

A new species of *Zethus* (*Zethoides*) Fox, 1899 (Hymenoptera, Vespidae) from South America

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Abstract. *Zethus* is the most speciose genus among vespid wasps and has become even larger after the inclusion of closely related taxa as subgenera after a morphological phylogenetic analysis. Despite being taxonomically reviewed in the past, the Neotropical diversity of the group demonstrates potential for even further growth. A new species of *Zethus* (*Zethoides*) Fox, 1899 is herein described, being the fifth one to be described in this subgenus after the great taxonomic revision of the genus in the New World.

Keywords. Morphology; Taxonomy; *Zethus biglumis* species-group.

INTRODUCTION

Although more popularly known by their social representatives such as hornets and paper wasps, most of the Vespidae diversity lies in Eumeninae, mostly represented by solitary wasps. *Zethus* Fabricius, 1804 is the largest genus in this subfamily, with nearly 300 species and is currently divided into nine subgenera with some species-groups being treated as *Incertae sedis* (Lopes *et al.*, 2021). *Zethus* (*Zethoides*) Fox, 1899 is a well established monophyletic subgenus that comprises mostly Neotropical representatives in 43 species, from the United States to Argentina (Lopes & Noll, 2018; Lopes *et al.*, 2021). Few descriptions of new taxa have been provided for the subgenus after its New World revision (Bohart & Stange, 1965), with *Z. carpenteri* described in the *Z. carinatus* group (Stange, 1997), *Z. anomalus* described by Cooper (1999) and later assigned to the *Z. olmecus* group (Lopes *et al.*, 2020) and *Z. milleri* described by Stange (1997) and *Z. denticlypeus* in Lopes *et al.* (2020), both assigned to the *Z. biglumis* group. The *Zethus biglumis* species-group currently contains 18 species, including those previously belonging to the *Z. clypearis* group, and represents the most diverse assemblage in *Z. (Zethoides)* (Lopes & Noll, 2018; Lopes *et al.*, 2020).

Obtained from museum collections, four examined specimens 1), three of which collected at least 30 years ago, key out in Bohart & Stange's (1965), key as *Zethus lunaris* Zavattari, 1912 within the *Z. biglumis* group, bearing a wedge-shaped petiole in posterior view. However, the distribution is further south than the expected and closer examination led to the observation of characters

that easily define them as belonging to a new species, which is herein described.

MATERIAL AND METHODS

Four examined specimens, two males, one deposited in the Coleção Entomológica Padre Jesus Moure, of the Universidade Federal do Paraná, Curitiba, Brazil (DZUP) and one deposited in the Naturalis Biodiversity Center, Leiden, Netherlands (NBCN), and two females, deposited in the American Museum of Natural History, New York, USA (AMNH) were examined and identified to species according to Bohart & Stange's (1965) key. For subgenus designation, the key in Lopes *et al.* (2021) was also used. Running to *Z. lunaris*, these insects were compared to type material of both subspecies (*Z. l. lunaris* and *Z. l. cooperi*) deposited in the AMNH and the Zoologisches Museum und der Humboldt-Universität zu Berlin, Berlin, Germany (ZMHB). Data about type specimens of the new species are brought under the Examined material section, while *Z. lunaris* specimens used for comparison are brought under the Additional material section.

Specimens were examined with the aid of a M205 C stereoscope and photographed with an attached Flexacam C1 camera using the LASx software. Image stacking was done in the Helicon Focus software. Adobe Photoshop was used for minor editions (brightness and contrast) and mounting plates.

Due to the age of the male paratype specimen, it was chosen not to risk its integrity by attempting genitalia extraction.

