

## On the presence of *Cissites maculata* (Coleoptera: Meloidae) in Mexico

### Sobre la presencia de *Cissites maculata* (Coleoptera: Meloidae) en México

Mario García-París<sup>1</sup>✉, Celeigher Piñango<sup>2</sup>, Jesús Manzanilla<sup>2</sup> and Alejandro Zaldívar-Riverón<sup>3</sup>

<sup>1</sup>Museo Nacional de Ciencias Naturales, Consejo Superior de Investigaciones Científicas. José Gutiérrez Abascal, 2, 28006 Madrid, Spain.

<sup>2</sup>Museo del Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela. Maracay, 2101-A, Aragua, Venezuela.

<sup>3</sup>Colección Nacional de Insectos, Instituto de Biología, Universidad Nacional Autónoma de México. 3er. circuito exterior s/n, Cd. Universitaria, Copilco. Apartado postal 70-233, 04510 México, D. F., Mexico.

✉ mparis@mncn.csic.es

**Abstract.** The presumed sympatry and validity of morphological diagnostic characters used to separate the only 2 described species of *Cissites* (Coleoptera: Meloidae), *C. maculata* (Swederus) and *C. auriculata* Champion, are assessed. Morphological diagnostic features between both species (head shape, antennae length, thorax shape, first metatarsal segment length, and elytral coloration) are constant over their entire geographic distribution, without the existence of intermediate morphs. Regional sympatry between these species was found in central Mexico, confirming the presence of *C. maculata* in Central America and Mexico, whereas *C. auriculata*, widely distributed in Central America, has not colonized South America. Sequences of the mitochondrial gene cytochrome oxidase were obtained from single Mexican specimens of each species. Divergence between the sequences is considerably high (14.5%), suggesting separation of both species as a result of an ancient cladogenetic event.

Key words: Nemognathinae, Mexico, South America, sympatry, COI.

**Resumen.** Se investiga la probable simpatria y validez de los caracteres morfológicos diagnósticos empleados para distinguir a las 2 únicas especies de *Cissites* (Coleoptera: Meloidae), *C. maculata* (Swederus) y *C. auriculata* Champion. Los caracteres morfológicos diagnósticos de ambas especies (forma de la cabeza, longitud antenal, forma del tórax, longitud del primer segmento del metatarso y color de élitros) son constantes a lo largo de toda su distribución geográfica, sin existencia de formas intermedias. Se encontró simpatria regional entre ambas especies en el centro de México, confirmándose la presencia de *C. maculata* en América Central, mientras que *C. auriculata*, ampliamente distribuida en América Central, no ha colonizado América del Sur. Las secuencias del gen mitocondrial citocromo oxidasa, obtenidas a partir de un ejemplar mexicano de cada especie, muestran una divergencia considerablemente alta (14.5%), por lo que la separación entre ambas especies sería consecuencia de un evento cladogenético muy antiguo.

Palabras clave: Nemognathinae, México, América del Sur, simpatria, COI.

#### Introduction

Beetles of the subfamily Nemognathinae (Coleoptera: Meloidae) are represented in the Americas by species classified in 2 tribes: Horiini and Nemognathini (Pinto and Bologna, 1999). American Nemognathini are represented by about 130 species grouped in 8 genera, whereas the New World fauna of Horiini only has 2 species, both in the genus *Cissites* Latreille, 1804: *C. maculata* (Swederus, 1787) and *C. auriculata* Champion, 1892. According to literature, the geographic distribution of the New World species of *Cissites* appears to be mostly parapatric. *Cissites maculata* occurs from northern Argentina and Brazil to Panama and the Antilles (Selander and Bouseman, 1960;

Genaro, 1996), with questionable isolated records in Costa Rica, Nicaragua, Mexico (Champion, 1892; Enns, 1958), and southern United States (Champion, 1892; Enns, 1958; Werner et al., 1966). The geographic range of *C. auriculata* extends from Costa Rica to northern Mexico and southern United States (Champion, 1892; Enns, 1958; Maes, 1989; Lewis, 2004; Maes and Huether, 2007; García-París et al. 2007, 2009). Records of *C. auriculata* from the Antilles (Champion, 1892; Leng and Mutchler, 1914; Blackwelder, 1945) require confirmation according to Enns (1958) and Selander and Bouseman (1960). This last species was introduced in Hawaii, apparently without success (Bianchi, 1962; Pinto and Bologna, 1999).

Since the discovery and description of *C. auriculata* (Champion, 1892), all previous records of *C. maculata* (Swederus, 1787) located north of Panama have been questioned or discarded. Rejection of records previous to

Champion (1892) was based in objective reasons, because at that time only *C. maculata* was known, and consequently all subsequently revised material certainly corresponded to *C. auriculata*. This is apparently the case of Dugès' (1869, 1889) records of *C. maculata* from Colima, which were transferred to *C. auriculata* by Champion (1892). In other cases, however, rejection was made only based on the implicit assumption that both species would not occur sympatrically. As a result, records of *C. maculata* within the geographic area of *C. auriculata* would be treated as erroneously labeled or accidentally introduced (Werner et al., 1966). Such were considered, for example, the Mexican records of *C. maculata* of Champion (1892) from Morelia (Michoacán), or Enns' (1958) records from Arizona. Those uncertainties led García-París et al. (2007) to conclude that *C. maculata* probably had to be excluded from the Mexican fauna of Meloidae. With this large amount of possible erroneous historical identifications or labeling mistakes it is easy to believe that *C. maculata* and *C. auriculata* are easy to confuse with each other; however, despite a common general facies, and considerable sexual and intrapopulational variability, the specific characters reported by Champion (1892) have not been challenged for consistent species identification.

In order to shed light on the geographic distribution and presumable sympatry between *C. maculata* and *C. auriculata*, we revised 2 large series of *Cissites* from Mexico and Venezuela. Our objectives were to determine the validity of morphological diagnostic characters used to separate *C. maculata* and *C. auriculata*, to document the existence of regional sympatry between the 2 taxa in Mexico, and to determine mitochondrial differentiation level between single Mexican specimens of each taxon.

## Materials and methods

Adult specimens of *Cissites* are nowadays difficult to find in the field; most old collections consist of isolated specimens found casually wandering on wood houses (Champion, 1892). Recent collections are mostly made at light, and large series from a given locality are generally unavailable. Fortunately, 2 large series of *Cissites*, including multiple localities, but also a number of specimens from single localities, were available for study in scientific collections. These series are the basis for our work. One series contains 65 specimens from Mexico, which are held at the Colección Nacional de Insectos, Instituto de Biología (CNIN-IBUNAM), and the Estación de Biología de Chamela (EBCH-UNAM), both administrated by the Universidad Nacional Autónoma de México. A second series consists of 171 specimens from Venezuela, Colombia

and Peru, held at the collection of the Museo del Instituto de Zoología Agrícola de la Universidad Nacional de Venezuela (Maracay) (MIZA). Five additional specimens from Ecuador, French Guiana, Dominican Republic, and Trinidad and Tobago, were examined in the collection of Marco Bologna at the Università degli Studi, Roma Tre (Italy) (MAB) (Appendix).

