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Myanmarinidae, a new family of basal Apocrita (Hymenoptera: Stephanoidea) from mid-Cretaceous Burmese amber

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ABSTRACT

A new family of basal apocritan wasps is established based on three new species discovered from the mid-Cretaceous Burmese amber and tentatively allied to the superfamily Stephanoidea. The family Myanmarinidae Zhang and Rasnitsyn fam. nov. contains one new genus *Myanmarina* Zhang and Rasnitsyn gen. nov., including three new species: *Myanmarina lisu* Zhang and Rasnitsyn sp. nov., *Myanmarina kachin* Zhang and Rasnitsyn sp. nov. and *Myanmarina lahu* Zhang and Rasnitsyn sp. nov. Comparisons are made between Myanmarinidae and its similar families. Some general remarks are also made about the new family in taxonomy and biology.

1. Introduction

Burmese amber is currently one of the richest sources of knowledge about the past of insects and some other segments of the non-marine biosphere (Rasnitsyn, 1996; Zherikhin and Ross, 2000; Grimaldi et al., 2002; Ross et al., 2010; Rasnitsyn et al., 2016; Guo et al., 2017). Indeed, the Burmese amber arthropod assemblage accounts for 252 families which is the highest figure among the Cretaceous Lagerstätten (Rasnitsyn et al., 2016; the data by the end of 2013). Years later Ross (2017) lists 356 arthropod families and 481 insect species there, and Guo et al. (2017) cite 73 described species in Hymenoptera. Hymenoptera represents a significant part of the modern and, since the Jurassic, past world biodiversity: the above source counts 30 families, that is, 12 percent of the total arthropod diversity in the Burmese amber. Like other taxa, Hymenoptera displays a number of described (Aptenoperissidae, Bryopompilidae, Melittisphecidae, Othniodellithidae, Syspasthoxyelidae, cf. Rasnitsyn et al., 2017; Rodriguez et al., 2016; Poinar and Danforth, 2006; Engel et al., 2016a, 2016b, respectively) and undescribed (in preparation) endemic families within the Burmese amber assemblage. Description of one more such family is the objective of the present publication.

2. Material and methods

The present research is based on the amber collected from the amber mines situated in the Hukawng Valley of Kachin State, Myanmar (locality in Kania et al., 2015: fig. 1). The rock containing the Burmese amber was radiometrically dated at 98.79 ± 0.62 Ma (Shi et al., 2012). The date corresponds to the early Cenomanian, that is, the earliest Late Cretaceous. However, the amber displays clear traces of re-deposition (Ross, 2015) and so can be older than enclosing rocks. That is why we prefer to refer to the amber age informally as mid-Cretaceous.

The material was studied under Nikon SMZ-10 R stereoscopic microscope and Nikon Optiphot compound microscope with magnifications up to 800× at the State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and

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Palaeontology, Chinese Academy of Sciences, and using Leica M165C stereomicroscope with a Leica DFC 420 camera at the A.A. Borissiak Paleontological Institute, Russian Academy of Sciences, in Moscow. In most instances, incident and transmitted light were used simultaneously. Helicon Focus Pro ×64 was used to stack photos for better depth of field. The line drawings were prepared based on photographs using image-editing softwares (CorelDraw X7 and Adobe Photoshop CS6). The specimens are housed in the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences (NIGPAS). Morphological terminology and symbols to wing vein homology are standard, except that ampersand (&) linking two adjacent vein sections denotes those aligned and forming a seemingly entire vein section. Particularly, 1-RS&1-M means the first (basal) sections of RS and M joining to form a smooth, seemingly entire vein (basal vein in older nomenclature; cf. Fig. 1C). All taxonomic acts established in the present work have been registered in ZooBank (see below), together with the electronic publication LSID: urn:lsid:zoobank.org:pub:FC26F5AC-E0FF-44CB-B621-C68973E0BEAF.

3. Systematic paleontology

Order Hymenoptera
Suborder Vespina
Superfamily Stephanoidea
Family Myanmarinidae Zhang and Rasnitsyn, fam. nov.
(LCID: urn:lsid:zoobank.org:act:A6499035-F929-449A-8477-63D8BCCB0191)

Type genus *Myanmarina* Zhang and Rasnitsyn, gen. nov.

