

Research Article

Three species of *Megacerus* Fahraeus (Coleoptera: Chrysomelidae: Bruchinae) associated to *Merremia umbellata* (L.) Hall. Fil. (Convolvulaceae) in México

Tres especies de *Megacerus* Fahraeus (Coleoptera: Chrysomelidae: Bruchinae) asociadas a *Merremia umbellata* (L.) Hall. Fil. (Convolvulaceae) en México

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Abstract. In order to determine the species of bruchids that feed on *Merremia umbellata* (L.) Hall. Fil. (1892) seeds, 110 samples of ovoid capsule were collected, from which 753 bruchids of the genus *Megacerus* Fahraeus, 1839 were obtained. The most abundant species was *M. alabani* (Terán and Kingsolver, 1977) (84.86%), followed by *M. cubiculus* (Casey, 1884) (14.87%) and *M. tricolor* (Suffrian, 1870) (0.27%). A total of 5,709 seeds was evaluated to determine the damage these insects cause plants. Of these, 880 presented some type of condition, representing a 15.41% damage caused by the three *Megacerus* species include the parasited. This is the first record of the species *M. alabani*, *M. cubiculus* on the host *M. umbellata*.

Key words: Bruchids, Convolvulaceae, host, seeds.

Resumen. Con la finalidad de conocer las especies de brúquidos que se alimentan de las semillas de *Merremia umbellata* (L.) Hall. Fil. (1892), se recolectaron 110 capsulas secas, de las que se obtuvieron 753 brúquidos del género *Megacerus* Fahraeus, 1839. La especie más abundante fue *M. alabani* (Terán y Kingsolver, 1977) (84,86%), seguida de *M. cubiculus* (Casey, 1884) (14,87%) y *M. tricolor* (Suffrian, 1870) (0,27%). Un total de 5.709 semillas se evaluaron para determinar el daño que estos insectos ocasionan a las plantas. De éstas, 880 mostraron algún tipo de afección, lo que representó un daño de 15,41% causado por las tres especies de *Megacerus* incluyendo los parasitados. Este es el primer registro de las especies *M. alabani*, *M. cubiculus* y *M. tricolor* en el hospedante *Merremia umbellata*.

Palabras clave: Brúquidos, Convolvulaceae, hospedante, semillas.

Introduction

The genus *Megacerus* Fahraeus, 1839 (Coleoptera: Chrysomelidae: Bruchinae) is closely related to the Convolvulaceae, mostly the genera *Ipomoea* L., 1753, *Convolvulus* L., 1753,

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Calystegia R. Br., 1810, *Argyreia* Lour, 1790 and *Merremia* Dennst., 1841 data on its hosts is incomplete or in some cases require confirmation (Zacher 1952), as is the case of the genus *Merremia*. The only records are to *Merremia disecta* (Jacq.) Hallier f., 1893 is host of *Megacerus baeri* (Pic, 1934) (Johnson & Raimundez-Urrutia 2008) and *Merremia quinquefolia* (L.) Hallier f. for *Megacerus tricolor* (Suffrian, 1870) and *Megacerus impiger* (Horn, 1873) (Romero *et al.* 2009, 2014). The reports for *Merremia cissoides* (Lam.) Hallier f. and *Merremia aegyptia* (L.) Urban are hosts of *Megacerus cubiculus* (Casey, 1884) and *Megacerus porosus* (Sharp, 1885) (Reyes *et al.* 2009). Studies that relate *Megacerus capreolus* (Jekel, 1855), *Megacerus bifloccosus* (Motschulsky) and *Megacerus flabelliger* (Fähræus, 1839) to *Merremia* include data that were never confirmed for species (Terán & Kingsolver 1977). For *Megacerus alabani* (Terán & Kingsolver, 1977) is report in seeds of Convolvulacea unconfirmed (De la Cruz *et al.* 2013).