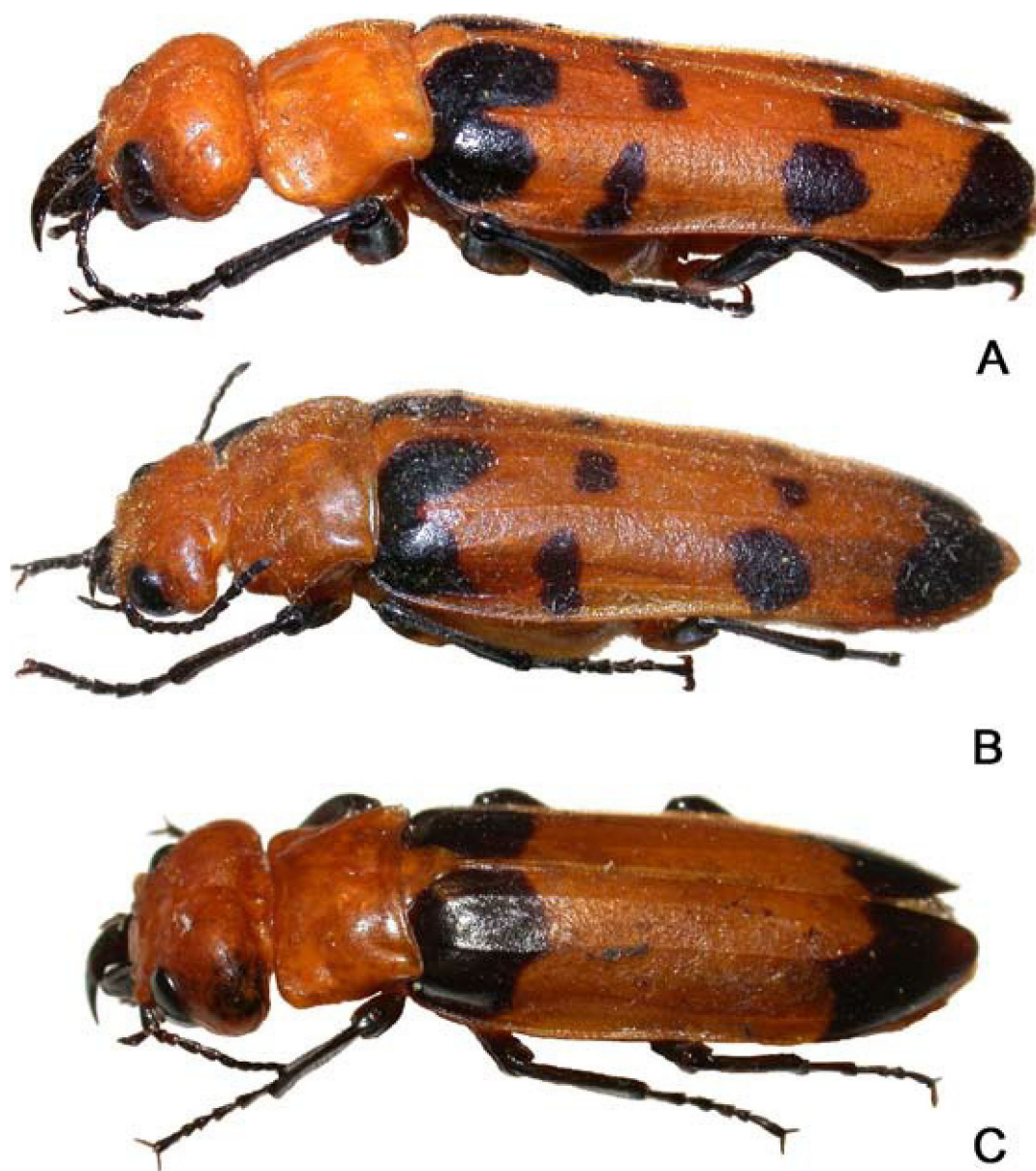
External morphology was studied under a stereomicroscope. Habitus and morphological details were photographed with a Nikon digital camera. For morphological descriptions we follow Enns (1958).

A 658 bp fragment of the cytochrome oxidase I mitochondrial DNA gene, was generated for 2 specimens of *Cissites* following Alcobendas et al. (2008) procedures (HF586634 *C. auriculata* y HF586635 *C. maculata*). These specimens, each morphologically assignable to *C. maculata* and *C. auriculata* following Champion's (1892) criteria, were obtained from nocturnal inspection of building lights in Estación de Biología de Los Tuxtlas (Veracruz) and Estación de Biología de Chamela (Jalisco) respectively, both administrated by the Instituto de Biología (UNAM). These 2 specimens were the only individuals found after 8 and 3 visits made to Chamela and Los Tuxtlas regions during 3 years and 2 years, respectively (including settings of UV light traps).

## Results

*Morphological diagnostic characters.* Adult specimens of *Cissites* are easily identified as such among Neotropical and Nearctic Coleoptera based on their characteristic habitus. Large size, buprestoid shape, orange-red coloration spotted with large irregular black dots, large prothorax, large wide head, with oversized black mandibles in males, give to *Cissites* an unmistakably appearance (Figs. 1-4).

According to Champion (1892), the 2 species currently included in *Cissites* are diagnosed by differences in head shape, antennae length, thorax shape, first metatarsal segment length, and to a lesser extent, elytral coloration. Champion's (1892) description of *C. auriculata* is precise, and allows a readily and accurate identification of specimens of both sexes; however, individual variation is extreme in Mexican samples. This is particularly evident in male head and prothorax shape, which seems to vary in relation to specimen size. Large males of *C. auriculata* show marked bumps in head temples, strong and robust prominent mandibles, and a much more robust and subcylindrical prothorax (Figs. 2, 4). A similar variation pattern occurs within *C. maculata* (Figs. 1, 3), in which larger males present the anterior portion of the pronotum wider than the base, as already indicated by Champion (1892). Specimens with reduced black elytral pattern,

