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Subfamily Limoniinae SPEISER, 1909 (Diptera, Limoniidae) from Baltic amber (Eocene): the genus *Trichoneura* LOEW, 1850

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Abstract. A review of the genus *Trichoneura* LOEW, 1850 of the subfamily Limoniinae (Diptera, Limoniidae) from Baltic amber is presented with three existing species: *Trichoneura* (*Trichoneura*) *gracilistylus* ALEXANDER, 1931 (five new specimens), *Trichoneura* (*Trichoneura*) *ritzkowskii* KRZEMIŃSKI, 1990 (two new specimens), *Trichoneura* (*Trichoneura*) *vulgaris* LOEW, 1850 (ten new specimens) are included. The description of a female of *T.* (*T.*) *gracilistylus* is given. One new species is described – *Trichoneura* (*Trichoneura*) *wegiereki* n. sp. The key to species of the genus *Trichoneura* from Baltic amber is provided.

Key words: Diptera, Limoniidae, Limoniinae, *Trichoneura*, Baltic amber, Eocene, new species, evolution.

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I. INTRODUCTION

The genus *Trichoneura* (Diptera: Limoniidae) established by LOEW (1850) comprises 10 extant species representing three subgenera: a monotypic *Trichoneura* (*Ceratolimnobia*) ALEXANDER, 1920, the also monotypic *Trichoneura* (*Trichoneura*) LOEW, 1850, and *Trichoneura* (*Xipholimnobia*) ALEXANDER, 1921 comprising eight species. The genus is known mainly from the Oriental region (six species). In the Afrotropical region three species are known, while from Australia and Oceania only one species is reported (OOSTERBROEK 2015). Four fossil species are known, one described from Upper Cretaceous amber from Canada – *Trichoneura* (*Trichoneura*) *canadensis* KRZEMIŃSKI & TESKEY, 1987 – and three from the Eocene Baltic amber (EVENHUIS 2014). Interestingly, all fossils belong to the nominative subgenus, which is represented in modern fauna only by one species from Indonesia (Iryan Jaya). The inclusions of *Trichoneura* in Baltic amber appear to be fairly frequent. New discoveries of fossil material enable me to make additional descriptions of three of them – *Trichoneura* (*Trichoneura*) *gracilistylus* ALEXANDER, 1931, *Trichoneura* (*Trichoneura*) *ritzkowskii* KRZEMIŃSKI, 1990, *Trichoneura* (*Trichoneura*) *vulgaris* LOEW, 1850 – and the description of a new species, the fifth fossil representative of this genus and fourth known from Baltic amber.

II. MATERIAL AND METHODS

The present study is based on material from the collections of the following institutions: Institute of Systematics and Evolution of Animals, Polish Academy of Sciences (ISEA PAS) (17 specimens); Museum of the Earth, Polish Academy of Sciences, Warsaw (MEPAS) (two specimens); University of Göttingen (GMUG) (two specimens); Natural History Museum, Humboldt University, Berlin (NHMB) (one specimen), Coll. G. C. BERENDT (one specimen) (NHMB), and Coll. G. KÜNOW (two specimens) (NHMB).

The wing venation nomenclature is after KRZEMIŃSKI & KRZEMIŃSKA (2003). The specimens were studied using a Nikon SMZ 1500 stereomicroscope equipped with a Nikon DS-Fi1 camera. The drawings were produced on the basis of specimen and photographs. The measurements were taken with NIS-Elements D 3.0 software.

Chresonymy given according to open nomenclature rules proposed by MATTHEWS (1973) and BENGSTON (1988) for names of fossil taxa.

III. SYSTEMATIC PALAEONTOLOGY

Order: **Diptera** LINNAEUS, 1758

Family: **Limoniidae** SPEISER, 1909

Subfamily: **Limoniinae** SPEISER, 1909

Genus: ***Trichoneura*** LOEW, 1850

Type-species*: Trichoneura vulgaris* LOEW, 1850, by monotypy.

1869 *Trichoneura* LOEW: 37, 36.

1845 *Trichoneura* BERENDT: 57, *nomen nudum*.

1847 *Trichoneura* BRONN: 597, *nomen nudum*.

1869 *Trichoneura* OSTEN SACKEN: 193, 15.

1894 *Sackeniella* MEUNIER: clxxviii (178) [1895: clxxviii (178)].

Type-species. *Trichoneura vulgaris* LOEW, 1850, by subsequent monotypy in SPEISER (1900: 317).

1894 *Sackaniella*: MEUNIER: incorrect original spelling of *Sackeniella* {MEUNIER: clxxviii [178] (1895: clxxviii)}.

1894 *Trichoneura* SCUDDER: 165, 183, 217, 218.

1900 *Sackeniella* MEUNIER, 1894: SPEISER: 317.

1907 *Limnophila* HANDLIRSCH: 996.

1931 *Trichoneura* ALEXANDER: 54.

1992 *Trichoneura* CARPENTER: 404.

1994 *Trichoneura* EVENHUIS: 88.

Subgenus ***Trichoneura*** LOEW, 1850

Type-species*: Trichoneura vulgaris* LOEW, 1850, by monotypy.

Key to species of the genus *Trichoneura* LOEW, 1850 known from Baltic amber

1. Vein Sc short, ending opposite 3/4 of Rs (Fig. 1); male genitalia: interbase curved at a 90° angle (Fig. 8C) . . . . . *Trichoneura* (*T.*) *wegiereki* n. sp.

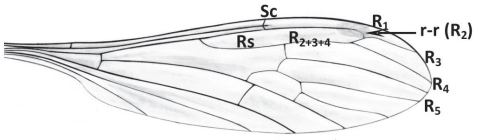

Fig. 1. *Trichoneura wegiereki*

– Vein Sc elongated, ending opposite 6/7 of Rs or at fork of Rs; interbase rather straight or slightly arche . . . . . (2).

2. Cross-vein m-cu near the middle of d-cell basal part, vein R_3 longer than R_{2+3+4} (Fig. 2); outer gonostylus straight, with tip not much wider than the base; inner gonostylus bent in the middle at an angle of almost 45°; aedeagus big and thick, not much shorter than the gonocoxite (Fig. 5D) . . . . . *Trichoneura* (*T.*) *gracilistylus*

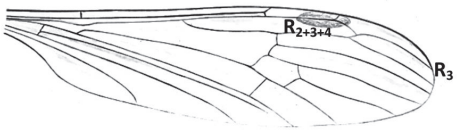

Fig. 2. *Trichoneura gracilistylus* ALEXANDER, 1931 (redrawing after KRZEMIŃSKI 1990, changed)

– Cross-vein m-cu before midlength of d-cell basal part; vein R_3 shorter than or almost equal R_{2+3+4} (Figs 3, 4); outer gonostylus with tip conspicuously widened or narrowed; inner gonostylus only slightly bent; aedeagus distinctly shorter than gonocoxit . . . . (3).

