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First record of the Bermuda grass scale *Odonaspis ruthae* Kotinsky, 1915
(Hemiptera: Coccoomorpha: Diaspididae) in Colombia

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Abstract. The Bermuda grass scale *Odonaspis ruthae* Kotinsky, 1915 (Hemiptera: Coccoomorpha: Diaspididae) is reported for the first time in Colombia. The scale insect was collected in two localities, in northwestern and southwestern Colombia. This is the first record of the tribe Odonaspidini in Colombia. Aspects of the distribution and biology of the species are discussed. A key to separate the species of *Odonaspis* recorded in the Neotropical region is provided.

Key words. Armored scale, biology, Coccoidea, distribution, invasive species.

Resumen. Se registra por primera vez la escama del pasto Bermuda *Odonaspis ruthae* Kotinsky, 1915 (Hemiptera: Coccoomorpha: Diaspididae) en Colombia. El insecto escama fue recolectado en dos localidades, una al noroccidente y otra al suroccidente de Colombia. Este es el primer registro de la tribu Odonaspidini en el país. Se discuten aspectos de la distribución y biología de la especie. Se provee una clave taxonómica para separar las especies de *Odonaspis* en la región Neotropical.

Palabras clave. Biología, Coccoidea, distribución, escama protegida, especie invasora.

Introduction

In a recent workshop on scale insect taxonomy held at the Colombian Corporation for Agricultural Research (Corpoica), Palmira Research Station, the authors collected an armored scale on Bermuda grass, *Cynodon dactylon* (L.) Pers. (Poaceae), which was later identified as *Odonaspis ruthae* Kotinsky, 1915 (Hemiptera: Diaspididae). The species was again collected by J.M.M.R. in the city of Cúcuta, in the Department of Norte de Santander, Colombia, on another grass, *Echinochloa colona* (L.) Link. (Poaceae). This turned out to be the first records of *O. ruthae* in Colombia.

In Colombia, Bermuda grass is well adapted to warm and temperate climates, but it does not perform well at elevations above 2000 meters where mean temperatures are lower (Crowder 1960). Bermuda grass slows its growth when mean temperatures drop below 15°C (Burton 1954). Mainly grown for cattle grazing, Bermuda grass is one of the most common grasses in Colombia, found at altitudes that range from 0–1800 meters above sea level, with a mean dry matter production of 1000–3000 kg/ha/month (Cardona et al. 2012). On the other hand, *C. dactylon* is also known as a weed when it grows outside pastureland. In Colombia, both *C. dactylon* and *E. colona* have been listed as weeds in coffee plantations (Salazar and Hincapié 2007) and in rice paddies (Fuentes et al. 2006).

Diaspididae, the armored scales, is the largest family in the superfamily Coccoidea (Hemiptera: Sternorrhyncha: Coccoomorpha) with about 2400 species in 380 genera (Miller and Davidson 2005). There are currently 74 species of armored scales recorded in Colombia (Kondo 2001; Garcia et al. 2016). Armored scales have three female instars and five male instars including the adults (Miller and Davidson 2005), but males are not known in some species. The name “scale insect” is said to be derived from the shape of the waxy scale cover of the females, which resembles the scales of a fish or reptile.

Currently, the tribe Odonaspidini (Hemiptera: Diaspididae) (in which *O. ruthae* is included) is composed of 55 species and five genera, namely *Circulaspis* MacGillivray, 1921 (4 spp.), *Dicirculaspis* Ben-Dov, 1988 (2 spp.), *Froggattiella* (Leonardi, 1900) (5 spp.), *Odonaspis* (Cockerell in Leonardi, 1897) (43

spp.) and *Batarasa* Takagi, 2009 (1 sp.) (Garcia et al. 2016). Species in the Odonaspidini feed almost exclusively on host plants of the Gramineae (= Poaceae) and are distributed between the 45th northern and southern latitudes of all zoogeographical regions (Ben-Dov 1988). Ben-Dov (1988) in his taxonomic analysis of the tribe Odonaspidini provides keys to species of the tribe and discussed in detail the morphological features that define the group.

