

RESEARCH ARTICLE

## New species and identification key to species of *Pseudoazya* (Coleoptera: Coccinellidae: Azyini)

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**ABSTRACT.** Two new species, *Pseudoazya mirabilis* **sp. nov.** and *Pseudoazya massayo* **sp. nov.**, both from North-east Brazil, are described. *Pseudoazya* is distributed in other localities of Brazil. The new species of *Pseudoazya* Gordon, 1980 are described based on the external morphology and genitalia of the adults. The genus is distinguished from *Azya* Mulsant, 1850, the only other genus of Azyini, by prosternum with intercoxal process flat, not elevated, and apex of penis bifid.

**KEY WORDS.** Coccinellinae, description, Identification key, Neotropical Region, taxonomy.

### INTRODUCTION

Azyini Mulsant, 1850 is a tribe of Coccinellidae distributed in the Western Hemisphere, encompassing two genera: *Azya* (14 species) and *Pseudoazya* (six species). The tribe is characterized by the following general features: dorsal surface pubescent; antenna 11-segmented; abdominal postcoxal line incomplete (Gordon 1980); hypomera with rounded fovea; protibia flat and angulated. Members of this tribe are predators of scale insects (Hemiptera: Diaspididae). They primarily feed on armored scales (Diaspididae), although they may also consume other Sternorrhyncha: Coccidae (soft scales) and Pseudococcidae (mealybugs) (Gordon 1980, Almeida and Carvalho 1996, Nais and Busoli 2012).

The bioecology and taxonomy of Azyini remains relatively understudied. The literature predominantly documents the association of *Azya luteipes* with various Coccoidea (Hemiptera) in diverse settings. These include agricultural contexts such as commercial coffee (Costa et al. 2014), citrus (Rodrigues 2004, Guerreiro et al. 2005, Silva et al. 2005, Rodrigues et al. 2008, 2010), and mango trees (Oliveira et al. 2013). In addition, *A. luteipes* has been observed in natural environments (Oliveira et al. 2022), and has been reared in laboratory (Nais and Busoli 2012).

*Pseudoazya* was proposed by Gordon (1980) in a taxonomic revision of Azyini to accommodate six species, three of which were formerly classified in *Azya*: *Pseudoazya trinitatis* (Marshall, 1912), *P. pusilla* (Weise, 1922), and *P. nana* (Marshall, 1912). Additionally, Gordon included three newly described species: *Pseudoazya aberrans* Gordon, 1980; *P. boliviana* Gordon, 1980; and *P. gnoma* Gordon, 1980. The distinguishing characters of this genus, which differentiate it from *Azya*, include: prosternum with intercoxal process flat, not elevated; and male with apex of penis bifid (Gordon 1980).

Regarding the Brazilian Azyini, the Taxonomic Catalog of the Brazilian Fauna registers eight species, six in *Azya*, and two in *Pseudoazya* (Almeida et al. 2023). In this contribution two new species of *Pseudoazya* are described based on their external morphology and genitalia; and the distribution records of the *Pseudoazya* are expanded to include Brazil.

### MATERIAL AND METHODS

Specimens for this study were borrowed from the following Brazilian institutions: Coleção Entomológica Pe. J.S. Moure, Universidade Federal do Paraná, Curitiba, Paraná (DZUP); Coleção Entomológica da Universidade Federal

Rural de Pernambuco, Recife, Pernambuco (CERPE); and Coleção de Invertebrados do Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas (INPA). Distribution records were accessed from the literature (Gordon 1980) and specimens labels.

The genitalia dissected from specimens were stored in micro-vials with glycerin and were pinned together with the respective specimen. Photographs were taken using a Leica DMC 2900 digital camera coupled to a Leica M 205 C compound stereomicroscope. The plates were made with CorelDraw® and Corel Photo-Paint® Home & Student 2018.

The terminology used in the descriptions follows Gordon (1980) and Ślipiński (2007).

The labels of the type material are arranged in sequence from top to bottom, with the data for each label within double quotes (“”); back slashes (\) separate the rows, and the information between brackets ([ ]) provides additional details recorded on the labels.

A distribution map was made by using the following software: GPSTrackerMacker® version 13.9.596, Google Earth® to include the coordinates, and the website <https://www.simplemappr.net/> (Shorthouse 2010) to illustrate the map. Geographic coordinates were obtained indirectly from the analysis of specimens labels data both from realia and from Gordon (1980). When it was impossible to obtain precise geographic coordinates due to the lack of data on the labels, the coordinates representing the Municipality, or the State were used.

