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A remarkable brachyceran fly (Diptera: Tabanomorpha) from Late Cretaceous Burmese amber

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ABSTRACT

A new brachyceran fly (Diptera: Tabanomorpha), *Pseudorhagio zhangi* gen. et sp. nov., is described from Late Cretaceous Burmese amber. It is tentatively placed as Family *incertae sedis* in Tabanomorpha and distinguished from other Tabanomorpha by the following unusual combination of characters: head wider than thorax; body densely covered with fine and short setae, devoid of macrosetae; scutum strongly convex, nearly spherical; scutellum rather small, convex; antennal flagellum elongated, tapering, unsegmented; vein R4 perpendicular to R5, and strongly curved; crossvein m-m very long, strongly sinuated; tibial spur formula 0, 2, 0. This discovery further confirms the high diversity of Tabanomorpha in Late Cretaceous Burmese amber. An updated list of brachyceran species in Burmese amber is given.

1. Introduction

The Diptera represent an insect order that is one of the most species-abundant, ecologically diverse and evolutionarily significant groups. The order Diptera is composed of two suborders: Nematocera and Brachycera. Brachycera are composed of four infraorders, the lower Brachycera: Xylophagomorpha Fallén, 1815, Stratiomyomorpha Hennig, 1973, Tabanomorpha Hennig, 1948 and the higher Brachycera: Muscomorpha Sharp, 1894 (Yeates and Wiegmann, 1999; Wiegmann et al., 2000; Yeates, 2002). Krzemiński and Krzemińska (2003) added Asilomorpha Rohdendorf, 1961 in lower Brachycera. Tabanidae Latreille, 1802, Pelecorhynchidae Enderlein, 1922, Rhagionidae Latreille, 1802, Athericidae Stuckenberg, 1973, and Vermileonidae Nagatomi, 1977 have been commonly assigned to Tabanomorpha based on the following apomorphic characters: adult with convex and bulbous clypeus; expanded first article of the female cercus; a brush on the larval mandible and larval head retractile (Yeates and Wiegmann, 1999; Yeates, 2002; Santos, 2008; Kerr, 2010). Until now, a large number of Mesozoic Tabanomorpha have been described worldwide, including more than 80 rhagionid species in more than 40 genera (Zhang, 2010, 2011, 2013; Nel et al., 2014; Angelini et al., 2016), seven tabanid species in five genera (Zhang, 2012), and 12 athericid species in seven genera (Zhang, 2012; Oberprieler and Yeates, 2014), and to date, no record of vermileomid and pelecorhynchid flies have been found as Mesozoic fossils.

Among the insect taxa preserved in amber, dipterans are the most common and diverse organismal inclusions (Grimaldi and Cumming, 1999; Grimaldi et al., 2002; Dikow and Grimaldi, 2014). Many brachyceran flies as amber inclusions have been studied in Lebanese, Canadian, Siberian, French, New Jersey, Spanish and Burmese ambers (Grimaldi and Cumming, 1999; Perrichot, 2004; Grimaldi and Arillo, 2008; Grimaldi et al., 2009, 2011; Dikow and Grimaldi, 2014; Arillo et al., 2015; Angelini et al., 2016; Zhang et al., 2016). Several brachyceran flies have been described from Burmese amber (see Table 1), and here we describe a new genus and species within lower Brachycera in

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Table 1
List of brachyceran species in Burmese amber, modified and updated from Grimaldi et al., 2009, 2011; Arillo et al., 2015; Dikow and Grimaldi 2014.

Infraorder	Family	Genus	Species
Stratiomyomorpha	Zhangsolvidae Nagatomi and Yang, 1998	*Linguatormyia* Grimaldi, 2015	*Linguatormyia teletacta* Grimaldi, 2015
	Eremochaetidae Ussatchev, 1968	*Zhenia* Zhang et al., 2016	*Zhenia xiai* Zhang et al., 2016
Muscomorpha	Chimeromyiidae Grimaldi and Cumming, 2009	Chimeromyia Grimaldi and Cumming, 1999	*Chimeromyia burmitica* Grimaldi & Cumming, 2009
	Acroceridae Leach, 1815	*Schlingeromyia* Grimaldi & Hauser, 2011	*Schlingeromyia minuta* Grimaldi & Hauser, 2011
		Burmacyrtus Grimaldi & Hauser, 2011	*Burmacyrtus rusmithi* Grimaldi & Hauser, 2011
	Mythicomyiidae Zaitzev, 1991	*Microburmyia* Grimaldi & Cumming, 2011	*Microburmyia analvena* Grimaldi & Cumming, 2011
			Microburmyia veanalvena Grimaldi & Cumming, 2011
	Apsilocephalidae Nagatomi, 1991	*Kumaromyia* Grimaldi & Hauser, 2011	*Kumaromyia burmitica* Grimaldi & Hauser, 2011
	Apystomyiidae Nagatomi and Liu, 1994	*Hilarimorphites* Grimaldi & Cumming, 1999	*Hilarimorphites burmanica* Grimaldi & Cumming, 2011
	Tethepomyiidae Grimaldi and Arillo, 2008	*Tethepomyia* Grimaldi & Cumming 1999	*Tethepomyia zigrasi* Grimaldi & Arillo, 2011
	Unplaced	*Myanmyia* Grimaldi, 2011	*Myanmyia asteiformia* Grimaldi, 2011
	Asilidae Latreille, 1802	*Burmapogon* Dikow & Grimaldi, 2014	*Burmapogon bruckschi* Dikow & Grimaldi, 2014

Tabanomorpha from Burmese amber based on two relatively well preserved specimens.

