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TRICHOCERIDAE (DIPTERA) FROM BALTIC AMBER (EOCENE) IN THE COLLECTION OF THE MUSÉUM D'HISTOIRE NATURELLE, NEUCHÂTEL, SWITZERLAND

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Mots-clés: Trichoceridae, Diptera, fossiles, ambre de la Baltique, nouvelles espèces, description, taxonomie, clé de détermination

Abstract

Five new species of Trichoceridae (Diptera) from the Baltic amber (Eocene), *Trichocera* (*Oligotrichocera*) *anbar* sp. n., *T. (O.) bona* sp. n., *T. (O.) cerea* sp. n., *T. (O.) diluta* sp. n. and *T. (O.) ebenos* sp. n. are described from the collection of the Muséum d'Histoire Naturelle, Neuchâtel, Switzerland. Additional data for *T. (O.) antiqua* Dahl, 1971 are given and a key for the identification of the Trichoceridae in Baltic amber is provided.

Résumé

Cinq nouvelles espèces de Trichoceridae (Diptera) de l'ambre de la Baltique (Eocène), *Trichocera* (*Oligotrichocera*) *anbar* sp. n., *T. (O.) bona* sp. n., *T. (O.) cerea* sp. n., *T. (O.) diluta* sp. n. et *T. (O.) ebenos* sp. n., sont décrites de la collection du Muséum d'histoire naturelle de Neuchâtel (Suisse). Une clé pour l'identification des Trichoceridae fossiles dans l'ambre de la Baltique est proposée.

INTRODUCTION

Fossil representatives of the winter gnats (Diptera, Trichoceridae) are few, since only 14 species belonging to 5 genera are listed by EVENHUIS (1994). Trichoceridae are extremely rare in Baltic amber (Eocene), with only 3 specimens recorded so far. Two species, *Trichocera* (*Oligotrichocera*) *antiqua* Dahl, 1971 and *T. (O.) primaeva* Dahl, 1971, have been described by DAHL (1971) on the basis of 2 specimens, and later fragments of another specimen in the collection of the Museum of the Earth in Warsaw (Poland) were tentatively ascribed to *T. (O.) ?antiqua* (KRZEMIŃSKI, 1985).

For the present study, altogether 19 specimens of Trichoceridae have been available, that is more than 6 times the number of specimens known up to now. Six species are

present in this material, 5 of which are new to science and described below.

MATERIAL AND METHODS

The present study is based on material preserved in the palaeontological collections of the Muséum d'Histoire Naturelle, Neuchâtel, Switzerland, (18 specimens) and collections of the Zoological Museum of Vilnius University, Lithuania (1 specimen). Eight of the specimens are males, nine are females while the sex cannot be ascertained for 2 badly preserved specimens. The major part of this material happened to belong to still unknown species, while only one male and one fragment were identified as belonging to the species *T. antiqua*.

It is well known that small insects are generally best preserved in amber, and this is also the case for this collection of Trichoceridae, with only representatives of small species and no specimen of larger species like *T. primaeva*.

As Trichoceridae are very scarce in amber, finding of pairs in copula is very unlikely. Thus the association of male and female sexes was made upon the basis of morphometrics criteria (comparative length of veins, antennal segments and tarsomeres) (KRZEMIŃSKA, 1992).

Drawings have been made by the author using a camera lucida.

Key to fossil species of Trichocera Meigen, 1803 in Baltic amber

Males (unknown in *T. primaeva* Dahl and *T. ebenos* sp. nov.)

1. Gonostylus with tubercle at inner base (Fig. 17) 2

-. Gonostylus simple, without tubercle at inner base (Fig. 6) 3

2. Tubercle at inner base of gonostylus very obvious, prominent, pointed at apex (Fig. 17). Ninth sternite with lateral lobes ..... *T. cerea* sp. n.

-. Tubercle at inner base of gonostylus flat and rounded. Ninth sternite simple, without lateral lobes ..... *T. antiqua* Dahl

3. Aedeagus long and wide; its tip protrudes through the bridge made of the ventrobasal lobes of gonocoxites (Fig. 6). Vein R_{2+3+4} hardly shorter than R_{2+3} (Fig. 1) ..... *T. anbar* sp. n.

-. Aedeagus shorter, its tip does not protrude through the bridge of ventrobasal lobes of gonocoxites. Length of R_{2+3+4} strongly differs from that of R_{2+3}, either much longer or much shorter 4

4. Gonostylus nearly cylindrical with rounded apex (Fig. 11). Vein R_{2+3+4} clearly longer than R_{2+3} (Fig. 8) ..... *T. bona* sp. n.

-. Gonostylus widened in apical part (Fig. 21). Vein R_{2+3+4} clearly shorter than R_{2+3} (Fig.19)..... *T. diluta* sp. n.

Females (unknown in *T. antiqua* Dahl and *T. bona* sp. nov.)

1. Body length about 12.5 mm. Cercus of ovipositor very long and slender, nearly 5 times as long as wide ..... *T. primaeva* Dahl

-. Body length less than 7 mm. Cercus of ovipositor shorter, less than 4 times as long as wide..... 2

2. Cercus of ovipositor long and slender; 3 times as long as wide (Fig. 22) ..... *T. diluta* sp. n.

-. Cercus of ovipositor short and wide; no more than 2.5 times as long as wide 3

3. Cercus strongly bent downwards, with curved lower margin and slender apical part (Fig. 18). Length ratio R_{2+3+4}/R_{2+3} = 0.7 ..... *T. cerea* sp. n.

-. Lower margin of cercus nearly straight. Whole cercus is very broad. Vein R_{2+3+4} comparatively longer 4

4. Cercus with slightly rounded dorsal margin (Fig. 25). Vein R_{2+3+4} longer than R_{2+3} ..... *T. ebenos* sp. n.

-. Cercus with angled dorsal margin (Fig. 7). Vein R_{2+3+4} shorter than R_{2+3} ..... *T. anbar* sp. n.

DESCRIPTIONS

Trichocera (Oligotrichocera) anbar sp. n. (figs. 1-7; Pl. I)

Holotype.- Male, in Baltic amber (Pl. I); coll. Muséum d'Histoire Naturelle, Neuchâtel, Switzerland, MHNN 1176.

Paratypes.- Male, same as holotype, MHNN 1127; male, the same, MHNN 1137; female, the same, MHNN 1165; female, the same, MHNN 1182.

