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Two Species of Armored Scale Insects (Hemiptera: Diaspididae) Associated with Sori of Ferns

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Abstract. This note reports the presence of two scale insects species *Hemiberlesia palmae* (Cockerell) and *Pinnaspis strachani* (Cooley) (Coccoidea, Diaspididae), associated respectively with *Asplenium serratum* L. (Aspleniaceae) and *Niphidium crassifolium* (L.) Lellinger (Polypodiaceae). It is the first record of a fern species as host plant of *H. palmae*. In both fern species, the diaspidids were found nearby the sori.

Keywords: Aspleniaceae; Fern-insect interactions; Polypodiaceae; Pteridophytes; Scale Insect.

Duas Espécies de Cochonilhas (Hemiptera: Diaspididae) Associadas com Soros de Samambaias

Resumo. A presente comunicação relata a presença de duas espécies de cochonilhas *Hemiberlesia palmae* (Cockerell) e *Pinnaspis strachani* (Cooley) (Coccoidea, Diaspididae), associadas respectivamente com *Asplenium serratum* L. (Aspleniaceae) e *Niphidium crassifolium* (L.) Lellinger (Polypodiaceae). É o primeiro registro de uma samambaia como planta hospedeira de *H. palmae*. Nas duas espécies de samambaias, os diaspidídeos encontravam-se concentrados principalmente ao redor dos soros.

Palavras-chave: Aspleniaceae; Cochonilhas; Interações samambaia-inseto; Polypodiaceae; Pteridófitas.

Interactions between ferns and insects are more poorly studied than those between insects and angiosperms (Mehltreter 2010). Diaspididae (Hemiptera: Coccoidea), popularly known as armored scale insects, are parasites of plants, feeding mainly on plant cell contents (Veilleux *et al.* 2014). In a bibliographic survey of scale insect in ferns, Hendrix (1980) reported 42 species of the families Coccidae (24 spp.), Diaspididae (11 spp.), Margarodidae (1 spp.) and Pseudococcidae (6 spp.). Most of recorded species is polyphagous (86.4% in Coccidae and 100% in Diaspididae), but only 9.1% of the Coccidae species are monophagous and none in Diaspididae (Hendrix 1980). The ScaleNet reports 72 scale insect species registered for ferns: Coccidae (32 spp.), Pseudococcidae (17 spp.), Diaspididae (14 spp.), Eriococcidae (2 spp.), Monophlebidae (2 spp.), Ortheziidae (2 spp.), Rhizoecidae (2 spp.) and Putoidae (1 spp.). It also mentions 7 species for lycophytes: Pseudococcidae (3 spp.), Ortheziidae (2 spp.), Coccidae (1 spp.) and Diaspididae (1 spp.) (Veilleux *et al.* 2014).

Armored scale insects (Coccoidea, Diaspididae) were observed on two fern species, *Asplenium serratum* L. (Aspleniaceae) and *Niphidium crassifolium* (L.) Lellinger (Polypodiaceae). Leaves of seven specimens of *Asplenium serratum* were collected in June 2013 and February 2014, in Serra da Tiririca State Park (22°057'55.6"S 43°001'18.2"W), while the leaves of five specimens of *N. crassifolium* were harvested in February 2012 from Itatiaia National Park (22°26'57.5"S 44°36'38.6"W), Rio de Janeiro State, Brazil. The scale insects attached to the fern leaves were fixed and preserved in alcohol 70%. Permanent slides of the adult female specimens were prepared for Coccoidea following the method adapted by Claps & Haro (1995), using KOH solution (10%) for clarification, alcoholic series for dehydration, mounting in Canada balsam and deposited at the Entomology Collection of the Fundação Estadual de Pesquisa Agropecuária (FEPAGRO, Rio Grande do Sul, Brazil). The scale insect species were identified under an optical microscope, using the keys by Claps & Wolff (2003). The collected fern species have been herborized following conventional techniques (Sylvestre & Rosa 2002) and identified using specific bibliography (Moran & Riba 1995). Voucher specimens were deposited at the herbarium of the Faculdade de Formação de Professores (RFFP) of the Universidade do Estado do Rio de Janeiro.