## TAXONOMY

### *Pseudoazyza* Gordon, 1980

Figs 1–3

*Pseudoazyza* Gordon, 1980: 192 (description); Gordon 1987: 34 (catalog); Almeida et al. 2023 (catalog).

Type species. *Azyza trinitatis* Marshall, 1912 (original designation).

Diagnosis. *Pseudoazyza* is a Neotropical genus that resembles *Azyza* Mulsant, 1850 by the similar external morphology, but differing by the length range from 2.11 to 2.65 mm and by short, flat prosternum with intercoxal process not elevated or ridged. In *Azyza* the length range from 2.90 to 4.40 mm and by the intercoxal process of prosternum elevated.

#### Key to species of *Pseudoazyza* (adapted from Gordon 1980)

1. Elytra black without spots, light reflection from pubescence often giving the appearance of a spot, but only at point of illumination ..... 2
1. Elytra black with defined spot due to dark pubescence surrounded by light pubescence ..... 3
2. Elytra with uniform, fine punctation, without intermixed coarse punctations; Guyana, Colombia, Puerto Rico, Trinidad, Venezuela, West Indies .....  
.....*P. trinitatis* (Marshall, 1912)
2. Elytra with intermixed fine and coarse punctations, coarse punctations especially visible on disc of each elytron; Panamá .....*P. aberrans* Gordon, 1980
3. Elytra with two distinct spots, one in each elytron; spots separated from each other by a light narrow pubescent line on sutural margin ..... 4
3. Elytra with only one spot fused along the sutural margin ..... 5
4. Elytra with bluish metallic glow, spot area with violaceous metallic glow (Fig. 1); Brazil.. *P. massayo* sp. nov.
4. Elytra with greenish glow, spot area without metallic glow; Bolivia .....*P. boliviana* Gordon, 1980
5. Surface of pronotum smooth, between punctations, lacking metallic sculpture; coarse punctations on elytron not arranged in subsutural rows; Argentina ...  
.....*P. pusilla* (Weise, 1922)
5. Surface of pronotum between punctations dull, metallic; coarse punctations on elytron usually arranged in subsutural rows ..... 6
6. Dorsal surface black, without greenish or bluish glow; Brazil .....*P. gnoma* Gordon, 1980
6. Dorsal surface black, with strong greenish, bluish or violaceous glow ..... 7
7. Elytra with longitudinal rows of punctations beyond the spot area; spot iridescent and violaceous (Fig. 2); Brazil .....*P. mirabilis* sp. nov.
7. Elytra with longitudinal rows of punctations restricted to the spot area; if spot iridescent, greenish or bluish; Brazil .....*P. nana* (Marshall, 1912)

### *Pseudoazyza massayo* Duarte-de-Mélo & Almeida, sp. nov.

Figs 1, 3

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Diagnosis. *Pseudoazyza massayo* sp. nov. resembles *P. boliviana* by one oval spot in each elytral disc and yellowish clypeal apex. *Pseudoazyza massayo* sp. nov. can be distinguished from the latter by bluish iridescence in the elytra and spots; penis capsule with inner arm almost as long as wide; and apex of penis sinuous. *Pseudoazyza boliviana* has greenish iridescence in the elytra, except on spots area; penis