The genus *Merremia* includes around 80 species that have a pantropical distribution. The greater number of species is found in Asia and Africa, with about 30 species in the new world (O'Donnell 1941). *Merremia umbellata* (L.) H. Hallier (Convolvulaceae) is a climbing plant. It has alternating ovate leaves, trichomes and yellow inflorescences in bouquets. The fruit is a dehiscent ovoid capsule with four seeds, black to brown, with abundant trichomes (McDonald 1993). In America, this plant is distributed from the southern United States, Mexico and Colombia to northern Argentina (McDonald 1993). In Mexico it has been reported for Campeche, Chiapas, Colima, Guanajuato, Guerrero, Jalisco, State of Mexico, Michoacán, Morelos, Nayarit, Oaxaca, Puebla, Queretaro, Quintana Roo, San Luis Potosi, Sinaloa, Tabasco, Tamaulipas, Veracruz and Yucatan (McDonald 1993; Villaseñor & Espinosa 1998). At present, *M. umbellata* is considered a brush in sugar cane, maize and tomato plantations (Villaseñor & Espinoza 1998). It is used as forage for cattle (Arellano *et al.* 2003).

The interaction between *Merremia umbellata* and other species of *Megacerus* is unknown. For this reason, the objectives of this study were to identify the bruchid species that are associated with *M. umbellata*, to evaluate the damage the insects do to seeds, and to elaborate a dichotomic key for the identification of the species.

Material and Methods

Collection took place throughout the 17 municipalities of the state of Tabasco, from September 2014 to June 2016. Plant samples were collected in order to confirm the species and dry capsules of *Merremia umbellata*, and were placed in brown paper bags including collection data. The material was checked once a week during three months in order to obtain the insects that emerged. These were placed in plastic jars with 70% alcohol (De la Cruz *et al.* 2013).

The insects that emerged were mounted and labeled with their respective collection data. They were then placed in the Colección de Insectos de la Universidad de Tabasco (CIUT), in the División Académica de Ciencias Biológicas (DACBIOL) of the Universidad Juárez Autónoma de Tabasco (UJAT).

The male specimens were identified after extracting the genitalia, as was established by Kingsolver & Whitehead (1974), Kingsolver (1970) and Romero & Johnson (1999) for a correct identification. The specimens were identified following the taxonomic key for the genus (Terán & Kingsolver 1977 ; Romero 2018), and the species were corroborated by the Mexican specialist on the family Bruchidae and by consulting the BRUCOL data base.

The damage that the bruchids did to the Convolvulaceae seeds was estimated with the method proposed by Romero *et al.* (2005) and considering the following parameters: number of entrance holes of the larvae (SOE), number of exit holes of the adults (SOS), total number of seeds (TS) and number of healthy seeds (SS). The percentage of damage to sample was then calculated.

A dichotomic key was prepared for the identification of the *Megacerus* species associated with *Merremia umbellata* seeds.

Results

Merremia umbellata provided 110 capsules from which 753 bruchids of the genus *Megacerus* emerged. The most abundant species was *Megacerus alabani* (Terán & Kingsolver) with 84.86% of the total abundance, followed by *M. cubiculus* (Casey) with 14.87% and *M. tricolor* (Suffrian) with 0.27% as the least abundant (Table 1).

Table 1. *Megacerus* abundance in *Merremia umbellata* seeds.

<i>Megacerus</i> species	Abundance
<i>Megacerus alabani</i>	639
<i>Megacerus cubiculus</i>	112
<i>Megacerus tricolor</i>	2
Total	753

Only 880 seeds showed some type damage of which 127 seeds was have parasitoids.

Damage was evaluated in 42 capsules of *M. umbellata*. A total of 5,709 seeds were examined and 4,829 were completely healthy. Only 880 seeds showed some type damage of which 127 seeds were have parasitoids. This provided a 15.41 % damage done to the seeds by the three *Megacerus* species include the parasited.

