

First records of two Amazonian species of *Zethus* (*Zethoides*) Fox, 1899 (Hymenoptera, Vespidae, Eumeninae) in Atlantic Forest fragments in São Paulo state, Brazil

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Abstract: *Zethus* Fabricius, 1804 is the largest genus in the subfamily Eumeninae with over 250 species. Its Neotropical representatives are divided into three subgenera: *Z. (Zethus)* Fabricius, 1804; *Z. (Zethusculus)* de Saussure, 1855; and *Z. (Zethoides)* Fox, 1899. Two specimens were collected in the northeastern region of São Paulo state, Brazil belonging to two species of the latter subgenus: *Z. (Zethoides) lobulatus* de Saussure, 1855 and *Z. (Zethoides) rugosiceps* Fox, 1899. These species have so far only been collected in the Amazon Forest and these findings not only expand the latitude of the species’ distribution but also their occurrence to the Atlantic Forest as well.

Key words: Neotropical mason wasps; potter wasps; distribution

INTRODUCTION

Zethus Fabricius, 1804 is the most speciose genus of the Eumeninae with 258 valid species (Lopes and Noll 2014; Cooper 2014; Lopes and Hermes 2015). Its 223 New World species are, so far, divided into three subgenera: *Z. (Zethus)* Fabricius, 1804, *Z. (Zethusculus)* de Saussure, 1855 and *Z. (Zethoides)* Fox, 1899, which are further divided in species groups. The latter subgenus can be identified mainly by the three-lobate apical lamella of the third tergum and the laterally tapered apical lamella of the third sternum (Bohart and Stange 1965). The subgenus *Zethoides* is composed of 42 species distributed in eight groups, whose diversities and ranges vary greatly, from monotypic assemblies that are each restricted to a limited area (e.g., *Z. aztecus* group to Mexico and *Z. minimus* group to Argentina) to groups occurring from North to South America with over 10

species each (e.g., *Z. olmecus* and *Z. biglumis* groups) (Bohart and Stange 1965).

Here we report range extensions for *Z. lobulatus* from the *Z. clypearis* group and *Z. rugosiceps*, from the *Z. biglumis* group, two species known to occur in the Amazon Forest (Bohart and Stange 1965).

MATERIALS AND METHODS

Two specimens deposited in the entomology collection of the Instituto de Biociências, Letras e Ciências Exatas (IBILCE) of the Universidade Estadual Paulista “Júlio de Mesquita Filho” were identified by Bolívar Rafael Garcete-Barrett as *Zethus lobulatus* and *Z. rugosiceps*, and their identifications were later confirmed using keys from Bohart and Stange (1965).

The specimens were examined and photographed under a Leica MZ16 stereoscope and the images were obtained with a Leica DFC295 camera, using Leica Application Suite and followed by image-stacking in CombineZP.

The specimen of *Z. lobulatus* is a female collected in Barretos, São Paulo state, Brazil (Figures 1–5) and the female specimen of *Z. rugosiceps* was collected in Sales, also in São Paulo state (Figures 6–9).

Maps were plotted using DIVA-GIS 7.5.0 (Hijmans et al. 2012) with shape files obtained from the MMA (2015) and TNC (2013) web sites.

IDENTIFICATION

Zethus lobulatus and *Z. rugosiceps* belong to *Z. clypearis* and *Z. biglumis* groups respectively, which are presumably closely related to each other (Bohart and Stange 1965). These groups have remarkable morphological resemblance, both presenting a very narrow sub-humeral area of the pronotum (Figure 10)

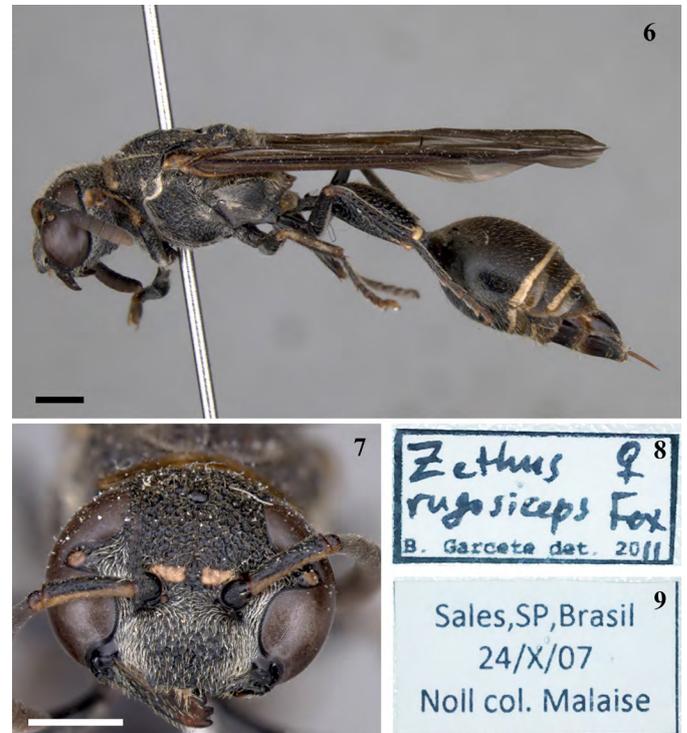
— except for (*Z. rugosiceps* Figure 11) — when compared to specimens from other species groups (Figure 12) and a broad tegula with outer margin posteriorly bowed (Figure 13–14) rather than evenly convex (Figure 15). This leaves only the punctuation in the dorsal face of pronotum as a differential feature for each group, being striate in the specimens of the *Z. clypearis* group (Figure 16) and punctate in the *Z. biglumis* group (Figure 17).

