

Blister beetles of genus *Epicauta* Dejean, 1834 (Coleoptera: Meloidae) from Panamá: diversity, distribution and clinical cases

Escarabajos ampollas del género *Epicauta* Dejean, 1834 (Coleoptera: Meloidae) de Panamá: diversidad, distribución y casos clínicos

Roberto J. Miranda^{1,*}, Sergio E. Bermúdez¹, Emilio E. Romero² & Roberto A. Cambra³

¹Departamento de Investigación en Entomología Médica, Instituto Conmemorativo Gorgas de Estudios de la Salud, Panamá, República de Panamá.

²Departamento de Fisiología, Universidad de Panamá, República de Panamá.

³Museo de Invertebrados G. B. Fairchild, Universidad de Panamá, República de Panamá.

*Corresponding author: rmiranda@gorgas.gob.pa

ABSTRACT

The blister beetle genus *Epicauta* Dejean, 1834 from Panamá is revised. The following eight species of *Epicauta* are recognized for Panamá: *E. aragua* Adams & Selander, 1979, *E. carmelita* (Haag-Rutenberg, 1880), *E. caustica* Rojas, 1857, *E. dohrni* Haag-Rutenberg, 1880, *E. flagellaria* (Erichson 1848), *E. grammica* (Fischer, 1827), *E. isthmica* Werner, 1949 and *E. major* Pic, 1924. Information on the species that have caused clinical cases in Panamá is reviewed. An illustrated key to species and distribution in Panamá is included.

KEYWORDS: Neotropic zoogeographic region, taxonomy, dermatozoonoses, species.

RESUMEN

Se revisa el género de escarabajos ampolla *Epicauta* Dejean, 1834 de Panamá. Para Panamá se reconocen las siguientes ocho especies de *Epicauta*: *E. aragua* Adams & Selander, 1979, *E. carmelita* (Haag-Rutenberg, 1880), *E. caustica* Rojas, 1857, *E. dohrni* Haag-Rutenberg, 1880, *E. flagellaria* (Erichson 1848), *E. grammica* (Fischer, 1827), *E. isthmica* Werner, 1949, *E. major* Pic, 1924. Se revisa información sobre las especies que han causado casos clínicos en Panamá. Se incluye una clave ilustrada de las especies y su distribución en Panamá.

PALABRAS CLAVE: especies, dermatozoonosis, región zoogeográfica Neotropical, taxonomía.

INTRODUCTION

Epicauta Dejean, 1834 is a genus of blister beetles, which includes two subgenera and 264 species for America (Campos-Soldini *et al.* 2018), represent approximately 75% of the 361 known species (García-París *et al.* 2016). The species of *Epicauta* have been recorded as causing of clinical cases due to skin conditions known as dermatozoonoses or dermatitis of contact, produced by a blistering substance called cantharidin (Moreno & Maldonado 2016). In Panamá the registered clinical cases are scarce, being Mendez *et al.* (1989)

who report a familiar case caused by *Epicauta flagellaria* and mentioned another by *Epicauta isthmica*. The few publications on the subject could be the result of underdiagnosis or the treated cases are confused with herpes zoster, thus exposing patients to long and expensive treatments (Moreno & Maldonado 2016).

The objective of this work is to carry out a bibliographical review and to examine the collections of the Museo de Invertebrados G. B. Fairchild, Universidad de Panamá and Colección Zoológica "Dr. Eustorgio Méndez", to improve

knowledge about the biodiversity and distribution of *Epicauta* in Panamá. Also, present a key of species with illustrations to facilitate the identification, and report on the clinical cases for Panamá.

MATERIALS AND METHODS

A total of 127 specimens of *Epicauta* from the Museo de Invertebrados G. B. Fairchild, Universidad de Panamá (MIUP) and Colección Zoológica Dr. Eustorgio Méndez, Instituto Conmemorativo Gorgas de Estudios de la Salud (CoZEM-ICGES) were examined. The collection dates of this material range from May 1958 to December 2022. The material was studied using a stereomicroscope Leica S9D coupled with a Leica Flexacam C3. Digital pictures with scale were obtained with the software LASX (Leica Application Suite X). Additional photographs were taken with a Cannon PowerShot SX60 HS

digital camera.

Specimens of *E. aragua*, *E. carmelita*, *E. caustica*, *E. flagellaria* and *E. major* were identified using the key of López-Estrada (2022). Some specimens of *E. isthmica* and *E. flagellaria* (deposited in MIUP) were identified by James E. Wappes (1996) and Wilbur R. Enns (1986) while several specimens of *E. isthmica*, *E. flagellaria* and *E. grammica* (deposited in CoZEM-ICGES) were identified by F. Werner (1988).

The distribution maps for each species (Figs. 5-6) were created using R software (R Core Team 2015) with the geographical coordinates of the localities where the specimens were collected or observed. The localities of the specimens were obtained from previous records in the literature (Pinto 1991, Campos-Soldini *et al.* 2018, López-Estrada *et al.* 2022), of specimens examined and deposited in the MIUP and CoZEM-ICGES collections; also in <https://panamabiota.org/stri/collections/list.php?usethes=1&taxa=48716> and <https://panama.inaturalist.org/taxa/59506-Epicauta>

RESULTS

KEY TO THE SPECIES OF *Epicauta* Dejean, 1834 IN PANAMÁ

(Modified from López-Estrada 2022)