The adult females of the tribe Odonaspidini are diagnosed by the following features: (i) scale cover with ventral and dorsal parts well developed and entirely enclosing the female body but not of the pupillarial form; (ii) body oval or elongate-oval in shape; (iii) pygidium without marginal lobes (occasionally appearing to have a single median lobe); (iv) plates absent, gland spines usually absent (but present in *Froggattiella*); (v) one- or two-barred, short and slender ducts of similar size present on dorsal and ventral surfaces, numerous, not arranged in neat rows; (vi) perivulvar disc pores, if present, arranged in two or three groups (vii) stigmatic disc pores present; (viii) pygidium without plates, but duct tubercles sometimes present; (ix) antennae each with only one seta; (x) intersegmental folds present on both surfaces of thorax and abdomen; (xii) crenulae (scale-like processes of the cuticle) numerous, present in distinct segmental bands across thoracic and abdominal sternites; (xiii) abdominal segments IV and V typically with separate tergites and fused sternites; postvulvar sternite distinct (Ben-Dov 1988; Watson 2005).

The Odonaspidini may resemble members of the Rugaspidiotini, however, the two tribes can be readily differentiated by the combination of the following features (character states of the Rugaspidiotini in parentheses): 1) one seta on each antenna (two setae), and 2) intersegmental folds present on both surfaces (intersegmental folds absent) (Ben-Dov 1988; Watson 2005). Although the Odonaspidini seems to be a well-defined monophyletic group based on morphological characters of the adult female, a study based on the sexual dimorphism of the second-instar nymphs of 14 Asian species and one North American species resulted in the identification of four types and an extra form based on dimorphism (Aono 2009). Dimorphism of the second-instar males of these odonaspines could be divided into homomorphic (in which the male morphology agrees with that of the odonaspine females), heteromorphic (in which the male morphology does not agree with odonaspine females and show the character pattern of the distinct tribe Parlatoriini), and other types which show different combinations of the odonaspine and parlatorine patterns (Aono 2009).

The purpose of this study is to report *O. ruthae* for the first time in Colombia, to provide some basic diagnostic information for the species based on available scientific literature and photographs of live and slide-mounted insects and a key to *Odonaspis* species of the Nearctic region.

Materials and methods

Scale insects were collected from the grasses *Cynodon dactylon* and *Echinochloa colona*. Samples were taken to the phytosanitary diagnostic laboratory of the Colombian Agricultural Institute (ICA) in the city of Cucuta, and the Museum of Entomology at the Colombian Corporation for Agricultural Research, Palmira Research Station (MECP) for slide-mounting and identification. Samples were thoroughly examined taking into account that some scale insects are found underneath the leaf sheaths of their host plant. Scale insects were slide-mounted following the protocol used by the Systematic Entomology Laboratory, Department of Agriculture the (USDA 2014), with some modifications, i.e., putting the specimens in 70% ethyl alcohol at least half an hour before staining in acid fuchsine dye. The scale insects were identified using taxonomic keys to species of scales insects of the Family Diaspididae by Miller and Davidson (2005) and Watson (2005). Photographs of the morphological characteristics of the slide-mounted specimens were taken using a camera head Nikon DS- Fi1 with a DS camera control unit DS-L2, attached to a Nikon Ci-S microscope and those of live specimens were taken with a Canon, IXY 640 digital camera.

Repositories

CTNI — Colección Taxonómica Nacional de Insectos “Luis Maria Murillo”, Corporación Colombiana de Investigación Corpoica, Mosquera, Cundinamarca, Colombia.