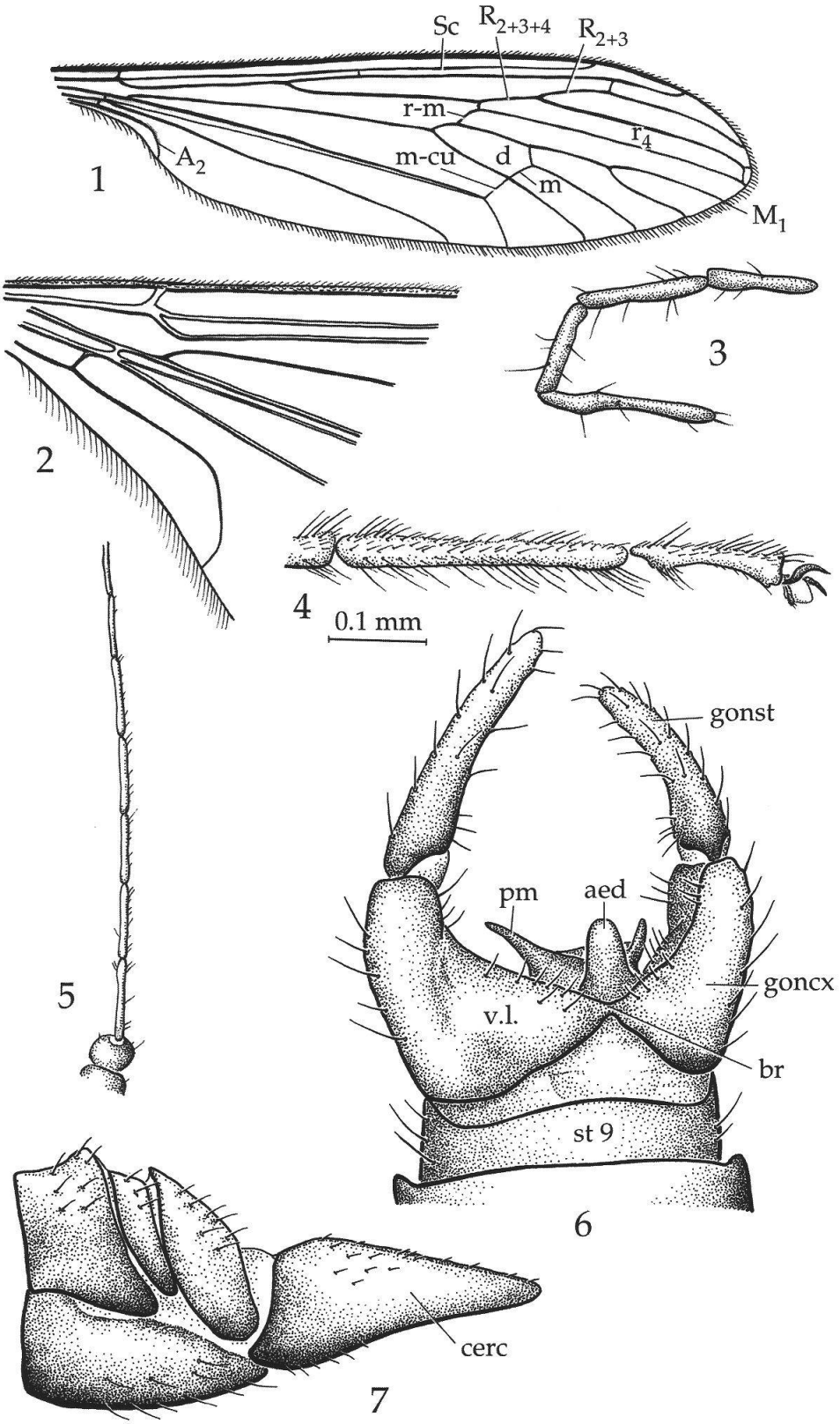
Derivatio nominis.- The new species is named after the Arabic word "anbar", used as an apposition, which is the origin of English "amber", French "ambre", Spanish "ambar" etc.

Diagnosis and description.- A comparatively small species. Body length 4.1-5.0 mm, wing length 4.0-6.7 mm. First flagellomeres of male antenna slender, cylindrical. Pleuron bare, without setae. R_{2+3+4} about the same length or hardly shorter than R_{2+3}. Male terminalia with comparatively short gonocoxite, with basally very broad ventrobasal lobe strongly tapered before apex; gonostylus elongate, tapered distally, without tubercle, but with few setae at inner base. Paramere short, spine-like; aedeagus long and wide. Cercus of female ovipositor with a blunt apex, 2.4 times longer than wide.

MALE. Body length 4.1-5.0 mm, wing length 5.9-6.7 mm. Head brown to blackish. Eyes large with sparse short hairs between ommatidia. Antenna slightly shorter than entire body, 3.5 mm long (in the smallest specimen) with all flagellomeres moderately long; proximal flagellomeres slender, cylindrical, shortly verticillate, the first slightly longer than the four other which are about the same length (Fig. 5); Mouthparts with slightly rounded labellae. Palpus (Fig. 3) of moderate length, 0.7 mm long, fourth segment longest, bristles comparatively short.

Thorax brown to blackish, depending on preservation. Pleuron blackish; epimeron and metepisternum bare, without setae. Wings (Figs. 1-2) comparatively broad, entirely clear, without any darker spots; macrotrichia on veins moderately long, longer in hind fringe; vein *Sc* with scattered bristles dorsally and no bristles ventrally; R_{2+3+4} about the same length or hardly shorter than R_{2+3}; *r-m* slightly curved; discal cell rather long and narrow, more than twice as long as broad; *m-cu* at the same level as cross-vein m; A_2 short and curved, with few bristles; anal angle rather prominent. Right wing of holotype with additional cross-vein at the apex of cell r_4, which is missing in the left wing and in the paratype. Coxae, trochanters and legs brownish, apices of femorae darkened. Femur I: 2.6-2.8 mm long, II: 2.6- 3.2 mm, III: 2.8-3.4 mm; tibia I: 3.3-3.8 mm, II: 3.7 mm, III: 3.6-4.3 mm, tarsus I: 4.1 mm, II: 3.7 mm, III: 3.8 mm long; compared length of tarsal segments of hind legs (from first to fifth): 1: 5/9: 1/3: 1/6:1/12 (1/9 including length of claws) (Fig. 4). Tibial spurs simple, as long as tibia is wide. Halter brown throughout, 1.3 mm long. Abdomen yellowish brown, with conspicuous, rather dense and long setosity.

Male terminalia (Fig. 6) slightly darker than the rest of abdomen. Sternite 9 without any excision, its posterior margin nearly straight. Gonocoxite comparatively short, with ventrobasal lobe very broad at base and strongly tapered before apex, so bridge is low, with very narrow area at top. Gonostylus elongate, hardly longer than gonocoxite, distinctly tapered gradually distally, without tubercle, but with few setae at inner base. Paramere short, spine-like; aedeagus (apodeme of vesica or ejaculatory apodeme according to STARÝ, 1999) long and wide.



Figures 1-7: *Trichocera (Oligotrichocera) anbar* sp. n.: 1 - wing, 2 - base of the wing, 3 - palpus, 4 - last tarsomeres of hind leg, 5 - basal part of antenna, 6 - male genitalia, ventral view, 7 - ovipositor. 1-6 - holotype, 7 - paratype (MHNN 1165); aed - aedeagus, b - bridge, d - discal cell, cerc - cercus, goncx - gonocoxite, gonst - gonostylus, pm - paramere, st 9 - ninth sternite, v.l. - ventrobasal lobe of gonocoxite.

FEMALE: generally similar to male. Body length 4.3-4.4 mm, wing length 4.0-4.2 mm.

Head dark brown. Eyes with scarce short hairs between ommatidia. Antenna 3.3 mm long; first flagellomere longer than each of four following segments, second flagellomere shortest among five basal segments, third through fifth flagellomeres of the same length. Palpus of moderate length, fourth segment longest, bristles comparatively short.

Thorax dark brown. Pleuron bare, without setae. Wing venation similar to that of male, except vein *m-cu* which is slightly beyond the level of cross-vein m. Femur I: 2.0 mm long, II: 2.1 mm, III: 2.4 mm; tibia III: 2.5 mm long. Tibial spurs simple, as long as tibia is wide.

