

The second species of *Acartophthalmites* from Baltic amber (Eocene), with notes on the relationships of the genus (Diptera: Acalyptrata)

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Abstract. Hitherto, the Paleogene fossil genus *Acartophthalmites* Hennig, 1965 included only the type species, *A. tertiaria* Hennig, 1965, from Baltic amber (Eocene, ca. 40 Mya). An additional species, *Acartophthalmites clusioides* sp. nov., is described based on a well preserved male in a Baltic amber inclusion from Kaliningrad: Yantarny (Russia). It distinctly differs from *A. tertiaria* in a number of characters demonstrating that the genus *Acartophthalmites* is morphologically more diverse than considered previously. Moreover, the study of *A. clusioides* resulted in finding that *Acartophthalmites* is obviously not related to *Acartophthalmidae* (where it was originally affiliated), but seems to be closer to *Clusiidae*, although surely not belonging to the latter family as currently delimited. Therefore a revision of all available specimens of *Acartophthalmites* is suggested to gain a more complete set of morphological data of this genus, enabling analysis of its phylogenetic relationships.

Keywords. Taxonomy, *Acartophthalmites*, *A. clusioides* sp. nov., Baltic amber, Eocene, relationships

Introduction

The fossil genus *Acartophthalmites* was established by HENNIG (1965: 130) for a single species, *A. tertiaria* Hennig, 1965, described on the basis of four female specimens from Baltic amber (lower Eocene, cca 40 Ma). Subsequently, HENNIG (1969: 18–19) also described a male attributed to the same species, albeit with an erroneous name (*A. electrica*) under the illustrations (HENNIG 1969: Figs 19–21). Recently, a new Baltic amber sample (originating from Russia: Kaliningrad: Yantarny) with a nice inclusion of *Acartophthalmites*, has been purchased from Jonas Damzen. This amber specimen contains a male in very good condition, examination of which revealed it as a representative of a new species, distinct from *A. tertiaria*. Discovery of the second species of the genus *Acartophthalmites* raised a question about the

conspecificity of specimens (type females and a non-type male) assembled by HENNIG (1965, 1969) under the name *A. tertiaria* because Hennig himself commented upon some variability of these specimens. In addition to these 5 specimens there are at least 18 other unpublished amber samples with *Acartophthalmites* specimens (15 are given by VON TSCHIRNHAUS & HOFFEINS 2009: Table 5), most of them in possession of Christel and Hans Werner Hoffeins (Hamburg, Germany). This is a relatively rich source of material that may contain further unnamed species, as was found during a recent revision of extinct Anthomyzidae from Baltic and Bitterfeld amber (ROHÁČEK 2013, 2014).

In contrast to *A. tertiaria* the new species (described below) is distinguished by a more slender body, rather elongate wings and stronger cephalic setae, thus habitually closely resembling members of the family Clusiidae. Although *Acartophthalmites* is currently affiliated to Acartophthalmidae following HENNIG's (1965) tentative placement (see EVENHUIS 1994: 417; VON TSCHIRNHAUS & HOFFEINS 2009: 207), McALPINE (1987, 1989) compared this fossil group with the recent genus *Acartophthalmus* Czerny, 1902 and doubted its classification within Acartophthalmidae. He instead suggested a possible relationship to certain genera of Clusiidae (see also EVENHUIS 1994, PAPP & OZEROV 1998). Most recently, LONSDALE et al. (2010) considered that *Acartophthalmites* together with *Xenanthomyza* Hennig, 1967 (a Baltic amber fossil genus formerly placed to Anthomyzidae but later transferred from there by McALPINE (1989) to Clusiidae, see also ROHÁČEK (1998) may be related to Clusiidae but claimed they almost certainly belong outside this family as currently delimited. For this reason the affinity of *Acartophthalmites* to both Clusiidae and Acartophthalmidae is tested here and the preliminary results of its relationships are discussed.

Material and methods

The Baltic amber sample with the new *Acartophthalmites* male examined (now deposited in SMOC – Silesian Museum, Opava, Czech Republic) was cut, ground, polished and subsequently embedded in artificial resin by Christel and Hans Werner Hoffeins, in order to facilitate the stereoscopic investigation of this insect inclusion. Methods followed are described by HOFFEINS (2001). The specimen was examined, drawn and measured using two types of binocular stereoscopic microscopes (Reichert, Olympus) and photographed by digital camera (Canon EOS 5D Mark III) with macro lens (Canon MP-E 65 mm 1–5×) and ring macro flash (Canon MR-14EX). In addition, several unidentified *Acartophthalmites* specimens in Baltic amber inclusions (including some macrographs) from coll. Hoffeins were available for the study. For comparison, specimens (all in SMOC) of recent European species of the genera *Clusia* Haliday, 1838, *Clusiodes* Coquillett, 1904, *Hendelia* Czerny, 1903 and *Heteromeringia* Czerny, 1903 were examined from the family Clusiidae, and the species *Acartophthalmus bicolor* Oldenberg, 1910 and *A. nigrinus* (Zetterstedt, 1847) were examined from the family Acartophthalmidae.

Morphological terminology follows that used in ROHÁČEK (2006, 2013, 2014) including terms of the male postabdomen and genitalia. That of the male genitalia is largely based on the “hinge” hypothesis of the origin of the eremoneuran hypopygium, re-discovered and documented by ZATWARNICKI (1996). Therefore, the following alterations of terms of the male

genitalia need to be listed (synonymous terms used by other hypotheses in parentheses): epandrium (periandrium), gonostylus (surstylus, telomere).

Abbreviations of morphological terms used in text and/or figures.