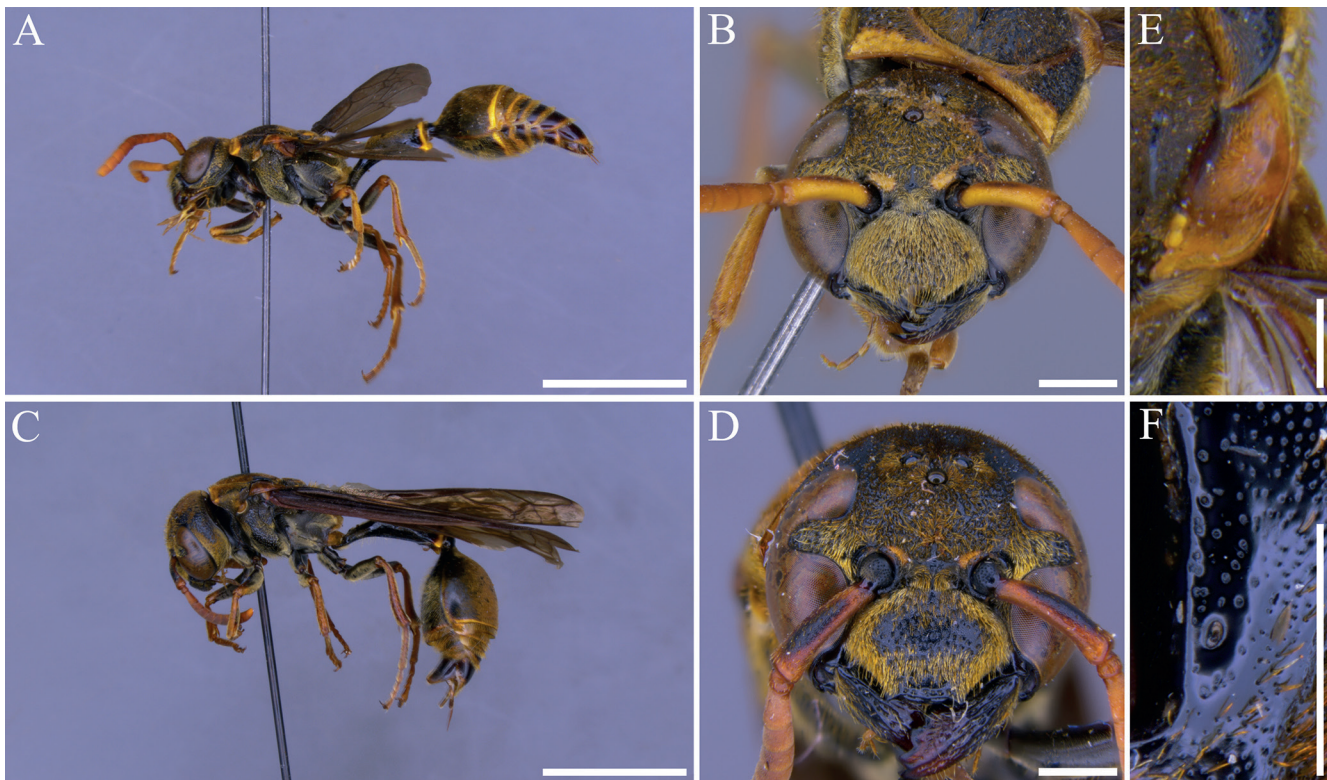


Figure 1. Male (A, B) and female (C, D) of *Zethus latipetiolatus* Lopes, **sp. nov.** and synapomorphic characters for the *Z. biglumis* species group (E, F). (A, C) Lateral habitus. (B, D) Head, frontal view. (E) Discoideum puncture standing on tubercle. (F) Tegula posteriorly bowed. Scales: (A, C) 5,0 mm; (B, D) 1,0 mm; (E, F) 0,5 mm.

Terminology follows Bohart & Stange (1965) and Carpenter & Garcete-Barrett (2002). Abbreviations are used in the text for tergum (T), sternum (S) and flagellomere (F). Terga and sterna are followed by Arabic numbers indicating their respective segment. Flagellomeres are followed by Roman numerals indicating their respective segment.

RESULTS AND DISCUSSION

The examined specimens key out as belonging to the *Zethus* (*Zethoides*) Fox, 1899 subgenus, presenting all modifications on the third metasomal tergum, such as the apical projection, trilobate secondary lamella, primary lamella laterally tapered, and lateral indent, as well as in the S3 with reduced lamella and developed medial lamellar lobe (Bohart & Stange, 1965; Lopes & Noll, 2018 – see figs. 5A, 9B); Lopes *et al.*, 2021 – see fig. 10). Further identification reveals them to be inserted in the *Z. biglumis* species group, bearing the tegula posteriorly angled (Fig. 1E) and the discoideum puncture on a tubercle (Fig. 1F) (Lopes & Noll, 2018). As mentioned previously, the specimens run to *Z. lunaris*, but are quite distinct from this known species, presenting differences that are more outstanding than the difference between subspecies. It is worth noting that the subspecies of *Z. lunaris* are not discussed here as there were no morphological traits that varied besides the petiole, already mentioned by Bohart & Stange (1965) and the only male specimens obtained were types and, therefore, not dissected to examine their genitalia.

