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1 A new species of the long-legged fly genus *Microphorites* in Burmese amber (Dolichopodidae:  
2 Microphorinae)

3

4 Valerie Ngô-Muller<sup>a,b</sup>, Romain Garrouste<sup>b</sup>, Jean-Marc Pouillon<sup>c</sup>, André Nel<sup>b</sup>

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6 <sup>a</sup>*UFR Sciences du Vivant, Université Paris Diderot, Université de Paris, Paris, France*

7 <sup>b</sup>*Institut de Systématique, Évolution, Biodiversité, ISYEB – UMR 7205 – CNRS, MNHN,*

8 *UPMC, EPHE, Muséum national d’Histoire naturelle, Sorbonne Universités, Paris, France*

9 <sup>c</sup>*Nivolas Vermelle, France*

10

## 11 **ABSTRACT**

12 We describe *Microphorites pouilloni* sp. nov., as first representative of this Cretaceous–  
13 Paleogene genus of Dolichopodidae Microphorinae from the mid-Cretaceous Burmese amber.  
14 The oldest records of this genus of small Diptera are from the early Cretaceous Lebanon and  
15 Jordan, while the Burmese amber was probably produced on an island during the mid-  
16 Cretaceous, which had separated from Gondwana during the Jurassic. This situation suggests a  
17 possible late Jurassic origin for the genus *Microphorites*.

18

19 *Keywords:* Diptera

20 Empidoidea

21 sp. nov.

22 paleobiogeography.

23

## 24 **1. Introduction**

25 The subfamily Microphorinae is a small group of empidoid flies classified within the  
26 Dolichopodidae (Sinclair and Cumming, 2006; Wahlberg and Johanson, 2018). It contains 47  
27 extant described species in two genera and 16 extinct species in two extant and four fossil  
28 genera (Brooks et al., 2019). They are recorded in the early Cretaceous Lebanese and Jordan  
29 amber, the mid-Cretaceous of Spain and France, the late Cretaceous of France, and the  
30 Paleogene amber of Czechia and France. Brooks et al. (2019) recently described two fossil  
31 species they attributed to the extant genus *Schistostoma* Becker, 1902, from the mid-Cretaceous  
32 Burmese amber. Tang et al. (2019) also described a monospecific genus *Pristinmicrophor* from  
33 the same amber. *Microphorites* Hennig, 1971 is the most diverse extinct genus, with eight  
34 described species from Lebanon, Jordan, France, Spain, and Moravia. Curiously no  
35 *Microphorites* have been recorded from the very rich Burmese amber (Ross, 2019) until now.  
36 Here we describe a new species of *Microphorites* from this amber, based on a well-preserved  
37 male specimen. This new finding is of interest for the knowledge of the Cretaceous distribution  
38 of this genus.

39

## 40 **2. Material and methods**

41 The type of *Microphorites pouilloni* sp. nov. is embedded in a small clear piece of amber  
42 together with another small Diptera: Brachycera. They were separated and the type was  
43 prepared using a diamond disk and examined using a Nikon binocular microscope SMZ 1500.  
44 Photographs were taken with a Nikon camera D800, and the images were treated with Adobe  
45 Photoshop Element 12. The piece of Burmese amber was found in deposits in the Hukawng  
46 Valley (Kachin) of Myanmar (Yin et al., 2018: fig. 1A). The age of amber is confirmed by  
47 radiometric analysis of zircons as earliest Cenomanian, *ca.* 99 Ma. (Shi et al., 2012). We follow  
48 the classification of Brooks et al. (2019) for the Microphorinae, and Grichanov and Brooks  
49 (2017) for the morphology and venation.

50

51 **3. Systematic paleontology**

52 Order: Diptera Linnaeus, 1758.

53 Family: Dolichopodidae Latreille, 1809.

54 Subfamily: Microphorinae Collin, 1960.

55 Genus: *Microphorites* Hennig, 1971.

56

57 Type species: *Microphorites extinctus* Hennig, 1971, p. 16, figs. 2, 3, 19–25.

58 Other species: *Microphorites extinctus* Hennig, 1971 (Lower Cretaceous, Lebanese amber); *M.*

59 *oculeus* Grimaldi and Cumming, 1999, *M. similis* Grimaldi and Cumming, 1999 (both Lebanese

60 amber); *M. deploegi* Nel et al., 2004 (Albian amber, Lower Cretaceous, France); *M. utrillensis*

61 Peñalver in Arillo, Peñalver and Delclós, 2008 (San Just amber, Lower Cretaceous, Spain);

62 *Microphorites pouilloni* sp. nov. (lowermost Cenomanian, Burmese amber, Myanmar); *M.*

63 *magaliae* Perrichot and Engel, 2014 (Vendean amber, Upper Cretaceous, France), *M.*

64 *moravicus* Tkoč et al., 2016 (Študlov amber, Cretaceous (Cenomanian) / lower Paleogene,

65 Moravia), *M. erikai* Bramuzzo and Nel, 2017 (lowermost Eocene Oise amber, France).

66

67 *Microphorites pouilloni* Ngô-Muller & Nel, sp. nov.

