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Elmohardyia Rafael (Diptera, Pipunculidae) from northeastern Brazil: new records and description of new species

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Abstract

Eleven species of *Elmohardyia* are recorded for the first time in northeastern Brazil, the most arid Brazilian region. There are two new records, *E. lindneri* (Collin) and *E. trinidadensis* (Hardy), and nine new species, which are here described and illustrated: *Elmohardyia cearensis* **sp. nov.**; *E. cheliformis* **sp. nov.**; *E. distincta* **sp. nov.**; *E. formosa* **sp. nov.**; *E. limeirai* **sp. nov.**; *E. martae* **sp. nov.**; *E. potiguar* **sp. nov.**; *E. quadricornis* **sp. nov.** and *E. rosalinae* **sp. nov.**

Key words: Pipunculinae, Eudorylini, taxonomy

Introduction

Pipunculidae, or big-headed flies, are inconspicuous flies (body length 2.0–11.5 mm), closely related to the flower flies (Syrphidae) (Rafael & Skevington 2010). They are almost exclusively endoparasitoids of Auchenorrhyncha (Hemiptera) during their larval stage (Rafael & Skevington 2010), except for *Nephrocerus* whose larvae develop in adult specimens of Tipulidae flies (Koenig & Young 2007). Pipunculidae occur in all biogeographic regions and slightly more than 1.400 species are described worldwide (Kehlmaier *et al*. 2014). Previous to this study, only two species of Pipunculidae were recorded in northeastern Brazil, *Clistoabdominalis spinitibialis* (Hardy) and *Cephalosphaera miriamae* Rafael, collected in Bahia and Piauí states, respectively (Rafael 1992, 1995).

Elmohardyia Rafael was proposed for a group of species called "complex *doelloi*" by Hardy (1965a, b). Specimens can readily be identified by the following combination of characters (Rafael 1987, 1988; Skevington & Yeates 2001): no ocellar bristles, postpedicel with obtuse apex, dorsocentral bristles diminute, no propleural fan of bristles, no vein M_2, pterostigma present, tegula with cluster of setae, scutellum occasionally rugose on posterior third, mid femur with rows of ventral spines, tergites with inconspicuous setae and commonly with oblique spot of gray pruinescence posterolaterally, larger in the posterior tergites; sternite 1 absent; male specimens with tergite 6 and sternite 7 visible dorsally; sternite 6 swollen with sclerotized subapical protuberances; tergite 7 reduced to wispy band, sternite 7 and syntergosternite 8 partially to entirely fused, the latter with membranous area rarely absent; epandrium swollen, partially visible dorsally on the right side; surstyli usually markedly asymmetrical, gonopods usually asymmetrical, right gonopod usually protruding, phallic guide generally with complex structures; phallus simple, not divided, membranous, with a subapical spicule, ejaculatory apodeme funnel-shaped; female ovipositor somewhat short and straight.

Elmohardyia belongs to the Eudorylini (Pipunculinae) and is closely related to *Amazunculus*, which is considered as its sister group (Rafael & De Meyer 1992; Skevington & Yeates 2001). The genus has a New World distribution with the peak diversity in the Neotropics. *Elmohardyia* has 52 known species, but only 51 of them were listed in Skevington (2005a) since *E. nicaraguaensis* Rafael was omitted. These constitute the first records of *Elmohardyia* in northeastern Brazil that has shown to be a high place of diversity for Pipunculidae. This region has three main biomes, Caatinga, Cerrado and Atlantic Forest biomes.

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The Caatinga, an exclusively Brazilian biome, is a region characterized by arboreal or bushy forests, having mainly small trees and bushes which bear spines and some xerophytic characteristics, typified by a long dry season and irregular rainfall (Prado 2003). The Caatinga is one of the least known biomes from a scientific point of view and has been treated with low priority for purposes of biodiversity conservation, and only a small area (less than 1%) is under protection (Franca-Rocha *et al*. 2006). The Cerrado is a region characterized by a savannah-like vegetation, with a seasonal climate, the rainy season occurring between October and March and a long dry period between June and September (Harley *et al*. 2005). The Cerrado is considered one of the priority areas for conservation, because it has a high degree of endemism, endangered and migratory species. The Atlantic Forest has several forest types along the Brazilian coast, from Rio Grande do Norte to Rio Grande do Sul (Silva *et al*. 2004). It is one of the richest and most diverse biomes in the world, but is in a critical condition because of changes to its natural ecosystems. The devastation of the Atlantic Forest is a reflection of uncontrolled human occupation and exploitation of natural resources. Nowadays, it is largely fragmented, existing only as small degraded patches and protected areas (Maury 2002).

There is little known biological information on *Elmohardyia*. Specimens have been collected in the lower stratum by Malaise traps as well as in the canopy using suspendable traps (=armadilhas suspensa), as can be seen in the examined material. Larvae, hosts and behavior are unknown.

Material and methods

This study is based on the examination of specimens from northeastern Brazil, housed in the Coleção Zoológica do Maranhão (CZMA), Caxias, Maranhão state, and Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas state, Brazil (INPA).

All specimens were collected mainly in the Caatinga and Cerrado biomes, and a few specimens in the Atlantic Forest. We provide information on the distribution of each species and also the biome where it was found.

Specimens were identified using Rafael (1988), and by comparing them to type or non-type specimens deposited at the INPA collection and to notes and sketches made by the junior author.

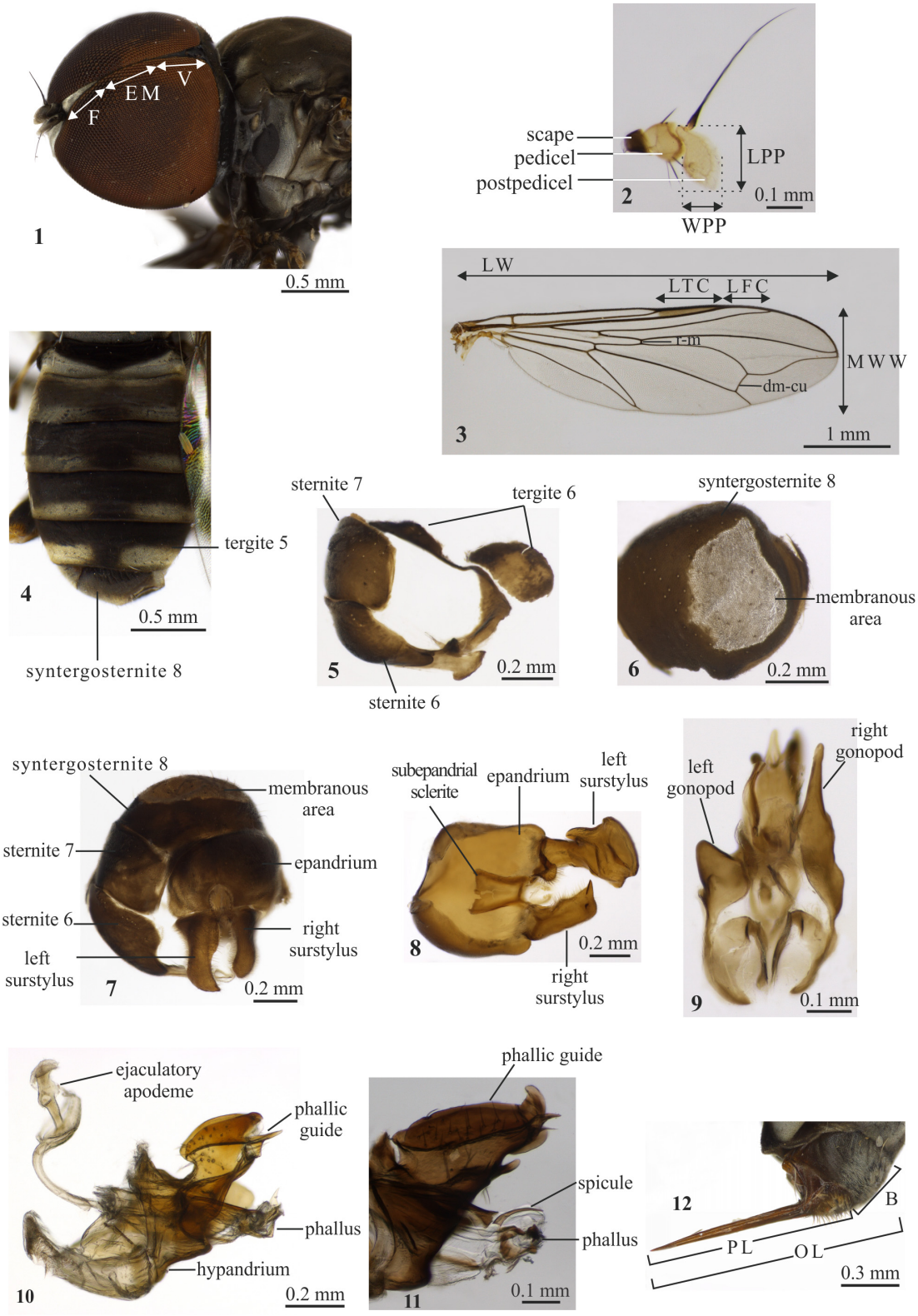
Photographs were taken through a Leica DFC500 digital camera fitted on a Leica MZ205 stereomicroscope and connected to a personal computer with the Leica Application Suite software, which includes an Auto-Montage module (Syncroscopy software) (http://www.syncroscopy.com/syncroscopy/) which combines multiple layers of photographs into a single fully focused image.

The specimen length was measured in lateral view as a sum of the distances from the front of the head (antenna excluded) to the apex of the scutellum and from there to the apex of the abdomen. The apex of the abdomen was removed and then macerated in 85% lactic acid heated at 150°C for about 30 min. The macerated abdomen was examined on excavated slides with glycerin. The wing was mounted on a microslide with Canada balsam and dissected terminalia were placed in a microvial with glycerin, both were pinned on the same pin as the source specimen.

Descriptions were made from the holotype specimens, and the variations, when observed, are presented separately.

