

# Hemiptera, Coccoidea: Distribution extension and new records for the states of Espírito Santo, Ceará, and Pernambuco, Brazil

Mark P. Culik<sup>1,2\*</sup>, Vera R. S. Wolff<sup>3</sup>, Ana Lúcia B. G. Peronti<sup>4</sup>, Yair Ben-Dov<sup>5</sup> and José Aires Ventura<sup>1</sup>

1 Instituto Capixaba de Pesquisa, Assistência Técnica e Extensão Rural – INCAPER. Rua Afonso Sarlo 160. CEP 29052-010. Vitória, ES, Brasil.

2 AgriEco. Rua Tristão Athayde sn. CEP 29173-008. Manguinhos, ES, Brasil.

3 Fundação Estadual de Pesquisa Agropecuária FEPAGRO. Rua Gonçalves Dias, 570, (Menino Deus). CEP 90130-060. Porto Alegre, RS, Brasil.

4 Universidade Federal de São Carlos – UFSCar, Departamento de Ecologia e Biologia Evolutiva. CP 676. CEP 13565-905. São Carlos, SP, Brasil.

5 The Volcani Center, Agricultural Research Organization, Department of Entomology. P.O. Box 6, Bet Dagan, 50250, Israel.

\* Corresponding author. E-mail: [markculik3@yahoo.com](mailto:markculik3@yahoo.com)

**ABSTRACT:** New host plant and geographic distribution records are presented for 22 scale insect species of six families collected in the Brazilian states of Espírito Santo, Ceará, and Pernambuco during 2006 to 2009. Nine species, *Aclerda takahashii* Kuwana, 1932, *Ceroplastes cirripediformis* Comstock, 1881, *C. acutus* Peronti, 2008, *C. stellifer* (Westwood, 1871), *Howardia biclavata* (Comstock, 1883), *Insignorthezia insignis* (Browne, 1887), *Dysmicoccus texensis* (Tinsley, 1900), *Nipaecoccus* cf. *nipae*, and *Planococcus halli* Ezzat, 1962, are registered for the first time in Espírito Santo, and this is the initial record of Aclerdididae in this state.

Scale insects (Hemiptera: Coccoidea) are common throughout the world and they often cause damage to plants by feeding on their sap (Miller *et al.* 2005). There are about 7,500 described scale insect species (Ben-Dov *et al.* 2009) but relatively few (~ 60) are known to occur in Espírito Santo, Brazil (Culik *et al.* 2007; Culik *et al.* 2008), although this State contains some of the most biologically diverse forests (Atlantic Rain Forest) in the world (Mori 1989; Thomaz and Monteiro 1997). Agriculture is also an important part of the State's economy with many small, family farmers dependent on agriculture for their income. Preservation of biodiversity and development of sustainable agriculture, based on ecologically informed practices such as integrated pest management (IPM), in Espírito Santo and similar areas depends on accurate knowledge of the actual biological diversity (pest and beneficial insects, for example) present in such areas (Valdecasas and Camacho 2003). Therefore, because increased information on the insect fauna of Espírito Santo and similar areas is needed for preservation of biodiversity and sustainable development, scale insects and their natural enemies were collected during 2006 to 2009 from various plants in Espírito Santo, Ceará, and Pernambuco, Brazil, to identify the species present in these States. In this note we document new scale insect records for Espírito Santo, Ceará, and Pernambuco based on this research to add to the limited information available on the scale insect fauna of these areas, as well as contribute to a more complete knowledge of scale insect biogeography and host plant relationships in general.

Scale insects and their natural enemies were collected during surveys of the insect fauna of pineapple, *Ananas comosus* (L.) Merr., 1917, var. *comosus* (Bromeliaceae), and when noticed on other plants during fieldwork or other activities in Espírito Santo in 2006 to 2008. Samples

