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2 authors:

Alejandro E. Segarra
University of Puerto Rico at Mayagüez
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SYSTEMATICS, MORPHOLOGY AND PHYSIOLOGY

Four New Ladybug Species Belonging to *Decadiomus* Chapin (Coleoptera: Coccinellidae) from Puerto Rico

AE Segarra-Carmona[2], M Otero[1]

[1]College of Agricultural Sciences, Agricultural Experiment Station, Dept of Crops & Agro-Environmental Sciences, Univ of Puerto Rico, Mayagüez, PR, USA

[2]Dept of Crops & Agro-Environmental Sciences, Univ of Puerto Rico, Mayagüez, PR, USA

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Correspondence
AE Segarra-Carmona, Dept of Crops & Agro-Environmental Sciences, Univ of Puerto Rico, 00680 Mayagüez, PR, USA; alejandro.segarra@upr.edu

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Abstract

While searching for native natural enemies attacking invasive insect pests in Puerto Rico, we found four undescribed ladybug species belonging to the Caribbean ladybug genus *Decadiomus* Chapin. In this article, we describe the following species from Puerto Rico: *Decadiomus seini* n. sp., *Decadiomus ramosi* n. sp., *Decadiomus hayuyai* n. sp., and *Decadiomus martorelli* n. sp. Illustrations of the dorsal habitus, shape of prosternal carinae, and drawings of male and female genitalia are presented. We also present a key for Diomini of Puerto Rico and discuss their importance as potential biocontrol agents.

Introduction

Decadiomus Chapin (Chapin 1933) is a group of small to minute ladybugs native to southern Florida and to the West Indies. Its members belong to tribe Diomini (sensu Gordon 1999) and share the following set of characters: postcoxal line in the first visible ventrite reaching its hind margin; trimerous tarsi; and 10-segmented antennae. This last characteristic is revealed in the generic epithet of *Decadiomus*. Up until now, six species have been described, with *Decadiomus bahamicus* (Casey 1899, p. 158) described as the type species. Later, Chapin (1933) described four species: *Decadiomus peltatus* from Cuba and Hispaniola, *Decadiomus hubbardi* from Montserrat, and *Decadiomus pictus* and *Decadiomus tricuspis* from Puerto Rico. All species described by Chapin have straw white or reddish pink elytra with dark spots. The latest member of this genus to be described was *Decadiomus hughesi* (Gordon & Hillburn 1990, p. 279), a species of uncertain Caribbean origin with dark elytra, which was introduced to Bermuda from either Jamaica or Trinidad as a biological control agent against mealybugs (Hemiptera: Pseudococcidae).

Currently, little is known about their life history or ecological relationships of these ladybugs. Members of this genus, such as *D. pictus* and *D. hughesi* are known as predators of Hemiptera: Sternorrhyncha, mostly mealybugs (Chapin 1933, Gordon & Hillburn 1990). Coccidae, Diaspididae, Monophlebidae, and Ortheziidae have also been associated as prey insects to these tiny ladybug beetles (Böving 1933, Wolcott 1948, Chapin 1933, Gordon & Hillburn 1990, Bennett & Gordon 1991).

This work is the product of a 3-year search for native natural enemies of invasive insect pests in Puerto Rico, especially in citrus production areas and in subtropical dry forest habitats. During that period, we found a number of new records for Coccinellidae, including four undescribed ladybug species belonging to the Caribbean genus *Decadiomus*. Some of these *Decadiomus* species appear to be abundant and ubiquitous in our collections, perhaps indicating a previously unrevealed importance as natural control agents in these ecosystems. In addition, a monograph of Puerto Rican Coccinellidae is now being prepared, which will include these new species. This paper aims at describing these species and discusses their potential as biological control agents.

Material and Methods

Morphological terminology followed Gordon (1999). Structures were studied using an Olympus SZX-12 stereomicroscope and an Olympus BX41 phase contrast compound microscope. Genitalia were dissected after maceration of abdomens in KOH and placed in glass slides with glycerin. Line illustrations were drawn from a camera lucida tube attached to the compound microscope, and sketches scanned and redrawn using illustration software. Illustrations are arranged by species and each presenting a ventral view of the phallobase, a dorsal view of the phallobase, the sipho and enlargement of its apical section, and female genitalia. Shape of depression between prosternal carinae is described, with "apex" referring to its narrowest width cephalad and "base" referring to its widest diameter within the intercoxal process, closest to the mesosternum. Prosternum images were produced with a JEOL 5410LV scanning electron microscope. Holotypes and paratypes for *D. bahamicus*, *D. peltatus*, *D. hubbardi*, *D. hughesi*, *D. pictus*, and *D. tricuspis* were examined by the senior author at the United States National Museum of Natural History, Smithsonian Institute, Washington DC (USNM). Additional paratype specimens of *D. pictus* were examined at the Museum of Entomology and Tropical Biodiversity (METB) at the University of Puerto Rico Agricultural Experiment Station in Rio Piedras. Other specimens examined were deposited at the Invertebrate Collection at the University of Puerto Rico Mayaguez Campus (UPRM-IC) or in the senior author's private collection. This last collection has obtained during a 3-year sampling effort (2007–2010), using specimens usually obtained through foliage sweeping or beating of citrus trees and dry forest vegetation, or by using an aspirator in the case of cactus-dwelling species. All locality information for types is given exactly as it appears in the label, correcting for obvious misspellings. Authorship is given for each species according to the preparer of the description.