A ₁ – anal vein	pa – postalar (seta)
ac – acrostichal (setulae)	pk – preapical kink on R ₁
ar – arista	ppl – propleural (= proepisternal) (seta)
C – costa	prs – presutural (seta)
ce – cercus	pvt – postvertical (seta)
Cs ₂ , Cs ₃ , Cs ₄ – 2nd, 3rd, 4th costal sector	R ₁ – 1st branch of radius
CuA ₁ – cubitus	R ₂₊₃ – 2nd branch of radius
Cx ₁ , Cx ₂ – fore, mid coxa	R ₄₊₅ – 3rd branch of radius
dc – dorsocentral setae	rgs – right lobe of gonostylus
dm – discal medial cell	r-m – radial-medial (= anterior, ta) cross-vein
dm-cu – discal medial-cubital (= posterior, tp) cross-vein	S1–S10 – abdominal sterna
ep – epandrium	sa – supraalar (seta)
f ₁ , f ₂ , f ₃ – fore, mid, hind femur	sc – scutellar (seta)
hu – humeral (= postpronotal) (seta)	Sc – subcosta
hum – humeral cross-vein	stpl – sternopleural (= katepisternal) (seta)
lgs – left lobe of gonostylus	T1–T10 – abdominal terga
M – media	t ₁ , t ₂ , t ₃ – fore, mid, hind tibia
mspl – mesopleural (= anepisternal) (seta)	tr ₁ , tr ₂ – fore, mid trochanter
npl – notopleural (seta)	vi – vibrissa
oc – ocellar (seta)	vte – outer vertical (seta)
ors – fronto-orbital (seta)	vti – inner vertical (seta)

Taxonomy

Acartophthalmites clusioides sp. nov.

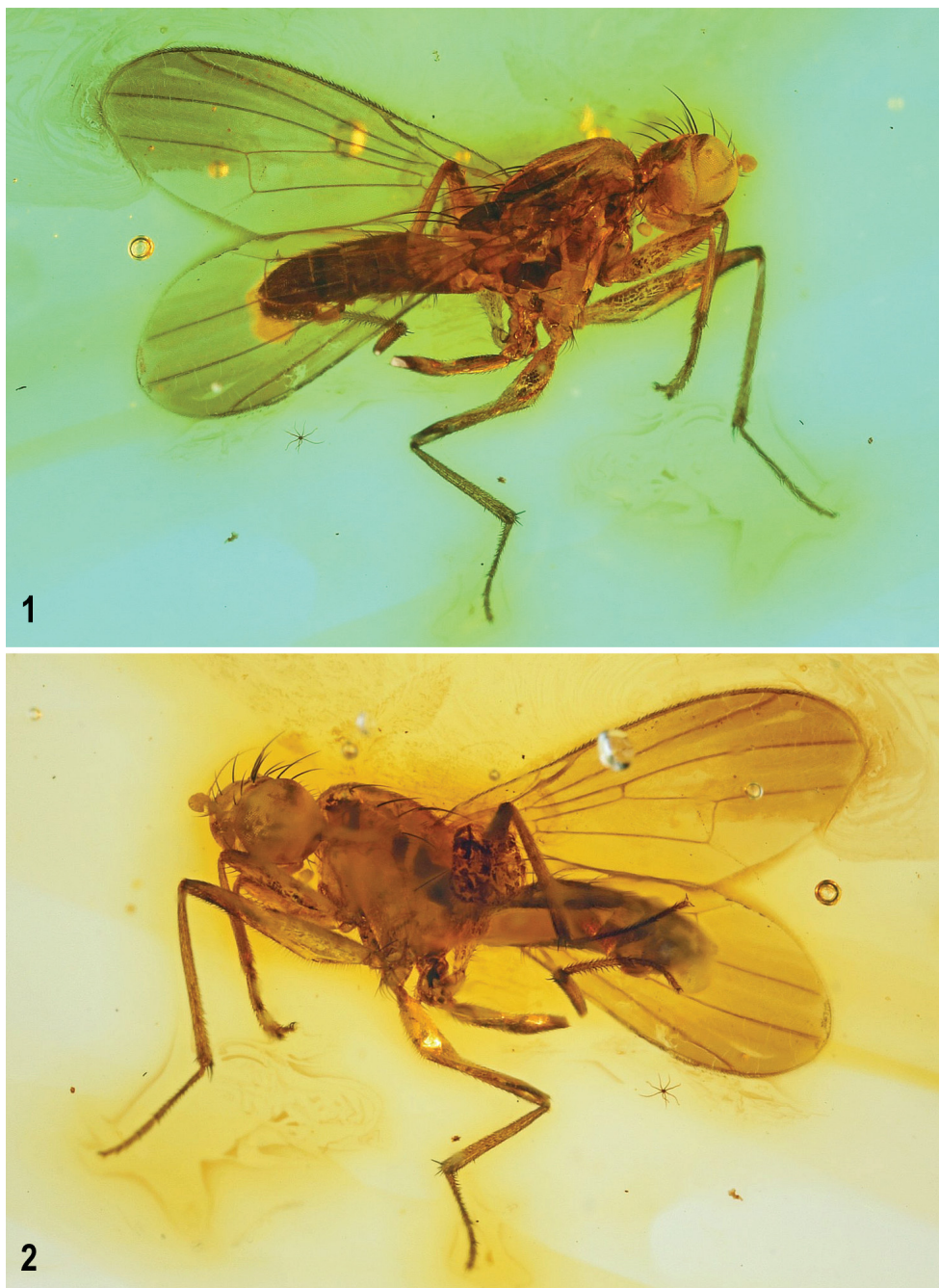
(Figs 1–19)

Type material. HOLOTYPE ♂, labelled: ‘Baltic amber, Russia: Kaliningrad region, Yantarny. Purchased from Jonas Damzen (8th ICD, Potsdam 10.-15.viii.2014)’ and ‘HOLOTYPUS ♂, *Acartophthalmites clusioides* sp.n., J. Roháček det. 2015’ (red label), embedded in polyester resin, size 13.8 x 10.0 x 4.9 mm (Fig. 1), deposited in SMOC. Syninclusions: only a few stellate hairs of various shapes.