The morphological terminology is based on Cumming & Wood (2009) and on Rafael & Skevington (2010) as illustrated in Figs 1–12. Measurements, in millimeters, referring to the head, antenna and wing are the same as those used by Kehlmaier (2005): F, EM, V—single values of F, length of the frons, EM, length of the meeting of the eyes, and V, length of the vertex (Fig. 1); LPP/WPP—ratio between length and maximum width across the midpoint of the postpedicel (Fig. 2); LW/MWW—ratio between length and maximum width of the wing (Fig. 3); LTC/LFC—ratio between length of third costal section by length of fourth costal section of the wing (Fig. 3). Abdomen (Fig. 4) and male terminalia terminology are presented in figures 4 to 11.

Measurements referring to the ovipositor are the same as those used by Skevington (2005b): ovipositor length (OL) was measured in a straight line from the piercer tip to the point where the ovipositor base articulates dorsally with sternite 6 (Fig. 12). Piercer length (PL) was measured as a straight line from the proximal edge of the cerci to the tip of the piercer (Fig. 12). The length of the ovipositor base (B) was measured as a straight line from the proximal end of the cerci to the point where the ovipositor base articulates dorsally with sternite 6 (Fig. 12).



FIGURES 1–12. Measurements and morphology. **1**, Male head of *Elmohardyia martae* **sp. nov.**, dorsolateral view; **2**, Female antenna of *E. trinidadensis*; **3**, Male left wing of *E. rosalinae* **sp. nov.**; **4**, Male abdomen of *E. quadricornis* **sp. nov.**, dorsal view; **5**, Male tergite 6 and sternites 6, 7 of *E. quadricornis* **sp. nov.**, ventral view; **6**, Syntergosternite 8 of *E. quadricornis* **sp. nov.**, posterior view; **7**, Male terminalia of *E. trinidadensis*, ventral view; **8**, Epandrium, surstyli and subepandrial sclerite of *E. cheliformis* **sp. nov.**, dorsal view; **9**, Hypandrium and gonopods of *E. quadricornis* **sp. nov.**, ventral view; **10**, Phallic guide, phallus, hypandrium and ejaculatory apodeme of *E. formosa* **sp. nov.**, lateral view; **11**, Phallic guide and phallus of *E. distincta* **sp. nov.**, lateral view; **l2**, Ovipositor of *E. formosa* **sp. nov.**, lateral view.

Vectorized illustrations, to highlight some difficult to visualize structures, were made using the Adobe Illustrator CS3® software.

Label data are given as presented on the labels. Square brackets ([ ]) are used to indicate complementary data that are not present in the holotype labels. Data for the same specimen, but from different labels, are separated by quotes (“”).

Elmohardyia will soon be revised by the authors and there are already many new species to be described from other areas of the Neotropical region, thus a key for its species will only be presented in the following paper treating the genus.

Taxonomy

Elmohardyia Rafael, 1987

Elmohardyia (Rafael 1987: 37, Figs 9–13, description; 1988: 224, Figs 1–168, revision).
Pipunculus (Cresson 1911: 282, 323, group I, *part*.).
Dorilas (Hardy 1943: 54, *part*.; Aczél 1952: 240, *part*.).
Eudorylas (Aczél 1952: 242, *part*.).
Pipunculus (*Eudorylas*) (Hardy 1965a: 206, *part.*; 1965b: 25, *part*.; 1965c: 552, *part*.; 1966: 2, *part*.).

Elmohardyia cearensis sp. nov.

Figs 13–28

Diagnosis. Tergite 2 with large basal gray pruinose band and two posterolateral gray pruinose spots. Sternite 6 with a subtriangular subapical projection and acute apex. Surstyli asymmetrical, the left one strongly developed, curved inward, about 2.2X longer than right surstylus. Left gonopod more developed than right one, with rounded apex. Phallic guide with one additional process that is enlarged distally.

Description of male holotype. (Fig. 13). Body length 4.5 mm. **Head.** Eyes contiguous for a distance of eighteen facets. F, EM, V = 0.4 mm, 0.4 mm, 0.3 mm. Frontal triangle and face gray pruinose. Postcranium dark, brown pruinose dorsally and gray pruinose laterally and ventrally. Antennae (Fig. 14) with scape dark brown; pedicel dark brown, with three dorsal and two ventral bristles; postpedicel dark brown at basal half and remaining light brown to yellow. LPP/WPP = 2.1. Labellum yellow. **Thorax.** Postpronotal lobe brown, gray-brown pruinose. Scutum dark brown to black, brown pruinose. Notopleuron brown, gray pruinose with twelve weak bristles. Scutellum black, gray pruinose anteriorly and brown pruinose along margins, with inconspicuous bristles. Mesopleuron and mediotergite dark brown to black, gray pruinose. **Wing.** (Fig. 15). Length 4.7 mm. LW/MWW = 3.4. LTC/LFC = 1.3. Membrane slightly light brown infuscated, almost entirely covered with microtrichia, except for cells bc, c, basal three quarters of sc, basal half of r_1, small basal area of r_{2+3} and r_{4+5}, br, bm, basal half of cup and basal one third of anal lobe without or with very sparse microtrichia. Vein r-m placed near basal third of cell dm. Vein dm-cu straight. Halter brown, except for yellow stem. **Legs.** (Fig. 13). Fore and mid coxae dark brown, hind coxa dark yellow to brown, all coxae gray pruinose. Trochanters yellow. Femora dark brown with base and apex yellow, entirely gray pruinose posteriorly. Tibiae yellow, gray pruinose posteriorly. Tarsi dark yellow, except fifth tarsomere dark brown. Pulvilli yellow. **Abdomen.** (Fig. 16). Dark brown to black, gray pruinose on tergite 1, on a large band at the base of tergite 2 and on posterolateral spots of tergites 2–5; tergite 1 with two stout black lateral bristles. Tergite and sternite 6 as in Fig. 17. Sternite 6 (Fig. 18) with a subtriangular subapical projection and acute apex. Syntergosternite 8 as long as tergite 5 (Fig. 16) and with large membranous area (Fig. 19). **Terminalia.** Epandrium and surstyli yellow (Fig. 20). Surstyli (Figs 20–21) asymmetrical. Left surstylus strongly developed, curved inward, about 2.2X longer than right surstylus, with basal lobe and a narrow sinus medially (Fig. 21); wider at distal third in lateral view (Fig. 22). Right surstylus with small projections apicolaterally (Figs 21, 24), subquadrangular, truncated in lateral view (Fig. 23). Subepandrial sclerite as in Fig. 24. Left gonopod more developed than right one, with rounded apex (Fig. 25). Phallic guide (Figs 26, 27) with one additional dorsal process which is enlarged distally and directed downward. Phallus with a small subapical spicule (Fig. 26). Ejaculatory apodeme as in Fig. 28. **Female** unknown.

FIGURES 13–28. *Elmohardyia cearensis* **sp. nov.** Holotype male. **13**, Habitus, lateral view; **14**, Antenna; **15**, Wing; **16**, Abdomen, dorsal view; **17**, Tergite and sternite 6, ventral view; **18**, Sternite 6, ventral view; **19**, Syntergosternite 8, posterior view; **20**, Terminalia, ventral view; **21**, Surstyli, ventral view; **22**, Left surstylus, lateral view; **23**, Right surstylus, lateral view; **24**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **25**, Hypandrium and gonopods, ventral view; **26**, Phallic guide and phallus, left lateral view (arrow indicate additional process of phallic guide); **27**, Phallic guide, dorsal view; **28**, Ejaculatory apodeme.

Type material. HOLOTYPE ♂: "BRASIL, CE[ará], Ubajara, Parque Nac.[ional] de Ubajara, Cachoeira do Cafundó, 03°50'13"S, 40°54'35"W" "Armadilha Suspensa, 16–31.xii.2012, F. Limeira-de-Oliveira, J.S. Pinto-Júnior cols [collectors]" "Holotype ♂, *Elmohardyia cearensis* Marques & Rafael" (CZMA).

Holotype condition. Left wing detached, mounted on microslide, left hind leg glued on label. Terminalia placed in a microvial with glycerin.

Etymology. The specific name refers to the type locality, Ceará state.

Distribution. Brazil: Ceará (Caatinga Biome).

Discussion. *Elmohardyia cearensis* **sp. nov.** is close to *E. galeata* Rafael & Menezes due to the asymmetrical surstyli, inward curved left surstylus and shape of the phallic guide. *Elmohardyia cearensis* **sp. nov.** differs from *E. galeata* by tergites 2–5 being gray pruinose posterolaterally (only tergite 5 gray pruinose posterolaterally in *E. galeata*) and by the subquadrangular right surstylus, with its small apicolateral projections (without apicolateral projections in *E. galeata*).

***Elmohardyia cheliformis* sp. nov.**
Figs 29–44

Diagnosis. Tergite 2 almost entirely gray pruinose. Apex of sternite 6 forceps-like. Surstyli asymmetrical. Left surstylus strongly developed, somewhat straight, about 2X longer than right surstylus, with a short and bristled basal lobe. Right surstylus subrectangular. Right gonopod developed, with acute apex. Phallic guide with two additional processes.