68 (Fig. 1)

69 *Holotype*. MNHN.F.A71310 (specimen 17A, collection Jean-Marc Pouillon), stored in the

70 collections of the Muséum National d'Histoire Naturelle, Paris, France.

71 *Locality and horizon*. Hukawng Valley, Kachin State, northern Myanmar; mid-Cretaceous

72 (lowermost Cenomanian).

73 *Etymology*. Named after Jean-Marc Pouillon, who donated the type specimen.

74 *Diagnosis.* Postpedicel rather short, triangular; presence of a group of very long bristles on male  
75 terminalia; two pairs of scutellar bristles, apical pair more than twice length of lateral pair; no  
76 colored pterostigma; basal part of M2 oblique, not perpendicular to M1; costal vein ending  
77 between R4+5 and M1.

78 *Description.* A well-preserved specimen. Male. Body wholly dark brown, 1.7 mm long, wing  
79 1.4 mm long, 0.5 mm wide. Head hemispheric, 0.4 mm long, distinctly wider than thorax in  
80 dorsal view, ca 0.8 as long as thorax in dorsal view; eyes holoptic, close to each other on face,  
81 ommatidia uniform, bare; margin of eye with a weak notch near antenna; vertex flat, with a pair  
82 of ocellar bristles; ocellar tubercle weakly prominent; occiput round, slightly prominent;  
83 antenna located near vertex, brown; scape small, almost bare; pedicel with two dorsal bristles,  
84 small, globular; postpedicel nearly triangular, extended basally, rather short, 1.2 times as long  
85 as wide; arista-like stylus apical, 3.8 times as long as postpedicel, basal segment very short,  
86 simple, with microscopic hairs; palpus appressed to proboscis; palpus thin, finger-like, without  
87 distinct apical bristle and some tiny hairs; proboscis large, discoid laterally, with some tiny  
88 hairs.

89 Thorax narrow and strongly arched, 0.9 as long as high, setulae and bristles black; numerous  
90 biserial acrostichal and dorsocentral setulae anteriorly, two long strong dorsocentral bristles in  
91 posterior half, two notopleural bristles, one supra-alar bristle; pronotum small; mesonotum  
92 distinctly raised at middle and posterior area; scutellum with one pair of long apical bristles  
93 more than twice as long as a short pair of lateral bristles.

94 Legs wholly brown, fore coxa with three lateral bristles, mid and hind coxae each with two  
95 lateral bristles, outer bristle not visible; hind femora with a series of bristles; all tibiae with two  
96 rows of long lateral bristles.

97 Wings wide, 2.8 times longer than wide, hyaline, entirely covered with microtrichia, with long  
98 setulae on posterior margin, veins dark brown. Costal vein with row of short spine-like bristles;

99 Rs base situated at 0.18 times wing length, short, with two branches; Sc ending at basal third of  
100 Costa, no clearly darkened pterostigma; h very bold; R2+3 and R4+5 diverged at basal 1/4,  
101 parallel apically; R2+3 straight apically; R4+5 slightly arched apically, unforked, ending near  
102 wing tip; M with three branches M1, M2 and M4; short r-m crossvein present at basal 1/3 of  
103 wing; cell bm triangular; crossvein dm-m complete.

104 Abdomen short and cylindrical, ca 1.8 times as long as thorax; tergites I to VII all with spine-  
105 like dorsal bristles apically and near their middle; male genitalia: hypopygium large, rotated  
106 and lateroflexed with three long apical setae.

107

#### 108 **4. Discussion**

109 *Microphorites pouilloni* sp. nov. can be attributed to the Dolichopodidae subfamily  
110 Microphorinae because of the following characters: antennal arista-like stylus two-articled,  
111 male eyes holoptic, wing with costal vein circumambient, crossvein bm-m complete, wing cell  
112 dm present (cell dm absent in the extinct genus *Avenaphora* Grimaldi and Cumming, 1999,  
113 excluding affinities of *Microphorites pouilloni* sp. nov. with this last genus) and emitting three  
114 branches.

