

Two new species of *Supraserphites* (Hymenoptera, Serphitidae) in Burmese amber

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Through the ongoing research on Burmese amber, our knowledge about mid-Cretaceous life on an island in the Tethys ocean continually increases (Ross, 2019, 2020; Westerwheel *et al.*, 2019), a life that was exotic and highly endemic (Zhang, 2018; Rasnitsyn & Öhm-Kühnle, 2018a). Among its rich biota is the extinct, strictly Cretaceous family Serphitidae of the Hymenoptera, which still is underexplored. Serphitidae are known in Burmese amber in two subfamilies, one of them (Supraserphitinae) is confined exclusively to Burmese amber and recorded just with one genus and, before the present study, two species (Rasnitsyn & Öhm-Kühnle, 2018b, c). Another subfamily, Serphitinae, is known from three genera, with the type genus *Serphites* Brues, 1937 (Engel, 2015), which is the most diverse serphitid genus in other Cretaceous ambers and most likely in Burmese amber as well. While the description of Burmese Serphitinae needs to be reserved for our future research, the present work is devoted to the recently described genus *Supraserphites* Rasnitsyn & Öhm-Kühnle, 2018, the only one in the subfamily Supraserphitinae. We are adding two new species to this genus, hereby doubling its numbers.

Material and methods

The two amber pieces containing the fossils described herein were mined in the amber mines located in the Hukawng Valley, Kachin Province, Myanmar (for locality map see Li *et al.*, 2018: fig. 1). The rock yielding the amber in this province was dated paleontologically to the late Albian (Early Cretaceous, 97–110 Ma; Cruickshank & Ko, 2003) and later radiometrically, using U-Pb zircon dating, to 98.79 ± 0.62 Ma, therefore to the Albian/Cenomanian boundary (Shi *et al.*, 2012). The date corresponds with the early Cenomanian, being the earliest Late Cretaceous. However, since it is well known that amber easily becomes redeposited, we prefer to

refer to the amber informally as being of mid-Cretaceous age.

The amber pieces have been trimmed, polished and photographed by Dr. Dmitry D. Vorontsov (Moscow). The holotypes are deposited in the Öhm-Kühnle collection maintained permanently at the A.A. Borissiak Paleontological Institute, Russian Academy of Sciences, Moscow. The fossils were studied using a Leica M165C stereomicroscope with a Leica DFC 420 camera. For imaging, a compound microscope Nikon E-800 with dry (4×, 10×, 20×) and water dip optics (40× and 60×) was used. Specimens were imaged with a combination of brightfield and incident illumination. Stacks of images, comprising multiple focal planes, were obtained with an Olympus OM-D E-M10II camera. Stacks were processed with Helicon Focus version using mostly algorithm B. All taxonomic acts established herein have been registered in ZooBank (see below), together with the electronic publication LSID: [zoobank.org:pub:63D9DD26-352F-4C8F-A263-F6DEA1E50682](http://zoobank.org/pub:63D9DD26-352F-4C8F-A263-F6DEA1E50682)

Systematic palaeontology

Order Hymenoptera Linnaeus, 1758

Superfamily Serphitoidea Brues, 1937

Family Serphitidae Brues, 1937

Subfamily Supraserphitinae Rasnitsyn & Öhm-Kühnle, 2018

Genus *Supraserphites* Rasnitsyn & Öhm-Kühnle, 2018

Supraserphites vorontsovi sp. nov.

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(Fig. 1)

Holotype. Female, PIN no. 5620/31a; well preserved complete specimen. Syninclusion: Psocoptera.