Taxonomic Account

Decadiomus seini *Segarra n. sp.* (Figs 1d, 2, 6b)

Description

Male. Dorsal habitus oval, convex. Length 1.4 mm, width 1.1 mm. Body color yellowish brown. Head, mouthparts, antenna yellow. Antennomeres (length): 1—40 μm, 2—40 μm, 3—47 μm, 4—6 μm, 5—16 μm, 6—14 μm, 7—17 μm, 8—20 μm, 9—21 μm, and 10—30 μm. Eyes black, frontal inter-ocular space 2× width of eye; punctation fine, shallow, separated by 1–2 diameters; hairs yellowish, sparse, decumbent. Pronotum yellowish; punctation separated by 1 diameter, shallow; hairs decumbent to semi-erect; scutellum black. Hypomeron, prosternum yellowish brown; prosternal carina elongate narrow; shape long with base 1.5× apex (Fig 6b). Legs yellowish brown. Epipleuron, mesepimeron mesepisternum yellowish brown. Metaventrite dark brown, except at pleural margins, pale brown. Elytron dark brown, punctation coarse, deep, separated 2–3 diameters; hairs yellowish brown, semi-erect. First abdominal segment dark brown medially, yellow towards pleural edge. Segments 2–6 yellowish, with apex of 5th ventrite feebly emarginated medially; apex of 6th ventrite arcuate. Genitalia as in Fig 2. Phallobase moderately long; basal lobe half-length of parameres, with short dorsal keel without dorsal setae; parameres with internal small setae, gradually widening from base to apex; apex moderately rounded with long apical setae about 7/8 length of parameres. Sipho long with long flagellum. Basal capsule elongate, slightly bifid; outer arm very short apically, with small accessory piece; Basal margin with long emargination.

Female. Similar to male except head, mouthparts, and pronotum pale brown. Epipleuron, mesepimeron, mesepisternum dark brown. Metaventrite dark brown, abdominal sterna dark brown. Apex of 6th abdominal ventrite arcuate. Spermatheca bent close to middle; cornu rounded and slightly globose; ramus with small beak. Infundibulum long and usually ring-like.

Diagnosis. The species is easily recognized from *Decadiomus martorelli* by males having dark frons and a feebly margined clypeus. *Decadiomus seini* may not be reliably separated from *D. hughesi* without examining the male genitalia. Completely dark elytra distinguishes *D. seini* from congeners previously described by Casey (1899) or by Chapin (1933).

Variation. Length 1.3–1.6 mm, width 0.9–1.2 mm. Most individuals collected from Puerto Rico are dark brown. Some individuals have pronotum piceous or stramineus. Specimens collected from Mona Island all have light-colored pronotum.

Type material. *Holotype* male. Label "Puerto Rico, Guánica. 17°58.79′N 66°52.86W. 27.vi.2008. Sweeping. Coll. A. Segarra"; deposited at METB, Acc. No. 03-2010. *Paratypes*: 9. 2, Label: "Guánica, PR. 17.960°N 66.862°W. Ex. *P. royenii/Hypogeococcus pungens*." 1, Label "Puerto Rico, Guánica. 17°57.32′N 66°50.95W. 26.vi.2008. Sweeping. Coll. A. Segarra"; deposited METB, Acc. No. 03-2010. 2, Label: "17.995°N 67.059°W. Lajas, PR 4.iii.2008. Ex. *P. royenii/H. pungens* Coll. A. Segarra" (deposited at UPRM-IC). 2, Label "18°01.59N 66° 31.76W. Juana Diaz EEA. 28.11.2008. On guava. Coll. A. Segarra." 2, Label: "Mona Island. 06.ix.2013. North

