



Revision of Proctotrupidae (Insecta: Hymenoptera) described by Ch. T. Brues from Baltic amber

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Abstract

Re-examination of the type material of six species described by Brues from the Baltic amber in the genus *Cryptoserphus* revealed that none of them belong to this genus but represent four species within other extant genera, i.e. *Fustiserphus pinorum* (Brues, 1940) comb. nov., *Mischoserphus gracilis* (Brues, 1940) comb. nov., *Oxyserphus obsolescens* (Brues, 1940) comb. nov., and *O. hamiferus* (Brues, 1940) comb. nov. Two other species (*Cryptoserphus tertarius* and *C. succinalis*) described by Brues and *Cryptoserphus koggeauxillarius* described by Szabo & Oehlke (1986) are synonymised under *O. obsolescens*. All species are redescribed and illustrated.

Key words: Hymenoptera, Proctotrupidae, parasitic wasps, Baltic, Rovno, amber, Late Eocene, new synonymy, new combination

Резюме

Переизучение типового материала видов *Cryptoserphus*, описанных Брюсом из балтийского янтаря, показало, что ни один из них не может быть отнесен к этому роду. Материал относится к четырем видам современных родов: *Fustiserphus pinorum* (Brues, 1940) comb. nov., *Mischoserphus gracilis* (Brues, 1940) comb. nov., *Oxyserphus obsolescens* (Brues, 1940) comb. nov. и *O. hamiferus* (Brues, 1940) comb. nov. Два других описанных Брюсом вида (*Cryptoserphus tertarius* и *C. succinalis*) и *Cryptoserphus koggeauxillarius*, описанный Сабо и Элке (Szabo & Oehlke 1986), являются синонимами *O. obsolescens*. Все валидные виды переописаны и проиллюстрированы.

Ключевые слова: Нуменоптера, Proctotrupidae, паразитические наездники, балтийский янтарь, ровенский янтарь, поздний эоцен, новая синонимия, новые комбинации

Introduction

The Proctotrupidae is a relatively small family of parasitic wasps with a worldwide distribution. Species prefer regions with a temperate and humid climate and are most diverse in the Holarctic, where they occur mainly in shadowed forests. Proctotrupids are larval endoparasites of at least a dozen of beetle families, as well as the dipteran families Mycetophilidae and Sciaridae, the lepidopteran family Oecophoridae, and centipedes of the family Lithobiidae. Recent proctotrupid fauna consists of about 320 species in 27 genera (Townes & Townes 1981; Johnson 1992).

The Proctotrupidae are believed to originate from the extinct family Mesoserphidae, which is known from the Lower Jurassic until the mid-Cretaceous (Rasnitsyn 2002). The most diverse mesoserphid fauna is recorded in the locality of Karatau (Southern Kazakhstan). Mesoserphids are characterised by a set of the most plesiomorphic features within the whole superfamily Proctotrupeoidea, viz. complete wing venation, homonomous segmentation of the metasoma, numerous antennomeres, and by the exposed and unprotected ovipositor (Kozlov 1975, 1981; Rasnitsyn 1980). Various transitional forms referable to the family Proctotrupidae and having a somewhat reduced wing venation and various structure of the abdomen, as well as true proctotrupids appear during the Early Cretaceous and have been found in China (Ren *et al.* 1995; Zhang & Zhang 2000, 2001), Transbaikalia (Baissa) and Mongolia (Bon-Tsagaan) (Rasnitsyn 1980, 1986).

The history of studying proctotrupids in Baltic amber is closely associated with the collection of the Geological Museum of the University of Königsberg (now Kaliningrad). This collection was the biggest one and included dozens of thousands of specimens. After the World War II, the majority of this distinct collection was scattered; many specimens were moved to private and museum collections of various countries, some specimens were apparently unrecoverably lost. About 800 specimens remained in Russia and were bought from a private person and deposited in the Museum of the World Ocean, Institute of Oceanology of Russian Academy of Sciences, Kaliningrad. Regrettably, no proctotrupids have been found among 50 hymenopteran specimens in that collection.

The first proctotrupid species discovered in amber, *Serphus cellularis* Brues, 1923 is probably lost. However, types of six other species described later (Brues 1940) are housed in the Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA. Apparently due to the outbreak of the World War II, Brues could not return these types to Königsberg, and hence, they survived.

