

Journal of Melittology

Bee Biology, Ecology, Evolution, & Systematics

The latest buzz in bee biology

No. 53, pp. 1–7

18 September 2015

BRIEF COMMUNICATION

A gynandromorph of *Xylocopa augusti* and an unusual record of *X. iris* from Brazil (Hymenoptera: Apidae: Xylocopini)

Mariano Lucia¹, Soledad C. Villamil², & Victor H. Gonzalez³

Abstract. We describe and illustrate for the first time a mixed gynandromorph of *Xylocopa* (*Neoxylocopa*) *augusti* Lepeletier de Saint Fargeau from Buenos Aires, Argentina. Also, we document and discuss a historical specimen of the Old World carpenter bee *X. (Copoxylla) iris* (Christ) possibly collected in Brazil.

INTRODUCTION

The purpose of this work is two-fold. First, to describe a new case of gynandromorphism in the large carpenter bee genus *Xylocopa* Latreille (Apidae: Xylocopini), and second, to document a specimen of the Old World carpenter bee *X. (Copoxylla) iris* (Christ) possibly collected in Brazil. Gynandromorphs are sexually abnormal individuals that are rarely encountered in nature, and thus, when found, they are worth noting. Today, gynandromorphs are known for 122 species of bees belonging to 32 genera of all families, and from all major biogeographic regions of the world (Wcislo *et al.*, 2004; Michez *et al.*, 2009; Hinojosa-Díaz *et al.* 2012; Alvarez *et al.*, 2014). In *Xylocopa*, gynandromorphs have been recognized for 13 species belonging to five of the 31 subgenera worldwide; six of these records are for species in the Neotropical subgenus

¹ División Entomología, Museo de La Plata, Universidad Nacional de La Plata, Paseo del Bosque s/n, 1900FWA, La Plata, Argentina. CONICET, Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina (mlucia@fcnym.unlp.edu.ar).

² Laboratorio de Estudios Apícolas, Departamento de Agronomía, Universidad Nacional del Sur, San Andrés 800, Altos del Palihue, 8000 Bahía Blanca, Argentina (soledad.villamil@uns.edu.ar).

³ Undergraduate Biology Program and Department of Ecology & Evolutionary Biology, Haworth Hall, 1200 Sunnyside Avenue, University of Kansas, Lawrence, Kansas, 66045, USA (victorgonzab@gmail.com).

doi: <http://dx.doi.org/10.17161/jom.v0i53.4979>

Neoxylocopa Michener (Guershon & Ionescu-Hirsch, 2012; Lucia & Gonzalez, 2013). Herein, we describe for the first time a mixed gynandromorph of *Xylocopa* (*Neoxylocopa*) *augusti* Lepeletier de Saint Fargeau, a South American species occurring in Brazil, Argentina, Paraguay, Uruguay, and Chile (Moure, 2007; Montalva *et al.*, 2013).

The second part of this paper documents a female specimen of *X. iris* from Brazil, part of the Jean M. Pérez collection from the early 1900's and which is currently deposited in the Muséum National d'Histoire Naturelle, Paris, France. This species is common and widely distributed in Europe and western Asia (Guershon & Ionescu-Hirsch, 2012). Documenting this historical specimen is important because it could be an example of an unsuccessful introduction event of this species in South America, a common phenomenon among wood-nesting bees including *Xylocopa*. For example, Burmeister (1876) described as new *X. serripes* from both male and female specimens collected in Rio de Janeiro, Brazil, but that actually were of the widely distributed Asian species *X. (Ctenoxylocopa) fenestrata* (Fabricius). Unlike other taxa from the same region that appear to be adventive in South America, such as *Lithurgus huberi* Ducke (Megachilidae: Lithurginae) (*e.g.*, Gonzalez *et al.*, 2013), this carpenter bee did not successfully establish there, as it has not since been collected anywhere in Brazil. Also, even in the case of this specimen being mislabeled, it will bring attention to other possible examples of inaccurate locality data on specimens in the Pérez collection.

MATERIAL AND METHODS

External morphological structures were studied using a Nikon SMZ 745T stereomicroscope and photographs were taken with a Canon Power Shot A520 digital camera attached to it. Digital images were assembled using CombineZM open software. As in other studies of gynandromorphs, deviant morphological features are described in detail. Morphological terminology follows Michener (2007). The abbreviations T, S, and F are herein used for metasomal terga, sterna, and flagellomeres, respectively.