Identification key for bruchids associated with *Merremia umbellata*

- 1 Posteroventral border of metafemur smooth, or with a small tooth near the apex 2
- 1' Internal border of ventral face of metafemur serrate with all of teeth of equal size
Subgenus *Serratibruchus*....Body totally black.....*Megacerus alabani* Terán & Kingsolver
- 2 Posteroventral border of metafemur smooth; elytral striae with large punctures making borders of intervals undulating; intervals riblike and sometimes marked with a row of small punctures; mucro of metatibia as long as half width; lateral carina of metatibia ending very near or at base of mucro; apex of protibial of male with small hook.....subgenus *Pachybruchus*
- 2' Internal border of ventral face of metafemur flat, or with a single small tooth; elytral striae with punctures of variable size, which may or may not deform intervals, these without rows of small punctures; mucro of metatibia not as long as half width of tibia at apex; lateral carina of metatibia terminating in a small tooth at apical border; apex of protibial of male without small hook.....Subgenus *Megacerus*.....3
- 3 Eyes near each other with large rounded ommatidia, narrow deep notches up to half the length of the eye. Elytra elongated; grooves formed by elongated spots that do not deform the inter-grooves; abdomen with the sides of the urosternites hidden from dorsal view by the elytra; pygidium convex with large spots on its surface; tergite of the genital segment longer than wide; parameres with some slightly developed bristles on the distal edge...
.....*Megacerus cubiculus* (Casey)
- 3' Elytra with a slightly marked trough in the basal zone; deep grooves, with large rounded separate spots; inter-grooves with a finely spotted surface; pygidium with two small periapical glabrous areas and two more on the mid-third; spiculum gastrale with the stem slightly shorter than the arms; genital armature constituted by a group of teeth placed in two lines that converge.....*Megacerus tricolor* (Suffrian)

Megacerus species associated with *Merremia umbellata*

Megacerus alabani Terán & Kingsolver, 1977 (Figs. 1-4)

Description. Length 3 mm, width 2 mm; colour shiny black; eyes blackish chestnut with a golden shine. Head with spotted surface except on the frontal carina. Eyes low-cut up to their mid-length. Front and middle legs without peculiarities; external half of the posterior coxa spotted as the pronotum. Elytra with deeply marked grooves in which may be seen large separate spots. Inter-grooves sinuous, the first more dilated in its mid-section where there is a patch of white hairs, all the surface spotted and finely rugose. Abdomen with the pygidium in the shape of an isosceles triangle. Male genitalia parameres with the anterior edge strongly convex and with nine bristles at each side; half moon small with short rims on its free edge. Aedeagus with the basal lobule longer than the tube; armature of the internal sac with a group of equally sized irregularly distributed teeth.

Distribution. Mexico (Colima, Morelos, Nayarit, Oaxaca, Quintana Roo, Tabasco).