Description of male holotype. (Fig. 29). Body length 4.6 mm. **Head.** Eyes contiguous for a distance of twenty facets. F, EM, V = 0.4 mm, 0.4 mm, 0.3 mm. Frontal triangle and face gray pruinose. Postcranium dark, brown pruinose dorsally and gray pruinose laterally and ventrally. Antennae (Fig. 30) with scape dark brown; pedicel dark brown, with two dorsal and two ventral bristles; postpedicel dark brown on basal half, remaining light brown to yellow. LPP/WPP = 1.8. Labellum brown. **Thorax**. Postpronotal lobe brown, gray pruinose. Scutum dark brown to black, brown pruinose. Notopleuron brown, gray pruinose with three weak bristles. Scutellum dark brown to black, gray pruinose, with inconspicuous bristles. Mesopleuron and mediotergite dark brown to black, gray pruinose. **Wing.** (Fig. 31). Length 5.1 mm. LW/MWW = 3.4. LTC/LFC = 1.7. Membrane slightly light brown infuscated, almost entirely covered with microtrichia, except for cells bc, c, basal three thirds of sc, basal half of r_1, small basal area of r_{2+3} and r_{4+5}, br, bm, basal one third of cup and basal one third of anal lobe without or with very sparse microtrichia. Vein r-m placed near basal third of cell dm. Vein dm-cu straight. Halter brown with middle part of stem yellow. **Legs.** (Fig. 29). Coxae dark brown to black, gray pruinose. Trochanters dark yellow. Femora dark brown to black with base and apex yellow, entirely gray pruinose posteriorly. Tibiae dark yellow, gray pruinose. Tarsi dark yellow to brown, except fifth tarsomere darker or entirely black. Pulvilli yellow. **Abdomen.** (Fig. 32). Dark brown to black, gray pruinose on tergite 1, almost entirely on tergite 2, except for a brown pruinose spot medially, and with gray pruinose spots posterolaterally on tergites 3–5. Tergite 1 with two stout black bristles laterally. Tergite and sternite 6 as in Fig. 33. Sternite 6 (Figs 33–34) with forceps-like apex. Syntergosternite 8 dark brown to black, slightly longer than tergite 5, brown pruinose anteriorly, gray pruinose laterally and posteriorly (Fig. 32), and with small membranous area (Fig. 35). **Terminalia**. Epandrium and surstyli yellow (Fig. 36). Surstyli (Figs 36–37) asymmetrical. Left surstylus strongly developed, somewhat straight, about 2X longer than right one, with distinct basal lobe densely bristled distally (Fig. 37); with a medial ventral projection in lateral view (Fig. 38). Right surstylus subrectangular (Fig. 37); with apex directed downward in lateral view (Fig. 39). Subepandrial sclerite as in Fig. 40. Right gonopod developed, with acute apex (Fig. 41). Phallic guide (Figs 42–43) with two additional processes; when seen in dorsal view, the dorsal most process is larger and both are somewhat acute and placed laterally (Fig. 43). Phallus with a small subapical spicule (Fig. 42). Ejaculatory apodeme as in Fig. 44. **Female** unknown.

Type Material. HOLOTYPE ♂: "BRASIL, CE[ará], Ubajara, Parque Nac.[ional] de Ubajara, Cachoeira do Cafundó, 03°50'13"S, 40°54'35"W" "Armadilha Suspensa, 01–10.x.2013, F. Limeira-de-Oliveira, T.T.A. Silva cols [collectors]" "Holotype ♂, *Elmohardyia cheliformis* Marques & Rafael" (CZMA).

Holotype condition. Left wing detached, mounted on microslide, right wing slightly damaged, left mid tarsus lost. Terminalia placed in microvial with glycerin.

FIGURES 29–44. *Elmohardyia cheliformis* **sp. nov.** Holotype male. **29**, Habitus, lateral view; **30**, Antenna; **31**, Wing; **32**, Abdomen, dorsal view; **33**, Tergite and sternite 6, ventral view; **34**, Sternite 6, ventral view; **35**, Syntergosternite 8, posterior view; **36**, Terminalia, ventral view; **37**, Surstyli, ventral view; **38**, Left surstylus, lateral view; **39**, Right surstylus, lateral view; **40**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **41**, Hypandrium and gonopods, ventral view; **42**, Phallic guide and phallus, right lateral view (arrows indicate additional processes of phallic guide); **43**, Phallic guide, dorsal view; **44**, Ejaculatory apodeme.

Etymology. From Latin, *chela* = claw, *formis* = shape; refers to forceps-like apex of sternite 6.

Distribution. Brazil: Ceará (Caatinga Biome).

Discussion. *Elmohardyia cheliformis* **sp. nov.** differs from other *Elmohardyia* species by the forceps-like apex of sternite 6. It is close to *E. merga* Rafael due to the complex shape of the phallic guide. *Elmohardyia cheliformis* **sp. nov.** differs from *E. merga* by the almost entirely gray pruinose tergite 2 (two small posteromedial gray pruinose spots in *E. merga*) and by left surstylus about 2X longer than right surstylus (only slightly longer in *E. merga*).

***Elmohardyia distincta* sp. nov.**
Figs 45–60

Diagnosis. Tergite 2 with narrow basal gray pruinose band and two posterolateral gray pruinose spots. Sternite 6 with two subapical protuberances. Surstyli asymmetrical. Left surstylus strongly developed, twisted, about 2.2X longer than right surstylus, with basal lobe acute on median face. Right surstylus with pointed apex. Right gonopod weakly developed. Apex of phallic guide with three additional processes.

Description of male holotype. (Fig. 45). Body length 5.4 mm. **Head.** Eyes contiguous for a distance of twenty facets. F, EM, V = 0.5 mm, 0.5 mm, 0.4 mm. Frontal triangle and face gray pruinose. Postcranium dark, gray-brown pruinose dorsally and gray pruinose laterally and ventrally. Antennae (Fig. 46) with scape dark brown; pedicel dark brown to black, with three dorsal and four ventral bristles; postpedicel dark brown, lighter towards the margins. LPP/WPP = 2. Labellum dark brown. **Thorax.** Postpronotal lobe brown, gray-brown pruinose. Scutum dark brown to black, brown pruinose. Notopleuron brown, gray pruinose with eight weak bristles. Scutellum dark brown to black, gray-brown pruinose, with inconspicuous bristles. Mesopleuron and mediotergite dark brown to black, gray pruinose. **Wing.** (Fig. 47). Length 5.7 mm. LW/MWW = 3.3. LTC/LFC = 1.3. Membrane light brown infuscated, almost entirely covered with microtrichia, except for cells bc, small basal area of c, basal three quarters of sc, basal one third of r_1, basal half of br and superior part of bm without or with very sparse microtrichia. Vein r-m placed in the basal third of cell dm. Vein dm-cu straight. Halter brown with middle part of stem yellow. **Legs.** (Fig. 45). Coxae dark brown to black, gray pruinose. Trochanters dark yellow. Femora dark brown to black with base and apex yellow, entirely gray pruinose posteriorly. Tibiae yellow, darker in distal half, gray pruinose. Tarsi dark brown, except fifth tarsomere darker or entirely black. Pulvilli yellow. **Abdomen.** (Fig. 48). Dark brown to black, gray pruinose on tergite 1, on a narrow band on the base of tergite 2 and on posterolateral spots on tergites 2–5; tergite 1 with three stout black bristles laterally. Tergite and sternite 6 as in Fig. 49. Sternite 6 (Fig. 50) with two subapical protuberances. Syntergosternite 8 dark brown to black, slightly longer than tergite 5, brown pruinose anteriorly, gray pruinose laterally and posteriorly (Fig. 48) and with large, somewhat rounded, membranous area (Fig. 51). **Terminalia.** Epandrium and surstyli light brown to yellow (Fig. 52). Surstyli (Figs 52–53) asymmetrical. Left surstylus strongly developed, twisted, about 2.2X longer than right surstylus, with basal lobe acute on median face (Fig. 53); with a large sinus medially in lateral view (Fig. 54). Right surstylus with acute apex (Figs 53, 55). Subepandrial sclerite as in Fig. 56. Right gonopod slightly developed (Fig. 57). Phallic guide, when seen in lateral view (Fig. 58), with three additional processes, two placed dorsally and one laterally; when seen in dorsal view (Fig. 59) the two dorsal processes seem placed laterally (Fig. 59). Phallic guide with a distinct groove (Figs 58–59). Phallus (Fig. 58) with distinct subapical spicule. Ejaculatory apodeme as in Fig. 60. **Female** unknown.

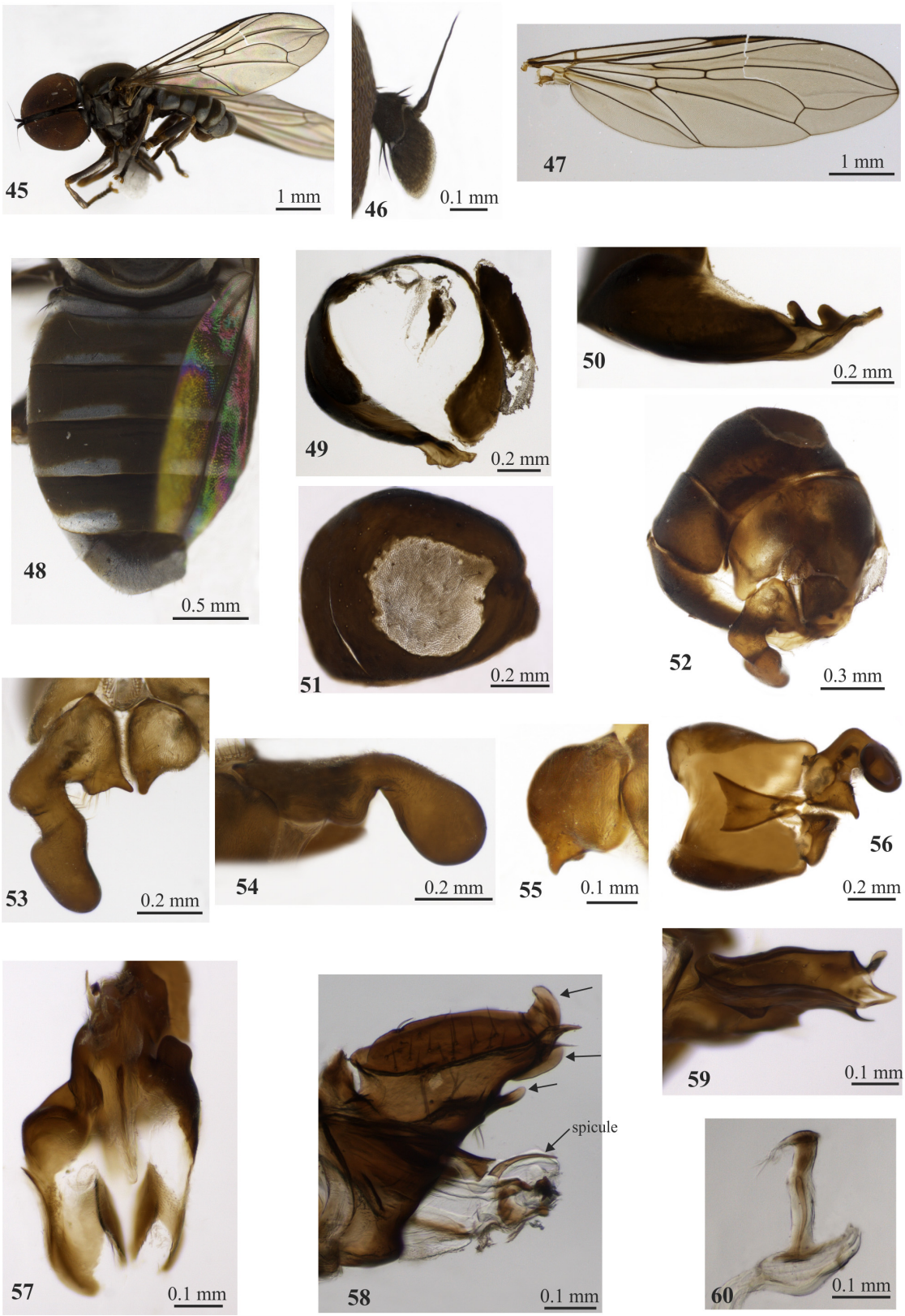
Variation (paratype). Body length 5.3 mm. Wing length 5.5 mm. Tergite 2 with basal band of gray pruinescence connected medially to the two posterolateral spots.