1. Elytral disc with yellowish longitudinal band (Fig. 1 F) 2
- Elytral disc without longitudinal band (Fig. 1A) 4
2. Tarsal claws with similar blades (Fig. 2E); head notoriously cleft in the disc area of the vertex (Fig. 2A); pronotum with median longitudinal band; body length range 18-20 mm *E. caustica*
- Tarsal claws forked with each blade very different from each other (Fig. 2F); head with convex vertex; pronotum without median longitudinal band (Fig. 2C); body length range 10-14 mm 3
3. Male antennae without ridge (carena) on the ventral surface *E. grammica*
- Male antennae with ventral smooth and shiny ridges on antennomeres III-VI (Fig. 4C in López-Estrada *et al.* 2022)
..... *E. aragua*
4. Tegument entirely black (Fig. 1A), a longitudinal red spot might be present in frons (Fig. 3A) *E. major* (in part)
- Tegument of a color other than entirely black 5
5. Pronotum with medial longitudinal line of whitish pilosity or smooth (Fig. 3E) 6
- Pronotum without medial longitudinal stripe (Fig. 3C) 7
6. Medial longitudinal line of pronotum smooth and shiny, without pilosity; antennomeres I and II (scape and pedicel) of males disproportionately large, broad, elongated, and flattened (Fig. 3E)
..... *E. flagellaria*
- Median longitudinal line of pronotum covered by dense whitish pubescence *E. major*
7. Elytra uniformly ferruginous-yellowish, rest of body black (Fig. 1B) *E. carmelita*
- Elytra not ferruginous-yellowish, integument of legs or head partly red 8
8. Disc of pronotum, base and apex of elytra with a pair of subcircular maculae of black setae mostly; head ferruginous, legs black (Fig. 1C, 4A-B) *E. dohrni*
- Pronotum and elytra uniform in coloration, without maculae of black setae; head black, legs partly ferruginous and black (Fig. 1D, 4C-F) *E. isthmica*

Until now, there are eight species of *Epicauta* registered for Panamá: *E. aragua* Adams & Selander, 1979; *E. carmelita* (Haag-Rutenberg, 1880); *E. caustica* Rojas, 1857; *E. dohrni*

Haag-Rutenberg, 1880; *E. flagellaria* (Erichson 1848); *E. grammica* (Fischer, 1827); *E. isthmica* Werner, 1949 and *E. major* Pic, 1924.

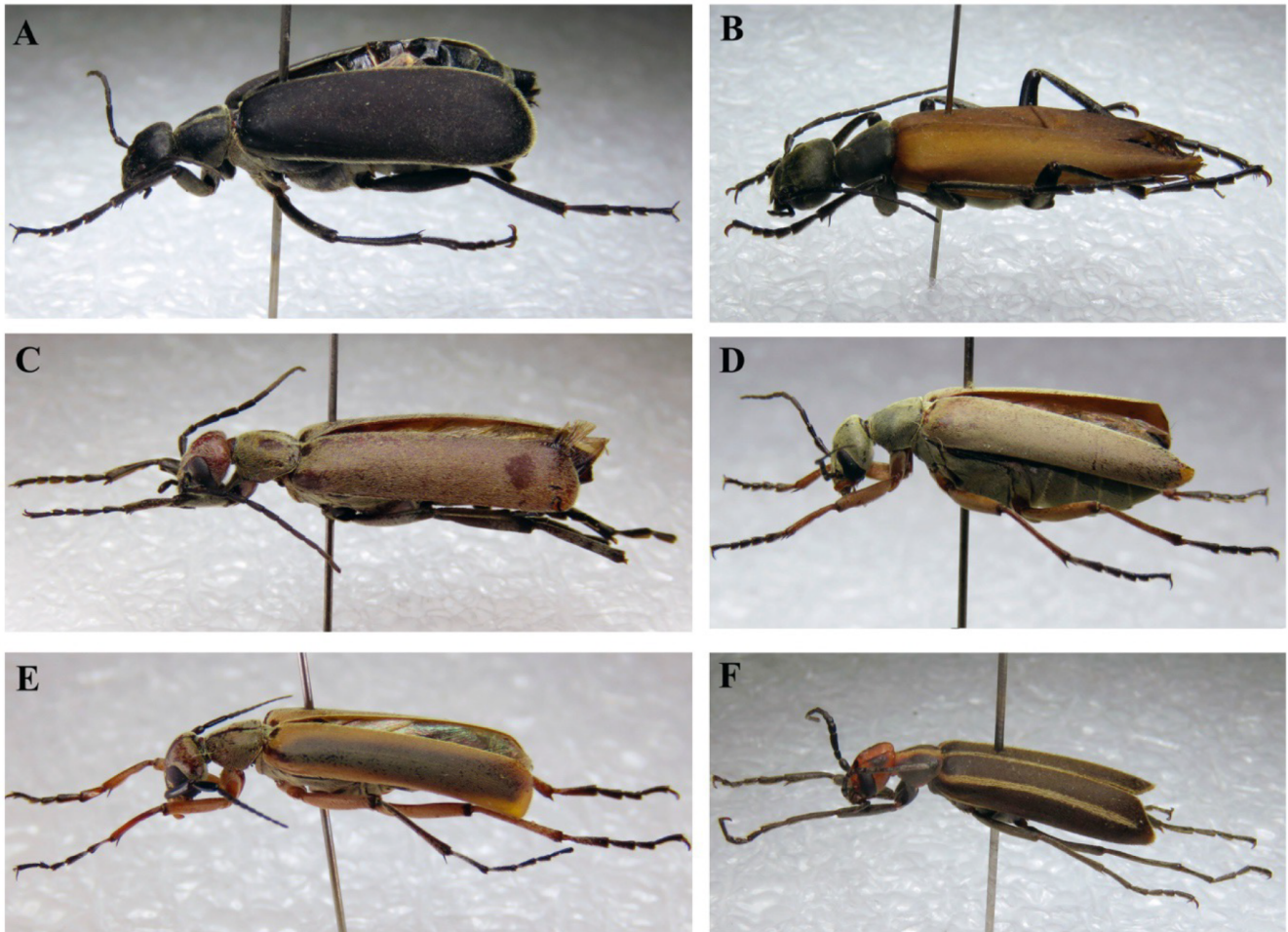


FIGURE 1. *Epicauta* species of Panamá, dorso-lateral habitus: A. *E. major*, B. *E. carmelita*, C. *E. dohrni*, D. *E. isthmica*, E. *E. flagellaria*, F. *E. caustica*. / Especies de *Epicauta* de Panamá, hábito dorsolateral: A. *E. major*, B. *E. carmelita*, C. *E. dohrni*, D. *E. isthmica*, E. *E. flagellaria*, F. *E. caustica*.

