



Research article

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***Relicthemisia*, a new subgenus of the oil-collecting bee
genus *Centris* Fabricius, 1804 with notes on distribution
and host plants of *C. xanthomelaena* Moure & Castro, 2001
(Hymenoptera: Apidae)**

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Abstract. *Centris xanthomelaena* Moure & Castro, 2001 is a relict species, endemic to northeastern Brazil and broadly recorded within the semiarid region of Caatinga xerophilous open vegetation. It was originally included in the subgenus *Paracentris* Cameron, 1903 but posteriorly interpreted as remotely related to it or to the subgenus *Centris* s. str. Fabricius, 1804. In this paper it is proposed to recognize this species as the single member of the monotypic *Relicthemisia*, a new subgenus which belongs to the ‘*Centris* group’, one of the main internal lineages of the genus. The proposition of this new subgenus is based on both, morphological and molecular data which indicate its long history as a distinct lineage. Distribution records, floral hosts as well as photographs of both sexes of *C. xanthomelaena* are also provided.

Keywords. Caatinga, Centridini, distribution, endemism, systematics.

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Introduction

Centris Fabricius, 1804 is one of the most abundant and diverse genus of solitary bees in the Neotropical Region. The taxonomy of this group is quite complex, mainly due to the lack of updated revisions, as well as the large number of described species. As a way to recognize apparently natural groups, several subgenera

have been described in it, with *Paracentris* Cameron, 1903 being one of the most diverse, both in number of species and morphology (Vivallo 2020). According to the distribution pattern of the species of this subgenus, sensu Zanella (2002), it corresponds to a group with amphitropical distribution, with a large number of species occurring in North and South America, being practically absent in Central America (Michener 1979). The complete taxonomic revision of the species of *Paracentris* was published by Vivallo (2020), following the interpretation of Zanella (2002) who carried out a phylogenetic analysis using morphological data of a large part of the taxa present in South America.

Before that taxonomic revision, some species were included in *Paracentris* intuitively or for practical reasons. An example of this is the species of the ‘*hyptidis* group’ Vivallo & Melo, 2009, whose species have been cited in the subgenera *Ptilocentris* Snelling, 1984; *Centris* s. str.; *Ptilotopus* Klug, 1810; *Wagenknechtia* Moure, 1950; as well as in *Paracentris* (Moure *et al.* 2009), with the species of this group recently located in a new subgenus *Anisoctenodes* Vivallo, 2020. A similar case was also observed for *Penthemisia* Moure, 1950, synonymized with *Paracentris* by Snelling (1966) and still kept as a junior synonym by Michener (2007), which was later recognized as a distinct lineage exclusive from southern South America and reinstated as a distinct subgenus of *Centris* (Zanella 2002).

Another similar case is observed in a species apparently endemic to northeastern Brazil described as *C. (Paracentris) xanthomelaena* Moure & Castro, 2001 and whose phylogenetic affiliation has remained uncertain until now. Moure *et al.* (2007) cited this species in the subgenus *Paracentris*, although the results obtained by Zanella (2002) indicated that it is not closely related to that subgenus, but it would correspond to a relict and undescribed lineage close to *Centris* s. str.

The phylogenetic relationships of *C. xanthomelaena* with other species of the genus were newly reconstructed by Martins & Melo (2015) in a study using molecular characters. According to those authors, this species would correspond to a lineage not closely related to *Centris* s. str., but remotely related to the South American species of *Paracentris*. Despite this inconsistency, in both cases *C. xanthomelaena* appears as a relict and distinct lineage, which is part of a larger clade known as the ‘*Centris* group’ (Zanella 2002).

Considering the results obtained by Zanella (2002) and Martins & Melo (2015), we formally propose a new monotypic subgenus, *Relicthemisia* subgen. nov., in this paper, containing *C. xanthomelaena* as type species and recognizing it as another of the major internal lineages of *Centris*. Both morphological and molecular evidence cited above support and justify the proposition of this new taxon.

Material and methods

General morphological terminology follows Michener (2007). Specimen labels were transcribed under the section ‘Material examined’. The backward slash (\) indicates different labels on the pin of the specimen. Specimens marked with a cross ‘[†]’ were lost in the fire of the Museu Nacional of Rio de Janeiro on September 2nd, 2018. The literature cited below the name of the species and above its diagnosis corresponds to an update of the information presented by Moure *et al.* (2007) in the *Catalogue of Bees in the Neotropical Region*.

Photographs were taken using a Leica DFC 450 camera attached to a Leica M205C stereo microscope and using extended-focus software Leica Application Suite ver. 4.8.0. All images were prepared using CombineZP ver. 7.0.0.1 software, and then enhanced with Adobe Photoshop® (ver. 7.0) without distorting the morphological characters of the specimens.