Type Material. HOLOTYPE ♂: "BRASIL, MA[ranhão], Mirador, Parque Est.[adual] Mirador, Base da Geraldina, 06°37'25"S, 45°52'08"W" "Armadilha Suspensa, 13–19.x.2012, F. Limeira-de-Oliveira, L.L.M. Santos & L.S. Santos" "Holotype ♂, *Elmohardyia distincta* Marques & Rafael" (CZMA). PARATYPE: *idem*, 5.vii.2007, F. Limeira-de-Oliveira & J.C. Silva (paratype ♂, INPA).

Holotype condition. Left wing detached, mounted on microslide, right hind leg with distal tarsomeres lost. Terminalia placed in microvial with glycerin.

Etymology. From Latin, *distinct* = distinct, refers to the structure of the male terminalia, with a twisted left surstylus and a peculiar phallic guide.

Distribution. Brazil: Maranhão (Cerrado Biome).



FIGURES 45–60. *Elmohardyia distincta* **sp. nov.** Holotype male. **45**, Habitus, lateral view; **46**, Antenna; **47**, Wing; **48**, Abdomen, dorsal view; **49**, Tergite and sternite 6, ventral view; **50**, Sternite 6, ventral view; **51**, Syntergosternite 8, posterior view; **52**, Terminalia, ventral view; **53**, Surstyli, ventral view inclined; **54**, Left surstylus, lateral view; **55**, Right surstylus, lateral view; **56**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **57**, Hypandrium and gonopods, ventral view; **58**, Phallic guide and phallus, right lateral view (arrows indicate additional processes of phallic guide); **59**, Phallic guide, dorsal view; **60**, Ejaculatory apodeme.

Discussion. *Elmohardyia distincta* **sp. nov.** is close to *E. inepta* (Hardy) and *E. spuria* Rafael due to the pattern of abdominal pruinosity and the shape of the phallic guide. *Elmohardyia distincta* **sp. nov.** differs from *E. inepta* and *E. spuria* by sternite 6 with its two curved protuberances (three spine-like projections in *E. inepta*; one elongated projection in *E. spuria*) and by the twisted left surstylus (somewhat subquadrate in *E. inepta*; C-shaped in *E. spuria*).

***Elmohardyia formosa* sp. nov.**
Figs 61–79

Diagnosis. Tergite 2 with narrow basal gray pruinose band and two posterolateral gray pruinose spots. Sternite 6 with two subapical protuberances and crest-like apex. Surstyli asymmetrical. Left surstylus strongly developed, about 2.4X longer than right surstylus, with apex curved outward. Right gonopod more developed than left gonopod. Phallic guide with a distinct dorsal groove.

Description of male holotype. (Fig. 61). Body length 6.7 mm. **Head.** Eyes contiguous for a distance of eighteen facets. F, EM, V = 0.6 mm, 0.6 mm, 0.5 mm. Frontal triangle and face gray pruinose. Postcranium dark, gray-brown pruinose dorsally and gray pruinose laterally and ventrally. Antennae (Fig. 62) with scape dark brown; pedicel dark brown to black, with four dorsal and five ventral bristles; postpedicel dark brown, lighter towards margin. LPP/WPP = 1.5. Labellum dark yellow. **Thorax.** Postpronotal lobe brown, gray pruinose. Scutum dark brown to black, brown pruinose. Notopleuron brown, gray-brown pruinose with six weak bristles. Scutellum dark brown to black, gray-brown pruinose, with inconspicuous bristles. Mesopleuron and mediotergite dark brown to black, gray pruinose. **Wing.** (Fig. 63). Length 6.9 mm. LW/MWW = 3.4. LTC/LFC = 1.4. Membrane slightly more brown infuscated at base; almost entirely covered with microtrichia, except for cells bc, basal half of c, sc, small basal area of r_1, r_{2+3} and r_{4+5}, br, bm, basal half of cup and small basal area of anal lobe without or with very sparse microtrichia. Vein r-m placed just before basal third of cell dm. Vein dm-cu straight. Halter brown, except for yellow stem. **Legs.** (Fig. 61). Coxae dark brown to black, gray pruinose. Fore and mid trochanters dark brown to black, hind trochanter dark yellow to brown. Femora dark brown to black with base and apex yellow, entirely gray pruinose posteriorly. Tibiae dark yellow to brown, gray pruinose. Tarsi dark brown to black. Pulvilli yellow. **Abdomen.** (Fig. 64). Dark brown to black, gray pruinose on tergite 1, on a narrow band on the base of tergite 2 and on posterolateral spots on tergites 2–5; tergite 1 with four stout black bristles laterally. Tergite 6 and sternites 6, 7 as in Fig. 65. Sternite 6 (Fig. 66) with two subapical protuberances and crest-like apex. Syntergosternite 8 dark brown to black, shorter than tergite 5, brown pruinose anteriorly, gray pruinose laterally and posteriorly (Fig. 64) and with small membranous area (Fig. 67). **Terminalia.** Epandrium and surstyli yellow (Fig. 68). Surstyli (Figs 68–69) asymmetrical. Left surstylus strongly developed, about 2.4X longer than right surstylus, with apex curved outward (Fig. 69); lateral view as in Fig. 70. Right surstylus with acute apex (Figs 69, 71). Subepandrial sclerite as in Fig. 72. Right gonopod more developed than left gonopod, with truncated apex (Fig. 73). Phallic guide (Figs 74–75) with a distinct dorsal groove and three additional processes, two placed dorsally and one laterally (not visible in Fig. 74); all processes are visible in dorsal view (Fig. 75). Phallus with subapical spicule (Fig. 76). Ejaculatory apodeme as in Fig. 77. **Female.** Similar to male, differing in the following aspects: Body length 6.4 mm. Head. Antennae with pedicel with three dorsal and three ventral bristles; postpedicel dark brown at basal one third, remaining dark yellow. Front facets enlarged. Wing. Length 6.8 mm. LW/MWW = 3.3. LTC/LFC = 0.8. Abdomen. Tergite 6 weakly brown pruinose dorsally, otherwise gray pruinose. Ovipositor. OL: 1.3 mm; PL: 1.1 mm; B: 0.3 mm. Base dark brown to black, weakly gray pruinose; small, subrounded. Piercer yellow with distal part shining, straight (Figs 78–79).

Type Material. HOLOTYPE ♂: "BRASIL, MA[ranhão], Riachão, Fazenda Altos, Armadilha Malaise" "18–22.viii.2009, F. Limeira-de-Oliveira & M.B. Aguiar-Neto" "Holotype ♂, *Elmohardyia formosa Marques* & Rafael" (CZMA). PARATYPE: same data as holotype (1♀ CZMA).

Holotype condition. Left wing detached, mounted on microslide. Terminalia placed in microvial with glycerin.

Etymology. From Latin, *formosus* = beautifully formed, refers to the specimens general appearance.

Distribution. Brazil: Maranhão (Cerrado Biome).

FIGURES 61–79. *Elmohardyia formosa* **sp. nov.** Holotype male, except figs 78–79 from paratype female. **61**, Habitus, lateral view; **62**, Antenna; **63**, Wing; **64**, Abdomen, dorsal view; **65**, Tergite 6 and sternites 6, 7, ventral view; **66**, Sternite 6, ventral view; **67**, Syntergosternite 8, posterior view; **68**, Terminalia, ventral view; **69**, Surstyli, ventral view; **70**, Left surstylus, lateral view; **71**, Right surstylus, lateral view; **72**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **73**, Hypandrium and gonopods, ventral view; **74**, Phallic guide and phallus, right lateral view; **75**, Phallic guide, dorsal view (arrows indicate additional processes of phallic guide); **76**, Phallus, lateroventral view; 77, Ejaculatory apodeme; **78**, Ovipositor, lateral view; **79**, Ovipositor, ventral view.

Discussion. *Elmohardyia formosa* **sp. nov.** is close to *E. gowdeyi* (Curran) due to the long left surstylus with its outward curved apex. *Elmohardyia formosa* **sp. nov.** differs from *E. gowdeyi* by tergite 2 showing gray pruinosity on a narrow band along the base and posterolaterally (entirely gray pruinose in *E. gowdeyi* except for a small spot of brown pruinescence posteromedially), by sternite 6 with two subapical projections (only one subapical projection in *E. gowdeyi*) and right gonopod not reaching to the apex of the phallic guide (surpassing the apex of the phallic guide in *E. gowdeyi*).

***Elmohardyia limeirai* sp.nov.**
Figs 80–96

Diagnosis. Tergite 2 almost entirely gray pruinose. Sternite 6 with two subapical protuberances. Surstyli asymmetrical. Left surstylus slightly longer than right surstylus, strongly curved inward, with basal lobe. Left gonopod not developed. Apex of phallic guide with two additional processes, one being bifid.