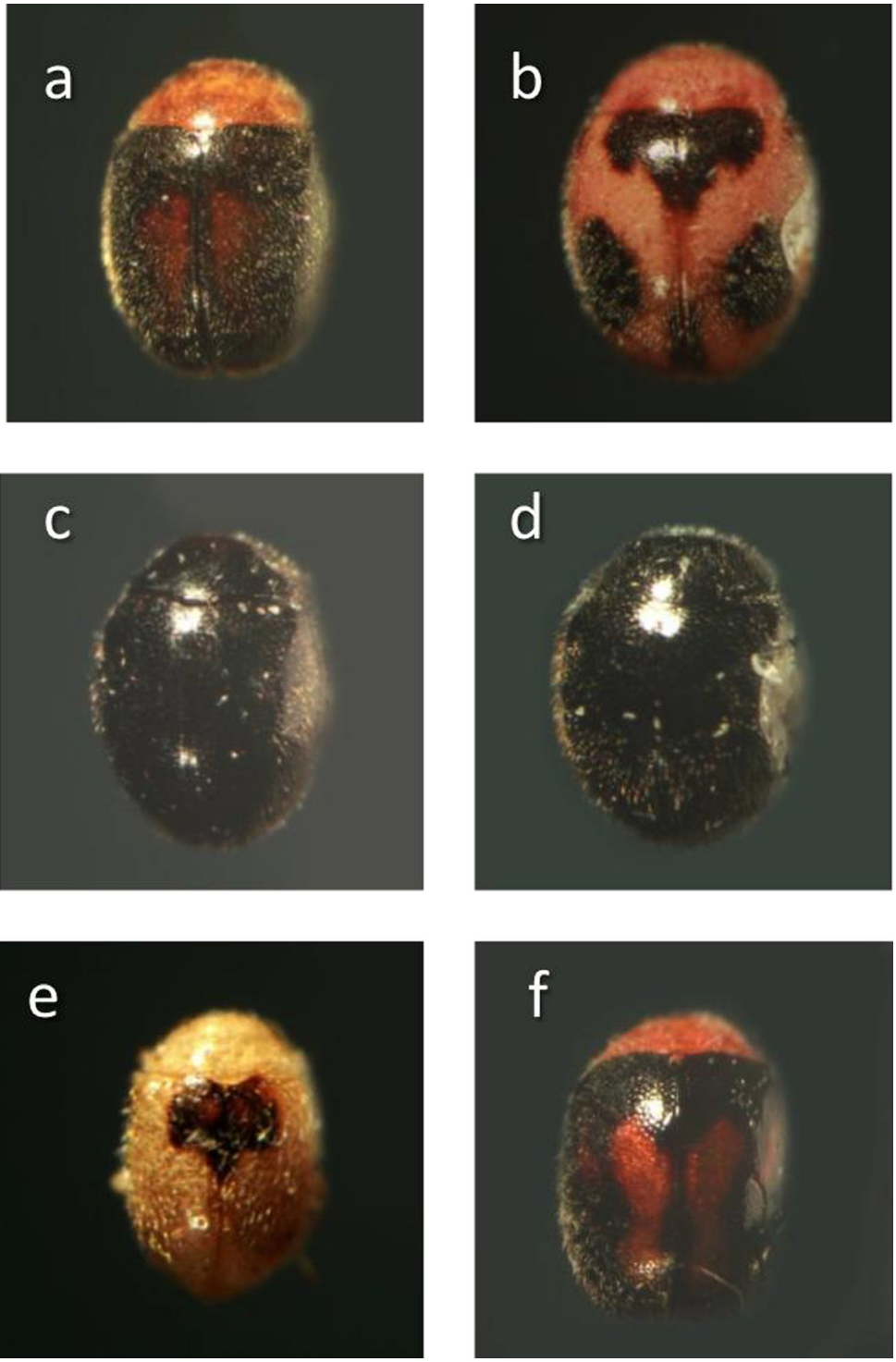

Fig 1 *Decadiomus* of Puerto Rico: habitus dorsal view of the following: **a** *Decadiomus ramosi* n. sp.; **b** *Decadiomus pictus* Chapin; **c** *Decadiomus martorelli* n. sp.; **d** *Decadiomus seini* n. sp.; **e** *Decadiomus tricuspis* Chapin; and **f** *Decadiomus hayuyai* n. sp.

of Lighthouse, Ex. Sweeping vegetation, Coll. A. Segarra & L. Collazo."

Remarks. This species is the smallest described here, and it is widely distributed in Puerto Rico, where it has been collected mostly from drier southern coastal areas. Specimens are also available from mountain locations (up to 750 m) and from northern coastal plains. Species is also common in Mona Island as collected by the author on 29 May 2008 in Sardinera beach and on 06 September 2013 from other parts of that island. Adults and larvae of this species have been repeatedly collected feeding on the *Harrisia* cactus mealybug, *H. pungens* Granara de Willink, in dry forest districts. In Mona Island, they were especially numerous in associations with the giant barber mealybug, *Puto barberi* (Cockerell), a common mealybug species from the Caribbean. Mature

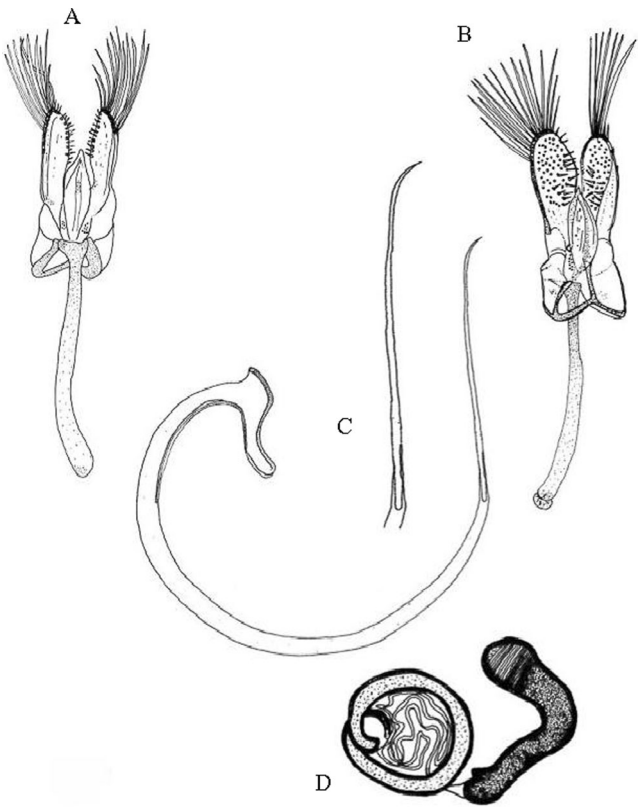

Fig 2 *Decadiomus seini* n. sp. Male genitalia (**a**–**c**). **a** Ventral view of the phallobase. **b** Dorsal view of the phallobase. **c** Sipho and enlargement of its apical section. **d** Female genitalia.