Zethus (*Zethoides*) *latipetiolatus* Lopes, **sp. nov.**

Diagnosis: The first metasomal tergum (Fig. 2) with extremely expanded posterior flaps is unique in the subgenus. The last male flagellomere slender and apically rounded, male clypeus with deep trapezoid concavity, male mandible with quadrate incision between teeth II and III, tubercle of discoideum puncture rising gradually and apical propodeal lamella oblique and close to the valvula also help to separate it from *Z. lunaris*.

Description: Male: Coloration: Black, with yellow markings as follows: ventral surface of scape; pair of spots above antennal sockets; band following base of pronotal carina; pronotal lobe; medial section of posterior margin of pronotum; spot on posterior portion of tegula; parategula; pair of spots on scutellum; pair of spots on metanotum; stripe on outer surface of hindtibia; strong subapical bands on T1 – 3 and S2 – 3, weak ones on T4 – 5 and S4 – 5. Testaceous: antennae except dorsal surface of scape; tibiae; tarsi; tegula. **Structure:** Apical flagellomere slender and digitiform. Clypeal apex with deep, trapezoid concavity. Mandible with a deep quadrate incision between teeth II and III. Genal margin slightly sinuous. Pronotum with humeri rounded, but with distinct dorsal and lateral surfaces. Subhumeral area very narrow. Tegula posteriorly angulated, with outer margin nearly transversal on posterior end. Parategula digitiform. Scutellum flat. Propodeum with rounded angles and posterior and lateral surfaces well separated by lateral carina. Apical propodeal lamella subquadrate, obliquely oriented on insertion and ending right above valvula. T1