Description of male holotype. (Fig. 80). Body length 4.2 mm. **Head.** Eyes contiguous for a distance of sixteen facets. F, EM, V = 0.4 mm, 0.4 mm, 0.3 mm. Frontal triangle and face gray pruinose. Postcranium dark, gray-brown pruinose dorsally and gray pruinose laterally and ventrally. Antennae (Fig. 81) with scape dark brown; pedicel dark brown, with three dorsal and two ventral bristles; postpedicel dark yellow to brown on basal one third, remaining yellow. LPP/WPP = 2. Labellum dark yellow. **Thorax.** Postpronotal lobe brown, gray pruinose. Scutum dark brown to black, brown pruinose. Notopleuron dark brown, gray pruinose with eight weak bristles. Scutellum dark brown to black, gray pruinose, with inconspicuous bristles. Mesopleuron and mediotergite dark brown, gray pruinose. **Wing.** (Fig. 82). Length 4.4 mm. LW/MWW = 3.4. LTC/LFC = 1.2. Membrane somewhat hyaline; almost entirely covered with microtrichia, except for cells bc, basal two thirds of c, basal three quarters of sc, basal two thirds of r_1, small basal area of r_{2+3} and r_{4+5}, br, bm, small basal area of cup and basal one third of anal lobe without or with very sparse microtrichia. Vein r-m placed just before basal third of cell dm. Vein dm-cu straight. Halter brown with middle part of stem yellow. **Legs.** (Fig. 80). Coxae dark brown, gray pruinose. Trochanters yellow. Femora brown with base and apex yellow, entirely gray pruinose posteriorly. Tibiae dark yellow to brown, gray pruinose. Tarsi dark yellow to brown, except fifth tarsomere darker. Pulvilli yellow. **Abdomen.** (Fig. 83). Dark brown to black, gray pruinose on tergite 1, almost entirely on tergite 2, except for a large band of brown pruinosity posteromedially, and only on posterolateral spots on tergites 3–5; tergite 1 with two stout black bristles laterally. Tergite 6 and sternites 6, 7 as in Fig. 84. Sternite 6 (Fig. 85) with two subapical protuberances, the left one stouter. Syntergosternite 8 dark brown to black, as long as tergite 5, brown pruinose anteriorly, gray pruinose laterally and posteriorly (Fig. 83) and with membranous area longer than wide, subrectangular (Fig. 86). **Terminalia.** Epandrium and surstyli yellow (Fig. 87). Surstyli (Figs 87–88) asymmetrical. Left surstylus slightly longer than right surstylus, strongly curved inward, with basal lobe (Fig. 88); lateral view as in Fig. 89. Right surstylus with base larger than apex (Fig. 88); with acute apex when seen in lateral view (Fig. 90). Subepandrial sclerite as in Fig. 91. Right gonopod with acute apex; left gonopod not developed (Fig. 92). Phallic guide (Figs 93–95) with two additional processes, lateral one bifid; dorsal view as in Fig. 95. Phallus with small subapical spicule (Fig. 93). Ejaculatory apodeme as in Fig. 96. **Female** unknown.

Variations (n = 5). Body length 3.8–4.2 mm. (one paratype headless and three specimens were not measured prior to dissection). Wing length 4.1–4.5 mm.

Type Material. HOLOTYPE ♂: "BRASIL, MA[ranhão], Carolina, PAR[que]NA[cional] Chapada das Mesas, Riacho Sucuruiu, 240 m, 07°07'05.6"S, 47°18'31.6"W" "Armadilha de Malaise, 01–10.xi.2013, J.A. Rafael, F. Limeira-de-Oliveira & T.T.A. Silva cols [collectors]" "Holotype ♂, *Elmohardyia limeirai* Marques & Rafael" (CZMA). PARATYPES: *idem*, 01–15.vii.2013 (1♂ INPA); *idem*, 15–31.vii.2013 (1♂ CZMA); *idem*, 20–31.viii.2013 (1♂ CZMA); *idem*, Mirador, Parque Est. Mirador, Base da Geraldina, Armadilha Malaise, 27.viii.2006, F. Limeira-de-Oliveira (2♂ CZMA); *idem*, 23–28.ix.2006 (1♂ CZMA); *idem*, Armadilha Luminosa, 22.ii–01.iii.2009, M.B. Aguiar-Neto & M.J.A. Holanda cols. (1♂ CZMA); *idem*, Armadilha Malaise, 13–19.x.2012, F. Limeira-de-Oliveira, L.L.M. Santos & L.S. Santos (1♂ INPA); *idem*, 10–16.v.2013 (1♂ INPA).

Holotype condition. Left wing detached, mounted on microslide. Left postpedicel glued on the specimen triangle card. Terminalia placed in microvial with glycerin.

Etymology. The specific epithet is a patronym honoring Francisco Limeira de Oliveira, curator of CZMA, from Universidade Estadual do Maranhão.

FIGURES 80–96. *Elmohardyia limeirai* **sp. nov.** Holotype male, except fig. 81 from paratype male. **80**, Habitus, lateral view; **81**, Antenna, paratype male; **82**, Wing; **83**, Abdomen, dorsal view; **84**, Tergite 6 and sternites 6, 7, ventral view; **85**, Sternite 6, ventral view; **86**, Syntergosternite 8, posterior view; **87**, Terminalia, ventral view; **88**, Surstyli, ventral view; **89**, Left surstylus, lateral view; **90**, Right surstylus, lateral view; **91**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **92**, Hypandrium and gonopods, ventral view; **93**, Phallic guide and phallus, right lateral view (arrows indicate additional processes of phallic guide); **94**, Phallic guide and phallus, left lateral view; **95**, Phallic guide, dorsal view; **96**, Ejaculatory apodeme.

Distribution. Brazil: Maranhão (Cerrado Biome).

Discussion. *Elmohardyia limeirai* **sp. nov.** is close to *E. potiguar* **sp. nov.**, due to the left surstylus with apex curved inward, sternite 6 with two subapical protuberances, membranous area longer than wide, and phallic guide with two additional processes. *Elmohardyia limeirai* **sp. nov.** differs from *E. potiguar* **sp. nov.** by the thinner distal half of the left surstylus (broader in *E. potiguar* **sp. nov.**), right surstylus with base wider than apex (almost equally wide in *E. potiguar* **sp. nov.**), and left gonopod not developed (short but distinct in *E. potiguar* **sp. nov.**).

***Elmohardyia lindneri* (Collin)**
Figs 97–113

Pipunculus lindneri (Collin 1931: 174, Figs 3–4, 5a).
Eudorylas lindneri (Aczél 1948: 25, distribution; 1952: 244, catalog).
Pipunculus discanthus (Hardy 1965b: 33, Fig. 10d; 1965a: 212, Figs 6a–b, record).
Elmohardyia lindneri (Rafael 1987: 38, citation; 1988: 242, Figs 10, 45, 85–86, redescription; De Meyer 1996: 46, catalog; Rodriguez & Rafael 2012: 19, catalog).

Material examined. BRASIL, Maranhão, Caxias, Pé do Morro, 04°36'48"S, 43°04'04"W, Arm.[adilha] Malaise, 12–25.iii.1997, F.L. Oliveira (1♂ CZMA); *idem*, Mirador, Parque Est.[adual] do Mirador, Base dos Cágados, 06°48'29"S, 45°06'34"W, Armadilha de Malaise, 27.ix–02.x.2011, F. Limeira-de-Oliveira & D.W.A. Marques (1♂ CZMA).

Remarks. Type material has been studied by Rafael (1987, 1988), who also redescribed and illustrated *E. lindneri*. Figures 97–113 included here should enable a better identification of this species.

Variations. When compared with the redescription and figures given in Rafael (1987, 1988), the specimens from Maranhão state do not have a S-shaped membranous area (straight instead) and their apex of left surstylus is narrower than the figure 85 of Rafael (1988). For the time being, these variations are considered as geographical variation.

Distribution. Brazil: Maranhão (new record, Cerrado Biome), Mato Grosso, São Paulo; Bolívia, Argentina.

***Elmohardyia martae* sp. nov.**
Figs 114–129

Diagnosis. Tergite 2 with narrow basal gray pruinose band and two posterolateral gray pruinose spots. Sternite 6 with two subapical protuberances. Surstyli asymmetrical. Left surstylus strongly developed with apex greatly expanded, about 3X longer than right surstylus. Right gonopod strongly developed, reaching to the apex of the phallic guide. Phallic guide simple. Phallus with strongly developed subapical spicule.

Description of male holotype. (Fig. 114). Body length 4.6 mm. **Head.** Eyes contiguous for a distance of twenty facets. F, EM, V = 0.4 mm, 0.5 mm, 0.3 mm. Frontal triangle and face gray pruinose. Postcranium dark, gray-brown pruinose dorsally and gray pruinose laterally and ventrally. Antennae (Fig. 115) with scape dark brown to black; pedicel dark brown to black, with five dorsal and four ventral bristles; postpedicel dark brown, lighter towards margin. LPP/WPP = 2. Labellum dark yellow. **Thorax.** Postpronotal lobe brown, brown pruinose. Scutum dark brown to black, brown pruinose. Notopleuron brown, gray-brown pruinose with twelve weak bristles. Scutellum dark brown to black, brown pruinose, with inconspicuous bristles. Mesopleuron and mediotergite dark brown, gray pruinose. **Wing.** (Fig. 116). Length 4.8 mm. LW/MWW = 3.3. LTC/LFC = 1.4. Membrane somewhat hyaline; almost entirely covered with microtrichia, except for cells bc, basal half of c, basal three quarters of sc, basal one third of r_1, br, small basal area and superior part of bm, basal two thirds of cup and basal one third of anal lobe without or with greatly reduced microtrichia. Vein r-m placed just before basal third of cell dm. Vein dm-cu straight. Halter brown, except for black knob. **Legs.** (Fig. 114). Coxae dark brown to black, gray pruinose. Trochanters dark yellow. Femora dark brown to black with base and apex yellow, entirely gray pruinose posteriorly. Tibiae dark yellow with distal one third brown, gray pruinose. Tarsi brown, except fifth tarsomere darker or entirely black. Pulvilli yellow. **Abdomen.** (Fig. 117). Dark brown, gray pruinose on tergite 1, on narrow basal band of tergite 2 and on posterolateral spots on tergites 2–5; tergite 1 with three stout dark brown bristles

FIGURES 97–113. *Elmohardyia lindneri* (Collin). Specimen of Maranhão state. **97**, Habitus, lateral view; **98**, Antenna; **99**, Wing; **100,** Abdomen, dorsal view; **101**, Tergite 6 and sternites 6, 7, ventral view; **102**, Sternite 6, ventral view; **103**, Syntergosternite 8, posterior view; **104**, Terminalia, ventral view; **105**. Surstyli, ventral view; **106**, Left surstylus, lateral view; **107**, Right surstylus, lateral view; **108**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **109**, Hypandrium and gonopods, ventral view; **110**, Phallic guide and phallus, right lateral view (arrows indicate additional processes of phallic guide); **111**, Phallic guide and phallus, left lateral view; **112**, Phallic guide, dorsal view; **113**, Ejaculatory apodeme.