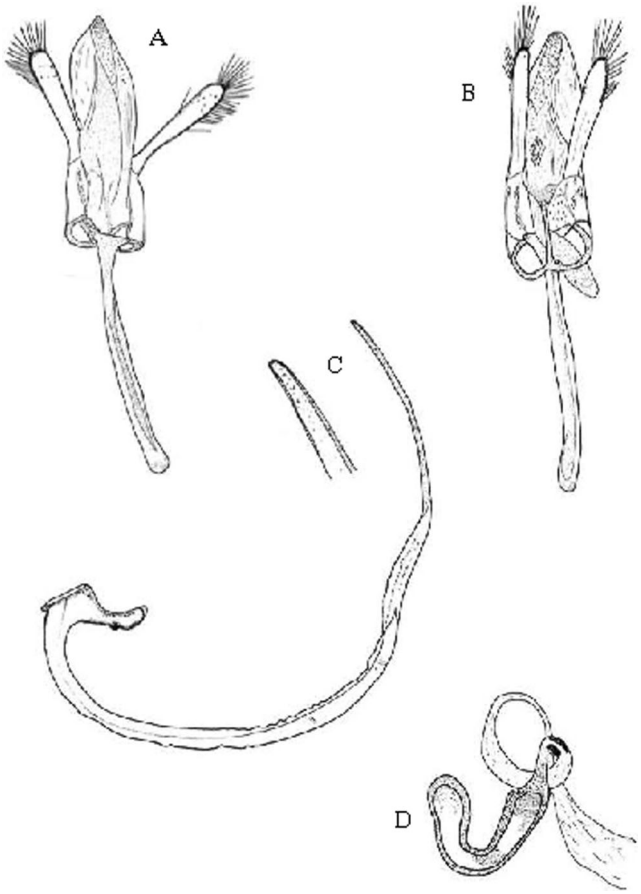

Fig 3 *Decadiomus ramosi* n. sp. Male genitalia (**a**–**c**). **a** Ventral view of the phallobase. **b** Dorsal view of the phallobase. **c** Sipho and enlargement of its apical section. **d** Female genitalia.

larvae of this ladybug are grayish white and feed on mealybugs (personal observation).

*Etymology***.** The species is named in remembrance of Mr. Francisco Seín, first native Puerto Rican entomologist, artist, and also collector of the first *Decadiomus* species described from Puerto Rico, *D. pictus* Chapin (1933, p. 97).

Decadiomus ramosi *Segarra, n. sp.* (Figs 1a, 3, 6d)

Description

*Male***.** Dorsal habitus oval, convex, elongate, slightly flattened posteriorly. Length 1.8 mm, width 1.3 mm. Body color yellowish brown. Head, mouthparts, antenna yellow. Antennomeres (length): 1—62 µm, 2—42 µm, 3—52 µm, 4—22 µm, 5—20 µm, 6—20 µm, 7—22 µm, 8—25 µm, 9—30 µm, and 10—37 µm. Eyes black, frontal inter-ocular space >2× width of eye; punctation double, fine, shallow, about one diameter; hairs short (less 1/3 diameter of eye), yellowish, dense, decumbent. Pronotum yellowish; punctation separated by 1 diameter, shallow, double; hairs erect to semi-erect; scutellum dark brown. Hypomeron, prosternum yellowish; shape prosternal carina elongate narrow, with base 1.7× apex (Fig 6d). Legs yellowish brown. Epipleuron, mesepimeron, mesepisternum, and metaventrite, dark brown. Elytron dark brown, shiny, with paler, elongate central spot extending apically after basal 1/3, and extending but reaching neither base nor suture, and extending 2/3 length. Apical 1/8 yellow. Punctation coarse, deep, separated by 1–2 diameters; hairs yellowish brown, semi-erect. First and second abdominal segments dark brown. Segments 3–6 yellowish brown, with apex of 5th ventrite feebly emarginated medially; apex of 6th ventrite arcuate. Genitalia as in Fig 3. Phallobase moderately long; basal lobe asymmetrical, broad, with dorsal setae; parameres slender, 7/8 length of phallobase with no internal short setae, apex rounded with short apical setae about 1/4 length of parameres. Sipho long with long flagellum. Basal capsule elongate, slightly bifid; outer arm short, with small accessory piece, inner arm elongate; basal margin emarginated.

*Female***.** Similar to male except head, mouthparts, and pronotum pale brown. Pale elytral spot smaller, sometimes altogether absent. Apex of 6th abdominal ventrite arcuate. Spermatheca bent close to middle; cornu rounded and

slightly globose; ramus with small beak. Infundibulum short and vestigial.

Diagnosis. This species is easily recognized from *D. seini*, *D. martorelli*, and *D. hughesi* for having distinct reddish brown areas on elytrae; *D. ramosi* may be reliably separated from *D. hayuyai* for having long and slender prosternal carinae. Dark elytron also distinguishes *D. ramosi* from congeners previously described by Casey (1899) or by Chapin (1933).