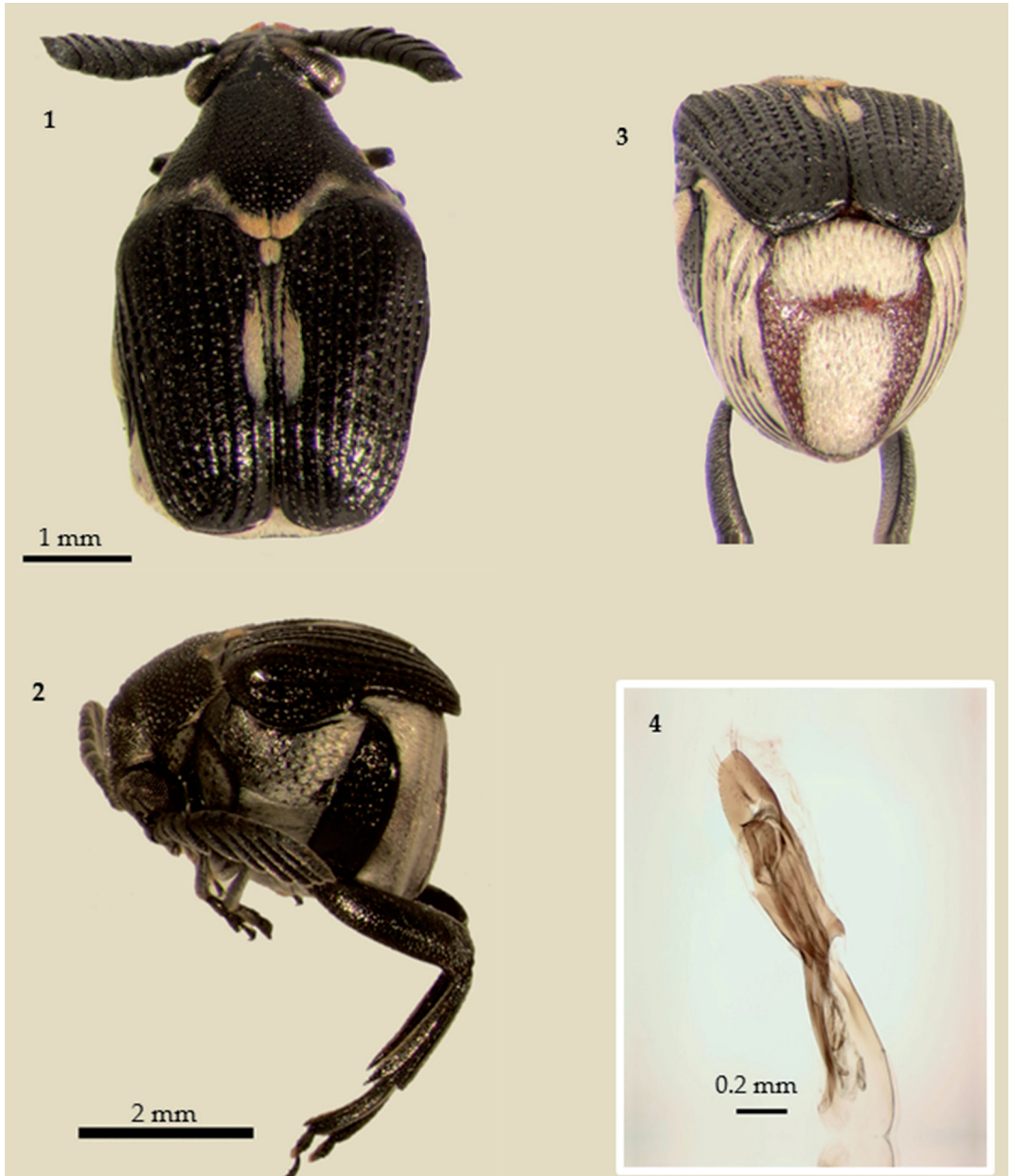
Hosts. *Ipomoea seducta*, *Merremia umbellata* (new host, Figs. 13-15).

Material examined. Tabasco. Reserva de la Biosfera de Pantanos de Centla, Centla. 18°21'37"N, 92°30'42"W. 7/IX /2014. Col. López M. T. *M. umbellata* (L.) H. Hallier. Chacté, Centro. 18°00'31.5"N, 92°43'11.2"W. 28/I/2015. R/a. Mecocacán, Jalpa de Méndez. 18°15'05"N, 93°05'31.5"W. 07/II/2015. Col. López M. T. *M. umbellata* (L.) H. Hallier. R/a. Mecocacán, Jalpa de Méndez. 18°14'21.5"N, 93°04'55.3"W. 07/II/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. R/a. Mecocacán, Jalpa de Méndez. 18°14'18.8"N, 93°04'52.3"W. 07/II/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Highway to Francisco Rueda, Huimanguillo. 17°52'42.4"N, 93°22'21.7"W. 22/II/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Highway to Francisco Rueda, Huimanguillo. 17°50'26.5"N, 93°35'50.5"W. 22/II/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. R/a. Morelos, Macuspana. 17°52'35.5"N, 92°37'02.3"W. 02/V/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Ejido las Palomas, Macuspana. 17°38'54.7"N, 92°28'42.5"W. 3/V/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Ejido las Palomas, Macuspana. 17°38'24.3"N, 92°28'54.9"W. 3/V/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Ejido las Palomas, Macuspana. 17°38'13.4"N, 92°28'54.5"W. 3/V/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Ejido las Palomas, Macuspana. 17°37'57.8"N, 92°28'47.7"W. 3/V/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. (2). Highway to Cd. PEMEX, Macuspana. 17°49'41.7"N, 92°42'45.6"W. 3/V/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Highway to Tenosique-Niños Héros. 17°17'25.8"N, 91°21'27.4"W. 23/V/2015. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Paraíso. 25/I/2016. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Comalcalco. 26/I/2016. Col. López López M. T. *M. umbellata* (L.) H. Hallier. (3). Villa Tamulté de las Sabanas, Centro. 17/II/2016. (2). Jalapa. 16/II/2016. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Nacajuca. 15/II/2016. Col. López López M. T. *M. umbellata* (L.) H. Hallier. (3). Villa Aldama, Comalcalco. 4/III/2016. Col. López López M. T. *M. umbellata* (L.) H. Hallier. Huapaca y Amestoy. 4/III/2016. Col. López López M. T. *M. umbellata* (L.) H. Hallier.

