esculenta* (leaf, root), weed cf. *Spermacoce* sp. (leaf/stem)	Widespread	New host: *Coffea canephora, Cucurbita*
Pseudococcus longispinus (Targioni Tozzetti), longtailed mealybug	Vilha Velha	*Dioscorea* sp.	Cosmopolitan	New host: Dioscoreaceae
Pseudococcus viburni (Signoret), obscure mealybug	Vitória	*Solanum tuberosum*	Cosmopolitan	Culik & Gullan 2005
ORTHEZIIDAE				
Praelongorthezia praelonga (Douglas)	Linhares; Vitória; 4	*Coffea canephora* (leaf), *Citrus sp.*, (leaf), *Schefflera* sp., *Tabebuia* sp. (leaf)	Neotropical and Mexico	Martins et al. 1989; New host: Araliaceae
MONOPHLEBIDAE				
Icerya purchasi Maskell, cottony cushion scale	Serra	*Cajanus cajan*	Cosmopolitan	-
Icerya genistae Hempel	Serra	unidentified legume	Brazil, Caribbean, Florida	-

Species collected in this study (2004-2006) are listed in bold font;
[1]No. = number of samples is indicated if the species was identified from more than one sample in this study;
[2]Reference cited if previously recorded from Espírito Santo.

in this study. M. B. Kaydan also prepared a number of slide-mounts to enable species identification for this study. T. Kondo was supported by the U.S. National Science Foundation (Partnership for Enhancing Expertise in Taxonomy program, under Grant No. 0118718 to P. J. Gullan). The Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq, Banco do Nordeste do Brasil - BNB, Fundação de Apoio à Ciência e Tecnologia do Espírito Santo - FAPES, Financiadora de Estudos e Projetos - FINEP, and Ministério da Agricultura, Pecuária e Abastecimento - MAPA, Brazil, provided financial support for this work.

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