of plant parts (fruits, leaves, stems) infested with scale insects were collected from locations ranging from municipalities of Serra in the north (20°7'48" S, 40°18'36" W) to Anchieta in the south (20°48'35" S, 40°38'59" W) and Vitória (20°19'12" S, 40°21'0" W), on the coast, to municipalities in the interior of the state such as Domingos Martins (20°22'48" S, 41°2'59" W), from a variety of sites including experimental research plots, residences, and greenhouses. One sample was also collected from *Carica papaya* L., 1753 (Caricaceae) in Ceará in 2006 and from *Vitis vinifera* L., 1758 (Vitaceae) in Pernambuco in 2009. Samples were transported to the Espírito Santo rural research and extension institute INCAPER (Instituto Capixaba de Pesquisa, Assistência Técnica e Extensão Rural) headquarters in Vitória for photographing and preservation of the insects collected and scale insect specimens were slide-mounted for identification using standard methods (permanent slides of adult females were prepared using 10 % sodium hydroxide for clearing, dehydration in alcohol, and Canada balsam mounting medium). Keys to species including Williams and Granara de Willink (1992) and Miller *et al.* (2007) were used to identify the specimens. Voucher specimens of these insects are deposited in the arthropod collections of INCAPER, Vitória, Espírito Santo, the Museu de Entomologia Professor Ramiro Gomes Costa, Fundação Estadual de Pesquisa Agropecuária FEPAGRO, Porto Alegre, Rio Grande do Sul, and the Coleção Entomológica do Departamento de Ecologia e Biologia Evolutiva, Universidade Federal de São Carlos – UFSCar, São Paulo, Brazil.

Based on this research, host plant and geographic distribution extensions are presented for 22 scale insect species of six families collected in Espírito Santo, Ceará, and Pernambuco during 2006 to 2009 (Table 1). Nine species, *Aclerda takahashii* Kuwana, 1932, *Ceroplastes*

*cirripediformis* Comstock, 1881, *C. acutus* Peronti, 2008, *C. stellifer* (Westwood, 1871), *Howardia biclavis* (Comstock, 1883), *Insignorthezia insignis* (Browne, 1887), *Dysmicoccus texensis* (Tinsley, 1900), *Nipaecoccus* cf. *nipae*, and *Planococcus halli* Ezzat, 1962, are registered for the first time in Espírito Santo, and this is also the initial record of the scale insect family Aclerididae in this State. Nine species, *Aonidiella comperei* McKenzie, 1937, *Hemiberlesia palmae* (Cockerell, 1893), *Melanaspis smilacis* (Comstock, 1883), *Pseudaulacaspis pentagona* (Targioni Tozzetti, 1886), *Unaspis citri* (Comstock, 1881), *Dysmicoccus brevipes* (Cockerell, 1893), *Ferrisia virgata* (Cockerell, 1893), *Planococcus minor* (Maskell, 1897), and an undetermined species of Monophlebidae, are documented for the first time in different municipalities in Espírito Santo. And, new host plants are recorded for five scale insect species: *Ceroplastes acutus* on *Psidium* sp. (Myrtaceae), *Aspidiotus destructor* Signoret, 1869 on *Clusia* sp. (Clusiaceae), a species of Ortheziidae, *Praelongorthezia* cf. *praelonga*, on *Jatropha curcas* L., 1753 (Euphorbiaceae), *Phenacoccus solenopsis* Tinsley, 1898 on *Capsicum annum* L., 1753 (Solanaceae) and *Vitis vinifera* (Vitaceae), and *Dysmicoccus texensis* on *Ananas comosus* (Bromeliaceae), *Annona* sp. (Annonaceae), *Cocos nucifera* L., 1753 (Palmae), *Coffea canephora*, Pierre ex Froehner, 1897 (Rubiaceae), and *Cucurbita pepo* L., 1753

(Curcubitaceae). In addition, this is the initial register of *Phenacoccus solenopsis* (Pseudococcidae) in the States of Ceará and Pernambuco, Brazil.

Most of the scale insect species collected in this study are polyphagous and widely distributed (Ben-Dov *et al.* 2009). Thus, they are potential pests of numerous agricultural crops in many tropical areas. However, natural enemies of many of these scale insects were also commonly found associated with these scale insects in Espírito Santo (Table 1), including several new species of predatory insects recently and in the process of being described (Culik and Ventura 2009), indicating the importance of using integrated pest management (IPM) methods, and avoiding ecologically disruptive practices such as improper use of pesticides, to prevent destruction of beneficial insects and natural enemies of scale insects that may commonly help control scale insect and other pests in this and similar areas.