FIGURES 114–129. *Elmohardyia martae* **sp. nov.** Holotype male. **114**, Habitus, lateral view; **115**, Antenna; **116**, Wing; **117**, Abdomen, dorsal view; **118**, Tergite 6 and sternites 6, 7, ventral view; **119**, Sternite 6, ventral view; **120**, Syntergosternite 8, posterior view; **121**, Terminalia, ventral view; **122**, Surstyli, ventral view; **123**, Left surstylus, lateral view; **124**, Right surstylus, lateral view; **125**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **126**, Hypandrium and gonopods, ventral view; **127**, Phallic guide and phallus, right lateral view; **128**, Phallic guide, dorsal view; **129**, Ejaculatory apodeme.

laterally. Tergite 6 and sternites 6, 7 as in Fig. 118. Sternite 6 (Fig. 119) with two asymmetrical subapical protuberances. Syntergosternite 8 dark brown, slightly shorter than tergite 5, brown pruinose anteriorly, gray pruinose posteriorly (Fig. 117) and with large membranous area (Fig. 120). **Terminalia.** Epandrium and surstyli yellow (Fig. 121). Surstyli (Figs 121–122) asymmetrical. Left surstylus strongly developed, about 3X longer than right surstylus; with one small protuberance medially and apex greatly expanded; lateral view as in Fig. 123. Right surstylus with apex curved inward and directed downward (Figs 122, 124). Subepandrial sclerite as in Fig. 125. Right gonopod strongly developed, reaching the level of phallic guide apex (Fig. 126). Phallic guide simple, without additional process (Figs 127, 128). Phallus with strongly developed spicule (Fig. 127). Ejaculatory apodeme as in Fig. 129. **Female** unknown.

Variation (paratype). Body length 4.2 mm. Wing length 4.4 mm.

Type Material. HOLOTYPE ♂: "BRASIL, MA[ranhão], Caxias, Res.[erva] Ecol.[ógica] Inhamum" "Armadilha Malaise, 23–27.ii.2005, G.A. Cunha, cols [collectors]" " Holotype ♂, *Elmohardyia martae* Marques & Rafael" (CZMA). PARATYPE: *idem*, Carolina, Serra Grande, 07°04'28"S, 47°24'12"W, 13.xii.2011, Arm. Malaise, F.L. Oliveira & J. Vidal (1♂ INPA).

Holotype condition. Left wing detached, mounted on microslide. Terminalia
placed in microvial with glycerin.

Etymology. The specific epithet is a patronym honoring Marta Maria Almeida Marques, mother of the first author.

Distribution. Brazil: Maranhão (Cerrado Biome).

Discussion. *Elmohardyia martae* **sp. nov.** is close to *E. quadricornis* **sp. nov.** due to the strongly developed right gonopod, almost reaching to the apex of the phallic guide, and the phallus with a long subapical spicule. *Elmohardyia martae* **sp. nov.** differs from *E. quadricornis* **sp. nov.** by the somewhat triangular apex of the left surstylus (somewhat subquadrangular in *E. quadricornis* **sp. nov.**), the simple phallic guide (two additional processes present in *E. quadricornis* **sp. nov.**) and the subapical spicule being simple apically (being bifid apically in *E. quadricornis* **sp. nov.**).

***Elmohardyia potiguar* sp.nov.**
Figs 130–146

Diagnosis. Tergite 2 almost entirely gray pruinose. Sternite 6 with two symmetrical subapical projections. Surstyli asymmetrical. Left surstylus longer than right surstylus, curved inward, with basal lobe. Right gonopod longer than left gonopod. Phallic guide with two additional processes, one of them bifid.

Description of male holotype. (Fig. 130). Body length 4.4 mm. **Head.** Eyes contiguous for a distance of eighteen facets. F, EM, V = 0.4 mm, 0.5 mm, 0.3 mm. Frontal triangle and face gray pruinose. Postcranium dark, gray-brown pruinose dorsally and gray pruinose laterallly and ventrally. Antennae (Fig. 131) with scape dark brown; pedicel dark brown, with three dorsal and two ventral bristles; postpedicel yellow. LPP/WPP = 2.1. Labellum yellow. **Thorax.** Postpronotal lobe dark yellow, gray pruinose. Scutum dark brown to black, brown pruinose. Notopleuron brown, gray-brown pruinose with ten weak bristles. Scutellum dark brown, gray pruinose, with inconspicuous bristles. Mesopleuron dark brown to black, gray pruinose. Mediotergite black, gray pruinose. **Wing.** (from paratype specimen) (Fig. 132). Length 4.4 mm. LW/MWW = 3.2. LTC/LFC = 1. Membrane hyaline, almost entirely covered with microtrichia, except for cells bc, basal two thirds of c, basal three quarters of sc, basal one third of r_1, br, bm, basal half of cup and basal one third of anal lobe without or with very sparse microtrichia. Vein r-m placed in the basal third of cell dm. Vein dm-cu straight. Halter brown, except for the yellow stem. **Legs.** (Fig. 130). Coxae brown, gray pruinose. Trochanters yellow. Femora dark yellow, entirely gray pruinose posteriorly. Tibiae dark yellow, gray pruinose posteriorly. Tarsi dark yellow, except fifth tarsomere dark brown. Pulvilli yellow. **Abdomen.** (Fig. 133). Dark brown to black, gray pruinose on tergite 1, almost entirely gray pruinose on tergite 2, except for a small brown pruinose spot, and tergites 3–5 gray pruinose only posterolaterally; tergite 1 with three small black bristles laterally. Tergite and sternite 6 as in Fig. 134. Sternite 6 (Fig. 135) with two symmetrical subapical projections. Syntergosternite 8 dark brown to black, slightly shorter than tergite 5, gray pruinose (Fig. 133) and with longitudinal membranous area, longer than wide (Fig. 136). **Terminalia.** Epandrium and surstyli yellow (Fig. 137). Surstyli (Figs 137–138) asymmetrical. Left surstylus longer than right surstylus,

FIGURES 130–146. *Elmohardyia potiguar* **sp. nov.** Holotype male, except fig. 132 from paratype male. **130**, Habitus, lateral view; **131**, Antenna; **132**, Wing, paratype male; **133**, Abdomen, dorsal view; **134**, Tergite and sternite 6, ventral view; **135**, Sternite 6, ventral view; **136**, Syntergosternite 8, posterior view; **137**, Terminalia, ventral view; **138**, Surstyli, ventral view; **139**, Left surstylus, lateral view; **140**, Right surstylus, lateral view; **141**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **142**, Hypandrium and gonopods, ventral view; **143**, Phallic guide and phallus, right lateral view (arrows indicate additional processes of phallic guide); **144**, Phallic guide and phallus, left lateral view; **145**, Phallic guide, dorsal view; **146**, Ejaculatory apodeme.

curved inward, with basal lobe (Fig. 138); lateral view as in Fig. 139. Right surstylus curved inward; lateral view as in Fig. 140. Subepandrial sclerite as in Fig. 141. Right gonopod slightly more developed than left gonopod (Fig. 142). Phallic guide (Figs 143, 144) with two additional processes, being lateral one bifid; dorsal view as in Fig. 145. Phallus with subapical spicule (Fig. 143). Ejaculatory apodeme as in Fig. 146. **Female** unknown.

Variations (n = 4). Body length varying from 3.8–4.4 mm (three paratypes were not measured prior to dissection).

Type Material. HOLOTYPE ♂: "BRASIL, RN [Rio Grande do Norte], Parnamirim, Est.[ação] Exp.[erimental] Rommel Mesquita de Faria" "05°55'45"S, 35°11'21"W, 18–25.ii.1995, Plant.[ação] Coco Anão" "Holotype ♂, *Elmohardyia potiguar* Marques & Rafael" (INPA). PARATYPES: same data as holotype (2♂ INPA); *idem*, 25.ii–04.iii.1995 (1♂ INPA); *idem*, 11–18.iii.1995 (2♂ CZMA).

Holotype condition. Specimen previously stored in 70% ethanol. Wings damaged. Tarsal segments of right mid leg missing. Terminalia placed in microvial with glycerin.

Etymology. The specific name 'potiguar' refers to a term traditionally used in Brazil for the native inhabitant of the Rio Grande do Norte state where the specimens were collected.

Distribution. Brazil: Rio Grande do Norte (plantation area surrounded with Atlantic Forest).

Discussion. *Elmohardyia potiguar* **sp. nov.** is close to *E. limeirai* **sp. nov.**, due to the left surstylus with inward curved apex, sternite 6 with two subapical protuberances, membranous area longer than wide, and by the phallic guide with two additional processes. *Elmohardyia potiguar* **sp. nov.** differs from *E. limeirai* **sp. nov.** by the stouter left surstylus (thinner in *E. limeirai* **sp. nov.**), right surstylus somewhat parallel sided (base wider than apex in *E. limeirai* **sp. nov.**), and short but distinct left gonopod (not developed in *E. limeirai* **sp. nov.**).

***Elmohardyia quadricornis* sp. nov.**
Figs 147–162

Diagnosis. Tergite 2 with narrow basal gray pruinose band and two posterolateral gray pruinose spots. Sternite 6 lighter at apex with a rounded and somewhat translucid subapical projection and a subtriangular expanded distal projection. Surstyli asymmetrical. Left surstylus strongly developed, about 2.2X longer than right surstylus. Right gonopod well developed, almost reaching to the apex of phallic guide. Phallic guide with two additional processes, the dorsal most bifid. Phallus with a bifid spicule.