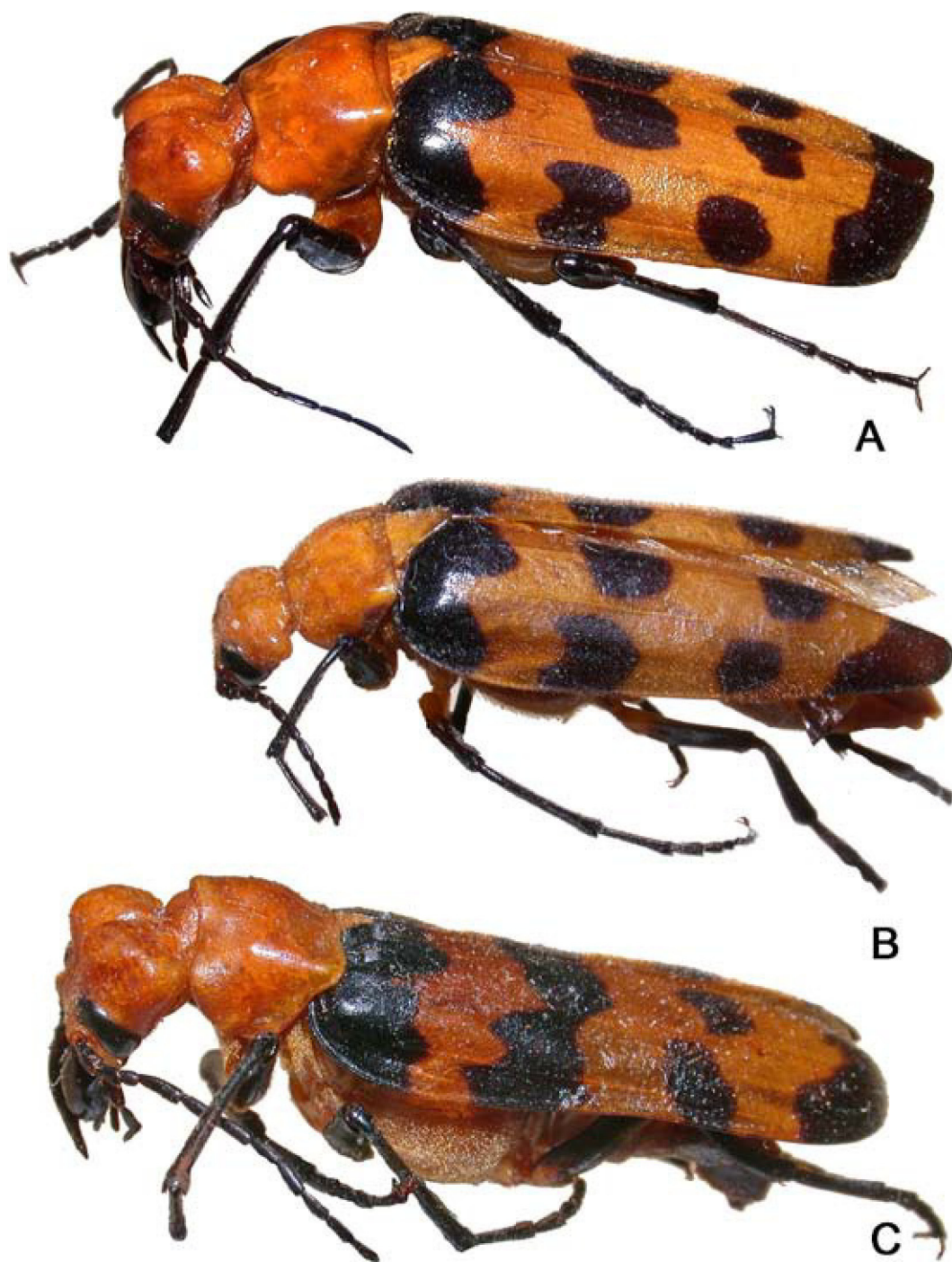


**Figure 1.** Habitus of selected specimens of *C. maculata*. A, male (Los Tuxtlas, Veracruz, Mexico); B, female (Los Tuxtlas, Veracruz, Mexico); C, specimen showing a color variant (Cerro Aracamuni, T. F. Amazonas, Venezuela).

or totally black, were reported amongst normal colored specimens of *C. maculata* (Perty, 1830; Pic, 1929; Betrem, 1932).

Champion's (1892) diagnostic characters were checked in our examined specimens. The head in *C. maculata* is flattened or broadly depressed frontally, while it is narrowly and more deeply incised in *C. auriculata*. Antennae are comparatively shorter in *C. maculata* than in *C. auriculata*, both in males and females. Thorax strongly transverse (length / width ratio= 0.61, n= 10) and with anterior angles

raised in *C. maculata*, while it is less transverse, almost subquadrate (in some specimens it actually looks longer than wide at naked eye) (length / width ratio= 0.76, n= 12) and with anterior angles deflexed in *C. auriculata* (Figs. 3, 4). First metatarsal segment clearly shorter than the following articles together in *C. maculata* (first segment vs. 2 to 4 segments length ratio= 0.68, n= 10), subequal or slightly shorter in *C. auriculata* (first segment vs. 2 to 4 segments length ratio= 0.96, n= 11). Coloration pattern is quite similar in specimens of both species, but

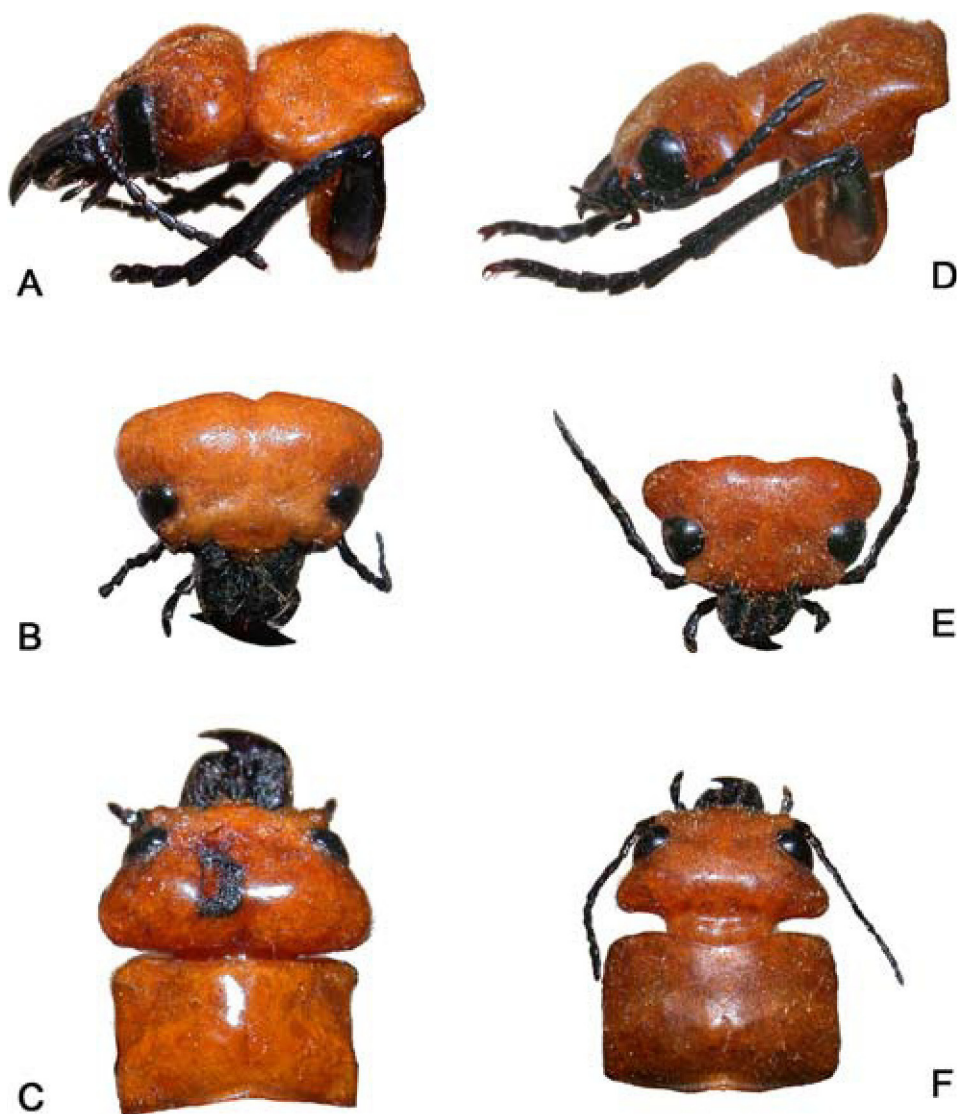


**Figure 2.** Habitus of selected specimens of *C. auriculata*. A, male (Playa Azul, Veracruz, Mexico); B, female (Chamela, Jalisco, Mexico); C, male (Valle de Bravo, Estado de México, Mexico).

in *C. maculata* the spots on central areas of the elytra are generally smaller (Figs. 1c, d) disappearing completely in some specimens. In contrast, in *C. auriculata* medial elytral spots are larger, and, following Champion's (1892)

terminology, the antemedial juxta-sutural spots are fused along the suture forming a transverse large black patch (Figs. 2a, c). Individual variation across Champion's (1892) diagnostic characters is minimal, and allows separation of