115 Except for *Avenaphora*, the Microphorinae comprise the following genera, after Brooks et al.  
116 (2019) and Tang et al. (2019): extant *Microphor* Macquart, 1827 and *Schistostoma*, and extinct  
117 *Curvus* Kaddumi, 2005; *Meghyperiella* Meunier, 1908, *Pristinmicrophor* Tang et al., 2019, and  
118 *Microphorites*. *Curvus* is a very poorly known genus with one species *C. khuludi* Kaddumi,  
119 2005 from the early Cretaceous of Jordan. *Microphorites pouilloni* sp. nov. differs from *Curvus*  
120 at least in the distinctly shorter cell dm (Kaddumi, 2005). *Meghyperiella* from the Baltic amber,  
121 has also never been revised. According to Meunier (1908: 112) it has a stylus shorter than the  
122 first flagellomere, unlike *Microphorites pouilloni* sp. nov. *Microphorites pouilloni* sp. nov. has  
123 two pairs of scutellar bristles, unlike *Microphor* (Shamsev and Sinclair, 2006). *Microphorites*

124 *pouilloni* sp. nov. differs from *Microphor* and *Schistostoma* in the small, not right-angled, anal  
125 lobe (Brooks et al., 2019). *Microphorites pouilloni* sp. nov. differs from *Pristinmicrophor* in  
126 the postpedicel distinctly shorter, only 1.2 times as long as wide, instead of 3.0 times in the  
127 later, a median vein with three branches, and no colored pterostigma instead of having a  
128 triangular one. *Microphorites pouilloni* sp. nov. has the typical characters for *Microphorites*,  
129 viz., antennae located near middle of anterior margins of eyes; arista two-articled; anal margin  
130 of wing not making a strong curvature (putative synapomorphy); three radial veins; crossvein  
131 r-m in basal fourth of wing; crossvein dm-m complete; cell dm present; three complete medial  
132 branches (Bramuzzo and Nel, 2017).

133 *Microphorites pouilloni* sp. nov. differs from *M. moravicus* and *M. erikai* in the absence of a  
134 clearly colored pterostigma (Tkoč et al., 2016; Bramuzzo and Nel, 2017). *Microphorites*  
135 *pouilloni* sp. nov. differs from *M. magaliae* in the presence of a group of very long bristles on  
136 male terminalia, and of two pairs of scutellar bristles, instead of only one pair in *M. magaliae*  
137 and *M. deploegi* (Nel et al., 2004; Perrichot and Engel, 2014). *Microphorites utrillensis* and *M.*  
138 *extinctus* have two strong subequal pairs of scutellar bristles, instead of one long apical pair  
139 more than twice as long as the lateral pair as in *Microphorites pouilloni* sp. nov. and in *M.*  
140 *similis* (Hennig, 1971; Grimaldi and Cumming, 1999; Arillo et al., 2008). *Microphorites*  
141 *pouilloni* sp. nov. differs from *M. similis* in basal part of M2 oblique, not perpendicular to M1,  
142 in the longer flagellomere I, in the costal vein ending between R4+5 and M1, not at apex of  
143 R4+5 (Grimaldi and Cumming, 1999). *Microphorites pouilloni* sp. nov. shares with *M. oculus*  
144 the long flagellomere I, but its costal vein ends between R4+5 and M1. The number and shape  
145 of scutellar bristles is unknown in *M. oculus*.

146

## 147 **5. Conclusion**

148 The mid-Cretaceous Burmese amber was deposited on a land that is currently supposed to have  
149 been an island in the Tethys Ocean at that time (Metcalf, 1996; Rasnitsyn and Öhm-Kühnle,  
150 2018). It was possibly separated from the Gondwana paleocontinent during the Jurassic and  
151 fused to Asia around 87 Ma. ago (Seton et al., 2012). The presence of *Microphorites*, a genus  
152 known in the early Cretaceous of Lebanon that was a part of Gondwana at that time, suggests  
153 that this genus is possibly late Jurassic.

154

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158

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225

226 **Fig. 1.** *Microphorites pouilloni* sp. nov., holotype MNHN.F.A71310. A, habitus, arrows  
227 scutellar bristles; B, wing and abdomen, lateral view; C, terminalia, lateral view; D, head,  
228 oblique view Scale bar = 1 mm (A); 0.5 mm (B); 0.1 mm (C); 0.2 mm (D).

229

230





R1

R2+3

R4+5

M1

M2

M4

r-m

dm-m