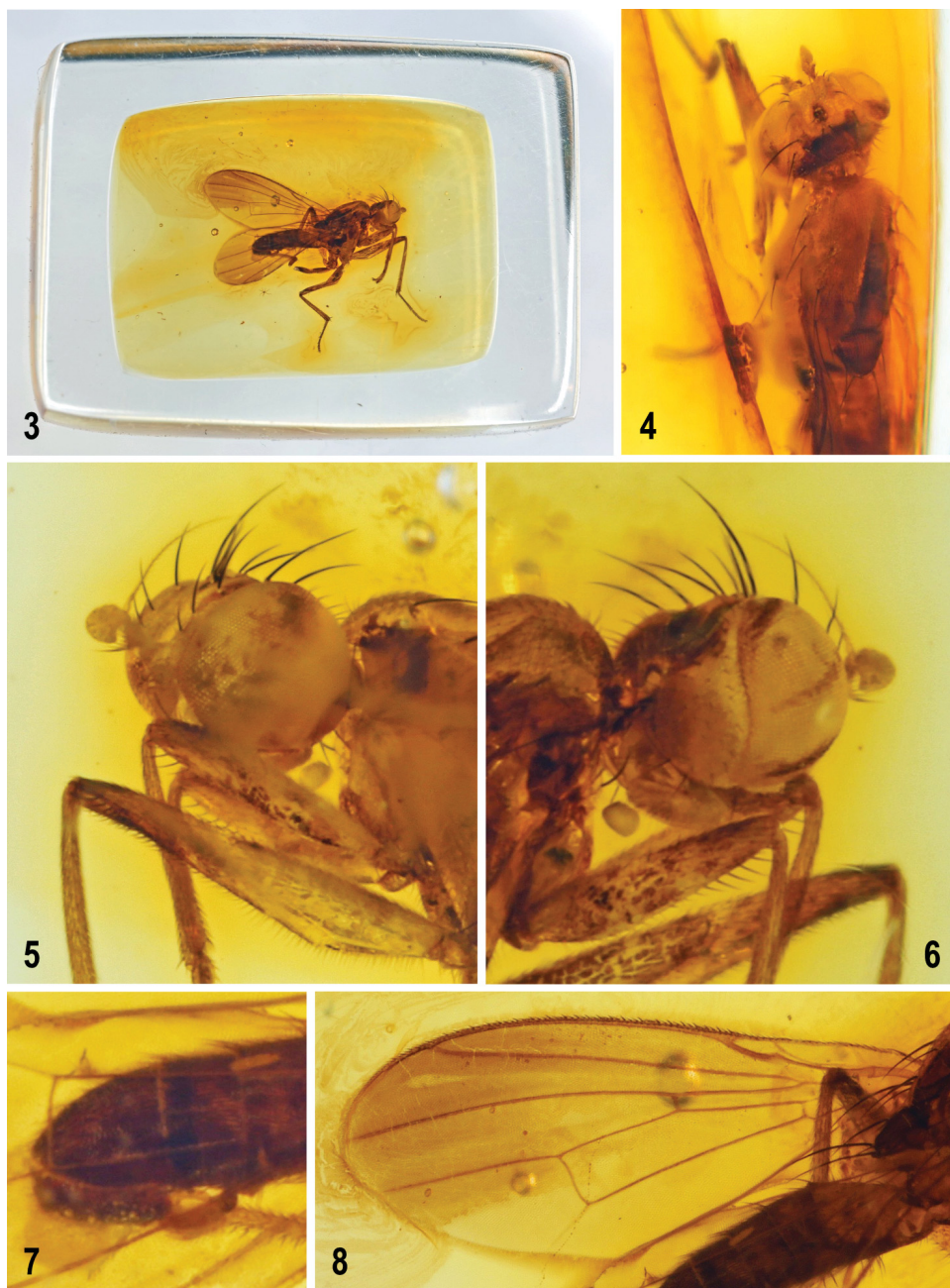
Description: Male. Total body length 3.85 mm; general colour probably bicolourous, dark brown and yellow or ochreous; legs pale brown; thorax and abdominal sclerites probably subshining (Figs 1, 2). Head (Figs 5, 6, 9, 18) about as long as high (not precisely measurable), dorsally somewhat wider than thorax; dorsal part of occiput concave. Head distinctly bicolourous, occiput darkest (dark brown), frons, face, gena and postgena pale, ochreous to whitish yellow except for some small parts. Frons moderately narrow (as wide as eye in dorsal view), slightly tapering anteriorly, largely yellow to ochreous with only ocellar triangle dark brown and orbits pale brown. Orbit narrowly brownish but this darkening tapered anteriorly, narrow and faded at foremost ors. Frontal triangle ochreous-brown, rather short (less than half length of frons) and its anterior corner identical with that of ocellar triangle. Ocellar triangle somewhat tubercle-like, protruding among ocelli. Frontal lunule poorly visible in the specimen, probably small. Face (prae-frons), parafacialia (both only partly visible) and gena yellowish white and apparently whitish microtomentose; gena with brownish line