The distribution map was created using ArcView software (ver. 3.2 GIS) and prepared from locality records taken from specimen labels and from records available in literature listed in the section ‘References’. The biogeographical provinces are according to Morrone (2014) and were implemented

with the shape file provided by Löwenberg-Neto (2014). This was also done for the compilation of the floral records (Table 1). Plant names were checked and updated according to the International Plant Names Index (ipni.org). New distribution and/or floral records were marked with an asterisk (*).

Institutional abbreviations

DZUP	=	Coleção de Entomologia P.J.S. Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil
LABE/EBDA	=	Laboratório de Abelhas da Empresa Bahiana de Desenvolvimento Agrícola, Salvador, Bahia, Brazil
MNRJ	=	Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil
RPSP	=	Coleção Entomológica 'Prof. J.M.F. Camargo', Universidade de São Paulo, Campus Ribeirão Preto, São Paulo, Brazil
UNILA	=	Coleção Entomológica Universidade Federal da Integração Latino-Americana, Foz do Iguaçu, Paraná, Brazil

Results

Systematics

Class Insecta Linnaeus, 1758
Order Hymenoptera Linnaeus, 1758
Family Apidae Latreille, 1802
Tribe Centridini Cockerell & Cockerell, 1901
Genus *Centris* Fabricius, 1804

Relicthemia subgen. nov.

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Figs 1–4

Type species

Centris xanthomelaena Moure & Castro, 2001

Diagnosis

Integument dark brown to black, clypeus and labrum coriaceous with coarse and dense punctation, but the clypeus with an unpunctated area as a median longitudinal band on upper half (Fig. 1A).

Female

Inner orbits of compound eyes converging downward (Fig. 1A). Mandible with four apically acute teeth, the fourth tooth slightly larger than the third (Fig. 1A). Basitibial plate elliptical, with S-like secondary plate (Fig. 2A). Elaiospathes normally developed.

Male

Clypeus, except lateral areas, and labrum yellow (Fig. 1C). Yellow spots on paraocular and supraclypeal areas (Fig. 1C). Apical margin of T7 with strong emargination (Fig. 2B). S7 without emargination on the basal border (Fig. 2B). S8, apical projection clearly defined, larger at middle and with rounded apex (Fig. 2C). Genital capsule with long dorsoapical projection of gonocoxite, ca 2/3 lengths of gonostylus (Fig. 2E).

Etymology

From Latin '*relictus*' (a survivor from a previous age) plus '*Hemisia*' (a junior synonym of *Centris*) due to the antiquity and isolation of this lineage.

Remarks

Centris xanthomelaena, the only species of the new subgenus *Relicthemisia*, was recognized as a distinct lineage with no close relationship to other species, based on morphological (Zanella 2002) and molecular data (Martins & Melo 2015). Depending on the study, the phylogenetic position of this lineage was different, either as sister group of *Centris* s. str. or *Paracentris* Cameron, 1903 respectively. Nevertheless, it was always recovered as a distinct and relatively old lineage within the ‘*Centris* group’. According to Martins & Melo (2015), *C. xanthomelaena* diverged from a South American clade formed by *Paracentris* around 18 million years ago, at about the same time when the major lineages within the ‘*Centris* group’ diverged from each other.

The hypothetical relationship of this species with *Centris* s. str. was based on the interpretation of two morphological characters: the strong emargination on the apical margin of T7 (Fig. 2B; character 25: 0 in Zanella 2002) and the short and wide translucent laminar projection on the dorsodistal region of the gonocoxite at the base of the long, giant bristles (Fig. 2E–F; character 44: 1 in Zanella 2002), but the states present in *C. xanthomelaena* are clearly unique and cannot be homologous to those present in species of *Centris* s. str.

Despite the fact that new phylogenetic analyses using a higher number of terminals of *Centris* s. str. and *Paracentris* can provide new information regarding the history and relatedness of the lineage of *C. xanthomelaena*, its distinctness and old history are well supported (see Martins & Melo 2015). Besides the uniqueness of the intense yellow slightly greenish pilosity covering the head, mesosoma (except the ventral surface) and on the anterior half of T1 that allow to easily recognize *C. xanthomelaena* from other species of the genus (Fig. 1A–D), this monotypic subgenus presents a unique combination of characters of the male’s genitalia that distinguishes it from the other members of the ‘*Centris* group’: an emargination on the apical margin of T7 (Fig. 2B); a long dorsoapical projection of gonocoxite, ca 2/3 lengths of gonostylus (Fig. 2E); the dorsomedial projections of the genital capsule (Fig. 2E), as well as the S-like lower margin of the female’s secondary basitibial plate (Fig. 2A).

