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Discovery of the female of *Bradepyris jordanicus* Barbosa et Azevedo, 2015, the first macropterous mesitiine without 2r-rs&Rs vein (Hymenoptera: Bethylidae)

Celso O. Azevedo

Universidade Federal do Espírito Santo, Departamento de Ciências Biológicas, Av. Fernando Ferrari 514, Goiabeiras, 29.075-910, Vitória ES, Brazil.
E-mail: bethylidae@gmail.com

Abstract – The hitherto unknown female of *Bradepyris jordanicus* Barbosa et Azevedo, 2015 (Hymenoptera: Bethylidae: Mesitiinae) is reported and described based on specimens collected at the type locality.

Key words – Chrysidoidea, ectoparasitoid, Mesitiinae, sexual dimorphism, wing venation

INTRODUCTION

The Hungarian National Museum Public Collection Centre – Hungarian Natural History Museum, Budapest (HNHM) holds the most important collection of Mesitiinae (Hymenoptera: Bethylidae) of the world due to the major efforts of László Móczár (Barbosa & Azevedo 2015). While visiting this museum for the second time in 2023, I found two females and a male pertaining to the genus *Bradepyris* Kieffer, 1905 (subfamily Mesitiinae) from Jordan. I immediately recognised the male as *Bradepyris jordanicus* Barbosa et Azevedo, 2015 and raised the initial hypothesis that the females could be conspecific because of their morphological similarity.

Given the fact that species of *Bradepyris* are rarely collected, specimens are hardly found in museums, and only one species has both sexes formally described, I have taken the opportunity to examine these females more deeply in order to investigate the pattern of conspecificity of males and females in this genus, and then improve the taxonomic boundaries of the genus and its included species.

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MATERIAL AND METHODS

The examined material is deposited in the Hymenoptera Collection of the HNHM. Terminology for integumental sculpture follows Harris (1979), general morphological terminology Azevedo *et al.* (2018) and Lanes *et al.* (2020), while terms concerning the mesopleuron follow Brito *et al.* (2021).

The illustrations were made by using a Leica MZ80 stereomicroscope. Images were obtained using a Leica MD2500 microscope magnifying glass attached to a Leica DFC 495 video camera, captured using Leica LAS (Leica Application Suite V3.6.0) Microsystems, and were combined using Helicon Focus (version 4.2.9), rendered based on Method C (Pyramid).

Figs 1–2. Habitus of *Bradepyris jordanicus* Barbosa et Azevedo, 2015, dorsal view, 1 = female, 2 = male. Scale bar = 500 μm (photos by Wilson José Marques Jr)

RESULTS

Bradepyris jordanicus Barbosa et Azevedo, 2015 (Figs 1–8)

Material examined – Holotype (male), "JORDAN, Wadi Sir, 600m, 20.4.56, J. Klapperich"; deposited in the HNHM; one male and two females, same label data as holotype, deposited in the HNHM.

Description – Female (Figs 1, 3–5). Body length 3.46 mm, length of forewing 1.65 mm.

Colour: Head and mesosoma dark castaneous, almost black, posterior surfaces of dorsal pronotal area and mesoscutellum lighter; clypeus, antenna, mandible, palpi, tegula and legs castaneous; forewing subhyaline with a median longitudinal spot lighter, hind wing hyaline, veins castaneous.

Head (Fig. 3): 1.2× as long as wide, barrel-shaped with sides hardly outcurved, hardly converging both anterad and posterad. Vertex slightly outcurved. Dorsal surface of head accentuated outcurved. Frons coriaceous, each unit well defined, large and flat, punctures shallow, somewhat large and irregularly sparse, frontal line sulcate, short, only slightly longer than torulus. Malar space 0.32× as long as eye and 0.43× as long as vertex-ocular line, eye placed slightly more anterior than posteriorly. Median clypeal lobe well delimited, subtrapezoidal, latero-anterior corner slightly produced, median clypeal carina complete, high, mostly straight in profile, surface progressively higher mesad, so that cross-section of lobe being somewhat triangular; lateral clypeal lobe short, separated of median lobe by rounded emargination. Mandible about evenly wide across its length, both ventral and dorsal margins straight, apical margin conspicuously inclined with four sharpened teeth, progressively larger ventrad. Palpal formula 6:3, palpomeres caliciform with cylindrical cross-section. Toruli conspicuous and well protruding from cephalic surface, slightly wider than long, their bases touching each other. Antenna slender; scape strongly curved, progressively wider apicad; pedicel about twice as long as wide, and about twice wider apically than basally when seen laterally, but only slightly wider apically when seen dorsally; flagellomeres progressively less caliciform and shorter apicad, median ones about as long as wide; antennal pubescence subappressed, somewhat dense, short, with some setae outstanding regular pubescence also subappressed. Eye with few long setae, slightly protruding from cephalic surface, lateral contour surpassing sides of head. Ocellar triangle broad, distance between posterior ocelli about 4.0× their diameter, its width about 0.9× its distance to eye, ocelli small and somewhat inconspicuous, anterior ocellus slightly smaller than posterior ones, anterior angle about right, area among ocelli slightly elevated. Occipital carina conspicuous, complete, partially visible in dorsal view of head.