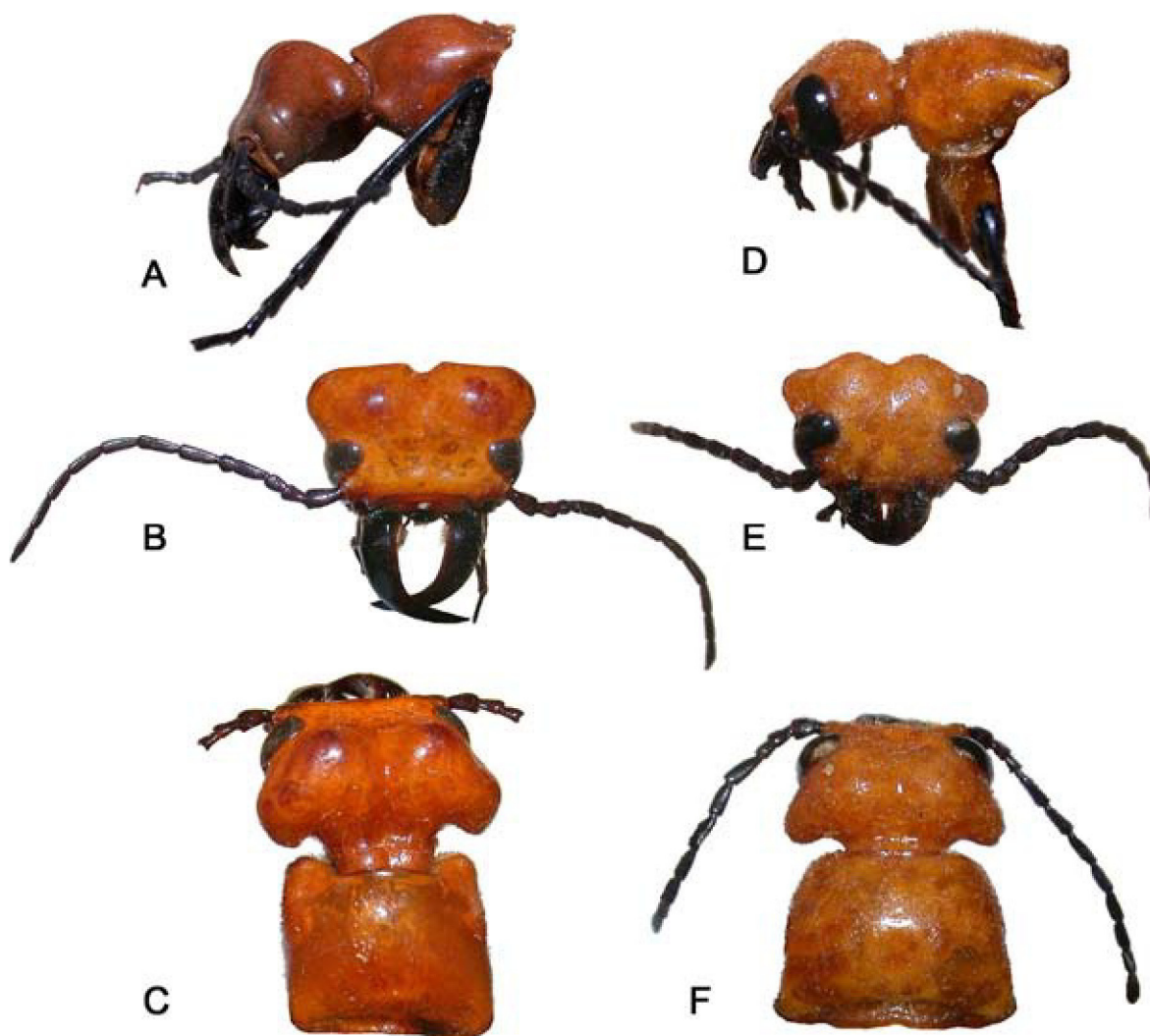
**Figure 3.** Morphological details of *C. maculata* (Los Tuxtlas, Veracruz, Mexico). Male: A, lateral view, head and thorax; B, frontal view, head; C, dorsal view, thorax and head. Female: D, lateral view, head and thorax; E, frontal view, head; F, dorsal view, thorax and head.

all specimens into 2 specific groups, which correspond to the species currently accepted.

Sympatry between *Cissites maculata* and *C. auriculata*. All specimens from Colombia, Ecuador, Guyane Française, Peru, Dominican Republic, Trinidad and Tobago, and Venezuela share the diagnostic characters described for *C. maculata*, showing the typical variation reported for the species (Perty, 1830; Champion, 1892). Most of our Mexican specimens examined (51), share the diagnostic features described for *C. auriculata*, encompassing the individual variation already mentioned for the species (Champion, 1892); however, 13 specimens from the state

of Veracruz (Los Tuxtlas), and 1 from the state of Puebla (Jicotepec de Juárez) are unambiguously assignable to *C. maculata*, including specimens without the medial elytral dots, like those described by Perty (1830).

The specimen of *C. maculata* from Jicotepec de Juárez is located north from any currently known Mexican continental population of the species, including the questioned records of *C. maculata* from Morelia (Champion, 1892), that Enns (1984), reported erroneously as “Morelos”. Populations of *C. maculata* from Jicotepec de Juárez and Los Tuxtlas are in close proximity to localities where *C. auriculata* is present, including some in Veracruz (Tierra Blanca, Plan



**Figure 4.** Morphological details of *C. auriculata*. Male: A, lateral view, head and thorax (Tierra Blanca, Veracruz, Mexico); B, frontal view, head (Playa Azul, Veracruz, Mexico); C, dorsal view, thorax and head (Playa Azul, Veracruz, Mexico). Female: D, lateral view, head and thorax (Chamela, Jalisco, Mexico); E, frontal view, head (Chamela, Jalisco, Mexico); F, dorsal view, thorax and head (Chamela, Jalisco, Mexico).

del Río), and more distantly, in Puebla (Tehuacán). In any case, Jicotepec de Juárez and Los Tuxtlas are deeply nested inside the geographic range of *C. auriculata*. Consequently, the implicit hypothesis of lack of sympatry between *C. maculata* and *C. auriculata*, used to question former localities of *C. maculata* located north of Panamá, should be disregarded. We therefore revalidate former Champion's (1892) records of *C. maculata* in Chontales (Nicaragua) and Morelia (Mexico). Based on habitat differences, and lack of presence along geographically intermediate localities, we agree with Werner et al. (1966) and treated records of *C. maculata* from Arizona (Enns, 1984) as the result of a possible man made introduction.

We had also the opportunity to study the 2 specimens upon which Dugès (1869, 1889) reported the presence of *C. maculata* in Colima (Mexico), and, in agreement with Champion (1892), we conclude that they actually belong to *C. auriculata*.

*Mitochondrial differentiation.* Uncorrected genetic divergence between the specimen assigned to *C. maculata* from Los Tuxtlas (Veracruz) and the one assigned to *C. auriculata* from Chamela (Jalisco) exceeds 14.5 %. This divergence is considerably higher than any intraspecific distance recorded for Meloidae, and is of the same magnitude than divergences found for the same COI fragment across genera from the tribe Mylabrini (15.0-

17.4%) (unpublished data based on 4 genera: *Actenodia*, *Croscherichia*, *Hycleus*, and *Mylabris*).

*Adult activity and phenology.* Data presented in labels of specimens of *C. maculata* from Venezuela show that adult specimens are active throughout the year. The maximum number of specimens captured per collecting event was normally one, but 2 specimens were collected in 12 occasions, and 3 in 3 occasions. Indications of capture methods report the use of mercury lamps and unspecified lights.

Fifty four specimens of *C. maculata* were collected in the nearby localities of El Limón and Maracay, in the state of Aragua, Venezuela, between 1952 and 1987 (with 1 additional record from 1996). The Museo de Zoología Agrícola is located in Maracay, where highly active entomologists have been collecting material along the period indicated. This large species is easily spotted and generally collected always when found, so it is probable that all specimens of *Cissites* found by MIZA researchers were kept in the collection. Counting all specimens captured along the period 1952-1987 in El Limón and Maracay, we obtained a collecting rate of 1.5 specimens of *C. maculata* per year. The maximum number of specimens captured per collecting event was 3 (1 occasion), and 2 (1 occasion also). These figures of per year collection rate and maximum number of specimens captured per event, are an additional indication of the rarity of the species even in highly favorable areas. The specimens collected in Maracay and El Limón were distributed along the year, with a maximum in September and a minimum in March, as follows: I (4 specimens), II (4), III (1), IV (2), V (4), VI (3), VII (2), VIII (4), IX (11), X (6), XI (10), XII (3).