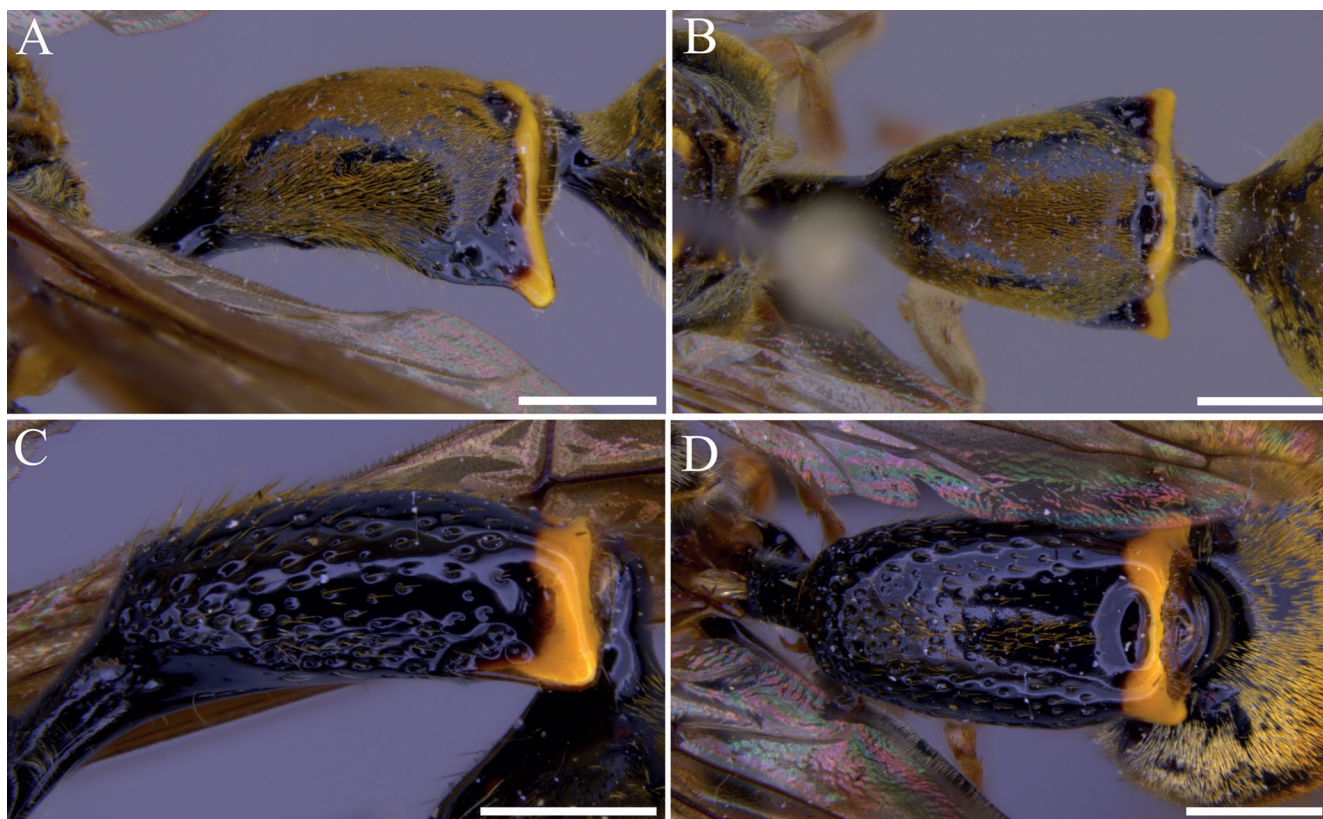


Figure 2. Petioles of *Zethus latipetiolatus* Lopes, **sp. nov.** (A, B) and *Z. lunaris cooperi* Bohart & Stange, 1965 (C, D) in profile (A, C) and dorsal view (B, D). Scales: 1,0 mm.

convex in profile, with large and wide posterior flap-like extensions ventro-laterally projected. Stem of T2 very short. Apical lamella of T2 wider laterally. **Sculpture:** Clypeus, vertex and gena with moderately macropunctuation intercalated by dense micropunctuation. Frons with shallow coalescent macropunctures with cariniform interspaces. Admedial lines present. Pronotum with moderate macropunctuation, a few coalescent. Mesoscutum and scutellum with sparse macropunctuation intercalated by dense micropunctuation. Discoid puncture present, on a low and gradually raised tubercle. Notauli absent. Mesepisternum with macropunctures and smooth interspaces. Metanotum with overall coarse irregular punctures and with lateral carina not curved inwards, restricted to sides of sclerite. Propodeum with strong and complete submedian and lateral carinas, with the later lamellar. Transverse/oblique striae on posterior propo-

deal surface and on lateral surface but only adjacent to lateral carina. T1 – 2 with sparse, small and weak macropunctures intercalated by dense micropunctuation. S2-3 with moderate macropunctuation and smooth interspaces. Subapical bands of T1 – 3 and S2 – 3 smooth. **Pilosity:** Overall very dense, short, golden tomentum. Long, thick, outstanding bristles on: clypeus, frons and metanotum; sparse on pronotum; thin on mesepisternum, propodeum and S1; short and sparse on base of T1; absent elsewhere. **Fore wing length:** 11,1 mm.

Female: as in male, except: **Coloration:** antennae and legs without yellow markings. **Structure:** Clypeal apex slightly convex with subapical ridge. **Sculpture:** overall punctuation slightly weaker and sparser. Lateral carina not lamellar. **Pilosity:** similar to that of male. **Fore wing length:** 13,4 mm and 14.4 mm.

Table 1. Diagnostic characters for differentiating *Zethus latipetiolatus* Lopes, **sp. nov.** from *Z. lunaris* Zavattari, 1912.

Character	Species	
	<i>Z. latipetiolatus</i>	<i>Z. lunaris</i>
T1, expansion	more gradual in profile, becoming much wider apically; larger apical flaps directed outwards (Fig. 2A, B)	more abrupt in profile, apical width not much greater than at middle of expansion; small apical flaps, directed downwards (Fig. 2C, D)
T1, punctuation	smooth with sparse micropunctuation (Fig. 2A, B)	macropunctate (Fig. 2C, D)
T1, pilosity	Only tomentum; bristles absent (Fig. 2A, B)	Tomentum absent; long erect thick bristles (Fig. 2C, D)
Occipital carina	shorter, straightly raised (Fig. 3A)	higher, reflexed (Fig. 3B)
Last male flagellomere	slender, apically rounded (Fig. 3C)	wider, apically truncate (Fig. 3D)
Male clypeus, apex	Trapezoid concavity (Fig. 3E)	Semicircular concavity (Fig. 3F)
Male mandible, incision between teeth II and III	Smaller, quadrate (Fig. 3E)	Larger, rounded (Fig. 3F)
Tubercle of discoid puncture	only slightly and gradually raised (Fig. 3G)	evidently and abruptly raised (Fig. 3H)
Apical propodeal lamella.	Oblique, ending right above valvula (Fig. 3I)	Horizontal, well-spaced from valvula (Fig. 3J)

Etymology: The epithet makes reference to the greatly expanded and broad T1, a unique trait in the subgenus so far.

