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New distribution and host records for white coconut scale,
Parlagena bennetti Williams (Hemiptera: Diaspididae)

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Abstract. The white coconut scale, *Parlagena bennetti* Williams, 1969 (Hemiptera: Diaspididae) is reported for the first time on New Zealand flax, *Phormium tenax* J.R. Forst. & G. Forst. (Xanthorrhoeaceae), coconut, *Cocos nucifera* L., Manila palm, *Veitchia merrillii* (Becc.) H.E. Moore, oil palm, *Elaeis guineensis* Jacq. and an oil palm hybrid OxG: *E. oleifera* x *E. guineensis* (Arecaceae) in continental Colombia, and on coconut from Venezuela. Previously, *P. bennetti* was known only on the Caribbean islands of Trinidad and San Andres, causing serious damage to coconut, its only known host until now. A brief characterization of *P. bennetti* and an updated list of 23 species of scale insects of the family Diaspididae reported worldwide on *Elaeis* spp. is provided.

Key words. Armored scale, Colombia, *Elaeis guineensis*, insect pest, oil palm, species list, Venezuela.

Resumen. Se reporta por primera vez la presencia de la escama blanca del cocotero *Parlagena bennetti* Williams, 1969 (Hemiptera: Diaspididae) sobre lino de Nueva Zelanda, *Phormium tenax* J.R. Forst. & G. Forst. (Xanthorrhoeaceae), palma de coco *Cocos nucifera* L., palma Manila *Veitchia merrillii* (Becc.) H.E. Moore, palma de aceite *Elaeis guineensis* Jacq. y un híbrido de palma de aceite OxG: *E. oleifera* x *E. guineensis* (Arecaceae) en Colombia continental y sobre cocotero en Venezuela. Hasta ahora *P. bennetti* solo se conocía en la isla de Trinidad y en San Andrés, en el Caribe, causando graves daños al cocotero, el único hospedero conocido hasta ahora. Se provee una breve caracterización de *P. bennetti*, y un listado actualizado de 23 insectos escama de la familia Diaspididae reportadas sobre *Elaeis* spp. en el mundo.

Palabras Clave. Escama de armadura, Colombia, *Elaeis guineensis*, insecto plaga, listado de especies, palma de aceite, Venezuela.

Introduction

Scale insects (Hemiptera: Sternorrhyncha: Coccoidea) are small sap-sucking insects with soft bodies, with about 8000 described species in more than 30 families worldwide (Ouvrard et al. 2013). Recently, the first author received samples of an armored scale causing damage to oil palm in the State of Santander, in northeastern Colombia. The scale insect samples were slide-mounted by the second author and identified as *Parlagena bennetti* Williams through the use of the original description by Williams (1969), and assistance from the third author. Later, the first author inspected palm species and other monocots planted in the grounds of the Colombian Corporation for Agricultural Research, Palmira Research Station and neighboring areas in the city of Palmira, State of Valle del Cauca, and found the same species on leaves and fruit of coconut, Manila palm, New Zealand flax and on leaves of a hybrid oil palm, OxG: *Elaeis oleifera* x *E. guineensis*. Slide-mounted specimens from Venezuela on coconut were also found in the California State Collection of Arthropods during this study. Hitherto, *P. bennetti* was recorded in the literature only on coconut from the Caribbean islands of Trinidad (Williams 1969) and San Andres (Mosquera 1976).

Heavy infestations of armored scale insects on palm fronds often cause leaf chlorosis, premature senescence, patches of necrotic leaf tissue, and premature leaf drop (Beardsley and González 1975). According to Williams (1969), Dr. F. Bennett described an infestation by *P. bennetti* on coconut in Trinidad as being associated with presence of necrotic areas on the leaves, with heavily attacked palms having an unthrifty appearance that was probably due to plant damage.

In mainland Colombia ten species of armored scale insects (Hemiptera: Diaspididae) have been reported previously on oil palm (*E. guineensis*) namely, *Aonidiella orientalis* (Newstead), *Aspidiotus destructor* Signoret, *A. excisus* Green, *Diaspis boisduvalii* Signoret, *Hemiberlesia lataniae* (Signoret), *Hemiberlesia* sp. possibly *H. palmae* (Cockerell), *Ischnaspis longirostris* (Signoret), *Pinnaspis aspidistrae* (Signoret), *P. strachani* (Cooley), and *Selenaspis articulatus* (Morgan) (Posada-Ochoa 1989).