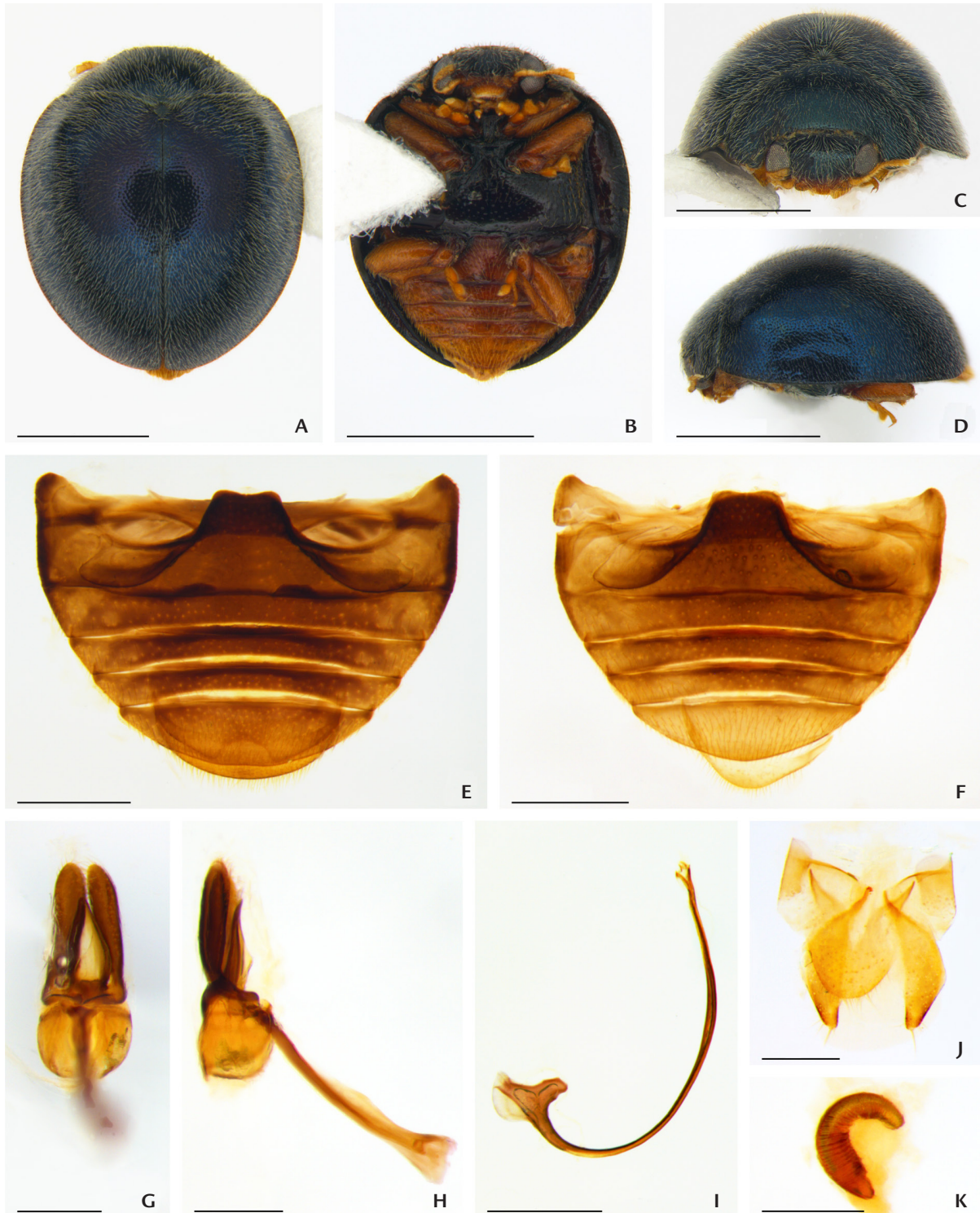


Figure 1. *Pseudoazyza massayo* sp. nov.: Body (A-D): dorsal view (A), ventral view (B), frontal view (C), and lateral view (D). Abdomen (E-F): male (E) and female (F). Male genitalia (G-I): tegmen ventral view (G), lateral view (H), and penis (I). Female genitalia (J-K): Coxites (J) and spermatheca (K). Scale bars: A-D = 1.0 mm; E, F, I = 0.5 mm; G, H, J, K = 0.25 mm.

capsule with inner arm twice longer than wide; and apex of penis membranous.

**Description.** Male. Holotype. Length 2.48 mm, width 2.17 mm. Body dark, with light setae, oval, convex, two times longer than elytral height (Fig. 1A, C, D). Dorsal tegument shiny, iridescent, with setae and punctations (Fig. 1A). Elytra iridescence with two spots, one on each elytron, formed by dark setae (Fig. 1A, C).

**Head.** Dorsal surface smooth, with slightly greenish dull glow, without iridescence. Antennae and mouthparts yellowish. Punctations with the same size and distant from each other by less than a diameter of a punctuation (Fig. 1B, C).

**Thorax.** Pronotum with color similar of the head. Pronotal punctations with the same size and distant from each other by, at least, a diameter of a punctuation. Ventral surface black, coxae and medial area of epipleura brownish. Prosternal punctation distant from each other by, at least, a diameter of the punctuation. Mesosternal punctations in smaller number and size than the prosternal ones. Metasternal punctations with irregular size, distant from each other by, at least, a diameter of punctuation in ventral area, and by less than a diameter on the lateral area. Hipomera and epipleura with deep fovea to reception of femoral apex. Epipleura with small sparse punctations. Mesosternum about half the longitudinal length of the prosternum (Fig. 1A–D).

