

Short communication

New serphitoid wasp *Supraserphites draculi* gen. et sp. nov. in Burmese amber (Hymenoptera, Serphitidae: Supraserphitinae)Alexandr P. Rasnitsyn^{a, b, *}, Christoph Öhm-Kühnle^c^a A.A. Borissiak Palaeontological Institute, Russian Academy of Sciences, 117647 Moscow, Russia^b Natural History Museum, Cromwell Road, London SW7 5BD, UK^c Kirchgasse 11, 71083 Herrenberg, Germany

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ABSTRACT

Described as new in Serphitidae are Supraserphitinae Rasnitsyn & Öhm-Kühnle, subfam. nov. and *Supraserphites draculi* Rasnitsyn & Öhm-Kühnle, gen. et sp. nov. from mid-Cretaceous Burmese amber. The new subfamily is synapomorphic with the other Serphitidae in having the number of flagellomeres reduced (less than 12), and autapomorphic in respect to other Serphitidae (Serphitinae and Microserphitinae) in having maxillary and labial palps very long and subequal in length. Alternatively, the sister family Archaeoserphitidae, the only other one in Serphitoidea, could be synapomorphic in respect to Serphitidae in having wing venation reduced (with basal vein and free Cu not tubular even basally). Serphitinae + Microserphitinae are synapomorphic in respect to Supraserphitinae in having antennae with 8 flagellomeres or less.

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1. Introduction

Serphitoid wasps have been first described by Brues (1937), as the family Serphitidae (Serphoidea = Proctotrupoidea) from Late Cretaceous (Campanian) Canadian amber. Later the family was proposed to cover all bipetiolar proctotrupomorph wasps, that is, former families Serphitidae and Mymaromatidae, based on the presence of morphologically intermediate forms (Kozlov and Rasnitsyn, 1979). This minimalist approach has been rejected by other researchers, which eventually resulted in the proposal of the taxon Bipetiolarida, covering the superfamilies Serphitoidea and Mymaromatoida, each with a few families (Engel, 2005, 2016). We doubt that this approach is productive, because taxa with intermingling characteristics question delimitations of the families and superfamilies, an observation for which we present an additional example herein, which shows features of both Serphitidae Brues, 1937, and Archaeoserphitidae Engel, 2016. However, present trends in taxonomy distinctly favor inflation of taxonomic ranks, and currently we accept this as *status quo*.

In Burmese amber, with its extraordinary rich and specific fauna of Arthropoda and particularly of Hymenoptera (Ross, 2015; Rasnitsyn et al., 2017; Li et al., 2018; Rasnitsyn and Öhm-Kühnle, 2018; Zhang et al., 2018a–d), continually unexpected fossils are being discovered. Among them is the wasp described in the present paper, in which characters of both Serphitidae and Archaeoserphitidae appear.

2. Material and methods

The fossil inclusion described herein was collected from the amber mines sited in the Hukawng Valley of Kachin Province, Myanmar (locality in Li et al., 2018: fig. 1). The rock yielding the amber at this site was dated to the late Albion of the Early Cretaceous (97–110 Ma) based on paleontological evidence (Cruickshank and Ko, 2003). A more recent study determined the age of the rock to be 98.79 ± 0.62 Ma or at the Albion/Cenomanian boundary using U–Pb zircon dating (Shi et al., 2012). The date corresponds with the early Cenomanian, being the earliest Late Cretaceous. The amber displays clear traces of redeposition (Ross, 2015; Smith and Ross, 2018) and so can be older than enclosing rocks. That is why we prefer to refer to the amber age as mid-Cretaceous informally.

The holotype is deposited in the Öhm-Kühnle collection maintained permanently at the A.A. Borissiak Paleontological Institute,

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Russian Academy of Sciences, Moscow, coll. no. 5620. Observations and photographs were made with a Leica M165C stereomicroscope with a Leica DFC 420 camera. Line drawings were made with CorelDRAW software based on photographs. Helicon Focus Pro $\times$ 64 was used to stack photos for better depth of field. All taxonomic acts established in the present work have been registered in ZooBank (see below), together with the electronic publication LSI-D:urn:lsid:zoobank.org:pub:440D5278-65E3-496B-82DD-69AE9-DBF0650.