Brues (1940) placed all of the above-mentioned six species into the genus *Cryptoserphus* Kieffer, 1907. However, re-examination of the types, and of additional material, showed that none of them belong to this genus, but should be referred to the genera *Fustiserphus*, *Mischoserphus*, and *Oxyserphus*.

Finally, there was one more species described from the Baltic amber, *Cryptoserphus koggeauxillarius* Szabo & Oehlke, 1986, which type has not been re-examined. However, judging from the original photograph and the drawing, it belongs to *Oxyserphus obsolescens* (Brues, 1940), comb. nov. Two more specimens of this species have been found in Rovno amber; this is the first record of the family Proctotrupidae in this resin.

The age of both Baltic and Rovno ambers is estimated as being Late Eocene (Zherikhin & Eskov 1999; Perkovsky *et al.* 2007).

Material and methods

The types of Brues' species are represented by inclusions in polished amber blocks glued onto micropreparation slides. The inclusions are generally satisfactorily preserved, although some specimens have distorted proportions due to air bubbles around their bodies or are partly destroyed due to maceration. In these cases, descriptions are based on the relief and sculpture of sclerites imprinted into the air bubble wall.

Pictures were taken through Leica MZ6 dissecting microscope with Canon PowerShot S50 digital camera. To create a diffused illumination, a sheet of white paper was placed between an object and a light source. Images were captured using RemoteCapture 2.7 software and modified using ©Adobe Photoshop 7.0. Line drawings have been made using ©Adobe Illustrator 10.

The studied material is deposited in the following institutions: MCZC – Museum of Comparative Zoology, Cambridge, MA, USA; PIN – Laboratory of Arthropods, Paleontological Institute, Moscow, Russia; SIZC – Schmalhausen Institute of Zoology, Kiev, Ukraine.

Taxonomy

Family Proctotrupidae Latreille, 1802

Subfamily Proctotrupinae Latreille, 1802

Tribe Cryptoserphini Kozlov, 1970

Genus *Fustiserphus* Townes, 1981

Type species. *Fustiserphus reticulatus* Townes, 1981; by original designation.

This genus is currently known from in Australia, New Zealand and in both Americas (Townes & Townes 1981). New Zealand representatives of *Fustiserphus* parasitise larvae of Oecophoridae (Lepidoptera) in *Nothofagus* forest, being found, however, in a variety of other habitats (Early & Dugdale 1994). This genus was previously unknown in the palaeontological record.

Fustiserphus pinorum (Brues, 1940), comb. nov.

(Figs 1, 2)

Cryptoserphus pinorum Brues, 1940: 260 (female).

Description. Body approximately 3.5 mm long including ovipositor sheath but excluding antennae. Forewing 1.8 mm long, hindwing 1.2 mm long, antenna 1.2 mm long. Head 1.3 times as high as broad. Face strongly convex. Gena 0.37 times as high as eye width. Malar sulcus deep. Mandibles with blunt point. Antenna 2.8 times as long as head height, 13-segmented; antennomeres cylindrical, with no noticeable constrictions between them, thickening apically, ratio of antennomere lengths as following: 3.1:1.2:2.7:3.6:2.8:2.7:2.5:2.5:2.3:2.2:2.0:1.8:3.8. Pronotum with small humeral tubercles. Epomia uninterrupted. Lateral sides of pronotum with weak horizontal reticulation. Mesoscutum with well-developed notauli reaching its midlength. Horizontal groove across mesopleuron incomplete, reaching only 0.7–0.8 distance toward mesopleural suture. Mesopleuron with complete vertical perforated mesopleural suture running along posterior margin. Lateral sides of metapleuron with strong oblique reticulation (striation), with small smooth area divided by deep horizontal suture. Propodeum quadrate, convex, 0.5 times as long as thorax, dorsally with two lateral fields separated by noticeably reticulated ridge. Vertical section of radial vein 2 times as long as wide. Radial vein slightly arched, joining costal vein at 38°. Costal section of radial cell slightly (1.3 times) greater than width of pterostigma. Costal vein not developed beyond radial cell. Base of syntergite with numerous well-developed longitudinal wrinkles. Ovipositor sheath 6 times as long as wide, approximately 0.8 times as long as hind tibia, rounded apically, with small scattered setae.