Centris (Relicthemisia) xanthomelaena Moure & Castro, 2001

Figs 1–4

Centris ‘*xanthomelaena*’ Vogel & Machado, 1991: 163–175, figs 6a–b, 9a, h (distribution, floral records, pollination). Nomen nudum.

Centris (Paracentris) xanthomelaena – Moure & Castro 2001: 330–332, figs 1–4 (original description).

— Silveira *et al.* 2002: 98, 253 (distribution, list). — Urban 2003: 24, 43 (taxonomic note, cited).

— Azevedo & Silveira 2005: 45 (cited). — Batalha Filho *et al.* 2007: 25 (distribution record).

— Moure *et al.* 2007: 120 (catalogue). — Azevedo *et al.* 2008: 143 (distribution record).

— Machado & Sazima 2008: 488 (floral record). — Rodarte *et al.* 2008: 307 (distribution record).

— Pigozzo & Viana 2010: 105 (distribution record). — Vivallo & Zanella 2012: 4, 6, 8–9, 13–

14, figs 37–38, 77–78 (distribution, key). — Giannini *et al.* 2013: 78 (list). — Silva 2014: 188

(distribution record). — Martins *et al.* 2018: 770, figs 1–2 (bionomy, nesting behavior, distribution

record). — Barenbaum 2019: 222 (bionomy, sleeping behavior). — Carneiro *et al.* 2019: 219

(distribution and floral records).

Centris xanthomelaena – Zanella 2002: 438, 444, 447, 451, 453, 455, 457, 459, 483, 485, 486, figs 26,

164–170 (diagnosis, male description, distribution map, morphological characters, phylogenetic

relationships). — Aguiar 2003a: 42, 43 (distribution and floral records); 2003b: 464 (floral record).

— Zanella 2003: 234 (list). — Aguiar *et al.* 2005: 249 (distribution record). — Aguiar & Zanella

2005: 17, 19 (distribution record). — Azevedo & Silveira 2005: 47 (cited). — Prevedello & Carvalho 2006: 45 (cited). — Zanella & Vivallo 2009: 68 (cited). — Martins & Melo 2015: 7–8, 10 (phylogenetic relationships). — Martins *et al.* 2018: 771, 772 (sleeping behavior). — Carneiro *et al.* 2019: 216, 220 (distribution and floral records, pollinator).

Diagnosis

Female

Integument dark brown to black, except flagellum dark brown and tegula yellowish brown (Fig. 1A–B). Wings brown with veins dark brown (Fig. 1B). Head, mesosoma (except the ventral surface) and anterior half of T1 with intense yellow slightly greenish pilosity, lighter on labrum and gena (Fig. 1A–B). The rest of the body with blackish hairs, except posterior apex of the femur of forelegs with some yellowish hairs (Fig. 1A–B). Clypeus coriaceous with coarse and dense punctation (Fig. 1A). Clypeal disc with an unpunctated area on upper half, without smooth longitudinal band. Labrum with the same punctation, but denser, without smooth basal margin. Terga and sterna, except T6 and S6, with very narrow smooth distal margin, but denser, without smooth basal margin. Terga and sterna, except T6 and S6, with very narrow smooth distal margin, wider on T4. Mandible with four apically acute teeth (Fig. 1A). Fourth teeth slightly larger



Fig. 1. *Centris (Relicthemia) xanthomelaena* Moure & Castro, 2001. **A–B.** ♀. **A.** Frontal view. **B.** Habitus, lateral view. **C–D.** ♂. **C.** Frontal view. **D.** Habitus, lateral view. Scale bars: A, C = 2 mm; B, D = 5 mm.

than the third (Fig. 1A). Maxillary palpus 4-segmented. Malar area very narrow (Fig. 1A). Labrum semicircular (Fig. 1A). Inner orbits of compound eyes converging downward (Fig. 1A). Elaiospathes normally developed. Basitibial plate elliptical, with S-like secondary plate (Fig. 2A). S2–S4 projected in the middle. Apex of primary pygidial plate slightly rounded with the apex of the secondary plate open and slightly projected towards the distal edge of the primary plate (Fig. 2D).

