



UnB

UNIVERSIDADE DE BRASÍLIA

PROGRAMA DE PÓS-GRADUAÇÃO EM ZOOLOGIA

**Taxonomia das abelhas do gênero *Xanthopedia*
(Hymenoptera, Apidae: Tapinotaspidini), com a descrição
de oito novas espécies para o Brasil.**

Mateus Griguç de Carvalho

Brasília

Outubro/2022



UnB

UNIVERSIDADE DE BRASÍLIA

PROGRAMA DE PÓS-GRADUAÇÃO EM ZOOLOGIA

**Taxonomia das abelhas do gênero *Xanthopedia*
(Hymenoptera, Apidae, Tapinotaspidini), com a descrição
de oito novas espécies para o Brasil.**

Mateus Griguç de Carvalho

Dissertação de Mestrado/Tese de
Doutorado apresentada ao Programa
de Pós-graduação em Zoologia,
Instituto de Ciências Biológicas, da
Universidade de Brasília, como parte
dos requisitos necessários à
obtenção do título de
Mestre/Doutor(a) em Zoologia.

Orientador(a): Antônio José Camillo
Aguar

Brasília

Outubro/2022

Taxonomia das abelhas do gênero *Xanthopedia* (Hymenoptera, Apidae, Tapinotaspidini), com a descrição de oito novas espécies para o Brasil.

Mateus Griguç de Carvalho

Antônio José Camillo Aguiar

Dissertação de Mestrado/Tese de Doutorado apresentada ao Programa de Pós-graduação em Zoologia, Instituto de Ciências Biológicas, da Universidade de Brasília, como parte dos requisitos necessários à obtenção do título de Mestre/Doutor(a) em Zoologia.

Brasília

Outubro/2022

Gt Griguç de Carvalho, Mateus
 Taxonomia das abelhas do gênero Xanthopedia
(Hymenoptera, Apidae, Tapinotaspidini), com a descrição de
oito novas espécies para o Brasil. / Mateus Griguç de
Carvalho; orientador Antônio José Camillo de Aguiar. --
Brasília, 2022.
 71 p.

 Dissertação(Mestrado em Zoologia) -- Universidade de
Brasília, 2022.

 1. Taxonomia de abelhas. 2. Descrição de espécies novas.
3. Distribuição geográfica . I. José Camillo de Aguiar,
Antônio, orient. II. Título.

AGRADECIMENTOS

O presente trabalho foi realizado com apoio da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Código de Financiamento 001.

Minha gratidão ao Universo por me permitir vivenciar cada momento, sejam eles tristes ou alegres. Todos fazem parte da minha história e me fizeram crescer, amadurecer e aprender a amar a vida de todas as formas.

Sou grato à minha família, principalmente pai e mãe, que sempre me apoiaram em minhas decisões e me deram as oportunidades para me tornar uma pessoa cada dia melhor. Não cabe em palavras o amor que sinto.

À minha esposa, parceira, companheira de profissão e de sonhos. Sou abençoado por tê-la como meu lar.

Agradeço à Universidade de Brasília pela oportunidade de fazer ciência mesmo em dias difíceis. E sei que ela há de resistir!

Aos professores que conheci durante o Mestrado, meu muito obrigado. Aprender com vocês foi uma oportunidade única. Um dia espero ser como alguns de vocês.

Agradeço, também, ao meu orientador, Antônio, por me acolher e me instruir durante a realização do trabalho, mesmo conhecendo as limitações a mim impostas.

EPÍGRAFE

“Cerre os punhos, sorria e
jamais volte pra sua
quebrada de mãos e mente
vazia.”
Emicida.

INDÍCE DE FIGURAS

| | |
|--|----|
| Figure 1 Geographical distribution of <i>Xanthopedia</i> species..... | 59 |
| Figure 2 <i>Xanthopedia larocai</i> , UNB 044686, Brasília - DF. Syntype male. A) face view; B) lateral view; C) dorsal view of metasoma. | 59 |
| Figure 3 <i>Xanthopedia</i> sp. nov. 1, UNB 060108, Brazlândia - DF. Holotype male. A) Face view; B) lateral view; C) dorsal view. | 60 |
| Figure 4 <i>Xanthopedia</i> sp. nov. 2, DSEC 1573, Mamanguape - PB. Holotype male. A) face view; B) lateral view; C) dorsal view..... | 60 |
| Figure 5 <i>Xanthopedia</i> sp. nov. 2, 2265, Mamanguape - PB. Paratype female. A) face view; B) lateral view; C) dorsal view of mesosoma. | 61 |
| Figure 6 <i>Xanthopedia</i> sp. nov. 6, UFMG 1207518, Ubajara - CE. Holotype male. A) face view; B) lateral view; C) dorsal view..... | 62 |
| Figure 7 <i>Xanthopedia</i> sp. nov. 6, UFMG 1207522, Ubajara - CE. Paratype female. A) face view; B) lateral view; C) dorsal view of mesosoma..... | 62 |
| Figure 8 <i>Xanthopedia</i> sp. nov. 8, UNB 250670, Sobradinho - DF. Holotype female. A) face view; B) lateral view; C) dorsal view. | 63 |
| Figure 9 Geographical distribution of <i>Xanthopedia</i> species belonging to <i>X. larocai</i> group (supraclypeal area elevated, strongly angled and flat). | 64 |
| Figure 10 <i>Xanthopedia iheringii</i> . Syntype male. A) face view; B) dorsal view of metasoma; C) dorsal view of mesosoma..... | 65 |
| Figure 11 <i>Xanthopedia</i> sp. nov. 3, UNB 000177, Teresina de Goiás - GO. Holotype female. A) face view; B) lateral view; C) dorsal view..... | 65 |
| Figure 12 <i>Xanthopedia</i> sp. nov. 4, UNB 000170, Formosa - GO. Holotype female. A) face view; B) lateral view; C) dorsal view of mesosoma..... | 66 |
| Figure 13 <i>Xanthopedia</i> sp. nov. 5, UFMG 92947, São Gonçalo do Rio Preto - MG. Holotype male. A) face view; B) lateral view; C) dorsal view of metasoma. | 66 |
| Figure 14 <i>Xanthopedia</i> sp. nov. 5, UFMG 90639, Jaboticatubas - MG. Paratype female. A) face view; B) lateral view; C) dorsal view..... | 67 |
| Figure 15 Geographical distribution of <i>Xanthopedia</i> species belonging to <i>X. iheringii</i> group (supraclypeal area elevated, convex)..... | 68 |
| Figure 16 <i>Xanthopedia</i> sp. nov. 7, Manaus - AM. Holotype female. A) face view; B) lateral view; C) dorsal view of metasoma. | 69 |
| Figure 17 <i>Tetrapedia globulosa</i> Friese, 1899 (<i>Xanthopedia globulosa</i>), ZMB, Bahia, Brazil. Holotype male. A) face view; B) lateral view; C) dorsal view. | 69 |
| Figure 18 <i>Xanthopedia xanthina</i> Moure, 1994, DZUP, Bolivia. Holotype male. A) face view; B) lateral view; C) dorsal view of metasoma. | 70 |
| Figure 19 <i>Xanthopedia tristriata</i> , INPA, Mato Grosso. Syntype female. A) face view; B) lateral view; C) dorsal view. | 70 |
| Figure 20 Geographical distribution of <i>Xanthopedia</i> species belonging to <i>Lissopedia</i> group (supraclypeal area very low). | 71 |

RESUMO

Taxonomia das abelhas do gênero *Xanthopedia* (Hymenoptera, Apidae, Tapinotaspidini), com a descrição de oito novas espécies para o Brasil.

Mateus Griguç de Carvalho

Antônio José Camillo Aguiar

Resumo da Dissertação de Mestrado/Tese de Doutorado apresentada ao Programa de Pós-graduação em Zoologia, Instituto de Ciências Biológicas, da Universidade de Brasília, como parte dos requisitos necessários à obtenção do título de Mestre/Doutor(a) em Zoologia.

O conhecimento das diferentes espécies do mundo é fundamental para proteger a biodiversidade. O conhecimento acerca das espécies, seus indivíduos, números e sua distribuição geográfica é uma parte importante das decisões de políticas de conservação. Como base para a sistemática, a revisão taxonômica de animais e plantas fornece dados importantes sobre espécies, geralmente desconhecidos. Além disso, espécies em coleções de museus e suas etiquetas podem conter dados para outros usos que ainda não foram completamente explorados. A taxonomia é uma disciplina que integra componentes importantes da pesquisa em biodiversidade, proporcionando estabilidade para as demais áreas da ciência. Neste trabalho, buscamos ampliar e atualizar o conhecimento taxonômico de abelhas através da revisão das espécies de abelhas solitárias do gênero *Xanthopedia* com diagnoses, mapas de distribuição geográfica e imagens de alta resolução. Como resultado, descrevemos oito novas espécies do gênero *Xanthopedia* a partir do estudo de 361 espécimes oriundos de coletas, visitas a coleções, empréstimos por museus de diferentes instituições e fotos do material tipo. A partir deste estudo comparativo foi possível produzir diagnoses comparativas e uma chave de identificação, além de discutir potenciais perspectivas de endemismos para o Cerrado e demais áreas savânicas do Brasil.

Palavras-chave: sistemática; filogenia; espécies novas; abelhas solitárias.

Brasília

Outubro/2022

ABSTRACT

Taxonomy of the bee genus *Xanthopedia* (Hymenoptera, Apidae, Tapinotaspidini)
with the description of eight new species from Brazil

Mateus Griguç de Carvalho

Antônio José Camillo Aguiar

Abstract da Dissertação de Mestrado/Tese de Doutorado apresentada ao Programa de Pós-graduação em Zoologia, Instituto de Ciências Biológicas, da Universidade de Brasília, como parte dos requisitos necessários à obtenção do título de Mestre/Doutor(a) em Zoologia.

Accurate knowledge of the world's different species is essential for protecting biodiversity. With increasing focus on habitats and ecosystems research, individual species understanding, total specimens, and geographic distribution is paramount to conservation policy decisions. As a staple for systematics, a taxonomic review of animals and plants provides data about usually unknown species. In addition, species in museum collections and their labels may contain data for other purposes, which researchers have not explored yet. Taxonomy is a field that integrates components of biodiversity research, providing stable support for areas of science. In this paper, we sought to expand and update taxonomic knowledge of bees by a review of solitary bees of the genus *Xanthopedia* with diagnosis, distribution maps and high-resolution images. As a result, we described 8 new species of the genus *Xanthopedia* from the study of 361 specimens from collected material, collections visits, specimens borrowings from museums of different institutions and photos of the material types. Based on this analysis, it is possible to provide a comparative diagnosis and an identification key, and discuss potential endemism prospects for the Cerrado and other Savannic areas of Brazil.

Key-words: systematics; phylogeny; new species; solitary bees.

Brasília

Outubro/2022

INTRODUÇÃO GERAL

A quantidade de espécies no planeta tem sido foco de muitas questões e estimativas ao longo do tempo e uma base de dados cada vez mais completa pode elucidar questões importantes sobre a biodiversidade. Com a maior incidência de estudos voltados aos habitats e ecossistemas, o conhecimento de espécies individualmente, suas quantidades e sua distribuição geográfica é parte importante na tomada de decisões para políticas de conservação. Como base das pesquisas em sistemática, as revisões taxonômicas de animais e plantas contribuem com dados de espécies que muitas vezes são desconhecidas. Ademais, espécies presentes em coleções de museus e suas etiquetas podem conter dados passíveis de usos adicionais ainda inexplorados. A criação e o enriquecimento de bancos de dados acerca de espécies descritas e revisadas são úteis, além de qualificar trabalhos com quantidades maiores de dados para estudos de táxons pouco conhecidos, como invertebrados (Meier & Dikow, 2004, Sheridan & Stuart, 2018).

A taxonomia é uma disciplina capaz de integrar componentes essenciais para estudos de biodiversidade, como biogeografia, biologia evolutiva, ecologia e conservação. Tudo isso fornece estabilização na classificação e nomenclatura de táxons, de forma que sem essas informações, não é possível estabelecer uma comunicação precisa entre os componentes citados. Apesar de sua importância, cada vez menos taxonomistas devidamente preparados para fazer trabalhos qualificados são encontrados. Aliado à grande pressão pela demanda de consumidores e a falta de investimentos em pesquisas, a dependência tecnológica tem desencorajado o estudo da taxonomia e, assim, a quantidade de dados não tem sido suficiente para suprir as lacunas de conhecimento, chamadas de impedimentos taxonômicos (Ebach *et al.*, 2011).

Diminuir as lacunas sobre conhecimento de espécies não é tarefa fácil e, apesar dos esforços, a rápida perda de biodiversidade e destruição de habitats causada por ações humanas trazem mais obstáculos para o trabalho da taxonomia. A estabilidade de listas taxonômicas são importantes auxiliares na construção de instrumentos regulatórios e fundamentam avaliações do status de espécies ameaçadas e inovações nos métodos são fundamentais. Contudo, descobertas e descrições inconsistentes, bem como uso de nomenclaturas em desacordo com os códigos internacionais têm gerado desafios à taxonomia. Isso porque o Princípio de

Prioridade, o qual consiste em publicar o nome mais antigo para um táxon por autores subsequentes, acaba sendo violado por estudiosos que estabelecem nomes sem seguir o rigor científico. Por não seguirem as regras dos códigos, tais nomenclaturas são usadas de forma antiética e tornam-se perpetuadas na taxonomia, conferindo para si credibilidade científica (Wüster *et al.*, 2021).

Ademais, outras barreiras ainda precisam ser superadas para a qualidade do estudo taxonômico, como o acesso ao número de riqueza de espécies. A distribuição geográfica de espécies em locais de difícil acesso gera deficiências de conhecimento e limitam a pesquisa nesses ambientes, comprometendo estudos sobre biogeografia, macroecologia, conservação e descrição de novas espécies. Áreas que se encontram longe das rotas de acesso principal são menos estudadas e afetam igualmente a cobertura amostral de todos os táxons e apresentam maiores déficits Lineano/Wallaceano. Desse modo, torna-se preocupante o fato de os padrões amostrais de pesquisas realizadas não permitirem uma representação real adequada da distribuição da diversidade (Oliveira *et al.*, 2016).

Mesmo em grupos mais diversificados como os invertebrados, ainda há muito a ser feito em relação à pesquisa taxonômica. A concentração dos esforços em revisões e novas descrições desses animais melhoram e tornam mais acessível o entendimento taxonômico dos grupos, além de preencher lacunas deixadas por equipamentos não tão precisos como os atuais. A classificação de muitos desses seres se manteve estável por um longo período de tempo e novos estudos filogenéticos foram capazes de confirmar casos que antes eram alvos de discussões. Outro ponto importante é que a taxonomia muitas vezes é baseada em caracteres morfológicos, sendo que a maioria deles foram propostos por antigos cientistas que contavam com equipamentos tecnológicos inferiores aos que se tem acesso hoje em dia. Cabe então, aos estudos atuais, utilizar de técnicas modernas, como microscópios e câmeras potentes, análises moleculares e fósseis, para fornecer estabilidade e contribuir para as tomadas de decisões (Gonzalez *et al.*, 2013).

Os insetos são o grupo com maior conhecimento sobre diversidade no mundo, passando de um milhão de espécies descritas. A estimativa é que esse número seja pelo menos cinco vezes maior e o Brasil é um país chave em relação a esses números, abrigando cerca de 9% das espécies de insetos conhecidas. Apesar de o país possuir um grande déficit de taxonomistas quando são confrontados números de pesquisadores por área territorial, esforços das últimas décadas trouxeram resultados

positivos progressivamente que podem ser vistos em números de publicações em revistas renomadas na área, como a Zootaxa, onde pesquisadores brasileiros fizeram parte de 16% das publicações na revista no período de 2001 – 2008. Já em 2009, o Brasil alcançou o 13º lugar em publicações, respondendo por 2,12% da produção científica mundial (Rafael et al., 2009).

Em síntese, dados obtidos a partir de revisões taxonômicas e descrições de novas espécies são essenciais para o melhor conhecimento da biodiversidade e para pesquisas de conservação. Informações sobre novas descobertas de espécies preenchem lacunas deixadas na taxonomia e são fatores importantes para tomadas de decisões. A partir de novos dados coletados, os números estimados de espécies no mundo podem ser mais precisos, interações entre espécies podem ser melhor compreendidas e listas de conservação de espécies ameaçadas podem ser devidamente atualizadas. Para que os resultados nos estudos de taxonomia continuem crescendo, é imprescindível que a comunidade acadêmica, junto à instituições e órgãos governamentais, unam esforços para investir em formação qualificada de novos taxonomistas, bem como em centros de pesquisa e universidades e no fortalecimento de ações contra o desmatamento (Dikow et al., 2010; Rafael et al., 2009).

Taxonomy of the bee genus *Xanthopedia* (Hymenoptera, Apidae, Tapinotaspidini) with the description of eight new species from Brazil

Manuscrito formatado segundo as normas de Revista Zootaxa para envio ao volume especial em Homenagem ao prof. Fernando Silveira

Abstract

The bees of the tribe tapinotaspidini are the most specialized group to collect floral oil. All the representatives are solitary and nests mostly in the ground. With nearly 180 species, the group is widely distributed in the Neotropical region, and represents an important component of the Brazilian honey bee fauna. Here we reviewed the taxonomy of the bee genus *Xanthopedia*, with the study of all the type specimens, and a large collection of specimens from the Brazilian savanna (Cerrado). Eight new species were recognized totaling fifteen valid species: *Xanthopedia globulosa*, *Xanthopedia iheringii*, *Xanthopedia larocai* Moure, *Xanthopedia flavopicta* (Smith), *Xanthopedia tristriata* Moure, *Xanthopedia xanthina* Moure, *Xanthopedia swaissonae* (Cokerell), and *Xanthopedia* sp. nov. 1 to sp. nov. 8. *Xanthopedia ochronota* Moure was synonymised under *X. flavopicta* (Smith). We present the comparative diagnosis based on the morphology of collected species, borrowings from museums and photos of the types, as well as providing distribution maps, and a key for the *Xanthopedia* species. With our results, we may collaborate with the taxonomic stability of the genus and we could show a wide distribution of specific endemic groups in the Cerrado savanna and Espinhaço Range, which indicates a misunderstood diversity of bees for these areas.

Keywords: oil-collecting bees, Neotropical, phylogeny, distribution.

Introduction

Bees are organisms that have a variety of adaptations for collecting floral resources, especially for their food, which makes their biology highly diverse. These adaptations are presented as techniques and morphological adaptations for collecting and storing food for the nest. Differently from what is thought, they are mostly solitary and, when they have some level of sociality, the females are responsible for providing food and resources for the nest (Buchmann 1987; Michener 2007).

Among the species presented in Michener (2007), the bees from the Macropidini, Redivivini (Mellitidae), Ctenoplectrini, Centridini, Tapinotaspidini and Tetrapediini (Apidae) tribes, are specialized in collecting floral oils, using this resource to feed their larvae and coat brood cells. The oil-collecting bees are more diverse in tropical and subtropical regions of America, with some tribes being holarctic – Macropidini and Redivivini –, and the tribe Ctenoplectrini is paleotropical (Alves-dos-Santos *et al.* 2007; Buchmann 1987).

The majority of groups of neotropical oil-collecting bees lack revisions, which makes them less known, less studied, and with exponentially fewer possibilities for conservation and management. However, among oil-collecting bees, the Centridini and Tapinotaspidini tribes are the most important and diversified in adaptation for oil

collection, representing important components of the Brazilian honey fauna (Roig-Alsina, 1997; Alves-dos-Santos *et al.*, 2007)

The bees of the tribe Tapinotaspidini are distributed in approximately 180 species, with geographic distribution from the neotropical region of Northern Argentina to Mexico and the Caribbean (Aguiar & Melo 2011). As far as it is known, they are all solitary and nest mostly in the ground. The main flowers visited by the Tapinotaspidini are of the Malpighiaceae, a family of oil-producing plants likely ancestral to the tribe. Some species, currently, collect oils from Plantaginaceae, Krameriaceae, Iridaceae, Calceolariaceae e Solanaceae (Aguiar *et al.* 2020; Bachiega & Carvalho 2007; Sazan *et al.* 2014; Silveira *et al.* 2002).

Xanthopedia was initially proposed as a subgenus of *Paratetrapedia* by Michener & Moure (1957). The genus is a poorly studied group formed by bees with body black to reddish, with yellow marks on the head, mesosome and, in some cases, in metasome. This group occurs from Panama to Bolivia and South Brazil, including northern Jamaica and Mexico (Michener, 2007). Currently, there are 8 species described in the group: *Xanthopedia flavopicta* (Cockerell 1931); *Xanthopedia globulosa* (Friese, 1899); *Xanthopedia iheringii* (Friese, 1899); *Xanthopedia larocai* Moure, 1995; *Xanthopedia ochronota* Moure, 1994; *Xanthopedia swainsonae* Cockerell, 1909; *Xanthopedia tristriata* Moure, 1994; e *Xanthopedia xanthina* Moure, 1994 (Aguiar, 2022).

In order to stabilize and advance in the taxonomic studies of the group, we reviewed the genus *Xanthopedia*, including the description of eight new species from Brazil, as well as providing a diagnosis for the genus and species, a key for the species and illustrations. Also, we produced distribution maps to better comprehend the relationship between species and the environment, with the possibility to found important endemic processes.

Material and methods

In all, we studied 361 *Xanthopedia* specimens. The examined material comes from collections available in the institutions and museums listed below, followed by the name of their respective curators:

DZUP: Coleção de Entomologia Pe. J. S. Moure, Departamento de Zoologia da Universidade Federal do Paraná, Curitiba, Paraná, Brasil (Dr. Gabriel A. R. Melo);

MZUEFS: Museu de Zoologia da Universidade Estadual de Feira de Santana, Feira de Santana, Bahia (Dr. Freddy Bravo);

RPSP: Coleção Entomológica Prof. J.M.F. Camargo (RPSP), Departamento de Biologia da Universidade de São Paulo, Ribeirão Preto, São Paulo, Brasil (Dr. Eduardo A. B. Almeida);

UNB: Universidade de Brasília, Brasília, Distrito Federal (Dr. Antonio J. C. Aguiar);

UFMG: Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais (Dra. Kirstern Lica Follmann Haseyam).

INPA: Instituto de Pesquisas da Amazônia, Manaus, Amazonas (Dr. Márcio Luis de Oliveira e MSc. Thiago Nauhmann).

Morphological terminology follows Michener (2007), except for the scutum and propodeal triangle, referred to as scutellum and metapostnotum, respectively. Antennal flagellomeres are indicated as F1, F2, F3, etc. and metasomal terga as T1 to T7. The analyzed specimens were measured by a micrometric ruler attached to the stereomicroscopa Leica M125C glass. All measurements are in millimeters, relative to the second flagellomere (F2) or the puncture diameter (pd).

The labels of the specimens examined were transcribed in the sections "Type material" and "Additional material examined" in the following way: one backslash (\) to indicate different lines in the same label and double quotation marks (") to indicate different labels of the same specimen. Male and Female symbols present in the label are represented by M or F, respectively.

Floral records and geographical distribution

The records of flowers visited by *Xanthopedia* species were gathered from the information contained in the labels of the examined material and published literature. The distribution of the species was obtained by the labels of the collected specimens. The geographical coordinates of the localities, when not present on the label, were obtained by Google Maps, being the municipality used as a reference.

RESULTS

Taxonomy

Xanthopedia Michener & Moure, 1957

Xanthopedia Michener & Moure, 1957:411. Type species: *Paratetrapedia (Xanthopedia) tricolor* Michener & Moure, 1957 by original designation.

Xanthopedia (Michener & Moure, 1957)

Xanthopedia Michener & Moure 1957: 411; type species *Paratetrapedia (Xanthopedia) tricolor* Michener & Moure.

Lissopedia Moure, 1994b: 306; type species *Tetrapedia globulosa* Friese.

Lissopedia; Michener (1997): 33 (cit.). Aguiar & Melo (2007): 511 (cit.)

Xanthopedia; Michener (1997): 60 (cit.), Michener (2000): 68 (cit.). Silveira et al. (2002): 137 (cit.). Michener (2007): 692; Type species: *Paratetrapedia tricolor* Michener and Moure, 1957 = *Tetrapedia iheringii* Friese, 1899, by original designation. Aguiar & Melo (2007): 511 (cit.). Aguiar & Melo (2010): 352 (cit.). Aguiar et al. (2020): 2 (cit.)