3. Systematic palaeontology

Order: Hymenoptera Linnaeus, 1758
Suborder: Vespina Laicharting, 1781
Infraorder Proctotrupomorpha Latreille, 1802
Superfamily Serphitoidea Brues, 1937

Family Serphitidae Brues, 1937

Emended diagnosis. Antenna geniculate, with 6–10 flagellomeres, sexually dimorphic with male having lesser segment number than female. Wing venation with pterostigma wide and high, of rounded triangular shape, nearly or fully reaching RS (1r-rs crossvein short to lost), or faded more or less, almost up to being lost (in Microserphitinae); at least basal vein (RS&M) and base of free Cu tubular. **Subfamilies included.** Serphitinae Brues, 1937, Microserphitinae Engel, 2016, and Supraserphitinae subfam. nov., all from Cretaceous ambers.

Remark. Unlike Serphitidae, Archaeoserphitidae, the only other family of Serphitoidea, has 14 flagellomeres and forewing with normal pterostigma (several times longer than wide and much narrower than 1r-rs long) (all plesiomorphies in Serphitoidea, as indicated by polymerous flagellum and normal pterostigma characteristic of basal Apocrita including basal Proctotrupomorpha such as Mesoserphidae) and only R, 1r-rs, and the very base of RS tubular (apomorphic in Serphitoidea, as indicated by relatively complete venation characteristic of the basal taxa mentioned above; cf. Rasnitsyn, 1988; Ronquist et al., 1999). Engel (2016) interpreted the more complete wing venation in Serphitidae as secondary reversal, the enlarged and sclerotized pterostigma in Serphitinae as derived. However, he presented no sound evidence supporting his hypothesis.

Subfamily **Supraserphitinae** Rasnitsyn & Öhm-Kühnle, subfam. nov.

LSID:urn:lsid:zoobank.org:act:1783DBB6-21D3-4661-A4D0-75B0-853617E2

Type genus *Supraserphites* Rasnitsyn & Öhm-Kühnle, gen. nov.

Diagnosis. Female antenna with 10 flagellomeres, not clavate, attached above rather than behind mandibular bases (clypeus subvertical). Maxillary and labial palpi long, subequal in length. Forewing with C, RS distal of 1r-rs, and M + Cu tubular, pterostigma well developed. Metasoma with petiolar segments both long and narrow (jointly taking one third of wing length).

Genera included. Type genus only.

Remarks. Supraserphitinae differ from both Serphitinae and Microserphitinae in having antenna with 10 and not 6–8 flagellomeres (plesiomorphy as indicated by polymerous flagellum in more basal and more ancient Proctotrupomorpha such as Archaeoserphitidae and Mesoserphidae), maxillary and labial palpi both very long and subequal in length (apomorphic in respect to Serphitinae and Microserphitinae being unique in all Serphitoidea and, to our knowledge, in all Proctotrupomorpha, at least more basal ones), generally more complete wing venation (RS is usually nebulous in other Serphitidae and pterostigma is faded in Microserphitinae), and in the long second petiolar segment (as long as

the first one) in contrast to being distinctly shortened in other Serphitidae (a possible plesiomorphy based on similar length of that segment in Archaeoserphitidae).

Genus ***Supraserphites*** Rasnitsyn & Öhm-Kühnle, gen. nov.

LSID:urn:lsid:zoobank.org:act:B71CB17F-F1D8-46A5-8B1F-F450C-D891E43

Type species *Supraserphites draculi* Rasnitsyn & Öhm-Kühnle, sp. nov.

Etymology. Genus name derived from the genus *Serphites* and *Supra-*, Latin for above, over.

Diagnosis. As to subfamily.

Species included. Type species only.

Supraserphites draculi Rasnitsyn & Öhm-Kühnle, sp. nov.