3. Vein Sc before fork of Rs; R_3 distinctly shorter than R_{2+3+4}; vein R_2 positioned between R_1 and the fork of R_{2+3+4} (Fig. 3); outer gonostylus with strongly widened tip and spine curved inwardly, inner gonostylus in its 1/3 length is conspicuously widened and in 2/3 strongly narrowed; aedeagus small about half as long as gonocoxite; ninth tergite broadly excised with the depression in the middle (Fig. 7C) . . . . . *Trichoneura* (*T.*) *vulgaris*

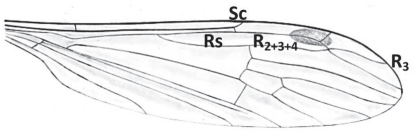

Fig. 3. *Trichoneura vulgaris* LOEW, 1850 (redrawing after KRZEMIŃSKI 1990, changed)

– Vein Sc long, opposite fork of Rs; vein R_3 almost equal or only slightly shorter than R_{2+3+4}; vein R_2 between R_1 and R_3 (Fig. 4); outer gonostylus short, with very broad base, its outer half strongly narrowed, tip blunt, spineless; inner gonostylus narrowing from 1/3 its length; aedeagus somewhat longer than the half of gonocoxite; ninth tergite with distinctly cut depression in the middle (Fig. 6C) . . . . . *Trichoneura* (*T.*) *ritzkowskii*

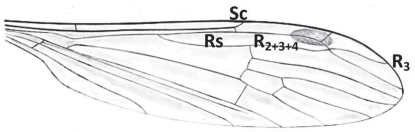

Fig. 4. *Trichoneura ritzkowskii* KRZEMIŃSKI 1990 (redrawing after KRZEMIŃSKI 1990, changed)

Trichoneura (*Trichoneura*) *gracilistylus* ALEXANDER, 1931

(Figs 5A-E; 9A-C)

* 1931 *Trichoneura gracilistylus* ALEXANDER: 57, figs. 65, 67.

1982 *Trichoneura gracilistylus* ALEXANDER in: KEILBACH: 320.

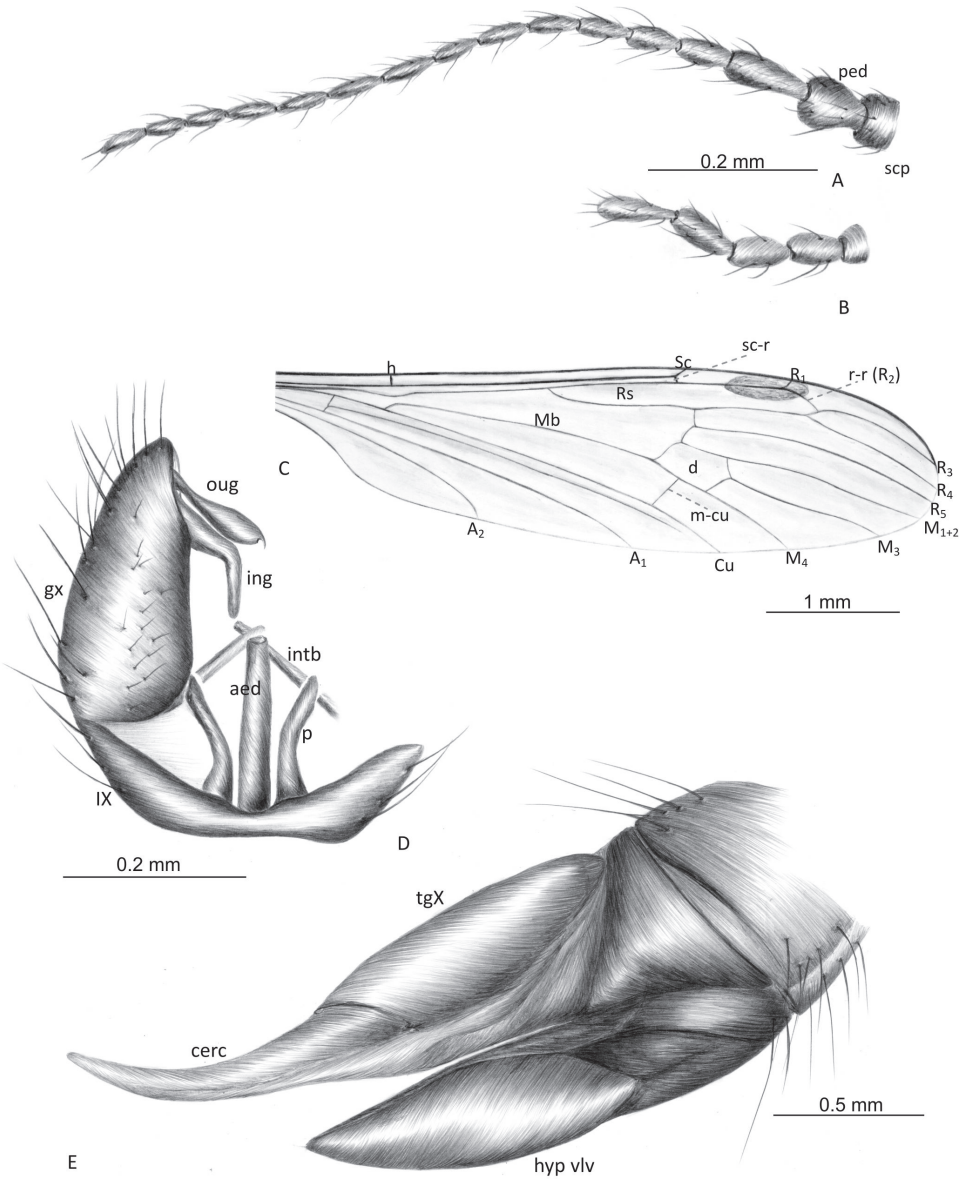

Fig. 5. *Trichoneura* (*Trichoneura*) *gracilistylus* ALEXANDER, 1931: A – antenna; B – palpus; C – wing venation; D – male genitalia, ventral view; E – ovipositor (Figs A, B, C after KRZEMIŃSKI 1990, redrawn). Abbreviations: aed – aedeagus; cerc – cerci; gx – gonocoxite; hyp vlv – hypogynal valvae; ing – inner gonostylus; intb – interbase; oug – outer gonostylus; p – paramere; ped – pedicel; scp – scapus; IX – sternite IX; tg X – tergite X.

1982 '*Trichoneura longicornis* LOEW, 1850: 37' in: KEILBACH: 320, *nomen nudum*.

1990 *Trichoneura* (*Trichoneura*) *gracilistylus* ALEXANDER in: KRZEMIŃSKI: 188, figs. 14-17.

1994 '*Trichoneura longicornis* LOEW, 1850: 37' in: KEILBACH 1982: 320, *nomen nudum* in: EVENHUIS: 88.

R e m a r k s. The taxon name *Trichoneura longicornis* is not mentioned in LOEW (1850), neither on p. 37 nor in others. The name, treated as a valid taxon attributed to LOEW, first appeared in KEILBACH's (1982) catalogue, with a note about two specimens from the BERENDT collection representing this species. EVENHUIS (1994: 88) treated this name as *nomen nudum* and (probably) synonymic to *Trichoneura gracilistylus* LOEW, 1850.

