Two new species of *Pirhosigma* Giordani Soika (Vespidae, Eumeninae), with an updated catalog for the genus

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Abstract

Two new species of eumenine wasps were described from Panama and Peru, namely *Pirhosigma abregoi* Garcete-Barrett & Hermes sp. nov. and *P. cambrai* Garcete-Barrett & Ferreira sp. nov. Lectotypes are designated for *Eumenes deformata barberoi* Bertoni and *Eumenes superficialis mondaiensis* Bertoni. *Pirhosigma meirimense putumayense* Giordani Soika stat. nov. is treated as a color variation of the typical *P. meirimense* (Zavattari). Additions to the key by Ferreira et al. (2017) are made and an updated catalog for species included in the genus is provided.

Keywords

New species, Panama, Peru, Potter wasps, Taxonomy
Introduction

Recently, the Eumeninae, the so-called potter wasps, have been receiving much attention in studies regarding the higher-level phylogenetic relationships of their main lineages, especially with the aid of novel molecular data (Hines et al. 2007; Pickett and Carpenter 2010; Hermes et al. 2014; Bank et al. 2017; Piekarski et al. 2018). The most recent results based on large-scale genomic datasets (Bank et al. 2017; Piekarski et al. 2018) have implied paraphyly of Eumeninae sensu Carpenter (1982), whose monophyly was corroborated by Pickett and Carpenter 2010 and Hermes et al. 2014.

Despite this recent phylogenetic progress, the Neotropical fauna of potter wasps remains little explored, a fact that is particularly noticeable by the poor representation of the group in most Latin American entomological collections. In fact, the group is not as abundant as the social vespids, and few experts are carrying out research within the group. Nevertheless, the number of described species has been increasing constantly for the Neotropics (e.g. Hermes 2012; Lopes and Noll 2014; Lopes and Hermes 2015; Cooper, 2016a, b; Lopes et al. 2017), indicating the need for more research to be carried out for the taxon.

Pirhosigma is a somewhat small genus of eumenine wasps, currently comprising nine described species. Of these, two were described within the last three years (Ferreira et al. 2015, Ferreira et al. 2017). Recently, Hermes et al. (2013) provided an insightful study on the nesting biology of two species of Pirhosigma, with special reference to the use of vegetable matter for potentially camouflaging the mud nests. Such biological strategies are scarcely known for the potter wasps as a whole, but recent available data are showing them to be very plastic regarding nesting strategies (e.g. Hermes et al. 2015, Auko et al. 2015). We hereby propose the description of two new species of Pirhosigma, along with an updated catalog for all species included in the genus.

Material and methods

Material from the following institutions was examined (the acronyms follow Evenhuis (2018) when available):

MIUP Museo de Invertebrados Graham B. Fairchild, Universidad de Panamá, Panamá (Dr. Roberto Cambra, Dr. Diomedes Quintero and Jean Carlos Ábrego);
MSNG Museo Civico di Storia Naturale “Giacomo Doria”, Genova, Italy (Dr. Maria Tavano);
INPA Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil (Dr. Márcio L. de Oliveira).

Additional acronyms mentioned in the catalog of species of Pirhosigma are:

AMNH American Museum of Natural History, New York, USA;
CMNH Carnegie Museum of Natural History, Pittsburgh, USA;
Type specimens of species potentially closely related to the new species were examined from the cited institutions (details in the taxonomic catalog). All examined specimens were dry pinned preserved ones. Examination was undertaken with a Leica S8 APO stereomicroscope. Photographs of structures of interest were obtained with a Canon EOS Rebel T6 digital camera attached to the stereomicroscope. The same camera with a Canon Macro 100 mm lens and a Yongnuo 2x Extensor were used for photographing specimen habitus. All images were captured using Canon EOS Utility software and using a light dome modified from Kawada and Buffington (2016). The final stacking of multiple layers was carried out with the Helicon Focus software.

Body length is taken from the frons to the hind border of T2 and expressed as an approximate measurement, as body position can modify it more or less substantially. Wing length is taken from the humeral angle of the wing at the border of the tegula to the wing tip and expressed as an approximate measurement, as wing position can affect the total measurement.