The scale insect observed on *A. serratum* was identified as *Hemiberlesia palmae* (Cockerell) (Figure 1). This diaspidid is a polyphagous species that has been reported on 119 hosts worldwide. However, hitherto, no species of fern has previously been reported as its host (Veilleux *et al.* 2014). In Brazil, *H. palmae* is documented on *Citrus reticulata* Blanco (Rutaceae), *Cycas revoluta* Thunb. (Cycadaceae), *Eucalyptus tereticornis* Sm. (Myrtaceae), *Musa* sp. (Musaceae) and *Cocos nucifera* L. (Arecaceae) with geographic distribution in the states of Bahia, Espírito Santo, Rio de Janeiro, São Paulo, Paraná and Rio Grande do Sul (Claps *et al.* 2001; Culik *et al.* 2008, 2011).

The scale insect observed on *N. crassifolium* was identified as *Pinnaspis strachani* (Cooley) (Figure 2). According to Balick (1978) and Veilleux *et al.* (2014), this diaspidid is cosmopolitan and polyphagous occurring on 381 plant hosts worldwide, including five species of ferns: *Asplenium nidus* L. (Aspleniaceae), *Neottopteris rigida* Fée (=*Asplenium nidus* L.), *Nephrolepis davallioides* Kunze (Lomariopsidaceae), *Platycerium grande* J. Sm. (Polypodiaceae), *Niphobolus fissus* Blume [=*Pyrrosia longifolia* (Burm. f.) C.V. Morton] (Polypodiaceae) and *Adiantum* sp. (Pteridaceae). In Brazil, *P. strachani* has been reported on two fern species - *Nephrolepis cordifolia* (L.) C. Presl and *Nephrolepis exaltata* (L.) Schott (Lomariopsidaceae); it has a wide geographic distribution, from the Amazonas state (North Region) until Rio Grande do Sul state (South Region) (Claps *et al.* 2001; Peronti *et al.* 2001; Claps & Wolff 2003).

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The species *A. serratum* and *N. crassifolium* are recorded for the first time as host plants for armored scale insects. In both fern species, most of the adult females diaspidid were observed near the sori on fertile leaves (Figures 1 and 2). Patra *et al.* (2008) suggest a soral crypsis of the coccid *Sassetia filicum* (Boisduval) in the sori of the fern *Asplenium nidus* L. (Aspleniaceae). Scale insects are phytophagous, feeding by sucking plant juices through a set of highly modified mouthparts called stylets. The sori of the two fern species are born on veins. These are a great sink region of nutrients that probably attracts the scale insects. In this way, close to sori, the scale insects can find food and camouflage conditions. Additional studies may provide further data to assess the hypothesis of the cryptic adaptation of the scales insects in fern sori.