E m e n d e d d i a g n o s i s. Cross-vein m-cu near the middle of d-cell basal part; vein R_3 longer than R_{2+3+4}; outer gonostylus straight, with tip not much wider than the base, and provided with straight spine; inner gonostylus bent in the middle at an angle of almost 45°; aedeagus big and thick, not much shorter than the gonocoxite. The ninth tergite with wide medial depression.

(The part of diagnosis concerning male genitalia is based on that of KRZEMIŃSKI (1990)).

M a t e r i a l e x a m i n e d. Holotype: No. 25 (male) Coll. KLEBS (GMUG). Additional material: No. 250 (male) Coll. KÜNOW (NHMB); No. MP/3369 (female); No. MP/3429 (male); No. MP/3430 (male); No. MP/3431 (male); No. MP/3438 (male) (ISEA PAS).

A d d i t i o n a l d e s c r i p t i o n. Female: body 7.19 mm long.

Head: dark brown, antenna 16-segmented, morphology like in male (Figs 5A, 9A, B), the length of female antenna 1.12 mm; palpus 4-segmented, the last palpal segment slightly longer than penultimate one like in male (Fig. 5B), the length of female palpus 0.35 mm.

Thorax: dark brown, legs pale brown, wing (Fig. 5C) 4.93 long, 1.34 wide cross-vein m-cu at midlength of d-cell basal part, vein M_3 twice as long as d-cell, in male M_3 is longer.

Abdomen: female genitalia, ovipositor (Fig. 5E) 1.00 mm long, curved dorsally, tergite X large, cerci narrow, almost equal in length.

Trichoneura* (*Trichoneura*) *ritzkowskii KRZEMIŃSKI, 1990

(Figs 6A-D; 10A-C)

1850 *Trichoneura vulgaris* LOEW: 37.

1931 *Trichoneura vulgaris* LOEW in: ALEXANDER: 56 (pars) [sp. No. K 5602 (Z16)]

* 1990 *Trichoneura* (*Trichoneura*) *ritzkowskii* KRZEMIŃSKI: 189, figs. 24-27.

1990 *Trichoneura vulgaris* LOEW in: KRZEMIŃSKI: 189 (pars)

1994 EVENHUIS: 88.

R e m a r k s. The specimen No. K5602 (Z16) Coll. KLEBS was previously classified by LOEW (1850) and then by ALEXANDER (1931) as *T.* (*T.*) *vulgaris*. But in 1990 KRZEMIŃSKI decided to designate this specimen as a holotype of a new species *T.* (*T.*) *ritzkowskii*.

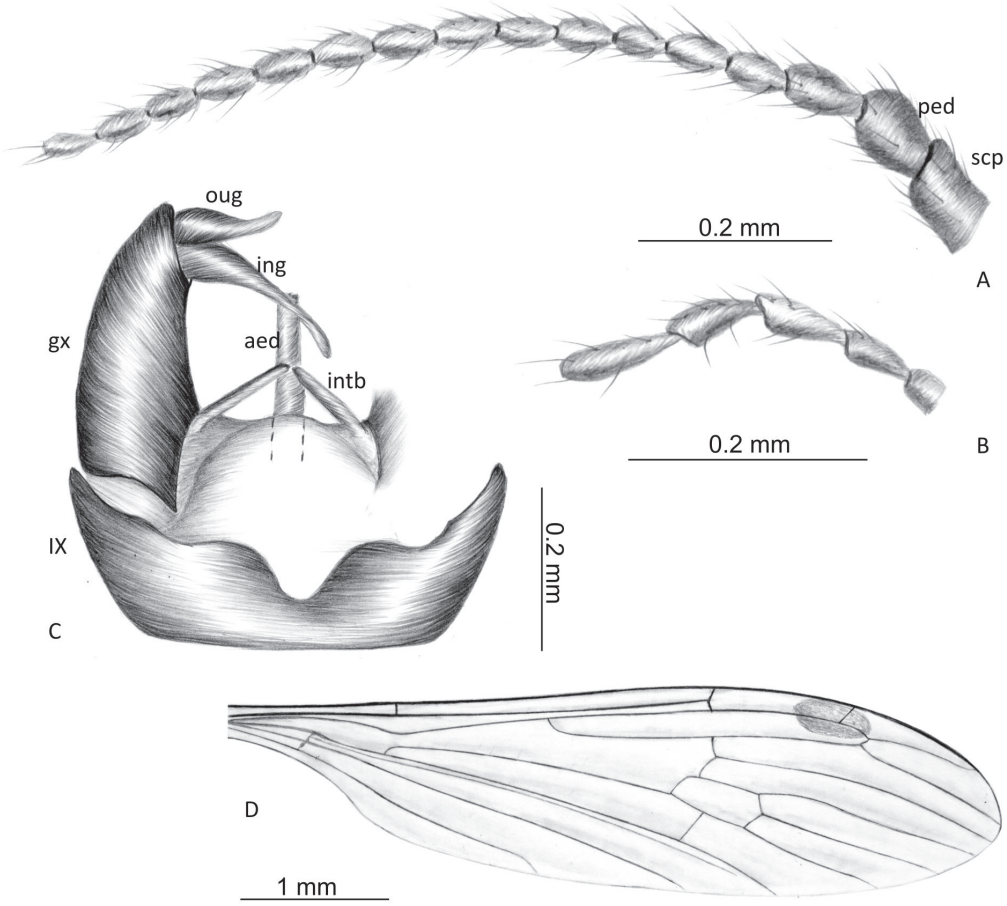

Fig. 6. *Trichoneura* (*Trichoneura*) *ritzkowskii* KRZEMIŃSKI, 1990; A – antenna; B – palpus; C – male genitalia, dorsal view; D – wing venation (Figs A, B, C, D after KRZEMIŃSKI 1990, redrawn). Abbreviations: IX – tergite IX; other as in Fig. 5.

D i a g n o s i s e m e n d e d. In *T.* (*T.*) *ritzkowskii* vein Sc is elongated, ending opposite the bifurcation of vein Rs, R_3 almost equal R_{2+3+4}. Outer gonostylus short, with very broad base, its outer half strongly narrowed, tip blunt, spineless; inner gonostylus narrowing from 1/3 its length; ninth tergite with a deep, V-shaped, medial depression.

(The part of diagnosis concerning male genitalia is based on KRZEMIŃSKI (1990)).

M a t e r i a l e x a m i n e d. Holotype: No. K5602 (Z16) Coll. KLEBS (GMUG). Paratype: MB.J. No. 242 (male) Coll. KÜNOW (NHMB). Additional material: No. 503/01 (male); MP/3420 (ISEA PAS).

Trichoneura* (*Trichoneura*) *vulgaris LOEW, 1850

(Figs 7 A-E; 11 A-C; 12A)

* 1850 *Trichoneura vulgaris:* LOEW: 37.

1856 *Trichoneura vulgaris*: GIEBEL: 246.