Variation. Length 1.5–2.1 mm, width 1.1–1.5 mm. Some individuals, especially those collected from coastal locations, with dark brown elytra with no spots. Males with pronotum lighter colored than females.

Type material. *Holotype* male. Label "18°09.450N 67°59.93W. Maricao PR, 25.vi.2008. Sweeping. Coll. A. Segarra"; deposited at METB, Acc. No. 04-2010. *Paratypes*: 8. 3, same label as holotype. 3, label: "18°16.99N 66°55.26W. San Sebastian P.R. 7.x.2008., Ex *Citrus*. Coll. A. Segarra" (2, at UPRM-IC). 2, label: "18°27.92N 67°03.22W. Isabela, P.R. 9.x.2008. Ex. *Citrus*. Coll. A. Segarra."

Remarks. This species is the largest described here and appears to be widely distributed in the more humid areas in northwestern and central Puerto Rico, and where it has been collected mostly from higher locations and some coastal areas. No specimens have been collected from drier areas in the southern coastal plains. Most collections are from citrus, but no Sternorrhyncha association has been directly established with their collection.

Etymology. The species is named in remembrance of the late Dr. José A. Ramos-Alemar (deceased), a renowned Puerto Rican taxonomist of Auchenorrhyncha in the twentieth century, collector of dozens of type specimens of Diomini from Colombia during his tenure as visiting professor of Universidad Javeriana in Bogota, and mentor to three generations of Puerto Rican entomologists.

Decadiomus hayuyai *Otero n. sp.* (Figs 1f, 4, 6c)

Description

Male. Dorsal habitus oval, convex. Length 1.6 mm, width 1.1 mm. Body color yellowish brown. Head, mouthparts, antenna pale yellow. Antennomeres (length): 1—65 µm, 2—41 µm, 3—58 µm, 4—21 µm, 5—19 µm, 6—19 µm, 7—21 µm, 8—21 µm, 9—23 µm, and 10—46 µm. Eyes black, frontal inter-ocular space 2× width of eye; punctation fine to almost imperceptible, separated 1–2 diameters; hairs short (less 1/4 diameter of eye), whitish, sparse, decumbent. Pronotum pale yellow, shinny;

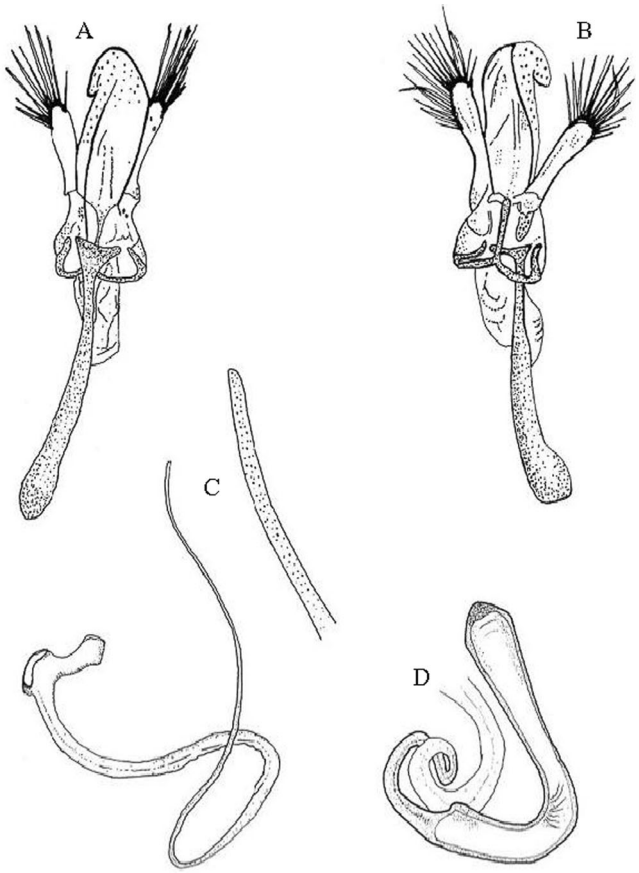

Fig 4 *Decadiomus hayuyai* n. sp. Male genitalia (**a**–**c**). **a** Ventral view of the phallobase. **b** Dorsal view of the phallobase. **c** Sipho and enlargement of its apical section. **d** Female genitalia.

punctation separated by 2 diameters, shallow almost imperceptible; hairs pale yellow, dense, decumbent to semi-erect. Scutellum light brown. Hypomeron, prosternum pale yellow; shape prosternal carina broad, trapezoid, with base 1.5× apex (Fig 6c). Legs pale yellow. Epipleuron pale brown; mesepimeron, mesepisternum, and metaventrite dark brown. Elytron dark brown, shiny, with two paler, elongate irregular spots. First smaller spot located almost medially, close but not reaching suture. Second spot elongate, on apical third, broadly separated from apex and not reaching suture. Apical 1/8 pale yellow. Punctation coarse, deep, 1–2× diameter; hairs pale yellow, decumbent to semi-erect. Abdominal segments dark brown, with apex of 5th ventrite deeply emarginated medially; apex of 6th ventrite arcuate. Genitalia as in Fig 4. Phallobase long; basal lobe asymmetrical, broad, with fleshy apical projection and no dorsal setae; parameres slender, widening towards apex, 2/3 length of phallobase with no small internal setae, apex rounded with long apical setae about 3/4 length of parameres. Sipho long with long flagellum. Basal capsule elongate, slightly bifid; outer arm short open, with no

accessory piece, inner arm elongate and widening towards apex; basal margin feebly emarginated.