The purpose of this paper is to report for the first time the presence of *P. bennetti* in continental Colombia and Venezuela, and also record New Zealand flax, *Phormium tenax* J.R. Forst. & G. Forst. (Xanthorrhoeaceae), Manila palm, *Veitchia merrillii* (Becc.) H.E. Moore, oil palm, *Elaeis guineensis* L. and an oil palm hybrid OxG, *E. oleifera* and *E. guineensis* (Arecaceae) as new hosts for this armored scale. An updated list of armored scale insects recorded on oil palm is provided.

Materials and Methods

Adult female specimens were slide-mounted following the procedure described by Williams and Granara de Willink (1992) except that 100% isopropyl alcohol (= 2-propanol) was used for dehydration and xylene was used instead of clove oil. Morphological terms for armored scales follow Williams and Watson (1988) and Miller and Davidson (2005). Photographs were taken *in situ* with a Canon Ixy 630 digital camera and close-ups of the insect were taken using the same camera with the aid of a stereomicroscope Nikon SMZ 745T. Photomicrographs of an adult female were made using a Nikon Digital

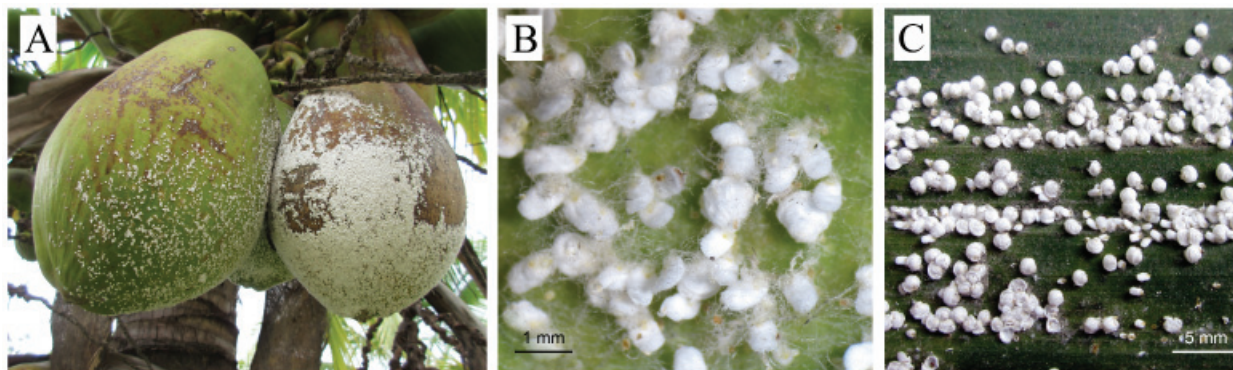


Figure 1. The white coconut scale, *Parlagena bennetti*. **A).** Infesting coconut fruits. **B).** Close-up of insects infesting fruit. **C).** Typical infestation on leaves. Photographs by T. Kondo, Palmira, Colombia.

Sight DS-5M camera, NIS-Elements F 3.0 software, and a Nikon Eclipse 80i compound microscope. Auto-montage of a photomicrograph series was done using Combine ZP software. The images were processed using the computer program Adobe Photoshop® CS 5.1.

The material studied is deposited in the Museo de Entomología, Corporación Colombiana de Investigación Agropecuaria, Centro de Investigación Palmira, Palmira, Valle del Cauca, Colombia (MECP), the California State Collection of Arthropods at the Plant Pest Diagnostics Center, California Department of Food & Agriculture, 3294 Meadowview Road, Sacramento, California, U.S.A. (CSCA) and the Museo Entomológico, Facultad de Agronomía, Universidad Nacional de Colombia, Sede Bogotá, Bogotá, Cundinamarca, Colombia (UNAB).

Taxonomy

Parlagena bennetti Williams, 1969.

Parlatoria bennetti (Williams), Davies and Boratynski 1979. [This change of combination is not accepted.]

Characterization of adult female. The following characterization of *P. bennetti* is based on the original description by Williams (1969).

Insects in life (Fig. 1A–1C). Scale cover of adult female white, about 1.00–1.25 mm in diameter, dome-shaped, with a distinctly downy texture. Exuviae pale yellow, situated at edge of scale, often at right angles to scale and leaf surface. Adult female small, 0.6 mm long and dark brown, completely surrounded by downy wax.

Slide-mounted specimens (Fig. 2A , 2B). Adult female about 0.6 mm in length, slightly longer than wide, turbinate. Body membranous except for pygidium. Spiracles lacking associated pores. Pygidium rounded. Median lobes small, short and rounded, about as long as wide, with a faint suggestion of a notch on outer margin; separated by a space greater than width of a lobe. Second lobes bilobed, varying in shape but always short and rounded. Third lobes represented by small projections from margin. Plates indistinct and very fragile, scarcely longer than a median lobe, with a pair between median lobes and one between each median and second lobe; plates without associated microducts.