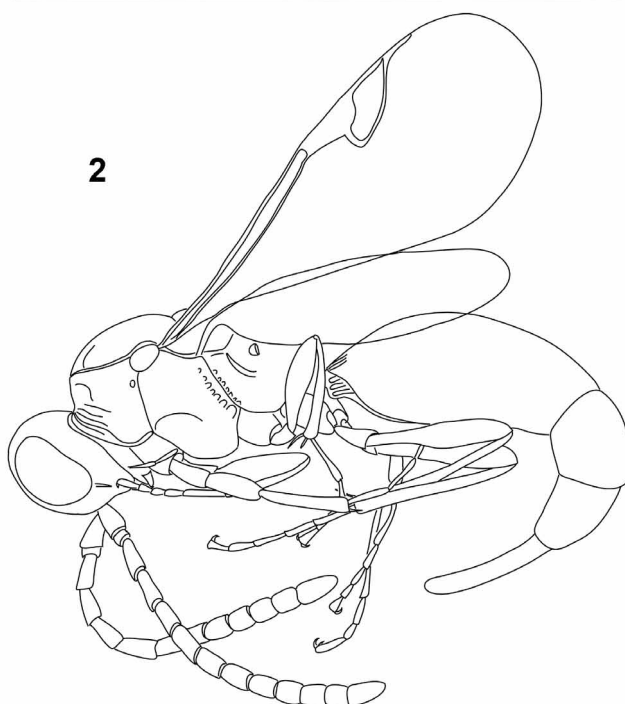
Holotype. Female, MCZC, no. 8257. The pronotum, mesopleuron and metapleuron of the right side of the body is almost entirely covered with milky substance.

Other material examined. Female labelled “1.07.1966; Ost. Prussen, G.V. Henningsen” (MCZC).

Genus *Mischoserphus* Townes, 1981

Type species. *Cryptoserphus arcuator* Stelfox, 1950; by original designation.

This genus is distributed around the world, except for Africa and some South American countries (Townes & Townes 1981). Representatives of *Mischoserphus* inhabit temperate and subtropical forests and parasitise fungus gnats (Mycetophilidae). Until recently, this genus has been unknown in the fossil record. Another representative of *Mischoserphus* is found in the Early Oligocene Bembridge Marls, Isle of Wight, UK (Antropov *et al.* in press).



FIGURES 1, 2. *Fustiserphus pinorum* (Brues, 1940), holotype: (1) general appearance; (2) details of body structures.