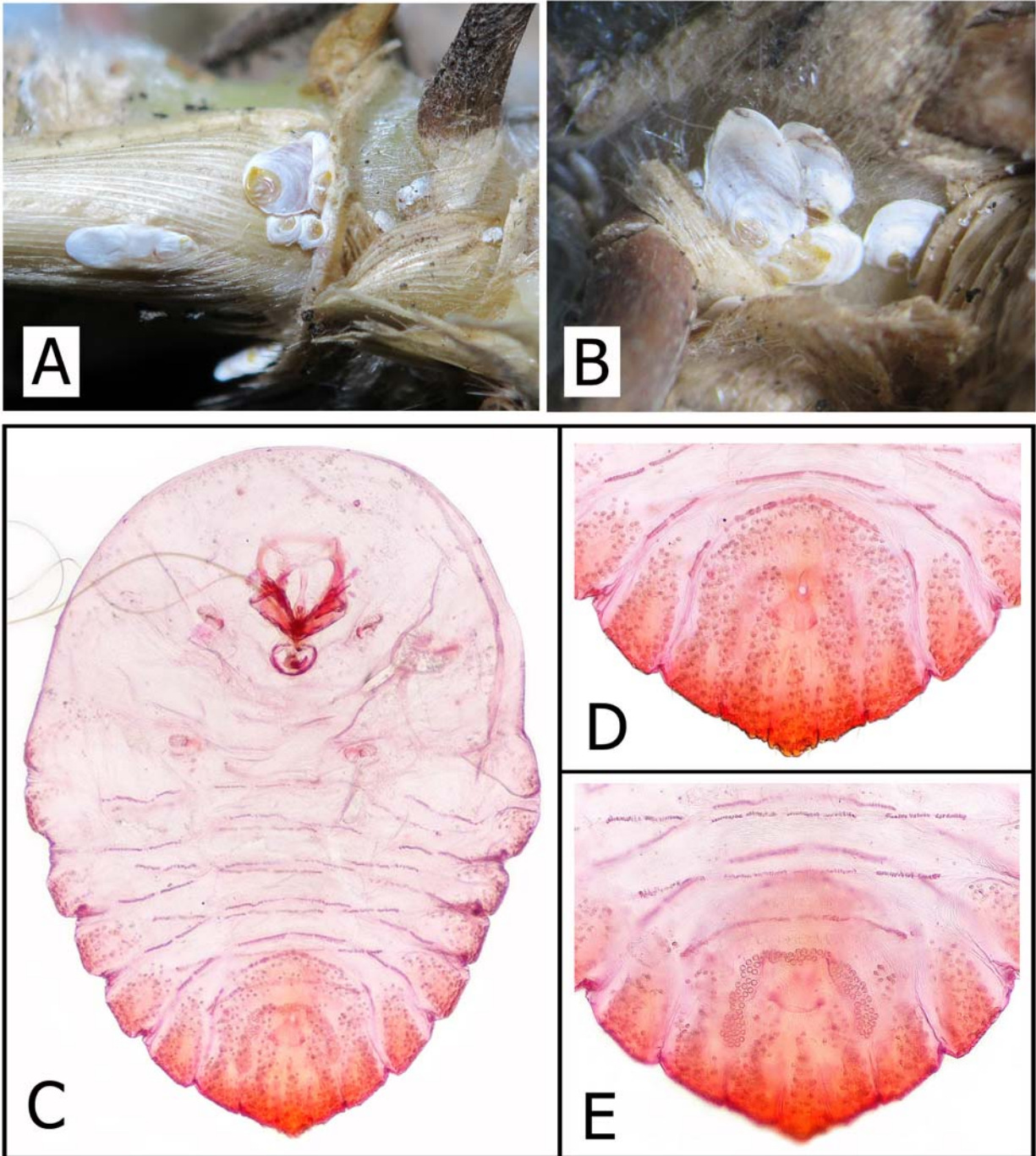


Figure 1. *Odonaspis ruthae* Kotinsky. **A.** Adult female (larger oval shape scale cover) and male (elongate test, e.g., specimen on left side of photo) and female (smaller round tests) second-instar nymphs after removing the leaf sheaths of its host. **B.** Close-up of adult female tests in life. **C.** Adult female as seen on slide. **D.** Details of the pygidium (dorsal side). **E.** Details of the pygidium (ventral side).

MECP — Museo de Entomología, Corporación Colombiana de Investigación Agropecuaria, Centro de Investigación Palmira, Palmira, Valle del Cauca, Colombia.

Results and discussion

Herein we report the Bermuda grass scale (Fig. 1) for the first time in Colombia, based on specimens collected on Bermuda grass in Cúcuta, Department of Norte de Santander and on *Echinochloa colona* in Palmira, Department of Valle del Cauca, Colombia.

Odonaspis ruthae Kotinsky

Diagnosis

Unmounted specimens (Fig. 1A, B). Scale cover of the adult female moderately convex, oval to cone shape, white in color; ventral side of cover thick; exuviae of earlier stages present on margin of waxy cover; scale cover yellow or brown when rubbed; male scale cover elongate oval, of similar color and texture to the female scale cover, of a yellow color when rubbed; adult female body pinkish in color; eggs pink or red in color; first-instar nymphs (crawlers) pink in color; commonly found on grasses, especially at the bases of leaf sheaths, stolons and roots, and occasionally on the leaves (Miller and Davidson 2005).

Mounted specimens (Fig. 1C, D and E). Perivulvar pores present (Fig. 1E); vulva placed at level or posterior to level of anus; postvulvar sternite not sclerotized; ventral macroducts present on all abdominal segments, each as wide as dorsal macroducts; gland tubercles absent from thorax; pygidial margin with 1 pair of scleroses (Ben-Dov 1988).