**Taxonomy**

*Pirhosigma abregoi* Garcete-Barrett & Hermes, sp. nov.

http://zoobank.org/A50BFD49-2125-49E6-88D2-873FDC30EEA9

Figs 1–7

**Comments and diagnosis.** This is the only species of *Pirhosigma* that does not present a preapical fossa in T1 (Fig. 5), which is present in all other species of this genus. However, this species presents all the other diagnostic features of *Pirhosigma*, such as the shape of T1, apically flask-shaped, with the apical lamella not preceded by a transverse swelling, and the basal portion with two laterally longitudinal carinae (Giordani Soika 1978; Carpenter and Vecht 1991) (Fig. 6). *Pirhosigma abregoi* differs from all other species of *Pirhosigma* by the following set of features: (i) absence of an evident preapical fossa on T1 (Fig. 5); (ii) pronotal carina in the shape of an inverted “V” in frontal view (Fig. 3), with a well-developed lateral lamella (Fig. 4); (iii) T2 oval, longer than wide, with evident, deep and spaced punctures (Fig. 7); (iv) lateral portion of the pronotum greatly shortened (Fig. 4); (v) short clypeus, wider than long (Fig. 2).

**Description.** *Holotype female.*

**Measurements.** Body length (from head to apex of T1): 5.5 mm; Forewing length (from mid tegula to apex): 6.07 mm.

**Color.** Body with predominantly brown-yellowish tegument. Yellow head, with a wide oval black mark on the frons, connected to a narrow black band extending to
Figures 1–6. Pirhosigma abregoi Garcete-Barrett & Hermes, holotype female 1 habitus 2 head, frontal view 3 pronotum, frontal view, arrow pointing to the pronotal carina in the shape of an inverted “V” 4 pronotum, lateral view, arrow pointing to the well-developed lateral lamella in the pronotal carina 5 T1, dorsal view, arrow pointing to the apical portion without a well-developed preapical fossa 6 T1, lateral view, arrow pointing to the well-developed longitudinal carina. Scale bars: 1 mm (1); 0.5 mm (2–6).

the occiput; brownish mark in the center of the clypeus. Mesosoma and metasoma with predominantly brown-yellowish tegument. Antennae with brownish scape and pedicel; progressively darker flagellum from the base to the apex. Mesoscutum totally
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blackened. Scutellum with a central black-brown spot. Brownish propodeum. Black mark in the basal portion of T1. Yellow marks more prominent in the regions that follow: parategulae; apical margin of T1; lateral and apical margins of T2; apical margin of S1. Brown wings.

**Structure.** Labrum truncated. Clypeus broader than long, with short and emarginated apex; small and not carinate apical teeth present. Interantennal region without cariniform elevation. Pronotal carina well developed in all its extension, in the shape of an inverted “V” in frontal view, with a well-developed lateral lamella. Lateral surface of pronotum narrow, with the distance between pronotal fovea and the mesepisternum smaller than the size of the fovea itself; pronotal fovea slit-shaped. Pretegular carina absent. Parategulae triangular. Sulcus between the scutellum and metanotum obsolete. T1 elongated, with basal portion longer than the apical portion; two lateral longitudinal carinae present, not reaching half of the segment; preapical fossa absent. T2 oval, longer than wide, with lamella well developed. S2 without abrupt basal elevation.

**Sculpture.** Clypeus without evident punctation. Frons and vertex with deep, coarse and abundant punctures, with space between them smaller than the size of a puncture. Pronotum with granular punctation, with shallow, abundant and slightly thickened punctures, distance between them smaller than the size of a puncture. Mesepisternum with deep punctures, denser in its upper portion; shallow and slightly evident punctures in its lower portion. Mesoscutum, scutellum and propodeum with deep and coarse punctures. Apex of T1 with evident shallow punctuation. T2 with well-marked deep punctuation, distance between them smaller than the size of a puncture.

**Pilosity.** Golden pubescence covering the entire surface of the body. Bristles shorter, thick and abundant on clypeus, frons, vertex, and mesosoma. Elongated, delicate and thin bristles in the metasoma.

**Male.** Unknown.

**Type material.** Holotype: PANAMA • 1 ♀; Peninsula Gigante, Barro Colorado Nature Monument; 30 Jul. 1990; A. Mena leg. (MIUP).