Description of male holotype. (Fig.147). Body length 4.5 mm. **Head.** Eyes contiguous for a distance of eighteen facets. F, EM, V = 0.4 mm, 0.4 mm, 0.4 mm. Frontal triangle and face gray pruinose. Postcranium dark, brown pruinose dorsally and gray pruinose laterally and ventrally. Antennae (Fig. 148) with scape dark; pedicel dark brown to black, with three dorsal and three ventral bristles; postpedicel dark brown at basal one third and remaining yellow. LPP/WPP = 2. Labellum dark yellow. **Thorax.** Postpronotal lobe brown, gray-brown pruinose. Scutum dark brown to black, brown pruinose. Notopleuron brown, gray pruinose with seven weak bristles. Scutellum dark brown to black, gray-brown pruinose, with inconspicuous bristles. Mesopleuron and mediotergite dark brown to black, gray pruinose. **Wing.** (Fig. 149). Length 4.8 mm. LW/MWW = 3.4. LTC/LFC = 1.0. Membrane hyaline, almost entirely covered with microtrichia, except for cells bc, basal two thirds of c, basal three quarters of sc, basal half of r_1, small basal area of r_{2+3} and r_{4+5}, br, superior part of bm, small basal area of cup and basal one third of anal lobe without or with very sparse microtrichia. Vein r-m placed near basal third of cell dm. Vein dm-cu straight. Halter brown with middle part of stem yellow. **Legs.** (Fig. 147). Coxae dark brown to black, gray pruinose. Trochanters dark yellow to brown. Femora dark brown to black with base and apex yellow, entirely gray pruinose posteriorly. Tibiae dark yellow to brown, gray pruinose posteriorly. Tarsi dark yellow to brown, except fifth tarsomere darker or entirely black. Pulvilli yellow. **Abdomen.** (Fig. 150). Dark brown to black, gray pruinose on tergite 1, on narrow basal band on tergite 2 and on posterolateral spots on tergites 2–5; tergite 1 with three small black bristles laterally. Tergite 6 and sternites 6, 7 as in Fig. 151. Sternite 6 (Fig. 152) lighter at apex with a rounded and somewhat translucid subapical projection and a subtriangular expanded distal projection. Syntergosternite 8 dark brown to black, slightly shorter than tergite 5, brown pruinose anteriorly, gray pruinose laterally and posteriorly (Fig. 151) and with large membranous area (Fig. 153). **Terminalia.** Epandrium and surstyli yellow (Fig. 154). Surstyli (Figs 154–155) asymmetrical. Left surstylus strongly developed, about 2.2X longer than right surstylus; with basal lobe and apex truncated; lateral view as in Fig. 156. Right surstylus with

FIGURES 147–162. *Elmohardyia quadricornis* **sp. nov.** Holotype male. **147**, Habitus, lateral view; **148**, Antenna; **149**, Wing; **150**, Abdomen, dorsal view; **151**, Tergite and sternite 6, ventral view; **152**, Sternite 6, ventral view; **153**, Syntergosternite 8, posterior view; **154**, Terminalia, ventral view; **155**, Surstyli, ventral view; **156**, Left surstylus, lateral view; **157**, Right surstylus, lateral view; **158**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **159**, Hypandrium and gonopods, ventral view; **160**, Phallic guide, dorsolateral view (arrows indicate additional processes of phallic guide); **161**, Phallus, lateral view; **162**, Ejaculatory apodeme.

acute apex (Figs 155, 157). Subepandrial esclerite as in Fig. 158. Right gonopod developed, almost reaching the level of phallic guide apex (Fig. 160). Phallic guide (Fig. 160) with two additional processes, dorsal most bifid. Phallus with a developed bifid spicule (Fig. 161). Ejaculatory apodeme as in Fig. 162. **Female** unknown.

Variations (n=2). Body length 4.4–4.6 mm (two paratypes headless); Wing length 4.5–4.7.

Type Material. HOLOTYPE ♂: "BRASIL, PI[auí], Guaribas, Parque Nacional Serra das Confusões, Andorinha, 515 m, 09°08'27.8"S, 43°33'42.1"W" "Armadilha de Malaise, 20–31.x.2013, J.A. Rafael, F. Limeira-de-Oliveira & T.T.A. Silva cols [collectors]" "Holotype ♂, *Elmohardyia quadricornis* Marques & Rafael" (CZMA). PARATYPES: *idem*, 15–31.vii.2013 (1♂ INPA); *idem*, 20–31.viii.2013 (1♂ CZMA); *idem*, 01–10.ix.2013 (1♂ CZMA); *idem*, Suspensa simples (5 m), 20–30. ix. 2013 (1♂ INPA).

Holotype condition. Left wing detached, mounted on microslides. Terminalia placed in microvial with glycerin.

Etymology. From Latin, *quadri* = four + *cornis* = horn, refers to the apex of the the phallic guide with four projections.

Distribution. Brazil: Piauí (Caatinga Biome).

Discussion. *Elmohardyia quadricornis* **sp. nov.** is close to *E. martae* **sp. nov.** due to the strongly developed right gonopod, almost reaching to the apex of the phallic guide, and the long subapical spicule of the phallus. *Elmohardyia quadricornis* **sp. nov.** differs from *E. martae* **sp. nov.** by the somewhat subquadrangular apex of the left surstylus (somewhat triangular in *E. martae* **sp. nov.**), phallic guide with two additional processes (simple in *E. martae* **sp. nov.**), and the apically bifid subapical spicule (simple in *E. martae* **sp. nov.**).

***Elmohardyia rosalinae* sp. nov.**
Figs 163–181

Diagnosis. Tergite 2 almost entirely gray pruinose, except for three brown pruinose spots. Sternite 6 with three sclerotized thorn-like projections, basal one longest. Surstyli asymmetrical. Left surstylus strongly developed, with outward curved apex, about 2X longer than right surstylus. Right gonopod longer than left one. Phallic guide with one bifid additional process.

Description of male holotype. (Fig. 163). Body length. 4.3 mm. **Head.** Eyes contiguous for a distance of eighteen facets. F, EM, V = 0.4 mm, 0.4 mm, 0.3 mm. Frontal triangle and face gray pruinose. Postcranium dark, brown pruinose dorsally and gray pruinose laterally and ventrally. Antennae (Fig. 164) with scape dark brown; pedicel dark brown, with two dorsal and three ventral bristles; postpedicel dark brown on basal one third, remaining yellow. LPP/WPP = 2.3. Labellum brown. **Thorax.** Postpronotal lobe dark yellow, gray pruinose. Scutum dark brown to black, gray-brown pruinose. Notopleuron dark brown, gray pruinose with eight weak bristles. Scutellum dark brown to black, gray pruinose, with inconspicuous bristles. Mesopleuron and mediotergite dark brown, gray pruinose. **Wing** (Fig. 165)**.** Length 4.5 mm. LW/MWW = 3.4. LTC/LFC = 1.6. Membrane hyaline, almost entirely covered with microtrichia, except for cells bc, c, sc, basal half of r_1, small basal area of r_{2+3} and r_{4+5}, br, bm, basal half of cup and basal one third of anal lobe without or with very sparse microtrichia. Vein r-m placed just before basal third of cell dm. Vein dm-cu straight. Halter brown with middle part of stem yellow. **Legs** (Fig. 163)**.** Coxae dark brown to black, gray pruinose. Trochanters yellow. Femora brown with base and apex yellow, entirely gray pruinose posteriorly. Tibiae yellow, gray pruinose. Tarsi dark yellow to brown, except fifth tarsomere darker or entirely black. Pulvilli yellow. **Abdomen.** (Fig. 166). Dark brown to black, gray pruinose on tergite 1, almost entirely on tergite 2, except for two brown pruinose spots anterolaterally and a small spot medially; gray pruinose posterolaterally on tergites 3–5; tergite 1 with three stout bristles laterally. Tergite and sternite 6 as in Fig. 167. Sternite 6 (Figs 168, 169) with three sclerotized spine-like projections, basal one longest. Syntergosternite 8 dark brown to black, shorter than tergite 5, gray pruinose (Fig. 166) and with large membranous area (Fig. 170). **Terminalia.** Epandrium and surstyli (Fig. 171) yellow. Surstyli (Figs 171–172) asymmetrical. Left surstylus strongly developed, apex curved outward, about 2X longer than right surstylus, with basal lobe; lateral view as in Fig. 173. Right surstylus with acute apex in lateral view (Fig. 174). Subepandrial sclerite as in Fig. 175. Right gonopod longer than left one (Fig. 176). Phallic guide (Figs 177–178) with one additional bifid process; dorsal view as in the Fig. 179. Phallus with inconspicuous subapical spicule (Fig. 180). Ejaculatory apodeme as in Fig. 181. **Female** unknown.

FIGURES 163–181. *Elmohardyia rosalinae* **sp. nov.** Holotype male, except fig. 169 from paratype male. **163**, Habitus, lateral view; **164**, Antenna; **165**, Wing; **166**, Abdomen, dorsal view; **167**, Tergite and sternite 6, ventral view; **168**, Sternite 6, ventral view; **169**, Sternite 6, ventral view, paratype male; **170**, Syntergosternite 8, posterior view; **171**, Terminalia, ventral view; **172**, Surstyli, ventral view; **173**, Left surstylus, lateral view; **174**, Right surstylus, lateral view; **175**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **176**, Hypandrium and gonopods, ventral view; **177**, Phallic guide, right lateral view (arrows indicate additional processes of phallic guide); **178**, Phallic guide, left lateral view; **179**, Phallic guide, dorsal view; **180**, Phallus, lateroventral view; **181**, Ejaculatory apodeme.

Variation (paratype). Body length 4.4 mm. Wing length 4.6 mm. Sternite 6 with basal protuberance longer than in the holotype specimen.

Type Material. HOLOTYPE ♂: "BRASIL, PI[auí], Guaribas, Parque Nacional Serra das Confusões, Andorinha, 515 m, 09°08'27.8"S, 43°33'42.1"W" "Armadilha de Malaise, 01–10.ix.2013, J.A. Rafael, F. Limeira-de-Oliveira & T.T.A. Silva cols [collectors]". "Holotype ♂, *Elmohardyia rosalinae* Marques & Rafael" (CZMA). PARATYPE: *idem*, 20–30.ix.2013 (1♂ INPA).

Holotype condition. Left wing detached, mounted on microslide. Terminalia
placed in microvial with glycerin.

Etymology. The specific epithet is a patronym honoring Rosalina da Silva, a great friend and a "second mother" of the first author.

Distribution. Brazil: Piauí (Caatinga Biome).

Discussion. *Elmohardyia rosalinae* **sp. nov.** is close to *E. valida* Menezes & Rafael due to sternite 6 with thorn-like protuberances, left surstylus with outward curved apex and longer than right surstylus, and by the similar shape of the phallic guide. *Elmohardyia rosalinae* **sp. nov.** differs from *E. valida* by tergites 3–5 being gray pruinose posterolaterally (only on tergite 5 in *E. valida*), and by sternite 6 with three protuberances (only two in *E. valida*).

