

Revision of Some Parasitic Wasps (Hymenoptera: Proctotrupoidea sensu lato) from the Florissant Locality, United States

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Abstract—The types of the parasitic wasps described in the families Proctotrupidae, Diapriidae, and Scelionidae (Hymenoptera) from the Upper Eocene Florissant locality (Colorado, United States) are revised. All the specimens are shown to belong to the family Proctotrupidae, representing the genera *Oxyserphus*, *Mischoserphus*, *Nothoserphus*, and *Palaeoteleia*. The known species are redescribed and two new species, *Mischoserphus bruesi* sp. nov. and *Nothoserphus rasnitsyni* sp. nov., are described. A new combination, *Oxyserphus exhumatus* (Brues, 1910), comb. nov., and a new synonymy, *Paramesius defectus* Brues, 1910, syn. nov. = *Oxyserphus exhumatus* (Brues, 1910), are established.

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INTRODUCTION

In the early 20th century, three species of parasitic wasps were described from the Florissant locality of Colorado, United States, in the families Proctotrupidae, Diapriidae, and Scelionidae (Brues, 1910; Cockerell, 1915). Reexamination of the type material has demonstrated that all three species in fact belong to the Proctotrupidae.

The Proctotrupidae is a relatively small, cosmopolitan family of parasitic wasps, which prefer regions with temperate and humid climate. They are most diverse in the Holarctic, where they occur predominantly in the forest zone. Proctotrupidae parasitize the larvae of beetles and dipterans or, more rarely, larvae of the lepidopteran family Oecophoridae or centipedes of the family Lithobiidae. In the modern fauna, the family comprises about 320 species classified into 27 genera (Townes and Townes 1981; Johnson 1992).

It is believed that Proctotrupidae descended from the extinct family Mesoserphidae, known from the Early Jurassic to the Middle Cretaceous (Rasnitsyn, 1980). The highest diversity of mesoserphids has been discovered in the Karatau locality (southern Kazakhstan). Mesoserphidae differ from other members of the superfamily Proctotrupoidea in displaying a combination of the most plesiomorphic characters: complete wing venation, homonomous abdominal segmentation, large number of flagellomeres, and external ovipositor with sheaths that served exclusively for protection (Kozlov, 1975, 1981; Rasnitsyn, 1980). Various intermediate forms assigned to the Proctotrupidae, displaying a reduced wing venation and variable abdominal morphology, and true Proctotrupidae first appeared in the Early Cretaceous of China (Beipiao locality) (Ren

et al., 1995; Zhang and Zhang, 2000, 2001), Transbaikalia (Baissa), and Mongolia (Bon-Tsagan) (Rasnitsyn, 1980, 1986).

In the Cenozoic, Proctotrupidae are represented by the extant genera *Fustiserphus*, *Mischoserphus*, and *Oxyserphus* and are known from the Eocene Baltic and Rovno amber (Kolyada and Mostovski, 2007) as well as from the Eocene–Oligocene of the Isle of Wight (Kolyada and Mostovski, 2007) (the age of the latter deposits is given after Gale et al., 2006, and Hooker et al., 2007). Unidentified proctotrupids are known from the Eocene deposits in Washington State, United States, and in British Columbia, Canada (Okanagan Highlands). From the Florissant locality, in addition to *Mischoserphus* and *Oxyserphus*, the genus *Nothoserphus* is known.

All the material examined comes from the Florissant locality (Colorado, United States), famous for its rich fossil insect fauna. The deposits are currently dated as the uppermost Eocene (Evanoff et al., 2001); they appear to belong to the temperate or warm-temperate climatic zone (Moe and Smith, 2005).

The material examined is deposited at the Museum of Comparative Zoology, Harvard University (MCZC).

SYSTEMATIC PALEONTOLOGY

Family Proctotrupidae Latreille, 1802

Subfamily Proctotrupinae Latreille, 1802

Tribe Cryptoserphini Kozlov, 1970

Genus *Oxyserphus* Masner, 1961

This genus of approximately 20 species is known from the Australian and Oriental regions (Townes and

