

## SHORT COMMUNICATION

### **New distribution and host records of chalcidoid parasitoids (Hymenoptera: Chalcidoidea) of scale insects (Hemiptera: Coccoidea) in Espírito Santo, Brazil**

Mark P. Culik\*, David dos S. Martins and José A. Ventura

*Instituto Capixaba de Pesquisa, Assistência Técnica e Extensão Rural – INCAPER, Rua Afonso  
Sarlo 160, CEP 29052-010, Vitória, Espírito Santo, Brasil*

(Received 8 April 2011; returned 22 April 2011; accepted 11 May 2011)

Three species of chalcidoid parasitoids of scale insects are recorded for the first time in Brazil: *Adelencyrtus moderatus*, *Homalopoda* sp., and *Diglyphomorpha* sp.; and new parasitoid–host associations are recorded between the chalcidoids *Encarsia lounsburyi* with *Hemiberlesia palmae*, *Encarsia lounsburyi* with *Melanaspis smilacis*, and *Diglyphomorpha* sp. with *Dysmicoccus brevipes*.

**Keywords:** biological control; biodiversity; biogeography; beneficial insects; natural enemies; parasitoids

The superfamily Chalcidoidea (Insecta: Hymenoptera) includes approximately 22,000 known species, with members widely distributed throughout the world. Many chalcidoids are beneficial parasitoids of pests such as scale insects (Hemiptera: Coccoidea), and this group is considered to be among the most important used in applied biological control (Noyes 2010).

Although the state of Espírito Santo, Brazil contains remnants of one of the most biologically diverse ecosystems in the world (Thomaz and Monteiro 1997), relatively few chalcidoid species are known from this region (Tavares and Araujo 2007; Noyes 2010). Only seven chalcidoid parasitoids of scale insects have previously been identified in this area (Marangoanha, Martins, Tavares, and Vieira 2005). Therefore, scale insects and their chalcidoid parasitoids were sampled in Espírito Santo during 2006 through 2008 as part of a research to support the development of biocontrol and integrated pest management (IPM) in this state, as well as increase knowledge of the biodiversity of this area and of chalcidoid parasitoids of scale insects in general.

Samples of scale insects on host plant leaves and stems and parasitoids associated with the scale insects were collected from various municipalities in Espírito Santo from 2006 to 2008 during surveys of pests of economically important crops (coconut, coffee, guava, papaya, peach, and pineapple) and from other plants when scale insect infestations were noticed (Culik et al. 2007; Culik, Martins, Ventura, and Wolff 2008). Live scale insects on the plant samples were transported in plastic bags to facilities in Vitória for collection and preservation of scale insects and associated parasitoids present. Samples of live material collected

---

\*Corresponding author. Email: markculik3@yahoo.com

were also maintained at room temperature in plastic containers covered with fabric for approximately 2 weeks to allow any immature parasitoids present to complete development, and adult parasitoids observed were collected every few days and preserved in 70% ethanol for study and identification. Scale insects and parasitoids collected were sent to taxonomic specialists to confirm identifications of the species when possible.

In this research, 14 species of chalcidoid parasitoids, belonging to five families (Aphelinidae, Encyrtidae, Eulophidae, Myrmaridae, and Signiphoridae), were identified in association with the scale insects collected in Espírito Santo (Table 1). Most of these parasitoid species (11) were registered for the first time in the state and these results more than double the number of species of chalcidoid parasitoids of scale insects known to occur in Espírito Santo. Three species were recorded for the first time in Brazil (Noyes 2010): *Adelencyrtus moderatus*, associated with diaspidid scale insects on pineapple; *Homalopoda* sp., associated with *Pseudaulacaspis pentagona* (a major pest of peach and other crops throughout the world); and *Diglyphomorpha* sp., associated with the pineapple mealybug *Dysmicoccus brevipes*, a major pest of pineapple worldwide. New parasitoid–host associations were also documented between the chalcidoids *Encarsia lounsburyi* with *Hemiberlesia palmae*, *E. lounsburyi* with *Melanaspis smilacis*, and *Diglyphomorpha* sp. with *Dysmicoccus brevipes*.

Despite the diversity, wide geographical distribution, and environmental importance of Chalcidoidea, only 92 chalcidoid species have previously been identified in Espírito Santo (Azevedo, Kawada, Tavares, and Perioto 2002; Marangoanha et al. 2005; Alencar, Fraga Tavares, and Azevedo 2007; Tavares and Araujo 2007; Noyes 2010). This study demonstrates that the diversity of chalcidoid parasitoids of scale insects is much greater in this biologically diverse area than has previously been recognized. Biological control efforts and IPM for control of scale insects and other pests depends on basic knowledge of the natural enemies (parasitoids and predators) of pests present in specific areas, as well as accurate identification of the pests themselves, to enable selection of the best pest management options available. Therefore, the information on the parasitoids of scale insects present in Espírito Santo obtained in this study will contribute to development of IPM and biocontrol efforts in this state. Most species of scale insects known to occur in Espírito Santo are polyphagous and are also distributed worldwide (Culik et al. 2007, 2008; Ben-Dov, Miller, and Gibson 2010). Thus, they are potential pests of many economically important crops and environmentally important plants in many areas, and increased knowledge of the parasitoids of the scale insects in Espírito Santo obtained in this research should also be of use in other regions where these scale insect pests occur as well. In addition, these results confirm the importance of using IPM, and avoiding environmentally harmful practices (such as improper use of pesticide), to prevent the destruction of such parasitoids and other beneficial insects that contribute to biocontrol of scale insects and related pests in agricultural as well as natural environments in Espírito Santo and similar areas (Marangoanha et al. 2005).