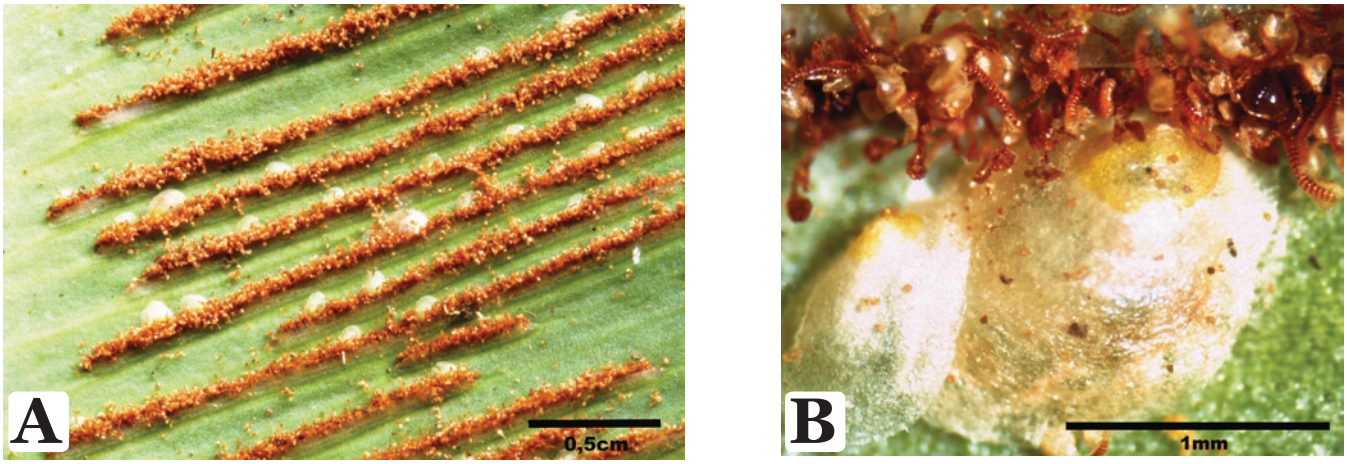

Figure 1. Scale insect on *Asplenium serratum*. A) Scale insect females on fern sori. B) Detail of the *Hemiberlesia palmae* females. (Photos: M.G. Santos)

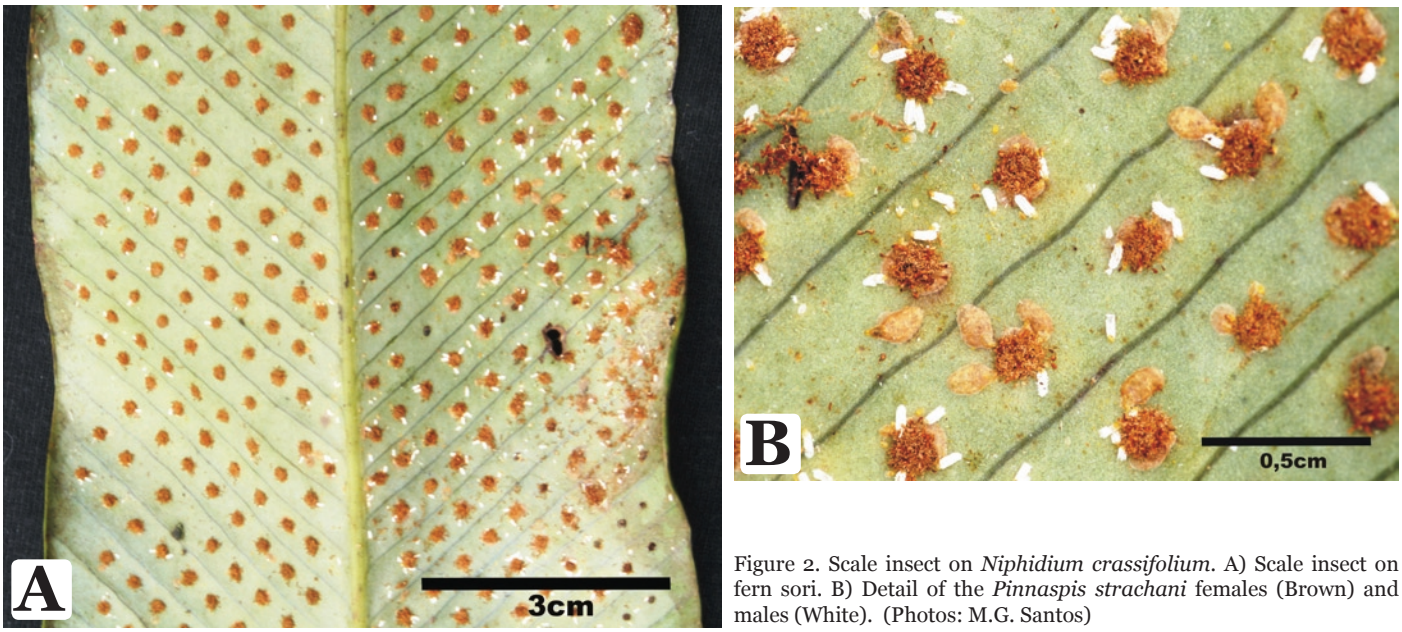

Figure 2. Scale insect on *Niphidium crassifolium*. A) Scale insect on fern sori. B) Detail of the *Pinnaspis strachani* females (Brown) and males (White). (Photos: M.G. Santos)

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