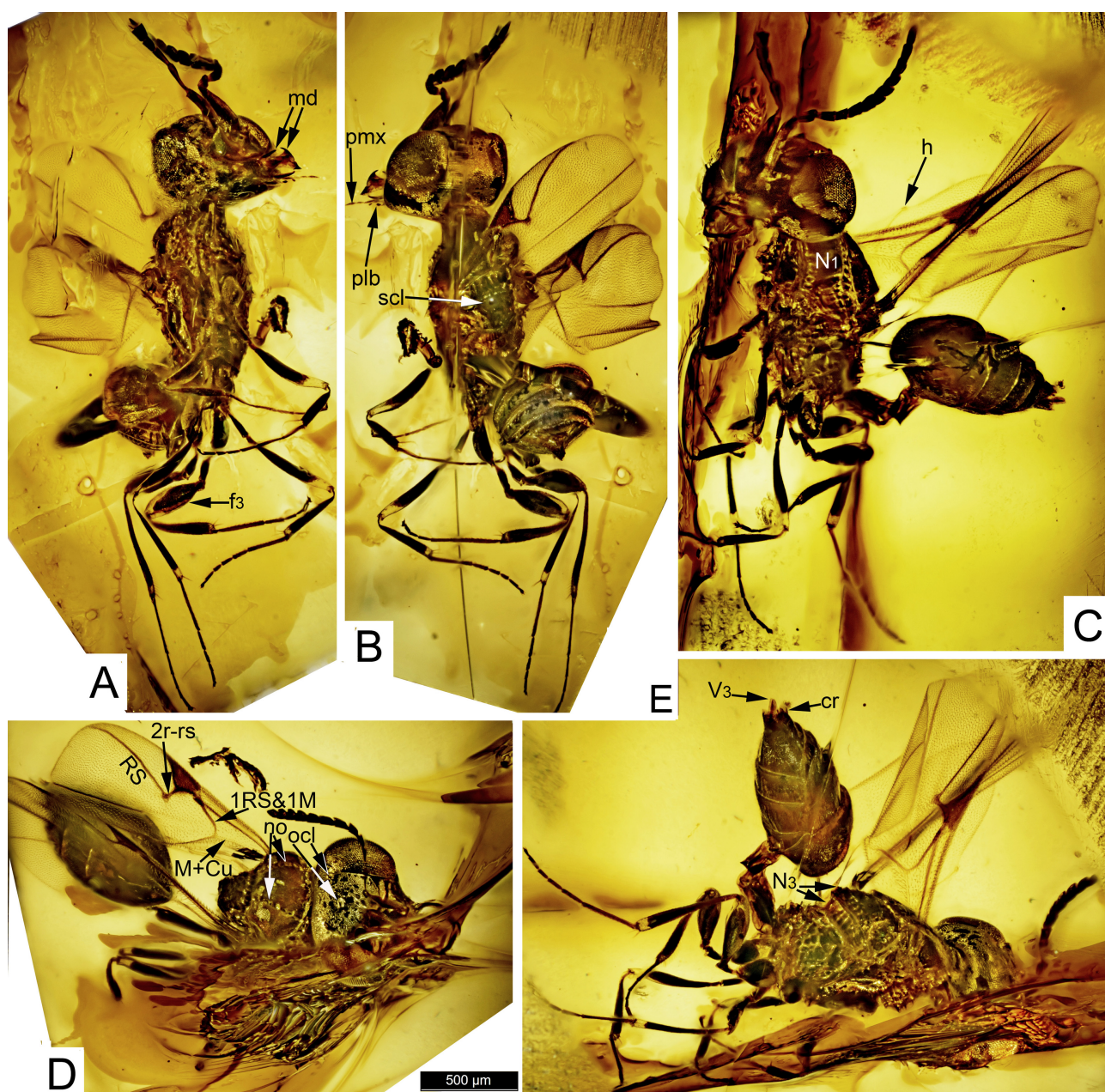


FIGURE 1. *Supraserphites vorontsovi* sp. nov., holotype. **A**, Oblique right view. **B**, Oblique left view. **C**, Left view. **D**, Oblique dorsal view. **E**, Oblique rear view. Symbols: cr, cercus, f₃, hind femur, h, hamuli, md, mandible, N₁, pronotum, N₃, metanotum, no, notaulus, ocl, ocelli, plb, labial palp, pmx, maxillary palp, scl, mesoscutellum, V₃, ovipositor sheath. Venational symbols: 1RS&1M, basal vein, 2r-rs, 2nd interradial (stigmatal) vein, RS, radial sector, M+Cu, mediocubital vein.

Etymology. Named in honor of Dr. Dmitry Vorontsov for his skillful preparation and imaging of the fossils described herein.