The 15 specimens of *C. maculata* collected at Los Tuxtlas (Veracruz, Mexico) were found from January to July, with almost half of the records obtained in June (7 specimens). Adult specimens of *C. auriculata* are active along the Mexican territory during most of the year, though there are no records for March, October and December. Eleven records from Chamela (1976-1982) show activity as follows: II (2), IV (3), V (3), VII (3), but this pattern may reflect taxonomist's preferred collecting periods for other taxa.

## Discussion

Morphological diagnostic features between *C. maculata* and *C. auriculata* are constant and expressed over large geographic areas, without any sign for the existence of intermediate morphs. Cytochrome oxidase sequence divergence between *C. maculata* and *C. auriculata* is deep, suggesting that the split amongst them was the result of an ancient cladogenetic event. Lack of intermediate

morphs and deep mitochondrial divergence indicate that *C. maculata* and *C. auriculata* have been separated as independent species for a long period of time. Current sympatry in Mexico could be a consequence of relatively recent colonization events, resulting from *C. maculata* dispersals into the range of *C. auriculata*, that occurred once the speciation process was concluded. Evidence of regional sympatry of *C. maculata* and *C. auriculata* in central Mexico, allows to reconsider all previous "questionable" reports of *C. maculata* in Central America and Mexico, while the study of large series of Venezuelan material, confirms Champion's (1892) opinion that *C. auriculata* has not colonized South America.

## Acknowledgments

We appreciate all the help from the Museo del Instituto de Zoología Agrícola (MIZA) of the Universidad Central de Venezuela (Maracay), and from the Colección Nacional de Insectos of the Instituto de Biología (CNIN-IBUNAM) of the Universidad Nacional Autónoma de México, for allowing the study of material. We are particularly indebted to Vilma Savini (MIZA), Luis José Joly (MIZA), Ma. Cristina Mayorga (IBUNAM), and Santiago Zaragoza (IBUNAM). We thank Marco Bologna for allowing us to study his meloid collection at the University Roma Tre. We especially thank Valeria Salinas, Erik Luque, Oscar Pérez, and Nohemí Percino for field assistance looking for or finding *Cissites* samples, and Yolanda Jiménez for obtaining the mitochondrial sequences. MGP collaborative research with the Universidad Central de Venezuela was supported by a grant of the AECI (Agencia Española de Cooperación Internacional). This work was funded by the project grant CGL2010-15786 (Ministerio de Ciencia e Innovación, Spain).

## Literature cited

- Alcobendas, M., J. L. Ruiz, C. Settanni and M. García-París. 2008. The taxonomic status of *Euzonitis haroldi* (Heyden, 1870) (Coleoptera: Meloidae) inferred from morphological and molecular data. *Zootaxa* 1741:59-67.
- Betrem, J. B. 1932. Beiträge zur Kenntnis des Tribus der Horiini der Familie der Meloiden. I. Die Systematik der Horiini. *Treubia* 14:85-102.
- Bianchi, F. A. 1962. Notes on the biology of *Cissites auriculata* (Champion) (Coleoptera: Meloidae). *Proceedings of the Hawaiian Entomological Society* 18:111-119.
- 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.
- Champion, G. C. 1892. Family Meloidae. *In* *Biologia Centrali-*

- Americana. Coleoptera Heteromera, F. E. Godman and O. Salvin (eds.). Vol. 4. pt. 2. London. p. 369-448.
- Dugès, E. 1869. Descripción de algunos meloideos indígenas. La Naturaleza 1:100-113.
- Dugès, E. 1889. Sinopsis de los meloideos de la República Mexicana. Anales del Museo Michoacano 2:49-113.
- Enns, W. R. 1958. Distribution records of two American species of *Cissites* (Coleoptera-Meloidae). The Coleopterists' Bulletin 12:61-64.
- García-París, M., D. Buckley and G. Parra-Olea. 2007. Catálogo taxonómico-geográfico de los coleópteros de la familia Meloidae de México. Graellsia 63:165-258.
- García-París, M., J. L. Ruiz, J. Vörös and G. Parra-Olea. 2009. Sinopsis de los Meloidae (Coleoptera) de Chiapas (México) y comentarios sobre el género *Denierota* Kaszab, 1959. Graellsia 65:47-58.
- Genaro, J. A. 1996. Resumen del conocimiento sobre los meloidos de Cuba (Insecta: Coleoptera). Caribbean Journal of Science 32:382-386.
- Latreille, P. A. 1804. Tableau méthodique des insectes. In Tableaux méthodiques d'Histoire naturelle, Nouveau dictionnaire d'Histoire naturelle. Déterville, Paris. p. 129-200.
- Leng, C. W. and A. J. Mutchler. 1914. A preliminary list of the Coleoptera of the West Indies as recorded to Jan. 1, 1914. Bulletin of the American Museum of Natural History 33:391-493.
- Lewis, E. 2004. A United States record for the genus *Cissites* Latreille (Coleoptera: Meloidae: Zonitini). The Coleopterists' Bulletin 58:635-636.
- Maes, J. M. 1989. Catálogo de los insectos controladores biológicos en Nicaragua. VII. Insectos depredadores del orden Coleoptera. Super Familia Meloidea. Revista Nicaragüense de Entomología 9:111-120.
- Maes, J. M. and J. P. Huether. 2007. Catálogo ilustrado de los Meloidae (Coleoptera) de Nicaragua y otras especies contenidas en el Museo Entomológico de León. Revista Nicaragüense de Entomología 67(Supl. 3):1-90.
- Perty, J. A. M. 1830. De insectorum in America meridionali habitantium vitae genere, moribus ac distributione geographica observationes nonnullae. In Delectus animalium articulorum, quae in itinere per Brasiliam annis MDCCCXVII-MDCCCXX collegerunt J.B. de Spix et C.F.Ph. de Martius; digesit, descripsit, pingenda curavit Maximilianus Perty, jussu et auspiciis Maximiliani Josephi I. Monachii. 224 p.
- Pic, M. 1929. De l'utilité des noms pour les variétés. Bulletin de la Société Entomologique de France 1929:80-82.
- Pinto, J. D. and M. A. Bologna. 1999. The New World genera of Meloidae (Coleoptera): a key and synopsis. Journal of Natural History 33:569-620.
- Selander, R. B. and J. K. Bouseman. 1960. Meloid beetles of the West Indies. Proceedings of the United States National Museum 111:197-226.
- Swederus, N. S. 1787. Et nytt genus, och femtio nya species af Insekter beskrifne. Svenska Vetenskaps Akademien Nya Handlingar 8:181-201.
- Werner, F. G., W. R. Enns and F. H. Parker. 1966. The Meloidae of Arizona. The University of Arizona Agricultural Experiment Station Technical Bulletin 175:1-96.