at ventral margin in addition. Postgena and adjacent part of occiput large, expanded, pale yellow behind eye to pale brown medially (near foramen). Cephalic chaetotaxy (Figs 9, 18): pvt relatively strong (longer and thicker than oc), divergent and inserted rather closely; vti very strong (longest cephalic seta), almost twice as long as vte; oc relatively weak, inserted between ocelli and strikingly (possibly unnaturally) erect in the holotype; 3 reclinate ors becoming shorter anteriorly, the hindmost ors longest and strongest (about as long as vte); no microsetulae on frons medially or in front of ors; postocular setulae in a single long row surrounding posterior eye margin, none of them enlarged but there are numerous additional and relatively long erect setulae (see Figs 6, 18) scattered on adjacent lateral parts of occiput and postgena; postgena with 2 or 3 (1 distinctly longer) posteroventral setae in addition; occiput with a brush of small setulae above foramen; vi (Fig. 19) distinct though relatively short, curved medially; subvibrissa not developed; peristomal setulae small and sparse (5 observed, Fig. 19). Eye large, bare, strongly convex and covering most of head in profile, subcircular (slightly concave along posteroventral margin); its longest diameter oblique and only about 1.1 times as long as shortest diameter. Gena very low; its height about 0.06 times as long as shortest eye diameter. Palpus not visible, only its ventroapical seta discernible. Mouthparts ochreous to (posterodorsally) brownish; labella large, fleshy and finely setulose, setulae pale. Antenna porrect (Figs 9, 19) and relatively small, yellowish white or scape + pedicel somewhat darker; pedicel externally laterally without anterior process in the middle but with somewhat excavated anterior margin, with 1 stronger erect seta dorsally and 2 finer setae ventrally in addition to series of marginal and submarginal setulae; 1st flagellomere strongly laterally compressed, in profile subcircular with excavated posterior side (Fig. 19). Arista dorsal subbasal, about 3 times as long as antenna, with elongate and whitish basal segment and darker ochreous terminal section being distinctly but relatively short ciliate (Figs 9, 18).

Thorax obviously slightly narrower than head (Fig. 4), bicolourous, largely brown, with some parts paler, ochreous (Fig. 1). Mesonotum originally probably entirely brown, possibly darker medially and posteriorly, with finely shagreened surface (this microstructure arranged transversely in anterior part of mesonotum). Humeral (postpronotal) callus brown and markedly protruding; notopleural area pale brown; scutellum and subscutellum dark brown, the former with surface densely grooved longitudinally; pleural part of thorax distinctly bicolourous: anterior part of mesopleuron (anepisternum) and almost entire sternopleuron (katapisternum) pale ochreous; propleuron, posterior part of mesopleuron, hypopleuron (meron) and metanotum (anatergite) pale brown; pteropleuron (anepimeron) and metapleuron (katatergite) dark brown. Scutellum subtriangular with rounded apex, slightly convex dorsally; subscutellum well developed. Thoracic chaetotaxy (Figs 1, 2, 10): 1 strong and long hu (plus a number of microsetae on humeral callus), 2 npl (anterior strong, twice as long as posterior; both setae broken on right side), 1 very long and robust sa (only slightly shorter than pa), 2 pa (anterior very long and strong, longer than posterior dc; posterior pa thinner and about half length of the anterior), no prs; 2 dc (both postsutural, also anterior situated behind level of sa), anterior short (slightly more than half length of posterior), posterior robust but shorter than apical sc or anterior pa; scutum otherwise covered by uniform and relatively dense microsetae (more than 15 dc microsetae in row in front of anterior dc; ac microsetae arranged in about 8 rows in front of suture but less posteriorly, and only 4 rows reaching slightly beyond level of posterior dc); 2 sc, apical strong and very long (with anterior pa the longest thoracic seta), also



Figs 1–2. *Acartophthalmites clusioides* sp. nov., male holotype. 1 – right side. 2 – left side. Length of holotype 3.85 mm. Photo by J. Roháček.



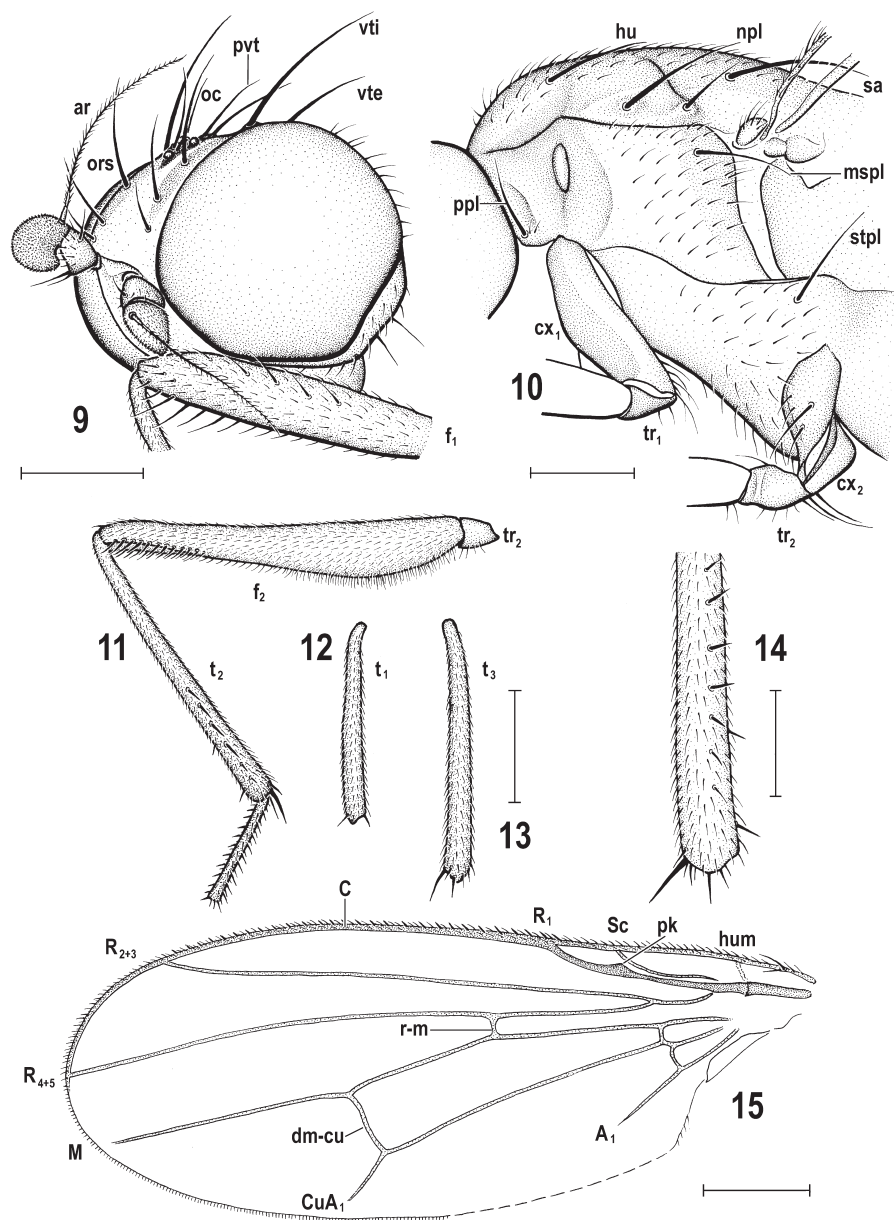
Figs 3–8. *Acartophthalmites clusioides* sp. nov., male holotype. 3 – Baltic amber sample embedded in polyester resin in situ (length of preparatum 13.8 mm); 4 – head and thorax dorsally; 5 – head and anterior part of thorax, left laterally; 6 – ditto, right, laterally; 7 – postabdomen, right, laterally (body length of holotype 3.85 mm); 8 – left wing (length 3.53 mm). Photo by J. Roháček.