Male

Similar to the female, except for the following characters: integument dark brown to black, except basal segments of the flagellum brown and apical segments slightly orange (Fig. 1C–D). Supraclypeal area, discs of clypeus and labrum yellow (Fig. 1C–D). Tegula yellowish brown. Clypeal disc with small unpunctated area on upper half, without smooth longitudinal band. Terga and sterna, except T7 and S6, with relatively broad light brown smooth distal margin, wider on T4. Mandible with three apically acute teeth (Fig. 1C). Distance between clypeus and compound eyes shorter than half of the shortest diameter of F1 (Fig. 1C). Apical margin of the hind tibia without tooth-like projection. Apical half of fore and middle basitarsi without a row of long, erect, slightly spatulate and curved setae similar to an elaiospathe. Pygidial plate absent.

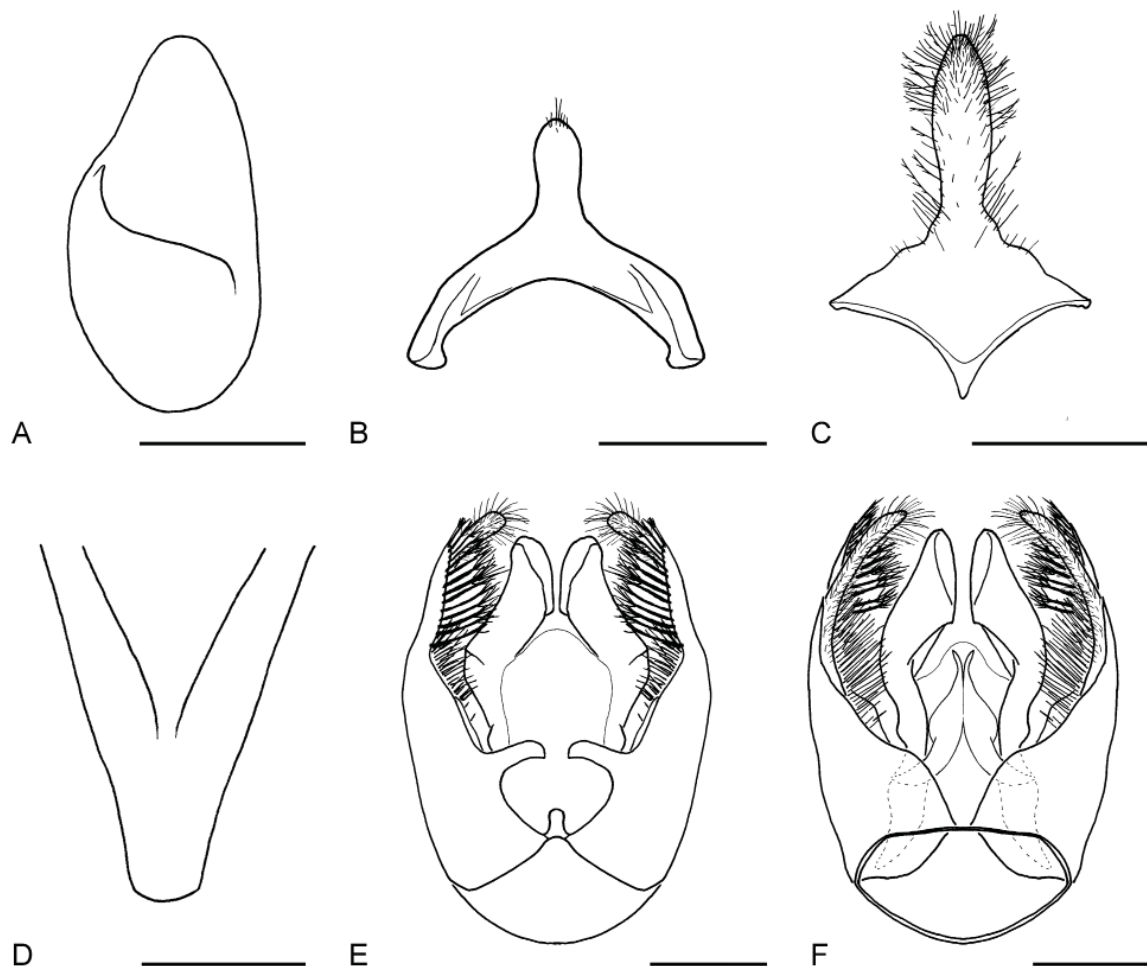


Fig. 2. Morphological characteristics of *Centris (Relicthemia) xanthomelaena* Moure & Castro, 2001. **A.** Female basitibial plate. **B.** Male S7. **C.** Male S8. **D.** Female pygidial plate. **E.** Genital capsule (dorsal view). **F.** Genital capsule (ventral view). Scale bars = 0.5 mm.

Type material

Holotype

BRAZIL – **Bahia State** • ♀; Milagres; 28 Jan. 1998; 10h50; Marina Siqueira de Castro leg.; *Chamaechrista amiciela* (Caesalpiniaceae)\1070; LABE/EBDA (not examined).

