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Taxonomic revision and morphometric analysis of *Meteorus* Haliday, 1835 (Hymenoptera: Braconidae: Meteorinae) from Colombia

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Abstract

Meteorus Haliday 1835 (Hymenoptera: Braconidae) is a cosmopolitan genus with nearly 250 species around the world. Its species are koinobiont endoparasitoids that use Coleoptera and Lepidoptera caterpillars as hosts, some of them are important agricultural pests. The *Meteorus* fauna is better known for the Palearctic, Nearctic, Afrotropical and Australian regions, but these wasps are poorly studied in the Neotropical region. From Colombia only two species have been previously reported. The goals of this paper are to study the taxonomic diversity of *Meteorus* from Colombia and to test the taxonomic value of morphometric characters used to discriminate species. The taxonomic value of the morphometric traits is tested using discriminant function analysis, principal components analysis and graphical exploration of data. A taxonomic key and diagnoses for the species are presented. Nineteen species are newly described: *M. amazonensis* sp. nov., *M. andreae* sp. nov., *M. antioquiensis* sp. nov., *M. boyacensis* sp. nov., *M. calimai* sp. nov., *M. caquetensis* sp. nov., *M. cecavorum* sp. nov., *M. chingazensis* sp. nov., *M. dixi* sp. nov., *M. farallonensis* sp. nov., *M. guacharensis* sp. nov., *M. guineverae* sp. nov., *M. huilensis* sp. nov., *M. iguaquiensis* sp. nov., *M. jerodi* sp. nov., *M. magdalensis* sp. nov., *M. muiscai* sp. nov., *M. quimbayensis* sp. nov., *M. santanderensis* sp. nov. Sixteen species are new records for Colombia: *M. alejandromasisi* Zitani, *M. arizonensis* Muesebeck, *M. corniculatus* Zitani, *M. desmiae* Zitani, *M. dimidiatus* (Cresson), *M. dos* Zitani, *M. mariamartae* Zitani, *M. megalops* Zitani, *M. oviedo* Shaw & Nishida, *M. papiliovorus* Zitani, *M. pseudodimidiatus* Zitani, *M. rogerblancoi* Zitani, *M. rugonasmus* Shaw & Jones, *M. townsendi* Muesebeck, *M. uno* Zitani, *M. yami-juanum* Zitani. Most of the new species are found in Andean forests above 2000 m. New hosts are recorded for *M. alejandromasisi*, *M. laphygmae*, *M. papiliovorus* and *M. rubens*. The morphometric traits of the head are the most useful for separating species. In contrast, the wings traits are very labile and species differentiation with only wing characters is difficult.

Key words: *Meteorus*, Colombia, parasitoid, Braconidae, taxonomy, morphometry

Introduction

The Braconidae comprise almost 17,605 species (Yu *et al.* 2005) whose members develop as parasitoids on other insect orders (Wharton *et al.* 1997). The subfamily Meteorinae is composed of two genera, *Zele* Curtis and *Meteorus* Haliday (Shaw 1997), the latter being a cosmopolitan genus with more than 250 species (Shaw & Jones 2009) composed of koinobiont endoparasitoids of Lepidoptera and Coleoptera (Shaw 1997). To date, 653 host species are known for this genus (Yu *et al.* 2005, Shaw & Jones 2009) and several meteorines have been used to control insect pests (Shaw 1997).

Taxonomic revisions of *Meteorus* have been conducted for some regions including the Nearctic (Muesebeck 1923), African (Nixon 1943), west Palaearctic (Huddleston 1980), Australian and New Guinea (Huddleston 1983), and east Palaearctic (Chen & Wu 2000). The Neotropical region has received attention only recently. Zitani *et al.* (1998) revised the Costa Rican *Meteorus* species lacking dorsopes, recorded five previously named species and described fourteen new species. Shaw & Jones (2009) described from eastern Ecuador the first *Meteorus* species attacking ithomiine nymphalid caterpillars. However, for the remaining megadiverse countries, such as Brazil, Peru, Venezuela, Bolivia and Colombia, the genus has been poorly studied. In Colombia only *M. laphygmae* Viereck, *M. rubens* (Nees von Esenbeck) and *M. gigas* Aguirre, Shaw & Jones are previously known (López-Ávila 1981, García 1993, Aguirre *et al.* 2010).

Muesebeck (1923) and Huddleston (1980) discussed characters to distinguish *Meteorus* species and both authors agreed that the dorsopes, the ventral borders of first tergite, the ovipositor length, the ocelli size and the malar space length, are helpful characters. However, Muesebeck gives more importance to the wing venation characters while Huddleston considers that the shape of head is the most important. Zitani *et al.* (1998) mostly agreed with Huddleston although she found that the length of vein r / vein 3RSa ratio, that describes the second submarginal cell shape of fore wing, is useful to diagnose *M. congregatus* Muesebeck and *M. papiliovorus* Zitani from several others.

Given the populational nature of the species and the continuous characters studied in the *Meteorus*, a formal morphometric analysis is a reliable approach to assess the taxonomic value of these characters (MacLeod *et al.* 2008, Heraty & Polaszek 2000). Thus, the purposes of this paper are to provide a revision of the genus *Meteorus* from Colombia and to study the taxonomic value of the morphometric characters currently used to discriminate its species.