Diagnosis. Pedicel about as long as first two flagellomeres combined. Flagellar segments distinctly serrate. Scutellum simple. No furrow between metanotum and propodeum. Forewing with 2r-rs before mid-length of pterostigma and half as long as pterostigma width, with M+Cu ill-defined. Hind femur short and thick. Petiole shorter than hind tibia, with 1st segment 0.7× as long as 2nd.

Locality and horizon. Hukawng Valley, Kachin State,

Myanmar; lowermost Cenomanian or uppermost Albian, mid-Cretaceous.

Description. Female. Body and appendages dark as preserved (apparently dependent on inner tissue preservation: legs pale where looking empty). Integument finely punctuate, much of mesosoma with rough sculpture (see below for details). Vestiture inconspicuous except ventral and apical setae on tarsomeres and ventroapical ones on hind tibiae. Head large, moderately transverse, with eyes large but well distant from mandibles (malar space scarcely longer than half of scape length), lateral ocelli almost touching eyes, frons just slightly convex, temples moderately narrow,

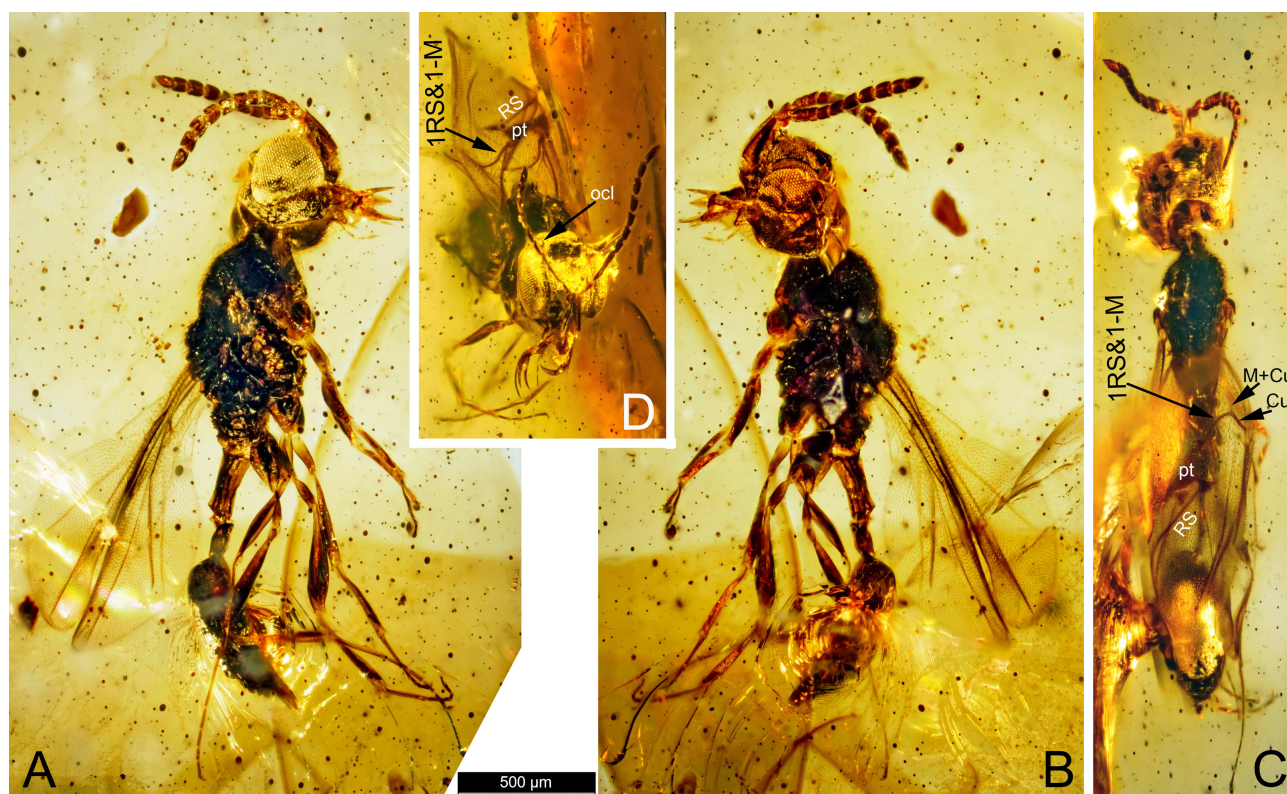


FIGURE 2. *Supraserphites margritae* sp. nov., holotype. **A**, Right view. **B**, Left view. **C**, Dorsal view. **E to D**, Frontal view. Symbols: Cu, cubital vein, pt, pterostigma, otherwise as in Fig. 1.