Abdomen light brown, covered with scarce short yellowish hairs. Posterior segments dark brown. Cercus of ovipositor (Fig. 7) blunt at apex, short, 2.4 times as long as wide at widest point.

The amber piece MHNN 1165 includes also a fragment of a Mycetophilidae.

Discussion.- This new species is ascribed only tentatively to the subgenus *Oligotrichocera* Vevers, 1975, because some features do not fit exactly with the description of that group by DAHL (1971). These could be features of specific value, but they may also have been overlooked in both previously described species because of the poor state of preservation of former material (DAHL, 1971). Though the holotype of *Trichocera* (*Oligotrichocera*) *anbar* sp. n. is a well preserved specimen, even there the small hairs between ommatidia are difficult to see. The subgenus *Oligotrichocera* is characterized by glabrous eyes, but in descriptions of both species this feature is considered as unreliable, since these setae may be so short that they would escape notice or they could have been torn off in resin (DAHL, 1971). Palpus of the new species is similar to that of other *Oligotrichocera*, except that bristles are scarce, in which it differs from all other known Trichoceridae. Antennal segments are long and slender, and differences between species are observed only in relative length of segments; thus the first flagellomere of *T. antiqua* Dahl, 1971 is longer than the second and the third, the second is shortest, when second and third proximal flagellomeres of *T. anbar* sp. n. are nearly equal in length. Proportions in length of tarsomeres of the new species are nearly the same as in subgenus *Trichocera*, differing thus from the other *Oligotrichocera*. Male terminalia are similar to that of *T. antiqua* in basic details (*T. primaeva* Dahl, 1971 is known from female only). The bridge is very broad at base in both species, basal tubercle in *T. antiqua* is flat and rounded, while it is not expressed at all in *T. anbar* sp. n. The broad tip of aedeagus is especially distinctive, more resembling that of *Diazosma* (STARÝ & MARTINOVSKY, 1993), or *Nothotrichocera* (KRZEMIŃSKA, 1994) than that of *Trichocera* (Fig. 3 in DAHL, 1971).

Female is similar to that of *T. ebenos* sp. n. (described further), but has clear differences in wing venation (comparative length of *R* and *M* branches); legs and antennae are comparatively longer, as is also cercus of ovipositor.

Trichocera (Oligotrichocera) antiqua Dahl, 1971

Material examined - Male from Baltic amber, coll. Muséum d'Histoire Naturelle, Neuchâtel, MHNN 1173; fragment from Baltic amber, probably of *T. antiqua* (?), MHNN 1183.

The male is not well preserved, but all features fit very well with the description of *O. antiqua*, except length of the wing. This specimen is exactly of the same size as holotype, body length is 6.0 mm, but wing is much longer, reaching 7.0 mm, when wing of holotype is only 4.5 mm long, according to DAHL (1971). However the wings of the holotype are twisted, and

no male Trichoceridae in Baltic amber has wings shorter than body length, but in the contrary they are clearly longer.

This amber piece MHNN 1173 was cut during preparation into a few smaller pieces; it contains also 2 specimens of Sciaridae, 2 Chironomidae, 2 winged aphids, 1 mite and fragment of an antenna which probably belonged to a caddis fly. The amber piece MHNN 1183 also contains remnants of 1 spider and 1 fly.

Trichocera (Oligotrichocera) bona sp. n. (Figs. 8-12; Pl. II, A)

Holotype.- Male from Baltic amber, coll. Muséum d'Histoire Naturelle, Neuchâtel, MHNN 1175 (Pl. II, A).

Derivatio nominis.- The name is derived from the Latin adjective "bonus" which means good or beautiful.

Diagnosis and description.- Medium sized fly. Body length 5.3 mm, wing length 6.8 mm. First flagellomeres of male antenna slender, cylindrical. Pleuron bare, without setae. R_{2+3} is about two thirds of R_{2+3+4} length. Male terminalia with ninth sternite simple; gonocoxite comparatively short with ventrobasal lobe broad at base and tapering regularly toward apex; gonostylus elongate, without tubercle, but slightly dilated at inner base. Paramere long, rod-like; aedeagus short and wide.

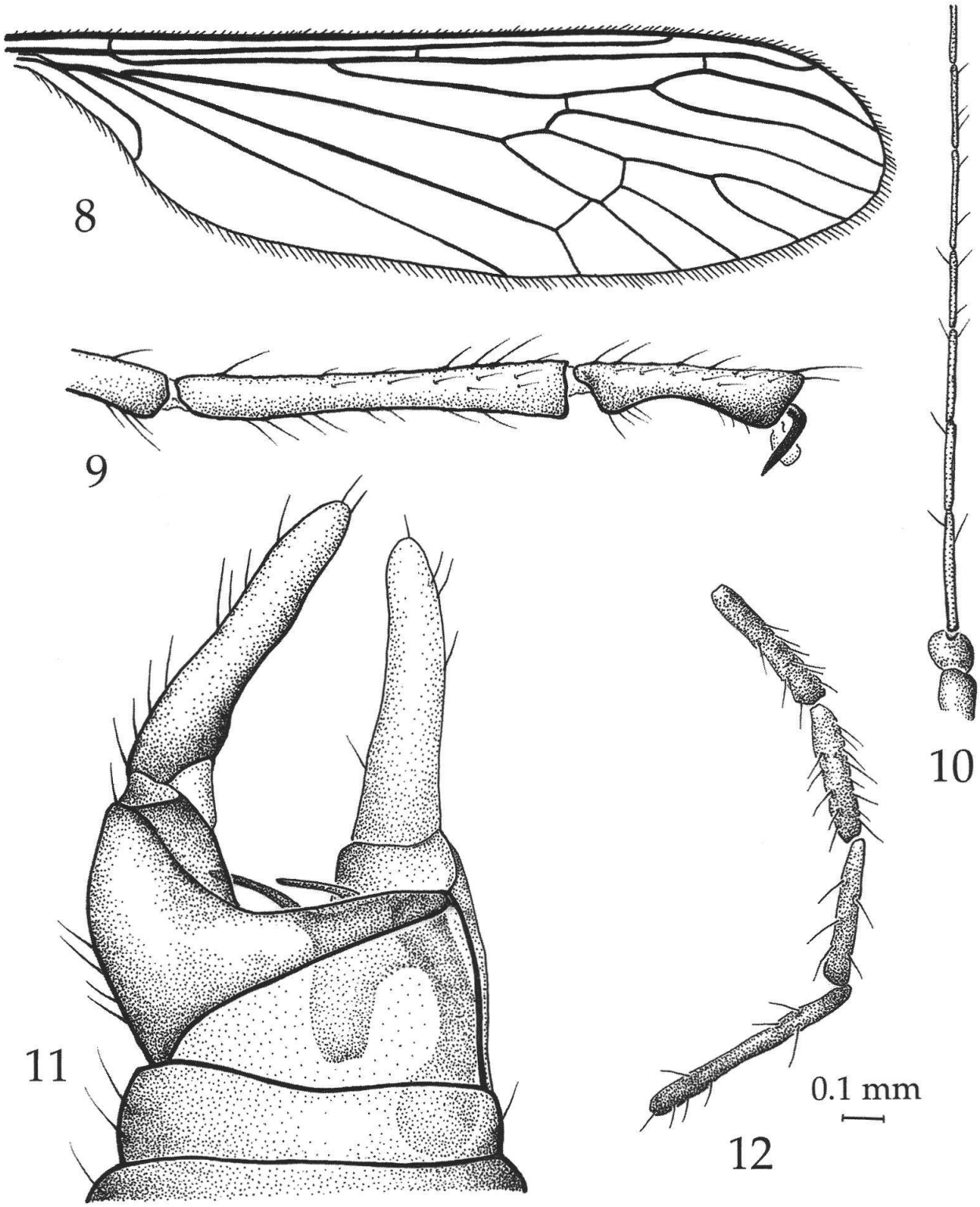
MALE: Head brown. Eyes large with short hairs between ommatidia. Antenna 3.5 mm long; proximal flagellomeres slender, cylindrical, shortly verticillate), all flagellomeres moderately long, first longest, second and third equal in length, reaching 3/4 of the first (Fig. 10). Mouthparts with small rounded labellae. Palpus long (Fig. 12), 1.4 mm long, fourth segment longest, bristles comparatively short.