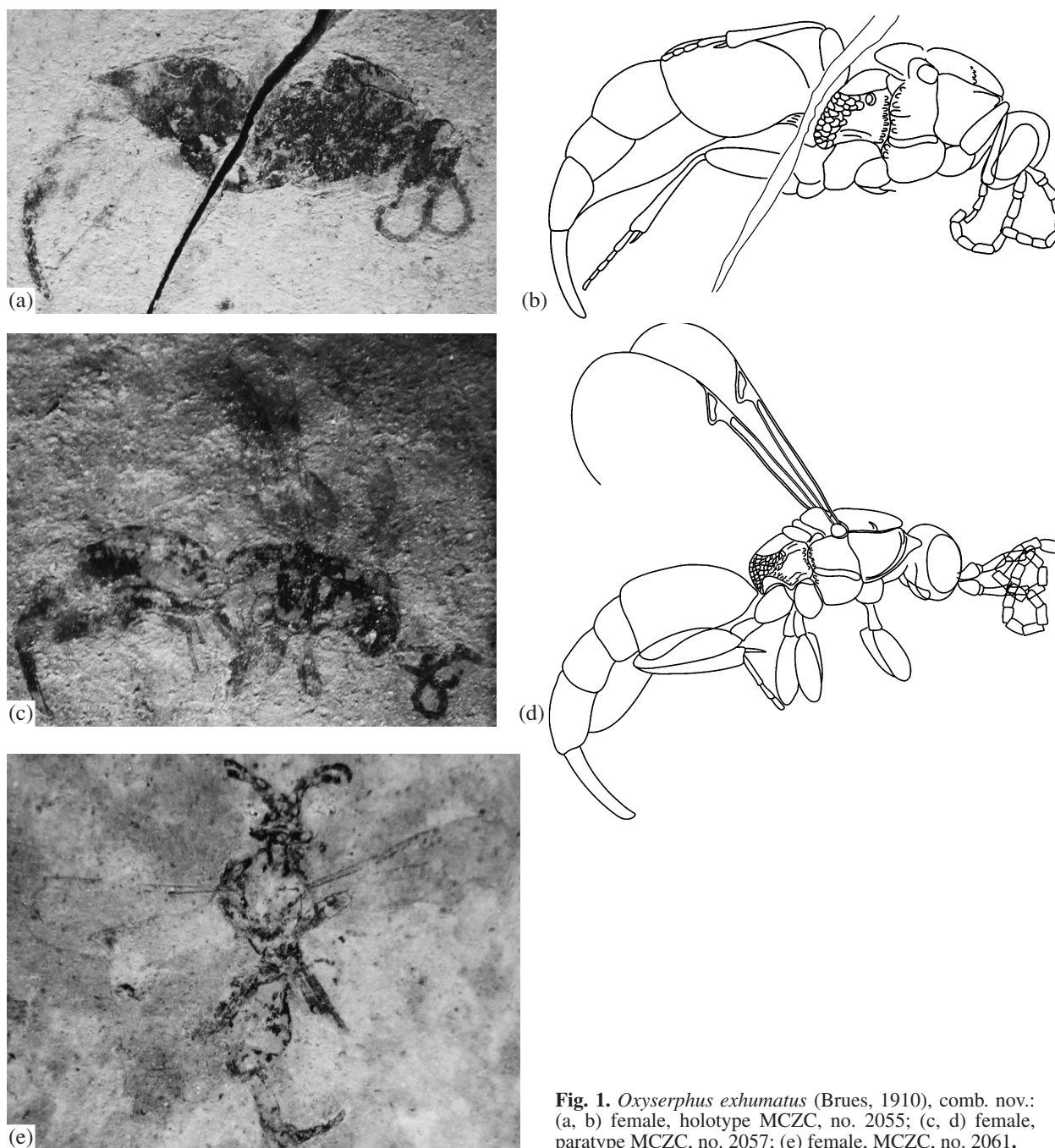


Fig. 1. *Oxyserphus exhumatus* (Brues, 1910), comb. nov.: (a, b) female, holotype MCZC, no. 2055; (c, d) female, paratype MCZC, no. 2057; (e) female, MCZC, no. 2061.

Townes, 1981; Johnson, 1992), as well as from the eastern Palearctic, including one species extending to Europe (Kolyada, 2007). Additionally, several undescribed species have been found in South and Central America. Species of this genus occur in temperate and subtropical forests, often in mountains. They are parasites of beetle larvae from the families Curculionidae and Anthribidae. Recently, this genus has been found in the Eocene-Oligocene of the Isle of Wight (Bembridge Marls) in Great Britain and also in the Late Eocene Baltic amber (Kolyada and Mostovski, 2007).

***Oxyserphus exhumatus* (Brues, 1910), comb. nov.**

Serphus florissantensis Rohwer, 1909: Kieffer, 1914, pp. 4–5 (partim).