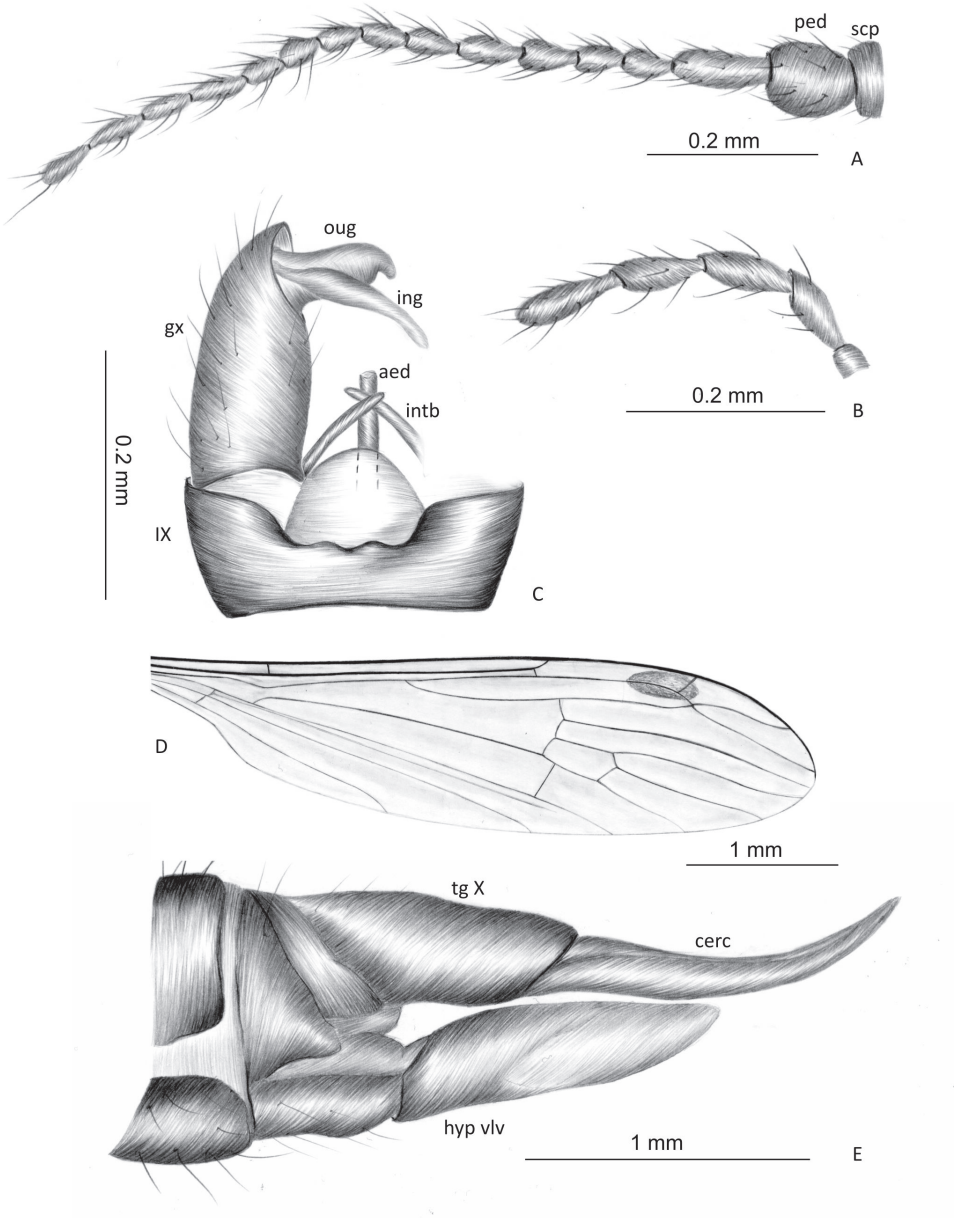

Fig. 7. *Trichoneura* (*Trichoneura*) *vulgaris* LOEW, 1850: A – antenna; B – palpus; C – male genitalia, dorsal view; D – wing venation; E – ovipositor (Figs A, B, C, D, E after KRZEMIŃSKI 1990, redrawn); Abbreviations: as in Figs 5, 6.

1894 *Trichoneura vulgaris* LOEW, *Limnophila:* SCUDDER: 181.

1900 *Trichoneura vulgaris* LOEW: SPEISER: 317.

1906 *Trichoneura* (*Sackeniella*) *vulgaris* LOEW (MEUN.): MEUNIER: 386, Pl. XIV, fig. 13-14; Pl. XV, fig. 4, var.

1906 *Trichoneura* (*Sackeniella*) *decipiens:* MEUNIER: 387, Pl. XV, fig. 5.

1907 *Limnophila vulgaris* LÖW: HANDLIRSCH: 996.

1916 *Trichoneura* (*Sackeniella*) *vulgaris* LOEW (MEUN.): MEUNIER: 492, fig. 35.

1916 *Trichoneura* (*Sackeniella*) *vulgaris* var. *prolifica*: MEUNIER: 492, fig. 36.

1982 *Trichoneura vulgaris* (LOEW, 1850): KEILBACH: 320.

1990 *Trichoneura* (*Trichoneura*) *vulgaris* LOEW, 1850: KRZEMIŃSKI: 188., figs. 19-23.

1992 *Trichoneura vulgaris*: CARPENTER: 404.

1994 *Trichoneura (Trichoneura) vulgaris* LOEW, 1850: EVENHUIS: 88.

Emended diagnosis. The vein R_2 is positioned between R_1 and the fork of R_{2+3+4}; outer gonostylus with strongly widened tip and spine curved inwardly, inner gonostylus in its 1/3 length conspicuously widened and in 2/3 strongly narrowed; aedeagus small about twice shorter than gonocoxite; ninth tergite with a subrectangular depression and an additional small excision in the middle; outer gonostylus with strongly widened tip and spine curved inwardly, inner gonostylus in its 1/3 length is conspicuously widened and in 2/3 strongly narrowed; aedeagus small about twice shorter than gonocoxite.

(The part of diagnosis concerning male genitalia is based on KRZEMIŃSKI (1990)).

Material examined. Holotype: No. MB.J 350 Coll. BERENDT (male) (NHMB). Additional material: No. MB.J 327 (male) (NHMB); No. 63/54 (male) and No. 41/73 (male) (ME PAS); No. MP/3350 (male), No. 3368 (three specimens; males), No. 3370 (male), No. 3371 (male), No. MP/3374 (male), No. MP/3420 (male), No. 3422 (male), No. MP/3419 (male) and No. MP/3423 (male) (ISEA PAS).

Trichoneura* (*Trichoneura*) *wegiereki sp. nov.

(Figs 8 A-D; 13 A-B; 14 A-D)

Diagnosis. Vein Sc short, ending opposite 3/4 of Rs; cross-vein m-cu just behind fork of Mb; interbase curved at 90º right angle; outer gonostylus distinctly broad at the end with small tiny spine at apex; inner gonostylus rather narrow, elongated, bent in the middle at an angle almost 45°; aedeagus approximately half the length of gonocoxite; the hind edge of the ninth tergite almost straight with a shallow, wide depression.