Taxonomic history

Xanthopedia pertains to the *Paratetrapedia* lineage which is composed of *Urbanapis*, *Paratetrapedia*, *Nasutopedia*, *Tropidopedia* and *Lophopedia* according to Aguiar et al. (2020), and shares many characters with the remaining species of this group. Michener and Moure (1957) described *Xanthopedia* and presented a diagnostic key. However, in this key, numerous genera are no longer included in the same tribe. Further, Moure (1994) discusses the diagnosis of *Xanthopedia* based on a comparison with *Chalepogenus*, however, these two genera are far related and very distinctive by numerous characters. Moure made a respectable diagnostic description for the genus and showed the more visible diagnostic synapomorphy of the genus which is "a strong sulcus on the anterior portion of ocelli connecting each other in a strong furrow in the sides of central ocellus". This synapomorphy for the group is reinforced in the *Tropidopedia* and *Paratetrapedia* studies, by Aguiar & Melo (2007) and Aguiar & Melo (2011), respectively. However, Moure proposed the new genus *Lissopedia* and the relocation of *Xanthopedia globulosa* to this new group. According to him, it "differs from *Xanthopedia* by the punctuation of the supraclypeal area, the acute transverse carina of the pronotum, and the presence of the pygidial plate in the male". Aguiar & Melo (2007), as well as Michener (2000) and Silveira et al. (2002), suggest the synonym of *Lissopedia* under *Xanthopedia*, however, he did not provide information for it. According to the molecular phylogeny of Aguiar et al. (2020), there are two clades on the *Xanthopedia* lineage, one with corresponding to the name *Lissopedia*, type species *Xanthopedia globulosa*, and *Xanthopedia* s.s., type species *Xanthopedia tricolor*. The

phylogeny was built using six species of *Xanthopedia* and was able to confirm the monophyly of the group. The main characteristic that differs between these two groups is the supraclypeal area, which is elevated, convex, or flattened in the *Xanthopedia* lineage, or very low, found in the *Lissopedia* lineage. Here we decide to not consider them as two distinct genera because we prefer to consider the group of species distributed more widely in the Neotropical region, than partially in specific areas. The same is considered to *Paratetrapedia*, *Lophopedia*, and *Tropidopedia*, whose species are widely distributed in the Neotropical region.

Diagnosis

The following characters presented by Michener & Moure (1957) can be observed in all the specimens of *Xanthopedia*: frons, supraclypeal area, and clypeus with at least some punctures coarser than those found elsewhere; preoccipital carina present; paraocular area, next to orbit convex; pronotum without transverse carina; basitibial plate large in female; inner hind tibial spur much more broadly pectinate than outer; pygidial plate with lateral margins very weakly concave. Further, it is easily distinguished from the others groups by the sulcus on the anterior portion of the ocelli connecting each other in a strong furrow in the sides of the central ocellus (FIG. 5, A).

Geographical distribution

Xanthopedia species are widespread in the Neotropical region except on Chaco and Western Andes. The Southern records are *Xanthopedia iheringii* in Cerrado-like areas on Paraná, and the Northern records are *Xanthopedia flavopicta* in Mexico.

Xanthopedia flavopicta (Cockerell, 1931)

Tetrapedia flavopicta Cockerell (1931): 413; lectótipo fêmea, México: Yucatan, Chichen Itza (BMNH), designated by Moure (1994): 311; **examined**.

Tetrapedia flavopicta; Cockerell (1932): 12 (cit.).

Paratetrapedia flavopicta; Michener (1954): 114 (geographic record; Panamá: Pueblo Nuevo). Ayala et al. (1996): 461 (cit.).

Lissopedia flavopicta; Moure (1992b): 311 (cit.). Moure (1996): 936 (cit.).

Xanthopedia flavopicta; Sagot et al., (2018): 202 (cit.) Aguiar et al. (2020): 5, 6. (Figure (as *Xanthopedia flavopicta*))

Diagnosis

Xanthopedia flavopicta is very similar to *X. swainsonae* in integument color, frons punctuation, and pubescence pattern. Therefore, is distinguished by the wing membrane's blackish infumate.

Variation

This species presents a variation in integument color, with metasoma completely reddish-orange or with dark brown marks, and mesoscutum reddish-orange between the yellow stripes.

Comments

Moure (1994) designated the lectotype for *Tetrapedia flavopicta* based on a female specimen from Natural History Museum (NHM) of London number 17B-887, and also examined other six syntypes from the Museum of Comparative Zoology, all of them from Mexico, Chichen Itza. The MCZ disponible the pictures of one syntype female of the series (MCZ-DataBase 2022). We examined the photos of the holotype provided by NHM which correspond to the same species of the syntypes. Based on the photo we can describe the holotype as a predominantly reddish orange integument, except by yellow marks on the low paraocular area and the disc of the supraclypeal area, and gena pale yellow and fine yellow stripes on the mesoscutum. Some parts like the scape, pronotum collar, tegula, forelegs, and scutellum are slightly pale orange, almost yellow. The wing membrane and veins are blackish infumated, except by pterostigma slightly orange. The pubescence is completely pale reddish orange. The scopa of the hind tibia and hind basitarsus is completely reddish orange. The pubescence of frons is extremely short and inconspicuous. Mesoscutum and scutellum have a very short pubescence, almost inconspicuous. *X. swansione* belongs to the *Lissopedia* group of species with clypeus and supraclypeal areas very low and smooth, with few sparse punctures. The frons is mostly smooth, with punctures very sparse (> 4 dp.). Mesoscutum with fine dense puncture (<0.5 - 1dp>). Mesepisternum is mostly smooth with fine sparse punctures (>3dp).

Geographic distribution

The species is only recognized in Central America.

Material examined

HONDURAS: 1 female (AMNH), "HONDURAS: Olancho\ Bonanza-Río Platano\ Trail, 10 June 2008\ J. S; Ascher. 2 males, "Honduras: El Paraiso \. Yuscaran, (Rio \ Aguacote), 2800\ 12-V-1993 (H-1) \ L.Stange & R.Miller" "Florida Wiley". **MEXICO:** 1 male "4498 " "Mex, Chis, San Juan Cancuc \ Tzajalchen, 1020 m \ 16.9473 N, 92.3578

W \ 07 IV 2012, 8:40 \ Col. Carlos Balboa, Abierto \ Planta: Barrido" "Xanthopedia \ flavopicta" "MUTUAL". **BELIZE**: 2 females (AMNH), "BELIZE: Cayo Dist. \ Pine Ridge, Five \ Sisters Lodge, 1 May \ 2009, J. S. Ascher" "Xanthopedia \ flavopicta \ Aguiar det. 2019".

Xanthopedia globulosa (Friese, 1899)

Tetrapedia globulosa Friese, 1899: 298; holotype male, Brazil: Bahia (ZMB).

Tetrapaedia **[sic]** *globulosa*; Schrottky (1902): 555 (tradução da descrição para o português).

T. (X.) *globulosa* [sic]; Rozen (1988): 2 (cit.).

Chalepogonus globulosus; Cockerell (1917): 302 (misidentification *X. swainsonae*; based on geographic record). Lutz & Cockerell (1920): 562 (cit.). Cockerell (1929): 443 (taxonomy). Michener (1942): 281 (misidentification *X. swainsonae*; based on geographic record).

Chalepogonus [sic] *globulosus*; Michener (1954): 116 (cit.).

Paratetrapedia globulosa; Michener (1954): 116 (taxonomic notes). Rebêlo *et al.* (2003): 273 (Brazil: Maranhão).

Paratetrapedia (Xanthopedia) globulosa; Michener & Moure (1957): 411, figs. 7-9 (drawing of terminalia, sterna 7-8 and genital capsule). Silveira *et al.* (2002): 137 (Brazil: Bahia, Minas Gerais). Rasmussen & Ascher (2008): 55 (catalog.). Rêgo *et al.* (2017): 136 (cit.).

Paratetrapedia (Xanthopedia) globosula **[sic]**; Rozen & Michener (1988): 2 (cit.). Albuquerque & Mendonça (1996): 49 (flower record, *Byrsonima crassifolia* (Malpighiaceae); Brazil, Maranhão).

Lissopedia globulosa; Moure (1992b): 305 (taxonomic notes). Moure (1995): 936 (cit.).

Xanthopedia globulosa; Mendes *et al.* (2011): 107, 110 (catalog.). Rêgo & Albuquerque (2012): 53 (catalog.). Gostinski *et al.* (2016): 321 (catalog.). Carneiro *et al.* (2019): 219 (cit.)

Diagnosis

Xanthopedia globulosa is very similar to *Xanthopedia tristriata* and *X. xanthina* however it can be distinct by the blackish plumose hairs on tergal margins of T3-T7. Also, *Xanthopedia globulosa* has the integument bicolor, mostly yellow, except by black frons, vertex, and mesoscutum; mesoscutum with two central and lateral yellow

stripes; wing membrane blackish infumate with yellowish veins; T3-T7 with dense blackish plumose appressed hairs throughout the margins (Fig. 17).

Comments

AJCA examined the holotype in 2003 and photographed it. Further, Melo (personal communication) made other photos and examined it. We only know the holotype of this species and based on its morphology we suspected that its distribution is related to the Atlantic forest on the coast and mountains of east Bahia.

Geographic distribution

Brazil: Bahia, probably in the coastal Atlantic forest.

Additional material examined

Holotype male: "493" "Brasilien \ Bahia \ Gomez.S." "Tetrapedia \ globulosa \ M \ det. Friese 1898" "typus" "Zool. Mus. \ Berlin" "Lissopedia \ globulosa M \ (friese, 1899) \ det. J.S.Moure 1992".

Xanthopedia iheringii (Friese, 1899)

Tetrapedia iheringii Friese, 1899: 296; holotype male, Brazil: São Paulo (ZMB).

Paratetrapedia (Xanthopedia) tricolor Michener & Moure, 1957: 447; holotype female, Brazil: São Paulo, São Paulo (DZUP). Synonym proposed by Moure (1996): 934.

Tetrapaedia [sic] iheringii [sic]; Schrottky (1902): 554 (translation of description to portuguese).

Xanthopedia iheringii; Moure (1996): 934 (redescription). Moure (1995): 110 (cit.). Pagotto & Souza (2006): 269 (cit.). Azevedo et al. (2008): Gaglione et al. (2011): 662 (cit.). Martins et al. (2012): 32 (cit.). Lima & Silvestre (2017): 10 (catalog.). Sigrist et al. (2017): 4 (cit.). Aguiar et al. (2020): 6, 5 (fig.).

Paratetrapedia (Xanthopedia) tricolor; Moure (1995): 107 (cit.). Pedro (1994): 253 (floral record: *Byrsonima intermedia*; *B. crassa* (Malpighiaceae); *Waltheria cf. comunis* (Sterculiaceae)). Pedro (1996): 251 (Brasil: São Paulo). Silveira et al. (2002): 136 (Brasil: Minas Gerais, São Paulo). Urban (2003): 27 (cit.). Martins et al. (2012): 32 (geographic record: Parque Estadual da Serra do Rola Moça, Belo Horizonte, MG).

P. (Xanthopedia) iheringii; Pedro & Camargo, 1999: 202 (cit.).

Paratetrapedia (Xanthopedia) aff. tricolor; Faria-Mucci et al. (2003): 244 (floral record: *Gochnatia amplexifolia* (Compositae), *Byrsonima variabilis* (Malpighiaceae); Brasil: Minas Gerais).

Paratetrapedia (Xanthopedia) iheringii; Gonçalves & Melo (2005): 563, 567 (catalog.).
Rasmussen & Ascher (2008): 58 (cit.)

Diagnosis

Xanthopedia iheringii is very similar to *X. sp. nov. 5*. Therefore, it differs from the remaining species by the supraclypeal which has a sulcus in line shape on the upper portion, the wing veins hyaline, orangish brown, the integument bicolor with metasoma yellowish brown with dark brown marks on the final terga and hind basitarsus scopula pubescence dark brown (almost black) (Fig. 10).

Comments

Xanthopedia iheringii shares many characteristics with *X. sp. nov. 5*, and probably they are sisters. Its distribution overlaps to *X. sp. nov. 5* in Espinhaço Range, in *campos rupestres* areas, Minas Gerais, and probably was separated by a vicariance process. This is the southernmost localized species of *Xanthopedia* on record.

Geographic distribution

Xanthopedia iheringii is mainly distributed on rock fields and high areas of Southern Brazil from Paraná to Minas Gerais.

Material examined

BRAZIL, Paraná: 2 females (UNB), "089968" "Brasil, PR, Porto Amazonas, \ Recanto dos Papagaios. \ -25.46698; -49.769614. \ 30/XII/2012. AJCAguiar.", idem except for "089960". 1 female, "Brasil, PR, Palmeira. Rio dos \ Papagaios, -25.46670"S \ 49.76685"O, 28.x.2012 \ AJCAguiar" "*Xanthopedia iheringii* \ AJCAguiar det.2016". 1 female (DZUP), "162177" "VILA VELHA - PR \ Brasil, 4-XII-65 \ T. B. Mitchell leg. \ *Crotalaria* esp." "*Xanthopedia iheringii* (Friese) \ A.J.C.Aguiar det.2007". **Minas Gerais:** 3 females, "93787" "Santana do Riacho MG \ Serra do Cipó Vell.Gig. \ Brasil, 29/11/2012 \ Shlindwein leg." "L280 \ *Cuphea*", idem except for "93798 \ *Vernonia*", "93971 \ *Byrsonima*"; 3 females, "Abelhas da Zona \ Metalúrgica MG \ Serra da Moeda \ 2626-7825" "Brumadinho MG \ Brasil 11/10/1998 \ A. Silveira" "*Paratetrapedia (Xanthopedia) tricolor* Mich & Moure \ F.A.Silveira, det. 2000", idem except for "1893-5466 \ 12/12/1997 \ Oliveira & Almeida", "1893-5465 \ 12/12/1997"; 1 female, "COPASA \ Mutuca \ 7762-23395" "Belo Horizonte MG \ BRASIL 12/12/2201 \ Almeida & Pompeu"; 1 female, "Plano de Manejo \ Pq. E. Rola-Moça \ APE - Catarina \ 11357-33795" "Brumadinho MG \ BRASIL 13/11/2004 \ A.A.Azevedo" "*Xanthopedia iheringii* (Friese) \ A.J.C.Aguiar det 2007"; 2 females, "Abelhas Espinhaço \ Pq E. do \ Independente \ 12330-36345" "Conceição do Mato Dentro MG \ BRASIL 05/11/2005 \

A.A.Azevedo "L3", idem except for "12330-36345 \ A"; 1 female, "Abelhas Espinhaço \ Pq E. do Rio Preto \ 10162-29763" "São Gonçalo do Rio Preto MG \ BRASIL 20/10/2004 \ R.B.Martines" "Xanthopedia \ iheringii (Friese) \ A.J.C.Aguiar det. 2007".

Xanthopedia larocai Moure, 1995

Xanthopedia larocai Moure, 1995: 107; holotype male, Brasil: Paraná, Jaguariaíva (DZUP).

Paratetrapedia larocai; Rozen et al. (2006): 10 (cit.). Exam of photos of DZUP.

Paratetrapedia (Xanthopedia) larocai; Silveira et al. (2002): 137 (cit.).

Xanthopedia larocai; Urban (2003): 28. Pagotto & Souza (2006): 269 (catalog). Aguiar & Melo (2007): 514, 515, 517, 518, 546 (Phylogeny, descriptive note, figure (as *Xanthopedia larocai*)). Azevedo et al. (2008): 148 (catalog.). Gagliaone et al. (2011): 662 (catalog.). Martins et al. (2012): 32 (catalog). Almeida & Laroca (2013): 48, 115, 123, 169 (cit., catalog., floral record). Boas et al. (2013): 365 (catalog.). Sazan et al. (2014): 351, 353 (Behavior, catalog). Lima & Silvestre (2017): 10 (catalog). Sigrist et al. (2017): 4 (catalog).

Diagnosis

Xanthopedia larocai is mostly similar to *X. sp. nov. 1* and *X. sp.nov. 8* due to the elevated supraclypeal area and integument bicolor. *X. larocai* is sympatric to *X. sp.nov. 1*, however, has a narrow distribution on higher areas of the Brazilian central plateau. *X. larocai* can be easily distinguished from *X. sp.nov. 1* due to the punctuation of frons, the color of the wing membrane, and the color of the scopa (Fig. 2).

Comments

Xanthopedia larocai pertains to a complex of very similar species distributed on the Cerrado savanna and Rockfield of Brazil. We recognize two species on this lineage with a high variation of tegument color which sustain doubts about other future new species that may be recognized on other savanna areas like the Amapa savanna coast or Roraima. The type locality of *X. larocai* - Jaguariaíva (Paraná) is one of the southern limits of Cerrado in a lowland area, on Northern Paraná.

Variation

This species presents a high variation in size and color among the specimens. The integument varies from completely black to bicolor, with yellow marks on the face and mesosoma. The metasoma may present a ferruginous color with brown marks, and the scopa of hind basitarsus with dark brown pubescence.

Geographic distribution

High areas of the Cerrado savanna of Brazil: MG, PR, GO, DF, MT.

Material examined

BRAZIL, Paraná: 1 female (UNB), "238701" "Brasil, PR, Jaguaraíva \ Parque E. do Cerrado \ 24°11'10"S 49°39'40"W, \ 850 m, 18-19xi2009 \ P. C. Grossi col." "Xanthopedia larocai \ Aguiar det. 2019". **São Paulo:** 10 females (CEPANN), "Itirapina SP \ Est. Eco. Itirapina \ Brasil, 23.11.2011 \ E. Pinto leg." "42828", idem except for "42832 \ 24.11.2011", "42327", "42852, 07.12.2011", "42326", "42853, 27.11.2011", "42835, 24.11.2011", "42791 \ 19.12.2011", "42830", "42825 \ 24.11.2011". **Distrito Federal:** 1 male (UNB), "044686" "Brasília \ Água Limpa \ 01-10-1980" "Eriope crassipes" "Paratetrapedia \ sp. 28"; 1 female (UNB), "000111" "BRAZIL: DF \ Brasília Bot Gdn \ A. Raw 13.11.1995" "Andira inermis \ Leguminosae"; 1 female, "Brasil, Distrito Federal. Brasília \ Estação Experimental da Universidade \ de Brasília, Fazenda Água Limpa, \ -15.9486S, -47.9251W, 1090 mts alt \ 28.x.2011. Excursão Disciplina de \ Entomologia"; 1 female (UNB), "000109" "Brasília \ A. limpa \ 27-10-76" "Compositae A" "Paratetrapedia sp. 9"; 2 females (UNB), "060163" "Brasil, DF, Brazlândia, \ -15.604209S; -48.126809W; \ 05.x.2015; AJCAguiar & I. \ Malinov", idem, except for "060164"; 1 female, "Brasil, DF, Brasília \ Reserva Ecol. IBGE \ 15°57'S, 47°52'W \ 25-XI-2008 \ S. C. Cappellari col." "Scc 251108.1 \ B. laxiflora \ OIL 235-05 \ BMG"; 2 females (UNB) "088478" "Brasil, DF, Brasília \ Reserva Ecol. IBGE \ 15° 57'S, 47° 52'W \ 20-X-2009 \ S. C. Cappellari col." "Xanthopedia \ larocai \ Aguiar det. 2009" "SCC 201009.3 \ B. laxiflora \ OIL \ 229-59 \ C F", idem except for "088472 \ 06.XI.2009 \ SCC061109.9 \ B. Verbasc. \ CS 10:55-25"; 1 female, "Brasil, Distrito Federal. Brasília \ Estação Experimental da Universidade \ de Brasília, Fazenda Água Limpa, \ -15.9486S, -47.9251W, 1090 mts alt \ 28.x.2011. Excursão Disciplina de \ Entomologia"; **Goiás:** 14 females, "Abelhas altimontanas \ 11268-33471" "Alto Paraíso de Goiás GO \ BRASIL 15/11/2006 \ A.A.Azevedo" "Xanthopedia \ larocai Moure \ A.J.C.Aguiar det 2007", idem, except for "11268-33472", "11268-33473", "11268-33474", "11268-33475", "11268-33476", "11268-33477", "11268-33478", "11268-33479", "11268-33480", "11268-33481", "11268-33482", "11268-33483", "11268-33484"; **Minas Gerais:** 1 female, "Plano de Manejo \ Pq. E. S. Rola-Moça \ Sítio mineiração \ 11436-34012" "Ibirité MG \ BRASIL 19/11/2004 \ A.A.Azevedo" "Xanthopedia \ larocai Moure \ A.J.C.Aguiar det 2007"; 4 females, "Brasil, Minas \ Gerais, Serra do \ Salitre, outubro/2005 \ AJCAguiar"; 2 females (UNB), "000163"

"BRASIL, Minas \ Gerais, Serra do \ Salitre, outubro/2005 \ AJCAguiar", idem except for "000160 \ Byrsonima rosea"; 1 female (UNB), "218743" "Brasil, Minas Gerais, \ Serra do Salitre, \ RPPN Fazenda Cachoeira; \ -19.157030, -46.564155 \ 15-18.XI.2018; AJCAguiar \ BGSantos, WPSilva"; 1 female (UNB), "065360" "Brasil, MG, Serra do Salitre \ RPPN Fazenda Cachoeira \ -19.157030, -46.564155, \ 17.XI.2018, W PSilva; AJC \ Aguiar; BG Santos"; 9 females, "Abelhas - Cerrado \ Mannesmann \ Faz. Brejão \ 5851-16769" "Brasilândia de Minas MG \ BRASIL 30/11/1999 \ D.A.Simão" "Paratetrapedia \ (Xanthopedia) sp. 11 \ F.A.Silveira, det. 2000", idem except for "5853-16061", "5854-16062", "5859-16092", "5859-16093", "5866-16128", "5860-16102", "5861-16105", "5860-16101 \ sp. 25"; 12 females, "Abelhas - Cerrado \ Mannesmann \ Faz. Brejão \ 5869-16148" "Brasilândia de Minas MG \ BRASIL 30/11/1999 \ V. Silva" "Paratetrapedia \ (Xanthopedia) sp. 11 \ F.A.Silveira, det. 2000", idem except for "5865-16124", "5033-13832 \ sp.11", "5322-14576", "5866-16-092", "5866-16127", "5862-16110 \ 29/11/2011", "5868-16139 \ 10/11/1999", "5868-16135", "5868-16137", "5868-16138", "5330-4609"; 6 females, "Abelhas - Cerrado \ Mannesmann \ Faz. Brejão \ 5840-116025" "Brasilândia de Minas MG \ BRASIL 29/09/1999 \ A.A.Azevedo" "Paratetrapedia \ (Xanthopedia) sp. 11 \ F.A.Silveira, det. 2000", idem except for "5843-116031", "5840-116023", "5840-11590", "5840-16024 \ 30/11/1999", "5063-13905 \ 19/10/1999"; 1 female, "Abelhas - Cerrado \ Mannesmann \ Fazenda Corredor \ 2698-8038" "Bocaiúva MG \ BRASIL 25/11/1998 \ A.A.Azevedo" "Paratetrapedia \ (Xanthopedia) sp. 11 \ F.A.Silveira, det. 2000"; 10 females, "Abelhas - Cerrado \ Mannesmann \ Fazenda Santa Cruz \ 4979-13650" "Felixlândia MG \ BRASIL 16/09/1999 \ V. Silva" "Paratetrapedia \ (Xanthopedia) sp. 11 \ F.A.Silveira, det. 2000", idem except for "5808-15876", "5064-3907", "5076-13956", "5077-13959", "5077-13960", "5807-15869", "5807-15871", "5808-15875", "5063-13905"; 2 females, "Projeto Abelhas \ de Brasilândia \ D. alata \ 07:00 - 08:00" "Brasilândia MG \ BRASIL 27/11/1996 \ A.G.Damasceno" "Paratetrapedia \ (Xanthopedia) sp. 11 \ F.A.Silveira, det. 2000", idem except for "P. emarginatus \ 15:00-16:00 \ 14/10/1996"; 1 female, "Ilha Três Marias \ 3369-9922" "Três Marias MG \ BRASIL 22/11/1997 \ D.A.Yanega"; 1 female, "Monitor. V & M \ P. emarginatus \ Faz. Brejão \ 7522-22235" "Brasilândia de Minas MG \ BRASIL 11/10/2001 \ J.Damasceno".