Megacerus cubiculus (Casey, 1884) (Figs. 5-8)

Description. Length 2.5 mm, width 2.7 mm. Straw-yellow pubescence, slightly dense on antennae and legs, white and moderately dense on the ventral section of the thorax, and whitish and quite dense on the pygidium. Head with eyes near each other, with large

rounded ommatidia. Antennae with the longitudinal scapes as those on the 2nd and 3rd articles. Thorax with the pronotum with sides moderately convex. Legs with the posterior coxa with an area without spots; femur III without a visible small tooth. Elytra elongated; deep grooves formed by elongated mid-sized joined spots that do not deform the inter-grooves. Inter-grooves flat, of a uniform width except in the apical zone of the 2nd that becomes notably wider and is raised. Pygidium evenly convex, with large spots on its surface. Genitalia, tergite of the genital segment longer than wide, without peculiarities. Spiculum gastrale with the arms slightly shorter than the uneven stem and thinner than in *M. impiger*. Parameres with some bristles on the distal edge slightly more developed than in *M. impiger*.



Figures 1-4. *Megacerus alabani*. 1. Dorsal view, 2. Lateral view, 3. Pygidium, 4. Male genitalia.

Distribution. Bahamas, United States, Honduras, Mexico (Campeche, Chiapas, Guerrero, Jalisco, Michoacán, Morelos, Nayarit, Oaxaca, Queretaro, Sinaloa, Tabasco, Tamaulipas, Yucatan), Nicaragua, Tobago, Venezuela.

Hosts. *Convolvulus* sp., *Ipomoea batata*, *I. cordatotriloba*, *I. cholulensis*, *I. hederifolia*, *I. incarnata*, *I. lacunosa*, *I. nil*, *I. purpurea*, *I. trifida*, *I. triloba*, *Merremia aegyptia*, *M. cissoides*, *M. quinquefolia*, *M. umbellata* (new host, Figs. 13-15).

Material examined. Tabasco. Unidad de manejo Ambiental “Mono Sagrado”, Laguna Colorada, Balancán. 17°46'55.9"N, 91°30'55.5"W. 15/III/2015. Col. López López M. T. *Merremia umbellata* (L.) H. Hallier. Ejido las Palomas, Macuspana. 17°37'57.8"N,



Figures 5-8. *Megacerus cubiculus*. 5. Dorsal view, 6. Lateral view, 7. Pygidium, 8. Male genitalia.

92°28'47.7''W. 3/V/2015. Col. López López M. T. M. *umbellata* (L.) H. Hallier. (2). Bridge before entering Agua Blanca, Macuspana. 17°37'31.6''N, 92°28'36.2''W. 3/V/2015. Col. López López M. T. M. *umbellata* (L.) H. Hallier. Highway to Cd. PEMEX, Macuspana. 17°49'41.7''N, 92°42'45.6''W. 3/V/2015. Col. López López M. T. M. *umbellata* (L.) H. Hallier. Highway to Jonuta. 17°43'07.2''N, 92°07'54.2''W. 9/V/2015. Col. López López M. T. M. *umbellata* (L.) H. Hallier. Highway to Tenosique-Niños Héroes. 17°17'25''N, 91°23'04.5''W. 23/V/2015. Col. López López M. T. M. *umbellata* (L.) H. Hallier. (2). Highway to Tenosique-Niños Héroes. 17°16'08.8''N, 91°22'53.4''W. 23/V/2015. Col. López López M. T. M. *umbellata* (L.) H. Hallier. Highway to Tenosique-Niños Héroes. 17°15'97.8''N, 91°22'19''W. 23/V/2015. Col. López López M. T. M. *umbellata* (L.) H. Hallier. Comalcalco. 16/I/2016. Col. López López M. T. M. *umbellata* (L.) H. Hallier. La candelaria, Huimanguillo. UTM 436115 and 1915908. Col. Torres Pérez M.A.

