

A new brachypterous species of *Heterospilus* Haliday (Braconidae, Doryctinae) from the Neotropical Region

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Abstract

A new species, *Heterospilus michaeli* Kula, from the Neotropical Region is described and differentiated from all other New World species of Doryctinae with brachypterous or apterous individuals. It is the first species of *Heterospilus* Haliday in the Neotropical Region known to exhibit brachyptery and the fourth described brachypterous species of *Heterospilus* worldwide. Errors and omissions in a recently published article on brachypterous and apterous doryctines in the New World are corrected.

Keywords

Apterous, aptery, brachyptery, Neotropical, parasitoid, taxonomy

Introduction

Kula (2011) described *Heterospilus belokobylskiji* Kula and *Heterospilus vincenti* Kula, the first New World species of *Heterospilus* Haliday known to exhibit either brachyptery or aptery. There were also two brachypterous species of *Heterospilus* known from the Palearctic Region, *Heterospilus brachyptera* (Jakimavicius, 1968) and *Heterospilus he-*

mipterus (Thomson, 1892), at that time. Belokobylskij and Kula (2012) synonymized the two aforementioned species. A new brachypterous species of *Heterospilus* from the Neotropical Region was discovered following the publication of Kula (2011). The new species is described herein, increasing the total number of brachypterous species of *Heterospilus* worldwide to four.

Belokobylskij and Kula (2012) provided thorough background on brachyptery and aptery in Braconidae. Kula (2011) discussed the New World doryctines that exhibit brachyptery and aptery and provided a table indicating wing conditions for each species. However, errors and omissions were discovered in the discussion and table after Kula (2011) was published; they are corrected in this article. Additionally, research carried out as part of Belokobylskij and Kula (2012) elucidated wing conditions previously unknown or not reported for certain species in table 1 of Kula (2011). Therefore, the table is updated and included in this article.

Materials and methods

Specimens of the new species described herein were borrowed from the University of Wyoming Insect Museum, Laramie, U.S.A. (ESUW). They were examined as in Kula (2009), and their placement in *Heterospilus* was determined through reference to Marsh (2002), Marsh (1997), and Seltmann and Sharkey (2007). Specimens of the new species were compared with the holotypes of *H. belokobylskiji* and *H. vincenti*, as well as the paratype of each species (all in the Smithsonian Institution National Museum of Natural History, Washington, DC, U.S.A. [USNM]). The new species was differentiated from *H. hemipterus* using data in Belokobylskij and Kula (2012). Additionally, specimens of all New World species of Doryctinae with brachypterous or apterous individuals except *Oroceguera andersoni* Seltmann & Sharkey and *Psenobolus triangularis* van Achterberg & Marsh were examined as part of research reported in Kula (2011). See Kula (2011) for details on the numbers and kinds of specimens examined. *Ecphyllus caudatus*, known from the Palearctic and Oriental regions, was mistakenly included in the list of specimens examined in Kula (2011) instead of the Nearctic species *Ecphyllus arcuatus* Muesebeck. However, the holotype and six paratypes of *E. arcuatus* (all in the USNM) were examined as part of that research. Additionally, the author does not consider *Ecphylopsis swezeyi* Beardsley a species of *Heterospilus* as suggested in Marsh (2002) based on examination of that species as discussed in Kula (2011).

Terminology for morphological features, setation, and surface sculpture follows references listed in the materials and methods of Kula (2011). Wing conditions in Table 1 are characterized as brachypterous, micropterous, or apterous as in Belokobylskij and Kula (2012). Measurements, abbreviations, and imaging are as in Kula (2011). The maxillary and labial palpi were obscured in both female specimens of the new species. Therefore, data on penultimate maxillary palpomere length:flagellomere 1 length ratio are not presented in the description of the female.

Table 1. Species of Doryctinae in the New World, excluding ypsistocerines, that exhibit brachyptery, microptery, or aptery.

Species	♀ wing condition	♂ wing condition
<i>Aptenobracon formicooides</i> Marsh	apterous	apterous
<i>Ecphylopsis costaricensis</i> Marsh	micropterous	micropterous
<i>Ecphylus arcuatus</i>	macropterous	micropterous
<i>Ecphylus lepturgi</i> Rohwer	apterous macropterous	apterous macropterous
<i>Ecphylus pacificus</i> Marsh	apterous macropterous	apterous
<i>Ecphylus schwarzii</i> (Ashmead)	apterous macropterous	apterous
<i>Heterospilus belokobylskiji</i> Kula	brachypterous	brachypterous
<i>Heterospilus michaeli</i> Kula, new species	brachypterous	brachypterous
<i>Heterospilus vincenti</i> Kula	brachypterous	brachypterous
<i>Oroceguera andersoni</i> Seltmann and Sharkey	apterous	unknown
<i>Pambolidea yuma</i> Ashmead	micropterous brachypterous macropterous	apterous micropterous
<i>Psenobolus ficarius</i> Ramirez and Marsh	macropterous	brachypterous
<i>Psenobolus parapygmaeus</i> Ramirez and Marsh	macropterous	brachypterous
<i>Psenobolus triangularis</i> van Achterberg and Marsh	unknown	brachypterous