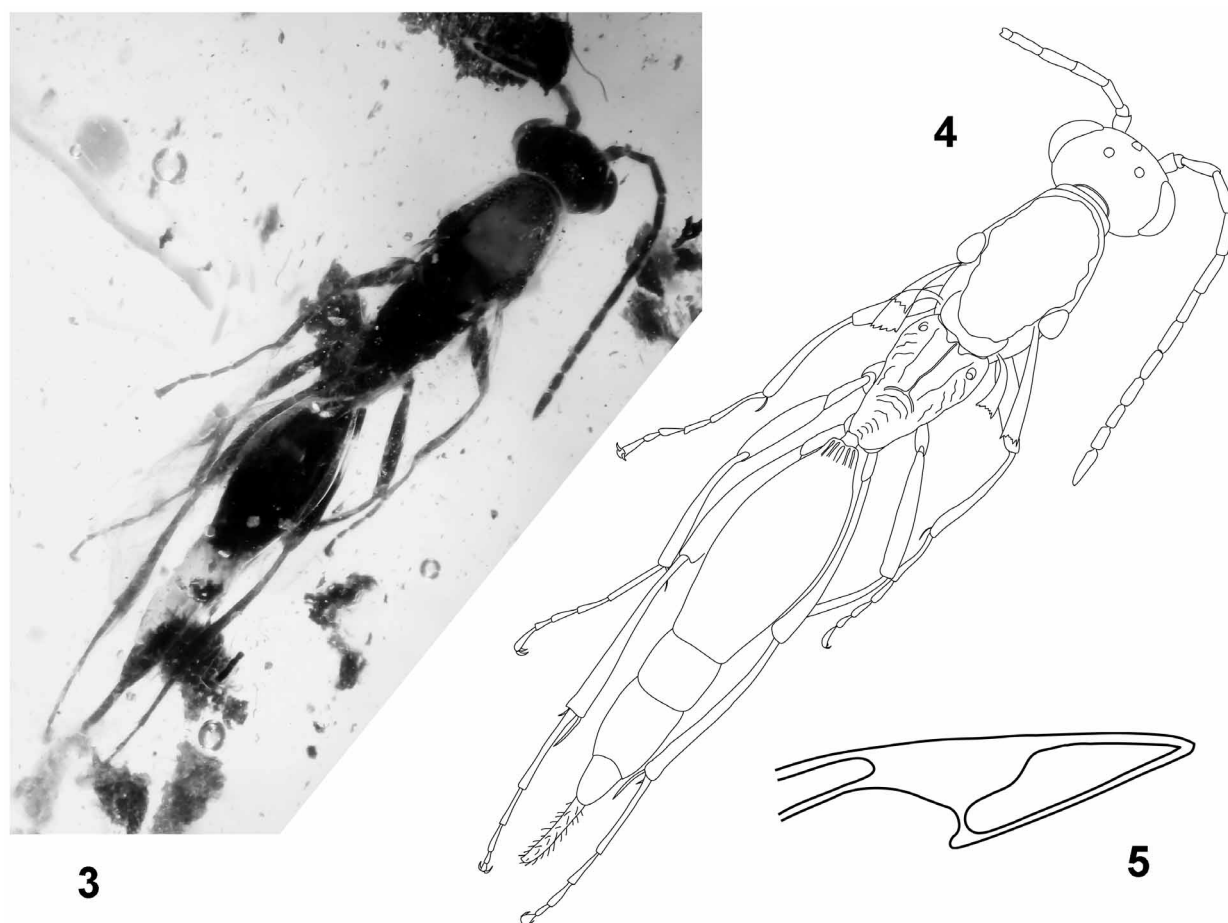
***Mischoserphus gracilis* (Brues, 1940), comb. nov.**
(Figs 3–5)

Cryptoserphus gracilis Brues, 1940: 259 (female).

Description. Body approximately 4.3 mm long including ovipositor sheath, but excluding antennae. Hind-wing 1.2 mm long, antenna 1.6 mm long. Clypeus narrow, 0.3 times as long as wide and almost 0.5 times as wide as face (distance between eyes). Malar sulcus deep. Mandibles weak and short. Antenna 13-segmented; ratio of antennomere lengths as following: 2.0:1.0:6.0:5.0:4.3:4.0:3.6:3.6:3.3:3.3:2.6:2.6:4.0. Propodeum 0.5

times as long as thorax. Dorsal side of propodeum with two bare elongated lateral fields separated by low simple ridge. Each lateral field 1.7 times as long as wide. Pterostigma almost as long as costal section of radial cell. Radial vein not curved, joining costal vein at 30°. Legs long and thin. Ovipositor sheath 9 times as long as wide, 0.49 times as long as hind tibia. Setation on ovipositor sheath becoming denser distally.

Holotype. Female, MCZC, no. 5219. The specimen is fixed in the dorsoventral position between the microscopic slide and the cover slip, so the lateral sclerites are not visible. The mesoscutum and scutellum are absent; seven apical segments of one antennae, left forewing and hindwings are detached and put on the right side of the body. The forewings are heavily deformed, the veins and the pterostigma are poorly distinguishable. The mouth is covered with milky substance.



FIGURES 3–5. *Mischoerphus gracilis* (Brues, 1940), holotype: (3) general appearance; (4) details of body structures; (5) pterostigma and radial cell.

Genus *Oxyserphus* Masner, 1961

Type species. *Proctotrupes maculipennis* Cameron, 1888; by original designation.