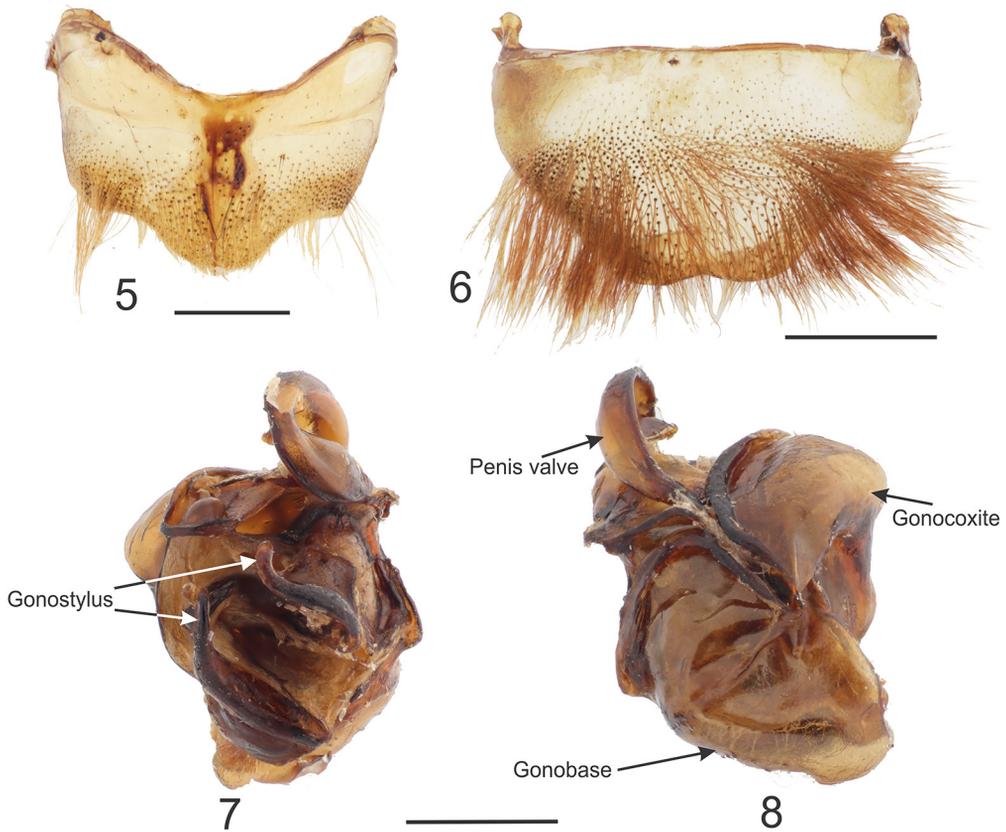
RESULTS

Xylocopa (*Neoxylocopa*) *augusti* Lepeletier de Saint Fargeau, 1841 gynandromorph (Figs. 1–8)

DESCRIPTION: Body length 22.80 mm, head length 5.20 mm, head width 6.90 mm, mesosoma width (measured between lateral margins of tegulae) 9.20 mm, metasoma width (measured across T2) 10.20 mm. Head (Fig. 1), integument and pubescence dark brown to black, female-like, except male-like yellow integumental maculations as follows: mandibles with small spots basally, larger on left mandible; left side of clypeus and left lower paraocular area with large maculation; right scape with long stripe ventrally; gena with small spots on left, stripes on right. Gena posteriorly with yellow setae; upper interorbital distance 3.85 mm; lower interorbital distance 3.9 mm; interalveolar distance 1.16 mm; alveolocular distance 1 mm. Antenna with 12 flagellomeres (length of scape, pedicel, and F1: 2.57 mm, 0.3 mm, and 0.9 mm, respectively). Mesosoma dorsally with mixed male and female features (Figs. 2–3). Mesoscutum black laterally, tawny to ferruginous on center; mesoscutellum yellow with black spots; metanotum black; propodeum tawny, yellowish on center, swollen as in normal male; tegula tawny to black, male-like. Pubescence yellow dorsally, except black on left side



Figures 1–4. Gynandromorph of *Xylocopa (Neoxylocopa) augusti* Lepeletier de Saint Fargeau. 1. Facial view. 2. Lateral habitus. 3. Dorsal habitus. 4. Ventral habitus. Scale bars: 2 mm in figure 1, 4 mm in remaining figures.