Etymology. The species name is dedicated to Prof. Piotr WĘGIEREK, the eminent specialist of the Hemiptera.

Material examined. Holotype: No. MP/3447 (male) (ISEA PAS).

Description. Body (Fig. 13A): brown, 2.45 mm long.

Head (Fig. 13B): antenna (Figs 8A, 14A) short, 0.76 mm long, 16-segmented; scape cylindrical, elongated, pedicel wide, barrel-like; flagellomeres cylindrical, first flagellomere elongated, twice as long as the next one, tapered at the base; each flagellomere with three long setae slightly shorter than segments bearing them. The last flagellomere short, shorter than the penultimate one. Palpus (Fig. 8B): 4-segmented, segments are of equal length.

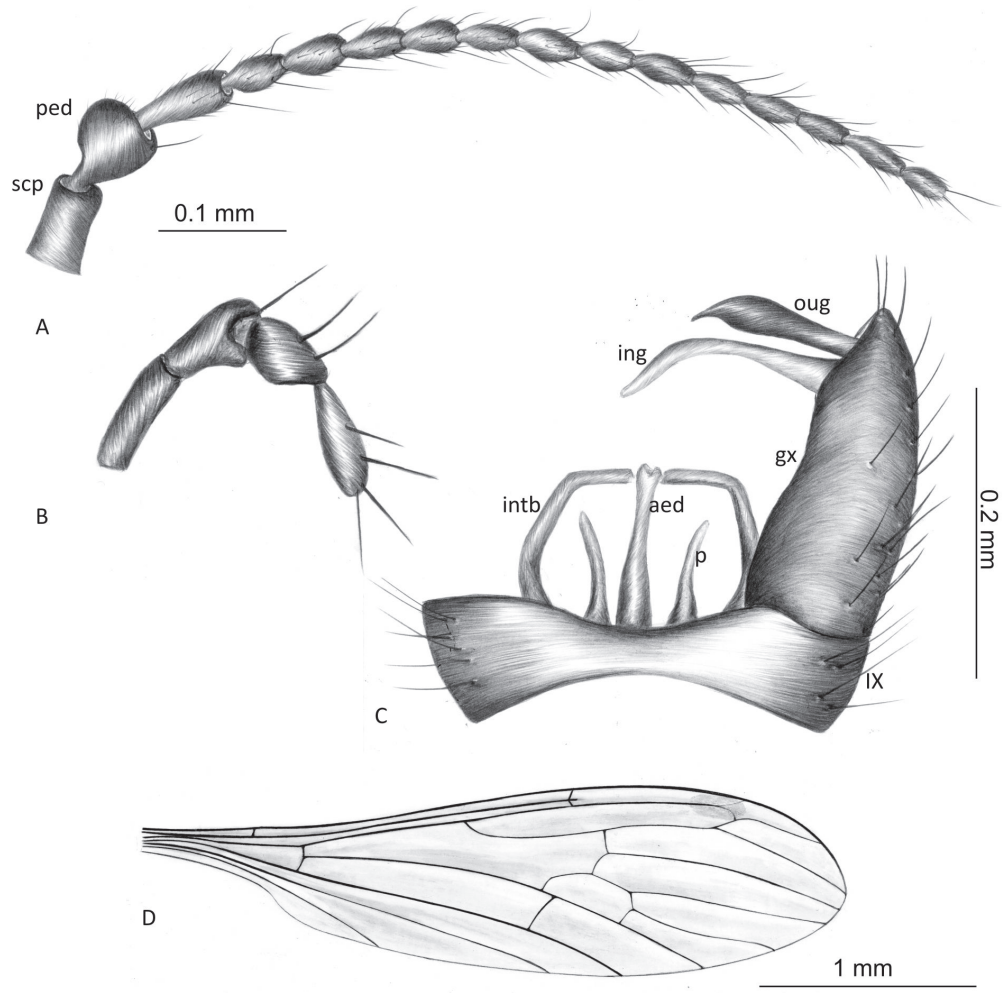

Fig. 8. *Trichoneura wegiereki* sp. nov., No. MP/3447 holotype (male); A – antenna; B – palpus; C – male genitalia, dorsal view; D – wing venation. Abbreviation: as in Figs 5, 6.

Thorax: brown; legs pale brown with darker distal part of femurs and tibiae. Wing (Fig. 8D, 14C, D) 3.49 mm long, 0.96 wide; pterostigma present, oval; vein Sc short, ending opposite 3/4 of Rs; sc-r short one its distance before the end of Sc; vein Rs slightly arcuated; R_2 between R_1 and R_3; r-r (R_2) well developed; vein R_1 with the terminal section well developed; vein R_3 slightly shorter than R_{2+3+4}; cross-vein m-cu just behind fork of Mb; A_1 and A_2 are rather straight.

Male genitalia: hypopygium (Figs 8C, 14B) 0.32 mm long; interbase curved at 90º right angle; outer gonostylus distinctly widened at the end with small spine at apex; inner gonostylus is rather narrow, elongated, bent in the middle at an angle almost 45°; aedeagus approximately half the length of gonocoxite; the hind edge of the ninth tergite almost straight with a shallow but wide depression medially.

IV. SPECIES OF *TRICHONEURA* FROM BALTIC AMBER: A COMPARISON

V e n a t i o n. The cross-vein m-cu in *T.* (*T.*) *gracilistylus* (Figs 5C, 9A) is positioned near the midlength of the d-cell basal part, in contrast to other congeners from Baltic amber. In *T.* (*T.*) *ritzkowskii* this vein is situated just before the midlength of the d-cell basal part (Figs 6D, 10A), in other species it occurs distinctly before the midlength of the d-cell basal part just behind the bifurcation fork of Mb.

