

A new genus of the Orussidae (Insecta: Hymenoptera) from Late Cretaceous New Jersey amber

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Abstract

A new species of Orussidae (Hymenoptera: Insecta) in a new genus is described, *Minyorussus luzzii*, and figured, preserved in Late Cretaceous amber of New Jersey. The phylogenetic affinities of the genus within the family are discussed.

Introduction

The affinities of the family Orussidae have long been of interest to entomologists because, although apparently closely related to sawflies, they are parasitic and therefore may form a link between two important groups of Hymenoptera, the otherwise phytophagous Symphyta and the principally parasitic and predaceous Apocrita. Traditionally orussids have been classified within the Symphyta, where they have been considered either as a family within the Siricoidea (Ross, 1937; Riek, 1970; Königsmann, 1977; Smith, 1979) or treated as a separate superfamily, the Orussoidea (Benson, 1955; Gauld and Bolton, 1988). Rohwer and Cushman (1917) proposed a new suborder Idiogastra for the family because it possesses many unusual larval and adult characters, as well as having a disparate biology compared with other Symphyta. More recently, Rasnitsyn (1980, 1988) erected a new infraorder,

the Orussomorpha in the Apocrita, for the Orussidae and its suggested ancestor, the Upper Jurassic family Paroryssidae. The orussid characters shared with the sawflies are all plesiomorphic and therefore do not justify grouping them together (Smith, 1995). Evidence from study of the mesosoma; the midcoxal articulation; the mesopostnotum; the antenna cleaner and preoral cavity structure, support the sister-group relationship of the Orussidae and Apocrita (Gibson, 1985; Johnson, 1988; Whitfield *et al.*, 1989; Basibuyuk and Quicke, 1995; Vilhelmsen, 1996). Rasnitsyn's (1988) hypothesis further implies that the traditional divisions of the order should be abandoned since neither are monophyletic.

The Orussidae is a cosmopolitan family consisting of two currently recognized extant subfamilies and an extinct one, which total 17 genera and about a hundred described species (Rasnitsyn, 1977; Smith, 1995). The only known extinct species, *Mesorussus taimyrensis*

Rasnitsyn, was described from the Upper Cretaceous of Taymyr, North Siberia, and belongs to the extinct subfamily Mesorussinae (Rasnitsyn, 1977). Another extinct species, *Siniorussus luzhongensis* Lin, was reported from the Miocene of China (Lin, 1982) but subsequently it was shown to belong to the Ichneumonidae (Zhang *et al.*, 1994).

Here, we describe a new species in a new genus from Late Cretaceous amber. The fossil under description is generally covered by small bubbles, in particular a thick layer of foggy material covers the mouth and upper part of the head. This obscures many important features. Nevertheless those which can be seen are sufficient to distinguish it from all other known orussid genera.

Family Orussidae Newman, 1834
MINYORUSSUS BASIBUYUK,
QUICKE & RASNITSYN, NEW GENUS

Diagnosis: The new genus differs from the only extinct genus *Mesorussus* in having 11-segmented antenna instead of 12-segmented in female and, by inference, 13-segmented in male *Mesorussus*. *Minyorussus* differs from all extant genera in the position of the antennal insertion, subclavate male antenna with long scape, pedicel and 1st flagellomere, wide submarginal cell (height/length ratio 0.45 rather than 0.33 or less in the extant genera), distinctly pentagonal discoidal cell, reclival cu-a cross vein, and very short and non-cylindrical metasoma. In other characters the new genus is most similar to *Ophrella* Middlekauff because of the distal position of cu-a combined with the subdistal position of 2r-rs in respect to the pterostigma, the more or less swollen hind femur and the 4- or 5-segmented maxillary palp.

Description: Apparent male. Small size (fig. 1). Antenna 11-segmented, subclavate (fig. 2); antennal insertion below level of ventral margin of eye, toruli not hidden under a transverse frontal carina, closer to each other than to genal margin (fig. 1); with scape and pedicel long and thick; first flagellar segment long, following ones much shorter, 9th flagellomere shorter than 1st but longer than intermediate ones that are all slightly elongate and