Elmohardyia trinidadensis (Hardy)

Figs 182–199

Dorilas (*Eudorylas*) *trinidadensis* (Hardy 1948:7, Figs 5a–c).
Eudorylas trinidadensis (Aczél 1952: 246, catalog).
Pipunculus (*Eudorylas*) *trinidadensis* (Hardy 1966: 6, catalog).
Elmohardyia trinidadensis (Rafael 1987: 38, citation; 1988: 252, Figs 52, 106–107, 137 and 168, redescription; De Meyer 1996: 47, catalog; Menezes & Rafael 1997: 297, record; Rodriguez & Rafael 2012: 20, catalog).

Material examined. BRASIL, MA[ranhão], Carolina, Rio Lages, Arm.[adilha] Malaise, 12.xii.2001, J.A. Rafael, F. Limeira-de-Oliveira & J. Vidal (1♀, INPA); *idem*, PARNA [Parque Nacional] Chapada das Mesas, Riacho Sucuruiu, 240 m, 07°07'05.6"S, 47°18'31.6"W, Armadilha de Malaise, 01–10.xi.2013, J.A. Rafael, F. Limeira-de-Oliveira & T.T.A. Silva cols. (1♀, CZMA); *idem*, Mirador, Parque Est.[adual] Mirador, Base da Geraldina, Armadilha de Malaise, 28.ii.2007, F. Limeira-de-Oliveira col. (1♀, CZMA); *idem*, 06°37'25"S, 45°52'08"W, 13–19.x.2012, F. Limeira-de-Oliveira, L.L.M. Santos & L.S. Santos (1♀, INPA); *idem*, 10–16.v.2013 (1♀, CZMA); *idem*, 402 m, 06°35'58"S, 45°50'49"W, 01–15.ix.2013 (2♀, CZMA); *idem*, 01–10.xii.2013, F. Limeira-de-Oliveira, L.L.M. Santos & T.L. Rocha (1♀, INPA); *idem*, CE[ará], Ubajara, Parque Nac.[ional] de Ubajara, Cachoeira do Cafundó, 03°50'13"S, 40°54'35"W, Armadilha de Malaise, 20–22.vii.2012, J.A. Rafael, F. Limeira-de-Oliveira cols. (1♂, CZMA); *idem*, Bahia, Igrapiúna, Res.[erva] Ecológica Michelin, 13°50'S, 39°10'W, Armadilha Malaise, i.2013, E. Menezes (1♀, INPA); *idem*, Ilhéus, Cepec, Ago[viii].1973, Soria col. (1♀, INPA).

Remarks. Type material has been studied by Rafael (1988), who also redescribed and illustrated *E. trinidadensis*. Figures 182–199 included here should enable a better identification of this species. The two small lateral lobes of the phallic guide are best seen in dorsal view (Fig. 196).

Distribution. Trinidad, Brazil: Amazonas, Pará, Maranhão (new record, Cerrado Biome), Ceará (new record, Caatinga Biome), Bahia (new record, Atlantic Forest Biome).

Elmohardyia spp. females

Fifty four female specimens belonging to at least 15 morphospecies could not be associated with males.

Material examined. BRASIL, MA[ranhão], Caxias, Res. Ecol. Inhamum, Armadilha Malaise, 23–27.ii.2005, G.A. Cunha cols (2♀ CZMA); *idem*, 15–19.xi.2005 (2♀ CZMA); *idem*, 12–26.xii.2005 (1♀ CZMA); *idem*, 16–19.i.2006 (1♀ CZMA); *idem*, 19–23.i.2006 (2♀ CZMA); *idem*, Carolina, Serra Grande, 07°04'28"S, 47°24'12"W, 13.xii.2001, F. Limeira-de-Oliveira & J. Vidal, Arm. Malaise (1♀ INPA); *idem*, Faz. Serra Grande, Armadilha Malaise, 23–27. ii. 2009, F. Limeira-de-Oliveira & A. L. Costa, cols (1♀ CZMA); *idem*, PARNA

FIGURES 182–199. *Elmohardyia trinidadensis* (Hardy). Male specimen of Ceará state, except figs 198–199 from female. **182**, Habitus, lateral view; **183**, Antenna; **184**, Wing; **185**, Abdomen, dorsal view; **186**, Tergite 6 and sternites 6, 7, ventral view; **187**, Sternite 6, ventral view; **188**, Syntergosternite 8, posterior view; **189**, Terminalia, ventral view; **190**, Surstyli, ventral view; **191**, Left surstylus, lateral view; **192**, Right surstylus, lateral view; **193**, Epandrium, surstyli and subepandrial sclerite, dorsal view; **194**, Hypandrium and gonopods, ventral view; **195**, Phallic guide, right lateral view; **196**, Phallic guide, dorsal view; **197**, Ejaculatory apodeme; **198**, Ovipositor, lateral view; **199**, Ovipositor, ventral view.

Chapada das Mesas, Riacho Cancela, 225 m, 07°06'44.2"S, 47°17'56.8"W, Armadilha de Malaise, 20–31.viii.2013, J.A.Rafael, F. Limeira-de-Oliveira & T.T.A. Silva cols (1♀ CZMA); *idem*, Riacho Corrente, 288 m, 07°04'24.2"S, 47°05'25.2"W, Armadilha de Malaise, 10–20.vi.2014, J.A.Rafael, F. Limeira-de-Oliveira, T.L. Rocha & G.A. Reis cols (1♀ CZMA); *idem*, Suspensa simples (5 m), 20–30.vi.2014 (1♀ CZMA); *idem*, Riacho Sucuruiu, 240 m, 07°07'05.6"S, 47°18'31.6"W, Armadilha de Malaise, 14–30.vi.2013, J.A.Rafael, F. Limeira-de-Oliveira & T.T.A. Silva cols (2♀ CZMA); *idem*, 01–15.vii.2013 (1♀ CZMA); *idem*, 15–31.vii.2013 (2♀ CZMA); *idem*, 01–10.viii.2013 (3♀ CZMA); *idem*, Suspensa simples (5 m), 10–20.viii.2013 (1♀ CZMA); *idem*, Armadilha de Malaise, 01–10.xi.2013 (1♀ CZMA); *idem*, Mirador, Parque Est. Mirador, Base da Geraldina, Malaise, 28.ix.2006, F. Limeira-de-Oliveira cols (1♀ CZMA); *idem*, 23–28.ix.2006 (1♀ CZMA); *idem*, 28.ix–01.x.2006 (1♀ CZMA); *idem*, 21–30.xi.2006 (1♀ CZMA); *idem*, Armadilha Luminosa, 22.ii–01.iii.2009, M.B. Aguiar-Neto & M.J.A. Holanda cols (1♀ CZMA); *idem*, 06°37'25"S, 45°52'08"W, Armadilha de Malaise, 14–18.viii.2012, F. Limeira-de-Oliveira, J. S. Pinto-Junior & D.W.A. Marques (2♀ CZMA); *idem*, 402 m, 06°35'58"S, 45°50'49"W, Armadilha de Malaise, 01–15.ix.2013, F. Limeira-de-Oliveira, L.L.M. Santos & L.S. Santos (1♀ CZMA); *idem*, 419 m, 06°37'25"S, 45°52'08"W, Armadilha Suspensa, 01–10.xii.2013, F. Limeira-de-Oliveira, L.L.M. Santos & T.L. Rocha (1♀ CZMA); *idem*, 15–31.v.2014, F. Limeira-de-Oliveira, L.L.M. Santos & L.S. Santos (3♀ CZMA); *idem*, Armadilha Malaise, 01–15.vi.2014 (1♀ CZMA); *idem*, 15–30.vi.2014 (1♀ CZMA); *idem*, Armadilha Suspensa, 15–30.vi.2014 (3♀ CZMA); *idem*, Base dos Cágados, 06°48'29"S, 45°06'34"W, Armadilha Malaise, 27.ix–02.x.2011, F. Limeira-de-Oliveira & D.W.A. Marques cols (1♀ CZMA); *idem*, Posto Avançado do Mel, 06°43'48"S, 45°00'22"W, Armadilha Malaise, 18–25.iii.2012, F. Limeira-de-Oliveira & D.W.A. Marques, cols (1♀ CZMA); *idem*, PI[auí], Piracuruca, P. N. de Sete Cidades, Posto do ICMBio, 04°05'57"S, 41°42'34"W, Armadilha Malaise, 21–30.xi.2012, F. Limeira-de-Oliveira, J. S. Pinto-Júnior (1♀ CZMA); *idem*, Caracol, Parq. Nac. Serra das Confusões, Riacho dos Bois, 575 m, 09°13'11.9"S, 43°29'26.2"W, Armadilha Malaise, 07–15.vi.2013, J.A.Rafael, F. Limeira-de-Oliveira & T.T.A. Silva (1♀ CZMA); *idem*, 15–31.vii. 2013 (1♀ CZMA); *idem*, 01–11.viii. 2013 (1♀ CZMA); *idem*, 20–31.viii. 2013 (2♀ CZMA); *idem*, 10–20.ix. 2013 (1♀ CZMA); *idem*, 01–10.x.2013 (1♀ CZMA); *idem*, Cores da Caatinga, 705m, 09°12'48.9"S, 43°27'59.9"W, Armadilha Suspensa, 07–15.vi.2013, J.A.Rafael, F. Limeira-de-Oliveira & T.T.A. Silva (1♀, CZMA); *idem*, Guaribas, Parque Nacional Serra das Confusões, Andorinha, 515 m, 09°08'27.8"S, 43°33'42.1"W, Armadilha de Malaise, 07–15.vi.2013, J.A.Rafael, F. Limeira-de-Oliveira & T.T.A. Silva (1♀ CZMA); *idem*, 01–15.vii.2013 (1♀ CZMA); *idem*, CE[ará], Ubajara, Parque Nac. de Ubajara, Cachoeira do Cafundó, 03°50'13"S, 40°54'35"W, Armadilha de Malaise, 13–17.xi.2012, F. Limeira-de-Oliveira, D.W.A. Marques cols (1♀ CZMA); *idem*, Posto do ICMBio, 04°05'57"S, 41°42'34"W, Armadilha Suspensa, 01–10.x.2013, F. Limeira-de-Oliveira, T.T.A. Silva cols (1♀ CZMA).

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