Female. Similar to male. Legs pale yellow. Mouthparts pale yellow. Apex of 6th abdominal ventrite arcuate. Spermatheca bent before middle; cornu with elliptical to lanceolate apex and enlarged; ramus with small rounded beak. Infundibulum absent.

Diagnosis. This species is easily recognized from *D. seini*, *D. martorelli*, and *D. hughesi* for having distinct reddish brown areas on elytra; *D. hayuyai* may be reliably separated from *D. ramosi* for having a broad and trapezoid-shaped prosternal carina, and legs pale yellow. Dark elytron separates *D. hayuyai* from congeners previously described by Casey (1899) or by Chapin (1933).

Variation. Length 1.4–1.8 mm, width 1.0–1.3 mm. Individuals with fused elytra spots, common. Some individuals with head, eyes, prothorax, and elytra piceous.

Type material. *Holotype* male. Label "PUERTO RICO, Jayuya, P.R., 18°13.72N 66°33.07W. 2.ii.2010. Ex. Sweeping. Coll. A. Segarra"; deposited at METB, Acc. No. 05-2010. *Paratypes*: 3, Label: "18°09.45N 66°59.93W; Maricao, P.R. Ex. Sweeping. Coll. A. Segarra"; (2, METB Acc. No. 06-2010; 1, UPRM-IC).

Remarks. This species also appears to be a distributed in the more humid and higher areas in western and central Puerto Rico. No specimens have been collected from drier coastal areas in the southern coastal plains. Most collections were done by sweeping trees, and some have been collected from citrus.

Etymology. The species is named after the last Taino cacique (chief) of the interior highland town of Jayuya, Puerto Rico, during the sixteenth century, and hometown of the author and discoverer.

Decadiomus martorelli *Segarra n. sp.* (Figs 1c, 5, 6a)

Description

Male. Dorsal habitus rounded, oval, convex. Length 1.3 mm, width 1.0 mm. Body color black. Head, mouthparts, antenna pale yellow. Antennomeres (length): 1—47 µm, 2—43 µm, 3—43 µm, 4—15 µm, 5—15 µm, 6—20 µm, 7—25 µm, 8—25 µm, 9—28 µm, and 10—25 µm. Eyes black, frontal inter-ocular space <2× width of eye; punctation coarse, deep, separated by 1 diameter; hairs pale yellow, short (less 1/3 diameter of eye), sparse, decumbent to semi-erect. Clypeus slightly produced apically, strongly marginate. Cardo, submentum dark. Pronotum black, shinny; anterior angles pale yellow;

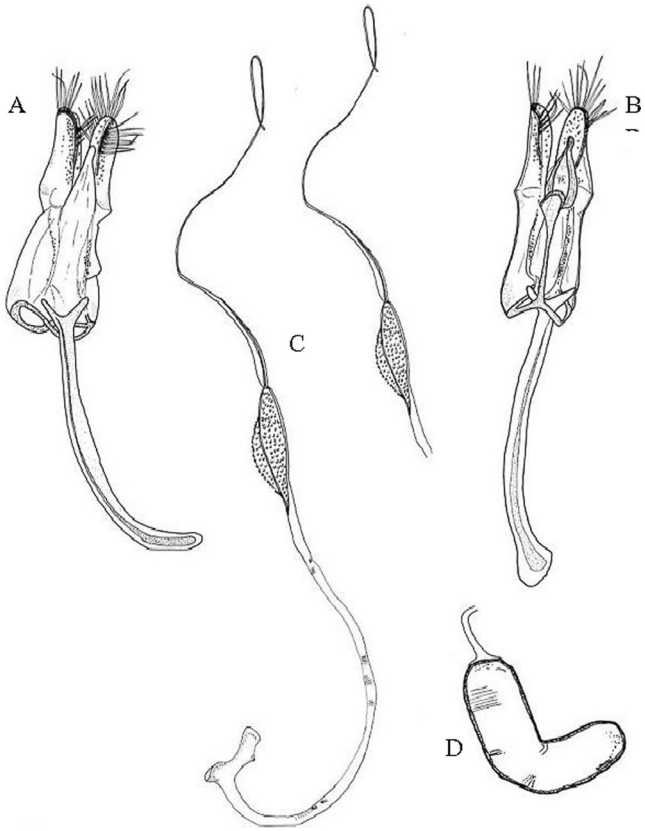

Fig 5 *Decadiomus martorelli* n. sp. Male genitalia (**a**–**c**). **a** Ventral view of the phallobase. **b** Dorsal view of the phallobase. **c** Sipho and enlargement of its apical section. **d** Female genitalia.