#### Appendix. Material examined.

- Cissites auriculata*: México:** Chiapas: Rizo de Oro: 10-IX-1994, 1 specimen (C. R. Beutelspacher leg.) [CNIN-IBUNAM]. Colima: Colima: 2 specimens (Colección E. Dugès, 807, D-785) [CNIN-IBUNAM]. Guerrero: Acahuizotla: 20-XI-1979, 1 specimen (A. Ibarra leg.) [CNIN-IBUNAM]; Acapulco: 20-I-1981, 1 specimen (J. Bueno leg.) [CNIN-IBUNAM]; Tecpan: 12-VIII-1981, 1 specimen [CNIN-IBUNAM]. Jalisco: Casimiro Castillo, 390 m: 17-VI-1994, 1 specimen (G. Nogueira leg.) [EBCH]; Chamela: 24-IV-1976, 3 specimens, nocturna (H. Brailovsky leg.); 2-V-1976, 1 specimen (C. R. Beutelspacher leg.); 9-VII-1981, 2 specimens (A. Pescador leg.); 15-II-1982, 2 specimens (S. Bullock leg.) (SB 890) [CNIN-IBUNAM]; 7-VI-1985, 1 specimen [EBCH]; Estación de Biología Chamela: 4-IX-1980, 1 specimen (A. Pescador leg.); 2-VIII-1985, 1 specimen (M.S.O. leg.); 14-XII-1985, 1 specimen, trampa de luz (R. A. Usela leg.) / *Cissites auriculata* (Champion), J. D. Pinto det. 1986; 14-XII-1985, 1 specimen, trampa de luz (R. A. Usela leg.); 30-VI-1986, 1 specimen (F. A. Noguera leg.) (N2Co); 23-VI-1988, 1 specimen, en luz (F. A. Noguera leg.) (N2Co); 24-IV-1989, 1 specimen (E. Ramírez leg.) [EBCH]; 6/8-VII-1980, 1 specimen (A. Pescador leg.); 25/29-V-1981, 1 specimen (A. Pescador leg.); 24/27-V-1982, 1 specimen (A. Pescador leg.) [CNIN-IBUNAM]; Río Cuitzmala: 10-IX-1991, 2 specimens (E. Ramírez leg.) [EBCH]; Río San Nicolás, Km. 84 Carretera Barra de Navidad - Puerto Vallarta: 14-IX-1980, 1 specimen (E. Ramírez leg.); 7-VI-1991, 1 specimen (E. Ramírez leg.) [EBCH]. Estado de México: Valle de Bravo: 20-XI-1981, 1 specimen (W. Sohn) [CNIN-IBUNAM]. Michoacán: Playa Azul: 13-VIII-1971, 1 specimen (L. Marsch leg.) (Col. J. Hendrichs S.) (Ex Col. J. Hendrichs) [CNIN-IBUNAM]. Morelos: 2.5 km N, 4 km O Huautla, Estación CEAMISH, 940 m, 18°27.671' N, 99°02.475' O: 12-VII-1996, 2 specimens, trampa de luz (F. A. Noguera et al. leg.) [EBCH]; Tepoz. [Tepoztlán]: 17-VII-1965, 1 specimen [CNIN-IBUNAM]; Tepoz. [Tepoztlán]: 22-VIII-1965, 1 specimen [CNIN-IBUNAM]. Nayarit: Unión ríos Santiago y Huaynamota, Las Adjuntas II: 27/28-XI-1991, 1 specimen (R. Barba; E. Barrera leg.) [CNIN-IBUNAM]. Oaxaca: Dominguillo, 760 m, 17°38.907' N, 96°54.703' O: 21-IX-1998, 1 specimen (S. Zaragoza leg.) [CNIN-IBUNAM]; San Gabriel Mixtepec: 20-VI-1984, 1 specimen (H. Velasco leg.); 20-VI-1984, 1 specimen (M. García leg.) [CNIN-IBUNAM]. Puebla: Tehuacán: 11-IX-



1934, 1 specimen (R. M. del Campo leg.) [CNIN-IBUNAM]. Querétaro: 4.5 km carretera La Lagunita - Tilaco, 21°12.75' N, 99°14.18' O: 27-II-1998, 1 specimen (E. Barrera; G. Ortega leg.) [CNIN-IBUNAM]. Quintana Roo: Km 146 Chetumal - Puerto Juárez: 17-III-1982, 1 specimen (M. García leg.); 17-III-1982, 1 specimen (A. Ibarra leg.) [CNIN-IBUNAM]. San Luis Potosí: Ciudad Valles: 8-IV-1978, 1 specimen (S. G. Figueroa leg.) [CNIN-IBUNAM]; Ciudad Valles: Micos: 8-IV-1978, 1 specimen (J. Figueroa leg.) [CNIN-IBUNAM]; Tamazunchale: El Sol: 5-V-1950, 1 specimen (L. Vázquez leg.) [CNIN-IBUNAM]. Tamaulipas: Cañón del Novillo, cerca de Ciudad Victoria: 3-VIII-1988, 1 specimen (A. Contreras leg.) [CNIN-IBUNAM]; Villa Aldama: 8-VI-1979, 1 specimen (R. Valencia leg.) [CNIN-IBUNAM]. Veracruz: Plan del Río: 2 specimens (L. Ancona) (*Horia auriculata* Champ. L. Ancona) [CNIN-IBUNAM]; Tierra Blanca: II-1948, 1 specimen (J. Hernández Corzo leg.) (prep. J.H.C.) [CNIN-IBUNAM]; Veracruz: 2 specimens (Ant. Col. Mus. de Hist. Nat.) (807) [CNIN-IBUNAM].

**Cissites maculata**: **Colombia**: Caquetá: Paujil, 1300 m: 1-II-1979, 1 specimen (O. Rojas leg.) [MIZA]; Vegas del Caquetá: 7-I-1982, 2 specimens (Zona nº 4) (O. Rojas leg.) [MIZA]. Huila: Gigante (estribaciones cordillera): 1 specimen (Zona nº 2) (O. Rojas leg.) [MIZA]; Gigante: XII-1979, 1 specimen (O. Rojas leg.); 4-VIII-1981, 1 specimen (O. Rojas leg.) [MIZA]. Valle del Cauca: Cali, 1 000 m: 1 specimen (L. Denhez leg.) [MIZA]; Valle, cerca Club Campestre, carretera a Buitrera: 3-V-1975, 1 specimen (J. E. Lattke leg.) [MIZA]. **Ecuador**: Napo: Tona, 518 m: 22-IV-1993, 1 specimen (L. and T. Rachelli leg.) [MAB]. Guyane Française: PK 43 PL Route de Kow: 1-IX-1997, 1 specimen (Audureau leg.) [MAB]. **Mexico**: Puebla: Villa Juárez [Jicotepec de Juárez]: Mi Ranchito: 29-V-1954, 1 specimen [CNIN-IBUNAM]. Veracruz: Estación de Biología Los Tuxtlas: 22-VI-1968, 1 specimen; 15-III-1969, 1 specimen; 12-I-1975, 1 specimen (col. noct.); 14/16-II-1975, 2 specimens (*Horia maculata*, female); 7/8-V-1975, 1 specimen (*Horia maculata*); 7/8-VI-1975, 2 specimens (col. noct.); 13-VI-1989, 1 specimen (J. L. Colin; H. Rojas leg.); 28-VI-1989, 2 specimens (M. A. Pérez leg.); 30-VI-1989, 1 specimen (M. A. Pérez leg.); 1/2-VII-1989, 1 specimen (M. A. Pérez leg.) [CNIN-IBUNAM]. **Peru**: Huánuco: Tingo María, La Divisoria, 2 300 m: V-1981, 3 specimens (M. Gadou leg.) [MIZA]. **Dominican Republic**: S. G. Boyá: San Cristóbal R. D.: 14-I-1985, 1 specimen (Matilde leg.) (MNHN) [MAB]. **Trinidad and Tobago**: Nariva: 14-IV-1964, 2 specimens, branchi nesti (T59) (T58) / *Cissites maculata* Swederus; M. A. Bologna det. [MAB]. **Venezuela**: Aragua: Choroní: 30-XI-1975, 2 specimens (Mattei leg.); 11-VII-1977, 1 specimen (Mattei leg.) [MIZA]; El Castaño, cerca de Maracay: 4-II-1968, 1 specimen (J. A. González leg.) [MIZA]; El Guacatal, Nac. Río Limón: 17-VII-1966, 1 specimen (F. Yoris leg.) [MIZA]; El Limón, 450 m: 16-XII-1952, 1 specimen (R. Requena leg.); 9-IX-1955, 1 specimen (F. Kern leg.); 18-VIII-1956, 1 specimen (C. J. Rosales leg.); 4-IX-1956, 1 specimen (N. Gélvez leg.); 6-XI-1956, 1 specimen (C. J. Rosales leg.); 8-