Paratypes

BRAZIL – **Bahia State** • 1 ♀; Milagres; 12°88.280' S, 39°92.298' W; 28 Jan. 1998; 10h45; Marina Siqueira de Castro leg.; *Chamaechrista amiciela* (Caesalpiniaceae)\1069; LABE/EBDA (not examined) • 1 ♀; Milagres; 12°88.280' S, 39°92.298' W; 31 Mar. 1997; 10h30; Marina Siqueira de Castro leg.; in *Stimaphyllom auriculatum* (Malpighiaceae); DZUP (not examined).

Material examined

(specimens labeled as paratype or holotype below do not belong to the type series)

BRAZIL – **Alagoas State** • 1 ♀; Piranhas, Poço da Ingazeira; 9°50.594' S, 37°88.113' W; 28 Oct. 2005; Debora Moura leg.; \ “*Centris xanthomelaena* Moure & Castro 2001 Schindwein Det.”\HYAP4004; UNILA. – **Bahia State** • 1 ♀; Curaçá, Faz. Humaitá; 9°07'262" S, 39°42'859" W; 440 m a.s.l.; 4 May 2011; PPBIO Caatinga; F.C.V. Zanella leg.; \ HYAP 0582, UNILA • 1 ♀; Monte Santo; 10°43.958' S, 39°33.566' W; 3 Feb. 2000; w.c.; Malpighiaceae \ HYAP 9706, UNILA • 2 ♀♀; Camacari, Dunas de Tauá; 12°71.621' S, 38°36.842' W; 24 Nov. 1993; J. Becker leg. [†]; MNRJ • 1 ♂; Maracás; 13°26.467' S, 40°25.850' W; 20 Jan. 1963 \ “Coleção Campos Seabra” \ J. Becker leg. \ “*Centris Xanthemisia bicolor* Lepelletier” \ “*C. Paracentris xanthomelaena* A.A. Azevedo Det.” [†]; MNRJ • 1 ♀, 1 ♂; Dias D'Avila; 12°60.621' S, 38°34.028' W; 2 Dec. 1951; Luiz Carlos leg. [†]; MNRJ • 1 ♀, 2 ♂♂; Dias D'Avila; 12°60.621' S, 38°34.028' W; 16 Dec. 1951; Luiz Carlos leg. [†]; MNRJ • 2 ♀♀, 1 ♂; Ipirá, Santa Quitéria; 12°15.642' S, 39°76.319' W; 6 Jan. 2010; K. Ramos and V. Kanamura leg. [†]; MNRJ. – **Minas Gerais State** • 1 ♀; Conego Marinho; 15°18" S, 44°25" W; 1 Apr. 1988; Nereu leg. 880824 \ “*C. (Paracentris)* sp. nov. Det. Moure, 1992” \ “Parátipo *Centris xanthomelaena* sp. nov. F. Zanella, 1999”; RPSP • 1 ♂; Conego Marinho; 15°18" S, 44°25" W; 29 Mar. 1988; Nereu leg. 880654 \ “ex *Penthemisia* Moure, 1950 Det. Moure 1992” \ “*C. (Paracentris)* sp. nov. Det. Moure, 1998” \ “Parátipo *Centris xanthomelaena* sp. nov. F. Zanella, 1999”; RPSP. – **Paraíba State** • 1 ♀; Patos; 7°03.860' S, 37°31.445' W; 16 Aug. 2002; Gislyllyana leg.; HYAP 9300; UNILA. – **Pernambuco State** • 1 ♀; Alagoinha; 8°46.622' S, 36°78.423' W; 18 Jun. 1987; I.C.S Machado leg.; in *Ruellia* sp. \ “*C. (Paracentris)* sp. nov., Det. Moure 1992” \ “Holótipo *Centris xanthomelaena* sp. nov. F. Zanella, 1999”; RPSP • 1 ♀; Buique, Vale do Catimbau; 8°49.210' S, 37°50.180' W; 17 Mar. 2005; R. Pick leg. \ “*Centris xanthomelaena* Moure & Castro 2001 Schindwein Det.” \; HYAP 4002; UNILA. – **Rio Grande do Norte State** • 1 ♂; Serra Negra do Norte, ESEC Seridó; 6°66.572' S, 37°40.515' W; 12 Aug. 1995; F. Zanella leg. \ 0938 10b03\HYAP 9705; UNILA • 2 ♀♀; Serra Negra do Norte, ESEC; 6°66.572' S, 37°40.515' W; 13 Mar. 2005; F. Zanella leg.; em pl. 1 roxa 10h\ HYAP 4601; UNILA • 1 ♂; Serra Negra do Norte, ESEC Seridó; 6°66.572' S, 37°40.515' W; 5 Jul. 2005; F. Zanella leg.; pl. 27 *Chamaechrista* 13h \ HYAP 4598; UNILA • 1 ♀; Serra Negra do Norte, ESEC Seridó; 6°66.572' S, 37°40.515' W; 22 May 2005; F. Zanella leg. \ HYAP 4600; UNILA • 1 ♀; Serra Negra do Norte, ESEC Seridó; 6°66.572' S, 37°40.515' W; 12 Jun. 2005; F. Zanella leg.; *Krameria* sp. 14h \ HYAP 4853; UNILA • 1 ♂; Serra Negra do Norte, ESEC Seridó; 6°66.572' S, 37°40.515' W; 8 Apr. 2005; F. Zanella leg.; Voando sobre arbusto 17h [†]; MNRJ • 1 ♀; Santana do Seridó; 6°46" S, 36°44" W; 10 Aug. 2007; J.M.F. Camargo leg.; 07.1024; RPSP.