Megacerus tricolor (Suffrian, 1870) (Figs. 9-12)

Description. Length 2.7 mm, width 1.8 mm. Pubescence: head with whitish or yellowish hair; antennae covered by a fine, white, non dense layer of short soft hair. Pronotum with yellowish hair, the rest of the thorax with more or less dense yellowish pubescence. Legs with a whitish or yellowish layer of short soft hair. Pygidium with a dense white pubescence except for two small glabrous areas in the middle and another two periapical. Head with eyes low-cut up to their mid-length. Thorax with the lateral carina of the pronotum invisible. Posterior legs with the tibia almost straight, mucro slightly longer than the lateral tooth. Elytra with a slightly marked trough in the basal zone, as that between the sutural edge and the 2nd groove on the second fourth of the elytron. Grooves with large rounded separate spots. Inter-grooves with a finely spotted surface. Abdomen with the pygidium slightly convex. Genitalia, spiculum gastrale with the stem slightly shorter than the arms. Genital armature constituted by a group of teeth placed in two lines that converge "in front", the more "anterior" flanked by a subtriangular tooth at each side, after a space.

Distribution. Antilles, Bolivia, Brazil, Colombia, Costa Rica, Cuba, United States, Dominican Republic, Ecuador, Guatemala, Honduras, Mexico (Baja California Sur, Chiapas, Guerrero, Jalisco, Mexico City, Michoacán, Morelos, Nayarit, Oaxaca, Puebla, Quintana Roo, Sinaloa, Tabasco, Tamaulipas, Yucatan), Nicaragua, Panama, Paraguay, Peru, Trinidad & Tobago, Venezuela.

Hosts. *Argyreia nervosa*, *Calystegia sepium*, *Convolvulus* sp., *Ipomoea alba*, *I. arborescens*, *I. cairica*, *I. carnea*, *I. crinicalyx*, *I. cholulensis*, *I. hederifolia*, *I. meyeri*, *I. murucoides*, *I. nil*, *I. purpurea*, *I. tricolor*, *I. triloba*, *Merremia aegyptia*, *M. quinquefolia*, *M. umbellata* (new host, Figs. 13-15), *Turbina corymbosa*, *T. racemosa*.

Material examined. Tabasco. Unidad de Manejo Ambiental "Mono Sagrado", Laguna Colorada, Balancán. 17°46'21.2''N, 91°31'35.4''W. 15/III/2015. Col. López López M.T. *Merremia umbellata* (L.) H. Hallier. Unidad de Manejo Ambiental "Mono Sagrado", Laguna Colorada, Balancán. 17°47'00.2''N, 91°31'07.8''W. 15/III/2015. Col. López López M.T. *M. umbellata* (L.) H. Hallier.