Mesosoma (Fig. 4): Dorsal pronotal area bell-shaped in dorsal view, anterior slope inclined in lateral view; without sulci or carinae, coriaceous, with few punctures progressively smaller and sparser posterad. Mesoscutum coriaceous, with very few small punctures, almost as long as mesoscutellum; without longitudinal mesoscutal sulcus. Notauli well impressed, almost reaching posterior margin of mesoscutum, evenly arched and wide, clearly converging posterad, weakly and sparsely trabeculate inside. Parapsidal signa weakly impressed, especially anteriorly, shallow, straight, slightly converging posterad. Mesoscuto-scutellar sulcus deep, evenly wide, medially straight, but angled laterally to form mesoscuto-scutellar fovea, the latter being slightly more dilated than sulcus. Metascutellum wide, occupying more than median third, surface lower than mesoscutellum, partially overlapped by it, metascutellar arm overlapping latero-posterior surface of mesoscutellum, metanotal trough slightly concave, inconspicuously trabeculate. Metapectal-propodeal disc 0.63× as wide as long; metapostnotal median and metapostnotal propodeal carinae complete and well impressed, posterior third of latter slightly converging posterad; surface between metapostnotal propodeal carinae with irregular and weak rugosities; surface between metapostnotal propodeal and paraspiracular carinae mostly coriaceous, but very weakly rugulose peripherally; paraspiracular carina incomplete posteriorly where anastomosed with weak rugosities; lateral marginal and transverse posterior carinae complete and well defined; posterior propodeal projection very small. Propodeal declivity strongly coriaceous, with conspicuous and complete median carina. Lateral surface of metapectal-propodeal complex mostly areolate, submarginal carina missing. Mesopleuron mostly coriaceous, areolate posteriorly, posterior oblique sulcus wide and trabeculate. Probasisternum small, diamond-shaped, profurcal pit very deep.

Wings (Fig. 5): Forewing with C cell very narrow and folded across its length; R cell shorter than 1Cu cell; Rs&M vein almost straight, not angulate at all; cu-a vein outcurved, but hardly bi-angulate, so that seemingly having three parts; prestigmal abscissa of radial 1 vein almost as long as Rs&M vein; pterostigma enlarged, with distal margin straight; poststigmal abscissa of radial 1 vein entirely absent; 2r-rs&Rs vein almost entirely absent, reduced to a stub much shorter than wide. Hind wing with only one basal straight hamulus, without any distal hamuli.

Legs: Protibial spur formula 1:2:2, all spurs with comb along whole inner margins; protibial spur 0.25× as long as protibia and 0.5× as long as probasitarsus. Protibia and metatibia not spinose, mesotibia spinose distally. Probasitarsus almost as long as remaining protarsomeres, inner surface almost entirely excavated, comb occupying almost all inner surface. Meso- and metatarsomeres spinose distally. Tarsal claws curved, sharpened with one small ventral median sharpened tooth.

Metasoma: Tergite I weakly varying from coriaceous anteriorly to polished posteriorly, units large and flat, anterior surface vertical, posterior surface distinctly horizontal; tergite II 1.5× as long as tergite I, coriaceous except extreme posterior band almost polished, units large and flat; remaining tergites coriaceous with units much smaller than preceding tergites, posterior bands always almost polished or nearly so. Sternite I rugose anteriorly and strongly coriaceous posteriorly; remaining sternites coriaceous with polished at very extremely posterior bands, units flat, progressively smaller posterad.

Figs 3–8. *Bradepyris jordanicus* Barbosa et Azevedo, 2015, dorsal view, 3 = head of female, 4 = mesosoma of female, 5 = forewing of female, 6 = head of male, 7 = mesosoma of male, 8 = forewing of male. Scale bar = 100 μm (photos by Wilson José Marques Jr)

DISCUSSION

Bradepyris contains 15 species of Mediterranean distribution, with records from Algeria, Gibraltar (United Kingdom), Israel, Jordan, Morocco, Spain (both the Iberian Peninsula and the Baleares), and Tunisia (Table 1). Five species are known only by males, nine only by females, and only one species has both sexes known (Table 1). The single male-female association in *Bradepyris* was established for *B. validithorax* (Duchaussoy, 1916) by Nagy (1972) based on morphological similarity; however, in this case the female is brachypterous and the male is macropterous.