This is a large genus with about 20 named and a similar number of yet undescribed species, which is distributed in the Australasian and Oriental regions (Townes & Townes 1981), and eastern part of the Palaearctic, with one species reaching Europe (Buhl 2004; Kolyada in press-a); several yet unnamed species are known from Central America (Kolyada, pers. observ.). Representatives of this genus inhabit temperate and subtropical, often montane, forests and parasitise larvae of Curculionidae and Anthribidae (Coleoptera). This genus was unknown in the fossil record, although it has been recently found in the the Early Oligocene Bembridge Marls, Isle of Wight, UK (Antropov *et al.* in press) and Eocene/Oligocene Florissant beds (Kolyada in press-b).

***Oxyserphus obsolescens* (Brues, 1940), comb. nov.**
(Figs 6–13)

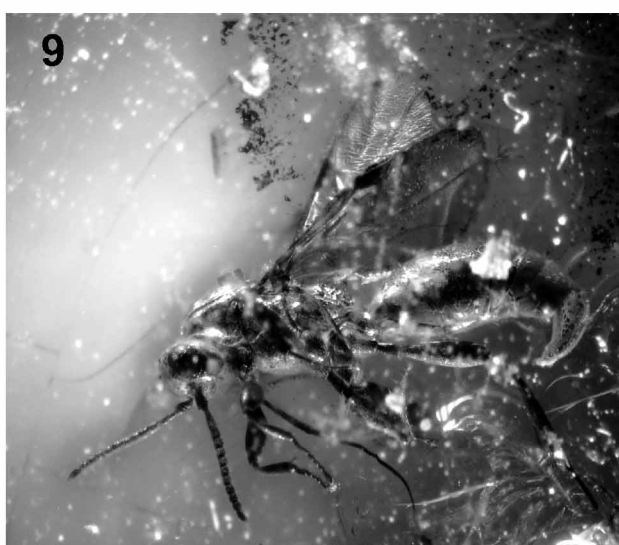
Cryptoserphus obsolescens Brues, 1940: 261 (female).

Cryptoserphus tertarius Brues, 1940: 261 (female). **Syn. nov.**

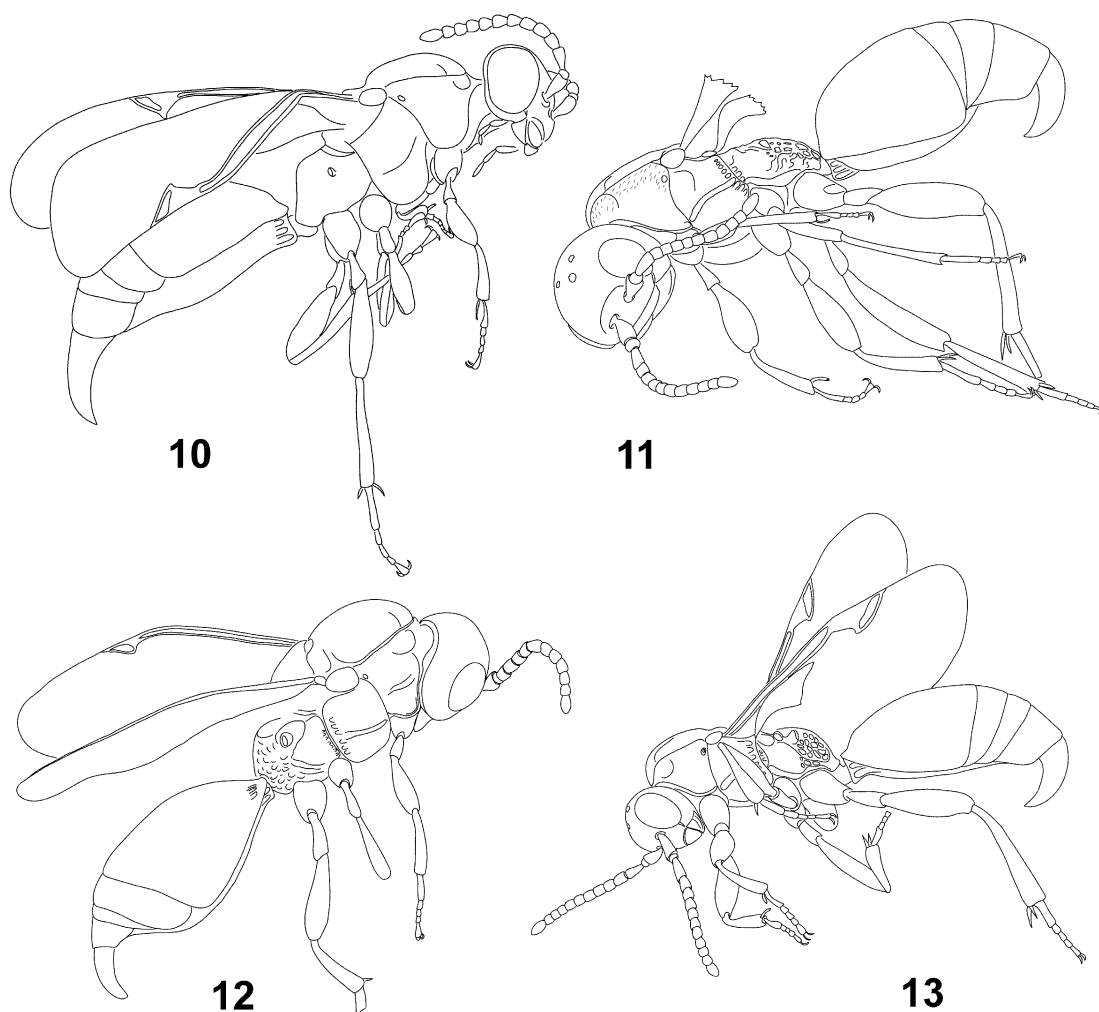
Cryptoserphus succinalis Brues, 1940: 262 (female). **Syn. nov.**