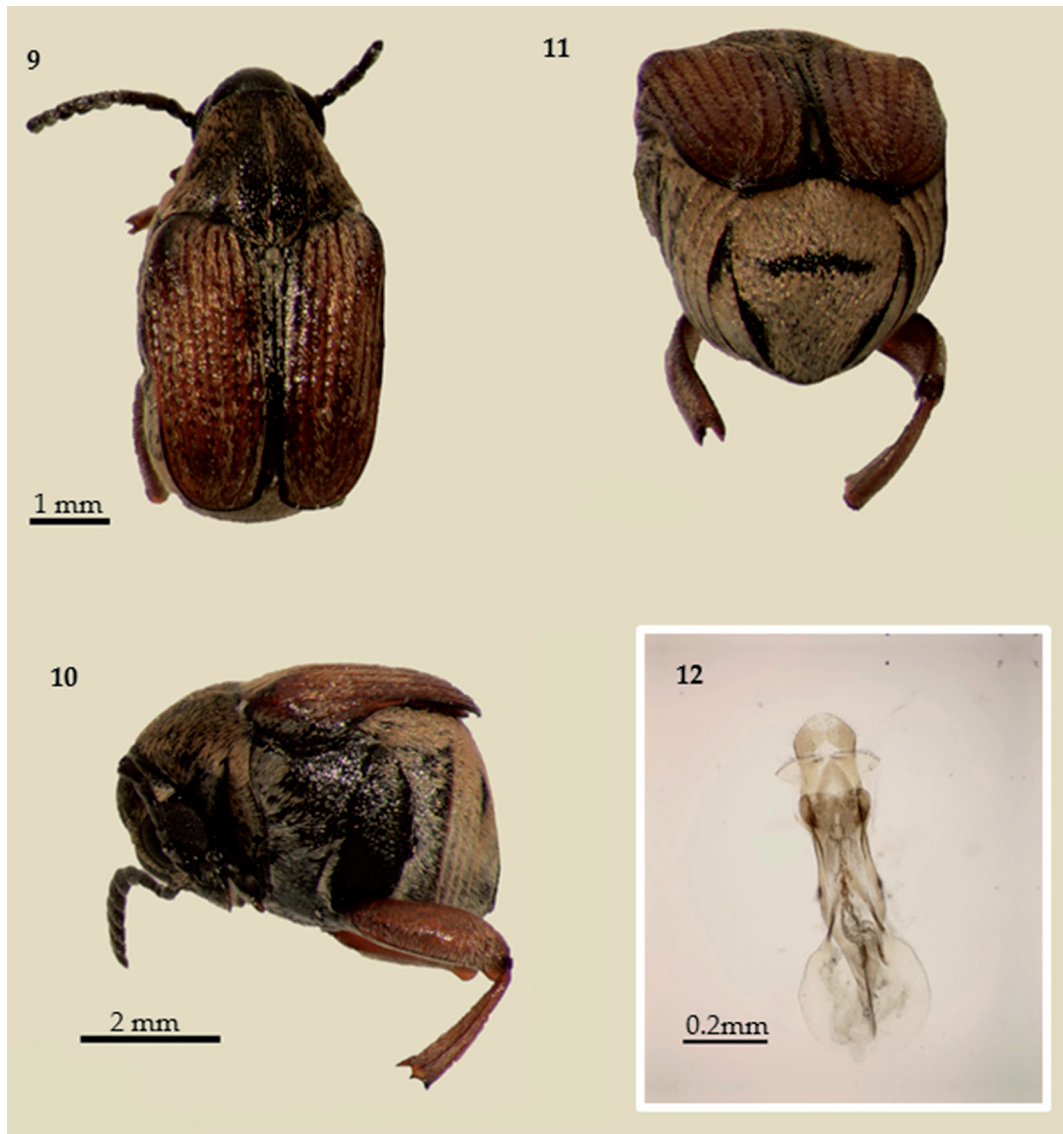
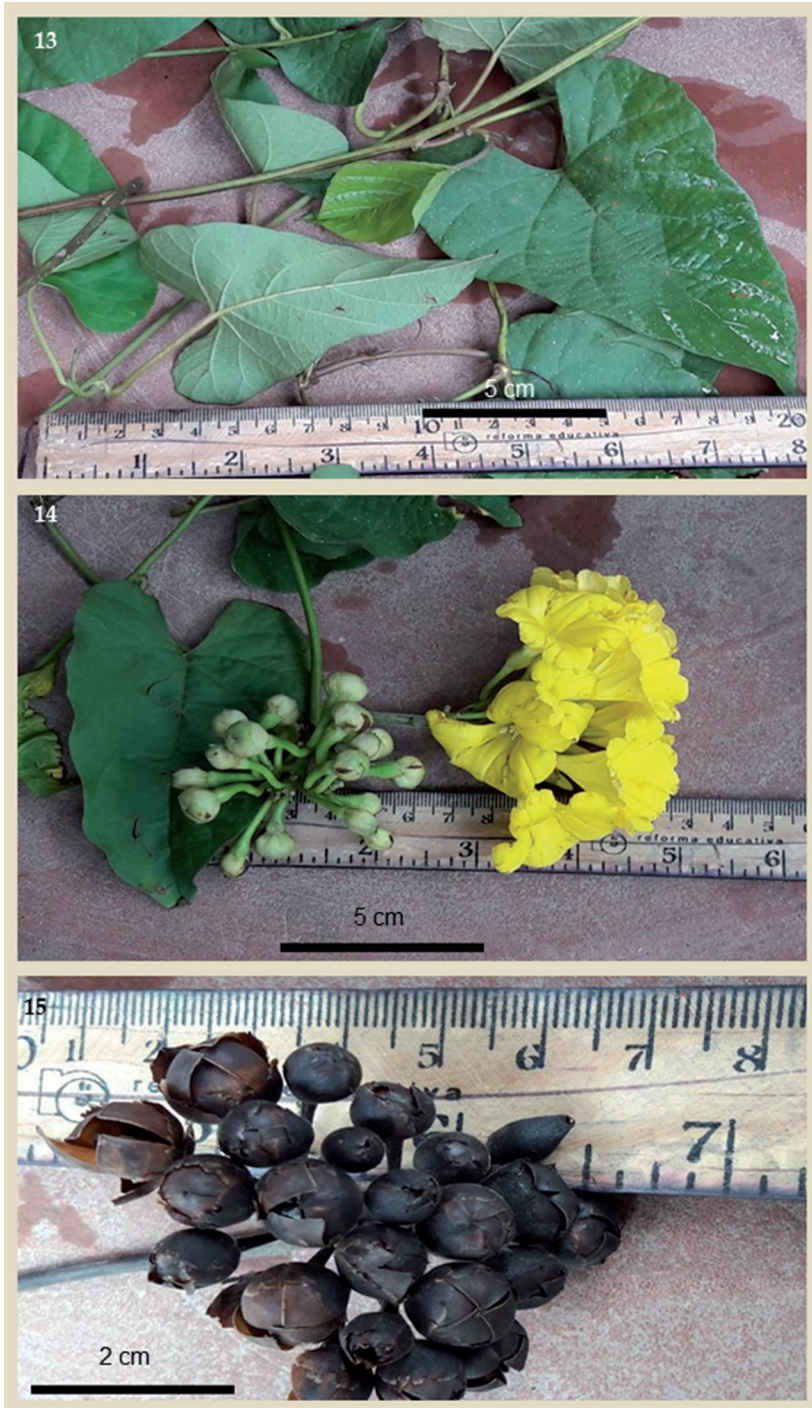