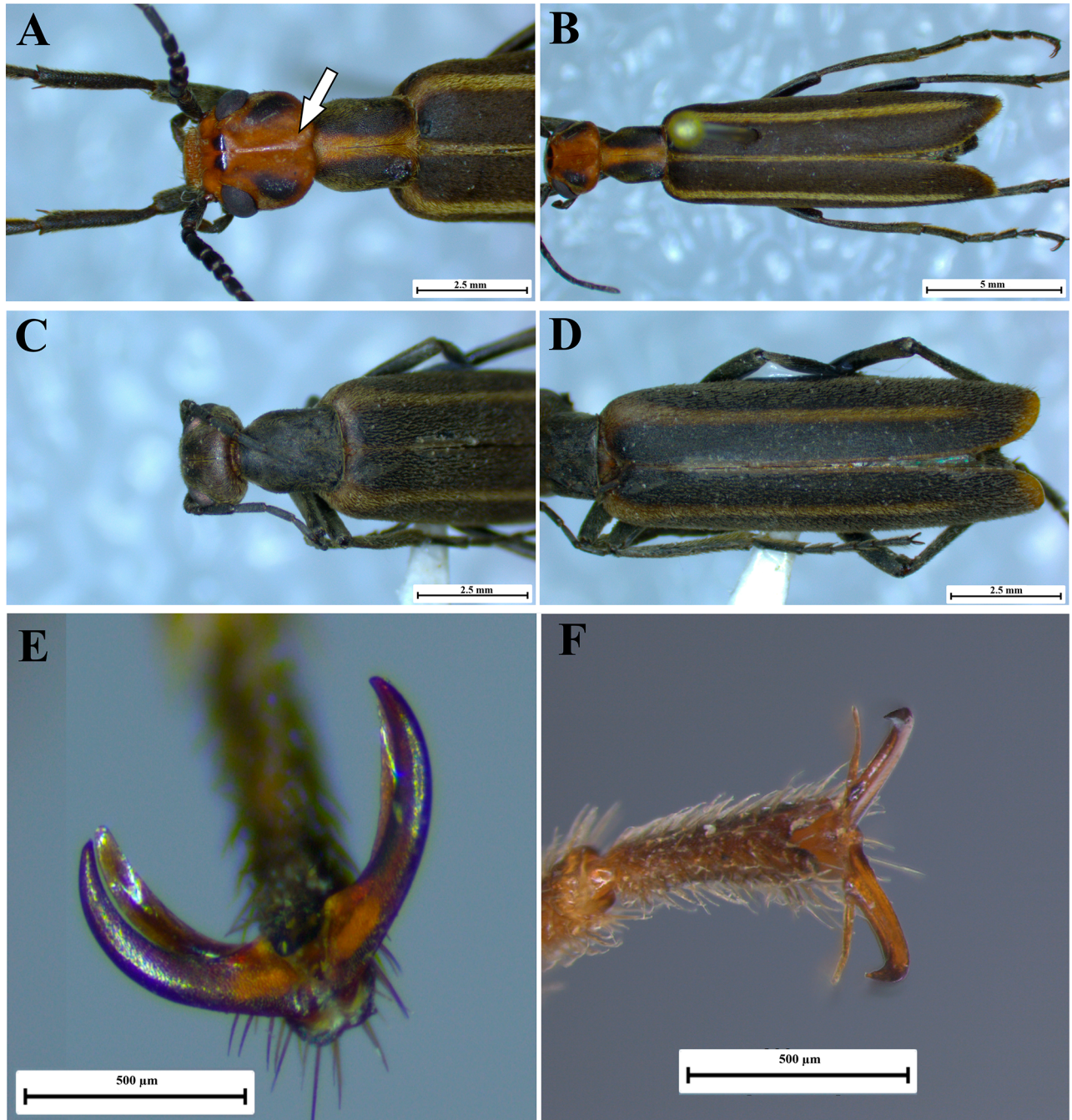


FIGURE 2. *Epicauta* species of Panamá: *Epicauta caustica*, dorsal view of head, pronotum (A, arrow pointed to cleft) and elytra (B); tarsal claws I, ventral view (E); *Epicauta aragua*, dorsal view of head, pronotum (C) and elytra (D); tarsal claws I, ventral view (F). / Especies de *Epicauta* de Panamá: *Epicauta caustica*, vista dorsal de la cabeza, pronoto (A, flecha apuntando a la hendidura) y élitros (B); garras tarsales I, vista ventral (E); *Epicauta aragua*, vista dorsal de la cabeza, pronoto (C) y élitros (D); garras tarsales I, vista ventral (F).