Results and discussion

Heterospilus michaeli Kula, new species can be differentiated from some brachypterous or apterous doryctines in the New World (excluding ypsistocerines) by the condition of the wings (Table 1). Additionally, *H. michaeli* can be differentiated from all brachypterous or apterous New World species of Doryctinae using the same morphological features Kula (2011) used to differentiate *H. belokobylskiji* and *H. vincenti* from those species. *Ecphylus caudatus* was mistakenly included in both table 1 and the discussion of diagnostic features in Kula (2011) instead of *E. arcuatus*. However, as was reported under the name *E. caudatus* in Kula (2011), the metacoxa is round at the base in *E. arcuatus*; it has a tubercle at the base in *H. michaeli*.

Taxonomy

Heterospilus michaeli Kula, sp. n.

<http://zoobank.org/34A1D33D-49A6-4914-8FBC-619D6C47EC84>

http://species-id.net/wiki/Heterospilus_michaeli

Figs 1–2

Holotype female. Top label (white; partially handwritten, partially typewritten) = “Costa Rica: Guanacaste [;] Santa Rosa National Pk. [;] 300m, Malaise, Ian Gould

[sic] [;] 14.vi 1986". Second label (white; partially handwritten, partially typewritten) = "Bosque Humedo [;] mature dry forest [;] high proportion [;] evergreen species [;] Sun." Third label (white; typewritten) = "BH-11-0 [;] 14. Vi. 86" (ESUW).

Paratypes. 1 ♀ 9 ♂ same data as holotype (6 ♂ ESUW, 1 ♀ 3 ♂ USNM); 1 ♂ Costa Rica: Guanacaste Santa Rosa Natl. Park 300m, ex. [sic] Malaise trap Site #: Dates: 24.v–14.vi 1986 I.D. Gauld & D. Janzen [H] open regenerating woodland <10 years old [C] more or less fully shaded as possible (ESUW).

Diagnosis. The vertex is entirely strigate in *H. michaeli*; it is smooth except a pair of small strigulate areas posterolaterad the lateral ocelli in *H. belokobylskiji* and entirely coriaceous in *H. vincenti*. The frons is entirely strigate in *H. michaeli*; it is entirely coriaceous in *H. vincenti*. The head is yellow in *H. michaeli* (Fig. 1); it is brown in *H. belokobylskiji* (Kula 2011: figs 1–2) and reddish brown in *H. hemipterus* (Belokobylskij and Kula 2011: fig. 110). The forewing stigma is distinct in *H. belokobylskiji* (Kula 2011: fig. 2) and *H. hemipterus* (Belokobylskij and Kula 2011: fig. 110); it is indistinct in *H. michaeli*, with only thickened sclerotization at the wing apex. The hind wing stigma is located slightly apicad the middle of the wing in *H. michaeli* (Fig. 2); it is slightly basad the middle of the wing in *H. belokobylskiji* (Kula 2011: fig. 2) and at the wing apex in *H. vincenti* (Kula 2011: fig. 4). The flagellum is entirely yellow in *H. michaeli* females, and in males it transitions from yellow proximally to whitish yellow or white distally. The flagellum transitions from yellow proximally to brown distally in *H. belokobylskiji*, *H. hemipterus*, and *H. vincenti* females and males.

Description. Female (Fig. 1).

Body length. 2.10–2.51 mm.

Head. HL 0.72–0.74× HW, HW 1.09–1.11× TW, FW 1.73–1.85× FH, EL 0.77–0.83× EH, MSH 0.72× EH, F1L 0.87–0.94× F2L; antenna with 20 flagello-meres; mandible with two teeth, tooth closest to labiomaxillary complex shorter than other tooth, setiferous; malar space smooth, setiferous, malar suture absent; clypeus with roughly apical 1/3 setiferous and basal 2/3 glabrous; face entirely smooth or smooth mesally and rugulose laterally, glabrous mesally and setiferous laterally; frons strigulate, glabrous except one to two setae along margin of eye; vertex strigulate, setiferous; ocelli present and small but slightly larger than in *H. belokobylskiji* and *H. vincenti*; gena smooth with a few strigae posteriorly, setiferous; occiput smooth, glabrous except a few setae ventrally on both sides of head.