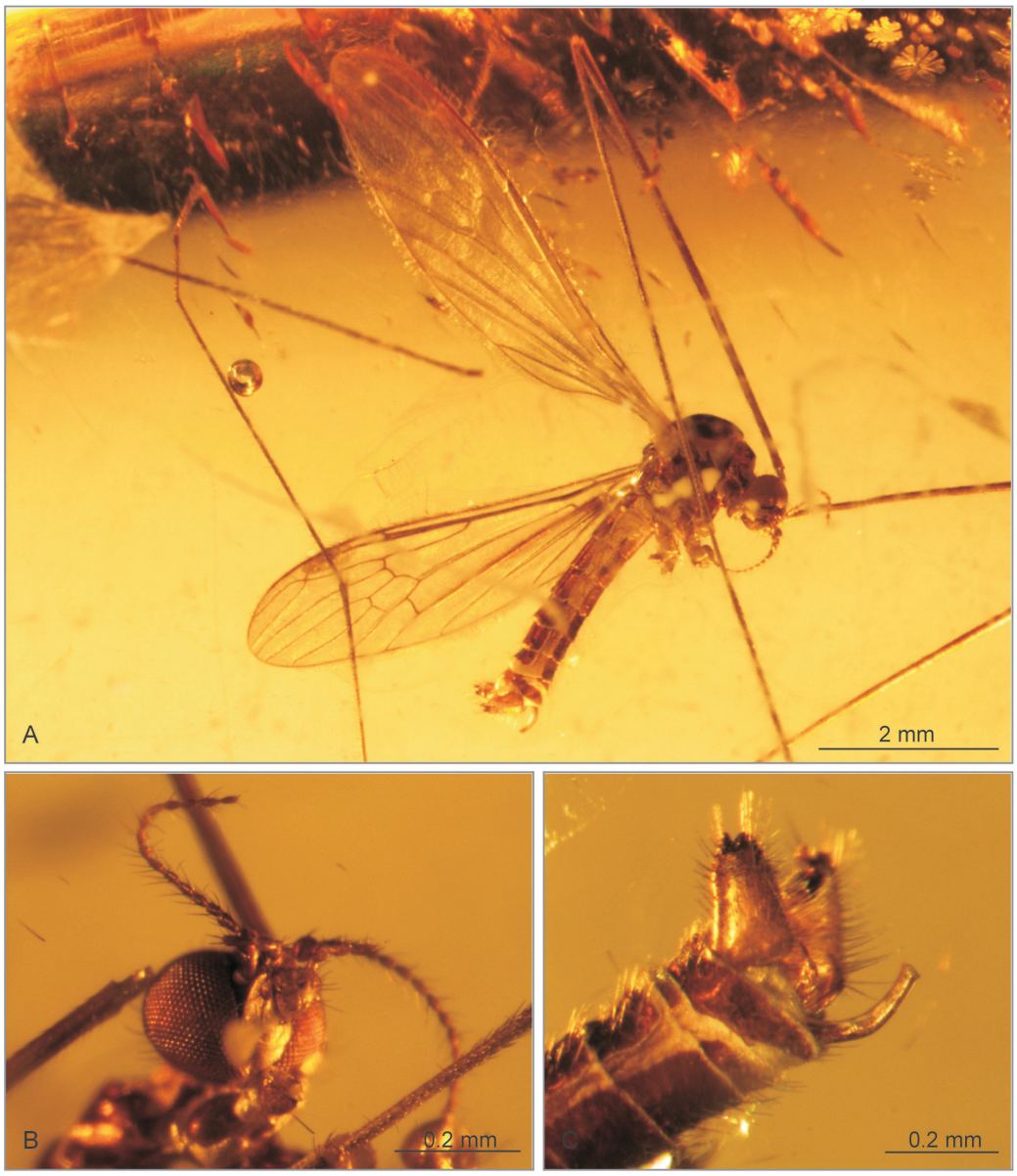

Fig. 9. *Trichoneura gracilistylus* ALEXANDER, 1931, No. MP/3430 (male); A – the body, lateral view; B – head; C – male genitalia.

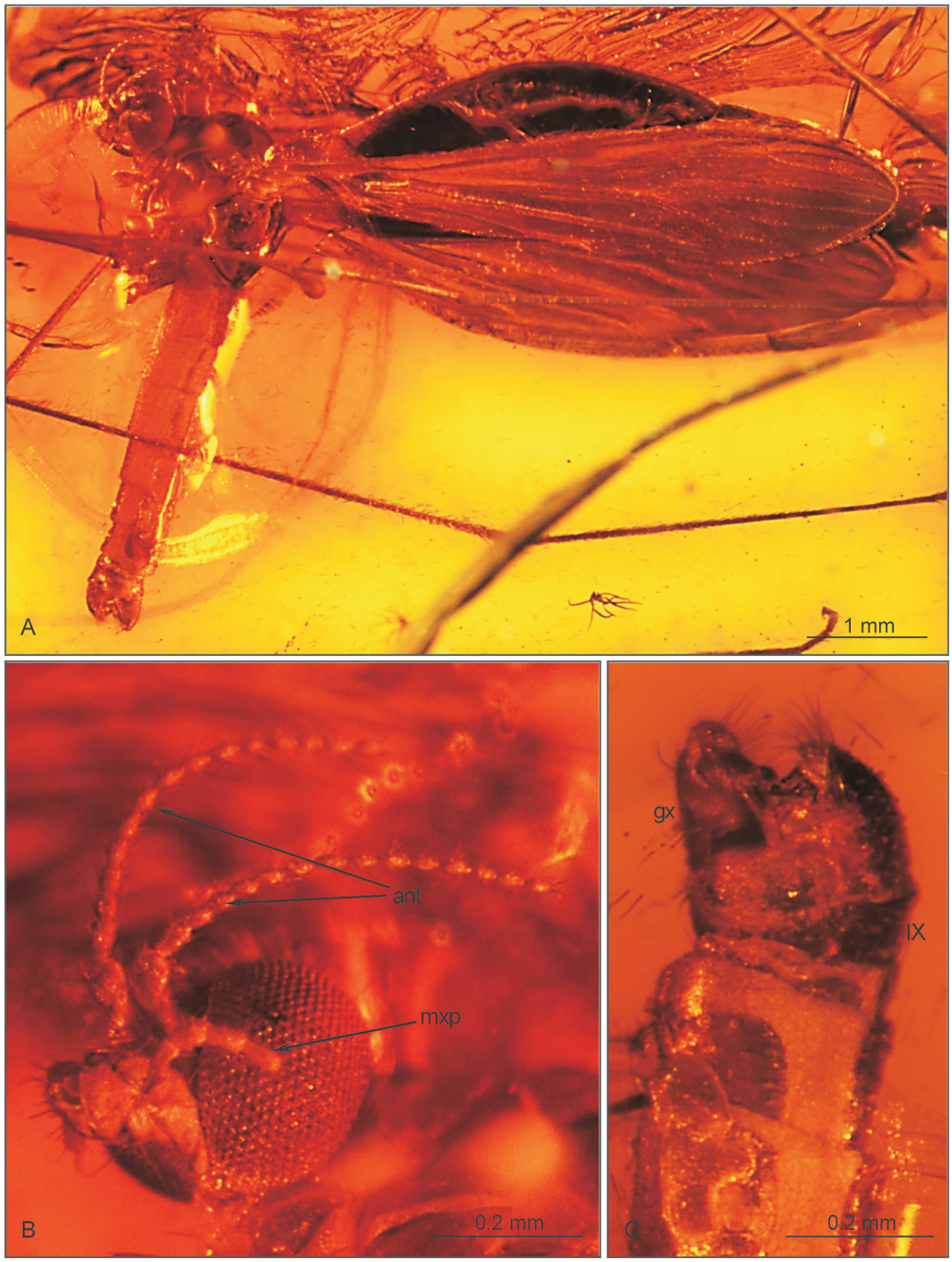

Fig. 10. *Trichoneura* (*Trichoneura*) *ritzkowskii* KRZEMIŃSKI, 1990, No. MB.J 242 paratype (male); A – the body, latero-dorsal view; B – head; C – hypopygium. Abbreviations: ant – antennae, gx – gonocoxite, mxp – maxillary palp, IX – tergite IX.