punctation same as head, coarse; hairs pale yellow, erect to semi-erect; scutellum black. Hypomeron pale yellow anteriorly, darker posteriorly. Prosternum black; shape prosternal carina narrow anteriorly and produced; process with base 5× apex (Fig 6a). Legs pale yellow. Epipleuron pale brown; mesepimeron, mesepisternum, and metaventrite black. Elytron black, shiny. Punctation coarse, deep, separated 1–2 diameters; Hairs yellowish brown, erect to semi-erect. Abdominal segments dark brown, with apex of 5th ventrite deeply emarginated medially; apex of 6th ventrite slightly emarginate. Genitalia as in Fig 5. Phallobase long, narrow with parameres shorter than base; basal lobe asymmetrical, broad, with fleshy apical projection and no dorsal setae; parameres with internal setae, with almost no gradual widening from base to apex; apex rounded with apical setae about 1/2 length of parameres. Sipho long with long flagellum, with noticeable widening at 2/3 length before end of flagellum, and present in no other species known to the authors. Basal capsule elongate; outer arm short apically, with small accessory piece; inner arm elongate, slightly widening towards apex. Basal margin with no noticeable emargination.

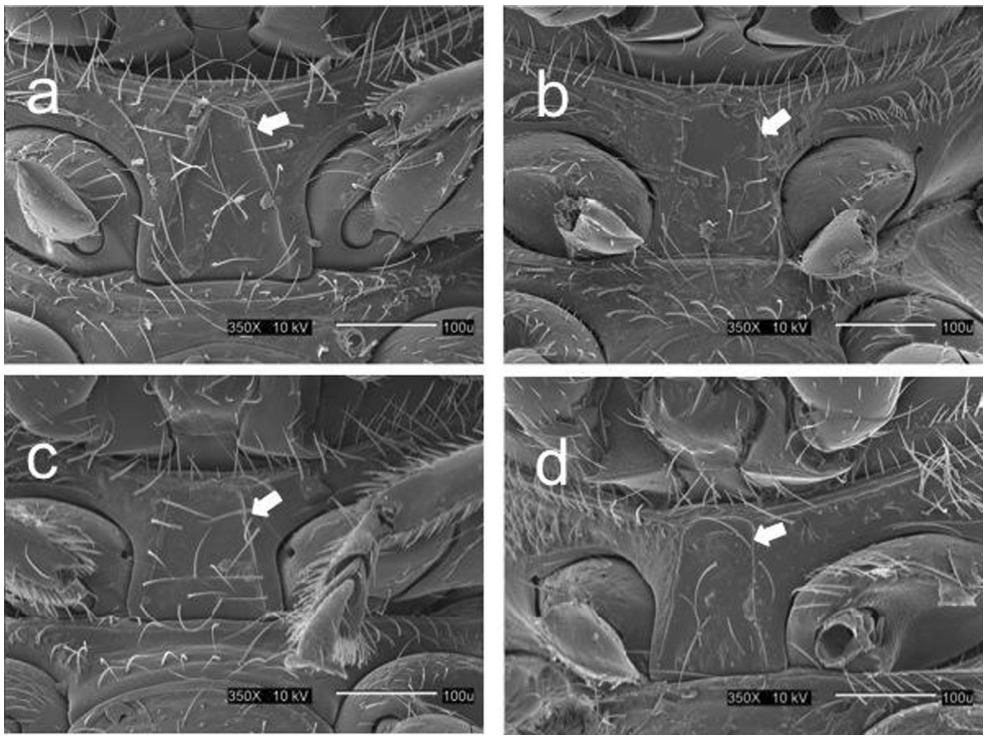

Fig 6 Prosterna and carinae of **a** *Decadiomus martorelli* n. sp.; **b** *Decadiomus seini* n. sp.; **c** *Decadiomus hayuyai* n. sp.; **d** *Decadiomus ramosi* n. sp. *Arrows* point at prosternal carina.

*Female***.** Black. Length 1.5 mm, width 1.1 mm. Legs dark brown. Mouthparts brown. Apex of 6th abdominal ventrite arcuate. Spermatheca wide, uniform caliber, bent close to middle; cornu with slightly truncate rounded apex and enlarged; ramus with almost unnoticeable beak. Infundibulum absent.

Diagnosis. This species is easily recognized from *D. seini* by the males having bright yellow frons, strongly margined clypeus, and for having a strongly triangle-shaped prosternal carina. As with *D. seini*, *D. martorelli* may not be reliably separated from *D. hughesi* without examining male genitalia. Completely dark elytron separates *D. martorelli* from congeners previously described by Casey (1899) or by Chapin (1933).

Variation. Length 1.3–1.5 mm, width 1.0–1.2 mm. Some specimens have darker head and legs.

*Type material***.** *Holotype* male. Label "27.V.2009. Las Marias, P.R., Finca Ana Luisa. 18°12.59N 66°59.97W. Coll. A. Segarra"; deposited at METB, Acc. No. 07-2010. *Paratypes*: three, "PUERTO RICO. 1, Adjuntas EEA. 18°10.34N 66°44.47W. 30.iii.2009. Ex. Citrus. Coll. A. Segarra" (UPRM-IC); and 2, "27.V.2009. Las Marias, P.R. 18°12.67N 66°59.17W. *Citrus*. A. Segarra."

Remarks. The species appears to be a distributed in the more humid and higher areas in western and central Puerto Rico. Most collections were done by sweeping trees, and some have also been collected from citrus.