LSID:urn:lsid:zoobank.org:act:BB647AA5-3352-43F0-B2EF-F17E5-10586CE

Fig. 1

Etymology. Species name derived from *dracul*, Romanian for devil, and the literary figure Count Dracula (Vlad Dracul).

Holotype. Female, PIN no. 5620/4; complete specimen affected by some distortion (body and some appendages irregularly compressed), and with integument somewhat degraded (black with surface sculpture practically invisible).

Locality and horizon. Hukawng Valley, Kachin State, Myanmar; lowermost Cenomanian or uppermost Albian, mid-Cretaceous.

Diagnosis. As for genus.

Description. Body dark as preserved, possibly because of degraded integument, appendages including antennae and mandibles yellow to brown, with femora darker, antenna, pterostigma and tibiae of intermediate coloration, tarsi yellow. Head distorted (cf. Fig. 1F, 1G) with eyes not discernible, helmet-like in side view as preserved, with antenna attached at its upper anterior margin well above mandibles, with clypeus apparently vertical (forming anterior side of head). Antenna geniculate, with scape about half as long as flagellum (original form unknown because of distortion), pedicel about as long as 3 basal flagellomeres together, long pyriform, flagellomeres bell-shaped except lanceolate ultimate one, possibly widening somewhat apically (original form is distorted by uneven compression, cf. Fig. 1G). Labrum long, truncate. Mandibles long, flat, with three (right) or two (left) long acute teeth. Maxillary and labial palpi long and thin, slightly widened apical, with indistinct segmentation, about as long as mandible, labial one only slightly shorter than maxillary. Pronotum long medially, with posterodorsal lobe angular and posteroventral one free, widely rounded (relation of posterodorsal lobe to wing base unknown). Structure of mesoscutum obscure: in side view, two bumps are visible, with posterior one possible to interpret either as hind part of mesoscutum of unusual (much distorted?) form, or as fore part of unusually modified mesoscutellum (both interpretations are questionable: the former infers the mesoscutellum being too short, the latter, unusually subdivided). Scutellum (or its hind part) with two transverse carinas. Metanotum comparatively long, convex in side view. Propodeum comparatively small, at most twice as long as metanotum, probably carinate or areolate (unless due to deformation). Legs comparatively short and thin, coxae small (hind one shorter than petiolar segments), trochanters elongate, trochantelli distinct, tibiae longer than respective femorae, spur formula 1:2:2, fore spur long, straight except somewhat bent apically, apex apparently simple, mid and hind spurs short, basitarsus about as long as tarsomeres 2–4 together, tarsomere 4 elongate, claws weak, simple, arolium rather big. Forewing short and densely pubescent, venation generally characteristic of *Serphites* Brues, with C, R, M + Cu, basal vein (RS&M), 1r-rs, RS from its base until wing fore margin, Cu until angulation near claval fold, and less distinctly R₁