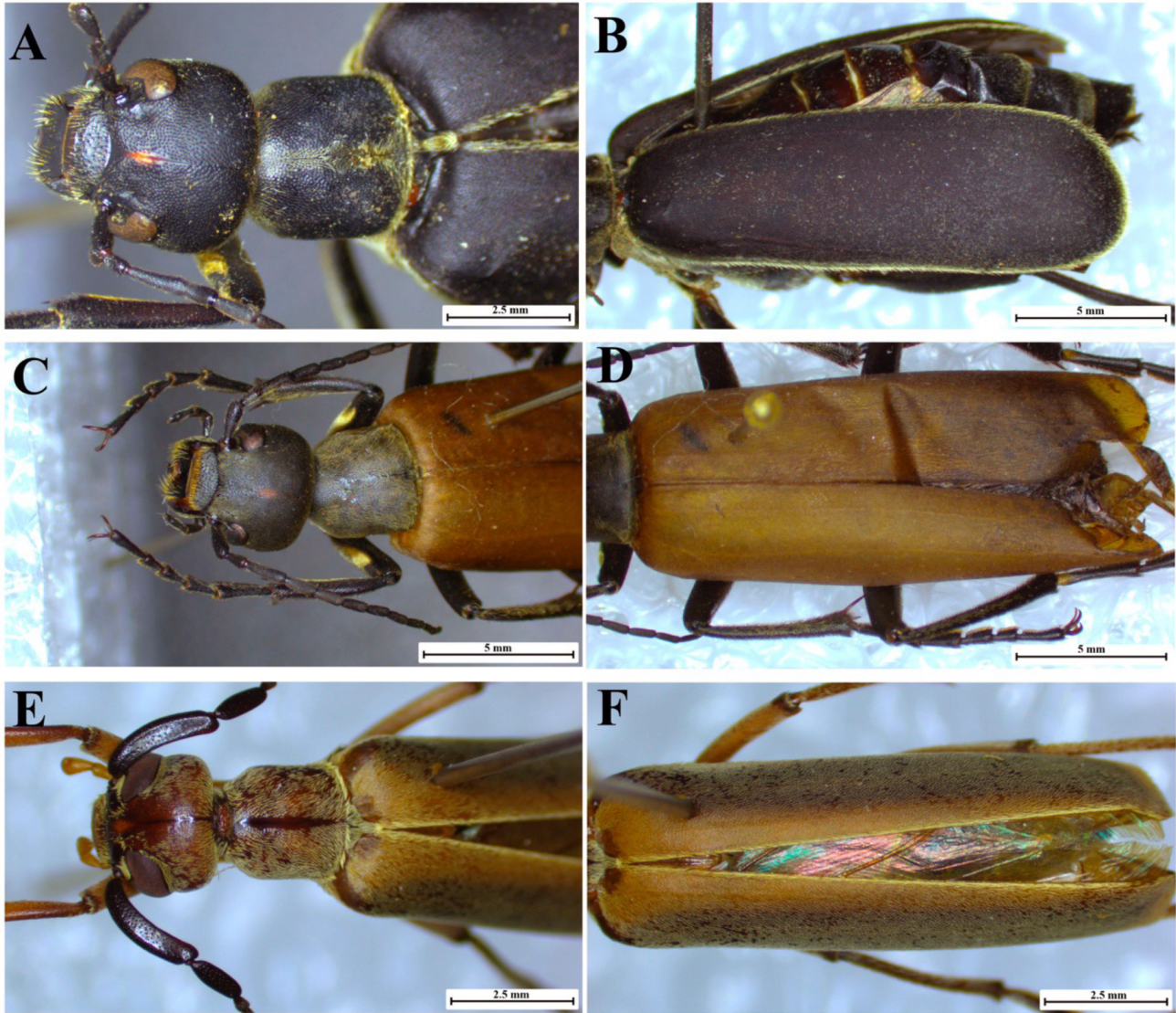


FIGURE 3. Dorsal view of head, pronotum and elytra of *Epicauta major* (A-B), *E. carmelita* (C-D) and *E. flagellaria* (E-F). / Vista dorsal de la cabeza, el pronoto y los élitros de *Epicauta major* (A-B), *E. carmelita* (C-D) y *E. flagellaria* (E-F).