A scale insect species that is similar to *Phenacoccus solenopsis* in appearance may be a pest of cotton in Ceará (Bastos *et al.* 2007). Therefore, the records of *P. solenopsis* in Ceará and Pernambuco are also of significance because this species has not previously been identified from those States and these records confirm that this potential pest is more widely distributed in Brazil than has previously been recognized (Culik and Gullan 2005).

**TABLE 1.** Host plant and geographic distribution extensions of scale insects (Hemiptera: Coccoidea) collected in the states of Espírito Santo (ES), Ceará (CE), and Pernambuco (PE), Brazil (2006-2009).

<sup>a</sup> Brazilian State and Federal District abbreviations: Amazonas (AM), Bahia (BA), Ceará (CE), Distrito Federal (DF), Espírito Santo (ES), Mato Grosso (MT), Minas Gerais (MG), Paraná (PR), Pernambuco (PE), Rio Grande do Norte (RN), Rio Grande do Sul (RS), Rio de Janeiro (RJ), Santa Catarina (SC), São Paulo (SP), Sergipe (SE).

<sup>b</sup> Associated natural enemies (insect parasitoids and predators) also collected.

| TAXON   | COLLECTION MUNICIPALITY, STATE | ASSOCIATED HOST PLANT  | NOTE (PREVIOUS KNOWN DISTRIBUTION IN BRAZIL) <sup>A</sup> |
|---|--------------------------------|--|---|
| <b>ACLERIDIDAE</b>  |                                |  |   |
| <i>Aclerda takahashii</i> Kuwana, 1932 <sup>b</sup>                     | Serra, ES                      | Poaceae: <i>Saccharum officinarum</i> L., 1753                                   | Initial register in ES (SP)                               |
| <b>COCCIDAE</b>   |                                |  |   |
| <i>Ceroplastes cirripediformis</i> Comstock, 1881                       | Domingos Martins, ES           | Passifloraceae: <i>Passiflora edulis</i> Sims, 1818                              | Initial register in ES (SP)                               |
| <i>Ceroplastes acutus</i> Peronti, 2008                                 | Serra, ES                      | Myrtaceae: <i>Psidium</i> sp.  | Initial register in ES, new host plant record (SP)        |
| <i>Ceroplastes stellifer</i> (Westwood, 1871) <sup>b</sup>              | Vitória, ES                    | Araliaceae: <i>Schefflera</i> sp., leaf  | Initial register in ES (PE, RJ, RS, SP)                   |
| <b>DIASPIDIDAE</b>  |                                |  |   |
| <i>Aonidiella comperei</i> McKenzie, 1937                               | Cariacica, ES                  | Rubiaceae: <i>Morinda citrifolia</i> L., 1753                                    | Initial register in municipality, ES (RN)                 |
| <i>Aspidiotus destructor</i> Signoret, 1869                             | Vitória, ES                    | Clusiaceae: <i>Clusia</i> sp., leaf  | New host plant record (BA, DF, ES, RJ, SE, SP)            |
| <i>Hemiberlesia palmae</i> (Cockerell, 1893) <sup>b</sup>               | Domingos Martins, ES           | Palmae   | Initial register in municipality, ES (ES)                 |
| <i>Howardia biclavis</i> (Comstock, 1883)                               | Vitória, ES                    | unidentified onamental, leaf   | Initial register in ES (BA, MG, RJ, SP)                   |
| <i>Melanaspis smilacis</i> (Comstock, 1883) <sup>b</sup>                | Domingos Martins, ES           | Bromeliaceae: <i>Ananas comosus</i> (L.) Merr., 1917, var. <i>comosus</i> , leaf | Initial register in municipality, ES (ES)                 |
| <i>Pseudaulacaspis pentagona</i> (Targioni Tozzetti, 1886) <sup>b</sup> | Domingos Martins, ES           | Rosaceae: <i>Prunus persica</i> (L.) Batsch, 1801                                | Initial register in municipality, ES (ES, PE, RS, SP)     |
| <i>Unaspis citri</i> (Comstock, 1881)                                   | Domingos Martins, ES           | Rutaceae: <i>Citrus</i> sp.  | Initial register in municipality, ES (ES, MT, RS, RJ, SP) |