Figures 5–8. Gynandromorph of *Xylocopa* (*Neoxylocopa*) *augusti* Lepeletier de Saint Fargeau. 5. Metasomal S6, ventral view. 6. Metasomal T7, dorsal view. 7. Genitalia, posterior view. 8. Genitalia, dorsal view. Scale bars: 2 mm in figures 5 and 6, 1 mm in figures 7 and 8.

of mesoscutum and small patch near right tegula; pleura with integument and pubescence black (female-like); foreleg with mixed features of both sexes, protrochanter and profemur structurally female-like, remaining podites male-like; profemur and protibia mixed in color, maculation more marked on protibia where black is less evident. Procoxa, protibia and protarsus with yellow setae mixed with black, remaining podites with black setae only. Middle leg female-like, mesotibia with yellow maculation on dorsal surface, mesotibia and mesotarsus with yellow setae mixed with black. Hind legs with mixed features of male and female, left leg mostly female-like, except integument yellow on dorsal, ventral, and posterior surfaces of metatibia; metabasitibial plate mixed, male-like anteriorly, female-like posteriorly; right leg with metacoxa and metatrochanter as in female; metatibia mixed, mostly structurally as in male but with anterior and posterior spines on apex as in female; metabasitibial plate as described for left leg; metafemur with yellow setae ventrally on inner surface; metatibia with mixed yellow and black setae on dorsal and ventral surfaces. Wings clear, coppery, with violet highlight more noticeable posteriorly. Metasoma male-like (Figs. 3–4), with seven exposed terga and six exposed sterna. Terga male-like in both integument and pubescence, except some segments mixed with black setae as in female. Sterna with mixed features of both sexes, tawny to black with yellow setae medially mixed with black setae. Terminal tergum and sternum and genital capsule as in figures 5–8.



Figure 9. Dorsal habitus and labels of female specimen of *Xylocopa (Copoxyla) iris* (Christ) possibly collected in Brazil. Scale: 2 mm.

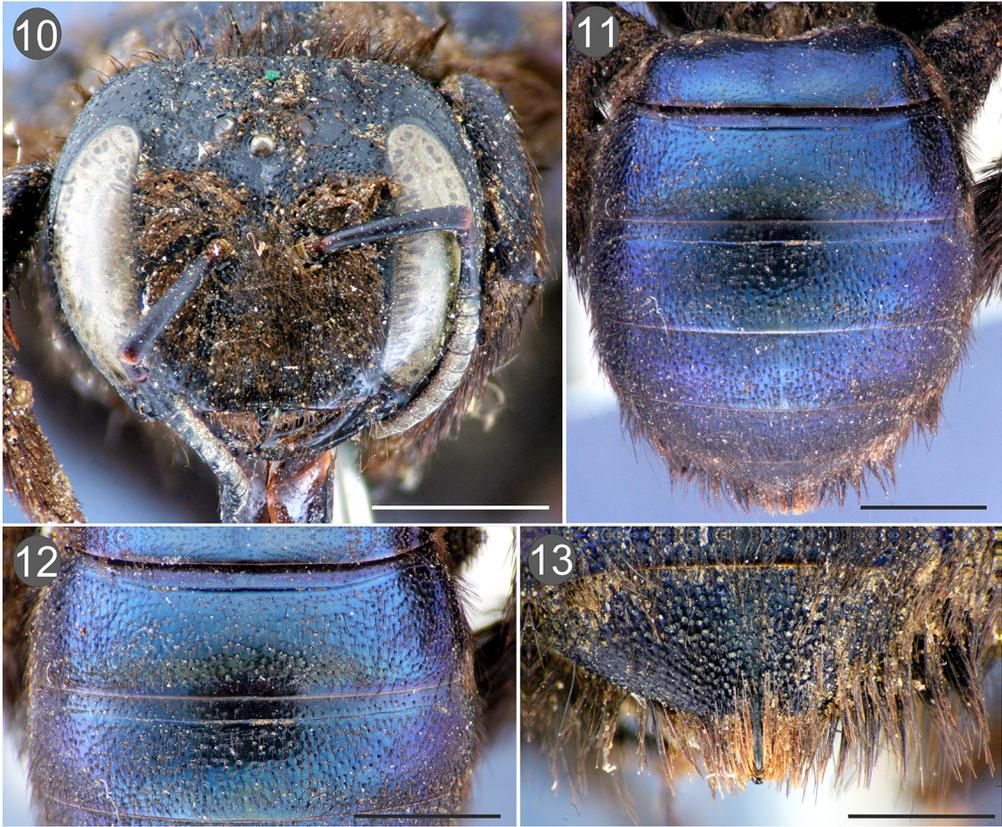
MATERIAL EXAMINED: One gynandromorph; Argentina, Buenos Aires, Pehuenco, 28-XI-2004, Col. S.C. Villamil; deposited in the División Entomología, Museo de La Plata, Argentina.