of similar length (fig. 2). Maxillary palp with 4 (possibly 5) segments, apical segment the longest (fig. 1). Head with indication of a crown of spines (though not clearly seen because of a thick layer of foggy material), occipital carina complete (figs 1, 3). Forewing with crossvein 2r-rs joining pterostigma slightly beyond its midlength; submarginal cell high apically (its apical height 0.45 length), Rs and M junction closer to M+Cu than to R; discoidal cell distinctly pentagonal, crossvein cu-a strongly curved and reclivous, and strongly postfurcal with respect to M; 1st and 2nd abscissas of vein Cu (1-Cu1 and 2-Cu1) forming a strong angle (approximately 140 degrees); vein 2A lost except short section aligned to a1-a2 crossvein distally (figs 3-4). Hindwing with 4 distal hamuli (fig 1). Foretarsus with more than 3 segments. Tibiae without pre-apical spurs, with rather short apical spurs (2 seen on middle tibia; only 1 on hind, but 2 could be present). Hind femur not very swollen (fig 5). Metasoma very short, approximately as long as mesosoma, slightly laterally compressed, distinctly widened near middle; tergites well sclerotized.

Type species: *Minyorussus luzzii*, n.sp.

Etymology: Combining Minys, Greek meaning small, with *Orussus*.

Discussion: Although we have not been able to determine the sex of the type specimen with certainty, comparison with sexual dimorphism displayed in extant taxa suggests that this is a male. Males of extant taxa possess 11-segmented antennae which are more or less setiform in shape, and 5-segmented fore tarsi. Females have 10-segmented antennae with the ultimate segment peglike, the penultimate segment swollen and as long as or longer than any other segments, and 3-segmented fore tarsi (Middlekauff, 1983; Smith, 1988, 1995).

Minyorussus luzzii Basibuyuk, Quicke &
Rasnitsyn, new species

Description: Holotype male. Measurements (mm): Length of body 2.20, forewing 1.40, scape 0.22, pedicel 0.12, length of 1st, ultimate and

penultimate flagellomeres 0.15, 0.11, and 0.06 respectively, apical segment of maxillary palp 0.14, hind femur 0.52, tibia 0.51, hind femur width 0.17, metasoma length 0.87, height 0.58.

Type: Holotype: American Museum of Natural History NJ-172. Locality and horizon: New Jersey, Middlesex Co., Sayreville, White Oaks Pits.

Etymology: *M. luzzii*, as acknowledgment to Keith Luzzi, collector of the type specimen.

Discussion

The correct taxonomic position of the new genus cannot be identified at present because of the incomplete preservation of the sole specimen available. Three subfamilies are currently recognized in the family, the monotypic Mesorussinae known only from the Lower Cretaceous, and two extant subfamilies, the Orussinae and Ophrynopinae, the former with 3 tribes and 10 genera, the latter with 2 tribes and 6 genera (Benson, 1955; Rasnitsyn, 1977; Middlekauff, 1983; Smith, 1995). *Minyorussus* could be attributed to the Mesorussinae which also lacks any form of a shelf-like ledge protruding above the antennal insertions. Some species of the extant Orussinae, *Orussobaius* Benson, have this ledge more or less reduced though not completely lost. However, in other characters *Orussobaius* species are quite similar to those retaining the ledge, implying this character being secondarily reversed to the plesiomorphic state. Hence, this observation does not affect the above conclusion that living orussid subfamilies are synapomorphic with respect to both *Minyorussus* and *Mesorussus* in their head capsule structure and that *Minyorussus* belongs to neither of these subfamilies. Additionally, *Minyorussus* is autapomorphic in the apically swollen male antenna with relatively long scape and pedicel, in the short and wide submarginal cell, and the short, non-cylindrical metasoma.

Minyorussus has several characters in common with the Ophrynopinae, and particularly with *Ophrella* Middlekauff. The character common to

