Efesus trufanovi Simutnik gen. et sp.n. (Hymenoptera: Chalcidoidea: Encyrtidae) from late Eocene Danish amber

Efesus trufanovi Simutnik gen. et sp.n. (Hymenoptera: Chalcidoidea: Encyrtidae) из позднеэоценового датского янтаря

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ABSTRACT. Efesus trufanovi Simutnik, gen. et sp.n., is described and illustrated based on a female specimen from Danish amber collection of the Zoological Museum of University of Copenhagen. It is the eighth Danish amber hymenopteran genus unknown from Baltic amber. The new genus is characterized by the long double row of closing setae (filum spinosum) on distal margin of the linea calva of forewings, cerci are advanced towards the middle of gaster, hypopygium not reaching metasomal apex, parastigma not expanded, stigmal vein with long uncus. Such a long double row of the filum spinosum, consisting of nine setae, has not yet been described among the fossil encyrtids. The new genus is considered unplaced within subfamily Encyrtinae.

РЕЗЮМЕ. Efesus trufanovi Simutnik, gen. et sp.n., описан и проиллюстрирован по самке из коллекции датского янтаря Зоологического музея Копенгагенского университета. Это восьмой род гименоптер из датского янтаря, неизвестный из балтийского янтаря. Новый род характеризуется длинным двойным рядом замыкающих щетинок (filum spinosum) на дистальном крае головы косой полоски передних крыльев, пигостили продвинуты к середине брюшка, гипопигий не достигает вершины метасомы, парастигма не расширена, радиальная жилка с длинным ункусом. Такой длинный двойной ряд filum spinosum, состоящий из девяти щетинок, ещё не был описан у ископаемых энциртид. Новый род занимает неопределенное систематическое положение в подсемействе Encyrtinae.

Introduction

The presence or absence of filum spinosum is one of the characters used to separate the Encyrtidae into two subfamilies [Trjapitzin, 1967]. In the oldest known representatives of the family from the middle Eocene Sakhalinian amber the closing setae have not been found [Simutnik, 2014, 2015b]. Encyrtidae with filum spinosum are known only since late Eocene and already described from the Baltic, Danish, and Rovno amber [Simutnik et al., 2014; Simutnik, 2015a; Simutnik, Perkovsky, 2017, 2018a, c, 2020]. In the present paper, one more encyrtid with the distinctly developed filum spinosum is described.

Material and methods

The studied specimen is housed in the Zoological Museum of the University of Copenhagen (ZMUC). Lars Vilhelmsen (ZMUC) kindly arranged a loan of specimens. From this collection of Danish amber, Sula glaesaria Simutnik, 2015, Protocopidosoma kononovae Simutnik, 2017 and Dencyrtus vilhelmseni Simutnik, 2018 have already been described. General information on the locality, age, and composition of the fauna from Danish amber were provided in works of Larsson [1978], Dlussky, Rasnitsyn [2009], Perkovsky [2011, 2016], Guénard et al. [2015], and Nadein et al. [2016].
The images were taken using a Leica Z16 APO stereomicroscope equipped with a Leica DFC 450 camera and processed with LAS V3.8 software. To improve imaging, we applied sucrose syrup of approximately the same refractive index as the amber itself and then placed a glass cover slip on top; after it syrup was removed by warm water. The images were then enhanced using Adobe Photoshop (brightness and contrast only).

Terminology and abbreviations follow Gibson [1997], Noyes et al. [1997], and Heraty et al. [2013]. The following abbreviations are used in the text and illustrations:

sp — mesothoracic spiracle
s — mesotibial spur
c — cercus
lc — linea calva
mps — multiporous plate sensilla
Mt1, Mt2, etc. — metasomal terga, numbering starts from petiole (Mt1)
n — notaulus
s — mesotibial spur
sp — mesothoracic spiracle

Family Encyrtidae Walker, 1837
Subfamily Encyrtinae Walker, 1837

Genus Efesus Simutnik, gen.n.

Type species. Efesus trufanovi Simutnik, sp.n.

DIAGNOSIS. Row of filum spinosum double, long, consisting of 9 setae; clava large, with rounded apex, as long as 5 preceding flagellomeres combined; notauli very short; parastigma almost not expanded; cerci advanced almost to middle of metasoma.

DESCRIPTION of female. Habitus as in Figs 1–3. Body compact, not flattening. Head slightly wider than thorax in dorsal view and approximately rounded in frontal view, hypognathous; occipital margin rounded; surface of frontal vertex with polygonal reticulate sculpture, elongated on genae, without deep punctures (Fig. 1); ocelli large, in approximately right triangle; distance between posterior ocellus and eye margin (OOL) as posterior ocellar diameter; genae long, height of eye slightly larger than malar space (Fig. 2); interantennal prominence, distance between cercus and apex of Mt8 17.