Xanthopedia swainsonae (Cockerell, 1909)

Tetrapedia swainsonae Cockerell, 1909: 398; syntypes males and females, Jamaica: St. Thomas Parish (AMNH); **examined**.

Lissopedia ochronota Moure, 1994: 311; holotype male, Jamaica: Albany (DZUP); new synonym.

Tetrapedia swainsonae; Lutz & Cockerell (1920): 569 (cit.). Lutz & Cockerell (1920): 569 (cit.). Cockerell (1931): 414 (taxonomic notes).

Paratetrapedia (Xanthopedia) swainsonae; Raw (1984): 504 (nesting biology; flower record: *Bidens pilosa* (Asteraceae), *Oreopanax capitatus* (Araliaceae), *Cyrilla racemiflora* (Cyrillaceae)). Raw (1985): 2 (cit.). Rozen & Michener (1988): 1, figs. 1-12, 15-17 (nesting biology, larval morphology; flower record: *Byrsonima crassifolia* (Malpighiaceae), *Verbena* sp., *Lantana camara* (Verbenaceae)). Aguiar et al. (2004): 80 (cit.). Reyes-Novelo et al. (2009): 536 (cit.). Rozen 2010: 333 (cit.). Ramirez et al. (2016): 734 (cit.).

Lissopedia ochronota; Urban (2003): 26 (cit.).

Diagnosis and comments

Xanthopedia swainsonae is very similar to *X. flavopicta*, however *X. swainsonae* is distinct by the frons with dense and coarse punctures (ca. 1 pd), the integument of mesoscutum dull with numerous fine minute punctures, almost intermingled, and the pubescence of mesoscutum which is dense and very short, velvet-like, with faint yellow marks.

Geographical distribution

X. swainsonae is only known in Jamaica.

Xanthopedia tristriata Moure, 1994

Lissopedia tristriata Moure, 1994b: 315; holotype male, Brazil: Amazonas, Manaus (DZUP).

Paratetrapedia (Xanthopedia) tristriata; Silveira et al. (2002): 137 (Brasil: Amazonas, Rondônia, Roraima).

Lissopedia tristriata; Urban (2003): 26 (cit.).

Diagnosis

Among the species of the lineage *Lissopedia*, *X. tristriata* can be distinct by the coarse and sparse punctures of frons, wing mostly hyaline - lightly infumate. It differs from *Xanthopedia* sp. nov. 7 by the postocellar carina, which is low (Fig. 19).

Variation

Face completely orangish brown or with black to dark brown marks on the ocelli area. Mesoscutum may present dark brown marks. Scopa of hind basitarsus reddish black or completely orangish brown.

Geographic distribution

BRZIL: Pará and Mato Grosso.

Material examined

BRAZIL, Pará: 1 female (UFMG), "Brasil, PA, Belterra, \ 13.xii.1999\ G.C. Venturieri leg.\ UFMG IHY\ 2200000" "Paratetrapedia\ sp.2" "Paratetrapedia\ (Xanthopedia) sp.2\ F. A. Silveira, det. 2000"; 1 male (UFMG), idem except "2200001"; **Mato Grosso:** 1 male (INPA), "Brasil, Mato Grosso\ Vera. Floresta.\ 55°8'51.90"w.\ 12°28'14.59"S. 07-XII-\ 2018. Ferreira,JVA.\ Malaise"; 1 female (INPA), "Brasil, Mato Grosso\ Nova Mutum\ Floresta\ 55°57'32.92"W\ 13°49'30.87"S. 21-XII\ 2018\ Ferreira JVA.\ Malaise";

Xanthopedia xanthina (Moure, 1994)

Lissopedia xanthina Moure, 1994b: 313; holotype male, Bolivia: Pando, Carmen, (DZUP).

Lissopedia xanthina; Urban (2003): 26 (cit.).

Diagnosis

X. xanthina belongs to *Lissopedia* group and is distinctive by the coarse and dense punctuation of frons (ca. <1 pd) and the weakly elevated postocellar carina in the lateral extremities (Fig. 18, A).

Variation

This species presents variations in the integument color. It can be completely orangish-brown or present the mesosoma black, the scopa of basitarsus dark brown, and brown marks on the metasoma.

Geographic distribution

The records of *Xanthopedia xanthina* suggest that this species is widespread in the Amazon basin, at least in Western and Eastern portions from Bolivia (Pando) to Acre, and Tocantins (Brazil).

Material examined

BRAZIL, Mato Grosso: 3 females (INPA), "INPA" "Brasil, Mato Grosso. \ Vera. Floresta. \ 55°8'51.90"W \ 12°28'14.59"S. 07-XII- \ 2018. Ferreira, JVA. \ Malaise." "G57_Borda \ Ferreira_2942", idem except for "2944", "2945", "2946"; 1 male (INPA),

"INPA" "Brasil, Mato Grosso. \ Vera. Floresta. \ 55°8'51.90"W \ 12°28'14.59"S. 07-XII- \ 2018. Ferreira, JVA. \ Malaise." "G57_Borda \ Ferreira_2943"; 1 male (INPA), "INPA" "BASIL, Mato Grosso. Nova \ Marilândia. Faz. Água Boa \ 14°14'28.1"S. 57°32'35.2"W. \ Cerrado Strictu sensu. Malaise. \ 12-I-2018. Ferreira, JVA." "G57_Borda \ Ferreira_2941";

Tocantins: 1 female, "BRASIL: TO: Araguacema, \ 16-30.xi.2005 \ 08°50'49"S 49°26'00"W \ Silva RR & Feitosa RM col."; 1 female (MZSP), "Palmas, TO \ S^a do Lajeado \ 17/XI/1992 \ MCN. MZSP leg." "Col. MCN \ 95.986". **Amazonas:** 1 female, "Brasil, AM, Manaus, \ FUA, Estrada \ principal, 26/XII/2000 \ 03o04`34"S59o57'50"W" "Col. Werley, Patrícia \ Oliveira, FPM \ col. rede entomológica"; 1 female, "BRASIL: Amazonas \ R. Ducke \ 21-IX-1981 \ J.A.RAFAEL"; 1 female, "BRASIL, Amazonas, Manaus \ Br 174 km 43 \ xxi.viii.2014 \ Alves, J, Setubal, R, Viana, G Leg. \ Visitante de *Byrsonyma chrysophylla*"; 1 male, "BRA, Amazonas, Manaus, \ Reserva Ducke, 2°55'14"S \ 59°55'24"W, 20.ix.2018, \ Male sleeping \ aggregation, 10 (M) (17h) \ T.Mahlmann Leg."; 1 female (PMC), "Xanthopedia sp. \ Aguiar det.2020" "PMC 75". **Pará:** 1 male, "BRAZIL, Altamira \ John F. Reinert \ nov.1974;No. 96" "Florida Wiley". **BOLIVIA:** 1 female (AMNH), "BOLIVIA: La Paz Prov \ Uyapi/Guanay, Nov \ 1998, A. Ugarte Peña". **PERU, Huánuco:** 7 females, "Peru Huánuco, \ Yuyapichis, Panguana \ 9°37'S - 74°56'W, 260m \ 18.IX.-2.X.2005 \ Malaisefalle, leg. DILLER, \ BURMEISTER, KOTHE" idem except for "13-IV-2003" "leg. C.J. Zwakhals", "21.IX.-04.X.2004" "leg. K. SCHÖNITZER" "Holotypes resulting from \ this material are \ property of Peru and \ Paratypes ZSM- \ collection only!"; 1 female, "Peru SE, 1.i-3.i.2007 \ Puerto Maldonado env. \ S12°37' W69°11' \ Jacub Straka leg."; 1 female, PERU: DEPT.HUÁNUCO, \ TINGO MARIA, CUEVA \ DE LAS PAVAS, 23-27- \ VII-1982. C. PORTER \ T. O'NEILL" "FLORIDA WILEY"; 1 female, "PERU: Junín Dept. \ La Merced, Río Chanchamayo \ 1000 m, 11°2'6"S, 75°19'12"W \ 14 OCT 1999; R. Brooks \ PERU1B99 023, ex: on *Bidens* sp." "SM0147666 \ KUNHM-ENT" "SEMK". **ECUADOR:** 1 female (AMNH), "Ecuador: Napo Prov. \ Rd. To La Punta, gravel pit \ S1.039409, W77.583095 \ 28 Jan 2012, J. S. Ascher \ E.S. Wyman, D. Weber" "Paratetrapedia \ s. l. n. sp? \ det. J. S. Ascher 2012".

Xanthopedia sp. nov. 1

Diagnosis

Xanthopedia sp. nov. 1 belongs to the *Xanthopedia larocai* species complex. It's almost completely sympatric with *X. larocai*. It differs from *X. larocai* by the punctures on frons disc dense (< 0.5 dp) and fine (Fig. 3), the color of the wing membrane pale yellow infumate, and hind tibia scopa mostly pale yellow to orange. *X. sp. nov. 1* is mostly distributed in western portions of Planalto Central of Brazil.

Comments

This species is very similar to *X. larocai*, and it's difficult to separate them, so a very good comparative view of the details is necessary, mainly in the frons punctuation pattern.

Variation

Xanthopedia sp. nov. 1 presents a high variation of the color of the integument, with some specimens completely reddish orange, however, most of the specimens are bicolor like the holotype. A variation in body length can be observed, ranging from 6.9 – 6.0, and the head width, ranging from 2.18 – 1.62.

Description

Holotype male. Body length: 5.9; wing length (without tegula): 4.5; maximum head width: 1.87; intertegular distance: 1.31. *Color*: integument bicolor (yellowish orange and yellow), mostly yellowish orange; except by frons dark brown. Mesoscutum orangish with thin yellow stripes on disc and lateral margins. Wing membrane hyaline, pale yellow infumated; veins mostly brownish orange. *Pubescence*: mostly pale yellow to pale white; hind legs with pubescence mostly brownish orange. Labrum with dense short plumose pubescence on the lower third. Clypeus, supraclypeal area and lower frons mostly glabrous, with some sparse thin hairs; frons, upper paraocular area and vertex with dense long plumose and simple hairs. Antennal scape with numerous stout setae on the inner face, ca. 1xF2. Gena with numerous long plumose pale white hairs; mesoscutum with short velvet pubescence; posterior margin of scutellum with sparse long plumose and simple setae; mesepisternum with numerous long simple and plumose pale white hairs; metapostnotum mostly glabrous with very sparse short simple setae. T3 and T4 with short simple pale yellow hairs on the lateral; T5 - T7 with complete fimbria of short simple pale yellow hairs; *Sculpture*: clypeus with sparse fine punctures (ca. 2 pd); supraclypeal area with sparse coarse punctures (ca. >1 pd); frons with dense fine punctures (ca. <1 pd); mesoscutum and scutellum with dense fine punctures (ca. ≤0.5 - 1 pd); mesepisternum with numerous fine minute punctures (ca. ≤1pd); metapostnotum with sparse fine punctures (ca. >1 pd). *Structure and*

measurements: head ~1.24x wider than long (1.87:1.5); compound eyes ~3.57x longer than wide (1.25:0.35); inner orbits converging below, upper interocular distance 1.15, lower interocular distance 0.95; clypeus 1.86x wider than long (0.86:0.46), slightly convex on the first two thirds and strongly convex on the lateral third; supraclypeal area elevated and flat; frons slightly convex, with a slight mid sulcus; upper paraocular area flat; scape length 0.48, width 0.15; length of the first three flagellomeres 0.13, 0.07, 0.13, respectively; mid tibial spur pectinated, ~0.54x the size of the mid basitarsus.

Paratype female. Body length: 6.32; wing length: 4.37; maximum head width: 1.90; intertegular distance: 1.84. *Color*: similar to male, except by central disc of mesoscutum black and posterior margin of terga brownish. *Pubescence*: labrum with dense erect simple setae, clypeus mostly glabrous, with few erect simple setae on the lateral thirds; frons and paraocular area with very short simple and plumose hairs; upper paraocular area and vertex with dense simple and plumose hairs; gena with numerous long plumose white hairs (ca. 2x F2). Scutellum with sparse short simple setae on the center and short plumose hair on sides; mesepisternum with numerous long simple and plumose pale white hairs. Metapostnotum with numerous very short plumose hairs. T1 – T4 mostly glabrous, with only short lateral fimbria; T5 and T6 with complete marginal bands (fimbria) of dense simple brownish-orange hairs. *Sculpture*: similar to male, except by frons with dense coarse punctures (ca. <1 pd on the central area and <0.5 pd on lateral). *Structure and measurements*: head ~1.19x wider than long (2.05:1.72); compound eyes ~2.54x longer than wide (1.27:0.5); inner orbits of compounding eyes converging slightly below, upper interocular distance 1.25, lower interocular distance 1.05; clypeus 2x wider than long (1:0.5), slightly convex; supraclypeal area elevated, strong angled and flat; frons slightly convex with a mid sulcus; upper paraocular area flat; scape length 0.55, width 0.35; length of the first three flagellomeres 0.19, 0.07, 11, respectively; scutellum convex on the posterior area with a slight mid sulcus until halfway; mid tibial spur strong pectinated on the anterior portion, ~0.49x the size of the mid basitarsus (0.39: 0.8).

Floral records

Byrsonima basiloba, *Malpighiaceae*, *Byrsonima coccolobifolia*, *Byrsonima laxiflora*, *Byrsonima verbascifolia*.

Distribution

Brazil: The species was recorded in the Brazilian Midwest, in the State of Goiás, Minas Gerais, São Paulo, Distrito Federal, and one specimen was collected in the coastal Bahia, Northeast Brazilian.

Type material

Holotype male: "UNB \ 060108" "Brasil, DF, Brazlândia \ -15.604209S; -48.126809W; \ 05.x.2015; AJCAguiar & I. \ Malinov". Paratype female described: "UNB 000110" "BRAZIL: BA \ Ilha Carapeba \ A.Raw Oct. 1986". Remaining paratypes: **BRAZIL, Distrito Federal:** 2 females and 2 males (UNB) " 060153" "Brasil, DF, Brazlândia, \ -15.604209S; -48.126809W; \ 05.x.2015; AJCAguiar & I. \ Malinov". 9 females (UNB), "UNB \ 088480" "Brasil, DF, Brasília \ Reserva Ecol. IBGE \ 15°57'S, 47°52'W \ 25-XI-2008 \ S. C. Cappellari col." "Scc 251108.7 \ B. coccoldo. \ Pollen \ CC 325-50" idem except for "'088476" "Xanthopodia \ Iarocai (Moure) \ AJCAguiar det 2008", "088475" "10-XI-2009" "Xanthopodia \ Iarocai \ AJCAguiar det. 2008" "SCC 101108.11 \ B. laxiflora \ Pollen 11-1130a \ BMG", "088481" "26-XI-2009" "SCC 261108.20 \ B. basiloba \ OIL \ CSQ915-45", "088473" "10-XI-2008" "Xanthopodia \ Iarocai \ Aguiar det 2009" "Scc 101108.7 \ B. coccol. \ OIL \ C240-310", "088477" "13-XI-2009" "Scc 131109.11 \ B. laxiflora \ Pollen \ BMG 1110-40", "088474" "10-XI-2009" "Scc 101109.8 \ B. cocco \ OIL \ C 240-310", "088479" "10-X-2009" "Scc 201009.7 \ B. laxiflora \ Pollen \ C 1112-42", "088471" "1-X-2009" "Scc 011009.2 \ B. verbasc. \ OIL \ C 211-41". 6 females (UNB), "090157" "Brasil, DF, Brasília, Parque \ Ermida Dom Bosco, \ 24/09/2014. AJCAguiar. \ Malp. Amarela sem glândula", idem except for "090166", "090158", "090159", "090160", "090179". 1 female, "Brasil, Distrito Federal, \ Brasília, Parque Dom \ Bosco, S15.79478 \ W47.80731, 14.x.2016, \ M. M. carvalho". 1 male (UNB), " 044686" "Brasília \ Água Limpa \ 01-10-1980" "Eriope crassipes" "Paratetrapedia \ sp. 28". 1 female (UNB), "062077" "Brasil, Distrito Federal \ Brasília, Fazenda Água \ Limpa - UnB. \ -15.9959694, -47.934552 \ 03.xi.2014; AJCAguiar". 1 female (UNB), "000168" "Brasília, DF, Fazenda \ Água Limpa, Byrsonima \ sericea; 10.xi.2011. \ AJCAguiar". 1 female (UNB), "000108" "BRAZIL: DF \ Águas Emendadas \ 26.11.88 A. Raw". 1 female (UNB), "073225" "Brasil, Distrito Federal \ Brasília, S-15.7002418 \ W-47.8946138, 22.xi.2016 \ AJCAguiar" "Byrs. basiloba". 1 female (UNB), " 060611" "Brasil, DF, Brasília. Out.2017 \ S-15.766836 W-47.854559 \ AJCAguiar". **Goiás:** 5 females (UNB), "UNB \ 235816" "Brasil, Goiás, Instituto \ Biorregional do Cerrado, \ 14°06'13"S 47°32'32"W, \ 1300 m, 10.x.2020, A. \ Albuquerque, F. Monteiro, K. \ Vasconcelos K. Norrana, R. H. \ Figueira", idem except

for "235817", "235818", "235819", 235830". 1 female, "Brasil, Goiás, Hidrolândia \ Cefaeh, 07.xi.08, 16:00 \ Melo, MS col" "Diadasina sp. \ Oliveira DE det./08". 1 female (UNB), "060725" "Brasil, Goiás, Flores de Goiás; \ 14°34'00.8"S \ 47°23'04.6"W \ 27.xi.2016 ; AJCAguiar & \ W. Silva". **São Paulo:** 7 females (RPSP), "0177 \ RPSP \ Fenológ. Livre" "Brasil, SP. Est. Ecol. Itirapina \ 22°13'27.9"S 47°54'05.9"W \ 26-28.x.2016 Tavares, Porto, \ Lucena, Gibran & Yoshida", idem except for "0187", "0178", "0179", "0268", "0580" "28-29/x/2016", "0579" "28-29.x.2016". 1 female (RPSP), "RPSP \ 12.0002" "Estação Ecológica Jataí \ Luiz Antonio - SP \ 21°35'17"S, 47°47'49"W \ BRASIL 02.XI.2011" "Altitude: 350 m \ J. A. Tavares \ E. Almeida et al. Leg.". 1 female (RPSP), "RPSP \ 17. 0684" "Brasil, MG, 16 km NW \ Pompéu -19.1569 -45.1461 \ 29.xi.2016 R. Ferrari & H. Hilário". 2 females, (CEPANN), "Itirapina SP \ Est. Eco. Itirapina \ Brasil, 18.12.2011 \ E. Pinto leg." "CEPANN 42778", idem except for "06.12.2010". **Minas Gerais:** 1 female (RPSP), "RPSP \ 17. 0462" "Brasil, MG, Serra do Salitre: \ RPPN Cachoeira do Campo \ -19.1603 -46.5647 \ 30.xi.2016 R. Ferrari & H. Hilário". 4 females (UNB), "000166" "Brasil, Minas \ Gerais, Serra do \ Salitre, outubro/2005 \ AJCAguiar", idem except for "000164", "000167", "000165". 5 females (UNB), "BRASIL, Minas \ Gerais, Serra do \ Salitre, outubro/2005 \ AJCAguiar". 2 females, "São Gonçalo do Rio \ Preto MG \ P. Estad. Rio Preto \ Brasil 30/10/2011 \ Schindwein et al. Leg." "92984" "L 280 \ dormitório", idem except for "92987". 2 females (UNB), "000113" "Brasil, Minas Gerais, estrada \ Passos-Capitólio, S20°39'24" \ W46°13'34", 826mts, \ 23.xi.2012, AJCAguiar", idem except for "000114". **Mato Grosso:** 1 female (UNB), " 005829" "BRAZIL: MT \ Ch. Guimarães \ 17.10.88 A. Raw" "Stachytarphaeta cayennensis". 1 female (UNB), "000112" "BRAZIL:MT \ Rio Manso \ 15.10.88 A.Raw". **Bahia:** 1 female (UNB), "000110" "BRAZIL: BA \ Ilha Carapeba \ A.Raw Oct. 1986".

Xanthopedia sp. nov. 2

Diagnosis

Xanthopedia sp. nov. 2 also belongs to the *Xanthopedia larocai* species complex. It differs from the remaining species of this group by the upper portion of the supraclypeal area slightly convex (Fig. 3, A), the smaller body size (body length 4.6, head width: 1.55), pubescence completely reddish orange, the integument completely reddish orange, except by frons reddish brown.

Comments

This species is only known by a small series of 16 specimens from Guaribas Biological Reserve (Paraíba, Northeastern Brazil), and one specimen from Catimbau (Pernambuco, NE Brazil). Most of the specimens were collected in December in flowers of *Byrsonima crassifolia* (Malpighiaceae).

Variation

The integument color of mesosoma can vary from black to reddish brown, and metasoma can present brown marks.

Description

Holotype male. Body length: 4.6; wing length (without tegula): 4.4; maximum head width: 1.55; intertegular distance: 1.32. *Color*: integument bicolor (yellowish orange and reddish brown), mostly yellowish orange; except by frons, upper paraocular area, vertex, occipital area, mesoscutum lower and anterior mesepisternal area reddish-brown. Mesoscutum with thin yellow stripes on disc and lateral margins. Wing membrane hyaline, mostly pale yellow; wing veins mostly reddish orange. *Pubescence*: pubescence pale yellow to pale white; hind legs with pubescence mostly brownish orange. Labrum with dense short plumose pubescence on the lower third. Clypeus with sparse short simple setae on disc, and few erect simple setae on the lateral third. Supraclypeal area and lower frons mostly glabrous; frons, upper paraocular area and vertex with dense long plumose hairs. Antennal scape with numerous stout setae on inner face, ca. 1xF2. Gena with numerous long plumose pale yellow hairs; mesoscutum and scutellum with short velvet pubescence; posterior margin of scutellum with sparse long simple setae; mesepisternum with numerous long simple and plumose pale yellow hairs; metapostnotum mostly glabrous with very sparse short simple setae. T3 and T4 with complete fimbria of short plumose reddish-brown hairs; T5 and T6 with complete fimbria of short plumose pale yellow hairs; T7 without marginal fimbria. *Sculpture*: clypeus with coarse punctures (ca. 1 pd); supraclypeal area with very sparse coarse punctures (ca. 2 pd), mostly on lateral portions; frons with dense fine punctures, ca. <0.5–1 pd; mesoscutum and scutellum with dense fine punctures (ca. ≤0.5-1 pd); mesepisternum with numerous fine minute punctures (ca. ≤1pd); metapostnotum with very sparse fine punctures (ca. >2 pd). *Structure and measurements*: head ~1.2x wider than long (1.8:1.5); compound eyes ~3.57x longer than wide (1.25:0.35); inner orbits converging below, upper interocular distance 1.1, lower interocular distance 0.9; clypeus 1.5x wider than long (0.87:0.5), slightly convex on the first two thirds and strongly convex on the lateral third; supraclypeal area slightly

convex; frons slightly convex, with a strong mid sulcus; upper paraocular area flat; scape length 0.4, width 0.15; length of the first three flagellomeres 0.14, 0.09, 0.14, respectively. Scutellum disc slightly biconvex on the posterior area; mid tibial spur pectinated, as long as mid basitarsus (0.42).

Paratype female. Body length: 6.5; wing length: 4.5; maximum head width: 2.05; intertegular distance: 1.5. *Color*: similar to male, except by mesepisternum completely yellowish. *Pubescence*: similar to male, except for labrum with dense erect simple setae on the lower third and short simple setae on the upper thirds; clypeus mostly glabrous, with few erect simple setae on the lateral thirds; frons and paraocular area with very short simple and plumose hairs; upper paraocular area and vertex with dense simple and plumose hairs; gena with numerous long plumose white hairs (ca. 2x F2). Posterior margin of scutellum with sparse short simple setae; mesepisternum with numerous long simple and plumose pale white hairs. Metapostnotum with numerous very short plumose hairs. T1 – T3 mostly glabrous, with only short lateral fimbria; T4 and T5 with complete fimbria of sparse short simple hairs brownish orange; T6 with complete marginal band (fimbria) of dense simple brownish orange hairs. *Sculpture*: similar to male, except by clypeus with dense coarse punctures (ca. 1pd); supraclypeal area with very sparse fine punctures, frons with dense fine punctures (ca. < 0.5 pd). *Structure and measurements*: head ~1.14x wider than long (2.12:1.85); compound eyes ~2.27x longer than wide (1.34:0.59); inner orbits of compounding eyes converging slightly below, upper interocular distance 1.22, lower interocular distance 1; clypeus 1.5x wider than long (0.9:0.6), slightly convex; supraclypeal area slightly convex, almost flat; frons slightly convex with a strong mid sulcus; upper paraocular area flat; scape length 0.55, width 0.13; length of the first three flagellomeres 0.2, 0.09, 0.12, respectively; scutellum convex on the posterior area with a slight mid sulcus; mid tibial spur strong pectinated on the anterior portion, ~0.49x the size of the mid basitarsus (0.43: 0.87).