Mesosoma. ML 3.07–3.33× MW, ML 1.93–2.06× MH, MW 0.62–0.63× MH, SSL 0.40–0.45× SSW; pronotal collar with transverse carina or transverse rugosities, anterior portion rugulose and posterior portion crenulate, collar setiferous anteriorly and mesally, pronope absent, lateral portion of pronotum rugulose to rugose except pronotal groove crenulate, roughly setiferous along margins and glabrous mesally; notauli complete and meeting posteromesally, crenulate-rugose; mesoscutal midpit absent; mesoscutum (excluding lateral margin and notauli) coriaceous, setiferous along margins and notauli; scutellar sulcus with median longitudinal carina only or median longitudinal carina and pair of crenulae adjacent to carina; scutellar disc weakly coriaceous, setiferous along lateral and posterior margins; propodeum strongly carinate,



Figures 1–2. Lateral habitus images of *Heterospilus michaeli*, scale bars = 1.00 mm. **1** Holotype female
2 Paratype male.

setiferous, carinae forming hastate areola mesally, sculpture within areola areolate-rugose, basal 1/2 of propodeum divided into median and lateral areas by dorsal lateral carinae, median area coriaceous and lateral area rugose to areolate-rugose, apical 1/2 areolate-rugose; subalar groove crenulate; precoxal sulcus present in roughly anterior 1/2 of mesopleuron, crenulate; posterior mesopleural furrow crenulate; mesopleuron (excluding subalar groove, precoxal sulcus, and posterior mesopleural furrow) coriaceous, setiferous except glabrous area between subalar groove and precoxal sulcus; metapleuron areolate-rugose, setiferous; metacoxa with anteroventral basal tubercle.

Forewing. Brachypterous, extending slightly posteriad middle of propodeum (including fringe); hyaline; stigma absent but with thickened sclerotization at wing apex; venation limited to one tubular vein each along anterior and posterior margins (likely C+SC+R and 1A, respectively) and one tubular vein mesally (likely M+CU), vein along posterior margin converging with vein mesally slightly before wing apex, vein mesally converging with vein along anterior margin at wing apex.

Hind wing. Brachypterous, extending slightly posterior to middle of propodeum (including fringe); basal and subbasal cells enclosed by veins, with veins enclosing cells differing in width and sclerotization but especially wide and sclerotized mesally posterior to apex of subbasal cell.

Metasoma. T1L 0.91× T1W; subcylindrical; ovipositor with minute teeth ventrally, EOL about 2.07–2.21× T2+T3L; ovipositor sheaths setiferous, setae increasing in density anteriorly to posteriorly; T1 costate-rugose, dorsal carinae sharply defined in roughly anterior 1/4 of tergum then blending posteriorly with other sculpture on tergum, setiferous; T2 costate-rugose, setiferous; transverse groove between T2+T3 weakly impressed, one specimen with and one without smooth transverse band posteriad impression; T3 anterior 1/2 costate and posterior 1/2 smooth, setae forming single transverse row in middle of tergum; T4–T8 smooth, setae forming single transverse row in middle or posterior 1/2 of tergum.

Color. Head (excluding mouthparts and antenna) yellow, mouthparts whitish yellow except mandible yellow with teeth brown, antenna yellow; mesosoma brownish yellow to yellow; wing venation tan; legs yellow to brownish yellow; T1 brownish yellow to yellow, T2–T8 yellow.

Male (Fig. 2). As in female except:

Body length. 1.79–2.36.

Head. HL 0.71–0.76× HW, HW 1.09–1.14× TW, FW 1.50–1.90× FH, MSH 0.62–0.68× EH, PMPL 0.60–0.80× F1L; antenna with 17–20 flagellomeres; gena smooth with a few strigae posteriorly or entirely smooth.

Mesosoma. ML 3.00–3.27× MW, ML 2.08–2.25× MH, MW 0.64–0.70× MH, SSL 0.40–0.50× SSW; lateral portion of pronotum smooth with a few rugosities to rugose except pronotal groove crenulate; notauli crenulate-rugose to crenulate; scutellar disc weakly coriaceous or entirely smooth; mesopleuron (excluding subalar groove, precoxal sulcus, and posterior mesopleural furrow) rugulose to coriaceous.

Forewing. Brachypterous, extending roughly to middle or posterior margin of T1 (including fringe); one specimen with indistinct veins likely corresponding to 1RS,

1M, RS+M, and 1CU in addition to three distinct horizontal veins (likely C+SC+R, M+CU, and 1A).

Hind wing. Brachypterous, extending roughly to or slightly posteriad middle of T1 (including fringe); stigma slightly apicad middle of wing, subelliptical; basal and subbasal cells enclosed by tubular veins except delimited distally by stigma, basal cell delimited ventrally by M+CU vein, 1M vein absent; R1 vein tubular.

Metasoma. T1L 1.21–1.36× T1W; transverse groove between T2+T3 weakly impressed, with or without smooth transverse band posteriad impression; T3 anterior 1/2 costate to costate-rugulose and posterior 1/2 smooth; T4–T8 smooth except T4 sometimes (40%) with a few faint carinae mesally.

Color. Antenna yellow proximally transitioning to whitish yellow or white distally; metathoracic leg with coxa, femur, and tibia brown in one specimen; T3–T5 yellow with posterior edge brown or slightly darker.

Host. Unknown.

Etymology. This species is named for the author's son, Michael Alden Kula.

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