XI-1956, 1 specimen (N. Gélvez leg.); 7-V-1959, 1 specimen (F. Fernández leg.); 25-V-1959, 1 specimen (F. Fernández leg.); 1-IX-1959, 1 specimen (F. Fernández leg.); 21-IX-1959, 1 specimen (F. Fernández leg.); 26-IX-1959, 1 specimen (C. J. Rosales leg.); 20-II-1961, 1 specimen (P. Guagliumi leg.); 6-IV-1961, 1 specimen (M. Gélvez leg.); 12-IV-1961, 1 specimen (C. J. Rosales leg.); 6-XI-1961, 1 specimen (F. Fernández leg.) (*Cissites maculata* Swed., Z. Kaszab det., 1961); 6-XI-1961, 2 specimens (F. Fernández leg.); 14-XI-1961, 1 specimen (C. J. Rosales leg.); 25-XI-1961, 1 specimen (D. de Zerpa leg.); 3-XII-1961, 1 specimen (F. Fernández leg.); 15-I-1962, 1 specimen (P. J. Salinas leg.); 1-IX-1963, 1 specimen (M. Gélvez leg.); 20-V-1965, 1 specimen (Stejskal leg.); 27-I-1966, 1 specimen (F. Fernández, E. Osuna leg.); 19-X-1966, 1 specimen, en la luz (J. B. García leg.); 27-X-1967, 1 specimen (A. Ramírez leg.); 20-IX-1973, 1 specimen (J. B. Terán leg.); 19-IX-1975, 1 specimen (B. Mazzani leg.); 26-VI-1976, 1 specimen, luz de mercurio (F. Fernández leg.); 19-X-1976, 1 specimen (F. Fernández leg.); 2-VI-1977, 1 specimen (B. Bechyne leg.); 7-VIII-1977, 1 specimen (B. Bechyne leg.); 11-X-1977, 1 specimen (F. Fernández leg.); 26-XI-1978, 1 specimen (E. Bermudes leg.); 24-I-1979, 1 specimen (O. Camarán leg.); 28-II-1979, 1 specimen (F. Fernández leg.); 28-V-1981, 1 specimen (B. Bechyne leg.); 13-VI-1981, 1 specimen (B. Bechyne leg.); 27-IX-1981, 2 specimens (B. Bechyne leg.); 12-VII-1987, 1 specimen (Instituto de Zoología Agrícola) (L. Valladares leg.); 3-XI-1996, 1 specimen (L. Valladares leg.) [MIZA]; El Limón, 550 m: 3-II-1969, 1 specimen (J. and B. Bechyne leg.) [MIZA]; El Limón: 1-III-1995, 1 specimen (O. Villarreal M. leg.) [MIZA]; La Isleta, Choroní: 200 m: 26/30-XI-1973, 2 specimens (J. Salcedo, A. Fernández leg.) [MIZA]; Maracay, 450 m: 10-I-1950, 1 specimen (P. Guagliumi leg.); 18-X-1952, 1 specimen (P. Guagliumi leg.); 23-XII-1953, 1 specimen (F. Kern leg.); 6-II-1954, 1 specimen (C. J. Rosales leg.); 10-X-1958, 1 specimen (F. Fernández leg.); 4-XI-1959, 1 specimen (J. A. González leg.); 6-VIII-1967, 1 specimen (A. Lagarde leg.); 27-VIII-1968, 1 specimen (O. Zerpa leg.); 4-IX-1973, 1 specimen (N. Rivas leg.); 17-VII-1978, 1 specimen (F. Quiñones leg.); 3-IX-1981, 1 specimen (E. Yanes leg.); 3-II-1987, 1 specimen (C. Moreno leg.) [MIZA]; Maracay: 27-XII-1950, 1 specimen (F. Fernández leg.) [MIZA]; Maracay: Palmarito, El Castaño, ± 800 m: 1-II-1992, 1 specimen (L. D. Otero leg.) [MIZA]; Pozo Diablo, cerca de Maracay, 500 m: 9-IX-1958, 2 specimens (C. J. Rosales leg.); 10-II-1964, 1 specimen (A. Fernández, A. Pérez leg.) [MIZA]; Rancho Grande, 1 100 m: 10-X-1966, 1 specimen (M. Gélvez, J. Salcedo leg.) [MIZA]; Represa Camatagua, Hacienda Suata: 7-VII-1983, 1 specimen (A. Chacón, F. Zambrano leg.) [MIZA]; Santa Barbara, valle del Río Choroní, 500 m: 26/29-VII-1973, 1 specimen (J. Salcedo, J. Clavijo leg.) [MIZA]; Tiara, 1 000 m: 7-VIII-1964, 2 specimens (C. J. Rosales, F. Fernández leg.) [MIZA]; Tocorón: 29-I-1972, 1 specimen (F. Zambrano leg.) [MIZA]; Turmero, Guayabita: 27-VII-1979, 1 specimen (G. Pérez leg.) [MIZA]. Barinas: Barinitas: 7-VIII-1966, 1