**Type locality.** Peninsula Gigante: Barro Colorado Nature Monument; Panama.

**Etymology.** This species is named after the Panamanian Biologist Jean Carlos Ábrego.

*Pirhosigma cambrai* Garcete-Barrett & Ferreira, sp. nov.

http://zoobank.org/73F75F9A-9304-437D-A8F6-957E2A33BF33

Figs 8–15

**Comments and diagnosis.** *P. cambrai* is quite similar to *P. mearimense* (Zavattari) and *P. sulcata* Ferreira & Hermes, sharing with them the S2 without a basal slope followed by an elevation (Fig. 14); T1 distinctly filiform with basal region of greater length than the apical portion (Figs 12–13); T2 wider than long (Fig. 15); pronotal carina well developed dorsally (Fig. 11); and a black body color, with few yellow marks (Fig. 8). *Pirhosigma cambrai* is distinguished from *P. mearimense* and *P. sulcata*
Figures 7–12. *Pirhosigma abregoi* Garcete-Barrett & Hermes, holotype female 7 T2 with an evident punctuation, dorsal view. *Pirhosigma cambrai* Garcete-Barrett & Ferreira, holotype female 8 habitus 9 head, frontal view 10 head, lateral view, arrow pointing to the curved clypeus apex 11 pronotum, dorsal view, arrow pointing to the well-developed dorsally pronotal carina 12 T1, lateral view, arrow pointing to the well-developed longitudinal carina. Scale bars: 1 mm (8); 0.5 mm (7, 9–12).
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**Figures 13–17.** Representatives of *Pirhosigma* species 13–15 *Pirhosigma cambrai* Garcete-Barrett & Ferreira, holotype female 13 T1, dorsal view, arrow pointing to the apex with a pre-apical fossa well-developed 14 T1 and S2, lateral view, arrow pointing to the S2 without a basal slope followed by an elevation 15 T2, dorsal view 16 *Pirhosigma mearimense* (Zavattari), female head, frontal view 17 *Pirhosigma sulcata* Ferreira & Hermes, holotype male head, frontal view. Scale bars: 0.5 mm (13–17).
Ferreira & Hermes by the presence of a short, wider than long clypeus (Fig. 9),
curved backwards (Fig. 10).

**Description.** Holotype female.

**Measurements.** Body length (from head to apex of T1): 5.10 mm; Forewing
length (from mid tegula to apex): 6.50 mm.

**Color.** Body with predominantly blackish tegument. Yellow marks as follows:
stripes on inner margin of compound eyes; upper surface of the gena; narrow range in
the antero-dorsal region of pronotum; narrow bands in the distal portions of the T1–T6

**Structure.** Labrum rounded, narrow. Clypeus broader than long, apically curved
backwards and with short, concave and emarginated apex; small and ecarinate apical
teeth present, with small distance between each other. Interantennal region without
cariniform elevation. Pronotal carina well developed dorsally, gently and roundly re-
curved in the humeral region. Lateral surface of pronotum narrow, with the distance
between pronotal fovea and the mesepisternum smaller than the size of the fovea itself.
Pretegular carina absent. Parategulae pointed. Sulcus between scutellum and metano-
tum obsolete. T1 distinctly filiform with basal region of greater length than the apical
portion; two lateral longitudinal carina present; preapical fossa present. T2 wider than
long, outlined as a half oval in dorsal view; well-developed apical lamella. S2 without
basal slope followed by an elevation.

**Sculpture.** Clypeus without evident punctuation. Frons and vertex with evident
and abundant punctures, with distance between them approximately smaller than
the size of a puncture; micro-punctuation evident. Pronotum, upper portion of the
mesepisternum, mesoscocum, scutelum, metanotum and propodeum with deep and
abundant punctures, with distance between punctures smaller than the size of a punc-
ture. Lower portion of the mesepisternum with shallow and sparse punctures, distance
between them approximately greater than the size of a puncture. T1 unpunctate. T2
with micro-punctuation evident.

**Pilosity.** Fine whitish pubescence covering the entire body. Whitish bristles cover-
ing the head, concentrated in the clypeus. Brownish, short and thin bristles on meso-
soma. Brownish and long bristles on T1–T6 and S2–S6.

**Male.** Unknown.

**Type material.** Holotype: PERU • 1 ♀; Madre de Dios, Manu Reserve, Pakitza
Station; 1–2 Mar. 1992; R. Cambra leg. (MIUP).