Remarks. Of the 43 species of scale insects assigned to the genus *Odonaspis*, nine species have been recorded from the Neotropical region, namely, *O. benardi* Balachowsky (Costa Rica, Cuba, Guatemala, Honduras, Martinique), *O. galapagoensis* Ben-Dov (Galapagos island), *O. greenii* (Cockerell) (Guadeloupe, Guyana, Martinique, Saint Lucia, Suriname), *O. litorosa* Ferris (Panama), *O. paucipora* Ben-Dov (Guyana), *O. ruthae* (Argentina, Bolivia, Brazil, Chile, Peru), *O. saccharicaulis* (Zehntner) (Bahamas, Brazil, Costa Rica, Cuba, Guatemala, Honduras, Puerto Rico and Vieques Island, Sao Tome and Principe, U.S. Virgin Islands, Venezuela), and *O. secreta* (Cockerell) (Cuba, Guadeloupe) (Garcia et al. 2016). Interestingly all species hitherto recorded from the Neotropical region have perivulvar pores which may be lacking in species of *Odonaspis* from other geographical regions.

The Bermuda grass scale is widely distributed in the New World, from North, Central and South America (Garcia et al. 2016). *Odonaspis ruthae* is considered an invasive species in South America (Wyckhuys et al. 2013); and it is a highly polyphagous species (recorded on plants from five different families), however, most of the host plants belong to the Poaceae and the main host is Bermuda grass (Ben-Dov 1988, Miller and Davidson 2005).

The economic impact caused by *O. ruthae* is not known in pastoral areas of Colombia and it is difficult to quantify its damage due to its cryptic habits and because is part of a complex of sap sucking insects present in pastures. The only reports of damage caused by *O. ruthae* in the world are those on grass pastures in the southern United States, causing wilt and dieback on Bermuda grass (Gill 1997).

Material examined. *Odonaspis ruthae* Kotinsky. **Colombia:** Norte de Santander, Cúcuta, Estadio General Santander. 07°53'24.83N, 72°30'206.83W. 350 m a.s.l., 23.ix.2015, col. F. Fuentes, ex. On the stalk of Bermuda grass *Cynodon dactylon* (L.) (Poaceae), 2 slides 2 adult females (CTNI); Valle del Cauca, Palmira, Corpoica, Centro de Investigación Palmira, 03°31'2033N, 76°19'206.13W, 998 m a.s.l., 25.x.2015, coll. T. Kondo, ex. Between leaf sheaths of the underground part of *E. colona* (L.) Link (Poaceae), 3 slides 3 adult females; 1 envelope with dry material (MECP).

Key to separate species of *Odonaspis* recorded in the Neotropical region (adapted from Ben-Dov, 1988).

1. Vulva placed anterior to level of anus; postvulvar sternite very distinct, sclerotized **2**
 — Vulva placed at level of or posterior to level of anus; postvulvar sternite not sclerotized **4**
- 2(1). Perivulvar pores in 2 lateral groups that are connected (on area anterior to vulva) by a narrow contiguous band of pores ***O. secreta* (Cockerell)**
 — Perivulvar pores in 2 lateral groups that are not connected by a narrow contiguous band of pores **3**
- 3(2). Perivulvar pores placed loosely, 1–4 pores in each lateral position; posterior spiracle without spiracular pores ***O. paucipora* Ben-Dov**
 — Perivulvar pores in lateral groups placed in compact clusters, 55–96 (78) pores in each; posterior spiracle with 1–22 spiracular pores ***O. greenii* (Cockerell)**
- 4(1). Ventral macroducts on all abdominal segments, or only on segments 1 to 6; 1/2 to 2/3 as wide as dorsal macroducts **5**
 — Ventral macroducts on all abdominal segments; as wide as dorsal macroducts **6**
- 5(4). Macroducts constricted at middle part of duct; with 1 cicatrix placed dorsally on each side of mouth parts ***O. galapagoensis* Ben-Dov**
 — Macroducts with parallel-sided ducts; dorsal cicatrices absent ***O. benardi* Balachowsky**
- 6(4). Gland tubercles absent from thorax ***O. ruthae* Kotinsky**
 — Gland tubercles present on thorax **7**
- 7(6). With 1 pair of marginal scleroses ***O. bromeliae* Ben-Dov**
 — With 2 pairs of marginal scleroses **8**
- 8(7). Emargination on apex of segment 8 with 2–5 marginal microducts; inner ends of marginal scleroses rounded ***O. litorosa* Ferris**
 — Emargination on apex of segment 8 without marginal microducts; inner ends of marginal scleroses not rounded, irregular in shape ***O. saccharicaulis* (Zehntner)**

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