***Zethus (Zethoides) lobulatus* de Saussure, 1855**

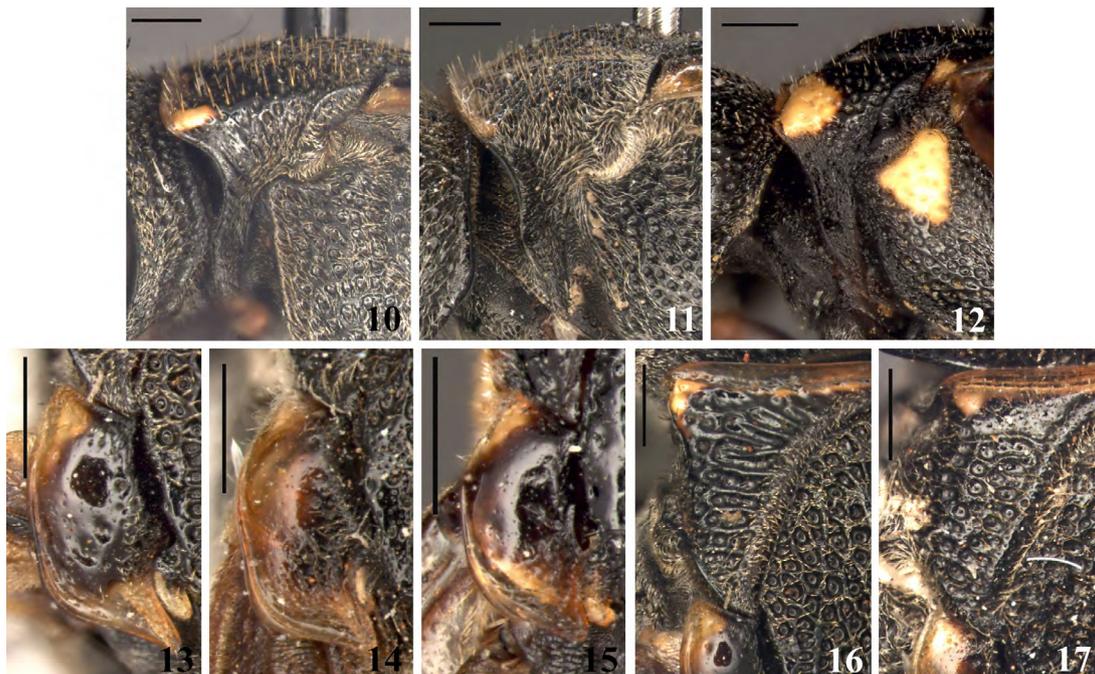
Diagnosis (female): Black with yellow markings on top of the antennal sockets, angles of humeri, spots on metanotum and bands from metasomal segments 1–5. Body covered by dense golden pilosity with thick and erect setae. Mandible with subapical reflexed tooth. Apical margin of clypeus straight with subapical edge (Figure 3). Pronotal dorsal surface with oblique striae



Figures 1–5. Female specimen of *Zethus lobulatus* collected in São Paulo. 1. Habitus. 2. Metasoma, lateral view. 3. Head, frontal view. 4. Identification label. 5. Collection label. Scale: 1.0 mm.



Figures 6–9. Female specimen of *Zethus rugosiceps* collected in São Paulo. 6. Habitus. 7. Head, frontal view. 8. Identification label. 9. Collection label. Scale: 1.0 mm.



Figures 10–17. Diagnostic features for the *Z. biglumis* and *Z. clypearis* groups. 10–12. Pronotum, lateral view. 13–15. Tegula, dorsal view. 16–17. Pronotum, oblique dorsal view. 10, 13, 16. *Zethus lobulatus*. 11, 14, 17. *Zethus rugosiceps*. 12, 15. *Zethus (Zethoides) guerreroi* Zavattari, 1913. Scale: 0,5 mm.