**Type locality.** Madre de Dios: Manu Reserve, Pakitza Station; Peru.

**Etymology.** This species is dedicated to the Panamanian entomologist Roberto
Cambra.

**Comments.** The holotype of *P. cambrai* sp. nov. (female, MIUP) was compared
with the holotypes of *P. mearimense* (Zavattari) (male, MSNG) and *P. sulcata* Ferreira
& Hermes (male, INPA). Additional material of *P. mearimense*, two males and two
females, were also analyzed (MSNVE). Unfortunately, the female of *P. sulcata* remains
unknown, but by the uniformity of the clypeus between the sexes of *Pirhosigma*, we
consider the comparison of this structure valid for the distinction between the species
*P. sulcata/P. mearimense* from *P. cambrai.*
Additional examined material. Pirhosigma mearimense (Zavattari): Holotype: BRAZIL • 1 ♂; Miarim; Gribodo leg. (MSNG). SURINAME • 1 ♂; Republiek; 6 May. 1963; J. v. d. Vecht leg. (MSNVE). 1 ♀; Republiek; 24 Sep. 1963; D. C. Geyskes leg. (MSNVE) PERU • 1 ♂; El Campamiente, Colonia Perene; 21 Jun. 1920; Giordani Soika leg. (MSNVE). BOLIVIA • 1 ♀; Buenavista, Dep. Sta Cruz; alt. 450 m. (MSNVE). Pirhosigma sulcata Ferreira & Hermes: Holotype: BRAZIL • 1 ♂; Amazonas, KM31 AM-010, CEPLAC; 18 Jun. 1976; Joselita M. Santos leg. (INPA).

Updated key to the species of Pirhosigma, adapted from Ferreira et al. (2017)

The species P. abregoi is readily differentiated from all other species in the key of Ferreira et al. (2017), since it is the only species that does not present a preapical fossa in T1 – compare Fig. 5: P. abregoi, without a preapical fossa on T1; and Fig. 13: P. cambrai, with a preapical fossa on T1.

1’ Preapical fossa on T1 absent (Fig. 5) ..............................................................................................................................................................................

– Preapical fossa on T1 present (Fig. 13) ....(couplet 1 in Ferreira et al. 2017)

The species P. cambrai runs to couplet 6 of Ferreira et al. (2017), which is modified as follows:

6 Pronotal carina well developed dorsally (Fig. 11); black, with a few yellow spots (Fig. 8) .................................................................................................................................................................

– Pronotal carina not evident dorsally; yellowish with black marks and bands ....8

6’ Short clypeus, wider than long (Fig. 9) ..............................................................................................................................................................................

– Clypeus longer than wide or almost as long as wide (Figs 16, 17)............. 7

7 Male with a well-marked groove between the metanotum and the scutellum [female unknown].........................................................
Pirhosigma sulcata Ferreira & Hermes

– Male without a well-marked groove between the metanotum and the scutellum .........................................................................................
Pirhosigma mearimense (Zavattari)

A Catalog of the genus Pirhosigma Giordani Soika (only taxonomic and nomenclatural procedures are indicated where they apply)

Type species: Eumenes simulans de Saussure, 1875, by original designation.

Type species: Eumenes pilosus Fox, 1899, by original designation and monotypy.

**Pirhosigma aenigmaticum** Giordani Soika, 1978


**Type Data:** Holotype female RMNH.
**Type Locality:** Valle Anchicaya, Cali, Colombia.


**Distribution:** Mexico, Costa Rica, Panama, Colombia, Venezuela, Ecuador.

**Pirhosigma deforme** (Fox, 1899)

*Eumenes deforma* Fox, 1899: 453, 461.

**Type Data:** Lectotype female CMNH.
**Type Locality:** Corumbá, Mato Grosso do Sul, Brazil.


*Eumenes deformata [!] barberoi* Bertoni, 1926: 76.

**Type Data:** Lectotype female by present designation (MNHNPY).
**Type Locality:** Puerto Bertoni, Paraguay.

*Eumenes deformata barberoi;* Bertoni 1934: 112, 118.


**Distribution:** Brazil, Paraguay.

**Remarks.** In the original description (Bertoni, 1926) of *Eumenes deformata barberoi*, the author did not mention how many specimens were part of the type series nor the locality where they were collected. Furthermore, Bertoni labelled seven specimens as *Eumenes deformata paranensis* (unpublished subspecific name), and the name *barberoi* was never attached to any specimen whatsoever. The lack of a locality, in this case, poses no issue, since all individuals bear a label with the locality “Puerto Bertoni”, where the author lived for many years and collected many of his specimens. Also, the only subspecific name proposed by Bertoni under the specific name *deformata* is indeed *barberoi*, which leaves no doubt about the members of the type series. Finally, the description matches these specimens, and one well-preserved female was chosen as the lectotype and labelled accordingly; the remainder of the specimens (two males and four females) are to be treated as paralectotypes.