Etymology. The species is named after Dr. Luis F. Martorell (deceased), first Puerto Rican forest entomologist and avid botanist, who worked at the University of Puerto Rico, Agricultural Experiment Station, and where he directed the Department of Entomology from 1960 until his retirement in 1973.

Discussion

Although the presence of some external characters is useful for preliminary identification, the species described here cannot be correctly identified without genitalia examinations. In fact, species of Diomini usually lack significant external characters that reliably allow species differentiation (Gordon 1999). Some useful external diagnostic characters used here are as follows: width of prosternum, shape of prosternal carina, the color of head and elytral apices, and body size. In general, males tend have paler pronotum, mouthparts, and legs, and have emarginated 5th abdominal segments. Among internal characters, the shape of the phallobase proved to be a reliable character to separate among two species groups: (1) a group with basal lobe longer than parameres (*D. ramosi* and *D. hayuyai*), and (2) a group with shorter basal lobes (*D. seini* and *D. martorelli*, and *D. pictus*). Also, the shape of spermathecae and the presence or absence of infundibula proved useful characters for separating females from different species. Unfortunately, we were not able to examine

D. tricuspis as only one female specimen was available to us, and this species is very rare. In fact, Wolcott (1960) found *Decadiomus* specimens rare in Puerto Rico and though them to be possibly extinct after several decades without collections. Most species described here are also uncommon to rare, except for *D. seini and D. ramosi*, which seem to be abundant and widespread.

Key to the Diomini of Puerto Rico

1. Antenna with 11 antennomeres (*Diomus* sp.) 2
– Antenna with 10 antennomeres (*Decadiomus* sp.) 3
2. Elytral suture black from base to apex, with posterior yellowish areas covering distal 1/5 of abdomen, and not joining at suture, length 1.5–1.6 mm ..... *Diomus roseicollis* (Mulsant)
– Body with heavily yellowish pubescence; pronotum reddish; posterior yellowish areas joining at suture and 1/6 of apex; length 1.5–1.7 mm ..... *Diomus ochroderus* (Mulsant)
3. Elytra mostly straw white or reddish pink, with darker spots (Fig 1 b, e) 4
– Elytra not as above, brown or black with or without yellowish spots 5
4. Elytra straw white with pale large basal triangular darker area and two spots 1/3 from apex; length 0.9–1.0 mm, and the smallest Diomini from Puerto Rico (Fig 1e) ..... *Decadiomus tricuspis* Chapin
– Elytra pale reddish pink with bluish black spots 1/3 from apex; humeral callus prominent and strongly shining; length 1.6–1.8 mm (Fig 1b) ..... *Decadiomus pictus* Chapin
5. Prosternal carina long, slender 6
– Prosternal carina not as above, either wide and trapezoid, or strongly triangular 7
6. Elytra completely dark, no spots; legs dark brown; length 1.3–1.6 mm ..... *Decadiomus seini* n. sp.
– Elytra dark, with last 1/8 of apex yellowish; and reddish brown areas extending ¼ from apex and not reaching apex; length 1.5–2.1 mm ..... *Decadiomus ramosi* n. sp.
7. Prosternal carina broad and trapezoid-shaped; head, legs pale yellow; Elytra dark with 2 pale spots; length, apex yellowish; 1.4–1.8 mm ..... *Decadiomus hayuyai* n. sp.
– Prosternal carina strongly triangular, produced anteriorly; elytra completely dark; length 1.3–1.7 mm .... *Decadiomus martorelli* n. sp.

In the past, some controversy has risen about the validity of *Decadiomus* Chapin as defined by the presence of 10-segmented antennae. Hong & Slipinski (2009) have argued that 10-segmented antennae are spontaneously found in normally 11-segmented *Diomus* species of Australasian origin. Although it would be difficult to conclusively adjudicate this issue from our data, all specimens studied here had 10-segmented antennae and complied with established generic characters (i.e., tarsi trimerous; postcoxal line reaching hind margin of sternum). Conversely, all Puerto Rican *Diomus* specimens examined by the senior author have had 11-segmented antennae. Thus, established generic characters appear robust in local Diomini fauna.

There appears that two color-based clusters are present within the genus *Decadiomus*: (1) the group described by Chapin (1933), all with pinkish or whitish-colored bodies and elytrae, similar to the type species *D. bahamicus*, which includes the following: *D. pictus*, *D. tricuspis*, *D. peltatus*, and *D. hubbardi*; and (2) a group of species with dark-colored bodies and elytrae, such as *D. hughesi* and the four species described here. A revision of this genus is outside the scope of this work, but some of the characters discussed may prove important to understand phyletic relations between these groups.

Finally, surveys of the more common *D. seini* have established its potential significance as a native predator of the destructive and invasive *Harrisia* cactus mealybug (*H. pungens* (Granara de Willink)) in Puerto Rico (Segarra Carmona *et al* 2010). Unpublished laboratory observations by the senior author showed preference of both, *D. seini* adults and mature larvae, for late instar or adult *H. pungens* females. Unfortunately, little is known about the host range of this ladybug, but observations of collection data suggests a broad range of likely hosts that may include other mealybugs. Further studies are needed to determine host preferences for other species, expand collections to other Caribbean Islands, and obtain more relevant life cycle and ecological data for all members of this potentially important group of mealybug predators.

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