laterobasal relatively robust, as long as three-fourths of the apical sc; 1 long upcurved ppl plus 2 microsetae near its base; mesopleuron with 1 distinct mspl in posterodorsal corner and numerous microsetae on most of its surface (except for anterodorsal part); sternopleuron with 1 long stpl and a number of scattered microsetae (also those on ventral part relatively short) leaving only anterodorsal corner of sclerite bare; prosternum obviously bare.

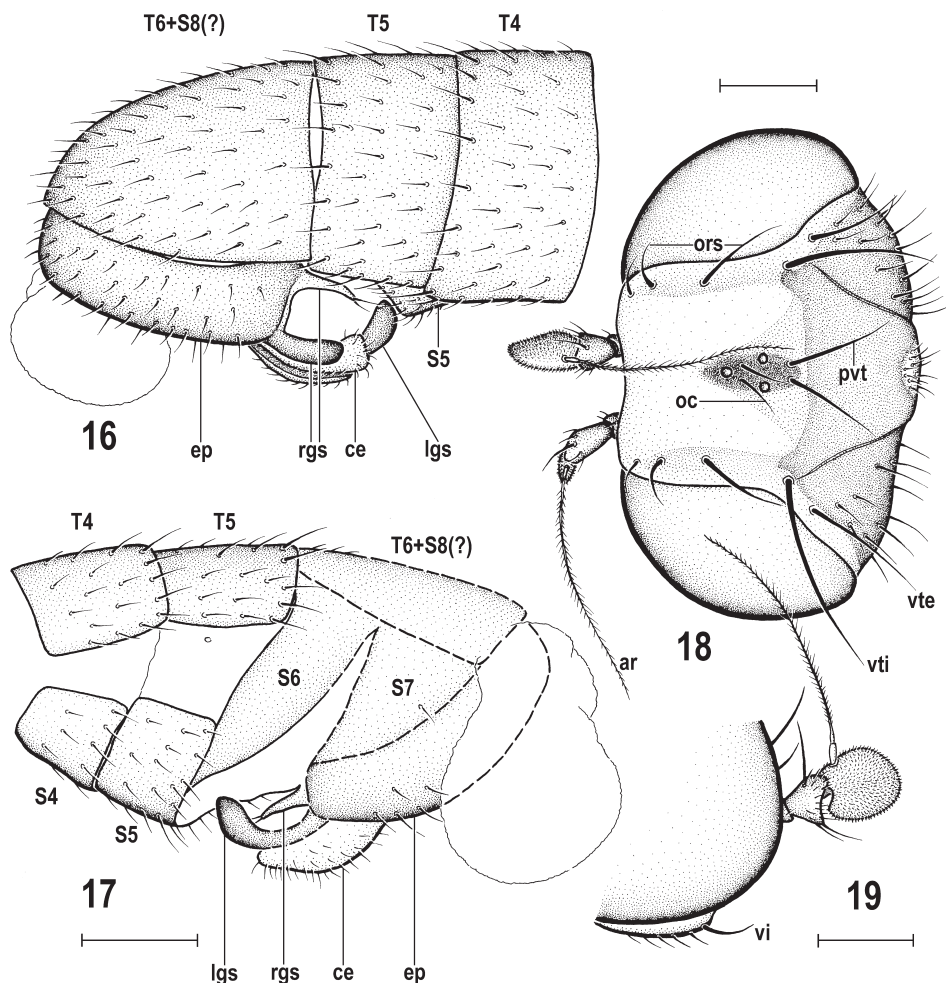
Legs originally probably all brown or pale brown (the densely brown-spotted appearance of femora is probably an artefact caused by the process of fossilization), relatively long and slender. Fore, mid and hind legs strikingly differing in length of their segments (see below); it seems like the mid leg is markedly prolonged in this species while the fore and hind legs have their normal proportions. Femur, tibia and also tarsus (basitarsus in particular) of mid leg are almost twice as long as those of fore leg, and distinctly longer than those of hind leg (cf. Figs 11–13). f_1 (Figs 6, 9) with a short row of 4–5 longer posteroventral to ventral setae in distal third and with about 4 posterodorsal setae forming a row in the middle of third of femur; f_2 (Figs 5, 11) very elongate, tapered distally, finely densely setulose but its distal fourth ventrally with a double row of thicker, shorter, denser setae (those in posterior row longer) and its proximal half with a dense brush of ventral upright hair-like setulae; f_3 without specific setae, uniformly densely finely setulose. t_1 (Fig. 12) also uniformly finely setulose but with a short dorsopreapical seta and a similar ventroapical one in addition; t_2 with distinctive chaetotaxy (Figs 11, 14) formed, besides usual short setosity, by a row of sparse erect posterior setae (4–5 longer and thicker) in distal two-fifths, 2 short dorsal setae (1 preapical, 1 in distal third) and 1 longer and thicker ventroapical seta plus 2 shorter setae on apex; t_3 (Fig. 13) without dorsopreapical seta, but with 1 longer ventroapical and 1 shorter anteroapical seta, otherwise uniformly finely setulose. Tarsi simple, slender; mid and hind basitarsi long and with thicker laterally directed setulae; claws relatively small.