Table 1. New records of parasitoids (Hymenoptera: Chalcidoidea) of scale insects in Espírito Santo (2006–2008).

Parasitoid taxon	Collection location	Associated plant	Associated scale insect; ID <sup>a</sup>
<b>Aphelinidae</b>			
<i>Aphytis lingnanensis</i> Rosen & DeBach	Linhares (19.416° S 40.075° W), Sooretama (19.114° S 40.079° W)	Caricaceae: <i>Carica papaya</i> L.	<i>Aonidiella comperei</i> McKenzie; GE
<i>Encarsia</i> cf. <i>aurantii</i>	Domingos Martins (20.383° S 41.050° W)	Bromeliaceae: <i>Ananas comosus</i> (L.) Merr. var. <i>comosus</i>	<i>Diaspis boisduvalii</i> Signoret; JW
<i>Encarsia</i> cf. <i>minuta</i>	Aracruz (19.810 S 40.260 W)	<i>Carica papaya</i> L.	<i>Aonidiella comperei</i> McKenzie; GE
<i>Encarsia</i> sp.	Domingos Martins (20.383° S 41.050° W)	Rosaceae: <i>Prunus persica</i> (L.) Batsch	<i>Pseudaulacaspis pentagona</i> (Targioni Tozzetti); JW
<i>Encarsia lounsburyi</i> (Berlese & Paoli)	Domingos Martins (20.383° S 41.050° W)	Palmae	<i>Hemiberlesia palmas</i> (Cockerell); GE
<i>Encarsia lounsburyi</i> (Berlese & Paoli)	Domingos Martins (20.383° S 41.050° W)	<i>Ananas comosus</i> (L.) Merr. var. <i>comosus</i>	<i>Melanaspis smilacis</i> (Comstock); GE
<i>Coccophagus</i> sp.	Vitória (20.319° S 40.306° W)	Araliaceae: <i>Schefflera</i> sp.	<i>Vinsonia stellifera</i> (Westwood) and <i>Coccus hesperidum</i> L.; GE
<i>Marietta</i> sp.	Domingos Martins (20.383° S 41.050° W)	<i>Prunus persica</i> (L.) Batsch	<i>Pseudaulacaspis pentagona</i> (Targioni Tozzetti); JW
<b>Encyrtidae</b>			
<i>Adelencyrtus moderatus</i> (Howard)	Sooretama (19.114° S 40.079° W)	<i>Ananas comosus</i> (L.) Merr. var. <i>comosus</i>	<i>Diaspis boisduvalii</i> and <i>Melanaspis smilacis</i> (Comstock); GE
<i>Anagyrus</i> cf. <i>cercides</i>	Serra (20.204° S 40.198° W)	Palmae: <i>Cocos nucifera</i> L.	<i>Dysmicoccus brevipes</i> (Cockerell); MT
<i>Anagyrus</i> cf. <i>cercides</i>	Sooretama (19.114° S 40.079° W)	<i>Ananas comosus</i> (L.) Merr. var. <i>comosus</i>	<i>Dysmicoccus brevipes</i> (Cockerell); MT
<i>Anagyrus</i> sp.	Jaguaré (18.890° S 40.089° W)	Rubiaceae: <i>Coffea canephora</i> Pierre	<i>Ferrisia virgata</i> (Cockerell) and <i>Dysmicoccus texensis</i> (Tinsley); MC
<i>Anagyrus</i> sp.	Pacotuba (20.750° S 41.290° W)	<i>Ananas comosus</i> (L.) Merr. var. <i>comosus</i>	<i>Dysmicoccus brevipes</i> (Cockerell); MC
<i>Hambletonia</i> sp.	Sooretama (19.114° S 40.079° W)	<i>Ananas comosus</i> (L.) Merr. var. <i>comosus</i>	cf. <i>Dysmicoccus brevipes</i> (Cockerell); MC
<i>Hambletonia</i> sp.	Jaguaré (18.890° S 40.089° W)	<i>Coffea canephora</i> Pierre	<i>Ferrisia virgata</i> (Cockerell) and <i>Dysmicoccus texensis</i> (Tinsley); MC

Table 1 (Continued)