Floral records

Eriope crassipes; *Byrsonima sericea*; *Byrsonima gardneriana*; *Byrsonima crassifolia*.

Distribution

The northern coast of Brazil: the species was recorded only in Paraíba and Pernambuco.

Type material

Holotype male: "DSEC 1573" "Paratetrapedia \ (Xanthopedia) \ sp. \ F.A.Silveira, det. 1999" "Brasil; PB; Mamanguape; \ Res. Biol. Guaribas \ 6°41'S / 35°07'W \ 24/X/1999 \ AJCAguiar". Paratype female described: "2265" "Brasil; PB; Mamanguape; \ Res. Biol. Guaribas \ 6°41'S / 15°07'W \ 12/XII/1999 \ AJCAguiar leg" "Byrsonima \ sericea". Remaining paratypes: **BRAZIL, Pernambuco:** 1 female, "Buique, PE \ Vale do Catimbau \ Brasil, 21/03/2009 \ Carvalho, A. leg" "43046 UFPE" "L 112 P 773 \ Eriope crasipes"; **Paraíba:** 1 male, "1573" "Paratetrapedia \ (Xanthopedia) \ sp. \ F.A.Silveira, det. 1999" "Brasil; PB; Mamanguape; \ Res. Biol. Guaribas \ 6°41'S / 35°07'W \ 24/X/1999 \ AJCAguiar", idem "1608" and 2 females with the same label, except for "1680", "1621" "Byrsonima \ gardneriana"; 11 females, "Brasil; PB; Mamanguape; \ Res. Biol. Guaribas \ 6°41'S / 35°07'W \ 25/X/1999 \ AJCAguiar leg". "2109", idem except for "2110", "2261", "2080", "1608" "25/X/999", "1873" "13/XII/1999", "1866" "13/XII/1999", "2265" "13/XII/1999", "1829" "12/XII/1999", "2148" "17/I/2000", "2029" "15/I/2000".

Xanthopedia sp. nov. 3

Diagnosis

Xanthopedia sp. nov. 3 is very similar to *X.* sp. nov. 4 and differs from other species of *Xanthopedia* by supraclypeal slightly convex with numerous coarse punctures. *X.* sp. nov. 3 differs from *X.* sp. nov. 4 by the prementum and stipite with only simple and straight setae, the scopa of hind tibia pale orange and pubescence of hind basitarsus reddish black (Fig. 11).

Comments

This species is known by a series of 15 specimens from Goiás, Distrito Federal (Midwest Brazil) and one specimen from Guaribas (Piauí, Northeastern Brazil). All the specimens analyzed were females.. The specimens were collected mostly in summer – December, January, and February – in flowers of Malpighiaceae e Krameriaceae. Despite the distribution occurring in areas of caatinga, the species seems to be related to a transition area between Caatinga e Cerrado, like Vale do Paranã, on Goiás, dry forest areas, and the plateau of Cerrado on Piauí.

Description

Holotype female. Body length: 6.5; wing length (without tegula): 4.5; maximum head width: 2.8; intertegular distance: 1.75. *Color:* integument bicolor (yellow to yellowish orange), mostly yellowish orange, except by the central portion of upper paraocular

area, vertex, occipital area and mesoscutum black. Mesoscutum with two no complete thin yellow stripes on disc and lateral margins. Wing membrane weakly brownish black infumate, with apical third darker by numerous blackish microtrichiae; wing veins yellowish orange. *Pubescence*: pubescence pale yellow to pale white; hind legs with pubescence mostly pale white, with basitarsus pubescence dark brown. Labrum with very long simple setae (4x F2); clypeus with sparse long simple setae; frons with very short hairs, mostly glabrous; paraocular area with dense very thin plumose hairs; lower parocular with short simple hairs; vertex and upper paraocular area with simple and plumose short hairs; antennal scape with short stout simple setae on inner face (ca. 1.5x F2); gena with numerous simple and plumose pale white hairs. Mesoscutum and scutellum with short velvet pubescence; lateral portion of scutellum with numerous very short plumose hairs; metanotum with dense simple and plumose setae on lateral portion; lateral portion of propodeum with dense plumose hairs; mesepisternum with long simple setae, with central area glabrous; T1 – T4 mostly glabrous, with sparse simple hairs on lateral portion; T5 – T6 with completely fimbria of long simple hairs. *Sculpture*: clypeus and supraclypeal area with sparse coarse punctures (ca. 1 – >2 pd); frons with dense coarse punctures (ca. 1 pd); mesoscutum and scutellum with dense fine minute punctures, almost contiguous (ca. <0.5 pd); metapostnotum with numerous very fine punctures (ca. >1 pd). *Structure and measurement*: head ~1.25x wider than long (2.45:2.0); compound eyes ~2.6x longer than wide (1.47:0.55); inner orbits of compounding eyes converging very slightly below, upper interocular distance 1.32, lower interocular distance 1.1; clypeus ~1.9x wider than long (1:0.52), slightly convex; supraclypeal area convex; frons convex with a mid sulcus, invading the upper portion of clypeus; upper paraocular area flat; scape length 0.82, width 0.15; length of the first three flagellomeres 0.21, 0.06, 0.11, respectively; scutellum slightly convex with a strong sulcus until halfway; mid tibial spur completely pectinated, ~0.75x the size of the mid basitarsus (0.06:0.08).

Floral Records

Byrsonima sericea; *Echinodorus* sp.; *Krameria grandiflora*; Malpighiaceae.

Distribution

Brazil: Goiás, Piauí, Ceará.

Type material

Holotype female: "UNB \ 000177" "Brasil, Goiás, 24.5 km N Teresina de \ Goiás, Rod. Go-118 (010) \ 13°34'36"S 47°11'06"W, 420m \ 15.ii.2012; EBAAlmeida & \

AJCAguiar". Paratypes: **BRAZIL, Goiás:** 1 female "GO-118, Teresina \ de Goiás, GO \ Brasil, 13°34'35,2"S \ 47°11'14,4"W \ 18/V/2014 10:40h \ L. Carneiro col." "Xanthopedia sp." "Krameria grandiflora \ A. St.-Hil \ (Krameriaceae) \ L. Carneiro det."; 1 female, (UNB), "060080" "Brasil, Goiás, Flores de \ Goiás; Córrego Macaquinho; \ 19/12/2014; 14°27'52.89"S \ 47°0'6.39"O; cl. A. J. C. \ Aguiar."; 1 female, "Brasil, Goiás, Formosa, Distrito do \ Bezerra, Fazenda Santo Antônio \ -15.30755, -4719584, \ 28.i.-5.ii.2012, Excursão \ Disciplina Entomologia de Verão"; 6 females (UNB), "000175" "Brasil, GO, Flores de \ Goiás, S14°27'39" \ W47°60'18", 450 m.; \ 26.i.2010; AJCAguiar" "Malpighiaceae rosa", idem except for "000173", "000174"; 4 females (UNB), "000180" "Brasil, Goiás, Formosa, Distrito do \ Bezerra, Fazenda Santo Antônio \ -15.30755, -4719584, \ 28.i.-5.ii.2012, Excursão \ Disciplina Entomologia de Verão", idem except for "000169", "000179", "000,171 \ *Byrsonima sericea*"; 2 females (UNB), "060740 \ 14°27'29.9"S 43°03'58.9"W; \ 27.xi.2016; AJCAguiar & W. Silva" idem except for "060739"; 1 female (UNB), "000177" "Brasil, Goiás, 24.5 km N Teresina de \ Goiás, Rod. Go-118 (010) \ 13°34'36"S 47°11'06"W, 420m \ 15.ii.2012; EABAlmeida & \ AJCAguiar"; 1 female (UNB), "UNB \ 000176" "Brasil, Goiás \ Flores de Goiás \ 19.xii.2010, \ AJCAguiar \ Área II" "Flores-GO Área II \ 19.xi.2010"; **Piauí:** 1 female, (UFPE) "Guaribas PI \ S. das confusões \ Brasil 30.03.2007 \ A. Carvalho leg." "33749 UFPE" "L 189 \ *Echinodorus* sp."

Xanthopedia sp. nov. 4

Diagnosis

Xanthopedia sp. nov. 4 is sympatric to *Xanthopedia* sp. nov. 3. Therefore, it differs from the remaining species of that group by strongly curved setae on the stipite and prementum, the wing membrane weakly brownish orange infumate, and the pubescence on the hind tibia and basitarsus mostly black (Fig. 12).

Comments

This species is known by a series of only 4 specimens from Goiás (Midwest Brazil). The specimens were collected between January and February, in flowers of *Byrsonima sericeae*. This species is rare and only known in two localities of Cerrado, close to Brasília - DF. All the specimens analyzed were females.

Variation

Mesomoma can vary from black to reddish-brown.

Description

Holotype female. Body length: 5.8; wing length (without tegula): 5; maximum head width: 2.2; intertegular distance: 1.5. *Color*: integument bicolor (yellow to brownish orange) mostly brownish orange, except by mesoscutum black, upper and lower portion of mesepisternum brown. Mesoscutum with two yellow stripes on disc and lateral margins; wing membrane weakly brownish orange infumate; wing veins yellowish orange. *Pubescence*: pubescence mostly pale yellow all over the body, with hind tibia and basitarsus pubescence black. Labrum with dense very long simple setae (ca. 5x F2); clypeus mostly glabrous with very sparse thin simple setae on the lateral; supraclypeal area and frons fully glabrous; paraocular area mostly glabrous with the upper portion with very short thin hairs; vertex with short and sparse simple hairs; antennal scape with short curved simple setae on inner face (ca. 1.3x F2); gena with long and sparse simple setae. Mesoscutum and scutellum with very short velvet pubescence; scutellum with fimbria of short plumose hairs on the posterolateral portion (< F2); posterior margin of metanotum with very short simple hairs; mesepisternum mostly glabrous, with long stout simple setae on the lower third; T1 – T4 mostly glabrous, with sparse simple hairs on lateral portion; T5 – T6 with complete fimbria of long simple hairs. *Sculpture*: clypeus with fine punctures, almost contiguous on the central area; supraclypeal area with sparse coarse punctures (ca. 1 – 2 pd); frons with coarse punctures (ca. 1 pd); mesoscutum and scutellum with dense fine minute punctures, almost contiguous (ca. <0.5 pd); metapostnotum with numerous very fine punctures (ca. < 1 pd). *Structure and measurements*: head ~1.075x wider than long (2:17:2); compound eyes 3.1x longer than wide (1.4:0.45); inner orbits of compounding eyes converging very slightly below, upper interocular distance 1.25, lower interocular distance 1.05; clypeus ~2.1x wider than long (1.05:0.5), slightly convex; supraclypeal area strongly convex; frons convex with a slightly mid sulcus; upper paraocular area flat; scape length 0.6, width 0.125; length of the first three flagellomeres 0.2, 0.075, 0.0.2, respectively; scutellum slightly convex, with a strong sulcus until halfway; mid tibial spur completely pectinated, ~0.61x the size of the mid basitarsus (0.525:0.85).

Floral records

Byrsonima sericea.

Distribution

Brazil: The species was recorded in the Brazilian Midwest, in the State of Goiás.

Type material

Holotype female: "UNB \ 000170" "Brasil, Goiás, Formosa, Distrito do \ Bezerra, Fazenda Santo Antônio \ -15.30755, -4719584, \ 28.i.-5.ii.2012, Excursão \ Disciplina Entomologia de Verão". Paratypes: **BRAZIL, Goiás:** 3 females (UNB), "000178" "Brasil, Goiás, Formosa, Distrito do \ Bezerra, Fazenda Santo Antônio \ -15.30755, -4719584, \ 28.i.-5.ii.2012, Excursão \ Disciplina Entomologia de Verão", idem except for "000178" "Byrsonima \ sericea", "000172" "Byrsonima \ sericea".

Xanthopedia sp. nov. 5

Diagnosis

Xanthopedia sp. nov. 5 is sympatric to *Xanthopedia iheringii* and differs from this species by body length (*X. iheringii* has a larger body length than sp. nov. 5), the supraclypeal area strongly angled on the upper portion with a strong coarse point rounded by a carina (Fig. 13), metasoma completely reddish brown and tibia and basitarsus scopa brownish orange.

Comments

This is the species with the most representatives present in the collections which were examined for this work. It is distributed along the Cerrado areas in the Midwest of Brazil, with representatives in Minas Gerais, Goiás e Bahia, mainly in the range of mountains of Serra do Espinhaço.

Description

Holotype male. Body length: 6.7; wing length (without tegula): 5.3; maximum head width: 4.5; intertegular distance: 4. *Color:* integument bicolor: mostly black on head and metasoma, with yellow marks on the face, pronotum, axilla and lateral portions of scutellum, and yellow to brownish orange on mesosoma and legs. Mesoscutum with two yellow stripes on disc and lateral margins; wing membrane weakly brown infumate with apical third darker by numerous brownish microtrichiae; wing veins hyaline, colored brown. *Pubescence:* pubescence mostly pale white to pale yellow. Labrum with dense very long simple and plumose hairs (ca. 2.85x F2); clypeus with long simple setae (ca. 4x F2); supraclypeal area with sparse simple setae; frons and upper paraocular area with dense long simple setae (ca. 3.5x F2); paraocular area with sparse long simple setae; vertex with dense plumose hairs; antennal scape with long curved simple setae on inner face (ca. 2.6x F2); gena with numerous long simple setae on the two distal portions and plumose and simple hairs on the apical portion. Mesoscutum with very short velvet pubescence; scutellum with erect simple and

plumose hairs, more numerous on the posterior portion; posterior margin of metanotum with dense short plumose hairs; mesepisternum with dense long simple setae and short plumose hairs; T1 – T2 mostly glabrous, with numerous simple hairs on lateral portion; T3 – T7 with complete fimbria of long simple hairs. *Sculpture*: clypeus with coarse punctures (ca. 1 pd); supraclypeal area with very sparse coarse punctures (ca. 2 pd), on the lateral portion; frons with coarse punctures (ca. >1 pd); mesoscutum and scutellum with dense fine punctures (ca. ≤0.5 – 1 pd); mesepisternum with sparse fine minute punctures (ca. 1 – 2 pd); metapostnotum with very sparse fine punctures (ca. >2 – 3 pd). *Structure and measurements*: head ~1.25x wider than long (2:1.6); compound eyes ~2.75x longer than wide (1.32:0.48); inner orbits converging below, upper interocular distance 1.2, lower interocular distance 0.92; clypeus ~1.69x wider than long (0.88:0.52), slightly convex on the first two thirds and strongly convex on the lateral third; supraclypeal area slightly convex; frons slightly convex, with a slightly sulcus on the final of the third portion; paraocular area concave; scape length 0.45, width 0.125; length of the first three flagellomeres 0.16, 0.08, 0.13, respectively. Scutellum disc slightly convex on the posterior area, with a slight mid sulcus until halfway; mid tibial spur pectinated, ~0.47x the size of the mid basitarsus (0.42:0.88). Paratype Female. Body length: 6.25; wing length (without tegula): 5.31; maximum head width: 2.18; intertegular distance: 1.72. *Color*: similar to male, except by mesoscutum completely black, with no yellow stripes. *Pubescence*: pubescence color similar to male, except by labrum pubescence pale yellow. Labrum with dense long simple setae (ca. 3.25x F2); clypeus mostly glabrous with some sparse simple setae on lateral portion; supraclypeal area with very short and sparse simple hairs, almost inconspicuous; frons mostly glabrous with few short hairs on upper portion; upper paraocular area with sparse short simple hairs; paraocular area mostly glabrous; vertex with dense plumose hairs; antennal scape with curved simple setae on the inner face; gena with numerous simple setae, longer on the two distal portions (ca. 3.75x F2); mesoscutum with very short velvet pubescence; scutellum with lateral fimbrias of plumose hairs; posterior margin of metanotum with sparse plumose hair; mesepisternum with long simple setae (4.12 xF2) in posterior portion, and plumose short hairs on the upper portion; T1 – T3 mostly glabrous in the central portion, with short simple hair on the lateral portion of T2 and T3; T4 – T6 with complete fimbria of long simple hairs. *Sculpture*: clypeus with intermingled coarse punctures (ca. 1 pd.); supraclypeal area with coarse punctures (ca. 1 pd.), with a glabrous mid-line; frons

numerous coarse and fine punctures (ca. <1 pd.), with a mid-sulcus; mesoscutum and scutellum with dense thin punctures, almost contiguous; mesepisternum with fine minute punctures; metapostnotum with very sparse fine punctures (ca. >2 pd.). *Structure and measurements*: head ~1.18x wider than long (2.21:1.87); compound eyes ~3.4x longer than wide (1.37:0.4); inner orbits converging below, upper interocular distance 1.25, lower interocular distance 1.02; clypeus ~1.72x wider than long (0.95:0.55), slightly convex; supraclypeal strongly convex; frons slightly convex, with a mid-sulcus; upper paraocular area flat; scape length 0.54, width 0.12; length of the first three flagellomeres 0.175, 0.075, 0,1, respectively. Scutellum disc convex with a slight mid sulcus until halfway; mid tibial spurs pectinated, ~0.42x the size of the mid basitarsus (0.4:0.95).

Floral records

Bidens sp., *Byrsonima cydormiifolia*, *Byrsonima gardnerana*, *Byrsonima sericea*, *Byrsonima verbascifolia*, *Cyrtocymura scorpioides*.

Distribution

Brazil: Minas Gerais, Bahia, Goiás.

Type material

Holotype male: "UFMG 92947" "São Gonçalo do Rio \ Preto MG \ P. Estad. Rio Preto \ Brasil, 30/20/2011 \ Schindwein et al. Leg" "L 280 \ dormitório". Paratype female described: "UFMG 90639" "Jaboticatubas MG \ Serra do Cipó ICMBio \ Brasil, 20/07/2012 \ Oliveira S S leg" "L279 P 1476 \ Cyrtocymura \ scorpioides". Remaining paratypes: **BRAZIL, Minas Gerais**: 29 females and 1 male (UFMG), "Abelhas Espinhaço \ 10559-30822" "Itacambira MG \ BRASIL 01/10/2005 \ A.A.Zevedo", idem except for "10563-30480", "10496-30599", "10569-30874", "10563-30839", "10500-30605" "11/03/2005 \ R.B.Martines", "10467-30501" "10/03/2005 \ R.B.Martines", "10496-30598" "11/03/2005", "10510-30619", "10569-30873" "M.F.Goulart", "10570-30902" "M.F.Goulart", "10725-31543" "12/05/2005", "10570-30903" "M.F.Goulart", "10565-30843" "M.F.Goulart", "10563-30841", "10562-30835", "10547-30737" "C.F.Cardoso", "10573-30922" "C.F.Cardoso", "10562-30836". 5 females (UFMG), "Abelhas Espinhaço \ Pq. E. Grão Mogol \ 10249-29967" "Grão Mogol MG \ BRASIL 21/01/2005 \ A.A.Azevedo", idem except for "10221-29899" "17/01/2005", "10576-30981" "26/09/2005", "10221-28896" "17/01/2005", "10145-29740" "19/10/2004 \ R.B.Martines". 8 females, "Pq. E. Rio Preto \ 9082-27135" "São Gonçalo do Rio Preto MG \ BRASIL 26/09/2003 \ A.A.Azevedo", idem except for "9082-27134", "9082-

27136", "9082-27133", "9082-27132", "9082-27131", "9082-27130", "9082-27129". 3 males and 4 females, "Variação altitudinal \ de vespas e abelhas \ RPPN Caraça MG \ 21612-62579" "Catas Altas MG \ BRASIL 13/09/2010 \ Perilo, L.N." "Xanthopedia \ sp. 1 \ R.R.Ferrari det 2011", idem except for "21610-62573", "21610-62572", "21608-62562", "21612-62579", "21607-62558", "21600-62545". 4 females, "300 \ 22/02/2014 \ Área 3 TR 9 \ 12:00h Temp: \ Cód. Planta: PL_Sp B s", idem except for "296", "295", "347 \ 23/02/2014 \ Área 4 TR 10 \ 11:00h". 8 males (UFMG), "92939" "São Gonçalo do Rio \ Preto MG \ P. Estad. Rio Preto \ Brasil, 30/10/2011 \ Schlindwein et al. Leg" "L 280 \ dormitório", idem except for "92945", "92978", "92971", "92956", "92999", "92947", "92965". 5 females, "93855" "São Gonçalo do \ Rio Preto MG \ Brasil 5/12/12 \ Schlindwein leg" "L 280 P 867 \ Byrsonima gardnerana", idem except for "93862", "93868", "93847", "93854". 1 male, "92997" "São Gonçalo do Rio \ Preto, MG \ Brasil, 30/10/2011 \ Schlindwein et al. Leg." "L 280 \ dormitório". 3 females (RPSP), "17.0559" "Brasil, MG, São Gonçalo Rio \ das Pedras -18.4064 -43.5136 \ 15.xii.2016 R. Ferrari & M. Ramos", idem except for "17.0591", "17.0585". 1 female, "São Gonçalo do Rio Preto. MG \ Parque Estadual do Rio Preto \ Maio.2009. AJCAguiar". 4 females, "Brasil, Minas Gerais \ Parque Estadual São \ Gonçalo do Rio Preto \ ix.2008; Aguiar, Martins, \ Gillung cols.". 4 females (UFMG), "90639" "Jaboticatubas MG \ Serra do Cipó ICMBio \ Brasil, 20/07/2012 \ Oliveira S S leg" "L279 P 1476 \ Cyrtocymura \ scorpioides", idem except for "90235" "15/04/2012" "P 1443 \ Byrsonima \ cydormiifolia", "91644" "06/10/2012" "1454 \ Byrsonima \ verbascifolia", "91866" "06/10/2012" "P1454 \ Byrsonima \ verbascifolia". 2 males and 3 females, "93480" "Milho Verde - MG \ Serro, \ Brasil 14/10/2011 \ Daniele & Marina leg." "L282 \ em flores de \ Byrsonima", idem except for "93469", "93470", "94378", "93476". 2 females (UFMG), "RPSP \ 16.0015" "Brasil, MG, Brumadinho Serra da \ Calçada. 21°06.026'S 43°59.092W \ 1450m 22.12.2015. E. Almeida", idem except for "16.0016". 2 females (UFMG), "94010" "S. Gonç. Rio Preto MG \ P. Estad. Rio Preto \ Brasil, 06/11/2013 \ Schlindwein et al. Leg." "L 280 P 867 \ B. gardnerana", idem except for "94011". 1 female (UNB), "Brasil, Minas Gerais, \ Parque Estadual São \ Gonçalo do Rio Preto, \ ix.2008; Aguiar, Martins \ Gillung cols.". 4 females (UNB), "Abelhas da Zona \ Metalúrgica MG \ Serra da Moeda \ 1983-5464" "Brumadinho MG \ BRASIL 12/12/1997 \ Oliveira & Almeida" "Paratetrapedia \ (Xanthopedia) \ sp. 13 \ F.A.Silveira, det 2000", idem except for "2626-7821" "11/10/1998 \ F.A.Silveira", "2626-7822" "11/10/1998", "2922-8641" "09/01/1999 \ F.A.B.Almeida". 4 females and 2 males (UFMG), "Abelhas da Zona \

Metalúrgica MG \ S. do Caraça \ 5417-14761" "Catas Altas MG \ BRASIL 15/11/1999 \ F.A.Silveira" "Paratetrapedia \ (Xanthopedia) \ sp. 13 \ F.A.Silveira, det 2000", idem except for "5421-14771", "5425-14793", "5425-14794", "5599-1520", "6056-16872". 1 female (UFMG), "Abelhas da Zona \ Metalúrgica MG \ Pq. Mangabeiras \ 0612-1445" "Belo Horizonte MG \ BRASIL 22/10/1996 \ J. Damasceno" "Paratetrapedia \ (Xanthopedia) \ sp. 13 \ F.A.Silveira, det 1996". 3 females (UFMG), "Abelhas da Zona \ Metalúrgica MG \ COPASA / Mutuca \ 3532-10378" "Nova Lima MG \ BRASIL 19/09/98 \ M.Pompeu" "Paratetrapedia \ (Xanthopedia) \ sp. 13 \ F.A.Silveira, det 2000", idem except for "2751-7723", "3535-10382". 4 females (UFMG), "UFMG IHY \ 1208255" "Brasil, MG, Porteirinha \ Serra Branca \ 15°43'40.4"S, 42°49'47.0"W \ 1287m 11.i.2011 Em flor, \ J.E.Santos Jr", idem except for "1208257", "1208256", "1208258". 1 female (UNB), "Abelhas da Canga \ Parque Estadual da \ Serra do Rola-Moça \ 25111-73925" "Nova Lima MG \ Brasil 28/10/2011 \ R.Cunha Santos" "Q2-2". 2 female (UFMG), "1414723" "Brasil, MG, Brumadinho \ Ponto de Fauna 04 \ 20°10'25.0"S, 43°58'50.0"W \ 1490m 27.xii.2011 Em \ flor, F.V.Freitas" "Paratetrapedia \ (Xanthopedia) sp. 2 \ R.B.Martines, det. 2012", idem except for "1414531" "Ponto de Fauna 13 \ 20°01'37.05"S, 43°59'06.0"W". 1 female (UFMG), "Serra do Cipó \ Campo rupestre \ 2265-7123" "Santana do Riacho MG \ Brasil 25/05/1998 \ R.M.Carmo" "Paratetrapedia \ (Xanthopedia) \ sp. 13 \ F.A.Silveira, det. 2000". 1 female (UFMG), "UFMG IHY \ 1413757" "Brasil, MG, Nova Lima \ Ponto de fauna 16 \ 20°07'00.0"S, 43°59'28.0"W \ 1450m 31.vii.2011 Em \ flor, R.B.Martines" "Paratetrapedia \ (Xanthopedia) \ sp 01 \ R.R.Ferrari det 2011".