Wing (Figs 8, 15) somewhat elongate (narrower than in *A. tertiaria*); veins pale brown; membrane distinctly brownish darkened in anterodistal half, having an elongate lanceolate light spot in otherwise brownish cell r_{2+3} . C reaching only slightly beyond apex of R_{4+5} , finely setulose but basally with a pair of longer setae and Cs_2 (sector between apices of R_1 and R_{2+3}) with thicker (but not longer) sparse spine-like setulae in addition. No costal break. Sc fine, proximally attenuated, distally ending into C, not fused with R_1 . R_1 short, robust and bare, having a distinct preapical kink (Fig. 15, pk) on the level of end of Sc. R_{2+3} long, very slightly sinuate, apically somewhat upcurved to C, ending distinctly farther from wing apex than would M. R_{4+5} shallowly but distinctly bent posteriorly, and distally subparallel with M. Distal part of M almost straight but not reaching (ending slightly in front of) wing margin. Discal (dm) cell relatively elongate; its upper distal corner somewhat acutely projecting; anterior cross-vein (r-m) situated in about the middle of discal cell. Distal part of CuA_1 shorter than dm-cu cross-vein and not reaching wing margin; A_1 short, ending far from it. Cells bm and cup closed. Anal lobe moderately developed. Alula obviously small and narrow. Wing measurements: length 3.53 mm, width 1.35 mm, $Cs_3 : Cs_4 = 2.00$, $r-m/dm-cu : dm-cu = 2.28$. Haltere pale brown, knob somewhat darker.

Abdomen (Figs 1, 2) relatively slender, elongate, largely brown to dark brown, with dorsal sclerites elongately shagreened. All preabdominal terga rather sparsely but distinctly setose, with longest setae (some upright) at posterior and lateral margins. T1 and T2 (at least dorsally) ochreous, T3–T5 dark brown. T1 probably separate (visible only laterally) from



Figs 9–15. *Acartophthalmites clusioides* sp. nov., male holotype. 9 – head and fore femur, left, sublaterally; 10 – thorax, left, laterally; 11 – left mid trochanter, femur, tibia and basitarsus, posteriorly; 12 – left fore tibia, posteriorly; 13 – left hind tibia, anteriorly; 14 – distal part of right mid tibia, posteriorly; 15 – left wing. Scales = 0.3 mm (Figs 9, 10), 0.5 mm (Figs 11–13, 15) and 0.2 mm (Fig. 14). For abbreviations see text (p. 411).



Figs 16–19. *Acartophthalmites clusoides* sp. nov., male holotype. 16 – apex of abdomen laterally, right side; 17 – the same, left side; 18 – head, dorsally; 19 – anteroventral part of head with antenna, right, laterally. Reconstructed parts in dashed lines. All scales = 0.2 mm. For abbreviations see text (p. 411).

T2. T1–T5 relatively large and long, distinctly bent laterally (pleural membrane not large). Preabdominal sterna pale brown, sparsely and shortly setose (only S4 and S5 visible, Fig. 17) and obviously becoming wider posteriorly; S4 distinctly transverse; S5 largest and very broad, strongly transverse.

Postabdomen (Figs 7, 16, 17) with sclerites well developed, dark-pigmented and asymmetrical. T6 not present as separate sclerite, either reduced (absent) or, more probably, completely fused with S8 to form with it a large, long synsclerite termed here T6+S8(?) being particularly extended on right side (Fig. 16). S6 elongately subtriangular, ventrally attenuated, situated on

left side of postabdomen (Fig. 17) and probably (not precisely visible) attached to T6+S8(?) dorsally and, at least partly, also to S7; S7 probably also subtriangular but its shape is not precisely discernible in the holotype. S6 apparently bare but S7 with at least 1 setula (most of sclerite covered by white moulding so that its setosity cannot be recognized). T6+S8 (?) rather densely shortly setose but setae are only visible on its right side (Fig. 16).

Genitalia. Epandrium (Figs 16, 17) short and high, with posterior side oriented ventrally due to enlarged synsclerite T6+S8 (?), probably shortly uniformly setose (only a few setae visible on left side). Anal fissure cannot be seen in the holotype. Gonostyli (Figs 16, 17) relatively small but clearly asymmetrical. Right gonostylus (Fig. 16) strongly bilobed, with anterior lobe very narrow and pale-pigmented, distinctly pointed and with a pair of small setae on apex; posterior lobe digitiform, dark, heavily sclerotized and bare, apically rounded. Left gonostylus (Fig. 17) with posterior lobe curved and distally dilated, markedly longer than that of right gonostylus, but its anterior lobe not observable or absent. Cerci probably also asymmetrical (cf. Figs 16, 17) and situated ventrally between posterior lobes of gonostyli and projecting below ventral epandrial margin; left cercus with apex in profile more rectangular, right cercus larger and with apex more rounded, both pale-pigmented and finely haired. Internal genitalia (aedeagal and/or hypandrial complex) not visible in the holotype.