Proctotrupes exhumatus: Brues, 1910, pp. 9–10, text-fig. 2; Johnson, 1992, p. 324.

Paramesius defectus: Brues, 1910, p. 11, text-fig. 4, syn. nov.

Serphus exhumatus: Kieffer, 1914, pp. 4–5; Townes, 1981, p. 384.

Holotype. MCZC, no. 2055 (original no. 4391), female in profile, incompletely preserved impression; Florissant locality; Upper Eocene.

Description (Fig. 1). The body is elongate and slender. The head is transverse, with short genae. The

antennae are filiform. The antennomeres are elongate: the first is 2.2 times as long as wide, the penultimate is 1.6 times as long as wide, and the terminal is 1.8 times as long as wide. The upper anterior angle of the pronotum has a distinct humeral prominence. The epomia is developed and reaches the apex of the humeral prominence. The mesoscutum is weakly convex; the notauli are short yet conspicuous, as long as the tegula. The horizontal groove at the middle of the mesopleuron is entire. The vertical row of holes on the posterior end of the mesopleuron is well developed. The propodeum is elongate, approximately as long as the mesoscutum, dorsally and laterally with large smooth areas. The rest of the propodeum has minute yet conspicuous reticulate sculpture. The metatibial spur extends for half the length of the first metatarsomere. The pterostigma is relatively narrow, with vertical 2r-rs on its lower side; 2r-rs is twice as long as wide. The radial vein leaves 2r-rs and enters the costal vein at a 40° angle. The costal segment of the radial cell is almost half as long as the pterostigma. The part of the costal vein extending beyond the apex of the radial cell is approximately as long as that cell. The petiole of the abdomen is concealed under the syntergite. The ovipositor sheaths are long, 0.9 times as long as the metatibia, 6 times as long as wide, weakly rounded at the apices.

Measurements (mm): body length, 5.2; forewing, 3.0.

Comparison. Within the genus *Oxyserphus* the species is most similar to *O. xanthura* Townes, 1981, particularly in the shape and size of the ovipositor sheaths, while differing from it in the presence of the vertical epomia.

Remarks. The redescribed species resembles representatives of the genus *Tretoserphus* but cannot belong to it because it has a shorter radial cell (in *Tretoserphus*, it is as long as or longer than the pterostigma) and a significantly shorter vertical 2r-rs, which is as long or slightly longer than wide (in *Tretoserphus*, it is 3–4 times as long as wide).

Reexamination of the holotype of *P. defectus* has demonstrated that the species does not belong to the family Diapriidae and that its ovipositor sheaths are identical in shape to those of *O. exhumatus*.

The identification of eight *O. exhumatus* specimens from Scudder's collection as *S. florissantensis* by Kieffer (1914, pp. 4–5) appears to be based on an error. Apparently, Kieffer interpreted the latter name as indicating that the species was found in the Florissant locality, i.e., that it was a fossil species. In fact, it is an extant species collected in the vicinity of the town of Florissant.

Material. In addition to the holotype, paratype MCZC, no. 2057 (original no. 8389), well-preserved female in profile; MCZC, no. 2061 (original no. 13394), incompletely preserved female in ventral aspect (the holotype of *P. defectus*).

Genus *Palaeoteleia* Cockerell, 1915

Examination of the holotype of *Palaeoteleia oxyura* Cockerell, 1915 has demonstrated that this species does not belong to the family Scelionidae. Its venation characters and the presence of strong external ovipositor sheaths indicate that it belongs, in fact, to the family Proctotrupidae and is particularly close to the genus *Pshornia*. However, the incomplete preservation and the unfortunate orientation of the impression do not allow its confident assignment to *Pshornia*. Until additional material is available, it seems preferable to retain *Palaeoteleia* as a separate genus.

Palaeoteleia oxyura: Cockerell, 1915

Palaeoteleia oxyura: Cockerell, 1915, p. 637; Johnson, 1992, p. 324.

Holotype. MCZC, no. 3912, female in ventral aspect, incompletely preserved impression; Florissant locality; Upper Eocene.