specimen (A. D'Ascoli leg.) [MIZA]. Bolívar: El Pao: 25-II-1986, 1 specimen (M. Gadou leg.) [MIZA]; El Playón, Río Caura, 100m: 8-10-IX-1980, 1 specimen (E. Osuna, J. Clavijo leg.) [MIZA]; Kanarakuni, 450m: 3-II-1967, 1 specimen (F. Fernández, A. D'Ascoli leg.); 4-II-1967, 1 specimen (F. Fernández, A. D'Ascoli leg.); 6-II-1967, 1 specimen (F. Fernández, A. D'Ascoli leg.) [MIZA]; Km 88 El Dorado-Santa Elena, 160 m: 27-IX-1967, 1 specimen (C. J. Rosales, M. Gélbez, L. Rodríguez leg.) [MIZA]; La Urbina, Río Orinoco, 60 m: 4-VI-1997, 1 specimen (E. Osuna, A. Chacón, F. Rojas leg.) [MIZA]; Río Paragua, al E de Río Chirguao, 425 m: 3/7-VIII-1983, 1 specimen (Expedición del Instituto de Zoología Agrícola, Facultad de Agronomía, U.C.V leg.) [MIZA]; Santa Elena: 14-VIII-1979, 1 specimen (J. E. Lattke leg.) [MIZA]; Campamento Minero Payapal, Río Yuruán, El Dorado, 190 m: 23/30-V-1987, 2 specimens (Expedición del Instituto de Zoología Agrícola leg.) [MIZA]. Carabobo: Río Borburata, 250 m: 18/23-I-1972, 2 specimens (F. Fernández, A. D'Ascoli leg.) [MIZA]; Tacarigua, 430 m: 23-VI-1966, 1 specimen, trampa de luz [MIZA]; Valencia: 12-XII-1964, 1 specimen (R. E. López leg.) [MIZA]; San Esteban: 29-VIII-1959, 1 specimen (E. García leg.) [MIZA]. Delta Amacuro: Caño Guayo, 0-100 m: 8-I-1961, 1 specimen (R. Lichy, A. Pérez leg.) [MIZA]; Tucupita, 0-100 m: 28-III-1965, 1 specimen (A. Gadou, M. Lourse leg.) [MIZA]. Distrito Federal: Caracas: 10-IX-1949, 1 specimen (F. Fernández leg.) [MIZA]; Cumbre de Boquerón, frente a Bajo Seco, 1 600 m: 20/30-VI-1970, 1 specimen (C. J. Rosales leg.); 21-IV-1973, 1 specimen (C. J. Rosales leg.) [MIZA]; El Valle: 14-II-1941, 1 specimen (C. H. Ballou leg.); El Valle: 20-V-1944, 1 specimen (S. Ballou, C. H. Ballou leg.) (Div. Entomología MAC, Venezuela) [MIZA]; Taguao, La Salina, 50 m: 4-IX-1982, 2 specimens (S. Segnini leg.) [MIZA]. Falcón: Coro: 6-VIII-1984, 1 specimen (J. M. Ayala leg.) [MIZA]; Finca Tillerías, Sanare: 25/28-X-1978, 1 specimen (Expedición del Instituto de Zoología Agrícola, Facultad de Agronomía, U.C.V leg.) [MIZA]; Las Dos Bocas, 200 a 550 m: 7-VI-1969, 1 specimen (R. Casares, J. B. Terán, M. Gélbez leg.) [MIZA]; Sanare: Finca Tillerías, 100 m: 27/ 30-X-1978, 2 specimens (J. Clavijo, A. Chacón leg.) [MIZA]. Guárico: San Juan de los Morros: 19-XI-1993, 1 specimen (J. L. Peña leg.) [MIZA]. Lara: El Cuji: 30-VI-1967, 1 specimen (J. Salcedo, R. Poole leg.) [MIZA]; Parapara: 22/24-XI-1979, 1 specimen (E. Osuna, F. Cerdá, D. Grance leg.) [MIZA]. Miranda: Estación Experimental Río Negro, cerca de Capaya, 100 m: 10/12-X-1977, 1 specimen (C. Andara, J. Clavijo leg.) [MIZA]; Parque Nacional Guatopo, 24 km al Norte de Altigracia de Orituco, 640 m: 5/9-V-1975, 1 specimen (J. Salcedo, R. E. Dietz leg.) [MIZA]; Presa El Guapo, 100 m: 10-V-1975, 1 specimen (J. Salcedo, R. E. Dietz leg.) [MIZA]. Monagas: Paso Nuevo, carretera Temblador-Barrancas: 29-IV-1974, 1 specimen (V. Vargas leg.) [MIZA]. Portuguesa: Hacienda El Pilar, San Nicolás, 180 m: 2/5-XII-91, 1 specimen (Expedición

MIZA-UCV leg.) [MIZA]; San Nicolás, 180 m: 1 specimen, trampa de luz. [MIZA]. Sucre: Cariaco: 28-6-1961, 1 specimen (Bordón leg.) (10 26) [MIZA]. T. F. Amazonas: Departamento Río Negro: San Carlos de Río Negro, 1°55' N, 67°1' O, 65 m: 21/23-XI-84, 2 specimens (E. Osuna, A. Chacón leg.) [MIZA]; El Valle: 20-V-1944, 1 specimen (S. Ballou leg.) (Div. Entomología M. A. C. Venezuela) (B. N. H.) [MIZA]; Ocamo, 2°47' N, 65°18' O, 100 m: 23-I-1992, 1 specimen (Exp. Terramar; J. Clavijo, A. Chacón leg.) [MIZA]; Parque Nacional Duida-Marahuaca, Culebra, 3°33' N, 65°55' O, 250 m: 26-III-1983, 1 specimen (Exp. Marawaca Fund. Terramar leg.) [MIZA]; Puerto Ayacucho: 15-VIII-1975, 2 specimens (Z. Hernández leg.) [MIZA]; San Carlos de Río Negro, 125 m: 19/31-VIII-1976, 2 specimens (J. Salcedo, A. Fernández leg.) [MIZA]; San Carlos de Río Negro: 7/13-XI-1982, 2 specimens (A. Chacón, G. Yépez leg.) [MIZA]; San Juan de Manapiare 20-X-1974, 1 specimen (J. Sykora leg.) [MIZA]; San Pedro: 10-VIII-1982, 1 specimen (C.E.U.M., Facultad de Agronomía, U.C.V., Maracay) [MIZA]; San Simón del Cocuy: 13/25-III-1974, 1 specimen (J. Sycora leg.) [MIZA]; Santa Bárbara: 13-VIII-1982, 3 specimens (C.E.U.M., Facultad de Agronomía, U. C.V., Maracay) [MIZA]; Santa Lucía: 15/21-XI-1982, 2 specimens (A. Chacón, G. Yépez leg.) [MIZA]; talud Cerro Aracamuni, 1°29' N, 65°38' O, 600 m: 18-24-X-1987, 1 specimen [MIZA]; Yavita, 2°55' N, 67°25' O, 130 m: 22-IX-1976, 1 specimen (Mattei leg.) [MIZA]. Táchira: Capacho: 3-I-1982, 1 specimen; 23-I-1982, 1 specimen (Blanca leg.); 5-VI-1982, 1 specimen, noche (Betty leg.) [MIZA]; Chorro del Indio: 22-IV-1981, 1 specimen [MIZA]; Cordero: 3-III-1982, 1 specimen, camino día (J. Sánchez leg.) [MIZA]; La Esmeralda, cerca de Colón, La Fria, 750 m: 17/22-VI-1998, 1 specimen (J. DeMarmels, A. Chacón leg.) [MIZA]; La Grita: 20-X-1981, 1 specimen (Gerión leg.) [MIZA]; La Morita, 300 m: 13/17-V-1973, 3 specimens (J. Salcedo, A. Fernández leg.) [MIZA]; Navay: 12-IV-1972, 1 specimen (A. D'Ascoli, A. Montagne, J. Salcedo leg.) [MIZA]; Poblado Márquez, Café Rodeo: 17-11-1981, 1 specimen [MIZA]; Pregonero: 20-IX-1966, 1 specimen (C. J. Rosales, J. Salcedo leg.) [MIZA]; Río Frío, 600 m: 2/10-IX-1981, 1 specimen (F. Fernández, J. Clavijo, A. Chacón leg.) [MIZA]; Rubio: 3-II-1982, 1 specimen (Blanca leg.); 13-V-1982, 1 specimen, techo mañana; 2-VIII-1982, 1 specimen (Blanca leg.) [MIZA]; San Cristóbal: 18-I-1981, 1 specimen [MIZA]. Trujillo: Valera: 4-IX-1950, 1 specimen (N. Angeles leg.) [MIZA]. Yaracuy: La Hoya, 100 m: 28/30-VI-1973, 1 specimen, en la luz (F. Fernández, J. Salcedo, J. Clavijo leg.); 28/30-IX-1973, 2 specimens (J. Salcedo leg.) [MIZA]; Mina de Aroa: 6-VI-1970, 1 specimen (J. Salcedo, C. Padrón leg.) [MIZA]; Yaritagua: 9-XI-1959, 1 specimen (R. Torres leg.) [MIZA]. Zulia: Kasmera, Perijá: 12-IV-1963, 1 specimen (P. J. Salinas; M. Gélbez leg.) [MIZA]; Misión El Rosario, 50 m: 12/13-I-1977, 1 specimen (L. J. Joly, J. Salcedo, J. Clavijo leg.) [MIZA].