Female. Unknown.

Etymology. The name of the new species is derived from its similarity to druid flies (Clusiidae), adjective.

Comparison with related species. Because the type series of the only known relative, *A. tertiaria* Hennig, 1965, is apparently not conspecific, *A. clusioides* sp. nov. is below compared with the female holotype of *A. tertiaria* but also with the male associated under *A. tertiaria* subsequently by HENNIG (1969). The new species differs from *A. tertiaria* (female holotype) in a number of characters including the following: (1) anterior ors smaller (Fig. 9); (2) vi short but distinctly larger than peristomal setulae (Fig. 19); (3) arista short ciliate (as in female paratypes of *A. tertiaria*, cf. HENNIG 1965: Fig. 173); (4) 1st flagellomere excavated posteriorly (in lateral view, Fig. 19); (5) thorax markedly narrower (Fig. 4, cf. HENNIG 1965: Fig. 176); (6) only 2 dc, the anterior dc short and situated beyond level of sa; (7) no prescutellar ac; (8) wing more elongate (Figs 8, 15) and distinctly (mainly distally) brown darkened (Fig. 8) with small pale spot in cell r_{2+3} ; (9) R_1 without setulae(!) and (10) with a distinct preapical „kink“ at level of end of Sc (Fig. 15); (11) M not reaching wing margin and (12) dm-cu longer than distal section of CuA_1 (Fig. 15); (13) mid tibia with 2 short dorsal setae (including the preapical one) in addition to a long row of posterodorsal setae (Figs 11, 14), but the latter obviously overlooked by HENNIG (1965: Fig. 180) in the *A. tertiaria* holotype; (14) mid femur ventrally with double row (antero- and posteroventral) of dense short curved setae in distal fourth (Fig. 11) but this feature can be sexually dependent (see note below) and hence missing in the female. Moreover, the scutellum of *A. clusioides* sp. nov. has a distinctive, longitudinally grooved surface structure hitherto unknown in *Acartophthalmites*.

The male of *Acartophthalmites* affiliated by HENNIG (1969) with *A. tertiaria* seems to be more similar to *A. clusioides* sp. nov. and hence also differing from the *A. tertiaria* female holotype. It is therefore highly plausible that this male does not belong to true *A. tertiaria*. This specimen resembles *A. clusioides* sp. nov. in the elongate wing (cf. HENNIG 1969: Fig. 19), short distal section of CuA_1 and in mid tibial chaetotaxy (cf. HENNIG 1969: Fig. 21). On

the other hand it cannot be conspecific with the above new species because it has a simple (lacking preapical kink) and setulose R_1 , M reaches the wing margin, A_1 is very long, the dorsal pregenital sclerite (= $T6+S8?$) is short and the posterior lobe of the gonostylus is bent posteriorly (see HENNIG 1969: Fig. 20).

A number of morphological characters found in *A. clusioides* sp. nov. revealed that the genus *Acartophthalmites* is apparently much more morphologically diverse than formerly anticipated. Particularly, the absence of setulae on R_1 (considered to be a generic character by HENNIG 1965) is rather surprising, although this may be the result of simple reduction only occurring in this species. Another important finding is the fact that a peculiar posterodorsal row of setae along t_2 has proved to be present in both males and females (seen in the unidentified specimens in Coll. Hoffeins), and was probably overlooked by HENNIG (1965). These setae may possibly be a diagnostic character of the whole genus (but see below). Further, the presence of a (albeit short) dorsal preapical seta on t_2 indicates a relationship to Clusiidae (see below) as does the more elongate and distally darkened wings of the new *Acartophthalmites* species. The strikingly prolonged mid leg, also seen in the male of '*A. tertiaria*' (HENNIG 1969: Fig. 21), and the setosity of f_2 (possibly an adaptation for copulation), may also be male-associated sexual characters. The preapical kink (see Fig. 5) on R_1 is another unexpected feature regarding the fact that there is no subcostal break on C (as is normal for the genus).

Additions to description of *Acartophthalmites*

The generic description provided by HENNIG (1965) and supplemented by HENNIG (1969) is to be modified following the study of *A. clusioides* as follows: vi present but short and inclinate; pedicel without anterolateral process but sometimes emarginate anteriorly; 1st flagellomere laterally flattened, rounded in lateral view, with posterior side shallowly to distinctly excavated; prescutellar ac present or absent; ac microsetae numerous, relatively dense; f_1 with posterodorsal and posteroventral series of setae; male f_2 sometimes with dense double row of short thicker setae in distal fourth; t_1 with small dorsopreapical and ventroapical setae; t_2 with a row of erect posterior setae in distal half, 1–2 small dorsal setae (including 1 preapical) and 1 longer and thicker ventroapical seta; R_1 setulose or bare, and sometimes with a preapical kink; C attenuated beyond apex of R_{4+5} and not reaching apex of M (or only as a very fine vein); M sometimes not ending in wing margin; terminal part of CuA_1 variable in length and often not reaching wing margin; A_1 relatively long but (? always) not reaching wing margin; male postabdomen with large dorsal pregenital sclerite, probably formed by fusion of $T6$ and $S8$; male $S6$ and $S7$ strongly asymmetrical, on left side; epandrium short and uniformly shortly setose; gonostylus bilobed (? always).