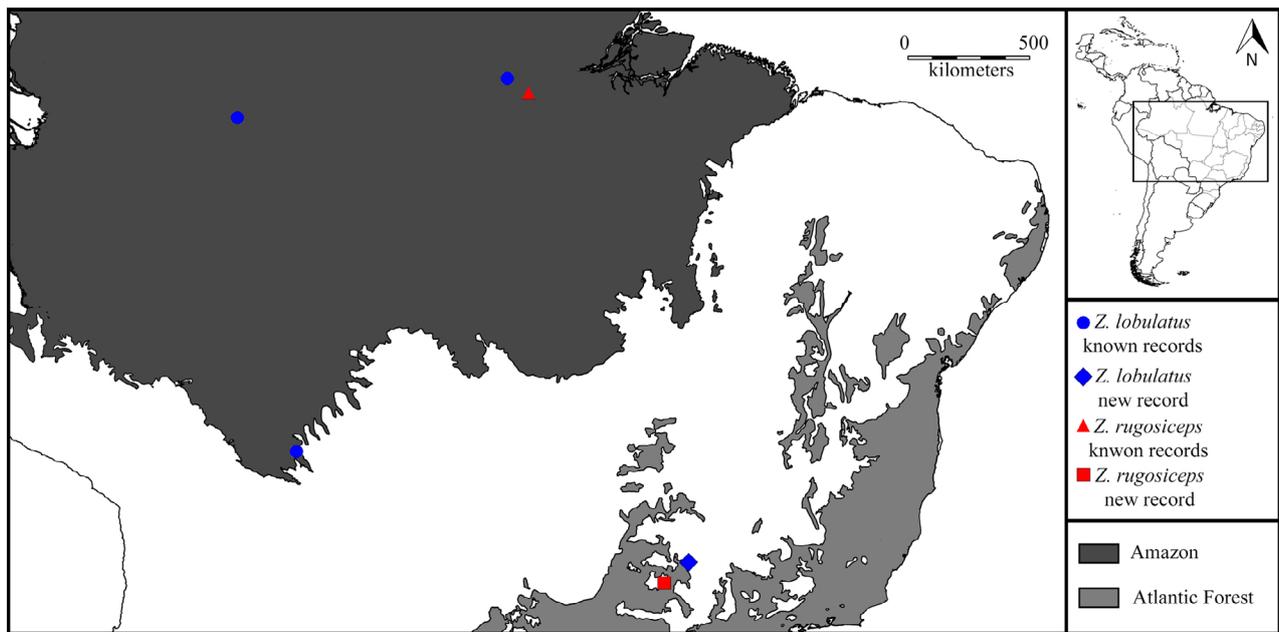


Figure 18. Records of *Zethus lobulatus* and *Z. rugosiceps* according to the biome where collected.

(Figure 16). Humeri forming an edge between dorsal and lateral surfaces. First metasomal tergum, on profile, expands more abruptly, becoming angulate and bent before expansion (Figure 2), which is unique in the group. Fore wing length: 9.3mm.

Distribution: Brazil (Amazonas, Pará, São Paulo); Bolivia.

Observation: The specimen collected in São Paulo is darker and many of the light markings are found wanting. Still, all the other morphological traits are similar, leading to believe it is just a color variation.

Material examined: BRAZIL: 1♀, Pará, Óbidos (01°54'21" S, 055°30'44" W), no date, no collector (University of California, Davis); 1♀, São Paulo, Barretos (20°33'13" S, 048°34'11" W), Faz. Vista Bonita, 22.xii.2010, leg. O.L. Capusso (IBILCE).

***Zethus (Zethoides) rugosiceps* Fox, 1899**

Diagnosis (female): Black with yellow markings on top of the antennal sockets, base of pronotal carina, spots on scutellum and bands from metasomal segments 1–3. Body covered by dense golden pilosity with thin and erect setae. Mandible with subapical reflexed tooth, which is unique in the group. Apical margin of clypeus biconcave with subapical edge (Figure 7). Pronotal dorsal surface with wide shallow punctures, some coalescent. Humeri rounded (Figure 17). Subhumeral area very broad, when compared to other species in the group. First metasomal tergum, on profile, expands gradually, evenly convex through expansion (Figure 6). Fore wing length: 9.1mm.

Distribution: Brazil (Pará, São Paulo)

Material examined: BRAZIL: 1♀, São Paulo, Sales (21°20'39" S, 049°30'03" W), Malaise trap, 24.x.2007, leg. F.B. Noll (IBILCE).

DISCUSSION

Zethus lobulatus and *Z. rugosiceps* are species that previously have only been recorded in the Amazon Rainforest (Bohart and Stange 1965). Our findings not only greatly expand the distribution of these species, but reveal their occurrence in a new biome, the Atlantic Rainforest (semi-deciduous rainforest) (Figure 18). It is still not rare to report new distributions in Eumeninae (e.g., Garcete-Barrett 2002; Stange 2003; Hermes and Köhler 2004; Grandinete and Noll 2013; Hermes and Garcete-Barrett 2013; Lopes and Noll 2014; Cooper 2014), showing that the group is poorly recorded.

Excluding *Z. diminutus*, the South American species belonging to the *Z. clypearis* and *Z. biglumis* groups have a small latitudinal range and some with very few distribution records (see examined material of the species included in these groups in Bohart and Stange 1965). However, these new findings reveal that we must be cautious before assuming that the known distribution area of a species in these groups is also the true limit of its range. In a similar case, Lopes and Noll (2014) recently documented *Z. (Zethoides) biglumis* Spinola, 1841 in an Atlantic Forest fragment in São Paulo state; until then was also believed to live only in the Amazon. Thus, our records are the second and third cases of latitudinal, as well as ecosystem/biome expansions within these species groups in a time span of just two years.

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