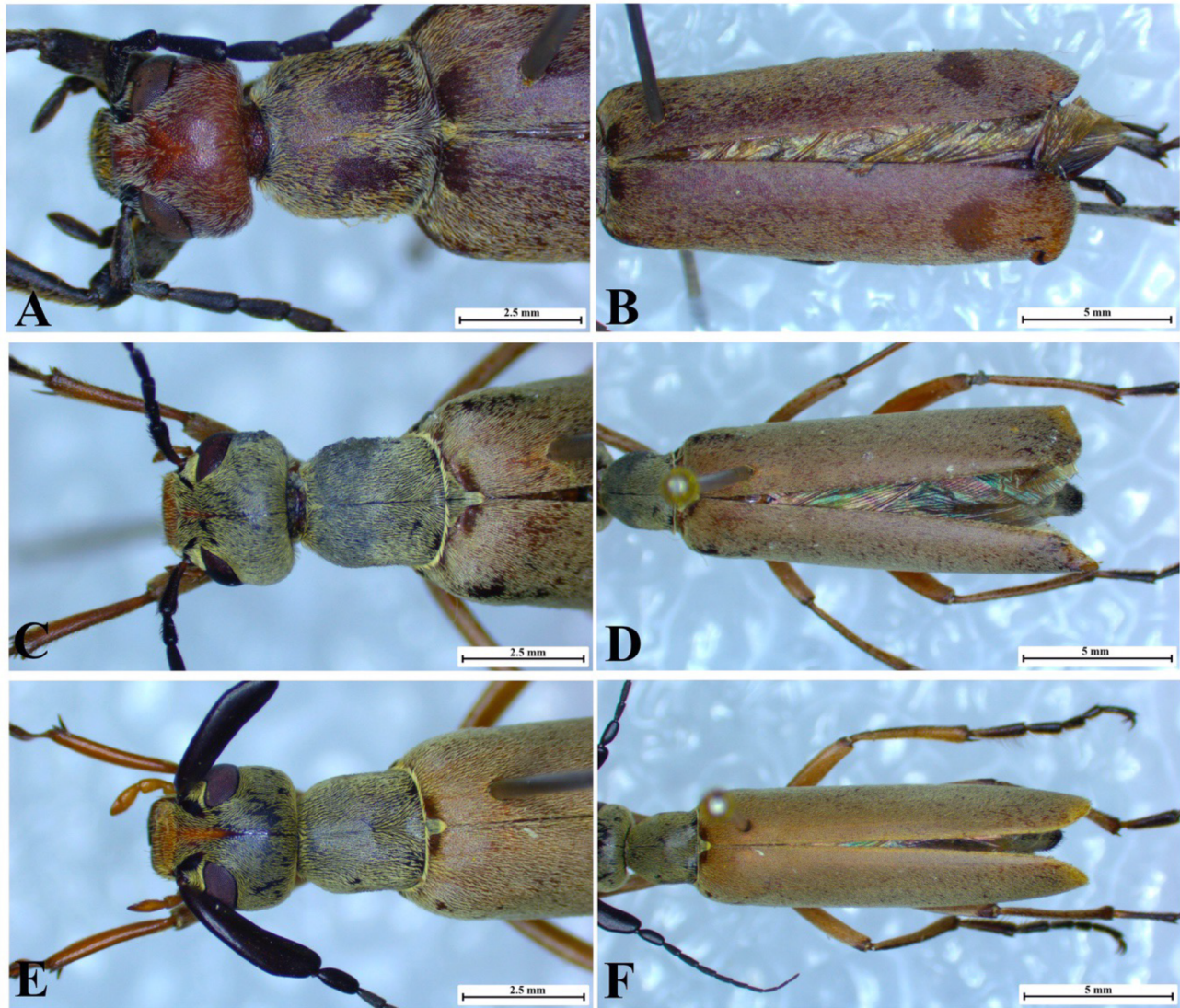


FIGURE 4. Dorsal view of head, pronotum and elytra of *Epicauta dohrni* (A-B), *E. isthmica* female (C-D) and male (E-F). / Vista dorsal de la cabeza, el pronoto y los élitros de *Epicauta dohrni* (A-B), *E. isthmica* hembra (C-D) y macho (E-F).

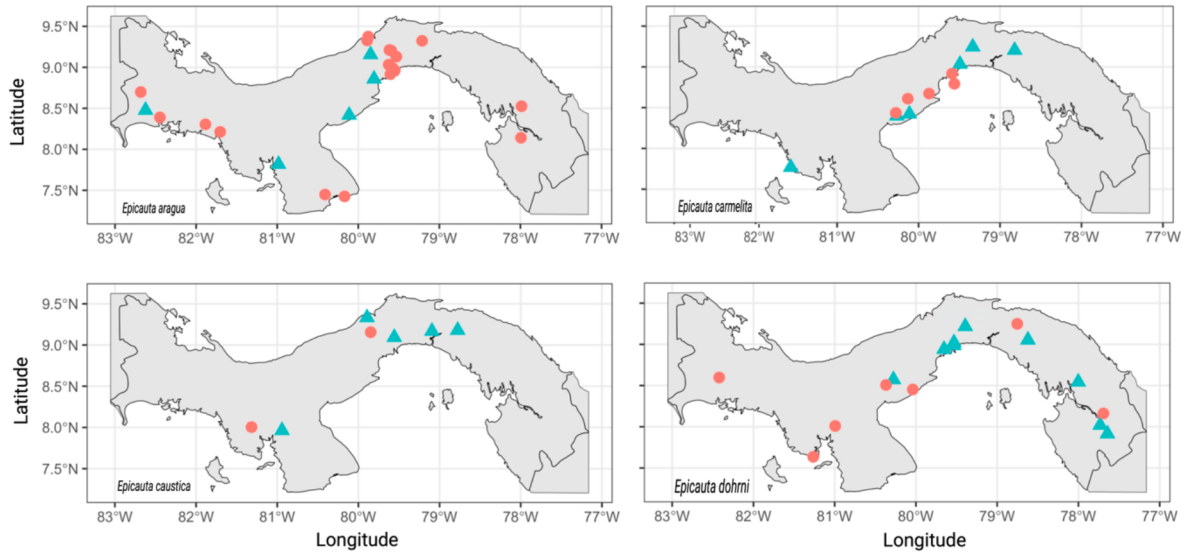


FIGURE 5. Geographical distribution of *Epicauta* species in Panamá: *E. aragua*, *E. carmelita*, *E. caustica* and *E. dohrni*. Triangle= material examined; circle= previous records. / Distribución geográfica de las especies de *Epicauta* en Panamá: *E. aragua*, *E. carmelita*, *E. caustica* y *E. dohrni*. Triángulo= material examinado; círculo= registros anteriores.

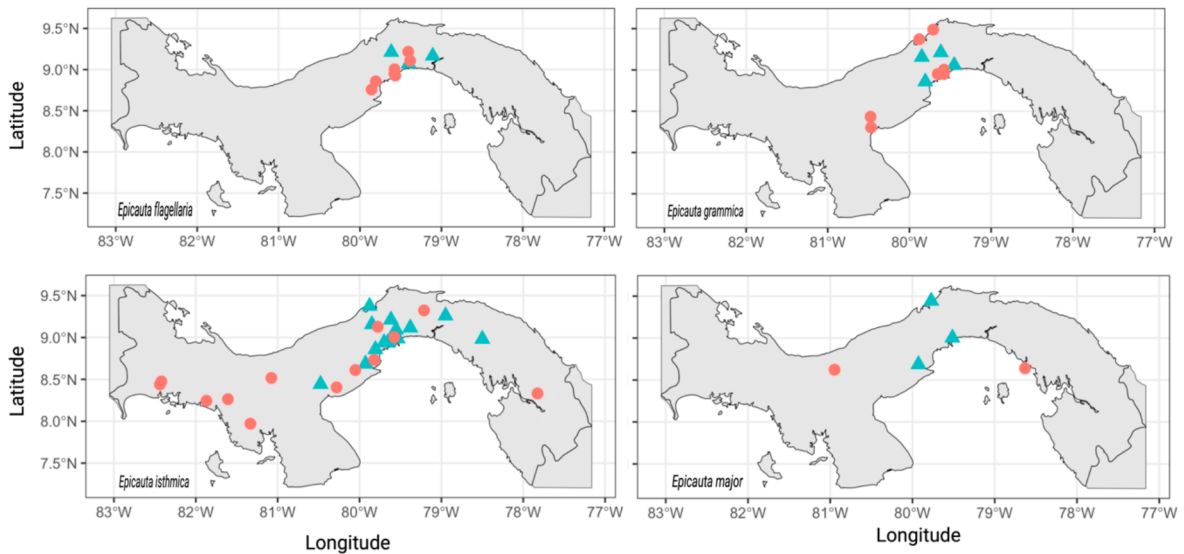


FIGURE 6. Geographical distribution of *Epicauta* species in Panamá: *E. flagellaria*, *E. grammica*, *E. isthmica* and *E. major*. Triangle= material examined; circle= previous records. / Distribución geográfica de las especies de *Epicauta* en Panamá: *E. flagellaria*, *E. grammica*, *E. isthmica* y *E. major*. Triángulo= material examinado; círculo= registros anteriores.