Bahia: 7 females (UFMG), "IHY \ 1208021" "Brasil, BA, Jacaraci \ Morro do Chapéu \ 14°53'38.8"S, 42°31'02.7"W \ 1292m 5.i.2011 Em flor, \ J.E.Santos Jr", idem except for "1207987", "1207988", "1207986", "1207991", "1207022", "1207990". 4 females (MZUEFS), " Brasil: Bahia: Palmeiras \ Área Coité; T1 \ Data: 17.XII.2012 - 13h- 14h \ 12°24'477"S / 41°30'263"W \ Lua, S.; Silva, M." "288", idem except for "Área Teto Verde; T1 \ Data: 08.I.2013 - 09h- 10h \ 12°25'597"S / 41°29'241"W \ Lua, S.; Silva, M." "500", "Área Barranco; T2 \ Data: 09.I.2013 - 11h- 12h \ 12°26'299"S / 41°30'093"W \ Lua, S.; Silva, M." "615" "Xanthopedia sp. \ A. Aguiar det. 2013", "Área Orquidário; T1 \ Data: 26.III.2013 - 09h- 10h \ 12°27'405"S / 41°28'006"W \ Lua, S." "681".

Xanthopedia sp. nov. 6

Diagnosis

Xanthopedia sp. nov. 6 belongs to the group of *Xanthopedia* sp. nov. 3 and sp. nov. 4 due to it having a supraclypeal area slightly convex with numerous dense coarse punctures. It differs from the others by the integument completely yellowish orange, without black marks. *X.* sp. nov. 3 and sp. nov. 4 have the integument bicolor. The scopa is completely yellowish-orange (Fig. 7).

Comments

The studied specimens of *Xanthopedia* sp. nov. 6 were all collected in Northeast Brazil, in Ubajara - CE, and did not present variations among the studied species.

Description

Holotype male. Body length: 6.24; wing length (without tegula): 4,81; maximum head width: 2.16; intertegular distance: 1.66. *Color*: integument mostly brownish orange, with yellow marks on the lower paraocular area and mesosoma. Mesoscutum with two yellow stripes on disc and lateral margins and; wing membrane weakly brown infumate; wing veins hyaline colored yellow orangish. *Pubescence*: pubescence mostly orangish all over the body, except for gena pubescence pale white. Labrum with long simple setae (ca. 2.1x F2); clypeus with simple setae mainly on the lower portion; supraclypeal area and frons fully glabrous; paraocular area mostly glabrous with the upper portion with very short thin hairs; vertex with short and sparse simple hairs; antennal scape with short simple setae on the inner face (ca. 1.1x F2); gena with dense plumose hairs. Mesoscutum with very short velvet pubescence; scutellum with fimbria of short plumose hairs; posterior margin of metanotum with very short simple and plumose hairs; mesepisternum with long stout simple setae; T1 and T2 mostly glabrous, with sparse simple hairs on lateral portion; T3 – T7 with complete fimbria of short simple hairs. *Sculpture*: clypeus with sparse coarse punctures; supraclypeal area with sparse coarse punctures (ca. 1 – 2 pd); frons with coarse punctures (ca. 1 pd); mesoscutum and scutellum with dense fine minute punctures, almost contiguous; metapostnotum with numerous very fine punctures (ca. < 1 pd). *Structure and measurements*: head ~1.13x wider than long (2,16:1.9); compound eyes 3x longer than width (1.38:0.46); inner orbits of compounding eyes converging very slightly below, upper interocular distance 1.2, lower interocular distance 1.04; clypeus ~1.76x wider than long (0.92:0.52), slightly convex; supraclypeal area strongly convex; frons convex with a slightly mid sulcus until the ocelli; upper paraocular area flat; scape length 0.52, width 0.14; length of the first three flagellomeres 0.18, 0.08, 0.14, respectively; scutellum

slightly convex, with a slightly mid-sulcus until halfway; mid tibial spur completely pectinated, ~0.47x the size of the mid basitarsus (0.5:1.06).

Paratype Female. Body length: 6.24; wing length (without tegula): 5.52; maximum head width: 3.04; intertegular distance: 1.6. *Color*: similar to male. *Pubescence*: pubescence color similar to male, except by antennal scape with short simple setae (<F2), gena with dense simple hairs, scutellum with short plumose hairs and a few long simple setae and T3-T6 with fimbria os long simple hairs *Sculpture*: similar to male, except by supraclypeal area with coarse punctures (ca. 1 pd.) *Structure and measurements*: head ~1.4x wider than long (3.04:2.17); compound eyes ~3.04x longer than wide (1.52:0.5); inner orbits converging below, upper interocular distance 1.27, lower interocular distance 1.1; clypeus ~2.12x wider than long (1:0.47), slightly convex; supraclypeal strongly convex; frons slightly convex, with a mid-sulcus until the ocelli; upper paraocular area flat; scape length 0.61, width 0.12; length of the first three flagellomeres 0.22, 0.1, 0.12, respectively. Scutellum disc convex with a slight mid sulcus until halfway; mid tibial spurs pectinated, ~0.58x the size of the mid basitarsus (0.58:1).

Distribution: Brazil: Ceará.

Type material

Holotype male: "UFMG IHY 1207518" "BRASIL, CE, Ubajara \ Sítio do Alemão \ 03°50'51.0"S 40°53'18.1"W \ 879m 25.iv.2012 Em flor \ J. E. Santos Jr". Paratype female described: "UFMG IHY 1207522" "BRASIL, CE, Ubajara \ Sítio do Alemão \ 03°50'51.0"S 40°53'18.1"W \ 879m 25.iv.2012 Em flor \ J. E. Santos Jr". Remaining paratypes: **BRAZIL, Ceará:** 2 males (UFMG), "1207523" "BRASIL, CE, Ubajara \ Sítio do Alemão \ 03°50'51.0"S 40°53'18.1"W \ 879m 25.iv.2012 Em flor \ J. E. Santos Jr", idem except for "1207524" and 12 females with the same label, except for "1207620", "1207515", "1207514", "1207516", "1207517", "1207519", "1207520", "1207521", "1207284", "1207284"; 1 female, "BRASIL, CE, Ubajara \ PARNA Ubajara \ 03°50'16.3"S 40°54'36.9"W \ 804m 23.iv.2012 Em voo \ C.F.Cardoso".

Xanthopedia sp. nov. 7

Diagnosis

Xanthopedia sp. nov. 7 belongs to the *Lissopedia* group, mainly *X. flavopicta*. This species differs from the others by the punctuation of the frons and supraclypeal area that is very fine and sparse, almost smooth and imperceptible; a strongly elevated

postocellar carina on the lateral portions (Fig. 16); a brown mark rounding the ocelli and pale yellow marks on frons just below the ocelli; wing veins hyaline, yellowish orange; wing pale yellow infumate and mesoscutum with dense simple hairs all over the surface.

Comments

With only two collected specimens, we could not observe variation for the species. This is the biggest species of the genus and its distribution in the Brazilian Atlantic Rainforest follows the pattern of the *Lissopedia* group.

Description

Holotype female. Body length: 8; wing length (without tegula): 6.5; maximum head width: 2.36; intertegular distance: 1.7. *Color*: integument mostly brownish orange, with yellow marks on the upper portion of frons, just below the ocelli, pale orange marks on paraocular area and brown marks above the ocelli and final terga (T3 - T6). Mesoscutum with two yellow stripes on disc and lateral margins; wing membrane pale yellow infumate; wing veins hyaline colored pale yellowish orange. *Pubescence*: pubescence mostly pale yellow all over the body, except for hind basitarsus and T3 - T6 with brown pubescence. Labrum with long simple setae (ca. 2x F2); clypeus with simple setae mainly on the lateral and upper portion, almost glabrous in the center; supraclypeal area and frons almost glabrous, with very short simple hairs; paraocular area mostly glabrous with the upper portion with very short thin hairs; vertex with short simple hairs; antennal scape with very short simple hairs; gena with dense simple hairs, mainly in the lower portion. Mesoscutum with dense simple hairs all over the surface; scutellum with fimbria of short simple hairs; posterior margin of metanotum with very short hairs; mesepisternum with long stout simple setae; T1 – T3 mostly glabrous, with simple hairs on lateral portion; T4 with fimbria of stout and sparse simple setae; T5 and T6 with complete fimbria of short simple hairs. *Sculpture*: clypeus with very sparse fine punctures (ca. >2pd); supraclypeal area almost smooth with sparse very fine punctures (ca. >2 pd); frons with very sparse and very fine punctures (ca. >2 – 3 pd); mesoscutum and scutellum with dense fine minute punctures, almost contiguous; metapostnotum with numerous very fine punctures (ca. < 1 pd). *Structure and measurements*: head ~1.1x wider than long (2,2:2); compound eyes 2.72x longer than width (1.5:0.55); inner orbits of compounding eyes converging very slightly below, upper interocular distance 1.4, lower interocular distance 1.25; clypeus ~2.5x wider than long (1.25:0.5), slightly convex; supraclypeal area convex; frons convex with a

slightly mid sulcus until the ocelli; upper paraocular area flat; scape length 0.64, width 0.18; length of the first three flagellomeres 0.24, 0.08, 0.12, respectively; scutellum slightly convex, with a slightly mid-sulcus until halfway; mid tibial spur completely pectinated, ~0.60x the size of the mid basitarsus (0.67:1.1).

Geographic distribution

Brazil: Manaus - AM.

Type material

Holotype female: "BRA, Amazonas, Manaus, \ Reserva Ducke, \ 2°55'49.5"S, 59°58'31.8"W \ 22.xii - 08.xii2014; Malaise \ A.M. Silva-Neto Leg.". Paratype female described: "BRA, Amazonas, Manaus, \ Reserva Ducke, \ 2°55'49.5"S, 59°58'31.8"W \ 22.xii - 09.xii2014; Malaise \ A.M. Silva-Neto Leg.". Remaining paratypes: 1 female, "BRA, Amazonas, Manaus, \ Reserva Ducke, \ 2°55'49.5"S, 59°58'31.8"W \ 22.xii - 09.xii2014; Malaise \ A.M. Silva-Neto Leg.".

Xanthopedia sp. nov. 8

Diagnosis

Xanthopedia sp. nov. 8 belongs to *Xanthopedia larocai* species complex, nonetheless presents particular characteristics that differentiate this species from others. The supraclypeal area is larger than *X. larocai* and presents many dense fine punctures, almost contiguous on the disc. Its shape, despite being elevated, differs from *X. larocai* species complex, due to not present a sulcus or carina in the upper portion of supraclypeal and a very slightly sulcus on frons, while in *X. larocai* it is notable strong.

Comments

The frons' punctuation is very particular to this species, with a few coarse punctures in the center area and two lateral lobes with very dense fine punctuation, almost contiguous.

Description

Holotype male. Body length: 5.5; wing length (without tegula): 5.37; maximum head width: 2; intertegular distance: 1.43. *Color*: integument tricolor: black, yellow, and completely orangish-brown on the metasoma; head mostly yellow with two black stripes on clypeus; frons black and paraocular area with yellow marks until the top. Mesoscutum with two yellow stripes on disc and lateral margins; wing membrane dark infumate with apical third darker by numerous blackish microtrichiae; wing veins hyaline, colored brown. *Pubescence*: pubescence mostly pale yellow to pale white on

the head and mesosoma; metasoma and legs with dark brownish orange pubescence. Labrum with long simple setae (ca. 2.5x F2); clypeus with long simple setae on the lateral portion and glabrous on the center (ca. 3.37x F2); supraclypeal area mostly glabrous on the center with sparse very short hairs on the lateral portion; frons mostly glabrous; paraocular area with simple hairs on the lower third, very short on the upper portion; vertex with dense plumose hairs; antennal scape with curved simple setae on the inner face (ca. 1.2x F2); gena with dense short and long simple and plumose hairs. Mesoscutum with very short velvet pubescence; scutellum with complete fimbria of plumose hairs, more numerous on the posterior portion; posterior margin of metanotum with sparse simple hairs on the center and dense and plumose hairs on lateral portion; mesepisternum with dense long simple setae; T1 – T4 mostly glabrous, with numerous simple hairs on lateral portion; T5 – T7 with fimbria of long simple hairs. *Sculpture*: clypeus with coarse punctures (ca. 1 pd); supraclypeal area with dense fine minute punctures, almost contiguous on the disc, with sparse coarse punctures on boards; frons with sparse coarse punctures (ca. >1 pd) on the central area, and lateral area forming two lobes with very fine minute punctures, almost contiguous; mesoscutum and scutellum with dense fine punctures (ca. ≤0.5 – 1 pd); mesepisternum with sparse fine minute punctures (ca. 1 – 2 pd); metapostnotum with very sparse fine punctures (ca. >2 – 3 pd). *Structure and measurements*: head ~1.258x wider than long (2:1.56); compound eyes ~4.03x longer than wide (1.25:0.31); inner orbits converging below, upper interocular distance 1.18, lower interocular distance 0.96; clypeus ~1.95x wider than long (0.9:0.46), slightly convex; supraclypeal area elevated, slightly convex on the center; frons slightly convex, with a strong mid sulcus until the ocelli; parocular area concave; scape length 0.63, width 0.142; length of the first three flagellomeres 0.18, 0.09, 0.12, respectively. Scutellum disc slightly convex on the posterior area, with a slight mid sulcus until halfway; mid tibial spur pectinated, ~0.63x the size of the mid basitarsus (0.45:0.71).

Geographic Distribution

Brazil: Distrito Federal

Type material

Holotype male: "UNB \ 250670" "Brasil, Distrito Federal, \ Sobradinho, Grotão, \ - 15.5648, -47.7707, \ 15.ix.2021, CMNTeixeira".

IDENTIFICATION KEY TO SPECIES OF XANTHOPEDIA

***Xanthopedia* lineage**

1. Supraclypeal area elevated, flat, in a triangular shape (Fig. 3A); ...2
 - Supraclypeal area slightly elevated, convex (Fig. 10A) ... 5
2. Frons with coarse and sparse punctures (ca. >1 pd) (Fig. 2); strong sulcus dot-shaped on the upper portion of supraclypeal; wing membrane hyaline; hind tibia and basitarsus with dark brown pubescence; ... *X. larocai*
 - Frons with dense and fine punctures (ca. <1 pd) (Fig. 3A) ... 3
3. supraclypeal area strongly angled, in the shape of a triangle, with coarse and sparse punctures (ca. >1pd) (FIG 2, A); wing membrane pale yellow; pubescence of hind tibia and basitarsus pale yellow to orangish; geographic distribution in Western Planalto Central ... *X. sp. nov.* 1
 - supraclypeal area slightly triangular, with coarse punctures (ca. ≤1 pd) (FIG. 5A) ... 4
4. sulcus of upper supraclypeal area in the shape of a point or a short line, with coarse punctuation (Fig. 5); frons with dark marks not overtaking the antennal alveoli, and with coarse and sparse punctures; wing membrane hyaline, with veins orangish brown; geographic distribution in Northeast Brazil, in Tabuleiro plateau areas ... *X. sp. nov.* 2
 - supraclypeal area enlarged, without sulcus on the upper portion, with very fine and contiguous punctuation (Fig. 8A); frons with black marks overtaking the antennal alveoli and subantennal suture, with coarse and sparse punctuation in the central portion and very fine and contiguous on sides, similar to two lobes (ca. <0.5 pd); wing membrane hyaline, blackish infumate, with veins yellowish brown ... *X. sp. nov.* 8
5. supraclypeal area convex with the format slightly triangular on the upper portion (Fig. 13A) ... 6
 - supraclypeal area convex with upper portion enlarged, without triangular shape and coarse punctuation ... 7
6. Upper portion of supraclypeal with a strong coarse puncture rounded by a carina; metasoma completely reddish brown; hind tibia and basitarsus scopa with brownish orange pubescence; ... *X. sp. nov.* 5

- Upper portion of supraclypeal with a linear sulcus (Fig. 12A); metasoma with brown marks on T2 - T4; hind basitarsus scopa with dark brown pubescence; ... *X. iheringii*
7. Frons with coarse and sparse punctuation (ca. 1 pd) (Fig. 12A); integument bicolor, with scutellum dark brown to black; scopa on hind tibia or tibia and basitarsus dark brown to black; ... 8
 - Frons with fine and dense punctuation (ca. <1 pd) (Fig. 11A); integument fully yellowish orange, without black or dark brown marks; scopa of hind tibia ad basitarsus yellowish orange ... *X. sp. nov.* 6
 8. prementum and stipes with strongly curved setae; scopa on the hind tibia and basitarsus mostly black (Fig. 12B); wing membrane weakly brownish orange infumated ... *X. sp. nov.* 4
 - prementum and stipes with only simple and straight setae; scopa of hind tibia pale orange; scopa of hind basitarsus reddish black (Fig. 11B); wing membrane hyaline ... *X. sp. nov.* 3

DISCUSSION

The two lineages proposed for the group (*Xanthopedia* and *Lissopedia*) can be easily distinguished by the supraclypeal area, and present a challenge for the taxonomy of genus *Xanthopedia*. Moure (1993) argued the distinction between the lineages, however subsequently authors, Michener (2000), Silveira et al. (2002) and Aguiar & Melo (2007), did not observe relevant differences that support the designation of a new genus.

In this paper, we are able to discuss the difficulty of describing a new genus due to its subjectivity. The genus concept is the oldest in the taxonomic categories and it is the basis of many studies. However, is difficult to define and recognize the taxa in this classification. For the majority of taxonomists, the Linnaean categories are subjective and have some problems in their concept, like the imprecision in the meaning of taxonomic names, and problems in comparative studies and evaluations of biodiversity. In addition, the species described have to pertain to a genus previously described, or a new genus. Due to this, in this study, we decide to emphasize on the importance of corroborating with the group stability. (Laurin, 2010; Malik, 2017).

The genus's basic concept can be understood as an assemblage of species that share the main characteristics between them, then with other any species. The narrowed similarity is due to the fact that they share a common ancestral. For this reason, data like morphology is traditionally used to describe the genus category, but also, the geographical distribution helps to delimitate them. Detailed analyses of the range of distribution from a species are a very useful and important component to determine a group (Malik, 2017). Therefore, a more precise analysis of the specimens and the biogeography of the lineages may be useful to understand the valid relationship amongst the clades and to describe *Xanthopedia* and *Lissopedia* as separate genera. Due to this, in this study, we decided to emphasize on the importance of corroborating the monophyly of the group.

As reported by Sano *et al.* (2019), the Cerrado savanna has at least 19 ecoregions which can be roughly divided into two groups, plateaus and depressions, and some groups may respond in different ways to these splits. Besides that, the Cerrado savanna shares ecological regions with four biomes, presenting a high level of endemism, which may contribute to its species richness. The biome probably originated in the Cretaceous, about 60 Mya, although, its large expansion occurred recently, in the Miocene, about 10 – 15 Mya, with the majority of the plant lineages occurring at less than 4 Mya (Simon *et al.*, 2009). Through the analysis of the distribution maps, we may observe the wide distribution in the Neotropical Region of *Xanthopedia* species, which occupies areas ranging from forested areas to Cerrado savanna. It can also be noticed a major distribution of the *Xanthopedia* lineage in the Cerrado and next to transitional areas, which may indicate endemism for *X. sp. nov. 3* and *X. sp. nov. 4*, due to the cited endemics process of the Cerrado, and a misunderstood diversity of bee species for these areas. The genus also arose in Miocene, at the same time as the Cerrado savanna expansion, and probably must have been affected by the diversification events. Only then, the group had incursions to forested areas, like Brazilian Atlantic Rainforest (Aguiar *et al.*, 2020). This pattern of distribution is different from the one observed for his closest groups *Paratetrapedia*, *Tropidopedia*, *Nasutopedia* and *Lophopedia*, which is widely diverse in humid forested areas (Aguiar & Melo, 2007). However, the *Lissopedia* lineage presents a major distribution from the forested areas to altitude vegetation, which probably, occurred with the transition of the group to these areas.

Xanthopedia sp. nov. 5 is possible endemic to rupestrian field (*campo rupestre*), with distribution amongst the highlands of Serra do Espinhaço, which is its core. Due to its location, the Espinhaço Range is an ecotone of two biodiversity hotspots, Cerrado and Caatinga. The *campo rupestre* presents several areas of endemism, mostly because of its past climatic stability and, although there is no endemism for high levels of taxonomy, it is common in more recent lineages of species. This ecosystem of Espinhaço Range is delimited by altitude and depression, which emerged nearly 640Mya, so, it may represent barriers to gene flow, suggesting that the process of vicariance is a significant role in diversification, promoting speciation (Silveira *et al.*, 2016). Based on this and the analysis of the maps and morphology, X sp. nov. 5 is a potential group sister of *X. iheringii*, which have a similar distribution, but with representatives in Southern Brazil, in Paraná.

In conclusion, knowledge about new species, their distribution and possible endemism, is essential to conservancy strategies and political decisions. The unequal distribution of species around the world is an old challenge for scientists. A solid taxonomy is crucial to stabilize the known taxa and newly described species may provide important data to fill knowledge gaps. Further, more efforts are necessary to minimize the taxonomic impediments, like the Linnaean/Wallacean deficit. In addition, an increased understanding of endemic species, even in small communities, can be very useful to decisions regarding endemism in general (Lamoreux *et al.* 2006).

REFERENCES

Aguiar, A.J.C. & Melo, G.A.R. (2007) Taxonomic revision, phylogenetic analysis, and biogeography of the bee genus *Tropidopedia* (Hymenoptera, Apidae, Tapinotaspidini). *Zoological Journal of the Linnean Society*, 151, 511–554.

Aguiar, A.J.C. & Melo, G.A.R. (2011) Revision and phylogeny of the bee genus *Paratetrapedia* Moure, with description of a new genus from the Andean Cordillera (Hymenoptera, Apidae, Tapinotaspidini): SYSTEMATICS OF THE GENUS *PARATETRAPEDIA*. *Zoological Journal of the Linnean Society*, 162, 351–442.

Aguiar, A. J. C., Melo, G. A. R. , Rozen Jr., J., & Alves-dos-Santos, I. (2004). Synopsis of Tapinotaspidini nesting biology pp. 80–85. In: Hartfelder, K., DeJong, D. et al. (ed.) *Proceedings of the 8th IBRA Conference on Tropical Bees and VI Encontro sobre Abelhas*. Ribeirão Preto: USP/FMRP, 775 pp.

Aguiar, A.J.C., Melo, G.A.R., Vasconcelos, T.N.C., Gonçalves, R.B., Giugliano, L. & Martins, A.C. (2020) Biogeography and early diversification of Tapinotaspidini oil-

bees support presence of Paleocene savannas in South America. *Molecular Phylogenetics and Evolution*, 143, 106692.