Thorax and pleuron brown; epimeron and metepisternum bare, without setae; only two setae on basalare. Wing (only left wing is preserved in holotype) comparatively broad (Fig. 8), entirely clear, without any darker spots; macrotrichia on veins and on the hind fringe of moderate length; no bristles on vein Sc; R_{2+3} is about 2/3 of R_{2+3+4} length; *r-m* slightly curved; discal cell rather long and narrow, more than twice as long as broad; *m-cu* slightly before the cross-vein *m*; A_2 short and curved with only one bristle just before apex; anal angle rather prominent. Coxae, trochanters and legs brownish, apices of femorae and posterior tibia darkened. Femur I: 2.8 mm long, III: 3.2 mm; tibia I: 4.2 mm, III: 4.6 mm, tarsus I: 4.0 mm, III: 3.9 mm long; compared length of tarsal segments of hind legs (from first to fifth): 1: 5/9: 2/7: 1/6: 1/12 (Fig. 9). Tibial spurs simple, same length as tibial diameter. Abdomen blackish brown, with setosity conspicuous, rather dense and long.

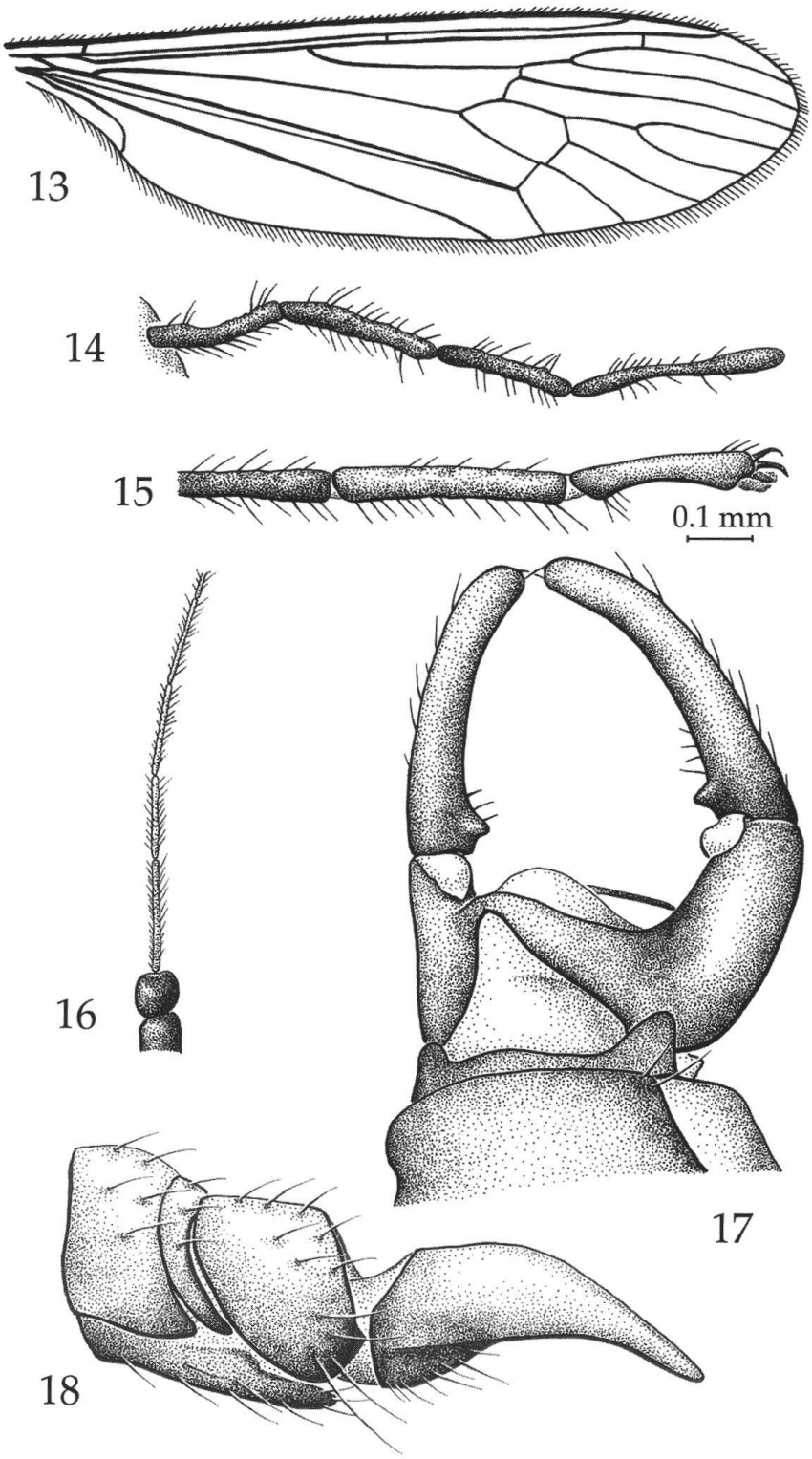
Male terminalia (Fig. 11) of same colour as rest of abdomen. Sternite 9 without any excision, its posterior margin nearly straight. Gonocoxite comparatively short, with ventrobasal lobe broad at base and constantly tapered before apex, so that bridge is high with a very narrow area at top. Gonostylus elongate, 1.3 times as long as gonocoxite, rounded at apex, without tubercle, but with slightly dilated at inner base. Paramere long, rod-like; aedeagus comparatively short and wide, its tip does not protrude through the bridge.

FEMALE unknown.

Discussion.- *T. bona* sp. n. is close to the previous species *T. anbar* sp. n. and similarly it is ascribed to the subgenus *Oligotrichocera* Vevers, 1975 only tentatively. The main difference between both newly described species *T. bona* sp. n. and *T. anbar* sp. n. and *T. antiqua* Dahl is the comparatively short aedeagus, the tip of which is covered by the ventrobasal lobes of gonocoxites and does not protrude through the bridge. The tip of the aedeagus may clearly be seen beyond the bridge in



Figures 8-12: *Trichocera (Oligotrichocera) bona s*p. n., holotype: 8- wing, 9 - last tarsomeres of hind leg, 10 - basal part of antenna, 11 - male genitalia, ventro-lateral view, 12 - palpus.