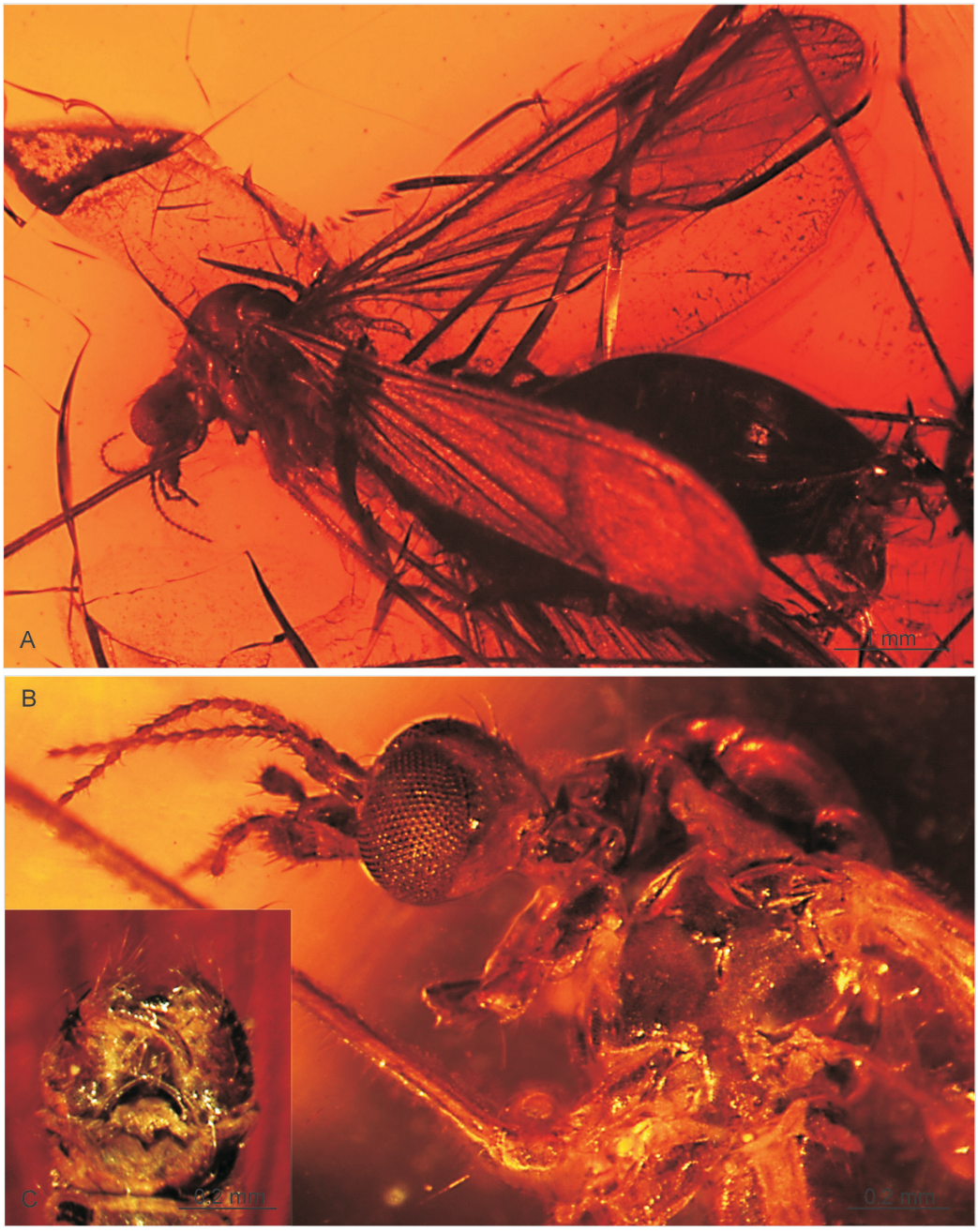

Fig. 11. *Trichoneura* (*Trichoneura*) *vulgaris* LOEW, 1850, A – No. MB.J 327 (NHMB), (male), the body, latero-dorsal view; B – No. 41/73 (ME PAS), (male), thorax and head, lateral view; C – No. MP/3350 (ISEA PAS), hypopygium, ventral view.

In *T.* (*T.*) *gracilistylus* the vein R_3 is longer than vein R_{2+3+4}, in *T.* (*T.*) *vulgaris* and in *T.* (*T.*) *wegiereki* n. sp. R_3 is shorter than R_{2+3+4}, in *T.* (*T.*) *ritzkowskii* it is almost equal or only slightly shorter than R_{2+3+4} (Fig. 6D).

The vein Sc terminates before the fork of Rs in *T.* (*T.*) *gracilistylus* and in *T.* (*T.*) *vulgaris* (opposite 6/7 of Rs), unlike *T. ritzkowskii* where the tip of Sc is opposite fork of Rs. In *T.* (*T.*) *wegiereki* n. sp. vein Sc is short, ending opposite 3/4 of Rs.

The vein R_2 in *T.* (*T.*) *vulgaris* (Fig. 7D, 11A) is positioned between R_1 and the fork of R_{2+3+4}, in contrast to other species where it is between R_1 and R_3.

Male genitalia. In *T.* (*T.*) *vulgaris* the interbase is slightly arched while in *T.* (*T.*) *wegiereki* n. sp. it is curved at a 90º angle and straight in other representatives of this genus from Baltic amber.

The outer gonostylus of *T.* (*T.*) *gracilistylus* is straight, with the tip not much wider than the base (Figs 5D, 9C), like in *T.* (*T.*) *vulgaris* (Fig. 7C, 11C), but provided with a straight spine, not curved inwardly like in *T.* (*T.*) *vulgaris*. In *T.* (*T.*) *ritzkowskii* the outer gonostylus is short, with a very broad base, with its outer half strongly narrowed and a blunt, spineless tip (Fig. 6C, 10C). In *T.* (*T.*) *wegiereki* n. sp. the outer gonostylus is distinctly broad at the end with a small tiny apical spine.