A. J. C. Aguiar (2022). Tapinotaspidini Roig-Alsina & Michener, 1993. In Moure, J. S., Urban, D. & Melo, G. A. R. (Orgs). Catalogue of Bees (Hymenoptera, Apoidea) in the Neotropical Region – online version. Available from: <http://www.moure.cria.org.br/catalogue>. Accessed Oct/15/2022.

Albuquerque, P. M. C. & Mendonça, J. A. C. (1996). Anthophoridae (Hymenoptera; Apoidea) e flora associada em uma formação de cerrado no município de Barreirinhas, MA, Brasil. *Acta Amazonica*, 26 (1–2), 45–54.

Almeida, M.C.D.E. & Laroca, S. (2013). Biocenótica e taxonomia de abelhas silvestres (Hymenoptera, Anthophila) de áreas restritas de cerrado no município de Jaguariaíva, Paraná, sul do Brasil. *Acta Biol. Paran. (Curitiba)*, 42 (3–4), 29–194.

Alves-dos-Santos, I., Machado, I.C. & Gaglianone, M.C. (2007) História natural das abelhas coletoras de óleo. *Oecologia Brasiliensis*, 11, 544–557.

Azevedo, A.A., Silveira, F.A., Aguiar, C.M.L. & Pereira, V.S. (2008). Fauna de abelhas (Hymenoptera, Apoidea) nos campos rupestres da Cadeia do Espinhaço (Minas Gerais e Bahia, Brasil): riqueza de espécies, padrões de distribuição e ameaças para conservação. *Megadiversidade*, 4 (1–2), 126–157.

Bachiega, M.I. & Carvalho, L. (2007) Sistema reprodutivo e polinização de *Byrsonima intermedia* A. Juss. (Malpighiaceae) em Mato Grosso do Sul, Brasil, 5, 3.

Boas, J.C.V., Fava, W.S., Laroca, S. & Sigrist, M.R. (2013). Two sympatric *Byrsonima* species (Malpighiaceae) differ in phenological and reproductive patterns. *Flora*, 208 (5–6), 360–369.

Buchmann, S.L. (1987) The Ecology of Oil Flowers and Their Bees. *Annual Review of Ecology and Systematics*, 18, 343–369.

Carneiro, L.T., André, C.B.D.S., Takahasi, A. & Alves-dos-Santos, I. (2019). Interactions between oil-collecting bees and *Krameria grandiflora* (Krameriaceae) with emphasis on the role of specialized floral traits in the mutual fit. *Arthropod Plant Interact*, 13 (2), 213–226.

Cockerell, T. D. A. (1909). Descriptions and records of bees. XXIII. *Ann. Mag. Nat. Hist.*, 8 (4), 393–504.

Cockerell, T. D. A. (1917). Descriptions and records of bees. LXXVII. *Ann. Mag. Nat. Hist.*, 8 (20) 298–304.

Cockerell, T. D. A. (1929). Some results of a journey to Kaieteur Falls, British Guiana. *Ann. Mag. Nat. Hist.*, 10 (4), 439–444.

Cockerell, T. D. A. (1931). Descriptions and records of bees. CXXIX. *Ann. Mag. Nat. Hist.*, 10 (8), 411–418.

Cockerell, T. D. A. (1932). Bees (Hymenoptera, Apoidea) collected at Chichen Itzá, Yucatan, by the Harvard Expeditions of 1929-1930. *Bull. Brooklyn Entomol. Soc.*, 27 (1), 9–17.

Dikow, T., Meier, R., Vaidya, G. G., & Londt, J. G. (2010). Chapter Twelve. Biodiversity Research Based On Taxonomic Revisions—A Tale Of Unrealized Opportunities. In: *Diptera Diversity: Status, Challenges and Tools.*, 323–346).

Ebach, M.C., Valdecasas, A.G., & Wheeler, Q.D. (2011). Impediments to taxonomy and users of taxonomy: accessibility and impact evaluation. *Cladistics*, 27.

Faria-Mucci, G. M., Melo, M. A. & Campos, L. A. O. (2003). A fauna de abelhas (Hymenoptera, Apoidea) e plantas utilizadas como fonte de recursos florais, em um ecossistema de campos rupestres em Lavras Novas, Minas Gerais, Brasil pp. 241–256. In: Melo, G. A. R. & Alves-dos-Santos, I. (ed.) *Apoidea Neotropica: homenagem aos 90 anos de Jesus Santiago Moure*. Criciúma: UNESC, 320 pp.

Friese, H. (1899). Monographie der Bienengattungen *Exomalopsis*, *Ptilothrix*, *Melitoma* und *Tetrapedia*. *Ann. K-K. Naturhist. Mus. Wien*, 14 (3), 247–304.

Friese, H. (1910). Einige neue *Tetrapedia*-Arten (Hym.). *Dtsch. Entomol. Z.*, 1910, 62–65.

Gaglianone, M.C., Aguiar, A.J.C., Vivallo, F., & Alves-dos-Santos, I. (2011). Checklist das abelhas coletoras de óleos do Estado de São Paulo, Brasil. *Biota Neotrop.*, 11, 657–666.

Goloboff, P.A., Farris, J.S. & Nixon, K.C. (2008) TNT, a free program for phylogenetic analysis. *Cladistics*, 24, 774–786.

Gonçalves, R.B. & Melo, G.A.R. (2005). A comunidade de abelhas (Hymenoptera, Apidae s. l.) em uma área restrita de campo natural no Parque Estadual de Vila Velha, Paraná: diversidade, fenologia e fontes florais de alimento. *Rev. Bras. Entomol.*, 49 (4), 557–571.

Gonzalez, V. H., Griswold, T., & Engel, M. S. (2013). Obtaining a better taxonomic understanding of native bees: where do we start?. *Systematic Entomology*, 38 (4), 645–653.

Gostinski, L.F., Carvalho, G.C.A., Rêgo, M.M.C. & Albuquerque, P.M.C. (2016). Species richness and activity pattern of bees (Hymenoptera, Apidae) in the resting area of Lençóis Maranhenses National Park, Barreirinhas, Maranhão, Brazil. *Rev. Bras. Entomol.*, 60, 319–327.

Lamoreux, J.F., Morrison, J.C., Ricketts, T.H., Olson, D.M., Dinerstein, E., McKnight, M.W. & Shugart, H.H. (2006) Global tests of biodiversity concordance and the importance of endemism. *Nature*, 440, 212–214.

Laurin, M. (2010) The subjective nature of Linnaean categories and its impact in

evolutionary biology and biodiversity studies J. W. Arntzen (Ed). *Contributions to Zoology*, 79, 131–146.

Lima, F.V.D.O. & Silvestre, R. (2017). Abelhas (Hymenoptera, Apidae sensu lato) do estado de Mato Grosso do Sul, Brasil. *Iheringia, Sér. Zool.*, 107: 1–14.

Lutz, F. E. & Cockerell, T. D. A. (1920). Notes on distribution and bibliography of North American bees of the families Apidae, Meliponidae, Bombidae, Euglossidae, and Anthophoridae. *Bull. Am. Mus. Nat. Hist.*, 42, 491–641.

Malik, V. (2017) THE GENUS: A NATURAL OR ARBITRARY ENTITY. *Plant Archives*, 17 (1), 251–257.

Martins, C., Silveira, R.A., Nascimento, N.O. & Antonini, Y. (2012). Fauna de abelhas de campos rupestres ferruginosos no Quadrilátero Ferrífero, Minas Gerais. *MG Biota*, 5 (1), 21–34.

Meier, R., & Dikow, T. (2004). Significance of Specimen Databases from Taxonomic Revisions for Estimating and Mapping the Global Species Diversity of Invertebrates and Repatriating Reliable Specimen Data. *Conservation Biology*, 18 (2), 478–488.

Mendes, F.N., Rêgo, M.M.C. & Albuquerque, P.M.C. (2011). Fenologia e biologia reprodutiva de duas espécies de *Byrsonima* Rich. (Malpighiaceae) em área de Cerrado no Nordeste do Brasil. *Biota Neotrop.*, 11 (4), 103–115.

Michener, C.D. & Moure, J.S. (1957) A study of the classification of the more primitive non-parasitic anthophorine bees (Hymenoptera, Apoidea). *Bulletin of the American Museum of Natural History*, 112 (5), 395–452.

Michener, C. D. (1942). Taxonomic observations on bees with descriptions of new genera and species (Hymenoptera: Apoidea). *J. N. Y. Entomol. Soc.*, 50, 273–282.

Michener, C. D. (1954). Bees of Panamá. *Bull. Am. Mus. Nat. Hist.*, 104 (1), 1–175.

Michener, C.D. (2007) *The bees of the world*. 2nd ed. Johns Hopkins University Press, Baltimore, 953 pp.

Moure, J.S. (1992) Lissopedia, gen.n. de Paratetrapediini para a região neotropical, com as descrições de três espécies novas (Hymenoptera, Apoidea, Anthophoridae). *Revista Brasileira de Zoologia*, 9, 305–317.

Moure, J. S. (1992). *Xanthopedia larocai* um Paratetrapediini do cerrado do nordeste Paranaense (Hymenoptera, Apoidea). *Acta Biol. Paran. (Curitiba)*, 21 (1–4), 107–112.

Moure, J. S. (1995). Redescrição de alguns exemplares tipos de espécies neotropicais de *Tetrapedia* Klug, descritos por Friese em 1899 (Apoidea, Anthophoridae). II. Espécies excluídas do gênero *Tetrapedia* Klug. *Rev. Bras. Zool.*, 12 (4), 927–938.

Oliveira, U., Paglia, A. P., Brescovit, A. D., de Carvalho, C. J., Silva, D. P., Rezende, D. T., ... & Santos, A. J. (2016). The strong influence of collection bias on biodiversity knowledge shortfalls of Brazilian terrestrial biodiversity. *Diversity and Distributions*, 22 (12), 1232–1244.

Pagotto, T.C.S. & Souza, P.R. (2006). *Biodiversidade do Complexo Aporé-Sucuriú: subsídios à conservação e ao manejo do Cerrado: área prioritária 316 Jauru*. Campo Grande: UFMS, 308 pp.

Pedro, S. R. M. (1994). Interações entre abelhas e flores em uma área de cerrado no NE do estado de São Paulo: abelhas coletoras de óleo (Hymenoptera: Apoidea: Apidae) pp. 243–255. In: Zucchi, R., Drumond, P. M., Fernandes-da-Silva, P. G., Augusto, S. C. (ed.) *Anais do I Encontro Sobre Abelhas de Ribeirão Preto*. Ribeirão Preto: USP/FFCLRP, 308 pp.

Pedro, S. R. M. (1996). Lista preliminar das espécies de abelhas (Hymenoptera, Apoidea) que ocorrem na região de Ribeirão Preto e Cajuru, SP pp. 248–258. In: Garófalo, C. A. (et al.) (ed.) *Anais do II Encontro sobre Abelhas*. Ribeirão Preto: USP/FFCLRP, 351 pp.

Pedro, S. R. M. & Camargo, J. M. F. (1999). Apoidea, Apiformes pp. 193–211 in Brandão, C. R. F. & E. M. Cancellato (ed.) *Biodiversidade do Estado de São Paulo, Brasil: síntese do conhecimento ao final do século XX. Invertebrados Terrestres Vol. 5*. São Paulo: FAPESP.

Rafael, J. A., Aguiar, A. P., & Amorim, D. D. S. (2009). Knowledge of insect diversity in Brazil: challenges and advances. *Neotropical Entomology*, 38, 565–570.

Ramírez, V.M., Ayala, R. & González, H.D. (2016). Temporal variation in native bee diversity in the tropical sub-deciduous forest of the Yucatan Peninsula, Mexico. *Trop. Conserv. Sci.*, 9 (2), 718–734.

Rasmussen, C. & Ascher, J.S. (2008). Heinrich Friese (1860-1948): Names proposed and notes on a pioneer melittologist (Hymenoptera, Anthophila). *Zootaxa*, 1833, 1–118.

Raw, A. (1984). The nesting biology of nine species of Jamaican bees (Hymenoptera). *Rev. Bras. Entomol.*, 28 (4), 497–506.

Raw, A. (1985). The ecology of Jamaican bees (Hymenoptera). *Rev. Bras. Entomol.*, 29 (1), 1–16.

Rebêlo, J. M. M., Rêgo, M. M. C. & Albuquerque, P. M. C. (2003). Abelhas (Hymenoptera, Apoidea) da região setentrional do Estado do Maranhão, Brasil pp. 265–278. In: Melo, G. A. R. & Alves-dos-Santos, I. (ed.) *Apoidea Neotropica: Homenagem aos 90 Anos de Jesus Santiago Moure*. Criciúma: UNESC, 320 pp.

Rêgo, M.M.C., Albuquerque, P.M.C., Ramos, M.C., Silva, O., Mendes, F.N. & Ribeiro, É.K.M.D. (2017). Polinizadores do murici (*Byrsonima crassifolia*, Malpighiaceae) em uma área nativa: diversidade de espécies, nidificação e seu uso

sustentável na agricultura pp. 455–462.

Reyes-Novelo, E., Meléndez-Ramírez, V., Ayala, R. & Delfín-González, H. (2009). Bee faunas (Hymenoptera: Apoidea) of six natural protected areas in Yucatan, Mexico. *Entomol. News*, 120 (5), 530–544.

Roig-Alsina, A. (1997) A generic study of the bees of the tribe Tapinotaspidini, with notes on the evolution of their oil-collecting structures (Hymenoptera, Apidae). *Mitteilungen der Münchner Entomologischen Gesellschaft*, 87, 3–21.

Rozen, J. G., Jr. & Michener, C. D. (1988). Nest and immature stages of the bee *Paratetrapedia swainsonae* (Hymenoptera: Anthophoridae). *Am. Mus. Novit.*, 2909, 1–13.

Sagot, P., Merida, J., Ayala, R. & Vandame, R. (2018). Situación actual del conocimiento de la fauna abejas (Apoidea: Anthophila) del estado de Chiapas, México pp. 191–211.

Sano, E.E., Rodrigues, A.A., Martins, E.S., Bettiol, G.M., Bustamante, M.M.C., Bezerra, A.S., Couto, A.F., Vasconcelos, V., Schüller, J. & Bolfe, E.L. (2019) Cerrado ecoregions: A spatial framework to assess and prioritize Brazilian savanna environmental diversity for conservation. *Journal of Environmental Management*, 232, 818–828.

Sazan, M.S., Bezerra, A.D.M. & Freitas, B.M. (2014) Oil collecting bees and *Byrsonima cydoniifolia* A. Juss. (Malpighiaceae) interactions: the prevalence of long-distance cross pollination driving reproductive success. *Anais da Academia Brasileira de Ciências*, 86, 347–358.

Schrottky, C. (1902). Ensaio sobre as abelhas solitárias do Brazil. *Rev. Mus. Paul.*, 5, 330–613.

Sereno, P.C. (2007) Logical basis for morphological characters in phylogenetics. *Cladistics*, 23, 565–587.

Sheridan, J.A., & Stuart, B.L. (2018). Hidden species diversity in *Sylvirana nigrovittata* (Amphibia: Ranidae) highlights the importance of taxonomic revisions. In biodiversity conservation. *PLoS ONE*, 13.

Silveira, F.A., Melo, G.A.R. & Almeida, E.A.B. (2002) *Abelhas brasileiras: sistemática e identificação*. 1. ed. Silveira, Belo Horizonte, 253 pp.

Sigrist, M.R., Aoki, C., Souza, C.S., Laroca, S., Maier, J.E., Vicente, M.R., Oda, F.H. & Consolaro, H. (2017). Listagem da entomofauna antófila do estado de Mato Grosso do Sul, Brasil. *Iheringia, Sér. Zool.*, 107, 1–15.

Silveira, F.A.O., Negreiros, D., Barbosa, N.P.U., Buisson, E., Carmo, F.F., Carstensen, D.W., Conceição, A.A., Cornelissen, T.G., Echternacht, L., Fernandes, G.W., Garcia, Q.S., Guerra, T.J., Jacobi, C.M., Lemos-Filho, J.P., Le Stradic, S., Morellato, L.P.C., Neves, F.S., Oliveira, R.S., Schaefer, C.E., Viana, P.L. & Lambers,

H. (2016) Ecology and evolution of plant diversity in the endangered campo rupestre: a neglected conservation priority. *Plant and Soil*, 403, 129–152.

Simon, M.F., Grether, R., de Queiroz, L.P., Skema, C., Pennington, R.T. & Hughes, C.E. (2009) Recent assembly of the Cerrado, a neotropical plant diversity hotspot, by in situ evolution of adaptations to fire. *Proceedings of the National Academy of Sciences*, 106, 20359–20364.

Urban, D. (2003). Catálogo das abelhas publicadas por Jesus Santiago Moure pp. 11-43. In: Melo, G. A. R. & Alves-dos-Santos, I. (ed.) *Apoidea Neotropica: Homenagem aos 90 anos de Jesus Santiago Moure*. Criciúma: UNESCO, 320 pp.

Wüster, W., Thomson, S.A., O'SHEA, M., & Kaiser, H. (2021). Confronting taxonomic vandalism in biology: conscientious community self-organization can preserve nomenclatural stability. *Biological Journal of The Linnean Society*, 133, 3, 645–670.

FIGURES

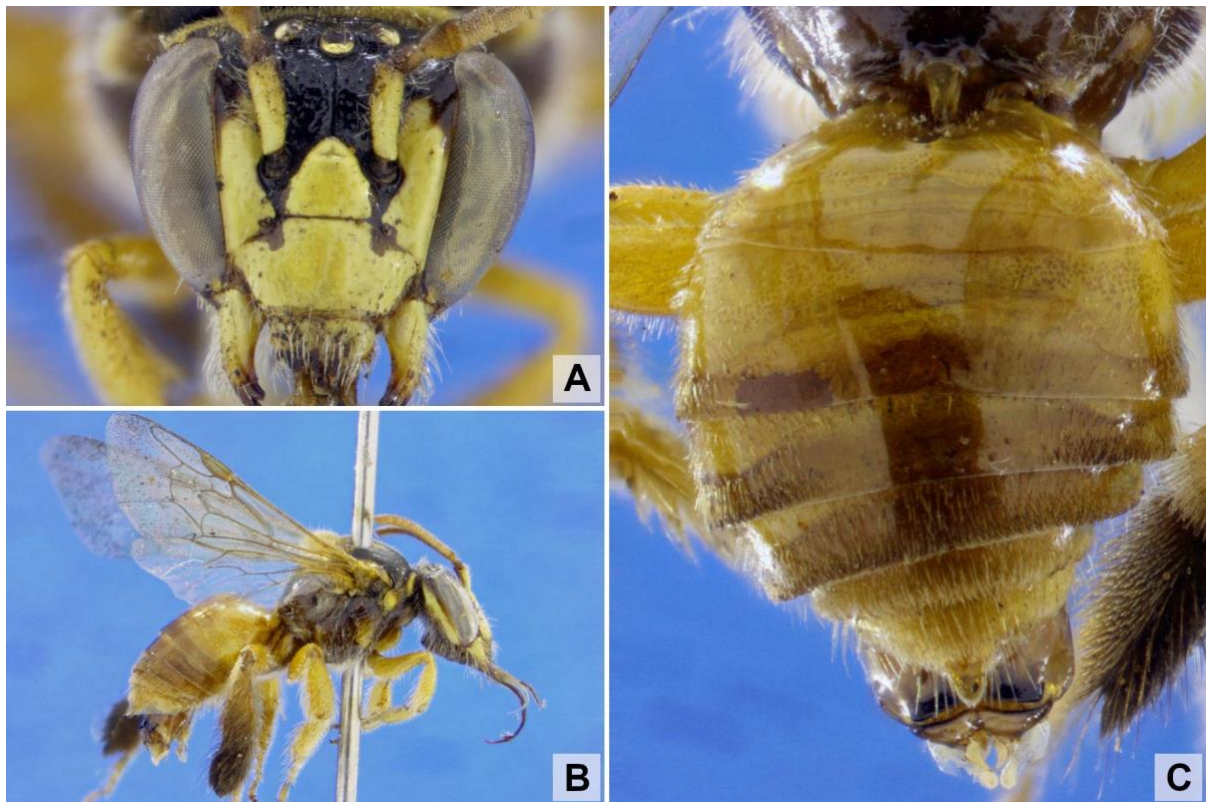
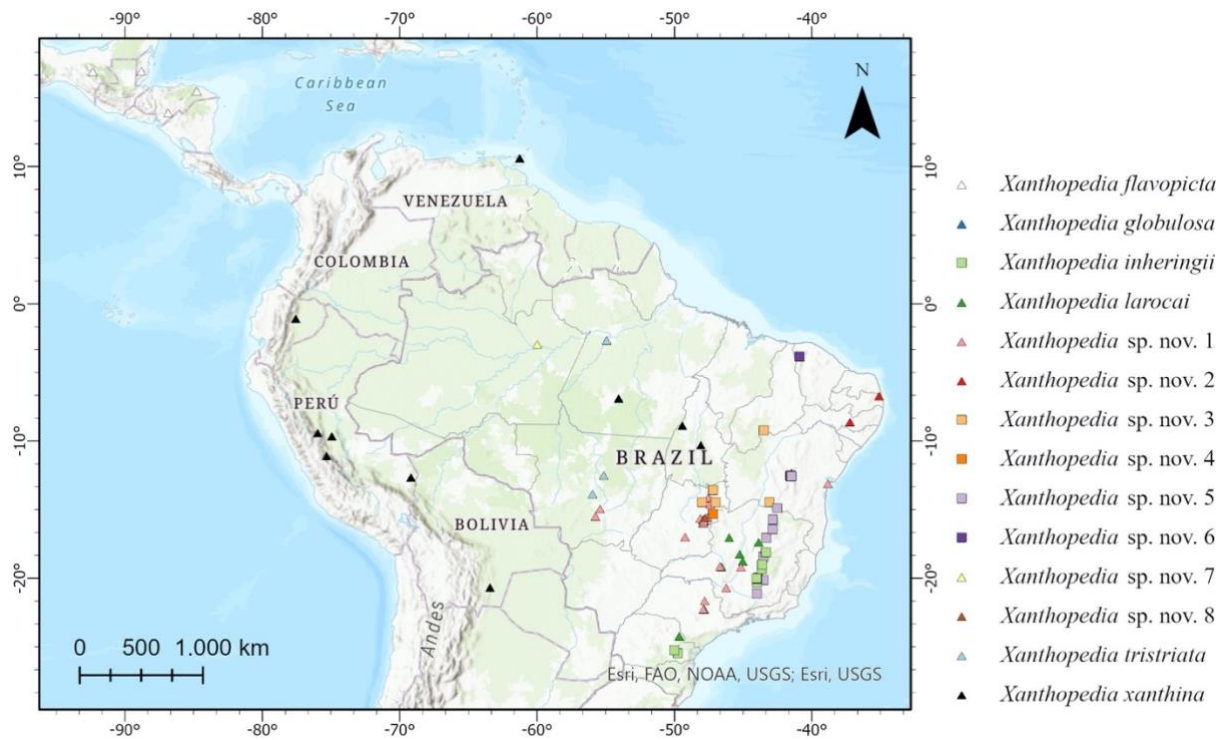


Figure 2 *Xanthopedia larocai*, UNB 044686, Brasília - DF. Syntype male. A) face view; B) lateral view; C) dorsal view of metasoma.



Figure 3 *Xanthopedia* sp. nov. 1, UNB 060108, Brazlândia - DF. Holotype male. A) Face view; B) lateral view; C) dorsal view.