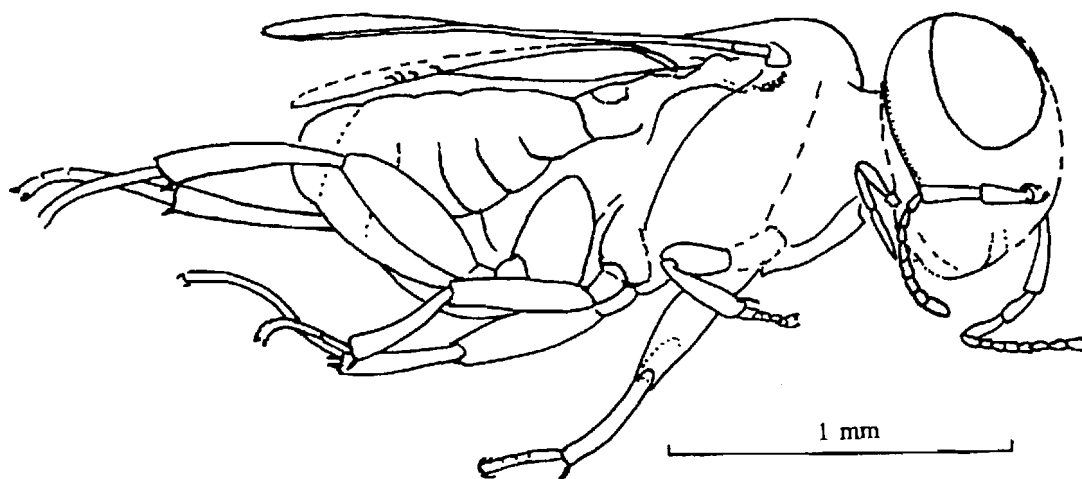
both the Ophrynopinae and *Minyorussus* is the position of the 2r-rs, which is shifted somewhat towards the pterostigmal apex (Benson, 1955; Middlekauff, 1983; Smith, 1988). Within the Ophrynopinae, *Minyorussus* has resemblance to the genera *Ophrynopus* Konow, *Ophrynon* Middlekauff, and *Ophrella* because of the complete occipital carina and 5-segmented maxillary palp. In terms of the position of crossvein cu-a with respect to the discoidal cell, it is reminiscent of *Ophrella* (Middlekauff, 1985). However, these similarities appear superficial when evaluated in a phylogenetic sense. The complete occipital carina and 5-segmented maxillary palp are plesiomorphic states, and so they cannot be used to suggest any phylogenetic relationship. The position of vein 2r-rs may be a synapomorphy of *Minyorussus* and the Ophrynopinae, as its sub-basal position in *Paroryssus* Martynov would imply. However, this character is known to be homoplastic in several groups: a varying amount of its apical shift can be seen, for instance, in the Tenthredinoidea, Pamphiliidae, Siricidae, Xiphydriidae within the Symphyta, Stephanidae, Cretevaniidae, Megaspilidae, and many Bethyidae in the Apocrita. Compared with the unique synapomorphy of Ophrynopinae and Orussinae, *i.e.*, the presence of the frontal ledge overhanging the antennal bases, the position of 2r-rs is a relatively weak character for grouping any subtaxa within Orussidae. *Minyorussus* can therefore be best considered as a basal grade to extant orussids with available evidence at present.

Because of the incomplete data on the new genus, the phylogenetic implications of this discovery are rather limited. However, it is possible to conclude that the Orussidae were not extremely rare even in Late Cretaceous times. Another observation is that the Mesozoic Orussoidea, both archaic Paroryssidae and the more advanced Orussidae, were of small size (Rasnitsyn, 1969, 1980). Paroryssid body size ranges from 2.6 to 6.5 mm, whilst both known Cretaceous orussids were probably under 3 mm long in life. If this is proven to be correct, then large body size should have been gained secondarily in the extant Orussidae. This may explain the contradiction observed between their relatively large body size

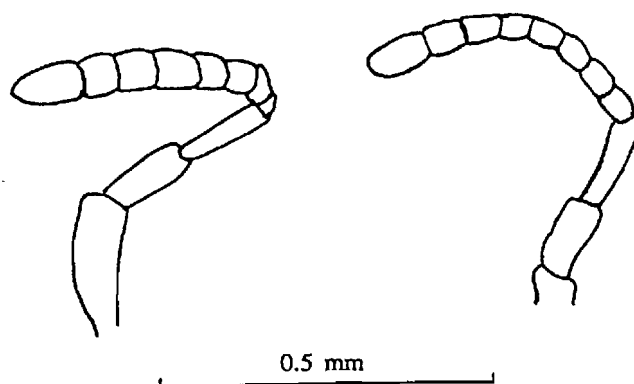
and extensive reduction in their wing venation and the number of hamuli, which are character states generally correlated with general reduction in size (Rasnitsyn, 1980).