Here we have the opportunity to correct the date of Bertoni’s paper “Hymenópteros nuevos o poco conocidos”. Though considered as published in December of 1925, as suggested in the heading of its cover, issue 2(1) of the “Revista de la Sociedad Científica del Paraguay”, was actually printed in 1926, as indicated in the foot of the very same cover. This paper contains the original descriptions of the species-level names *Zetamenes rufomaculata* ssp. *meridionalis* Bertoni, *Zetamenes filiformis* var. *costarricensis* Bertoni, *Discoelius strigosus* ssp. *costarricensis* Bertoni, *Pachymenes atra* var. *ornatissima*

**Pirhosigma limpidum** Giordani Soika, 1978


Type Data: Holotype female **MSNVE**.

Type Locality: Espírito Santo, Brazil.


Distribution: Brazil.

**Pirhosigma mearimense** (Zavattari, 1912)


Type Data: Holotype male **MSNG**.

Type Locality: Vitoria do Mearim, Maranhão, Brazil (Penati and Mariotti 2015).


*Pirhosigma mearimense mearimense*; Santos et al. 2015: 41.

*Pirhosigma mearimense putumayense* Giordani Soika, 1978: 245. **New status**.

Type Data: Holotype female **CUIC**.

Type Locality: Putumayo, Peru.

*Pirhosigma mearimense putumayense*; Rasmussen & Asenjo, 2009: 42.

Distribution: Suriname, Brazil, Peru, Bolivia.

**Remarks.** It is widely acknowledged by the vespid experts that Antonio Giordani Soika was very fond of proposing subspecies based solely on coloration (see Carpenter (1987) for a good example). We hereby treat *P. mearimense putumayense* as a mere color variation of the typical form.

**Pirhosigma pilosa** (Fox, 1899)

*Eumenes pilosa* Fox, 1899: 454, 461.

Type Data: Lectotype female **CMNH**.


*Tricomenes pilosus*; Giordani Soika 1978: 254 (inadvertent designation of lectotype).


Distribution: Ecuador, Brazil.

**Pirhosigma simulans** (de Saussure, 1875)

*Eumenes simulans* de Saussure, 1875: 91.

Type Data: Lectotype female **MHNG**.
Type Locality: Orizaba, Mexico.
*Zeteunenes simulans*; Bertoni 1934: 110.


Distribution: Mexico.

*Pirhosigma sulcata* Ferreira & Hermes, 2015

*Pirhosigma sulcata* Ferreira et al. 2015: 118.

Type Data: Holotype male **INPA**.

Type Locality: Km 31 AM-010, Ceplac, Amazonas, Brazil.

*Pirhosigma sulcata*; Ferreira et al. 2017: 277.

Distribution: Brazil.

*Pirhosigma superficiale* (Fox, 1899)

*Eumenes superficialis* Fox, 1899: 441, 460.

Type Data: Lectotype female **CMNH**.


*Eumenes superficialis mondaiensis* Bertoni, 1934: 118.

Type Data: Lectotype female by present designation (**MNHNPY**).

Type Locality: Puerto Bertoni, Paraguay.


*Pirhosigma superficiale impurum* Giordani Soika 1978: 230, 239.

Type Data: Holotype female **MCZ**.


*Pirhosigma superficiale impurum*; Carpenter and van der Vecht 1991: 211, 225 (synonym of typical *P. superficiale*).

Distribution: Brazil, Paraguay, Argentina.

**Remarks.** Bertoni (1934) mentioned 20 specimens, both males and females, which he randomly chose to provide the description of *Eumenes superficialis mondaiensis*. Fifteen out of these twenty specimens were found at the MNHNPY to be part of the type series. Seven specimens are labelled as from Puerto Bertoni, two from Assuncion and five from Vista Alegre. These localities were all mentioned in the original description, except for the latter. Bertoni (1934) also mentioned having examined specimens from
“Amambái (Norte)” which undoubtedly correspond to Vista Alegre, which is in the upper part of the Aguaray Guazu river in the Amabay Department and, according to Brêthes (1924), on the approximate coordinates 23°40’S, 55°50’W (though Brêthes indicated 33 degrees for the coordinate south, which was no doubt just a lapsus ending in an inadvertent error of 10 degrees). One well preserved female from Puerto Bertoni was chosen as the lectotype and labelled accordingly; the remainder of the specimens (six males and eight females) are to be treated as paralectotypes.

*Pirhosigma transfluvium* Ferreira & Oliveira, 2017


Type Data: Holotype male AMNH.

Type Locality: Beni: Rio Itenez, Bolivia.

Distribution: Bolivia.

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