Cryptoserphus koggeauxillarius Szabo & Oehlke, 1986: 100 (female). **Syn. nov.**

Description. Body somewhat gracile. Head clearly transverse, rounded, frons convex. Genae 0.18 times as high as eye width, with deep vertical groove. Clypeus 0.79 times as wide as face, with depressed border along anterior margin. Labrum triangular. Antennae 0.6 times as long as head height, 13-segmented. Antennomeres almost quadrate; ratio of antennomere lengths as following: 2.1:0.8:1.6:1.1:1.1:1.2:1.0:1.1:0.9:0.9:0.9:0.8:1.6. Epomia uninterrupted. Depression below humeral tubercles with weak reticulation, strip in upper part of pronotum consisting of 3–5 setae. Notauli as long as tegulae. Mesopleural perforated suture complete. Horizontal mesopleural groove complete. Propodeum with fine reticulation. Radial vein joining costa at 44°. Costal section of radial cell short, less than depth of pterostigma. Costa not developed beyond radial cell. Ovipositor sheath 3 times as long as wide, approximately 0.75 times as long as hind tibia, with small setae.



FIGURES 6–9. *Oxyserphus obsolescens* (Brues, 1940), general appearance: (6) holotype of *obsolescens*; (7) female identified by Brues as *succinalis*; (8) holotype of *tertarius*; (9) holotype of *succinalis*.



FIGURES 10–13. *Oxyserphus obsolescens* (Brues, 1940), details of body structures: (10) holotype of *obsolescens*; (11) female identified by Brues as *succinalis*; (12) holotype of *tertiarius*; (13) holotype of *succinalis*.

Holotype. Female, MCZC, no. 5221.

Paratype. Female, MCZC, no. 5220. The specimen is inclosed within an air bubble, heavily distorting proportions.

Other material examined. Holotype of *Cryptoserphus tertiaryus* (female, MCZC, no. 8272) and holotype of *Cryptoserphus succinalis* (female, MCZC no. 8274). There are variously preserved four females and two males with Brues' identification labels (MCZC); they were previously identified by him as *succinalis* or simply *sp.* Additionally, there are nine females in MCZC with original labels "Proctotrypidae Preussen, Min. Mus. 1865" (1 ex.), "Proctotrypidae G.V. Henningsen/ 3-5 1960" (3 ex.), "Proctotrypidae Flanensgaard/ 2/4-60" (1 ex.), "Proctotrypidae Borge Martensen/ 12-10 1960" (1 ex.), "Proctotrupidae G.V. Henningsen/ 8-7 1965" (1 ex.), "Proctotrupidae A.K. Andersen/ 28-3 1968" (2 ex.). There are also three females in one piece of Baltic amber (PIN, nos. 363/131, 132, 133) and two females in one piece of Rovno amber (SIZC, K-3005).