convex, occipital carina distinct below, but not dorsal, antennal attachments apparently simple. Antenna 12-segmented, distinctly geniculate, broadened distally but with no distinct clava. Scape about 0.45× head width, as long as pedicel and flagellomeres 1–2 combined, pedicel longer than any flagellar segment, flagellum basally narrow, otherwise rather thick and serrate, flagellomeres subquadrate except for elongate basal and apical ones. Mandibles with long teeth, 3 in right and 2 in left one. Maxillary palps moderately long, with 4 visible elongate segments, labial palps short, with 3 visible segments, with apical one short and preapical ones elongate. Pronotum with rows of dots along upper and lower margins. Mesonotum convex with complete notauli, formed as a row of large dots. Prescutellar impression long and coarsely transcostate. Mesoscutellum simple, convex, smooth. Metanotum with short horizontal and high vertical parts, both transcostate and separated with transverse carina, metapostnotum not impressed, not clearly delimited from propodeum, both coarsely rugose. Forewing with membrane hairy and with no distinct marginal fringe, with C distinct, apparently tubular but dark only basally, with pterostigma large but not exaggerated, with R tubular, basal vein (1-RS&1-M) tubular, smooth, somewhat S-like bent, 2r-rs tubular, some half as long as pterostigma width, RS distal of it tubular but thin, arching forward, M visible and tubular in apical 0.4 only, M+Cu spectral, Cu tubular, very thin in

distal half. Hindwing with no veins but very weak R, with 2 hamuli. Legs slender, except hind femur 2.7× as long as wide, trochantelli short, distinct, tibial spurs 1-2-2, fore tibial spur long, thin, straight except somewhat bent near apex, basitarsi about as long as remaining segments combined, claws small, simple. Metasoma with petiole half as long as gaster and almost half as mesosoma, both petiolar segments subcylindrical, rather thick (particularly the 1st one), first segment about twice as long as second one, gaster wide, fusiform, widest at end of first (third metasomal) segment, receiving petiole ventrally, with 6 visible segments, with very short cerci, with ovipositor scarcely external, with sheaths as long as mid basitarsus.

Measurements (in mm). Body length 2.5, forewing 1.5, scape 0.37, pedicel 0.17, flagellum 0.75, mesosoma length 0.95, hind femur length 0.33, tibia 0.57, tarsomeres 0.31, 0.11, 0.075, 0.05, 0.075, 1st petiolar segment 0.33, 2nd petiolar segment 0.15, gaster 0.9.

Remarks. The new species differs from all congeners in having 2r-rs comparatively long, RS arching towards wing margin and hind femur shorter and thicker (for more detailed comparison see Key below).

***Supraserphites margritae* sp. nov.**

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(Fig. 2)

Holotype. Female, PIN no. 5620/33a; complete specimen with body integument much degraded and morphology largely obscured, with antennae compressed (wide laterally and thin frontally) and with wings superimposed so as venation obscured in part. Syninclusions: Diptera, Cyclorrhapha: 2 larvae.

Etymology. Named in honor of Margrit Öhm, mother of the co-author, as expression of his personal gratitude.

Diagnosis. Pedicel distinctly longer than first two flagellomeres combined. Flagellar segments not serrate. Scutellum smooth with apex roughly rugose. No furrow between metanotum and propodeum. Forewing with 2r-rs before mid-length of pterostigma and shorter than 0.3 of pterostigma width, with M+Cu ill-defined. Hind femur long and narrow. Petiole longer than hind tibia, with 1st segment twice as long as 2nd.