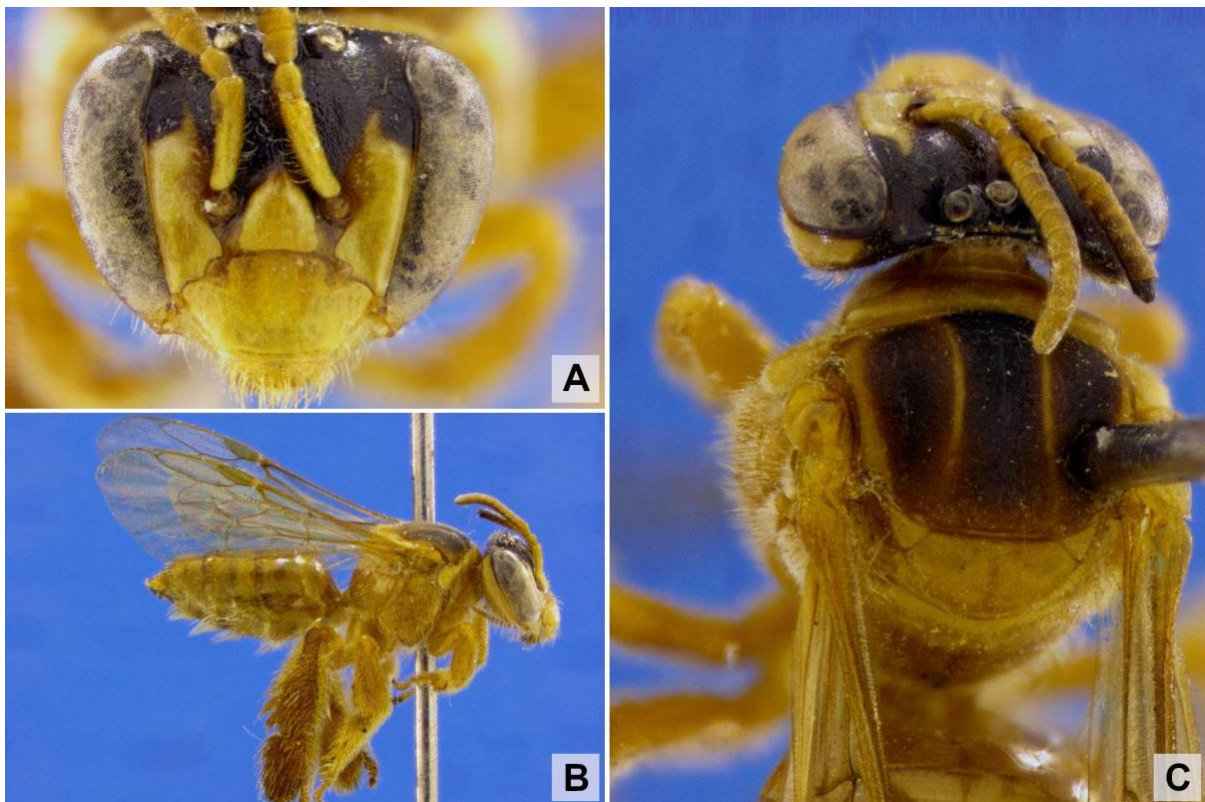


Figure 4 *Xanthopedia* sp. nov. 2, DSEC 1573, Mamanguape - PB. Holotype male. A) face view; B) lateral view; C) dorsal view.

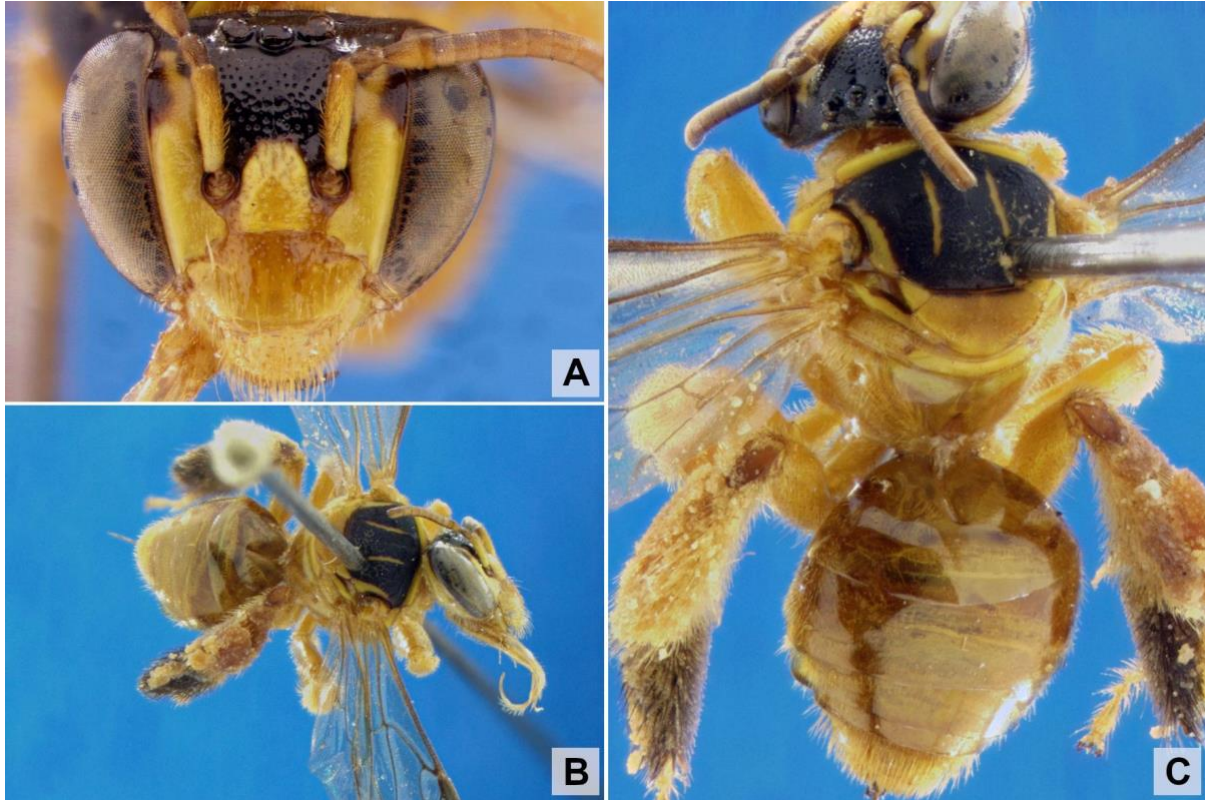


Figure 5 *Xanthopedia* sp. nov. 2, 2265, Mamanguape - PB. Paratype female. A) face view; B) lateral view; C) dorsal view of mesosoma.

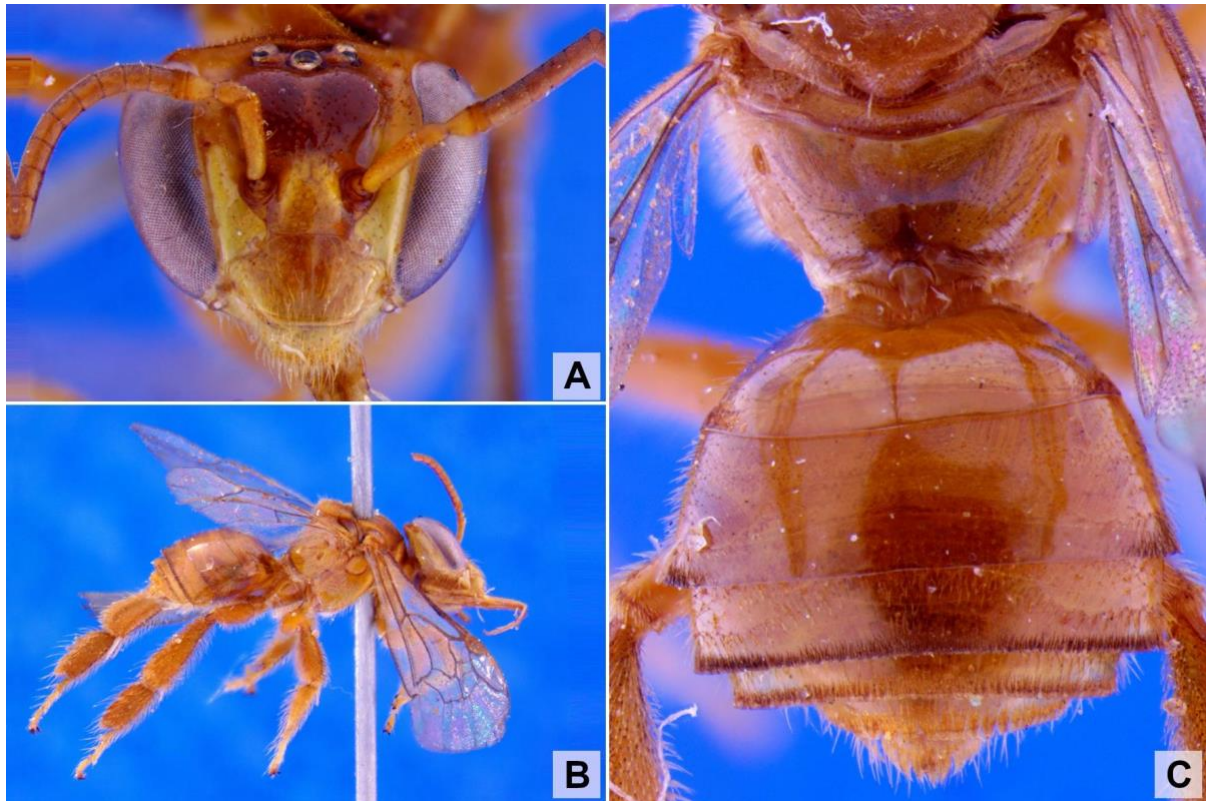


Figure 6 *Xanthopedia* sp. nov. 6, UFMG 1207518, Ubajara - CE. Holotype male. A) face view; B) lateral view; C) dorsal view.

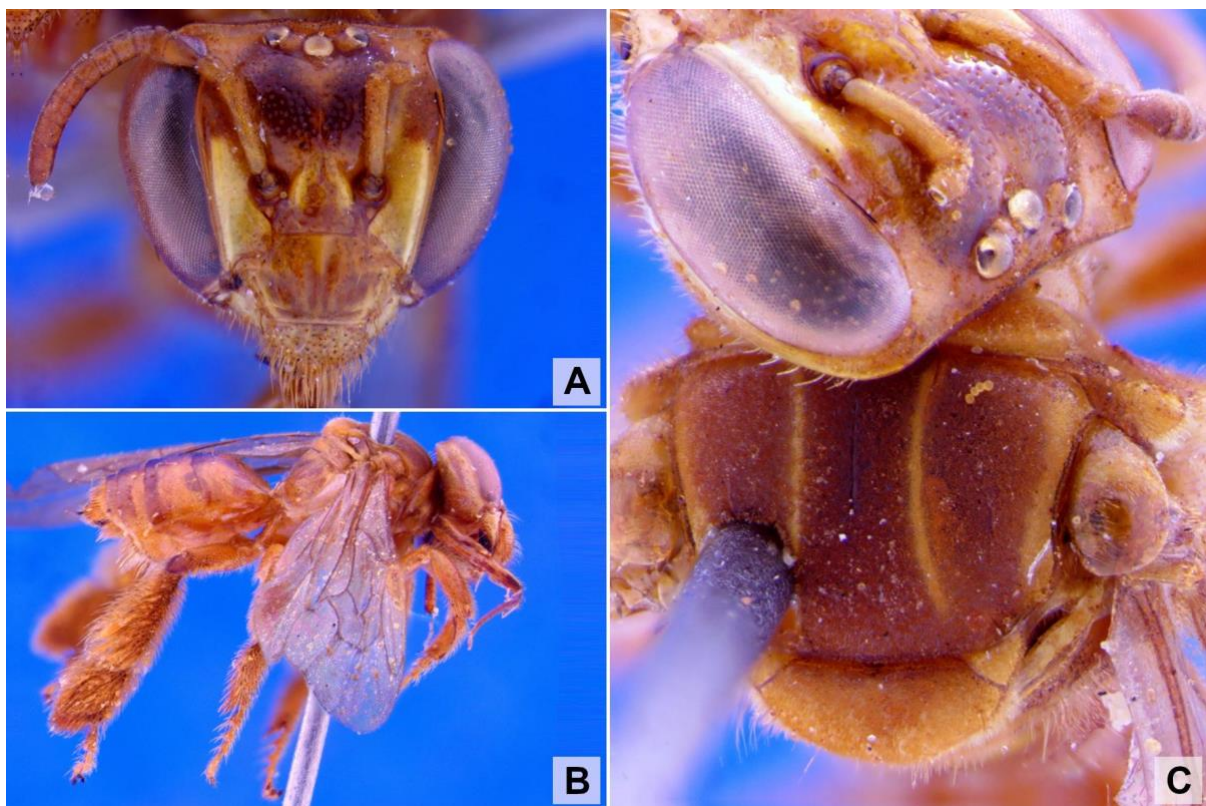


Figure 7 *Xanthopedia* sp. nov. 6, UFMG 1207522, Ubajara - CE. Paratype female. A) face view; B) lateral view; C) dorsal view of mesosoma.

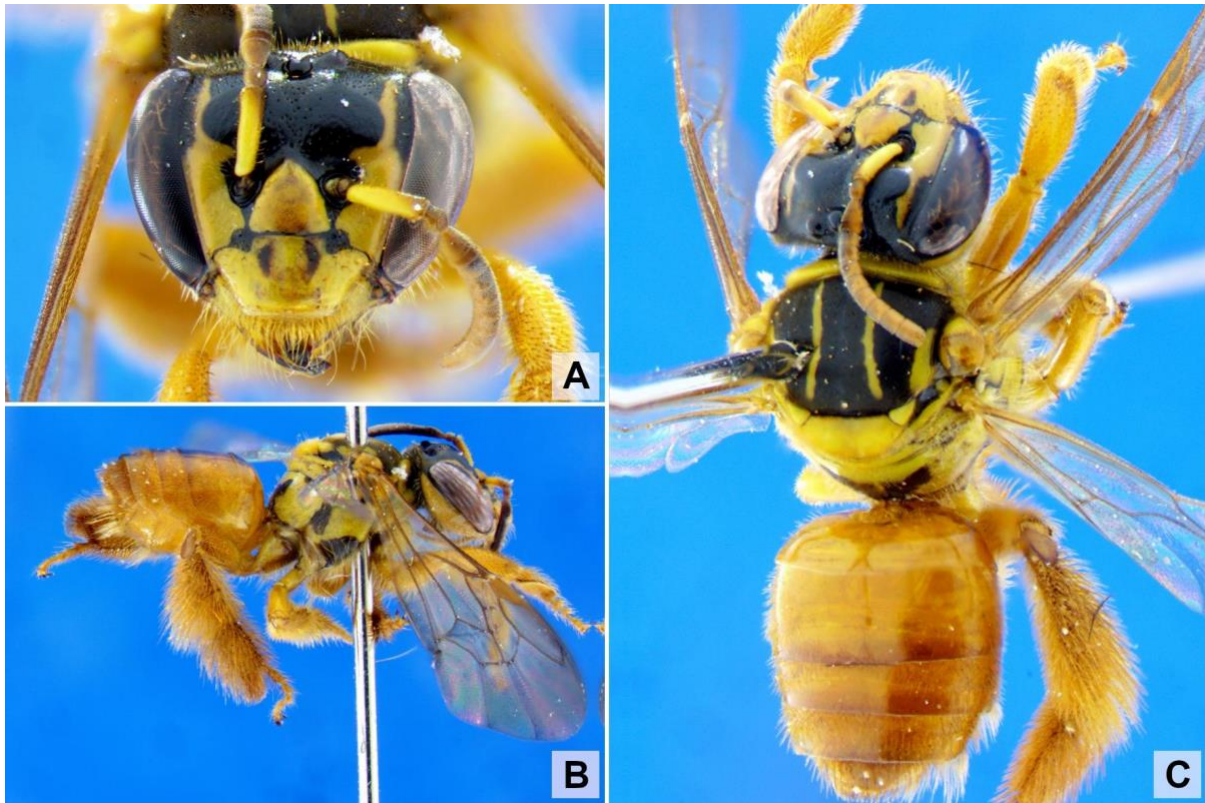


Figure 8 *Xanthopedia* sp. nov. 8, UNB 250670, Sobradinho - DF. Holotype female. A) face view; B) lateral view; C) dorsal view.

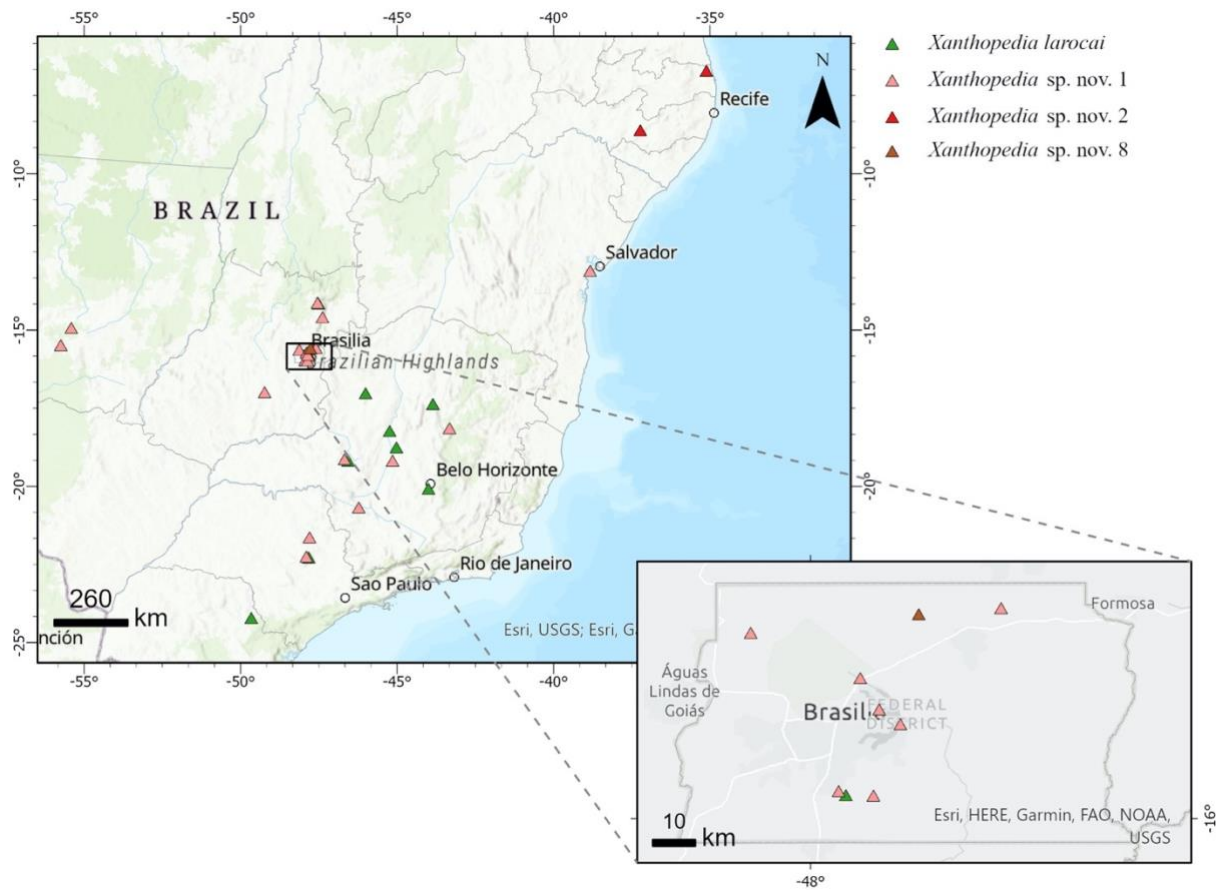


Figure 9 Geographical distribution of *Xanthopedia* species belonging to *X. larocai* group (supraclypeal area elevated, strongly angled and flat).

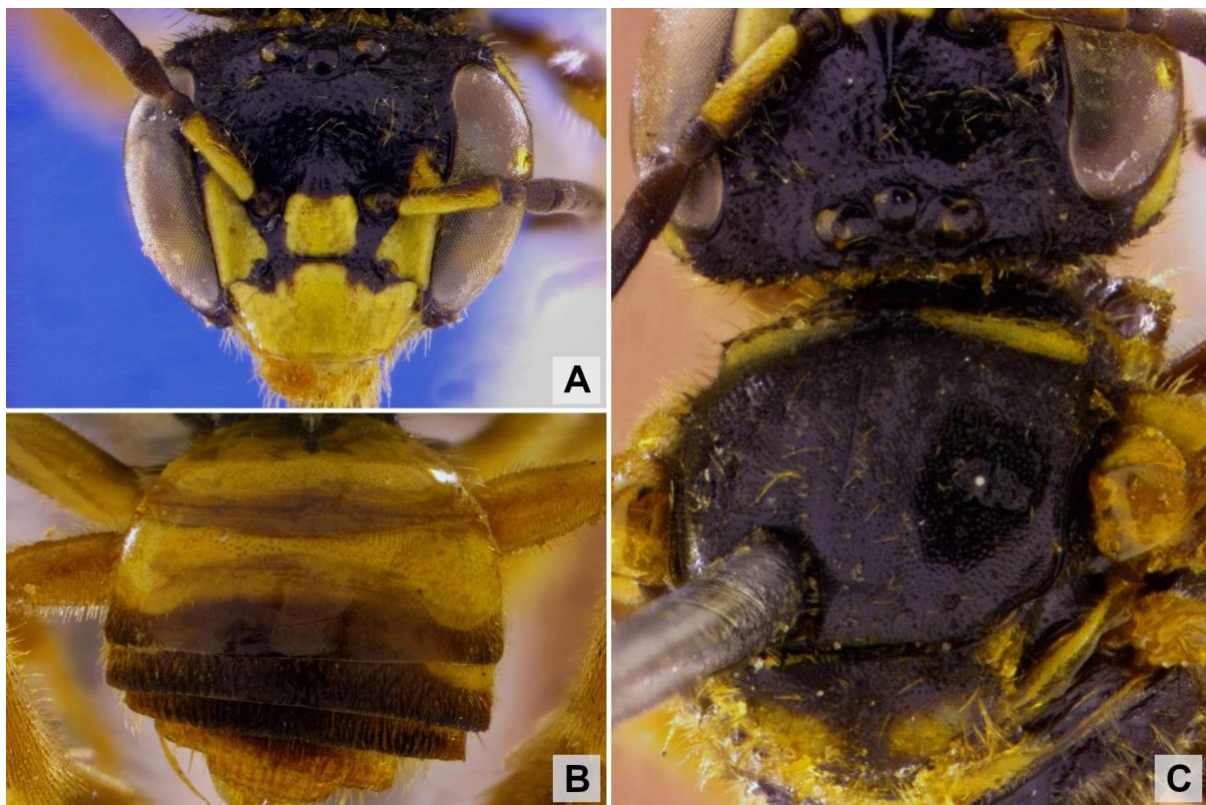


Figure 10 *Xanthopedia iheringii*. Syntype male. A) face view; B) dorsal view of metasoma; C) dorsal view of mesosoma.

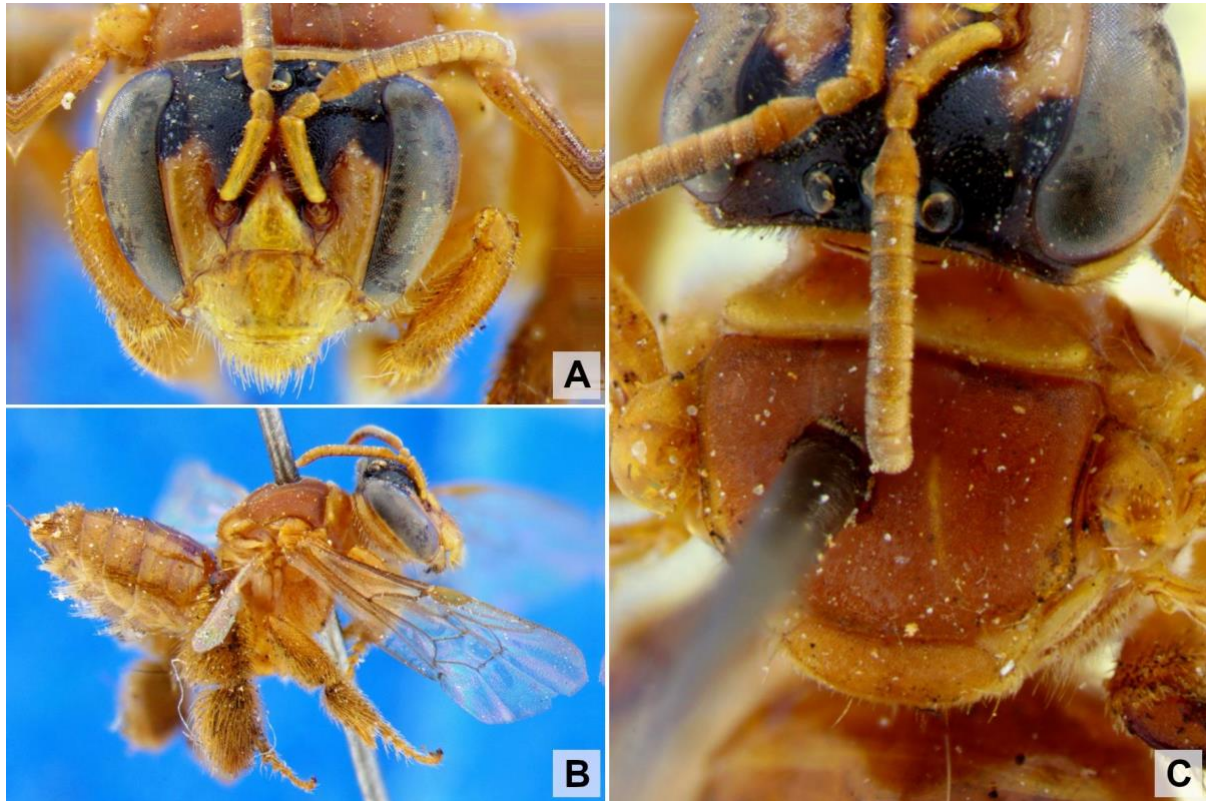


Figure 11 *Xanthopedia* sp. nov. 3, UNB 000177, Teresina de Goiás - GO. Holotype female. A) face view; B) lateral view; C) dorsal view.