Figures 13-18: *Trichocera (Oligotrichocera) cerea* sp. n.: 13 - wing, 14 - palpus, 15 - last tarsomeres of hind leg, 16 - basal part of antenna, 17 - male genitalia, ventro-lateral view, 18 - ovipositor. 13-17 - holotype, 18 - paratype (MHNN 1178).

T. antiqua and *T. anbar* sp. n. Parameres of *T. bona* sp. n. are long and narrow, while they are much shorter and broader in *T. anbar* sp. n.; the basally slightly dilated gonostyles of *T. bona* sp. n. are slightly resembling those of *T. antiqua*. The posterior tarsus is similar to that of *T. anbar* sp. n., with small difference observed in comparative length of second segment. Vein R_2 of *T. bona* sp. n. is closer to the branching of R_{2+3+4}, R_{2+3} being thus shorter than in *T. anbar* sp. n. and *T. primaeva* Dahl.

Trichocera (Oligotrichocera) cerea sp. n. (Figs. 13-18; Pl. II, B)

Holotype.- Male from Baltic amber, coll. Muséum d'Histoire Naturelle, Neuchâtel, MHNN 1185 (Pl. II, B).

Paratype.- Female, same as holotype, MHNN 1178. This amber piece contains also one Phorid fly and fragments of an other insect, probably a Collembola.

Derivatio nominis.- The name is derived from the Latin adjective "cereus" which means "yellow as wax".

Diagnosis and description.- A comparatively large winter fly. Body length 7.0 mm, wing length 8.8 mm. First flagellomeres of male antenna slender, cylindrical. Pleuron bare, without setae. R_{2+3+4} is about two thirds of R_{2+3} length. Male terminalia with elongated gonocoxite, whose ventrobasal lobe is broad at base and regularly tapering toward apex; gonostylus elongate, curved inwards, with prominent tubercle at inner base. Paramere long, rod-like, turned straight upwards; aedeagus long and wide.

MALE: Body length 7.0 mm, wing length 8.8 mm. Head dark brown. Eyes large, without hairs between ommatidia. Antenna 5.1 mm long; with all flagellomeres moderately long; proximal flagellomeres slender, cylindrical, with short abundant pubescence; the first flagellomere is longer than the second, third and the fourth (Fig. 16), the second is shortest. Mouthparts with small rounded labellae. Palpus (Fig. 14) brown, 1.3 mm long, fourth segment longest, bristles moderately long.

Thorax overall dark brown; prescutum with clear narrow blackish median line; whole prescutum covered with scarce hairs, which are longer on postsutural area; transverse suture surrounded with light brown; scutellum marginated with long hairs; mediotergite brown with longitudinal median fissure; pleuron dark brown; epimeron and metepisternum bare, without setae. Wing (Fig. 13) comparatively broad, entirely clear, without any darker spots; macrotrichiae on veins and on the hind fringe of moderate length; few bristles on vein Sc, only on ventral part basally; R_{2+3+4} is about two thirds of R_{2+3} length; *r-m* slightly curved; discal cell broad, twice as long as broad; *m-cu* slightly before the cross-vein m; A_2 short and curved, with bristles not preserved; anal angle rather prominent. Coxae light brown; trochanters dark brown; legs light brown, apices of median femur and tibiae blackened; tarsi dark brown. Femur I: 3.8 mm long, II: 3.7 mm, III: 4.1 mm; tibia I: 4.7 mm, II: 4.4 mm, III: 5.4 mm, tarsus I: 5.3 mm, II: 4.7 mm, III: 5.2 mm long; compared length of tarsal segments of hind legs (from first to fifth): 1: 2/3: 1/3: 1/7: 1/8 (Fig. 15). Frontal tibia with one, middle and posterior tibiae each with two spurs. Tibial spurs simple, slightly longer than tibial diameter. Halter 1.6 mm long with darkened knob. Abdomen yellowish brown, posterior margins of tergites with narrow brown fringe. Setosity of abdomen conspicuous, rather dense and long.

Male terminalia (Fig. 17) dark brown. Sternite 9 without any desclerotization, with comparatively large lateral lobes and slightly extended posterior margin. Gonocoxite long, with ventrobasal lobe broad at base and tapering regularly before apex, so that bridge is high with very narrow area at top. Gonostylus elongate, 1.3 times as long as gonocoxite, curved inwards and

rounded at apex, with prominent tubercle at inner base. Paramere long, rod-like, turned straight upwards; aedeagus long and wide, with its tip protruding through the bridge.

FEMALE is generally similar to the male, but slightly smaller. Body length 6.6 mm, wing length 6.9 mm. Antenna 3.7 mm long.

Thorax brown. Comparative length of veins R_{2+3+4} and R_{2+3} is the same as in male (R_{2+3+4}/R_{2+3}=0.7). Cell m_1 comparatively slightly longer than in male. Femur I: 3.2 mm long, II: 3.6 mm, III: 3.5 mm; tibia I: 3.9 mm long.

Abdomen brown. Posterior segments slightly darker. Cercus of ovipositor 2.4 times as long as wide (Fig. 18), strongly bent downwards at apex and with strongly ventrally dilated basal portion.

Discussion.- *T. cerea* sp. n. is closest related to *T. antiqua* Dahl, 1971, but many differences are observed. Both these species have a tubercle at inner base of gonostylus, but that of *T. antiqua* is flat and rounded, while it is very prominent in *T. cerea* sp. n. Gonostyles of both species are curved inwards. Ninth sternite of *T. antiqua* is simple, while it has lateral lobes in *T. cerea* sp. n. Antenna of both species is also similar with first flagellomere long and second shortest. Third and fourth segments are nearly equal in length in *T. cerea* sp. n., but fourth is even longer than first flagellomere in *T. antiqua*. Relative length of posterior tarsomeres 1-5 in *T. cerea* sp. n. are the same as in description of the subgenus *Oligotrichocera* by DAHL (1971), but fourth and fifth segments are shorter, thus more resembling that of the genus *Trichocera* given in the same publication. *T. cerea* sp. n. is bigger than *T. antiqua* with especially longer wings: in *T. cerea* sp. n. body length is 7.0 mm and wing length 8.8 mm, when in *T. antiqua* these are rerspectively 6 mm and 4.5 mm (DAHL, 1971).

***Trichocera (Oligotrichocera) diluta* sp. n. (Figs. 19-22; Pl. II, C)**

Holotype.- Male from Baltic amber; coll. Muséum d'Histoire Naturelle, Neuchâtel, Switzerland, MHNN 1174. The wings of the holotype are strongly folded and their tips were cut during preparation but these are kept together with the piece of amber containing the main part of the specimen (Pl. II, C).