2. Material and methods

The specimens described herein were collected from the Hukawng Valley of Kachin Province, Myanmar (for locality see Kania et al., 2015: fig. 1). The age of Burmese amber is radiometrically dated at 98.79 ± 0.62 Ma based on U–Pb zircon dating of the volcanoclastic matrix (Shi et al., 2012). The specimens are preserved in two pieces of yellow amber with some impurities. The amber pieces containing the inclusions were cut, trimmed and polished. The specimens are housed in the Nanjing Institute of Geology and Palaeontology (NIGP), Chinese Academy of Sciences. Photographs were taken using a Zeiss Stereo Discovery V16 microscope system and Zen software. In most instances, incident and transmitted light

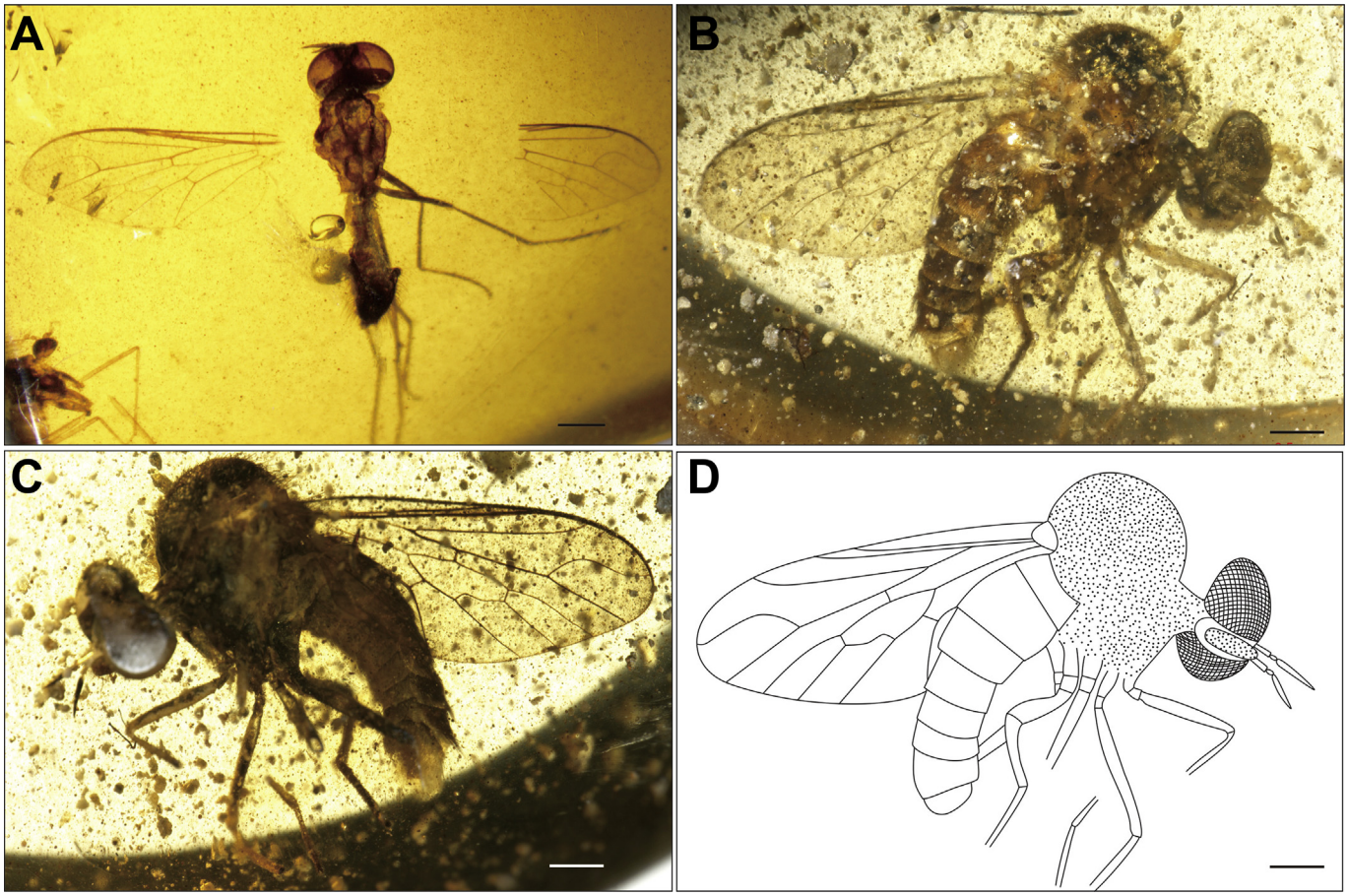

Fig. 1. *Pseudorhagio zhangi* gen. et sp. nov. A, Photograph of holotype, NIGP164490, in dorsal view; B, Photograph of paratype, NIGP164491, in lateral view; C, Photograph of paratype, NIGP164491, in lateral view; D, Drawing of paratype, NIGP164491.