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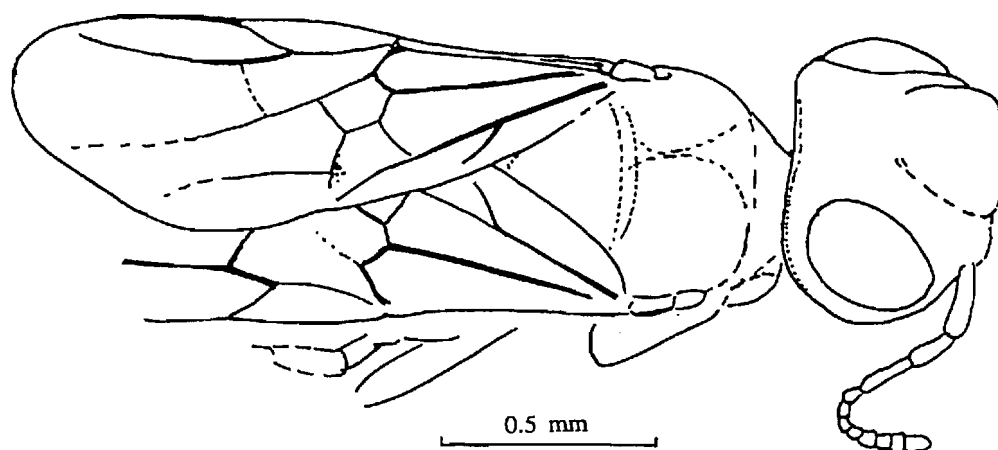
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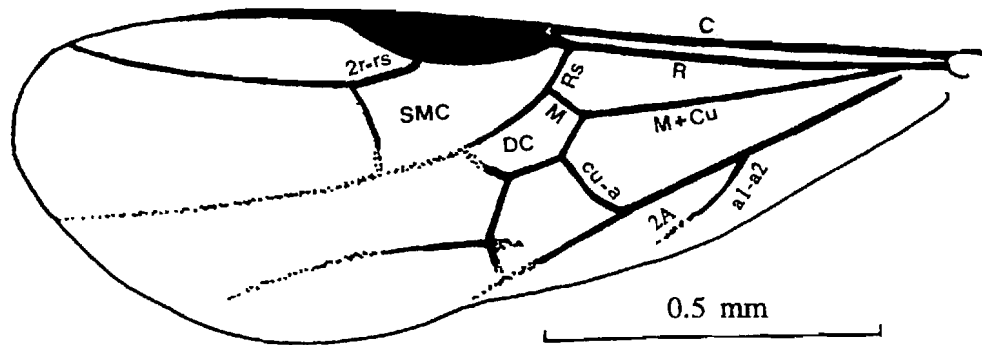


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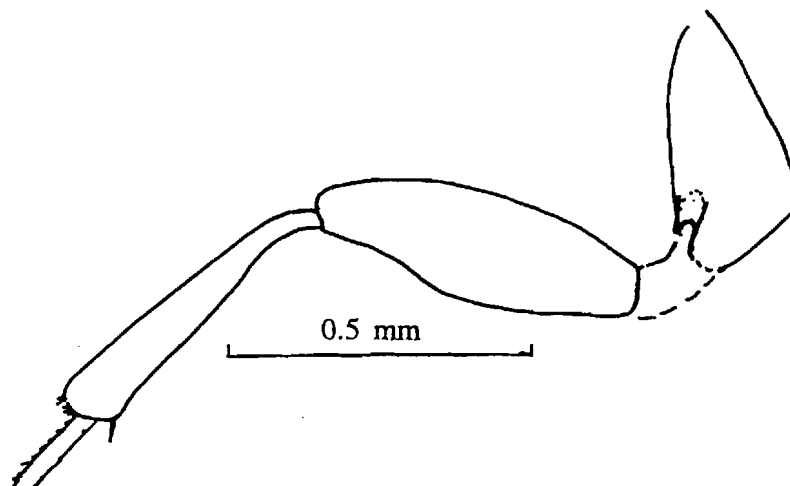


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Figs. 1-3. Minyorussus luzzii, n.gen., n.sp. Holotype. 1. Lateral aspect, 2. Antennae, 3. Dorsal aspect.



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Figs. 4-5. *Minyorussus luzzii*, n.gen., n.sp. Holotype. 4. Forewing venation. SMC: submarginal cell, DC: discoidal cell, 5. Hindleg.



Fig. 6. Photomicrograph of *Minyorussus luzzii* holotype. Above, lateral view; below dorsal view.