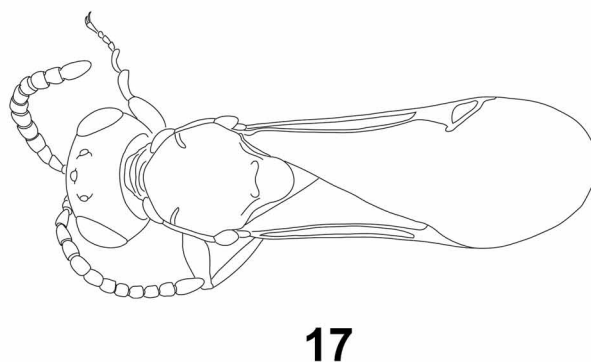
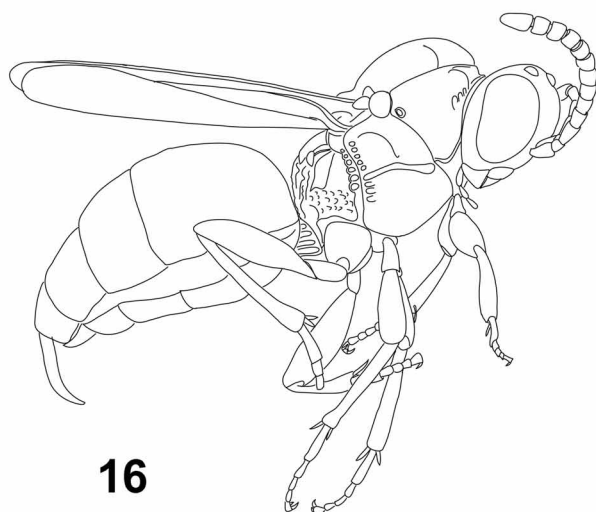
Remarks. Representatives of this species seem to be most abundant among amber proctotrupids. Obviously, the state of their preservation varies, and some specimens were described as separate species on the basis of poorly defined characters. Rich material, which became available through courtesy of Dr S.B. Archibald, Dr L. Masner and Prof. A.P. Rasnitsyn, made possible re-evaluation of some species and their synonymy.

***Oxyserphus hamiferus* (Brues, 1940), comb. nov.**
(Figs 14–17)

Cryptoserphus hamiferus Brues, 1940: 261 (female).

Description. Head weakly convex. Genae 0.23 times as high as eye width, with deep vertical groove. Clypeus 0.7 time as wide as face, with depressed border along anterior margin. Labrum triangular, 2.4 times as long as wide. Malar sulcus present. Mandibles with blunt point. Face, clypeus and labrum with noticeable rough punctures. Antennae 1.6 times as long as head height, 13-segmented. Antennomeres almost quadrate; ratio of antennomere lengths as following: 2.4:1.1:2.8:1.5:1.5:1.6:1.6:1.8:1.7:1.8:2.0:2.0:3.7. Epomia uninterrupted. Depression below humeral tubercles with vertical wrinkles, which run over centre of pronotum as a strip of weak reticulation. Notauli as long as tegulae. Mesopleural perforated suture complete. Horizontal mesopleural groove complete. Metapleuron with large smooth area, being slightly rough in its lower half. Upper 1/5 of this area shiny and separated by shallow groove. Propodeum short, with smooth reticulation. Radial vein joining costa at 38°. Radial cell 0.8 times as long as depth of pterostigma. Costa not developed beyond radial cell. Ovipositor sheath 4.6 times as long as wide, 0.6 times as long as hind tibia, curved apically, with few small setae.

Holotype. Female, MCZC no. 8267. The metasoma is split laterally, with heavily swollen base. The body is enclosed in an air bubble that distorts real proportions and makes the body to look stocky with a strongly convex mesoscutum. The description is based on the imprint of the body onto the wall of the air bubble.



FIGURES 14–17. *Oxyserphus hamiferus* (Brues, 1940), holotype: (14, 15) general appearance, lateral and dorsal aspects; (16, 17) details of body structures, lateral and dorsal aspects.

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