Parasitoid taxon	Collection location	Associated plant	Associated scale insect; ID <sup>a</sup>
<i>Homalopoda</i> sp.	Domingos Martins (20.383° S 41.050° W)	<i>Prunus persica</i> (L.) Batsch	<i>Pseudaulacaspis pentagona</i> (Targioni Tozzetti); JW
<i>Leptomastix</i> sp.	Jaguaré (18.890° S 40.089° W)	<i>Coffea canephora</i> Pierre	<i>Ferrisia virgata</i> (Cockerell) and <i>Dysmicoccus texensis</i> (Tinsley); MC
<i>Leptomastix</i> sp.	Domingos Martins (20.383° S 41.050° W)	<i>Coffea arabica</i> L.	cf. <i>Planococcus</i> sp.; MC
<i>Leptomastix dactylopii</i> (Howard)	Linhares (19.416° S 40.075° W)	<i>Coffea</i> sp.	Coccoidea; GE
<i>Mucronocryptus aclerdae</i> De Santis	Serra (20.204° S 40.198° W)	Poaceae: <i>Saccharum officinarum</i> L.	<i>Aclerda takahashii</i> Kuwana (syn. <i>Aclerda campinensis</i> Hempel); MC
<i>Prochiloneurus</i> sp.	Sooretama (19.114° S 40.079° W)	<i>Ananas comosus</i> (L.) Merr. var. <i>comosus</i>	<i>Dysmicoccus brevipes</i> (Cockerell); MT
Eulophidae			
<i>Diglyphomorpha</i> sp.	Serra (20.204° S 40.198° W)	<i>Cocos nucifera</i> L.	<i>Dysmicoccus brevipes</i> (Cockerell); MT
Myrmaridae			
<i>Gonatocerus</i> sp.	Linhares (19.416° S 40.075° W)	<i>Coffea</i> sp.	Coccoidea; GE
Signiphoridae			
<i>Signiphora</i> sp.	Vitória (20.319° S 40.306° W)	Myrtaceae: <i>Psidium guajava</i> L.	<i>Nipaecoccus</i> sp.; MC
<i>Signiphora</i> sp.	Domingos Martins (20.383° S 41.050° W)	<i>Prunus persica</i> (L.) Batsch	<i>Pseudaulacaspis pentagona</i> (Targioni Tozzetti); JW

<sup>a</sup>Parasitoids identified by: GE, Gregory A. Evans (USDA); MC, M.P. Culik (INCAPER); MT, Marcelo T. Tavares (UFES); JW, James B. Woolley (Texas A&M University).

### Acknowledgements

We thank Clair Barboza and Luiz C.S. Caetano, INCAPER, for help in the field and James Woolley, Texas A&M University, Marcelo T. Tavares, UFES, and Greg Evans, USDA, for identifying specimens collected in this study. The Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Fundação de Amparo à Pesquisa do Espírito Santo (FAPES), and Financiadora de Estudos e Projetos (FINEP) provided financial support for this work.

### References

- Alencar, I.D.C.C., Fraga, F.B., Tavares, M.T., and Azevedo, C.O. (2007), 'Perfil da fauna de vespas parasitoides (Insecta, Hymenoptera) em uma área de Mata Atlântica do Parque Estadual de Pedra Azul, Domingos Martins, Espírito Santo, Brasil', *Arquivos do Instituto Biológico*, 74, 111–114.
- Azevedo, C.O., Kawada, R., Tavares, M.T., and Periotto, N.W. (2002), 'Perfil da fauna de himenópteros parasitoides (Insecta, Hymenoptera) em uma área de Mata Atlântica do

- Parque Estadual da Fonte Grande, Vitória, ES, Brasil', *Revista Brasileira de Entomologia*, 46, 133–137.
- Ben-Dov, Y., Miller, D.R., and Gibson, G.A.P. (2010), 'ScaleNet', <http://www.sel.barc.usda.gov/scalenet/scaleson.htm>.
- Culik, M.P., Martins, D. dos S., Ventura, J.A., Peronti, A.B.G., Gullan, P.J., and Kondo, D. (2007), 'Coccidae, Pseudococcidae, Ortheziidae, and Monophlebidae (Hemiptera: Coccoidea) of Espírito Santo, Brazil', *Biota Neotropica*, 7, 61–65.
- Culik, M.P., Martins, D. dos S., Ventura, J.A., Wolff, V.R., and dos, S. (2008), 'Diaspididae (Hemiptera: Coccoidea) of Espírito Santo, Brazil', *Journal of Insect Science*, 8 (17), 1–6.
- Marangoanha, F., Martins, D. dos S., Tavares, M.T., and Vieira, L.P. (2005), 'Ocorrência de parasitoids em scale insects dos frutos do mamoeiro, *Aonidiella comperei* (Mckenzie, 1937) and *Coccus hesperidum* Linnaeus, 1758, na região norte do Espírito Santo', in *Papaya Brasil: mercado e inovações tecnológicas para o mamão*, ed. D dos S. Martins, Vitória: Incaper, pp. 514–517.
- Noyes, J.S. (2010). 'Universal Chalcidoidea Database', <http://internt.nhm.ac.uk/jdsml/research-curation/projects/chalcidoids/>
- Tavares, M.T., and Araujo, de B. C. (2007), 'Espécies de Chalcididae (Hymenoptera, Insecta) do Estado do Espírito Santo, Brasil', *Biota Neotropica*, 7(2), 1–8.
- Thomaz, L.D., and Monteiro, R. (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.