**Elytra.** Each elytron with an oval spot with dark setae on discal area. Spot oblique to the sutura, extending up to 2/5 of the sutural length, with anterior half next, and posterior half distant to the sutural margin. Sutural margin with only light setae along its entire length. Punctations bigger and denser than in the pronotum, distant from each other by less than a diameter of the punctuation (Fig. 1A, D).

**Abdomen.** Ventrites yellowish. Punctations small and sparse on ventrite I; dense and distant from each other by, at least, a diameter of the punctuation on medial area of ventrites II–IV; denser on ventrite V than the anterior ones. Ventrite VI hidden by ventrite V, emarginated (Fig. 1E).

**Genitalia.** Tegmen 2.3 times longer than wide. Penis guide 3/4 of the length of parameres, with rounded sides in ventral view, slightly larger on medial area than on the base, apex acute. Parameres with sides narrowing gradually from the base to the rounded apex, with short setae along the margins, not extending beyond the height of the penis guide. Penis capsule with inner arm almost as long as wide, apex rounded, slightly angulated, and outer arm with convergent sides, covered by a membrane, 2.5 times longer than wide, with the same length as the inner arm. Penis apex bifid, sinuous (Fig. 1G–I).

**Female.** Similar to male, except by ventrite VI, not emarginate (Fig. 1F). Coxites subtriangular, with rounded apex, twice longer than wide (Fig. 1J). Spermatheca apex as narrower as the ramus, slightly widened at the base of the cornu, narrowing to the apex; seven times longer than wide (Fig. 1K).

**Type Material.** HOLOTYPE: Alagoas “Maceió-AL\9-IV-1991-Lima, I.M.M” “folhas de\ *Cordyline* sp.\c/diaspidídeos”, [DZUP/131915]; PARATYPES: Pernambuco “BRASIL, PE, Fernando de\Noronha, Boldró 3°51'30”S – 32°25'50”W”; “20-27.ii.2020\ J.A. Rafael & M.S. Rafael” “PFN-20-28.ii.20\ Alojamento\em coqueiro”, 1 specimen, [INPA]; “Brasil, Pernambuco,\Fernando de Noronha,\ Boldró, 20-28.ii.2020,\ manual, Grossi, Rafael,\Limeira-de-Oliveira legs.”, 5 specimens, “2♂”, “3♀”, [CERPE]; Alagoas “Ipioca, Maceió-AL\18/01/96\ Lima, I.M. leg.”, “Em: *Aspidiotus destructor*\ Em: \Coqueiro”; 9 specimens, [DZUP 131924, 131925, 131927, 131928, 131929, 131930, 1♂, 131931, 131932, 131934]; “Brasil, Alagoas,\ Maceió\02/III/1991\I.M.M. Lima leg.”, “Diaspididae”, [DZUP 131921]; Bahia “São Felipe-Ba\Citros\M.branca, pulgão e\ Ortezia”; “Azyini”, [DZUP 327086].

**Distribution.** Brazil: Alagoas, Pernambuco (Fig. 3).

**Etymology.** The name *Pseudoazyza massayo* sp. nov. is from the Tupi-guarani, an indigenous language. It was the indigenous name of the municipality of Maceió, capital of the state of Alagoas, and place of origin of part of the type material. The name means “waterlogged land”, in reference to a large mangrove area of the city.

**Biological data.** *Pseudoazyza massayo* sp. nov. was collected inhabiting coconut trees, *Cocos nucifera* L. (Arecaceae), and preying on *Aspidiotus destructor* Signoret, 1869 (Hemiptera: Diaspididae). Additionally, this species was found on *Citrus* sp. (Rutaceae) and on *Cordyline* sp. (Asparagaceae), where it fed on diaspidids.

***Pseudoazyza mirabilis* Duarte-de-Mélo & Almeida, sp. nov.**

Figs 2, 3

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**Diagnosis.** *Pseudoazyza mirabilis* sp. nov. is similar to *P. nana*, *P. gnoma* and *P. pusilla*, by sharing one spot on the discal area of the elytra. It differs from: *P. pusilla* by the longitudinal rows of large elytral punctations; from *P. gnoma* by the iridescence of the elytra; and from *P. nana* by longitudinal rows of punctations beyond the spot area, also by iridescent and violaceous spot. Differs from all other species of *Pseudoazyza* by the sinuous inner area of the apex of the penis.