Type locality

Brazil: Bahia State: Milagres.

Distribution

Endemic to northeastern Brazil, being recorded mainly in the dry open Caatinga vegetation (Fig. 3). The only record in central Brazil, Mato Grosso State, needs confirmation. Brazil: Rio Grande do Norte State: Serra Negra do Norte (Zanella 2002, 2003; Aguiar *et al.* 2003; Silva 2014), *Santana do Seridó. Paraíba State: (Silveira *et al.* 2002). *Patos. Pernambuco State: Alagoinha (Vogel & Machado 1991; Machado & Sazima 2008). Petrolina (Xavier *et al.* 2016; Martins *et al.* 2018). Salgueiro (Xavier *et al.* 2016). *Buique. Alagoas State: *Piranhas. Bahia State: Canudos (Pigozzo & Viana 2010; Silva 2014). Ibiraba (Rodarte *et al.* 2008). Itatim (Aguiar 2003a, 2003b; Aguiar *et al.* 2003; Aguiar & Zanella 2005; Silva 2014). Jequié (Batalha Filho *et al.* 2007; Silva 2014). Juazeiro (Coelho *et al.* 2018). Milagres (Moure & Castro 2001; Silva 2014). Monte Santo (Zanella 2002; Aguiar *et al.* 2003). Xique-Xique (Carneiro *et al.* 2019). *Camacari (Dunas de Tauá), *Dias D'Ávila, *Ipirá (Santa Quitéria), *Maracás. Mato Grosso State: cf. Serra do Roncador (Zanella 2002). Minas Gerais State: Botumirim (Azevedo *et al.* 2008). Cônego Marinho (Zanella 2002).