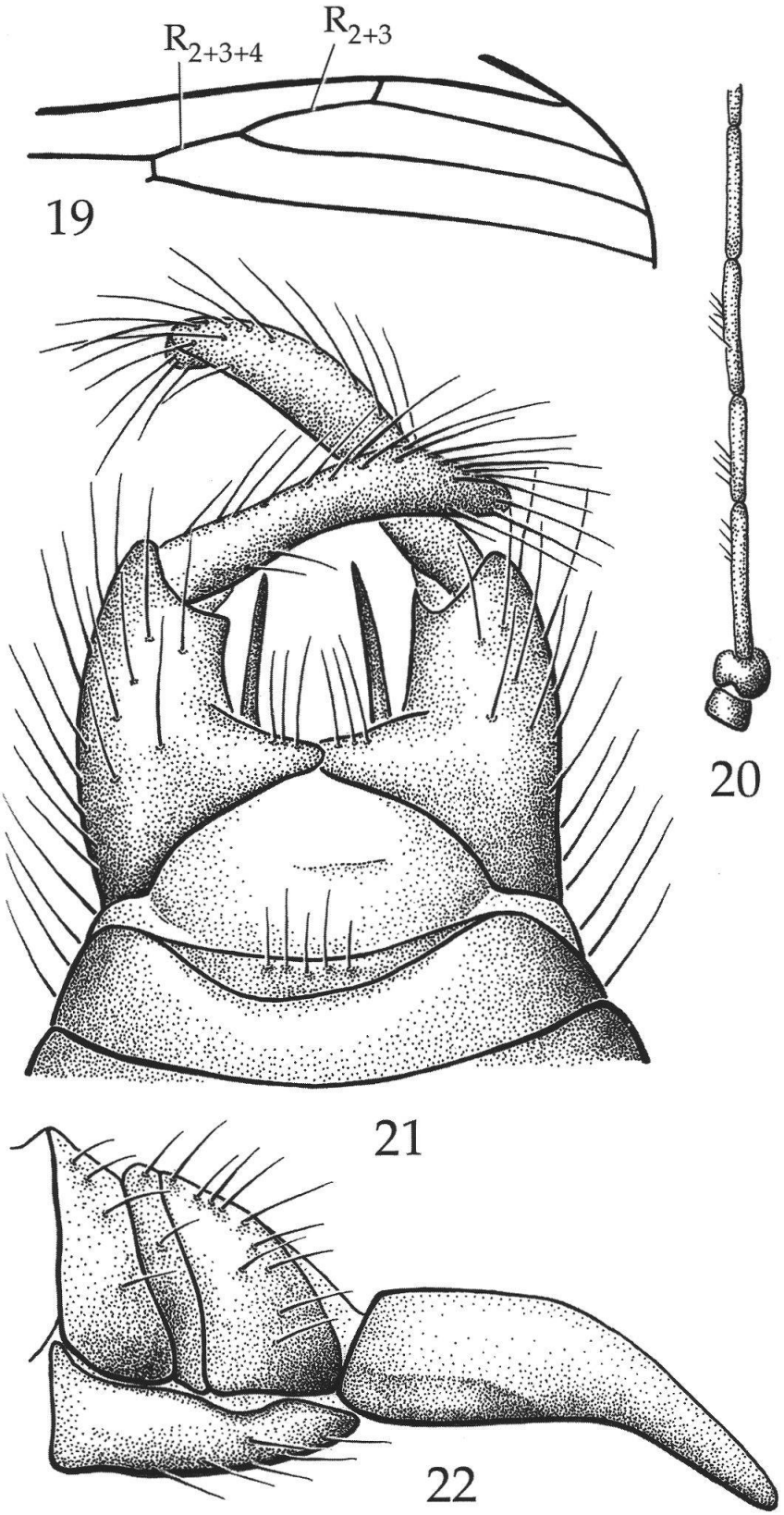
Paratypes.- Male, same as holotype, MHNN 1134; female, the same, MHNN 1172; female, the same, MHNN 1177; female, the same, MHNN 1179; female, the same, coll. of the Zoological Museum of Vilnius University, VU In. 026 (presented by S. Burakiene).

Additional material.- fragment, which, according to the measurements, best fits with female of *T. diluta* sp. n., MHNN 1125.

Derivatio nominis.- The name is an adjective referring to the blending colours, of specimens of insects preserved in amber due to oxidation processes.

Diagnosis and description.- A comparatively small winter fly. Body length 4.5-6.2 mm, wing length 5.2-6.5 mm. First flagellomeres of male antenna slender, cylindrical. Vein R_{2+3+4} is about two thirds length of R_{2+3}. Male terminalia covered with long hairs, with elongated gonocoxite, its ventrobasal lobe broad at base and tapering regularly toward apex; gonostylus elongate, slightly curved inwards, widening approximately at two thirds of its length, without any tubercle at inner base. Paramere long, rod-like, directed posteriorly (?); aedeagus short, not protruding through the bridge. Cercus of female ovipositor three times as long as wide.

MALE: Body length 5.2-5.9 mm, wing length about 6.5 mm. Head brown. Eyes large, without hairs between ommatidia. Antenna 3.1 mm long; proximal flagellomeres slender, cylindrical, with short scarce pubescence; first flagellomere lon-



Figures 19-22: *Trichocera (Oligotrichocera) diluta* sp. n.: 19 - fragment of the wing, 20 - basal part of antenna, 21 - male genitalia, ventral view, 22 - ovipositor. 19-21 - holotype, 22 - paratype (MHNN 1172).

gest (Fig. 20), second shortest from all four basal flagellomeres; third and fourth segments nearly of the same length. All flagellomeres moderately long. Palpus brown, fourth segment with slightly widened apex, bristles comparatively long.

Thorax overall brown. Wing (Fig. 19) entirely clear, without any dark spots; macrotrichia on veins and on the hind fringe comparatively long; vein R_{2+3+4} about two thirds of length of R_{2+3}; *r-m* straight; discal cell broad; *m-cu* directly proximal to the cross-vein *m*; A_2 short and curved; anal angle rather prominent. Coxae, trochanters and femorae reddish brown because of the oxidation, remains of all legs are missing. Femur I: 2.6-3.0 mm, III: 3.1 mm long. Halter 1.1 mm long with blackened knob. Abdomen yellowish brown.

Male terminalia (Fig. 21) dark brown. Sternite 9 without any desclerotization, with nearly straight posterior margin bearing few long setae. Sternite 9 widely covered by sternite 8. Gonocoxite long, with ventrobasal lobe broad at base and tapering regularly before apex, so that bridge is rather high and with narrow area at top. Gonostylus elongate, only slightly longer than gonocoxite, slightly curved inwards, widened approximately at two thirds of its length, without any tubercle at inner base. Paramere long, rod-like, directed posteriorly; aedeagus short, not protruding through the bridge.