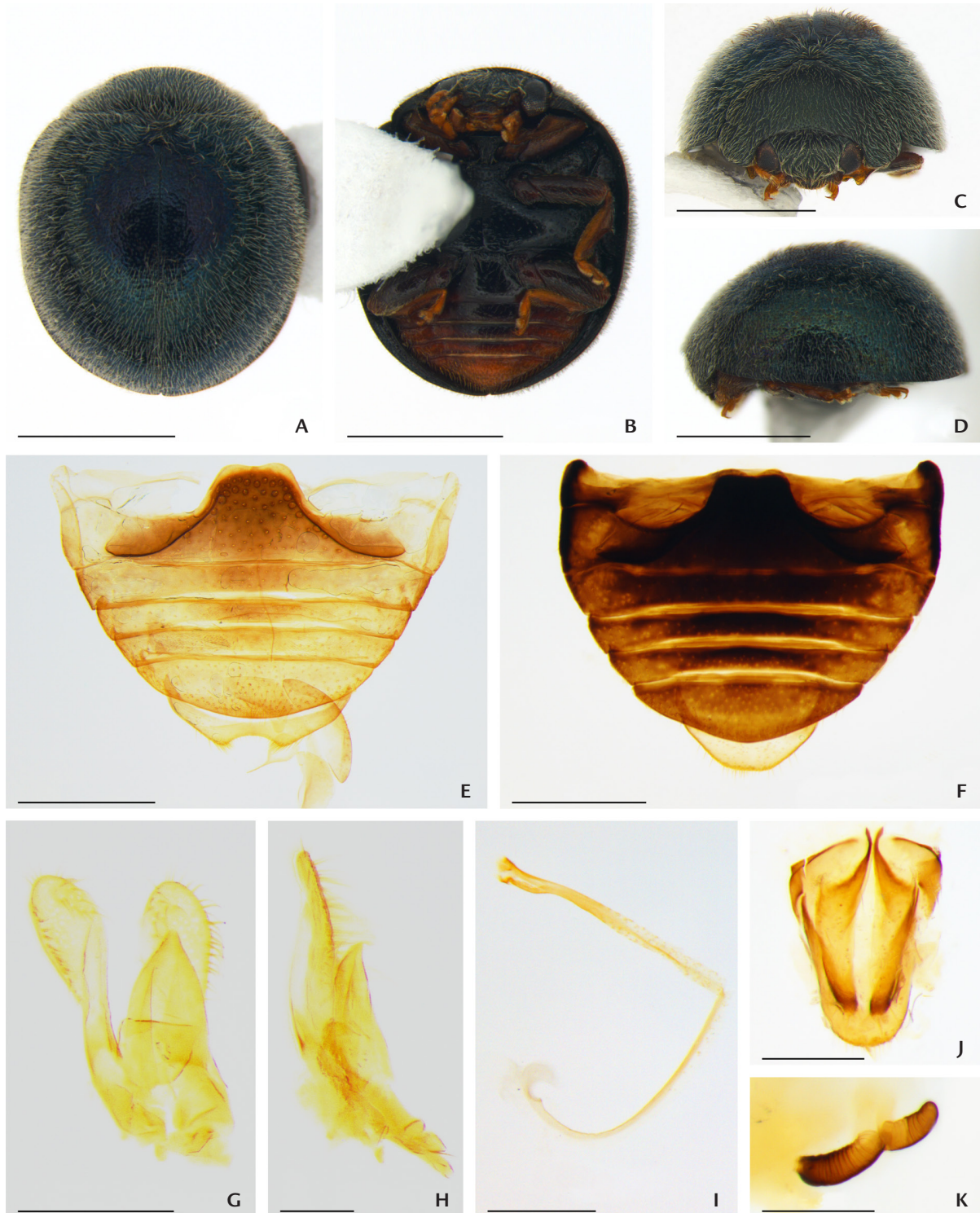


Figure 2. *Pseudoazyza mirabilis* sp. nov.: Body (A-D): dorsal view (A), ventral view (B), frontal view (C), and lateral view (D). Abdomen (E-F): male (E) and female (F). Male genitalia (G-I): tegmen ventral view (G), lateral view (H), and penis (I). Female genitalia (J-K): Coxites (J) and spermatheca (K). Scale bars: A-D = 1.0 mm; E, F = 0.5 mm; G, I, J, K = 0.25 mm; H = 0.1 mm.