Description (Fig. 2). The body is elongate and slender. The head is transverse. The face is convex; the genae are very short. The antennae are filiform. The antennomeres are elongate: the first is 2.3 times as long as wide and the penultimate is 1.1 times as long as wide. The metatibial spur extends for half the length of the first metatarsomere. The pterostigma is wide, with a small, almost square 2r-rs on its lower side. The radial vein leaves the lower margin of the pterostigma and enters the costal vein at a 40° angle. The length of the costal segment of the radial cell is half the width of the pterostigma. The costal vein does not extend beyond the apex of the radial cell. The abdominal petiole is concealed under the syntergite. The ovipositor sheaths are thick and massive, as long as the metatibia, pointed at the apices.

Measurements (mm): body length, ca. 7.0; forewing length, 4.0.

Material. Holotype.

Genus *Mischoserphus* Townes, 1981

This genus of approximately 20 species is distributed worldwide, except Africa (Townes and Townes, 1981; Johnson, 1992). Its representatives are typical mesophiles and occur in the temperate and subtropical forests, where they parasitize fungus gnat larvae (Diptera, Mycetophiloidea). The genus has only recently been found in the Eocene–Oligocene deposits of the Isle of Wight (Bembridge Marls) in Great Britain and in the Late Eocene Baltic amber (Kolyada and Mostovski, 2007).

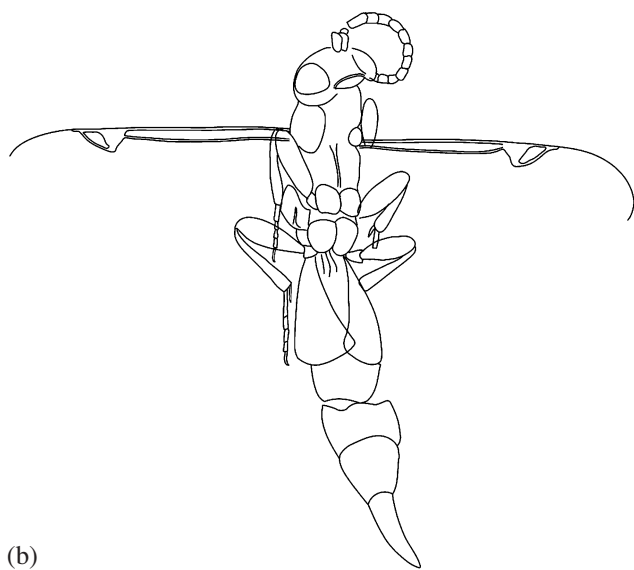
Mischoserphus bruesi Kolyada, sp. nov.

Proctotrupes exhumatus: Brues, 1910, pp. 9–10 (partim).

Etymology. Named in honor of the prominent entomologist and paleontologist Charles T. Brues.



(a)



(b)

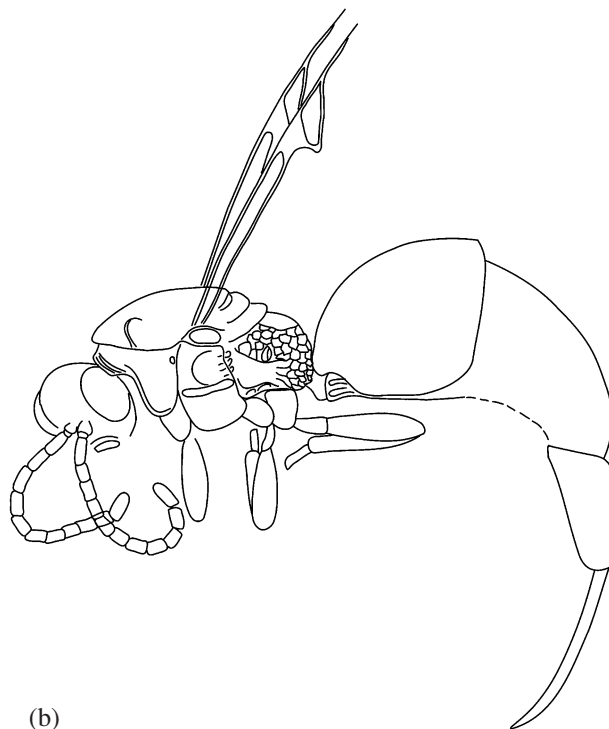
Fig. 2. *Palaeoteleia oxyura* Cockerell, 1915: (a, b) female, holotype MCZC, no. 3912.

Holotype. MCZC, no. 2059 (original no. 8111), female in profile, incompletely preserved impression; Florissant locality; Upper Eocene.