Figure 9-12. *Megacerus tricolor*. 9. Dorsal view, 10. Lateral view, 11. Pygidium, 12. Male genitalia.

Discussion

The species obtained in this study coincide with those reported by De la Cruz *et al.* (2009). However, these authors only recorded the *Megacerus alabani* – *Ipomoea seducta* association. In contrast, *Megacerus cubiculus* has been found associated with *Ipomoea heredifolia*, *I. nil*, *I. triloba*, *Merremia aegyptia* and *M. cisoides*, while *M. tricolor* has been reported feeding on seeds of *Ipomoea chulensis*, *I. crinicalyx*, *I. heredifolia*, *I. nil*, *I. purpurea*, *I. tricolor*, *I. triloba* and *Merremia quinquefolia* (Reyes *et al.* 2009; Romero *et al.* 2009, 2014). Although the number of hosts reported for *Megacerus* species is quite significant, the presence of these species in *M. umbellata* has not been previously recorded. After consulting the BRUCOL data base (Romero & Johnson 2004), this plant is a new host record for the subfamily Bruchinae. In view of this, it is important to continue exploring host interactions that will enable us to establish taxonomic relationships between bruchids of the *Megacerus* genus and the Convolvulaceae.



Figures 13-15. *Merremia umbellata*. 13. Leaf heart, 14. Corolla yellow, 15. Capsules dry.

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