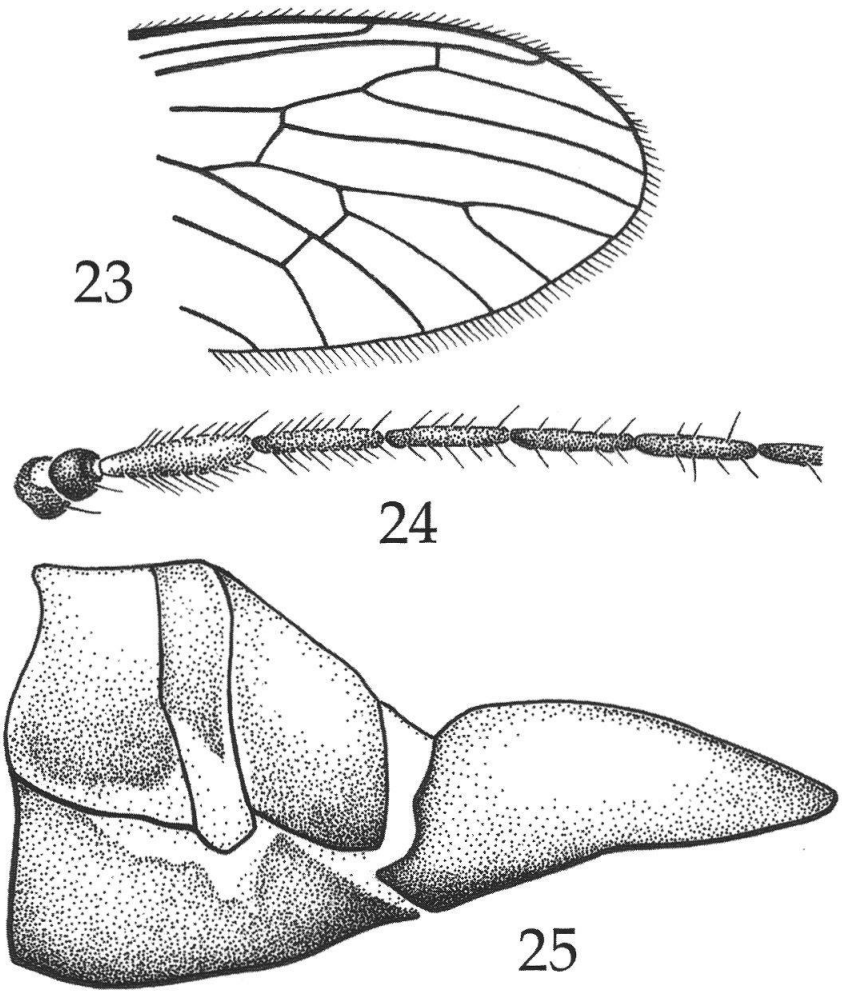
FEMALE generally similar to male; among the studied specimens, one is bigger than male, while the two other are smaller than male. Body length 4.5-6.2 mm, wing length 5.2-7.6 mm. Palpus 0.7-0.9 mm long. Antenna 2.3-3.2 mm long; first flagellomere longer than succeeding four segments; the second flagellomere the shortest, segments 3-5 only little longer than second.

Length of the vein R_{2+3+4} variable, either slightly longer or slightly shorter than in male depending on specimen. Cell m_1 comparatively slightly longer than in male (slight asymmetry may be observed in the length of cell m_1: in specimen MHNN 1177 it is slightly longer, and thus vein M_{1+2} shorter, in the right wing). Femur I: 2.1-4.0 mm long, II: 2.1-3.7 mm, III: 2.3-4.1 mm; tibia I: 2.7-4.7 mm, II: 2.7-4.4 mm, III: 3.7-5.4 mm, tarsus I: 2.8-5.3 mm, II: 2.6-4.7 mm, III: 5.2 mm long. Posterior tarsomeres slightly longer than in male: 1: 3/5: 2/5: 1/5: 1/8. Halter 0.9-1.2 mm long.

Abdomen yellowish brown. Posterior segments slightly darker (whole abdomen strongly affected by white oxidation products in resin). Cercus of ovipositor three times longer than wide (Fig. 22).

Female MHNN 1172 has numerous Nematoda worms attached to membranous areas of abdomen and there are 2 Chironomidae and 2 Sciaridae, legs of 2 spiders (?) and numerous setae of oak-trees *Quercus* in the same piece of amber. Amber piece MHNN 1179 also contains one Chironomidae midge; amber piece MHNN 1125 hold also one Hymenoptera-Parasitica and one mite aside from *Trichocera* fragments.

Discussion.- Male genitalia of *T. diluta* sp. n. differ from all other *Oligotrichocera* by the shape of gonostyle, which is usually nearly cylindrical or slightly narrowing toward apex. Gonostylus of *T. diluta* sp. n. is widened before tip, without any tubercles at inner base. This species is closest to *T. bona* sp. n. described over, but differences are observed in wing venation and in structure of male genitalia. Vein R_{2+3+4} is much longer than R_{2+3} in *T. bona* sp. n., shorter in *T. diluta* sp. n.; *m-cu* is placed before *m* in *T. bona* sp. n. while both veins meet at the same point in *T. diluta* sp. n. In *T. diluta* sp. n., ventrobasal lobes of male gonocoxites are much wider but comparatively shorter than in *T. bona* sp. n. Sternite 9 is very narrowed in *T. diluta* sp. n., when it is of usual width in *T. bona* sp. n. Also male genitalia of *T. diluta* sp. n. are covered by much longer and



Figures 23-25: *Trichocera (Oligotrichocera) ebenos* sp. n., holotype: 23 - apex of the wing, 24 - basal part of antenna, 25 - ovipositor.

denser hairs than in all other species of the subgenus.

Ovipositor is similar to that of *T. cerea* sp. n. but comparatively longer, with narrower basal part. Shape of cercus resembles that of *T. (Trichocera) sparsa* Starý & Martinovsky, 1996.

Trichocera (Oligotrichocera) ebenos sp. n. (Figs. 23-25; Pl. II, D)

Holotype.- Female from Baltic amber; coll. Muséum d'Histoire Naturelle, Neuchâtel, MHNN 1135 (Pl. II, D).

Paratype.- Female, same as holotype, MHNN 1144.

Derivatio nominis.- The name of the new species is derived from Greek "ebenos", which means ebony, used as an apposition.

Diagnosis and description.- The smallest *Oligotrichocera* known so far. Body length about 4.0 mm, wing length 4.2 mm (both wings of holotype are strongly folded). First flagellomere of female antenna oval, longer and wider than each of the four following segments. Pleuron bare, without setae. R_{2+3+4} 1.3 times as long as R_{2+3}; M_1 hardly shorter (0.9 times) than M_{1+2}. Cercus of ovipositor blunt at apex and short, only 2.1 times longer than wide.

MALE unknown.

FEMALE: Head dark brown. Eyes seem to be bare. Antenna nearly half as long as entire body, 2.1-2.3 mm long; two basal segments dark brown, flagellum light brown; first flagellomere widened, longer than each of the four following segments, oval; proximal flagellomeres covered with dense hairs; second flagellomere shortest of the five basal segments, third flagellomere hardly shorter than first; fourth and fifth of about the same length, shorter, than third (Fig. 24); all flagellomeres moderately long. Palpus of moderate length, fourth segment longest, bristles comparatively short.

Thorax dark brown. Pleuron bare, without setae. Wing (Fig. 23) comparatively broad, entirely clear, without any dark spots; macrotrichia on veins and on hind fringe rather long; vein *Sc* with scattered bristles dorsally and with only few visible bristles ventrally; R_{2+3+4} 1.3 times as long as R_{2+3}; *r-m* slightly curved; discal cell rather long and narrow, more than twice as long as broad; *m-cu* placed slightly proximal to level of cross-vein *m* in holotype, slightly beyond this level in paratype; A_2 short and curved; anal angle rather prominent. Coxae, trochanters and legs brown. Femur I: 1.7 mm long, II: 1.6-1.8 mm, III: 1.8-1.9 mm; tibia I: 2.1 mm, II: 2.1-2.2 mm, III: 2.3-2.5 mm, tarsus I: 1.5 mm, II: 1.9-2.3 mm, III: 2.0-2.4 mm long; compared length of tarsal segments of hind legs (from first to fifth): 1: 1/2: 3/10: 2/11:1/9. Tibial spurs simple, of the same length as tibial diameter. Halter light brown throughout, 0.7 mm long.