COMMENTS: The gynandromorph described here has a mix of male and female features in all tagmata and thus it can be assigned to the mixed category (see Wcislo *et al.*, 2004). Superficially, the genital capsule appears to be male-like, with some structures such as the gonobase, gonostylus, gonocoxite, and penis valves barely recognizable (Figs. 7, 8).

Xylocopa (Copoxyla) iris (Christ, 1791)
putative Brazilian record
(Figs. 9–13)

MATERIAL EXAMINED: 1♀ (Figs. 9–13); Brazil, MUSEUM PARIS-Coll. J. Perez 1915; deposited in the Muséum National d’Histoire Naturelle, Paris, France.

COMMENTS: This specimen is part of the J.M. Pérez collection, and it was found among specimens of *Xylocopa (Schonnherria) splendidula* Lepeletier de Saint Fargeau from Brazil, a species that resembles *X. iris* in the small body size and integument with distinctive blue metallic highlights. The two species are not only easily distinguished by the wing coloration (dark in *X. iris* and hyaline in *X. splendidula*), but also by the subgeneric characters [*i.e.*, presence of gradulus on T1–T5, pygidial plate without preapical spines in *X. iris* (of subgenus *Copoxyla* Maa) (Figs. 11–13)] indicated in the key to the subgenera of *Xylocopa* in Michener (2007). Two scenarios are equally plausible to explain the specimen of this Old World species possibly collected in Brazil nearly a century ago. Either it might represent an unsuccessful introduction event in the New World or a mislabeled specimen. Both hypotheses are equally possible because similar cases are commonly reported among bees, including *Xylocopa* (*e.g.*, Burmeister, 1876; Gonzalez & Griswold, 2011). The fact that *X. iris* has not since been collected in Brazil does not favor either hypothesis. A few South American species



Figures 10–13. Female specimen of *Xylocopa* (*Copoxylla*) *iris* (Christ) possibly collected in Brazil. **10.** Facial view. **11.** Metasoma, dorsal view. **12.** Detail of T2 and T3 showing gradulus. **13.** Pygidial plate of T6. Scale: 2 mm.

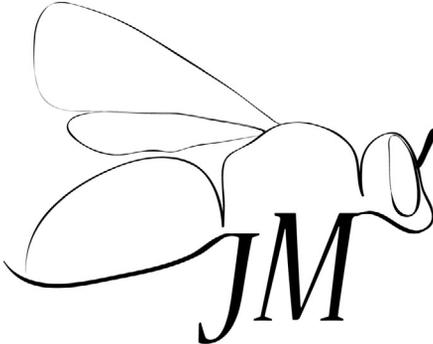
of *Xylocopa*, such as *X. maidli* Maa, are known only from the type specimen and have not since been collected (M. Lucia, unpubl. data). The handwriting of the locality label does not provide insights to the identity of its collector either. According to Mrs. Agnièle Touret-Alby, curator of the museum in Paris, the general appearance of the writing, particularly the capital letter, is clearly different from that of J.M. Pérez as well as from that of A.L.M. Lepeletier de Saint Fargeau. The second label that reads “collection Pérez, 1915” only indicates that this specimen was part of the Pérez collection, which the museum acquired in 1915.

ACKNOWLEDGEMENTS

We are indebted to Agnièle Touret-Alby for her comments on the Pérez collection as well as for kindly arranging the loan of the specimen of *X. iris*. We also thank Amy Comfort de Gonzalez and two anonymous reviewers for their comments and suggestions that improved this work. Financial support for M.L. was provided by the Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina (CONICET).