Description (Fig. 3). The body is elongate and slender. The head is round, narrowing ventrally; the genae are long. The clypeus is small, approximately as long as the genae. The antennae are filiform. The antennomeres are elongate: the first is 2.2 times as long as wide, the penultimate is 1.4 times as long as wide, and the terminal is 1.9 times as long as wide. In the upper anterior angle of the pronotum, the humeral prominence is indiscernible. The epomia is developed, but does not reach the apex of the pronotum. The mesoscutum is convex; the notauli are vertical, conspicuous, as long as the tegula. The horizontal groove at the middle of the mesopleuron is entire. The vertical row of pits on the posterior end of the mesopleuron extends only to the horizontal groove. The propodeum is short, approx-



(a)



(b)

Fig. 3. *Mischoserphus bruesi* sp. nov.: (a, b) female, holotype MCZC, no. 2059.

imately half as long as the mesoscutum. Large bare areas can be seen on the dorsal and lateral parts of the propodeum. The rest of the propodeum is covered with reticulate sculpture. The pterostigma is relatively narrow, with vertical 2r-rs, which is three times as long as wide. The radial vein leaves 2r-rs and enters the costal vein at an angle of 30°. The length of the costal segment of the radial cell equals the width of the pterostigma. The part of costal vein extending beyond the apex of radial cell is 1.3 times as long as the width of that cell.