Examined material: HOLOTYPE: Brasil, RO, Itapuã do Oeste, Flona do Jamari, 9.145°S, 63.011°W, 70m, 7-15.vi.2013/ Bueno, Luz & Williams [♂, DZUP]. PARATYPES: Satipo, Peru/ 2.xii.37, 750alt/ Deskandahl [♂, NBCN]; BOLIVIA, iii.95/ Chapare-Sajito/Ariagada [♀, AMNH]; BOLIVIA, Buena Vista/ Depto. Santa Cruz/10.i.1991/ Carpenter & Wenzel [♀, AMNH]."

Additional material: *Z. lunaris cooperi* Bohart & Stange, 1965. Barro Colorado/ CZ, Panamá/ N Banks [PARATYPE, ♂, AMNH]. *Z. lunaris lunaris* Zavattari, 1912. Columbien, Cauca, Rahde [LECTOTYPE, ♂, ZMHB]. Same data as lectotype [LECTOPARATYPE, ♀, ZMHB]. Same data as lectotype [label "type", ♂, ZMHB]. PANAMÁ: Canal Zone Area/ Pipeline Road/ 13.xii.1990/ Carpenter & Wenzel [♀, AMNH]. Canal Zone, Pan./ Barro Colorado I./ ix.17.1978/ RB & LS Kimsey [♀, AMNH]; same data, ix.25.1978 [♀, AMNH]."