| TAXON  | COLLECTION MUNICIPALITY, STATE | ASSOCIATED HOST PLANT   | NOTE (PREVIOUS KNOWN DISTRIBUTION IN BRAZIL) <sup>A</sup>                  |
|--|--------------------------------|---|--|
| <b>MONOPHLEBIDAE</b>                                       |                                |   |  |
| Monophlebidae  | Anchieta, ES                   | Moraceae: <i>Artocarpus heterophyllus</i> Lam., 1789, fruit                           | Initial register in municipality, ES                                       |
| <b>ORTHEZIIDAE</b>   |                                |   |  |
| <i>Insignorthezia insignis</i> (Browne, 1887)              | Serra, ES                      | Labiatae: <i>Coleus</i> sp.   | Initial register in ES (RS)  |
| <i>Praelongorthezia cf. praelonga</i>                      | Vitória, ES                    | Euphorbiaceae: <i>Jatropha curcas</i> L., 1753  | New host plant record  |
| <b>PSEUDOCOCCIDAE</b>                                      |                                |   |  |
| <i>Dysmicoccus brevipes</i> (Cockerell, 1893) <sup>b</sup> | Domingos Martins, ES           | Bromeliaceae: <i>Ananas comosus</i> var. <i>comosus</i> ,                             | Initial register in municipality, ES (BA, ES, MG, MT, PE, PR, RS, SC, SP)  |
|  | Serra, ES                      | Palmae: <i>Cocos nucifera</i> L., 1753, fruits  | New host plant record in ES  |
| <i>Dysmicoccus texensis</i> (Tinsley, 1900) <sup>b</sup>   | Domingos Martins, ES           | Bromeliaceae: <i>Ananas comosus</i>   | Initial register in ES, new host plant record (MG)                         |
|  | Linhares, ES                   | Rubiaceae: <i>Coffea canephora</i> Pierre ex Froehner, 1897, berries                  | New host plant record  |
|  | Jaguará, ES                    | Rubiaceae: <i>Coffea canephora</i>  | New host plant record  |
|  | Serra, ES                      | Cucurbitaceae: <i>Cucurbita pepo</i> L., 1753, fruit                                  | New host plant record  |
|  | Serra, ES<br>Vitória, ES       | Palmae: <i>Cocos nucifera</i> , fruits<br>Annonaceae: <i>Annona</i> sp., fruit        | New host plant record<br>New host plant record                             |
| <i>Ferrisia virgata</i> (Cockerell, 1893) <sup>b</sup>     | Jaguará, ES                    | Rubiaceae: <i>Coffea canephora</i>  | Initial register in municipality, ES; new host plant record in ES (AM, ES) |
| <i>Nipaeococcus cf. nipae</i> <sup>b</sup>                 | Vitória, ES                    | Myrtaceae: <i>Psidium guajava</i> L., 1753, leaf                                      | Initial register in ES   |
| <i>Phenacoccus madeirensis</i> Green, 1923                 | Serra, ES                      | Solanaceae: <i>Capsicum annuum</i> L., 1753   | New host plant record in ES (BA, ES, MG, RJ, SP)                           |
| <i>Phenacoccus solenopsis</i> Tinsley, 1898                | Serra, ES                      | Solanaceae: <i>Capsicum annuum</i>  | New host plant Record (ES)   |
|  | Acaraú, CE<br>Lagoa Grande, PE | Caricaceae: <i>Carica papaya</i> L., 1753<br>Vitaceae: <i>Vitis vinifera</i> L., 1758 | Initial register in CE<br>Initial register in PE, new host plant record    |
| <i>Planococcus halli</i> Ezzat, 1962 <sup>b</sup>          | Colatina, ES                   | Rubiaceae: <i>Coffea canephora</i> , roots  | Initial register in ES (previous distribution in Brazil unknown)           |
|  | Venda Nova, ES                 | Rubiaceae: <i>Coffea arabica</i> L., 1753, roots                                      | New host plant record  |
|  | Vitória, ES                    | Araceae: <i>Spathiphyllum</i> sp.   | New host plant record  |
|  | Vitória, ES                    | Myrtaceae: <i>Syzygium jambos</i> (L.) Alston, 1931                                   | New host plant record  |
| <i>Planococcus minor</i> (Maskell, 1897) <sup>b</sup>      | Vitória, ES                    | Myrtaceae: <i>Syzygium jambos</i>   | Initial register in municipality, ES; new host plant record in ES (AM, ES) |