Dorsal macroducts numerous and scattered; each orifice oval, surrounded by a distinct sclerotized rim, set almost at right angles to body margin. Each duct two-barred, with distal or innermost bar thickest and space between bars sclerotized. Marginal ducts near lobes situated a short distance from margin, with one or two between median lobes. Other ducts on pygidium scattered, becoming progressively smaller as far forward as second abdominal segment. Anal ring elongate, widest at anterior end, situated about one-third length of pygidium from apex. Perivulvar pores in five groups; median group with 1–4 pores, each anterior lateral group with 5–8 pores and each posterior lateral group with 2–5

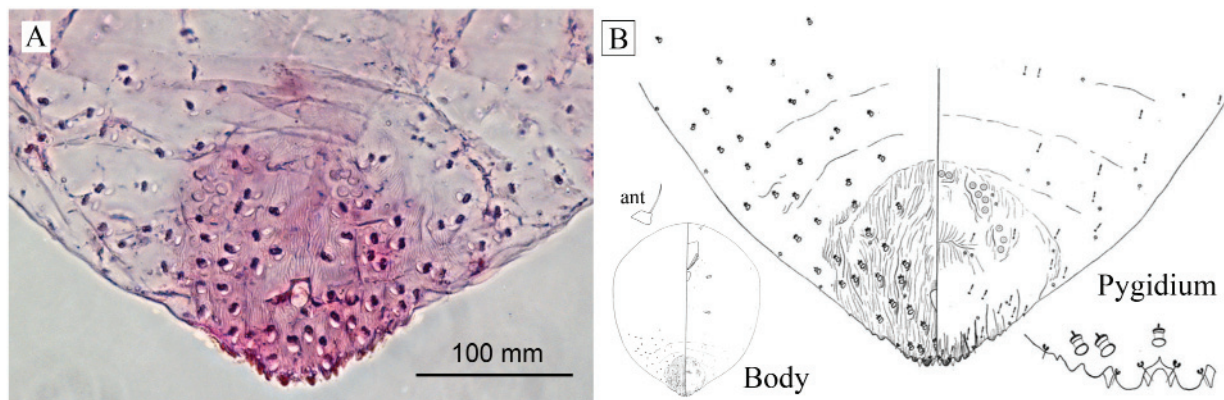


Figure 2. A). Auto-montage photomicrograph of an adult female of *Parlagena bennetti* from Venezuela, Lara, Barquisimeto. Photomicrograph by G.W. Watson, California Department of Food & Agriculture. B). Illustration of body and details of the pygidium (after Williams 1969).

Table 1. Updated list of armored scale insects (Hemiptera: Diaspididae) recorded on oil palm, *Elaeis* spp. (Arecaceae) in the world (adapted from Howard 2001 and Ben-Dov et al. 2015).

Diaspidid species	Literature records on <i>Elaeis</i>
<i>Aonidiella gracilis</i> (Balachowsky)	Balachowsky (1956)
<i>Aonidiella rex</i> Balachowsky	Balachowsky (1956), Howard (2001)
<i>Aspidiotus destructor</i> Signoret	Castel-Branco (1963), Almeida (1973), Williams and Watson (1988), Howard (2001)
<i>Aspidiotus elaeidis</i> Marchal	Marchal (1909), Sanders (1909), Leonardi (1914), Balachowsky (1956), Howard (2001)
<i>Aspidiotus nerii</i> Bouché	Howard (2001)
<i>Aspidiotus remaudierei</i> Balachowsky	Balachowsky (1956)
<i>Chrysomphalus dictyospermi</i> (Morgan)	Almeida (1973), Williams and Watson (1988)
<i>Diaspis boisduvalii</i> Signoret	Miller and Davidson (2005)
<i>Diaspis elaeidis</i> Munting	Munting (1969)
<i>Hemiberlesia lataniae</i> (Signoret)	Balachowsky (1956), Munting (1969), Almeida (1971, 1973), Howard (2001)
<i>Hemiberlesia palmae</i> (Cockerell)	Almeida (1973), Howard (2001)
<i>Ichnaspis longirostris</i> (Signoret)	Mamet (1943), Ben-Dov (1974), Miller and Davidson (2005)
<i>Leucaspis fulchironiae</i> (Boisduval)	Boisduval (1867)
<i>Lindingaspis musae</i> (Laing)	Balachowsky (1958), Howard (2001)
<i>Lindingaspis opima</i> (Silvestri)	Almeida (1973)
<i>Parlagona bennetti</i> Williams	Present study
<i>Parlatoria proteus</i> (Curtis)	Barber (1910)
<i>Pinnaspis aspidistrae</i> (Signoret)	Williams and Watson (1988)
<i>Pinnaspis strachani</i> (Cooley)	Cockerell (1902), Ferris and Rao (1947), Williams and Watson (1988)
<i>Pseudaonidia trilobitiformis</i> (Green)	Almeida (1973)
<i>Pseudaulacaspis cockerelli</i> (Cooley)	Chen (1983)
<i>Rolaspis chaetachmae</i> (Brain)	Munting (1969)
<i>Selenaspis articulatus</i> (Morgan)	Mamet (1958), Borchsenius (1966), Almeida (1973), Howard (2001)