MATERIAL EXAMINED

Epicauta (Epicauta) aragua Adams & Selander, 1979

8 specimens. PANAMÁ: Coclé: Río Hato, 10-VI – 24-VII-1985, (1 MIUP). Chiriquí: Bugaba, 1-2-XI-1985, coll. D. Quintero, R. Cambra (1 MIUP). Panamá Oeste: La Chorrera, 7-VI-1977, coll. C. Brandaris (1 MIUP); La Chorrera, 31-XII-1979, coll. E. Polo (1 MIUP); La Chorrera, Bajo Grande, 17-VI-2009, coll. M. Nuñez (1 MIUP); La Chorrera, vía El Espino, dentro de casa (caso clínico), 19-X-2022, coll. J. Suárez (2 MIUP). Veraguas: Pocrí, NO de Suay, carretera Ponuga a Suay, 31-VII-1982, coll. D. Quintero (1 MIUP).

Distribution: Colombia, Costa Rica, El Salvador, Honduras, Guatemala, Nicaragua, Panamá, Venezuela (Pinto 1991, Maes & Huether 2007, Campos-Soldini *et al.* 2018, López-Estrada *et al.* 2022). Other localities by Campos-Soldini *et al.* (2018) in Panamá are: Canal Zone, Chiriquí and Coclé.

Comments. According to the collection data, an individual of this species was associated with a case of contact dermatitis, reported by an adult man who suffered neck injuries. The collection location was in El Espino, La Chorrera, province of Panamá Oeste (see reviewed material).

Epicauta (Epicauta) carmelita (Haag-Rutenberg, 1880)

9 specimens. PANAMÁ: Coclé: Antón, 1-VIII-1992, coll. R. Rodríguez (2 MIUP); Río Hato, 10-VI-24-VII-1985, (1 MIUP); Valle de Antón, 20-VIII-1979, coll. G. De La Guardia (1 CoZEM-ICGES). Panamá: Cerro Jefe, 1007m, Parque Nacional Chagres, 30-V-1998, coll. B. Eya (1 MIUP); Ciudad de Panamá, Villa Guadalupe, 29-IV-1979, (1 MIUP); Bayano, Viejo Pedro, 14-V-1984, coll. Jara, Cambra, Quintero (1 MIUP). Veraguas: Bahía Honda, Limón, 28-V-2-VI-2002, coll. R. Cambra, A. Santos (2 MIUP).

Distribution: México to Venezuela (García-París *et al.* 2007). Another locality by Campos-Soldini *et al.* (2018) in Panamá: Canal Zone, El Coronero. El Coronero is a locality that does not exist in Panamá; however, it is a place in Venezuela, country where this species is present (RAC, pers. obs.).

Epicauta (Epicauta) caustica Rojas, 1857

5 specimens. PANAMÁ: Panamá: Plataneros de Chepo, 1-VIII-1988, coll. R. Rodríguez (1 MIUP); Bayano, 7-XI-1977, coll. I. Luna (1 MIUP); Las Cumbres (trampa de luz), 31-V – 3-VII-1984, coll. H. Wolda (1 MIUP). Colón: 1-IV-1983, coll. I. Luna (1 MIUP). Veraguas: carretera Atalaya-Ponuga, 27-VI-1982, coll. D. Quintero (1 MIUP).

Distribution: Argentina, Panamá, Paraguay, Venezuela (Selander 1981; Campos-Soldini *et al.* 2018). Other localities

in Panamá: Canal Zone, Barro Colorado Island (Selander 1981b, López-Estrada *et al.* 2022).

Epicauta (Epicauta) grammica (Fischer, 1827)

12 specimens. Panamá: ciudad de Panamá, Cerro Viento, 25-V-1987, coll. R. Ayala (1 MIUP); Isla Barro Colorado, C.Z., 9-V-1977, H. Wolda (1 MIUP); Clayton, 18-VII-1967, coll. E. Taylor (1 CoZEM-ICGES). Panamá Oeste: La Chorrera, 20-I-1980, coll. E. Polo (1 MIUP); La Chorrera, El Nazareno, 15-V-1986, coll. M. Guardia (1 MIUP); Roadman, 18-II-1988, coll. M. Correa (3 CoZEM-ICGES). Colón: puente sobre represa Madden, límite Panamá-Colón, 30-V-1984, coll. Quintero, Jara, Cambra (1 MIUP); Madden forest, 1-VI-1973, coll. E. Méndez, M. Correa (3 CoZEM-ICGES).

Distribution: Argentina, Bolivia, Brazil, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Panamá, Paraguay and Uruguay (Campos-Soldini *et al.* 2018).

Comments. Similar species: *Epicauta aragua* and *Epicauta apure* Adams & Selander, 1979.

Epicauta aragua is easily distinguished from the *E. grammica* and *E. apure* by the male antennae with ventral smooth and shiny ridges on antennomeres III–VI (López-Estrada *et al.* 2022). In the description of *E. apure*, the authors not provided solid characteristics to differentiate it from *E. grammica* (Adams & Selander, 1979), and López-Estrada *et al.* (2022), consider that both species require review in order to establish the morphological limits between them. Distribution of *Epicauta apure* includes Venezuela, Trinidad and Tobago (Campos-Soldini *et al.* 2018, López-Estrada *et al.* 2022).

Epicauta (Epicauta) major Pic, 1924

13 specimens. PANAMÁ: Colón: Playa Escondida, 13-XI-1979 (1 MIUP). Panamá: Ciudad de Panamá, Carrasquilla, 15-I-1979, coll. M. Marquinez (1 MIUP). Panamá Oeste: alturas de Cerro Campana, quebrada Anguilloso, 8-9-IV-1977, coll. D. Quintero, A. Araúz (11 MIUP).