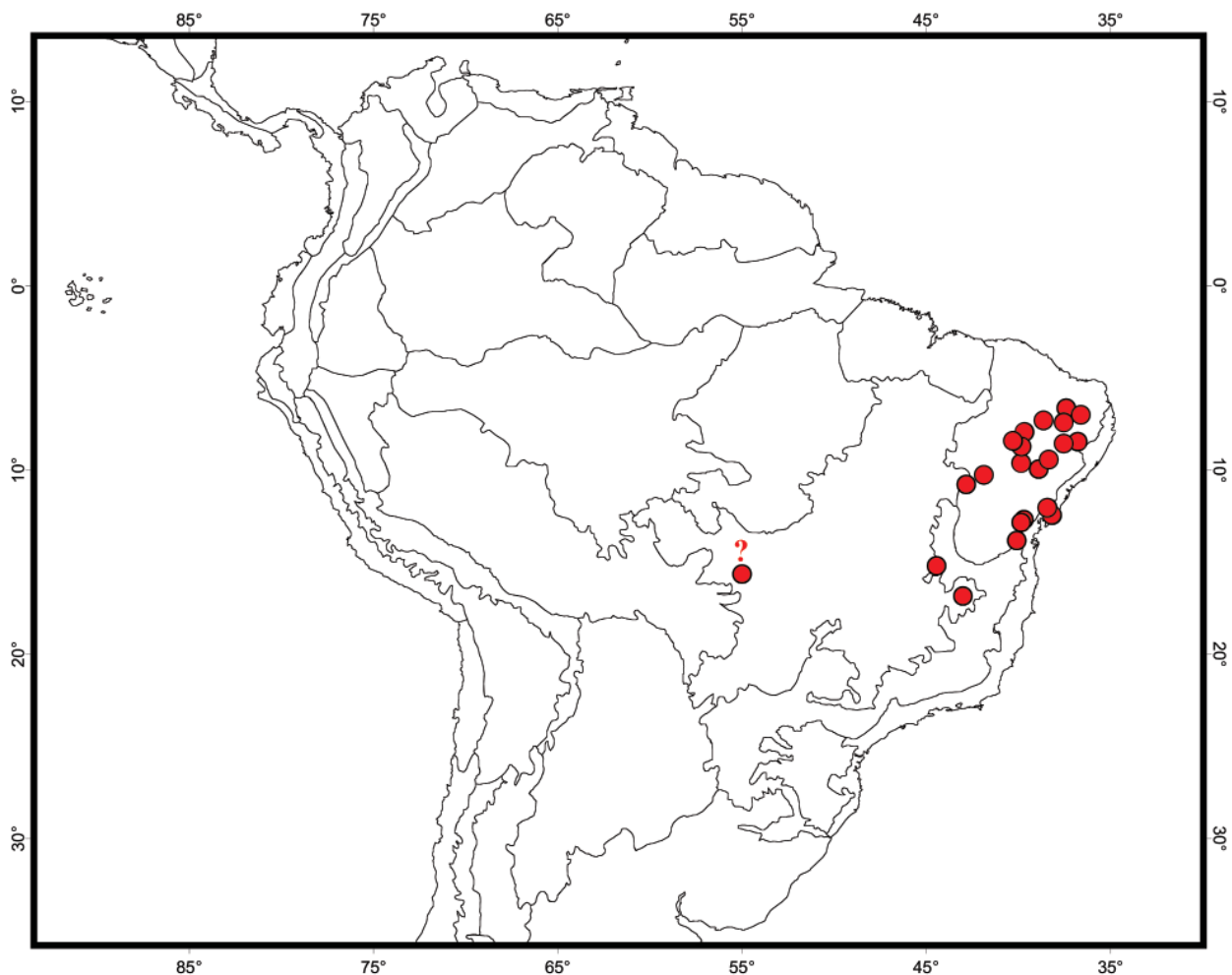


Fig. 3. Distribution records of *Centris (Relicthemia) xanthomelaena* Moure & Castro, 2001. The limits of biogeographical provinces are depicted in the map. Most records of this species are found in the Caatinga province in northeastern Brazil and marginally in the Cerrado Province, both in the South American diagonal of dry open areas.

Table 1. Floral host records for *Centris (Relicthemisia) xanthomelaena* Moure & Castro, 2001 and distribution of host plant species.

Plant family and species	Main resource (elaiophore type)	Vegetation and distribution of host plant species ^{1, 2}	Host plant record ¹
Acanthaceae			
* <i>Ruellia</i> sp.	Nectar	?	(H)
sp.?	Nectar	?	(I)
Fabaceae			
<i>Chamaecrista amiciella</i> (H.S. Irwin & Barneby) H.S. Irwin & Barneby	Pollen	Caatinga in Northeast Brazil and in GO state (A)	(J)
<i>C. pascuorum</i> (Benth.) H.S. Irwin & Barneby	Pollen	Caatinga, ‘campo rupestre’ and anthropized area in Northeast Brazil and MG state (A)	(I)
<i>Chamaecrista</i> sp.		?	(H)
Krameriaceae			
<i>Krameria grandiflora</i> A. St. Hill.	Oil (epithelial)	Caatinga, ‘campo rupestre’, restinga, cerrado (<i>lato sensu</i>) anthropized area from PA and RN to MS and ES states in Brazil (B)	(K)
<i>Krameria</i> sp. (Fig. 4)	Oil (epithelial)	?	(L, H)
Malpighiaceae			
<i>Mcvaughia bahiana</i> W.R. Anderson ³	Oil (epithelial)	Sandy Caatinga in BA state (C)	(I, M)
<i>Stigmaphyllon auriculatum</i> A. Juss.	Oil (epithelial)	Caatinga and restinga in Northeast Brazil and ES and RJ states (D)	(J)
Plantaginaceae			
<i>Angelonia campestris</i> Nees & Mart. (= <i>bisaccata</i> Benth. = <i>hookeriana</i> Gardner ex Benth.)	Oil (trichomatic)	Caatinga and ‘campo rupestre’ in Northeast Brazil (E)	(I, L, M)
<i>A. salicariifolia</i> Bonpl. (= <i>hirta</i> Cham.)	Oil (trichomatic)	Caatinga in Northeast Brazil and Cerrado (<i>lato sensu</i>) in MS state (E), reaching Argentina and Central America (F)	(I, L, M)
Sterculiaceae			
<i>Melochia tomentosa</i> L.	Nectar	Anthropized area, cerrado (<i>lato sensu</i>), rocky outcrops and rain forest in Northeast and Midwest Brazil (G)	(I, N, O)