Antenna 11-segmented, setation pattern as in Fig. 4. Antenna as in Fig. 6; distance between toruli 5, from torulus to eye margin 7. Metasoma. Length 40, width 29; scutellum length 15, width 17; proportions of veins and setae as in Fig. 4. Mesosoma. Mesoscutum length 18, width 29; scutellum length 15, width 17; proportions of veins and setation pattern as in Fig. 4. Metasoma. Length 40, distance between cercus and apex of M8 17.

ETYMOLOGY. The species is named after the zoologist Efesus trufanovi Simutnik from late Eocene Danish amber.

Comparison and remarks. The new genus differs from all known fossil genera by the double row of filum spinosum and almost not expanded parastigma. Among the extant representatives, the double and long row of closing setae also rare. For example, in Coenocercus puncticollis Thomson the filum spinosum also consists of 2 rows of setae.

Discussion

Hymenoptera fauna of Danish amber was never thoroughly studied, but first results of some revisions are enticing: e.g. myrmecofauna of the Danish amber is the most peculiar [Dlusky, Rasnitsyn, 2009; Perkovsky, 2016]. Three Danish ant genera and six species are unknown from Baltic amber. Six ant species unknown from northern coast of Subparathetys even seem not numerous in comparison with 15 Bitterfeld amber species unknown from Baltic amber [Dubovikoff et al., 2020], but only one genus and 6 species from these 15
belong to the representative Bitterfeld amber collection of Humboldt Museum, Berlin (HMC) [Dlussky, Ras-nitsyn, 2009; Dubovikoff et al., 2019]. Size of representative collection well correlate with probability to find new ant species, because not less than 89% of specimens in all representative collections belong

Figs 1–6. *Efesus* *trufanovi*, *gen.* et *sp.* *n.*, holotype ♀: 1–3 — habitus: 1, dorsal (n — notaualus); 2 — lateral (c — cercus); 3 — posterodorsal (hyp — hypopygium); 4 — forewing (fs — filum spinosum, p — parastigma, u — uncus); 5 — metasoma (Mt8 — last metasomal tergum); 6 — antennae (mps — multiporous plate sensilla), head, mesoscutum, mesotibial spur (s).

Рис. 1–6. *Efesus* *trufanovi*, *gen.* et *sp.* *n.*, голотип ♀: 1–3 — общий вид: 1 — сверху (n — нотаула); 2 — сбоку (c — церка (пигостиль)); 3 — сзади и сбоку (hyp — гипопигий); 4 — переднее крыло (fs — flum spinosum, p — парастигма, u — ункус); 5 — метасома (Mt8 — последний тергит); 6 — усики (mps — multiporous plate sensilla), голова, щит среднеспинки, щипор средней голени (s).
to 20 species, known from all four Priabonian ambers [Dlussky, Rasnitsyn, 2009; Perkovsky, 2016, 2018, our unpublished data]. These 20 species are mostly dominant or at least permanent species of amber forests communities [Dlussky, Rasnitsyn, 2009]. Only 35 specimens of Danish amber ants from ZMUC (our data) do not belong to these 20 species, but 86% of mentioned specimens and 60% of mentioned species are unknown from Baltic amber. For comparison, ants from Bitterfeld amber representative collection (HMC) are 2.3 times more numerous than in ZMUC, and ants that not belong to 20 dominant and subdominant Priabonian species are 1.3 times more numerous (45 specimens, and 26 species, our data); but in HMC only 18% of these specimens and 24% of species are unknown from Baltic amber. From two species of Danish amber Dryinidae one is unknown from Baltic amber [Perkovsky, Olmi, 2018]; single Danish amber Bethylidae belongs to genus, unknown from Baltic amber [Ramos et al., 2014].

The relationships of fossil to modern genera within Encyrtidae have not yet been established. The filum spinosum is known only since late Eocene and not been found in the middle Eocene Encyrtidae from Sakhalinian amber [Simutnik, 2014, 2015b]. All known middle Eocene representatives, the earliest in the family, also differ by the expanded parastigma, the long veins of forewings, the presence of the long uncus at stigmal vein, and the apical position of the cerci (pygostyles in Russian literature).

Majority of the known late Eocene Baltic, Rovno, and Danish amber encyrtids also retain the apical position of the cerci, expanded parasitica and rarely have filum spinosum [Simutnik, Perkovsky, 2006, 2015, 2017, 2018a–c, 2020]. Many of these directions of the morphological evolution of the family were predicted by V.A. Trjapitzin back in 1967 [Trjapitzin, 1967].

Thus, at this stage of research, it is possible to state that in the middle (Sakhalinian amber) and late Eocene (Baltic, Rovno and Danish amber) existed peculiar encyrtid faunas, different from each other and from extant fauna.

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