Diagnosis. Male (female unknown). Stature elongate, subcylindrical, as in Stephanidae. Body size small (1.5–3 mm). Head subglobular, without crown of teeth around fore ocellus, with big eyes, circular occipital carina and long genal bridge (the space where contralateral genae meet each other between postocciput and hypostome). Antenna 11- or 12-segmented, not geniculate, flagellar segments more or less uniform, possibly with elongate (multiporous plate) sensillae. Mandible short, wide, with 2 or, possibly, 3 subequal teeth, with cutting edge subparallel to mandible rotation axis, not distinctly oblique. Maxillary palps with 4 visible segments, apical three ones narrow and elongate. Labial palps not observed, probably much reduced. Mesosoma long and narrow, subcylindrical or somewhat depressed (possibly a preservational distortion), its morphology little known except that the pronotum is short centrally in dorsal view and the mesoscutum long. Propleurae more or less elongate, usually forming a distinct neck. Propodeum elongate, straight in lateral view, with no downward bending towards metasomal articulation. Legs elongate, ordinary; fore tibia with single, thin, arcuate spur. Wings densely pubescent, with comparatively long marginal setae, with venation much reduced. Forewing with tubular veins only in anterobasal part, namely fused C + R up to some 0.6 wing length, M + Cu, strongly oblique basal vein (1-RS&1-M), cu-a, 1-Cu and 1A up to cu-a only (Cu may continue after cu-a as nebulous vein). All distal wing surface free of veins, supported with system of nested radiated folds like in Spathiopterygidae. Hind wing short and very narrow, reaching level of upper end of basal vein (that is, level of 1-RS base), with only C + R tubular and with 3 hamuli. Metasoma linear, with 8 external segments, 1st segment distinctly narrowed basal but details of articulation not clear, male claspers wide and often long, pointing obliquely downward.

Genera included. Type genus only.
Genus *Myanmarina* Zhang and Rasnitsyn, gen. nov.
(LCID: urn:lsid:zoobank.org:act:BB9726BE-39FB-44A5-901A-A7791CFEEC21)

Type species: *Myanmarina lisu* Zhang and Rasnitsyn, sp. nov.

Etymology. From Myanmar, the country where all the three species of the new genus come. Gender feminine.
Diagnosis. As for family because of monotypy.
Species included. Three species.

Myanmarina lisu Zhang and Rasnitsyn, sp. nov.
(LSID: urn:lsid:zoobank.org:act:5AC41744-1151-4846-A7C6-FD58CBE42E3A)
Fig. 1

Derivation of name. After the Lisu, an ethnic group in northern Myanmar where the fossil material was collected. Noun in apposition.
Holotype. Male, NIGP166310 (Fig. 1A–D). Only few part of legs damaged, diagenetic deformation present, with some scattered debris around; small air bubbles distributed around the whole body including the antennae and legs make it difficult to discern the dorsal surface sculpture.
Paratype. Male, NIGP166311 (Fig. 1E–G). One forewing damaged, the other bent; many scattered debris around. Dark body and lots of small bubbles obscuring particular details of the fossil. The type specimens were originally found as syninclusions and subsequently separated for study.
Locality and horizon. Hukawng Valley, Kachin State, Myanmar; lowermost Cenomanian, mid-Cretaceous.
Description. NIGP166310. Head subglobose; ocelli small, well separated from compound eyes; compound eyes prominent, berry-like in appearance. Antenna 11-segmented, inserted moderately low on head, densely covered with fine setae; scape relatively straight; pedicel almost as long as scape; first flagellomere extremely long, thinner than pedicel basally and becoming gradually thicker; second about as long as scape and pedicel combined; third and fourth slightly longer than second and fifth, remaining ones shorter than fifth but still more than twice as long as wide, apicalmost flagellomere rounded. Maxillary palps almost as long as head height, with three apical segments long and thin, basal visible segment probably short. Mesosoma imbricate, long-column-shaped and wider than high; pronotum short, mesoscutum long with indistinct (possibly percurrent) notauli. Legs long with respect to body length and covered with minute setae; tibial spur formula 1-1-1; basitarsomeres almost as long as remainder of corresponding tarsomeres together; all femora shorter than their tibia, and hind femur slightly swollen. Length ratio of tarsomeres in all legs (similar in all congeners) ca. 10:5:3–3.5:1.5–1.7:2–2.5 (precise measurements often difficult because of imperfect preservation state and improper position of legs in amber). Forewing longer than metasoma, spatulate, with well-defined marginal fringe, fringe setae longest along hind margin (possibly also along wing apex which is obscured), moderate along veins on fore margin, growing shorter toward anterior preapical margin; membrane with dense and comparatively long setae all over surface distal of venation, with basal (1rm) and subbasal (1cua) cells naked; C + R reaching maximum wing width (0.64 wing length); M + Cu faded in basal third, branching in wing basal 0.2, 1-RS&1-M thickest vein, reaching C + R at 0.33 wing length, cu-a aligned with 1A, meeting Cu distinctly distal of M + Cu apex; free Cu long, nebulous, subparallel to wing hind margin, continuing into weak fold; five stronger folds running fan-like toward wing margin anterior of Cu. Hind wing very narrow, some 0.4 as long as forewing, with fringe of moderately long setae along all visible hind margin and apex and with 3 hamuli present. Metasoma narrow, about as long as head and mesosoma combined, and wider than high, with segments difficult to discern; first segment trapezoid, elongate, following apparently shorter;