¹References for plant species distribution and host plant record: (A) Souza & Bortoluzzi 2015; (B) Costa-Lima 2020; (C) Almeida *et al.* 2019; (D) Mamede 2015; (E) Souza *et al.* 2020; (F) Martins & Alves-dos-Santos 2013; (G) Esteves 2015. References for plant hosts: (H) this work; (I) Aguiar *et al.* 2003; (J) Moure & Castro 2001; (K) Carneiro *et al.* 2019; (L) Machado 2004; (M) Vogel & Machado 1991; (N) Aguiar 2003a, 2003b; (O) Machado & Sazima 2008.

²Brazilian states: BA: Bahia, ES: Espírito Santo, GO: Goiás, MG: Minas Gerais, MS: Mato Grosso do Sul, PA: Pará, RJ: Rio de Janeiro, RN: Rio Grande do Norte.

³Cited as *Macvaughia bahiensis*, a name that does not appear in ipni.org.

Discussion

The distinctiveness of *Centris xanthomelaena* as compared with the previously described subgenera of *Centris* was already characterized by Zanella (2002), especially based on the analysis of male genitalia. In the key for subgenera of *Centris* of Michener (2007), this species fits in *Paracentris*, considering the “female’s basitibial plate with defined secondary plate that lacks sharp projecting margin” and the “margin of secondary plate extending [...] near posterior margin of basitibial plate” (dilemma 13), while the male’s lateral ocellus is separated from the eyes by a distance similar to the ocellar diameter, and the T2–T4 covered with dark pubescence (dilemma 20). Nevertheless, males of *C. xanthomelaena* are clearly distinguished from males of *Paracentris* by the strong emargination on the apical margin of T7 (Fig. 2B), by the absence of emargination on the basal border of S7 (Fig. 2B), and by the presence of a long dorsoapical projection of gonocoxite, ca $\frac{2}{3}$ lengths of gonostylus (Fig. 2E–F). This latter feature is unique, being a somewhat intermediate condition between that observed in *Centris* s. str. and *Paracentris*.



Fig. 4. Female of *Centris (Relicthemis) xanthomelaena* Moure & Castro, 2001 visiting *Krameria* sp. (Krameriaceae) in Estação Ecológica do Seridó, Rio Grande do Norte State, Brazil.

Previously to its description and naming, *Centris xanthomelaena* was already recognized as a legitimate pollinator of *Angelonia campestris* Nees & Mart. and *A. salicariifolia* Bonpl. (Plantaginaceae) in the Caatinga (Vogel & Machado 1991). The two pollen sources *Chamaecrista* Moench species and oil sources *Krameria grandiflora* A. St. Hill., *Mcvaughia bahiana* W.R. Anderson, *Stigmaphyllon auriculatum* A. Juss. and *A. campestris* are endemic to northeastern Brazil and specially recorded in xerophilous Caatinga vegetation or at least in open vegetation areas.

A similar context was noted by Aguiar *et al.* (2003) in relation to *Centris hyptidis* Ducke, 1908, another species endemic from northeastern Brazil and typical from Caatinga vegetation. This species also has a more specialized relation with pollen and oil sources in the Caatinga biome as compared to other species with wider distribution patterns. This can be interpreted as a result of a longer history with plants of this semiarid region. Differing from the interpretation of Giannini *et al.* (2013), *C. hyptidis*, along with *C. hyptidoides* Roig-Alsina, 2000 and *C. thelyopsis* Vivallo & Melo, 2009, does not belong to the same lineage of the subgenus *Wagenknechtia*, but to *C. (Anisoctenodes)*, an old lineage distributed in the South American diagonal of open dry vegetation (Werneck 2011; Zanella 2011), probably with association to flowers of *Angelonia* (Plantaginaceae) (Vivallo & Melo 2009; Martins & Melo 2015).

A similar old history and restricted distribution is found in *Centris (Relicthemisia) xanthomelaena*, in spite of similar oil-collecting apparatuses found in other species of *Centris* that also occur in the Caatinga (Vogel & Machado 1991). Those structures are specialized in exploring plant species with epithelial elaiophores (Giannini *et al.* 2013). It must also be noted that there is no record of this bee visiting the introduced West Indian cherry (*Malpighia emarginata* D.C.) even though the intense collection effort in this tree at sites where *C. (Relicthemisia) xanthomelaena* occurs (Coelho *et al.* 2018; Siqueira *et al.* 2011).

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