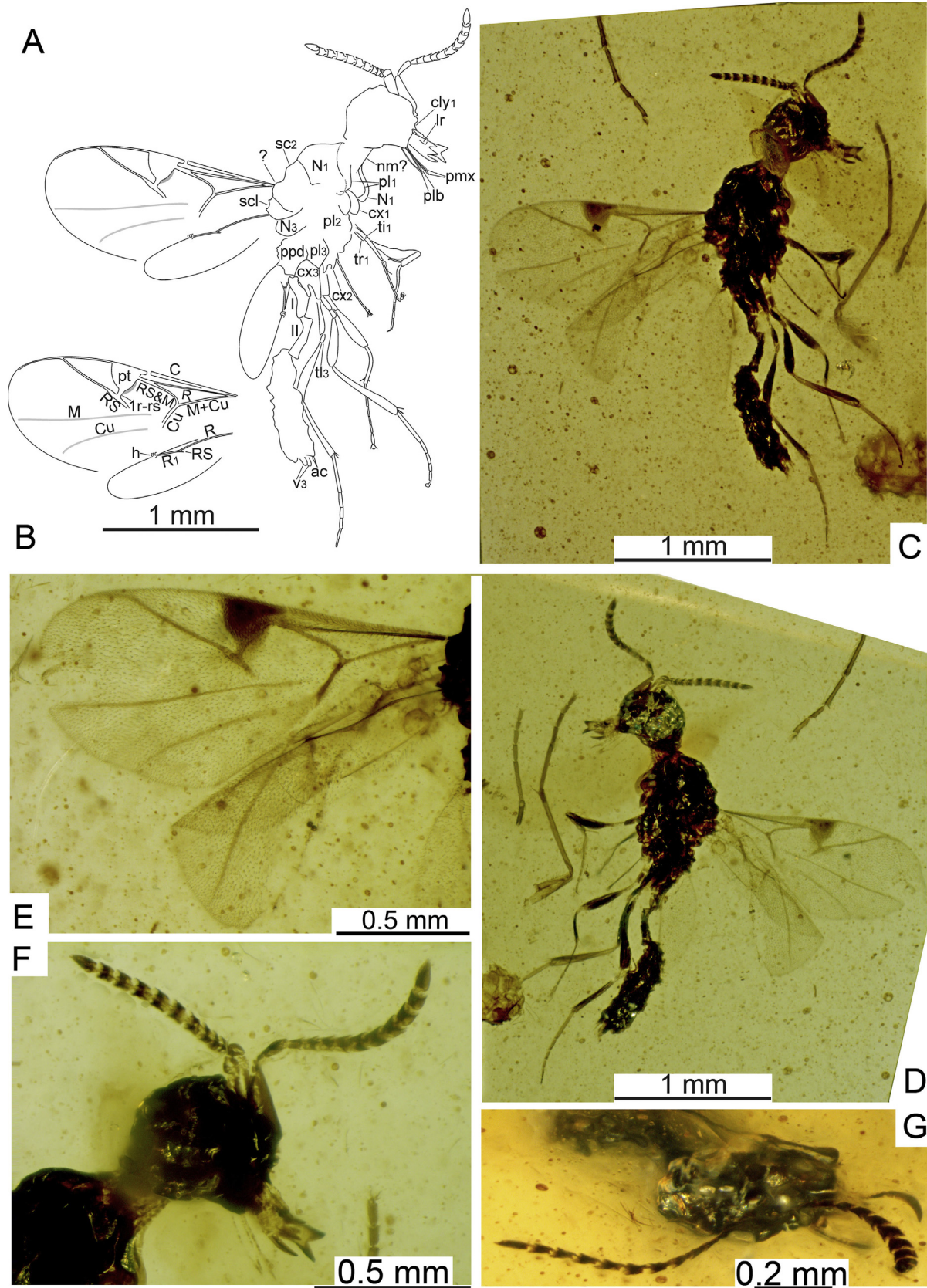


Fig. 1. *Supraserphites draculi* sp. nov., holotype, PIN no. 5620/4. A – general view. B – wings. C, D – general view from right and left side. E – wings. F – head with appendages, side view. G – head, anterior view to show extent of postmortem deformation (mandibles are to the right). Explanations of symbols: ac – sting, cly – clypeus, cx₁–cx₃ – fore, mid and hind coxae, lr – labrum, N₁, N₃ – pro- and metanotum, nm? – supposed neck membrane, pl₁, pl₂, pl₃ – pro-, meso- and metapleuron, plb – labial palp, pmx – maxillary palp, ppd – propodeum, sc₂ – mesoscutum, scl – mesoscutellum, ti₁ – fore tibia, tl₃ – metatrochantellus, tr₁ – fore trochanter, v₃ – ovipositor sheaths, I, II – first and second petiolar segment, ? – mesonotal structure of obscure homology (either hind part of mesoscutum or fore part of mesoscutellum). Venational symbols are standard.

between pterostigma and RS apex tubular, other visible veins nebulous; RS distinctly thickened near junction with 1r-rs. Hind wing with only R and R₁ up to hamuli and the very base of RS tubular, no nebulous veins, 3 hamuli visible. Petiolar segments long and rather thin (compressed as preserved), of equal length, jointly 0.37 as long as forewing and slightly longer than hind tibia. Gaster elongate, half as long as forewing, with segmentation not visible, with ovipositor apex and rather thick sheath valvae slightly extending from its apex.