Table 1. Wing form and distribution of species of *Bradepyris* Kieffer, 1905

Species	Wing form of female	Wing form of male	Distribution
B. apterus Kieffer, 1906	apterous	?	Tunisia
B. armatus Kieffer, 1911	micropterous	?	Morocco
B. balearicnsis Barbosa et Azevedo, 2015	?	macropterous	Baleares
B. dimorphus (Kieffer, 1911)	brachypterous	?	Morocco
B. fuscipennis (Kieffer, 1906)	?	macropterous	Algeria, Israel, Morocco, Spain
B. inermis Kieffer, 1906	?	micropterous	Morocco
B. jordanicus Barbosa et Azevedo, 2015	macropterous	macropterous	Jordan
B. levis (Móczár, 1986)	micropterous	?	Gibraltar
B. micropterus Kieffer, 1910	micropterous	?	Morocco
B. numidus (Marshall, 1906)	macropterous	?	Algeria
B. pardoi (Móczár, 1984)	brachypterous	?	Morocco
B. proximus (Kieffer, 1906)	?	macropterous	Spain
B. squamifer Kieffer, 1911	micropterous	?	Morocco
B. suarezi (Móczár, 1984)	micropterous	?	Morocco
B. validithorax (Duchaussoy, 1916)	brachypterous	macropterous	Algeria, Morocco

Although species of *Bradepyris* are quite uniform in general morphology (Barbosa & Azevedo 2015), apterous, micropterous, brachypterous and macropterous females exist. Males, however, are predominantly macropterous; micropterous males were reported for only one species. Thus, the degree of development of the wings is one of the most variable features in *Bradepyris*. Notably, *B. jordanicus* is the first species in this genus where both sexes are known to be macropterous (Figs 1–2).

Females of this species are morphologically similar to the males (Figs 1–8); however, there are two remarkable differences. First, the head of females is barrel-shaped with sides hardly outcurved, almost parallel, hardly converging both anterad and posterad (Fig. 3), whereas the head of males has more accentuated outcurved sides, making the head somewhat subpentagonal (Fig. 4). The elongated head with parallel sides in females is an adaptation for walking in galleries while searching for hosts. This pattern of dimorphism is known in several species of Bethylidae, for example *Plastanoxus westwoodi* (Kieffer, 1914), *Cephalonomia formiciformis* Westwood, 1833, *Cephalonomia urichi* Brues, 1920, and *Rysepyris vison* (Evans, 1970). In some genera of Pristocerinae, such as *Dissomphalus* Ashmead, 1893 and *Pseudisobrachium* Kieffer, 1904; almost all species possess a parallel-sided or nearly parallel-sided head.

The second main difference is the absence of the 2r-rs&Rs vein in the forewing. The males follow the usual venation pattern in Bethylidae, exhibiting an elongated 2r-rs&Rs vein (Fig. 8). This vein, however, is reduced to an imperceptible stub in females, which is much shorter than wide, to such an extent that one could consider it as virtually absent (Fig. 7). The absence of this vein in macropterous Bethylidae is rare: it has been documented only in one of the 72 species of *Laelius* Ashmead, 1893 (Marques *et al.* 2023), one of the three species of *Alongatepyris* Azevedo, 1992 (Colombo *et al.* 2022), one of the six species of *Nothepyris* Evans, 1973 (Colombo & Azevedo 2023), three of the five species of *Solepyris* Azevedo, 2006 (Colombo & Azevedo 2024), just to cite few instances. The case of *Bradepyris jordanicus* is particularly interesting because no other macropterous species is known with the males having a long 2r-rs&Rs vein in the forewing, while the females having a reduced one, adding one more kind of sexual dimorphism to Bethylidae.

An alternative hypothesis to be considered is that the females treated here represent an undescribed species, with so far unknown males. This option has, however, been discarded, given the strong general morphological similarity between them and the male holotype of *Bradepyris jordanicus*, with differences restricted only to the above two features mentioned above. Although geographic distribution is not a criterion for delimiting species, taking two pairs of a rarely collected genus in the same locality, at the same date, by the same person apparently also supports the conspecificity of the material studied.

*

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