Distribution. Costa Rica, Guatemala, Honduras, México, Panamá, Venezuela (Campos-Soldini *et al.* 2018, López-Estrada *et al.* 2022). Another locality by Campos-Soldini *et al.* (2018) in Panamá: Cerro Salud in Maje Island (Panamá Province).

Epicauta (Macrobasis) dohrni (Haag-Rutenberg, 1880)

17 specimens. PANAMÁ: Coclé: Churuquita Chiquita, 16-II-1999, coll. S. Bermúdez (1 MIUP); Darién: Villa Darién, 18-II-1984, coll. M. García (1 MIUP); Parque Nacional Darién, estación Cruce de Mono (7.9148°, -77.6426°), 15-28-II-1993, coll. R. Cambra, J. Coronado (1 MIUP); Parque Nacional Darién, Pirre, estación Rancho Frío, 80m, malaise trap, 16-

XI-2000 – 17-I-2001, coll. R. Cambra, A. Santos (1 MIUP). **Panamá:** Ciudad de Panamá, Tumba Muerto, 21-II-1982, coll. X. Luna (3 MIUP); bosque Tumba Muerto, 8-III-1981, coll. S. Buitrago (3 MIUP); Tumba Muerto, 29-III-1981, coll. A. Fernández (2 MIUP); Loma Bonita, 10-X-1984, coll. I. Luna (1 MIUP); Altos de las Acacias, 2-VII-1983, (1 MIUP); ciudad de Panamá, campus universitario, 9-VIII-1982, coll. M. García (1 MIUP); Cerro Azul, 28-II-1982, coll. L. de la Rosa (1 MIUP); Piriati, 8-IV-1978, (1 MIUP).

Distribution: Colombia, Panamá (García-París *et al.* 2007).

Epicauta (Macrobasis) flagellaria (Erichson 1848)

12 specimens. PANAMÁ: **Colón:** puente sobre represa Madden, límite Panamá-Colón, 30-V-1984, coll. Quintero, Jara, Cambra (1 MIUP); Gamboa, 20-VI-1980, coll. N. Roja (1 CoZEM-ICGES). **Panamá:** Hotel Riande Aeropuerto, 13-V-1996, coll. Wappes, Huether, Morris (1 MIUP); Chepo, 26-IV-1987, coll. E. Robles (1 MIUP); Clayton, 5-V-1986, coll. Bone (1 CoZEM-ICGES); Cerro Azul, 2-V-1976, coll. R. Rojas (1 CoZEM-ICGES); Tocumen, 16-V-1989, coll. E. González (3 CoZEM-ICGES). **Panamá:** Capira, 20-III-1996. Coll. M. Trute (1 CoZEM-ICGES); Farfan, 26-IV-1988, coll. M. Correa (1 CoZEM-ICGES); Roadman, 18-II-1988.18-2-1988, coll. M. Correa (1 CoZEM-ICGES).

Distribution: Colombia, Guyana, Panamá, Trinidad and Tobago, Venezuela (Erichson 1848, Blackwelder 1945, Pinto 1991, López-Estrada *et al.* 2022). In Panamá: La Chorrera (98-146), R.B. Selander det. 1954 (López-Estrada *et al.* 2022).

Epicauta (Macrobasis) isthmica Werner, 1949

59 specimens. PANAMÁ: **Coclé:** orillas de Río Grande, 9-XI-1978, coll. M. Guerra (1 MIUP). **Colón:** puente sobre represa Madden, límite Panamá-Colón, 30-V-1984, coll. Quintero, Jara, Cambra (11 MIUP); represa Madden (atraídos por luz, 2 a.m.), 11-V-1986, coll. D. Quintero (6 MIUP); Hospital Coco Solo, C.Z., 31-V-1984, coll. D. Engleman (1 MIUP). **Panamá:** Isla Barro Colorado (trampa luz), 26-VI-1984, coll. H. Wolda (4 MIUP); I. Barro Colorado (trampa luz), 17-V-1977, coll. H. Wolda (1 MIUP); Isla Barro Colorado (trampa luz), 5-VI-1977, coll. H. Wolda (1 MIUP); Bayano, 12-V-1979, coll. C. de Castro (2 MIUP); Bayano, 2.5 km W Ipeti, 11-22-V-1996, Wappes, Huether, Morris (2 MIUP); Tocumen, 1-III-1981, coll. L. Ferrer (1 MIUP); Las Cumbres, 21-X-2017, coll. A. Jácome (1 MIUP); km 8-13 El Llano – Carti road, 10-13-V-1986, coll. Wappes, Huether, Morris (3 MIUP); ciudad de Panamá, campus universitario, 26-IV-1978, coll. I. Luna (1 MIUP); Altos de Las Acacias, 10-X-1982, coll. I. Luna (1 MIUP); Clayton, 5-V-1986, coll. Bone (2 CoZEM-ICGES), 18-VII-1967, coll. E Taylor (1 CoZEM-ICGES). **Panamá:** Cerro Campana, Los Llanitos, 13-VI-2002, coll. M. Nuñez (1 MIUP); La Chorrera,

7-VI-1977, coll. C. Brandaris (2 MIUP); La Chorrera, 16-X-1978, coll. I. Luna (1 MIUP), 1-VI-1966, coll. A. Quintero (2 CoZEM-ICGES); Arraiján, Vista Alegre, 2-V-1987, coll. M. Lu (1 MIUP); Arraiján, Vista Alegre, 30-IV-1987, coll. R. Córdoba (1 MIUP); Capira, Cermeño, 14-IV-1980 (5 CoZEM-ICGES). **Colón:** Juan Mina, 15-V-1985, coll. N. Roja (5 CoZEM-ICGES). **Distribution:** Belize, Costa Rica, Guatemala, Honduras, México, Nicaragua, Panamá (García-París *et al.* 2007, Campos-Soldini *et al.* 2018, Zack *et al.* 2023).