pores. Microducts not numerous. Vulva situated almost in center of pygidium. Sclerotized duct tubercles absent.

Material studied. Colombia: Santander: Barrancabermeja, 6.ii.2015, coll. L. Montes, ex foliage of *Elaeis guineensis* Jacq., 3 slides, 14 specimens (MECP). Valle del Cauca: Palmira, Hotel las Victorias, Carrera 32, via a Candelaria, contiguo a la Universidad Nacional de Colombia, sede Palmira, 03°30'43.0"N, 76°18'46.0"W, 1020 m a.s.l., 17.iv.2015, coll. T. Kondo, ex leaves of *Phormium tenax* J.R. Forst. & G. Forst, 1 slide, 4 specimens (MECP); Palmira, near Centro Comercial Llanogrande, 03°31'44.6"N, 76°19'08.3"W, 1009 m a.s.l., 2.iv.2015, coll. T. Kondo, ex leaves of *Veitchia merrillii* (Becc.) H.E. Moore, 1 slide, 5 specimens (UNAB); Palmira, Corporación Colombiana de Investigación Agropecuaria (Corpoica), Centro de Investigación Palmira, Banco de germoplasma de frutales tropicales, 03°30'49.5"N, 76°19'43.5"W, 1001 m a.s.l., coll. 2.iv.2015, coll. T. Kondo, ex fruit of *Cocos nucifera* L., 3 slides, 15 specimens (UNAB); Palmira, Corporación Colombiana de Investigación Agropecuaria (Corpoica), Centro de Investigación Palmira, 03°30'48.3"N, 76°19'03.9"W, 1010 m a.s.l., coll. 3.iv.2015, coll. T. Kondo, ex leaves of OxG hybrid oil palm, *E. oleifera* x *E. guineensis*, 1 slide, 5 specimens (UNAB). Venezuela: Lara: Barquisimeto, v.2006, coll. R. Urtiaga, ex *C. nucifera*, 3 slides, 15 specimens (CSCA). Trinidad: Manzanilla Beach, 14.xi.1995, coll. M.J.W. Cock, ex leaves of *C. nucifera*, 1 slide, 3 specimens (CSCA).

Distribution. Colombia: San Andrés y Providencia, Santander, Valle del Cauca. **Trinidad and Tobago:** Trinidad. **Venezuela:** Lara.

Host plants. Arecaceae: *Cocos nucifera*, *Elaeis guineensis*, hybrid oil palm, *E. oleifera* x *E. guineensis*, *Veitchia merrillii*. **Xanthorrhoeaceae:** *Phormium tenax*.

Remarks. *Parlagena bennetti* may infest fruit, covering much of the fruit surface if the infestation is heavy (Fig. 1A, B); however, usually the scales are found on the underside of the leaves (Fig. 1C) although sometimes they occur on both surfaces. Williams (1969) described the adult females as dark and heavily sclerotized, however, it should be noted that young adult females are grayish white in color and membranous. The scale cover is somewhat shell-like (Fig. 1B). The scale of the adult male is about 1.0 mm long, elongate, with sides subparallel, and of the same downy consistency as female scale (Williams 1969) (Fig. 1B). The discovery of *P. bennetti* on a non-palm species, i.e., *Phormium tenax* (Xanthorrhoeaceae), indicates that the scale insect may be able to attack other species of monocots. No natural enemies have been reported in the literature.

Armored scales recorded on oil palm, *Elaeis* spp. There were 22 species of armored scales recorded previously on oil palms, *Elaeis* spp., worldwide. With the addition of *P. bennetti*, this tally is increased to 23 species (Table 1).

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