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

Description. Female. Body and appendages dark as preserved (apparently dependent on inner tissue preservation); legs possibly paler in part. Body sculpture obscure because of integument degradation. Vestiture obscure (possibly similar to the previous species). Head somewhat deformed, large, cubic or subglobose, with eyes large, almost reaching mandibles, lateral ocelli almost touching eyes, occipital carina possibly complete (not distinct enough dorsally). Antenna 12-segmented, in side view almost equally wide throughout, with scape about 0.6× head width, as long as pedicel and flagellomeres 1–3 combined, pedicel longer than any flagellar segment except apical one, flagellomeres subquadrate except for elongate apical one. Mandibles with long teeth. Maxillary palps moderately long, with 4 visible elongate segments, labial palps short. Pronotum with rows of wide dots along upper and lower margins. Mesosoma ill-preserved, scutellum roughly sculptured apically, metanotum vertically high (possibly similar to that in previous species). Forewing with membrane hairy and with rudimentary marginal fringe, with venation not well visible due to position, as visible similar to that of previous species except 2r-rs much shorter and RS straight except before apex. Legs similar to those in previous species except that hind femur longer and more slender (length about 5× width). Metasoma with petiole 0.6× as long as gaster and almost half as mesosoma, both petiolar segments subcylindrical, first segment about twice as long as second one, gaster deformed, difficult to describe adequately, receiving petiole frontally.

Measurements (in mm). Body length 2.1, forewing 1.2, scape 0.23, pedicel 0.06, flagellum 0.55, head height 0.37, width (somewhat compressed) 0.35, mesosoma length 0.85, hind femur length 0.38, tibia 0.40, tarsomeres 0.22, 0.09, 0.065, 0.055, 0.07, 1st petiolar segment 0.24, 2nd petiolar segment 0.12, gaster 0.6.

Remarks. The new species differs from all congeners

in having 2r-rs very short, hind femur longer, and petiolar segment 1 twice as long as segment 2 (for more detailed comparison see key below).

Key to species of female *Supraserphites* (males unknown)

- 1 M+Cu tubular. 2r-rs shorter than 0.3 of pterostigmal width. Labial palp almost as long as maxillary one. Metapostnotum slit-like. Petiolar segments of equal length. Gaster with petiolar attachment more or less frontal.....*S. draculi* Rasnitsyn & Öhm-Kühnle, 2018
- M+Cu very weak, nebulous or spectral. 2r-rs variable. Labial palp much shorter than maxillary one. 1st petiolar segment much longer than 2nd. Petiolar attachment variable.....2
- 2 Gaster with petiolar attachment frontal. Flagellum hardly narrowed basally. 1st petiolar segment twice as long as 2nd. 2r-rs shorter than 0.3 of pterostigmal width. Scutellum with apex roughly sculptured. Metapostnotum not impressed.....*S. margritae* **sp. nov.**
- Gaster with petiolar attachment distinctly ventral. Flagellum distinctly narrowed basally. 2r-rs and sculpture of mesoscutellum variable.....3
- 3 2r-rs shorter than 0.3 of pterostigmal width. RS straight except utmost apex. Mesoscutellum with apex roughly sculptured. Metapostnotum slit-like. Hind femur narrow.....*S. sidorchukae* Rasnitsyn & Öhm-Kühnle, 2018
- 2r-rs half as long as pterostigma wide. RS widely arching. Mesoscutellum smooth. Metapostnotum not impressed. Hind femur short and thick.....*S. vorontsovi* **sp. nov.**

Discussion

With the present description of two new species of *Supraserphites*, the diversity of the genus (and subfamily Supraserphitinae) is doubled. Each species being based on one specimen only, this implies a highly underexplored fauna and therefore many undescribed species. A reason to wonder is why all four known specimens are females. Female prevalence in Hymenoptera is not unique, but apparently this otherwise is not the case in Serphitidae. Calculations based on recent publications (Engel *et al.*, 2011; McKellar, Engel, 2011; Ortega-Blanco *et al.*, 2011; Engel, Perrichot, 2014) result in nine species of *Serphites* Brues, 1937, with 50 specimens identified in respect to their sex, with 23 males and 27 females. This suggests a sex ratio close to 50:50 in *Serphites*, so the ratio of *Supraserphites* of 100 % females is either indicative of being female biased (possibly due to thelytoky, that is parthenogenetic reproduction with no male production), or incidental due to limited material. Future records may resolve the puzzle.

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