Figure 3. Distribution of *Pseudoazya* Gordon, 1980 species: *Pseudoazya aberrans* Gordon, 1980; *Pseudoazya boliviana* Gordon, 1980; *Pseudoazya gnoma* Gordon, 1980; *Pseudoazya massayo* sp. nov.; *Pseudoazya mirabilis* sp. nov.; *Pseudoazya nana* (Marshall, 1912); *Pseudoazya pusilla* (Weise, 1922); and *Pseudoazya trinitatis* (Marshall, 1912).

Description. Female. Holotype. Length 2.11 mm, width 1.84 mm. Body dark, with whitish setae, oval, convex, to times longer than elytral height (Fig. 2A, C, D). Dorsal tegument shiny, iridescent, with punctations; one iridescent, violaceous spot formed by dark setae in the central area of elytra (Fig. 2A).

Head. Dorsal surface greenish; dull glow. Antennae and mouthparts yellowish. Punctations with the same size and distant from each other, by more than a diameter of a punctation (Fig. 2B, C).

Thorax. Pronotum with color and punctations similar of the head. Ventral surface black; coxae, trochanters and femora, brownish. Lateral area of pro, meso and metasternum with punctuation distant from each other by less than one diameter of the punctuation; metasternum punctations wider in the lateral area. Epipleura with punctations sparse on base and dense on apex. Hipomera and epipleura with fovea to reception of femoral apex. Mesosternum about 2/3 of longitudinal length of prosternum (Fig. 2A–D).

Elytra. Punctations denser than in the head and pronotum, with irregular size and distance, being separated by less than a diameter. Longitudinal rows of wide punctations from suture to outer elytral margin (Fig. 2A, D).

Abdomen. Ventrites brownish to yellowish. Punctations of ventrite I with the same size than the mesosternum. Punctations of the other abdominal areas sparse, separated by two diameters or more, denser in the ventrite V. Ventrite VI not emarginate (Fig. 2F).

Genitalia. Coxites subtriangular, rounded apex, three times longer than wide. Spermatheca apex narrower than the base, five times longer than wide (Fig. 2J–K).

Male. Similar to female, except by ventrite VI hidden by ventrite V, emarginated (Fig. 2E). Tegmen two times longer than wide; penis guide half of the length of parameres, wider in the base and sharp in the apex; parameres with base in ventral view with basal half narrow and apical wide and rounded, lobed, three times wider than the base, with setae in all apical margin of parameres (Fig. 2G, H). Penis capsule with inner arm 1.4 times longer than wide, curved, with an emargination at the base of penis tube, assuming the shape of a semicircle, and outer arm two times wider than long; penis apex bifid, with sinuous inner area (Fig. 2I).

Type material. HOLOTYPE: “Brasil. Pernambuco,\ Camaragibe, PE 027, Km 14,\ 1-30.vi.2018, 140m, -7.929°S,\ -35.038°W, P.C. Grossi”, “♀”, [DZUP 246596]. PARATYPE: “Brasil. Pernambuco,\ Camaragibe, PE 027, Km 14,\ 1-30.vi.2018, 140m, -7.929°S,\ -35.038°W, P.C. Grossi”, “♂”, [CERPE].

**Etymology.** The name *Pseudoazya mirabilis* sp. nov. alludes to the overall appearance of the species, which is remarkable.

**Geographic distribution.** Brazil: Pernambuco (Fig. 3).

**Remarks.** Only two specimens from *Pseudoazya mirabilis* sp. nov. are currently known. The female specimen was selected as the holotype because the male specimen is teneral.

#### Final remarks

This study advances our understanding of the Brazilian Azyini species, effectively expanding the number from eight to ten: six species of *Azya* (all described previously); and four of *Pseudoazya* (two previously described and two described here: *P. massayo* and *P. mirabilis*).

After plotting the collection locations available on a map, the following can be summarized: (1) *Pseudoazya* has a distribution pattern similar to *Azya* (Gordon, 1980), only one of the 12 species of *Azya* does not occur in South America; (2) *Pseudoazya nana*, *P. massayo* sp. nov. and *P. mirabilis* sp. nov. may be sympatric species.

Our data broadens our knowledge of Azyini, and expands the number of species and distribution of *Pseudoazya*.

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JDM: Conceptualization, Microscopy work and photographs, Writing-original draft preparation, reviewing and editing. DSB: Writing-original draft and photographs. IMML: Field collection and Writing-original draft. LMA: Supervision, Writing-original draft preparation and reviewing.
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