Measurements (all values to be considered as rough because of postmortem distortion of the fossil). Body length 2.5 mm, forewing length 1.5 mm, head length 0.45, scape 0.29, pedicel 0.12, flagellum 0.59, mandible 0.23, maxillary and labial palpi as visible 0.23 and 0.22, mesosoma 0.9, hind femur 0.42, hind tibia 0.52, hind tarsus 0.6, petiolar segments 0.27 each, gaster 0.72 mm.

4. Discussion

Discovery of *Supraserphites* gen. nov. and subfamily Supraserphitinae enlarges the taxonomic and morphological diversity of the family Serphitidae as well as of the hymenopteran fauna of the mid-Cretaceous Burmese amber. This also makes the superfamily Serphoidea an uncommon example of a higher rank group of high diversity combined with a comparatively narrow stratigraphic range limited to the Cretaceous Period. Absence of its Jurassic records as well as of the pre-Barremian Cretaceous ones, is no wonder because the amber is still the only source of the serphitoid fossils because of their small body size: the same holds true for the related superfamily Mymarommatoidea (Kozlov and Rasnitsyn, 1979; Ortega-Blanco et al., 2011). Of importance is, however, that Mymarommatoidea extend their range through the Palaeogene and, by inference, Neogene through the present time. We are not aware of another hymenopteran taxon which comparably flourished in the Cretaceous and has failed to cross the K/P boundary. The reason of that difference is obscure: the fate of respective host insects could be indicative, and yet the host is unknown even for living Mymarommatoidea. The puzzle is more difficult to resolve because we are aware of no potential host taxon identifiable as a group that has been similarly flourishing during all the Cretaceous (possibly except its pre-Barremian part) and went extinct at or before the end of the Cretaceous.

5. Concluding remarks

The new serphitid fossil described herein helps our understanding of diversity and taxonomic structure of the family in adding the third and relatively basal new subfamily Supraserphitinae. It makes more clear a general trend toward reduction of the number of flagellomeres and of the wing venation in serphitid evolution, reaching its summit in 6-segmented flagellum in *Jubaserphites* McKellar & Engel, 2011 and in disintegration of pterostigma and loss of tubular RS in *Microserphites* Kozlov & Rasnitsyn, 1979. At the same time, the new genus makes the diagnoses of taxa in Serphitoidea less straightforward, because *Supraserphites* takes a morphologically intermediate position between Archaeoserphitidae on the one side and Serphitinae and Microserphitinae on the other. It shows a 10-segmented flagellum, in contrast to the 12-segmented one in Archaeoserphitidae and 6–8 segmented one in Serphitinae and Microserphitinae, and a long second petiolar segment like in Archaeoserphitidae and unlike other Serphitidae. Also, the head form of *Supraserphites* looks similar to that of *Archaeoserphites* rather than to other Serphitidae, in the subvertical position of its clypeus in respect to the frontal and occipital surfaces of the head.

The newly described subfamily Supraserphitinae, like other recently discovered families, e.g., the unexpectedly highly diverse Aptenoperissidae (Rasnitsyn et al., 2017; Rasnitsyn and Öhm-Kühnle, 2018; Zhang et al., 2018a; Zhang et al., 2018c), the less diverse families Myanmarinidae (Li et al., 2018; Zhang et al., 2018b), Mysteromyiidae (Grimaldi, 2016), and Manipulatoridae (Vršanský and Bechly, 2015), as well as the order Tarachoptera (Mey et al., 2017), according to our current knowledge is endemic of the Burmese amber assemblage. This additionally supports an inference about an insular nature of the mid-Cretaceous Burmese biota suggesting a later date of collision of the West Burma plate into the Sunda plate and Proto-Southeast Asia mainland, comparing the time of existence of that biota (Acharyya, 2010; Metcalfe, 2013; Rasnitsyn and Öhm-Kühnle, 2018).

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