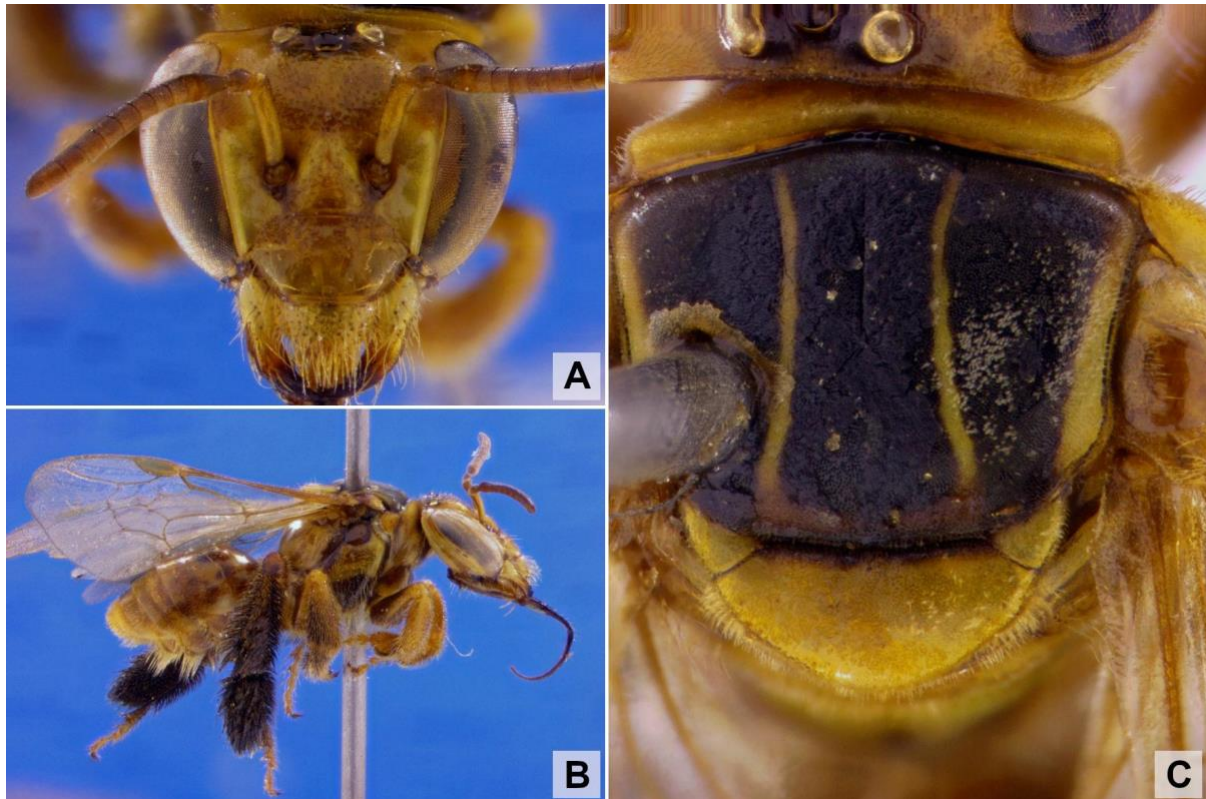


Figure 12 *Xanthopedia* sp. nov. 4, UNB 000170, Formosa - GO. Holotype female. A) face view; B) lateral view; C) dorsal view of mesosoma.

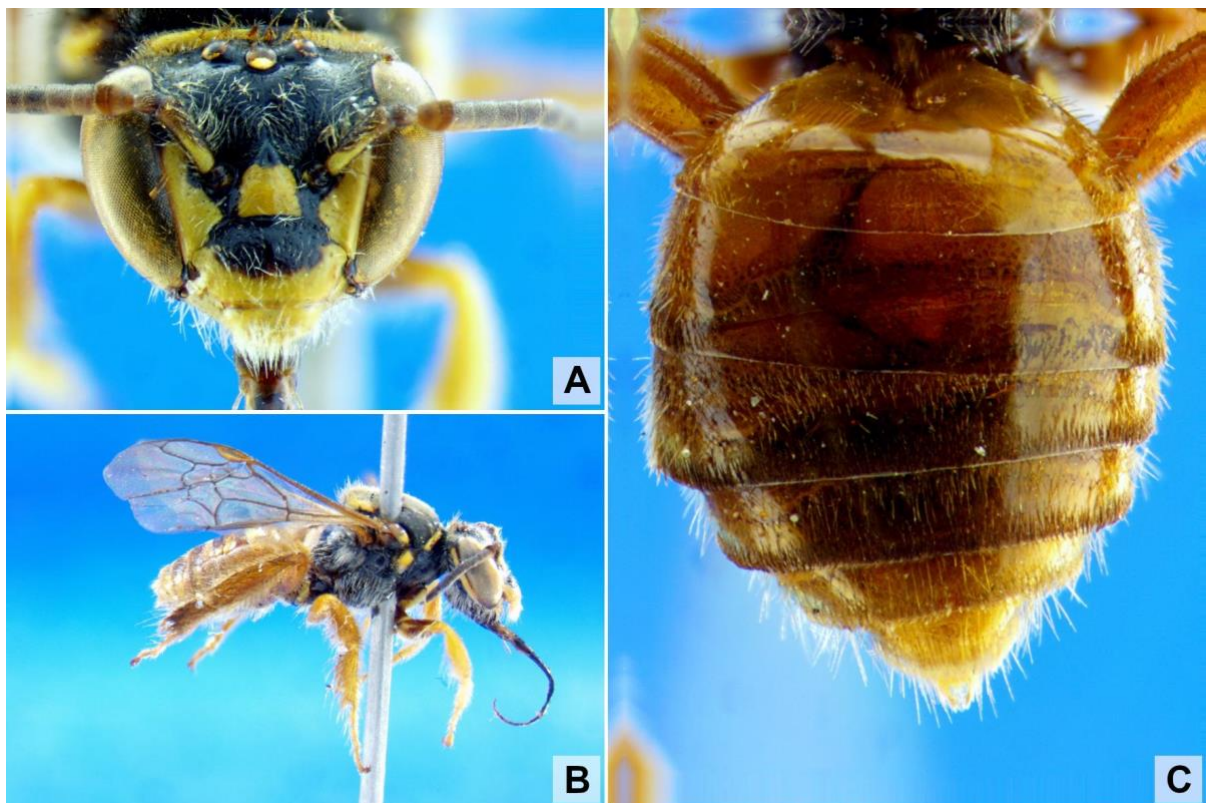


Figure 13 *Xanthopedia* sp. nov. 5, UFMG 92947, São Gonçalo do Rio Preto - MG. Holotype male. A) face view; B) lateral view; C) dorsal view of metasoma.

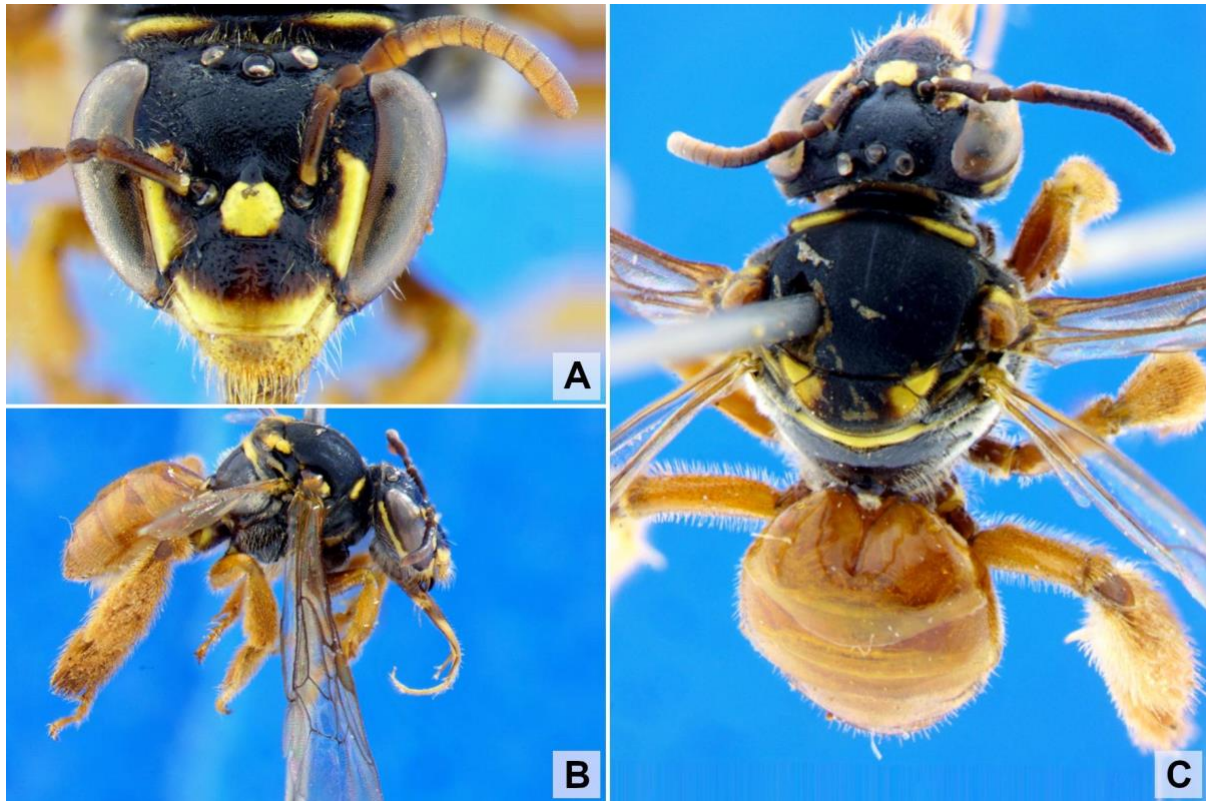


Figure 14 *Xanthopedia* sp. nov. 5, UFMG 90639, Jaboticatubas - MG. Paratype female. A) face view; B) lateral view; C) dorsal view.



Figure 15 Geographical distribution of *Xanthopedia* species belonging to *X. inheringii* group (supraclypeal area elevated, convex).

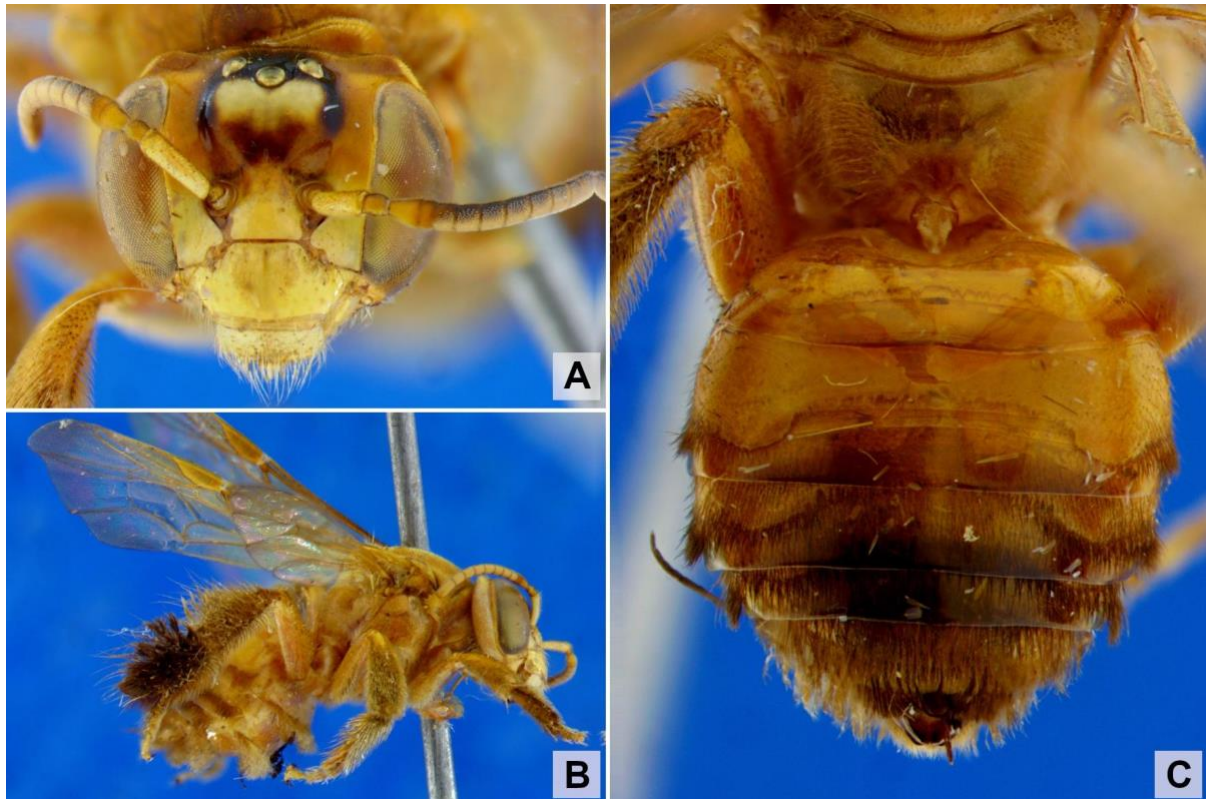


Figure 16 *Xanthopedia* sp. nov. 7, Manaus - AM. Holotype female. A) face view; B) lateral view; C) dorsal view of metasoma.

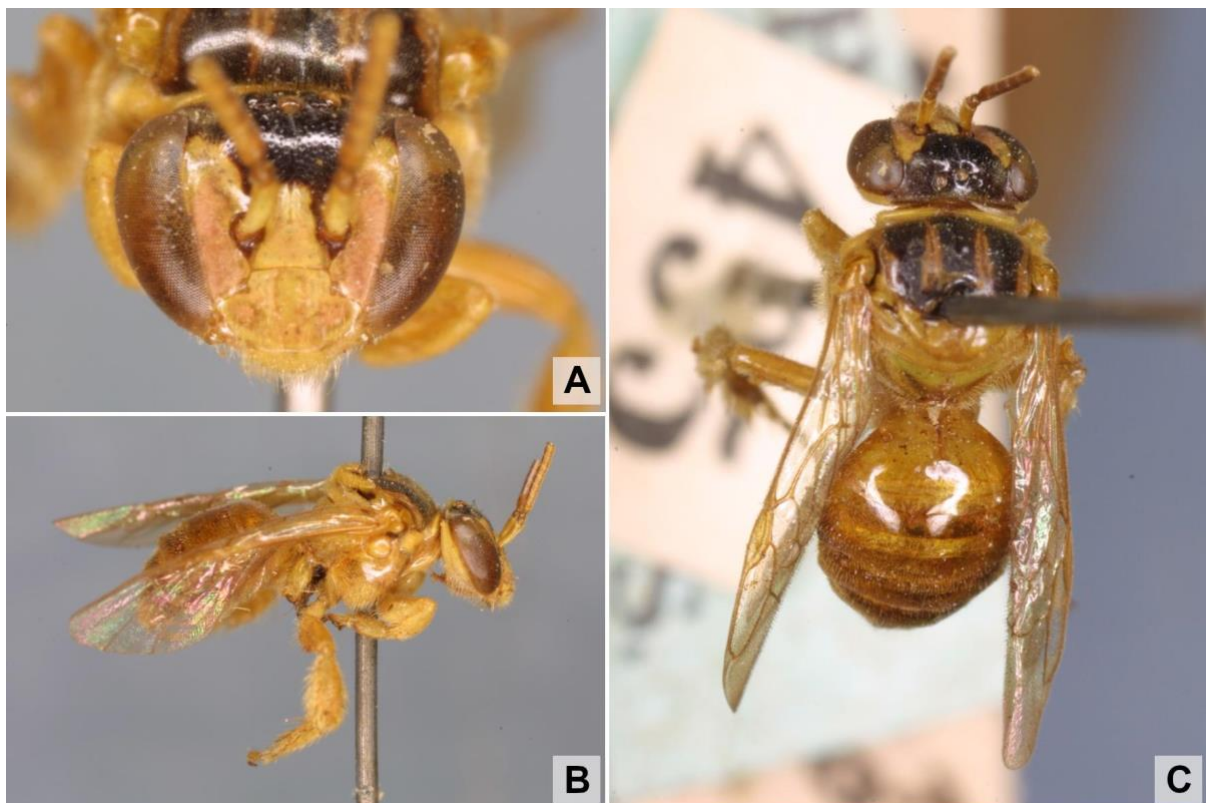


Figure 17 *Tetrapedia globulosa* Friese, 1899 (*Xanthopedia globulosa*), ZMB, Bahia, Brazil. Holotype male. A) face view; B) lateral view; C) dorsal view.

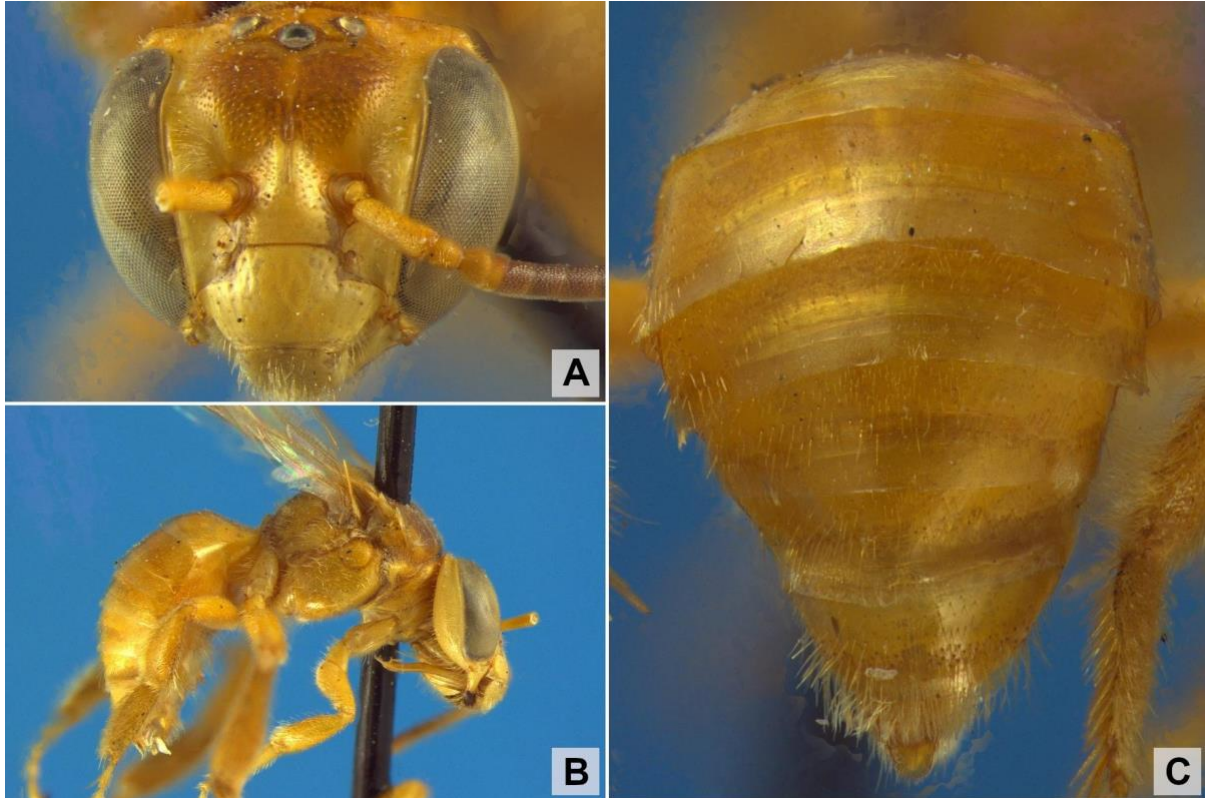


Figure 18 *Xanthopedia xanthina* Moure, 1994, DZUP, Bolivia. Holotype male. A) face view; B) lateral view; C) dorsal view of metasoma.

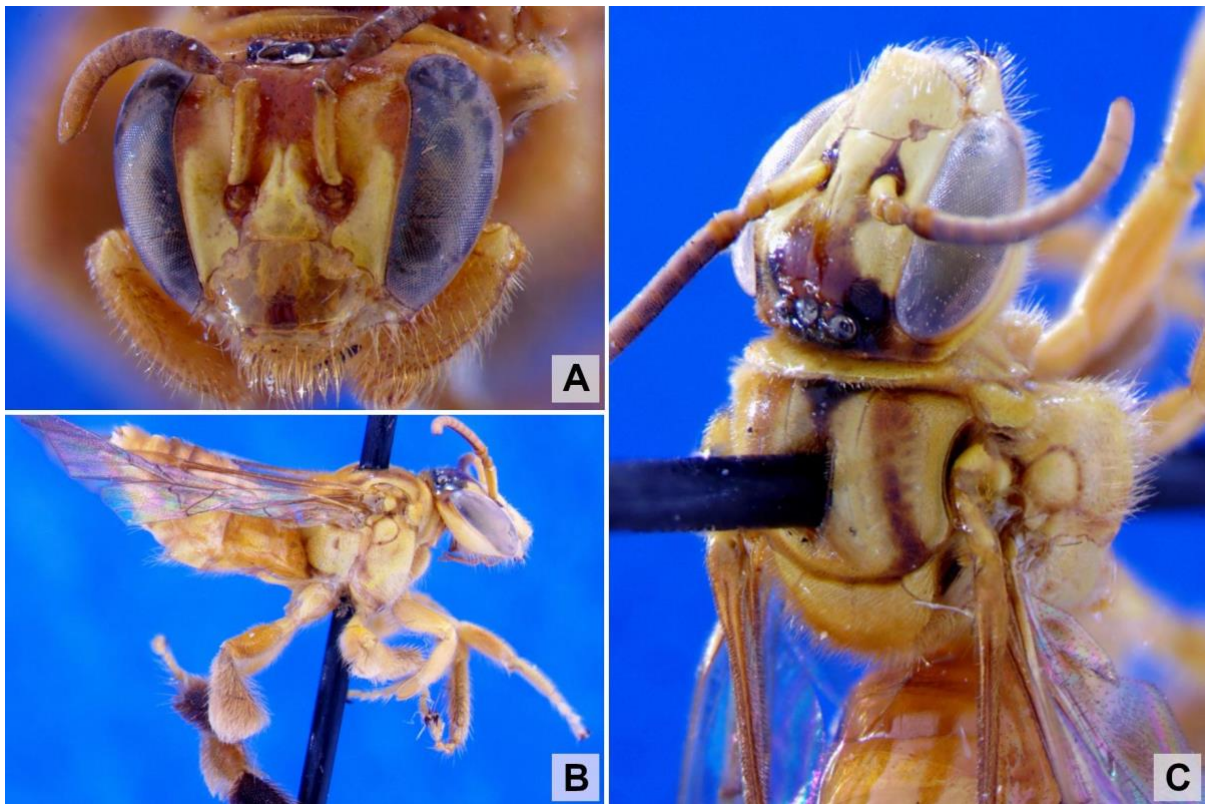


Figure 19 *Xanthopedia tristriata*, INPA, Mato Grosso. Syntype female. A) face view; B) lateral view; C) dorsal view.



Figure 20 Geographical distribution of *Xanthopedia* species belonging to *Lissopedia* group (supraclypeal area very low).