Abdomen light brown, covered with scarce short yellowish hairs. Posterior segments dark brown. Cercus of ovipositor blunt at apex, short, only 2.1 times longer than wide (Fig. 25).

Discussion.- *Trichocera ebenos* sp. n. has a unique set of measurable features. The main differences are observed in wing venation, comparative length of basal flagellomeres and comparative length of hind tarsomeres. According to these features (especially comparative length of *R* branches) *T. ebenos* sp. n. lies between *T. bona* sp. n. and other *Oligotrichocera*. It is much smaller than *T. bona* sp. n.; cell m_1 (length of vein M_1 was used for calculation) of *T. ebenos* sp. n., when compared with its stem, is shortest among all *Oligotrichocera*. Shape of ovipositor of *T. ebenos* sp. n. is totally different from that of the only previously described female of *Oligotrichocera* - *T. primaeva* Dahl, and resembles much that of recent *T. (Metatrichocera) lutea* Becher and *T. (Trichocera) japonica* Matsumura. One of the most distinctive features - thickened first flagellomere - is unique among all *Oligotrichocera*. *T. ebenos* sp. n. resembles also *T. anbar* sp. n., described in this paper. Both species are characterized by comparatively short and wide ovipositor. They could be separated by wing venation, especially by length of veins R_{2+3+4} and R_{2+3} (R_{2+3+4} is shorter than R_{2+3} in *T. anbar* sp. n. and longer in *T. ebenos* sp. n.) and shape of cercus (cercus is shorter with slightly rounded dorsal margin in *T. ebenos* sp. n. and angled in *T. anbar* sp. n.).

The amber piece MHNN 1135 (holotype) also contains remains of a spider and of another nematoceran fly, and setae of *Quercus*, which are very common in Baltic amber. The amber piece MHNN 1144 (paratype) also contains one Collembola and antenna of another insect.

GENERAL REMARKS

Trichoceridae, the Winter crane flies, are very rare in the Eocene Baltic amber. Tens of thousands of amber pieces with inclusions and thousands of amber pieces with crane flies (Diptera: Limoniidae, Tipulidae, Pediciidae) were checked by the author resulting in only 19 specimens of winters flies to be found. In crane flies, males are usually more abundant in resin.

This is due to their behaviour of flying in mating swarms (Limoniidae) or actively searching for the females (Tipulidae), resulting in males being more often entrapped. Males of winter flies may also form huge mating swarms during the colder seasons of the year, however they are not more frequently encountered in resin than females (sex ratio of all known specimens of Trichoceridae in Baltic amber is 8:9). This would indicate that specimens of winter crane flies were not entrapped while swarming but rather when searching for shelter. This may be due to the fact that mating swarms of Trichoceridae took place in more open spaces rather than under the shelter of trees, like in other crane flies for which it is rather usual to find several males of the same species (and even sometimes tens of them) in the same, even small, amber piece. This is usually regarded as due to the fact that males of these species were swarming under the trees among branches and were thus more easily entrapped in resin.

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Plate I. *Trichocera (Oligotrichocera) anbar* sp. n.: male holotype (MHNN 1176).

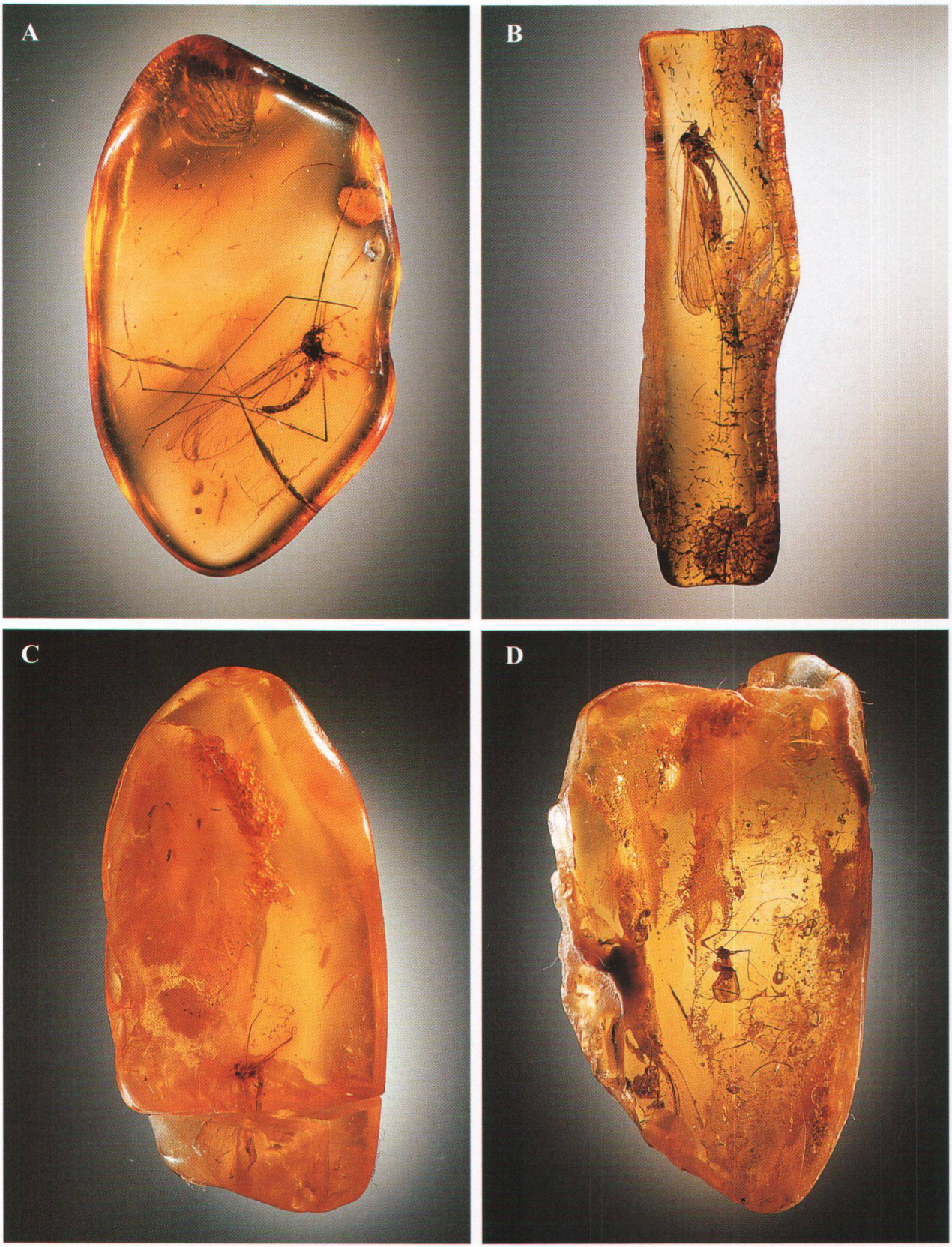

Plate II. **A**. *Trichocera (Oligotrichocera) bona* sp. n.: male holotype (MHNN 1175); - **B**. *Trichocera (O.) cerea* sp. n.: male holotype (MHNN 1185); - **C**. *Trichocera (O.) diluta* sp. n.: male holotype (MHNN 1174); - **D**. *Trichocera (O.) ebenos* sp. n., female holotype (MHNN 1135).