Discussion on the relationships of the genus *Acartophthalmites*

A preliminary comparative study of the male holotype of *A. clusioides* sp. nov., several unidentified specimens of *Acartophthalmites* from Coll. Hoffeins and descriptions of *A. tertiaria* in HENNIG (1965, 1969) resulted in finding that the genus *Acartophthalmites* is obviously not related to *Acartophthalmidae* (where it was affiliated by HENNIG 1965) but is closer to Clusiidae, although surely not belonging to this family as currently delimited (cf. LONSDALE et

al. 2010) because it lacks all three main autapomorphies, viz. (1) angulate anterior projection on outer and inner margins of pedicel; (2) arista dorsal subapical and (3) prosternum setose. However, besides general body appearance, *Acartophthalmites* shares with Clusiidae a number of other characters (albeit largely plesiomorphic, see for example thoracic chaetotaxy) including several possible apomorphies, e.g. t_2 with dorsal preapical seta (small but distinct in *Acartophthalmites*), closely arising divergent postverticals, an anterodistal infuscation on the wing (present at least in the new *Acartophthalmites*), and absence of the presutural intra-alar seta. The fossil (Baltic amber) clusiid *Electroclusiodes radiospinosa* Hennig, 1969 seems to be particularly similar to *Acartophthalmites* because of having Sc ending far from R_1 , R_1 setulose (as in *A. tertiaria* and some unnamed congeners) and mid tibia with a row of (?postero)dorsal setae (cf. HENNIG 1969: Figs 24, 25). On the other hand, *E. radiospinosa*, although looking in the above characters somewhat intermediate between *Acartophthalmites* and other Clusiidae, possesses most synapomorphies of Clusiidae including the formation of the antenna and the presence of a costal break at the end of Sc. The Eocene species *E. radiospinosa* appears to be an unusual member of Clusiidae and A. Woźnica (personal communication, 2015) does not think that it belongs to the genus *Electroclusiodes* Hennig, 1965. Nevertheless, the above mentioned characters which *E. radiospinosa* shares with *Acartophthalmites* can be considered an indication of the relationship of these two taxa.

The formation of male postabdominal sclerites in *Acartophthalmites clusioides*, especially the asymmetry of S6 and S7, is rather similar to the condition known in Clusiidae (and quite different from that in Acartophthalmidae, see below) but differs by the absence of separate T6 which can, however, be fused with the dorsally situated S8, forming with it a long pregenital sclerite (see Fig. 16). In Acartophthalmidae, T6 also is seemingly absent but in fact it is reduced to a short transverse submembranous strip between T5 and the pregenital ring-shaped synsclerite (S6+S8). Other interesting features of *A. clusioides* are the deeply bilobed gonostyli and well developed male cerci. This condition also resembles more the situation in certain Clusiidae (e.g. in the genus *Apiochaeta* Czerny, 1903, cf. LONSDALE & MARSHALL (2008) or in some Neotropical species of *Sobarocephala* Czerny, 1903, cf. LONSDALE & MARSHALL (2012)) than in Acartophthalmidae where gonostyli are simple but enlarged (as large as or larger than epandrium), while the male cerci are reduced and submembranous.

In my opinion, *Acartophthalmites* cannot be affiliated to the (exclusively recent) family Acartophthalmidae (represented by only four recent species of the genus *Acartophthalmus* Czerny, 1902 distributed in the Holarctic Region) because it lacks the core definitive characters of that family, viz. (1) eye distinctly haired, (2) C with humeral break, (3) no true vibrissa, (4) male sternites 6 and 8 fused to form a symmetrical pregenital synsclerite. Moreover, the most recent morphological phylogenetic analysis placed Acartophthalmidae in Carnoidea, see BUCK (2006), not Opomyzoidea where the Clusiidae are currently affiliated. The Acartophthalmidae not only lacks a true vibrissa, but it also has markedly enlarged peristomal setae, widely spaced postvertical setae (close and strongly divergent as in Clusiidae and *Acartophthalmites*), an almost bare occiput and postgena (with setae restricted to narrow postocular area), a markedly short arista, and 1–2 distinct dorsal preapical setae on a somewhat thickened f_3 , all of which seem to be important features differentiating the family from Clusiidae and *Acartophthalmites*. On the other hand, the haired eyes (see (1) above) can be doubted as an autapomorphic character of Acartophthalmidae because the eyes are bare at least in *A. bicolor* Oldenberg, 1910,

unless this loss is considered a secondary reduction. It is to be stressed that the construction of the male postabdomen in *Acartophthalmidae* is particularly different from that in *Clusiidae* and *Acartophthalmites*, where S6 and S7 are strongly asymmetrical and placed left laterally, while in *Acartophthalmidae* there is a symmetrical ring-shaped pregenital synsclerite formed by fusion of S6 (ventral part) and S8 (larger dorsal part), while S7 is represented by a small ventral transverse sclerite posteriorly to the original S6 (as stated also by BUCK 2006). This condition is surely an autapomorphic character of *Acartophthalmidae*.

Conclusions

The preliminary results of a study of *Acartophthalmites clusioides* sp. nov. seem to be very promising in terms of a possible solution of its currently unclear relationships and systematic placement within acalyptrate Diptera. Although the above preliminary comparative study indicates that *Acartophthalmites* is probably the closest relative of *Clusiidae*, a more thorough analysis of morphological characters of all above discussed groups is suggested to establish a new phylogenetic hypothesis about their mutual affinities. However, this should be performed only after a taxonomic revision of all available specimens of *Acartophthalmites* (more than 20 in various collections, including types of *A. tertiaria*), not only because there are obviously more unnamed species among them but mainly due to the necessity to establish precise taxonomic limits and reveal the diversity of morphological characters of this phylogenetically important ancient taxon.

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