DISCUSSION

This update of the distribution of *Epicauta* species in Panama seem to reinforces the old records of localities in lands below 1000 m elevation. Moreover, the largest number of records were in urban or rural areas, which could be due to the fact that some species demonstrate attraction towards artificial light, a fact demonstrable by the records of *E. caustica*, *E. grammica*, and *E. flagellaria* in light traps. In this sense, López-Estrada *et al.* (2022) mentions that *E. caustica* and *E. aragua* have nocturnal activity, which could be a behavior extended to other species. However, more specific collection efforts could increase data in other provinces or regions of Panama, mainly on the Caribbean side of the country, poorly represented in our data.

This paper reports the first case of *E. aragua* causing dermatitis in Panamá, increasing to three species of this genus with confirmed reports of this type of damage in people, taking as a reference what was pointed out by Méndez *et al.* (1989) for *E. flagellaria* and *E. isthmica* in Tocumen (eastern Panamá province). Due to the distribution of this genus in the country, it is possible that there is an underreporting of cases, similar to what could happen with other insects that cause skin problems (Cáceres *et al.* 2017).

On the other hand, knowing the distribution and species present in the country could favor future studies on the composition of the secretions they produce, considering the therapeutic use of *Lytta vesicatoria* in the treatment of warts or viral blisters such as molluscum contagiosum (Pomar Ladaria *et al.* 2009).

ACKNOWLEDGEMENTS

We are grateful to Estefany Karen López-Estrada, Museo de Ciencias Naturales, Madrid, España, for their thoughtful and critical review, and the suggestions made to improve the manuscript.

REFERENCES

- Adams, C.L., Selander, R.B. 1979. The biology of blister beetles of the *vittata* group of the genus *Epicauta* (Coleoptera, Meloidae). *Bulletin of the American Museum of Natural History*, 162: 139-266.
- Blackwelder, R.E. 1945. Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. Part 3. United States National Museum Bulletin, 185: 343-550.
- Cáceres, L., Suarez, J.A., Jackman, C., Gabster, A., Miranda, R., Murgas, I., Pascale, J., Sosa, N., Rodríguez-Morales, A.J. 2017. Dermatitis due *Paederus columbinus*: Report of an epidemic outbreak of 68 cases in the Province of Darien, Panama. *Cureus* 9(4): e1158. <https://doi.org/10.7759/cureus.1158>
- Campos-Soldini, M.P., Safenraiter, M.E., Wagner, L.S., Fernández, E.N., Sequín, C.J. 2018. Checklist of *Epicauta* Dejean from America (Meloidae, Meloinae, Epicautini). *ZooKeys* 807: 47-125. <https://doi.org/10.3897/zookeys.807.23375>
- García-París, M., Buckley, D. Parra-Olea, G. 2007. Catálogo taxonómico-geográfico de los coleópteros de la familia Meloidae de México. *Graellsia* 63(2): 165-258.
- García-París, M., Ruiz, J.L., Sánchez-Vialas, A., López-Estrada, E.K. 2016. Una especie nueva de *Epicauta* de Venezuela y comentarios sobre el grupo de especies de *Epicauta* (E.) *vittata* (Coleoptera: Meloidae). *Revista Mexicana de Biodiversidad* 87(3): 944-955. <http://dx.doi.org/10.1016/j.rmb.2016.07.016>
- Erichson, W.F. 1848. Vol. 3. Die Insekten, pp. 533-617. In: Schomburgk, R. *Reisen in Britisch-Guiana in den Jahren 1840-1844*. J.J. Weber, Leipzig.
- López-Estrada, K.E., Sánchez-Vialas, A., Manzanilla, J., Piñango, C., Ruiz, J.L., García-París, M. 2022. An overview of taxonomy and geographic distribution of Venezuelan *Epicauta* (Coleoptera: Meloidae). *Annales Zoologici (Warszawa)* 72(1): 9-47.
- Maes, J.M., Huether, J.P. 2007. Catálogo ilustrado de los Meloidae (Coleoptera) de Nicaragua y otras especies contenidas en las colecciones del Museo Entomológico de León. *Revista nicaragüense de Entomología* 67 (Suplemento 3). 90 pp. <http://www.bio-nica.info/RevNicaEntomo/67-2007-S3.pdf>
- Méndez, E., Sáenz, R.E., Johnson, C.M. 1989. Dermatitis ampollar causada por la especie *Epicauta flagellaria* (Erichson) (Coleoptera: Meloidae). *Revista Médica de Panamá* 14: 139-144.
- Moreno, M., Maldonado, P. 2016. Dermatozoonosis inespecífica por coleóptero. Reporte de tres casos en la región del Chaco Paraguayo. *Revista de Salud Pública del Paraguay* 6(1): 56-60.
- Pinto, J.D. 1991. The taxonomy of North American *Epicauta* (Coleoptera: Meloidae) with a revision of the nominate subgenus and a survey of courtship behavior. *University of California Publications in Entomology* 110: 1-372.
- Pomar Ladaria, I.B., Perales, J.I., Romera Santa Bárbara, B., Sancho Gracia, E., Justa Roldán, M.L., García Jiménez, M.C. 2009. Intoxicación por cantaridina tras su uso terapéutico en molluscum contagiosum diseminado. *Pediatría de Atención Primaria* 11 (Supl 17): e6.
- R Core Team. 2015. R: A language and environment for statistical computing. R Foundation for Statistical Computing. Vienna, Austria. Retrieved from <https://www.R-project.org>
- Selander, R.B. 1981. The Caustica Group of the genus *Epicauta* (Coleoptera: Meloidae). *Proceedings of the Entomological Society of Washington* 83(4): 573-591.
- Zack, R.S., Monzón, J., Huether, J.P., Huether, M.K., Landolt, P.J. 2023. New country records of blister beetles (Coleoptera: Meloidae) from Guatemala with distributional notes on other meloid species and a record of human blistering caused by *Epicauta* (*Macrobasis*) *forticornis* Haag-Rutenberg, 1880. *The Pan-Pacific Entomologist* 99(3): 169-182. <https://doi.org/10.3956/2022-99.3.169>

Received: 08.05.2024

Accepted: 07.08.2024