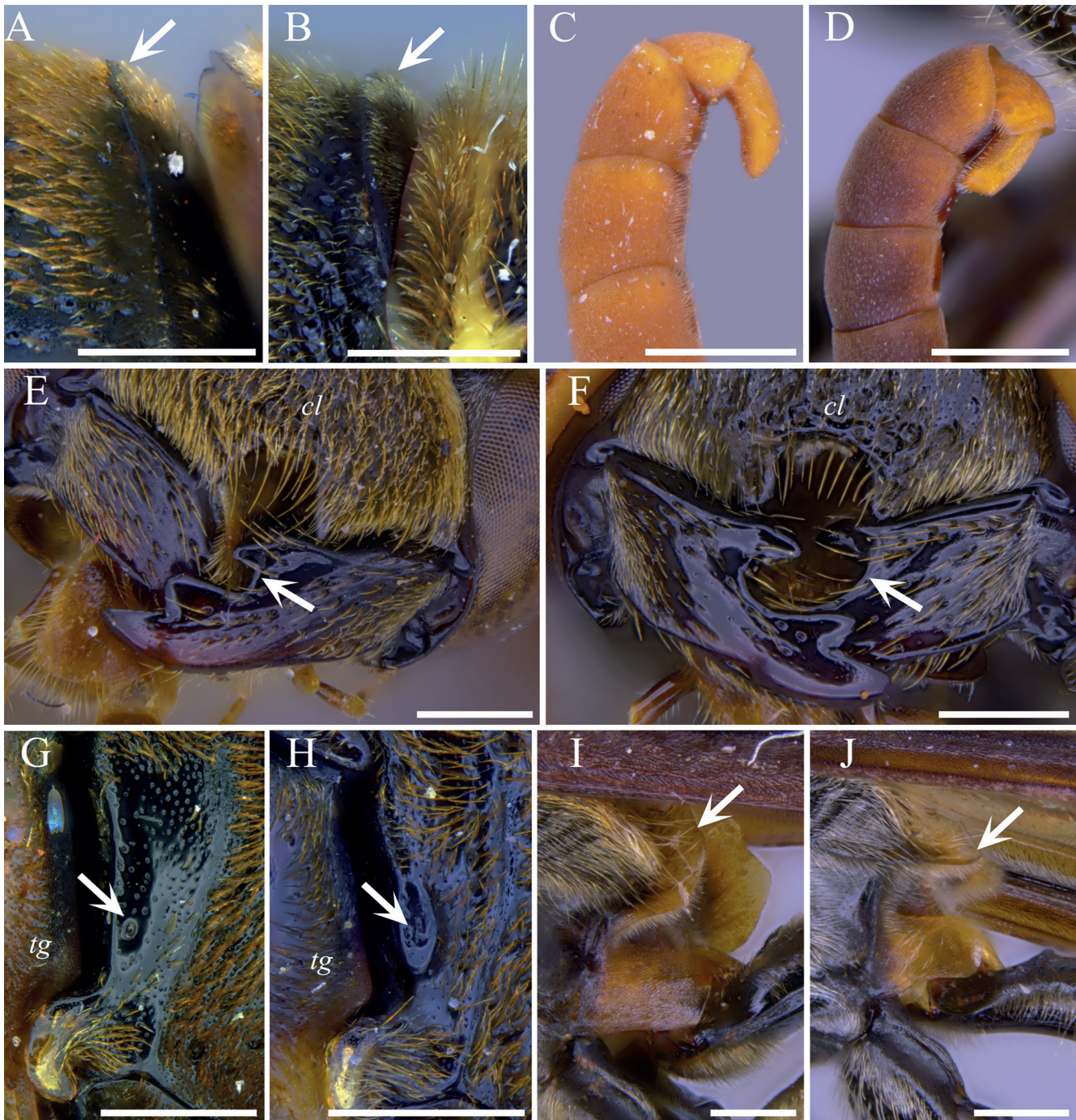


Figure 3. Diagnostic characters for differentiating *Zethus latipetiolatus* Lopes, **sp. nov.** (A, C, E, G, I) from *Z. lunaris* Zavattari, 1912 (B, D, F, H, J). (A, B) Zoom of vertex and occiput of head, lateral view; arrow indicates occipital carina. (C, D) Lateral view of the apex of male flagellum. (E, F) Oblique view of the apex of the clypeus (*cl*) and mandibles; arrow indicates mandibular incision. (G, H) Zoom of lateral portion of mesoscutum adjacent to tegula (*tg*); arrow indicates discoid puncture. (I, J) Lateral view of propodeal apex; arrow indicates apical propodeal lamella. Scales: 0,5 mm.

Observations: The new species is undoubtedly closely related to *Z. lunaris*, with very similar clypeus in females, most of the mesosoma, except the propodeum and the T1. Nevertheless, features in the male mandible, male F11, occipital carina, discoid puncture, apical propodeal lamella and T1 readily separate the new species from *Z. lunaris* (Table 1, Fig. 3).

CONCLUSION

This contribution is another addition to the ever-growing diversity of *Zethus*. This is only the fifth new species described in subgenus *Zethus* (*Zethoides*) since Bohart & Stange's (1965) revision, even though one of the paratypes had been already collected at the time of that study. This shows that entomological collections still have great deal of material to be examined despite the great amount of effort already carried out in past studies.

CONFLICTS OF INTEREST: The author declares that there is no conflict of interest.

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REFERENCES

- Bohart, R.M. & Stange, L.A. 1965. A Revision of the genus *Zethus* Fabricius in the Western Hemisphere (Hymenoptera: Eumenidae). *University of California Publications in Entomology*, 40: 1-208.
- Carpenter, J.M. & Garcete-Barrett, B.R. 2002. A key to the Neotropical genera of Eumeninae (Hymenoptera: Vespidae). *Boletín del Museo Nacional de Historia Natural del Paraguay*, 14: 52-73.
- Cooper, M. 1999. A new species of *Zethus* F. (Hym., Vespidae, Eumeninae) with unusual male genitalia. *Entomologist's Monthly Magazine*, 135: 39-42.
- Lopes, R.B. & Noll, F.B. 2018. Cladistic analysis of the *Zethus* (*Zethoides*) (Hymenoptera, Vespidae, Eumeninae) species groups with insights on the current subgeneric classification of *Zethus* Fabricius, 1804. *Insect Systematics & Evolution*, 49(2): 103-129. <https://doi.org/10.1163/1876312X-00002165>.
- Lopes, R.B.; Carpenter, J.M. & Noll, F.B. 2021. Cladistic analysis of *Zethus* Fabricius, 1804 (Hymenoptera, Vespidae): a new subgeneric classification. *Journal of Hymenoptera Research*, 82: 253-283. <https://doi.org/10.3897/jhr.82.65760>.
- Lopes, R.B.; Cruciol, A.H. & Noll, F.B. 2020. Notes on Zethini (Hymenoptera, Vespidae, Eumeninae): complementary sex descriptions, synonymies and a new species of *Zethus* Fabricius. *Zootaxa*, 4743: 232-246. <https://doi.org/10.11646/zootaxa.4743.2.6>.
- Stange, L.A. 1997. The *Zethus* of Venezuela (Hymenoptera: Eumenidae). *Insecta Mundi*, 11(3-4): 311-324.