REFERENCES

- Alvarez, L.J., M. Lucia, P.J. Ramello, & A.H. Abrahamovich. 2014. Description of two new cases of gynandromorphism in *Paratrigona* Schwarz and *Augochlora* Smith (Hymenoptera: Apidae and Halictidae). *Zootaxa* 3889(3): 447–450.
- Burmeister, H. 1876. Hymenopterologische Mittheilungen. *Entomologische Zeitung* 37(4–6): 151–183. [Nota bene: Part 1 of this paper covers, “Die *Xylocopa*-Arten des La Plata-Gebietes”]
- Christ, J.L. 1791. *Naturgeschichte, Klassifikation und Nomenclatur der Insekten vom Bienen, Wespen und Ameisengeschlecht; als der fünften Klasse fünfte Ordnung des Linneischen Natursystems von den Insekten: Hymenoptera. Mit häutigen Flügeln*. Hermannischen Buchhandlung; Frankfurt am Main, Germany; 535 pp., + 60 pls.
- Gonzalez, V.H., & T.L. Griswold. 2011. Taxonomic notes on the small resin bees *Hypanthioides* subgenus *Michanthidium* (Hymenoptera, Megachilidae). *ZooKeys* 117: 51–58.
- Gonzalez, V.H., M.S. Engel, M. Lucia, & L.J. Alvarez. 2013. Species status and new distribution records for *Lithurgus huberi* Ducke (Hymenoptera, Megachilidae, Lithurginae). *Journal of Hymenoptera Research* 30: 13–18.
- Guershon, M., & A. Ionescu-Hirsch. 2012. A review of the *Xylocopa* species (Hymenoptera: Apidae) of Israel. *Israel Journal of Entomology* 41–42: 145–163.
- Hinojosa-Díaz, I.A., V.H. Gonzalez, R. Ayala, J. Mérida, P. Sagot, & M.S. Engel. 2012. New orchid and leaf-cutter bee gynandromorphs, with an updated review (Hymenoptera, Apoidea). *Zoosystematics and Evolution* 88(2): 205–214.
- Lepelletier de Saint Fargeau, A.L.M. 1841. *Histoire Naturelle des Insectes. Hyménoptères* [Tome Second]. Roret; Paris, France; 680 pp.
- Lucia, M., & V.H. Gonzalez. 2013. A new gynandromorph of *Xylocopa frontalis* with a review of gynandromorphism in *Xylocopa* (Hymenoptera: Apidae: Xylocopini). *Annals of the Entomological Society of America* 106(6): 853–856.
- Michener, C.D. 2007. *The Bees of the World* [2nd Edition]. Johns Hopkins University Press; Baltimore, MD; xvi+[i]+953 pp., +20 pls.
- Michez, D., P. Rasmont, M. Terzo, & N.J. Vereecken. 2009. A synthesis of gynandromorphy among wild bees (Hymenoptera: Apoidea), with an annotated description of several new cases. *Annales de la Société Entomologique de France* 45(3): 365–375.
- Montalva, J.M., J.L. Allendes, & M. Lucia. 2013. The large carpenter bee *Xylocopa augusti* (Hymenoptera: Apidae): New record for Chile. *Journal of Melittology* 12: 1–6.
- Moure, J.S. 2007. Xylocopini Latreille, 1802. In: Moure, J.S., D. Urban, & G.A.R. Melo (Eds.), *Catalogue of Bees (Hymenoptera, Apoidea) in the Neotropical Region*: 637–673. Sociedade Brasileira de Entomologia; Curitiba, Brazil; xiv+1058 pp. [Available and updated online at <http://www.moure.cria.org.br/catalogue>; last accessed 11 August 2015]
- Wcislo, W.T., V.H. Gonzalez, & L. Arneson. 2004. A review of deviant phenotypes in bees in relation to brood parasitism, and a gynandromorph of *Megalopta genalis* (Hymenoptera: Halictidae). *Journal of Natural History* 38(11): 1443–1457.



Journal of JM Melittology

A Journal of Bee Biology, Ecology, Evolution, & Systematics

The *Journal of Melittology* is an international, open access journal that seeks to rapidly disseminate the results of research conducted on bees (Apoidea: Anthophila) in their broadest sense. Our mission is to promote the understanding and conservation of wild and managed bees and to facilitate communication and collaboration among researchers and the public worldwide. The *Journal* covers all aspects of bee research including but not limited to: anatomy, behavioral ecology, biodiversity, biogeography, chemical ecology, comparative morphology, conservation, cultural aspects, cytogenetics, ecology, ethnobiology, history, identification (keys), invasion ecology, management, melittopalynology, molecular ecology, neurobiology, occurrence data, paleontology, parasitism, phenology, phylogeny, physiology, pollination biology, sociobiology, systematics, and taxonomy.

The *Journal of Melittology* was established at the University of Kansas through the efforts of Michael S. Engel, Victor H. Gonzalez, Ismael A. Hinojosa-Díaz, and Charles D. Michener in 2013 and each article is published as its own number, with issues appearing online as soon as they are ready. Papers are composed using Microsoft Word® and Adobe InDesign® in Lawrence, Kansas, USA.

Editor-in-Chief

Michael S. Engel
University of Kansas

Assistant Editors

Victor H. Gonzalez
University of Kansas

Charles D. Michener
University of Kansas

Ismael A. Hinojosa-Díaz
Universidad Nacional Autónoma de México

Journal of Melittology is registered in ZooBank (www.zoobank.org), and archived at the University of Kansas and in Portico (www.portico.org).

<http://journals.ku.edu/melittology>
ISSN 2325-4467