**ACKNOWLEDGMENTS:** Research support provided by the Fundação de Amparo à Ciência e Tecnologia do Espírito Santo – FAPES, FINEP, and CNPq. We thank D. dos S. Martins, INCAPER, Vitória, and G.A. Evans, USDA, Beltsville, for collection and identification, respectively, of specimens from Ceará.

#### LITERATURE CITED

- Bastos, C.S., R.P. de Almeida, F.C.V. Neto and G.P. de Araújo. 2007. Ocorrência de *Planococcus minor* Maskell (Hemiptera: Pseudococcidae) em algodoeiro no Nordeste do Brasil. *Neotropical Entomology* 36: 625-628.
- Ben-Dov, Y., D.R. Miller and G.A.P. Gibson. 2009. *ScaleNet*. USDA, Beltsville, USA. Electronic Database accessible at: <http://www.sel.barc.usda.gov/scalenet/scalenet.htm>. Captured on 1 February 2009.
- Culik, M.P. and P.J. Gullan. 2005. A new pest of tomato and other records of mealybugs (Hemiptera: Pseudococcidae) from Espírito Santo, Brazil. *Zootaxa* 964: 1-8.
- Culik, M.P. and J.A. Ventura. 2009. New species of *Rhinoleucophenga*, a potential predator of pineapple mealybugs. *Pesquisa Agropecuária Brasileira* 44: 417-420.
- Culik, M.P., D.S. Martins, J.A. Ventura and V.S. Wolff. 2008. Diaspididae (Hemiptera: Coccoidea) of Espírito Santo, Brazil. *Journal of Insect Science* 8(17): 1-6.
- Culik, M.P., D.S. Martins, J.A. Ventura, A.B.G. Peronti, P.J. Gullan and T. Kondo. 2007. Coccidae, Pseudococcidae, Ortheziidae, and Monophlebidae (Hemiptera: Coccoidea) of Espírito Santo, Brazil. *Biota Neotropica* 7: 61-65.
- Miller, D.R., G.L. Miller, G.S. Hodges and J.A. Davidson. 2005. Introduced scale insects (Hemiptera: Coccoidea) of the United States and their impact on U.S. agriculture. *Proceedings of the Entomological Society of Washington* 107: 123-158.
- Miller, D.R., A. Rung, G.L. Venable, R.J. Gill, and D.J. Williams. 2007. *Scale Insects*. Washington: USDA.
- Electronic Database accessible at: <http://www.sel.barc.usda.gov/ScaleKeys/ScaleInsectsHome/ScaleInsectsHome.html>. Captured on 1 February 2009
- Mori, S.A. 1989. Eastern, Extra-Amazonian Brazil; p. 427-454 In D.G. Campbell and H.D. Hammond (ed.). *Floristic inventory of tropical countries: the status of plant systematics, collections, and vegetation, plus recommendations for the future*. New York: New York Botanical

Garden.

- Thomaz, L.D. and R. Monteiro. 1997. Composição florística da Mata Atlântica de encosta da Estação Biológica de Santa Lúcia, município de Santa Teresa - ES. *Boletim do Museu de Biologia Mello Leitão* 7: 3-48.
- Valdecasas, A.G. and A.I. Camacho. 2003. Conservation to the rescue of taxonomy. *Biodiversity and Conservation* 12: 61113-1117.
- Williams, D.J. and M.C. Granara de Willink. 1992. *Mealybugs of Central and South America*. London: CAB International.

RECEIVED: December 2009

LAST REVISED: June 2011

ACCEPTED: June 2011

PUBLISHED ONLINE: July 2011

EDITORIAL RESPONSIBILITY: Ana Lúcia Tourinho