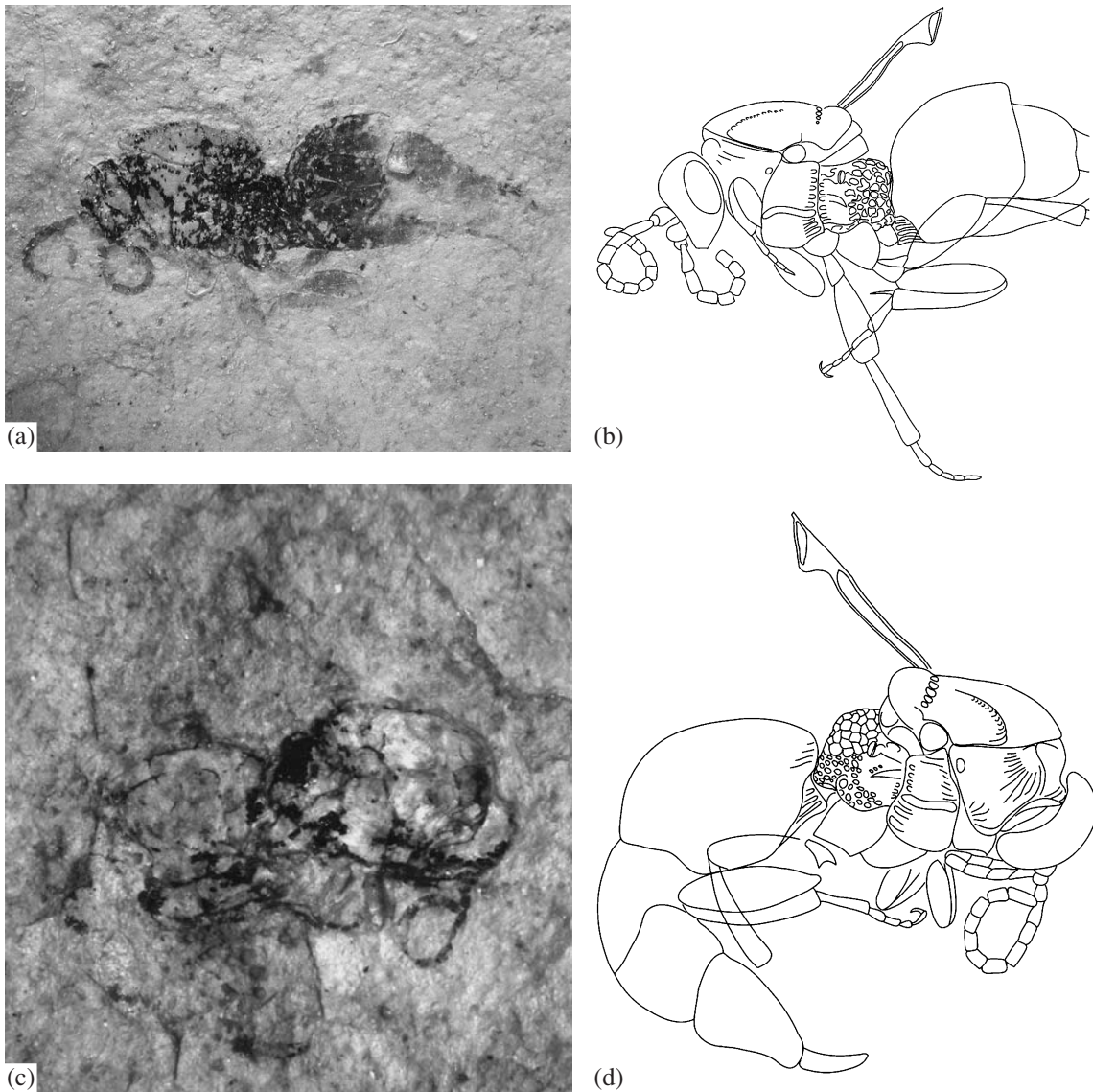


Fig. 4. *Nothoserphus rasnitsyni* sp. nov.: (a, b) female, holotype MCZC, no. 2056; (c, d) female, paratype MCZC, no. 2058.

The abdominal petiole is concealed under the syntergite. The ovipositor sheaths are long, 1.6 times as long as the metatibia, 16 times as long as wide, and pointed at the apices.

Measurements (mm): body length, 5.6; forewing length, 3.2.

Comparison. Within the genus *Mischoserphus*, the new species is most similar to *M. petiolatus* Townes, 1981, particularly, in the shape and size of the ovipositor sheaths, while differing from it in the ovipositor sheaths being longer, relative to the metatibia, and in different proportions of the pterostigmal veins.

Material. Holotype.

Genus *Nothoserphus* Townes, 1981

This genus of approximately 11 species occurs mostly in the Oriental region and in the eastern Palearc-

tic, with one species extending to Europe (Townes and Townes, 1981; Johnson, 1992). Its representatives live in temperate and subtropical forests and parasitize larvae of phytophagous species of the lady beetle family Coccinellidae (Coleoptera). This genus has not previously been recorded in the fossil record.

***Nothoserphus rasnitsyni* Kolyada, sp. nov.**

Proctotrupes exhumatus: Brues, 1910, pp. 9–10 (partim).

Etymology. Named in honor of the paleontologist Alexander Rasnitsyn.

Holotype. MCZC, no. 2056 (original no. 845), female in profile, completely preserved impression; Florissant locality; Upper Eocene.

Description (Fig. 4). The body is short and robust. The head is strongly transverse, narrowing ven-

trally. The occiput and temples are very narrow, barely conspicuous. The antennae are filiform. The first to third antennomeres are elongate, and the fourth to tenth ones are almost square. The first antennomere is 1.9 times as long as wide, the penultimate is 1.2 times as long as wide, and the terminal is 2.9 times as long as wide. The upper anterior angle of the pronotum has a very well developed humeral prominence. Almost half of the pronotum below the prominence is strongly rugose. The epomia is developed but does not reach the apex of the humeral prominence. The mesoscutum is convex; the notauli are well developed, wide, with internal reticulation, extending just short of the scutellar fovea. The scutellar fovea has several internal carinae. The horizontal groove at the middle of the mesopleuron is entire. Most of the mesopleuron has well developed longitudinal reticulation. The vertical row of pits on the posterior end of the mesopleuron is well developed. The propodeum is very short and high, 0.4 times as long as the mesoscutum. Except for a small lateral spot, the entire propodeum has conspicuous rough reticulation. The spur on the metatibia extends to the half length of the first metatarsomere. The pterostigma is wide, on its lower side with small vertical 2r-rs, which is almost fused to the pterostigma. The radial vein leaves the lower margin of pterostigma and enters the costal vein at a 36° angle. The width of the pterostigma is 3.8 times the length of the costal segment of the radial cell. The costal vein is not developed beyond the apex of the radial cell. The abdominal petiole is concealed under the syntergite. The base of the syntergite dorsally has longitudinal striae. The ovipositor sheaths are short, 0.5 times as long as the metatibia, rounded at the apices.

Measurements (mm): body length, 5.5; forewing length, 2.0.

Comparison. Within the genus *Nothoserphus*, the new species is most similar to *N. mirabilis* Brues, 1940, in particular, in the size and structure of the notauli and the strong reticulation of the pronotum, while differing from it in the absence of two dorsal processes on the head and in having significantly shorter antennae.

Remarks. In all the known extant species of *Nothoserphus*, the abdominal petiole is not concealed under the syntergite. Therefore, its absence in the new species is most probably an artifact.

Material. In addition to the holotype, paratype MCZC, no. 2058 (original no. 10894), female in profile, well preserved.

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