The inner gonostylus in *T.* (*T.*) *gracilistylus* and *T. wegiereki* n. sp. is bent in the middle at an angle of almost 45°, in contrast to *T.* (*T.*) *ritzkowskii* and to *T.* (*T.*) *vulgaris* where it is only slightly bent. In contrast to other species known from Baltic amber the inner gonostylus in *T.* (*T.*) *ritzkowskii* is only narrowing from 1/3 its length. In *T.* (*T.*) *vulgaris* the inner

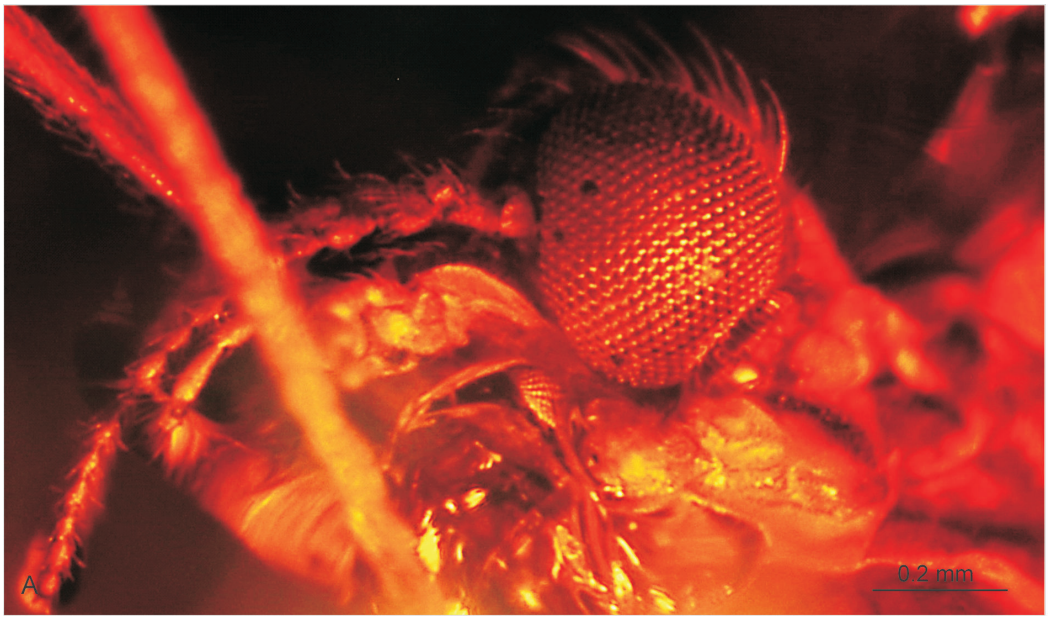

Fig. 12. *Trichoneura* (*Trichoneura*) *vulgaris* LOEW, 1850, No. MB.J 350 holotype (NHMB), (male); A – head; lateral view.

Fig. 13. *Trichoneura wegiereki* n. sp., No. MP/3447 holotype (male); A – the body, lateral view; B – head and thorax, lateral view.

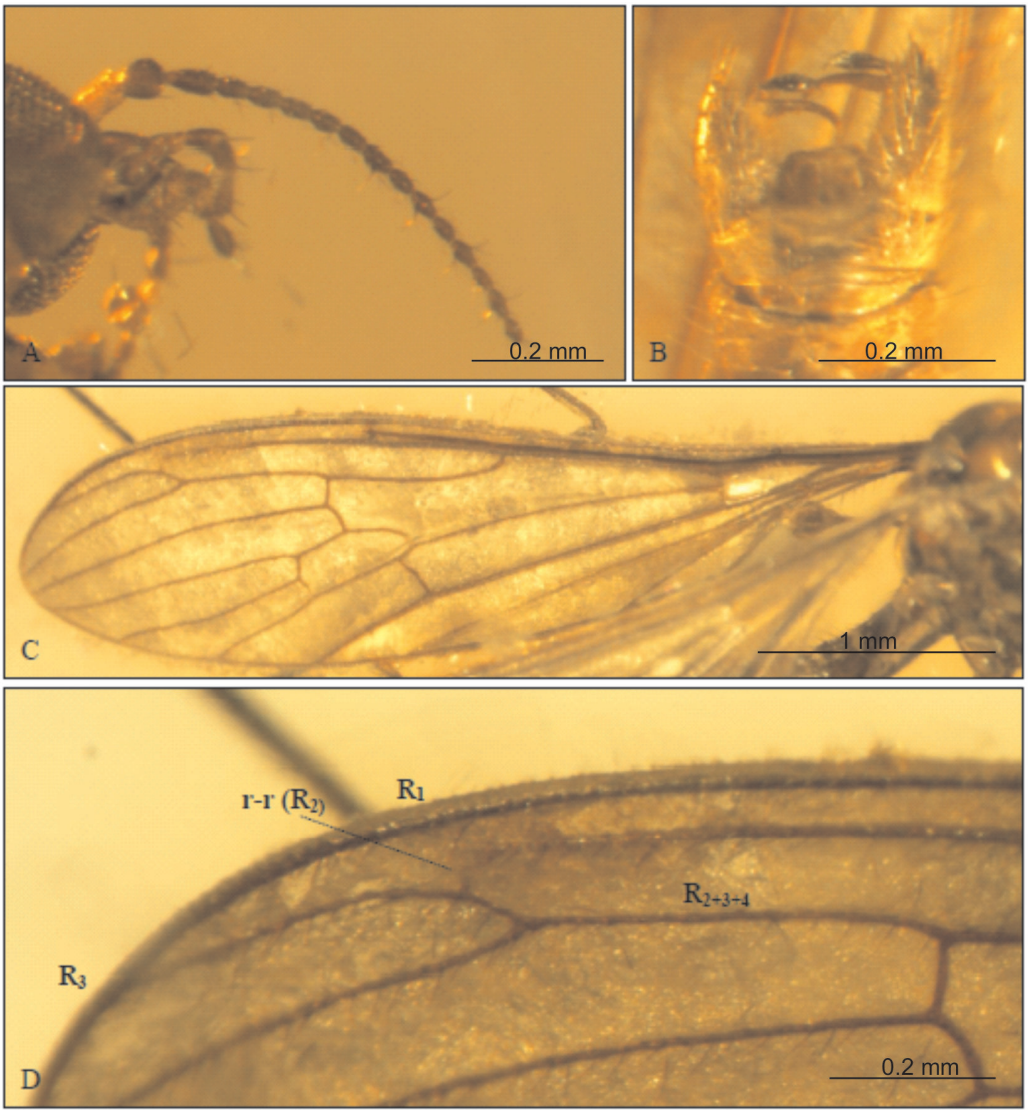

Fig. 14. *Trichoneura wegiereki* n. sp., No. MP/3447 holotype (male); A – antennae, palpi; B – hypopygium; C – wing venation; D – part of wing apex with the end of vein R1 visible.

gonostylus is conspicuously widened in its 1/3, and in 2/3 it is strongly narrowed; in *T.* (*T.*) *wegiereki* n. sp. and *T.* (*T.*) *gracilistylus* the inner gonostylus is rather narrow.

The aedeagus in *T.* (*T.*) *gracilistylus* is big and thick, slightly shorter than the gonocoxite; in *T.* (*T.*) *ritzkowskii* it is somewheat longer than half of the gonocoxite, in *T.* (*T.*) *vulgaris* and in *T.* (*T.*) *wegiereki* n. sp. the aedeagus is small, about half the length of gonocoxite.

The posterior edge of the ninth tergite has in *T.* (*T.*) *ritzkowskii* a V-shaped, deep depression in its middle (Fig. 6C); in *T.* (*T.*) *gracilistylus* the tergite is broadly excised (see KRZEMIŃSKI 1990: fig. 17); in *T.* (*T.*) *vulgaris* the depression is subrectangular, with an

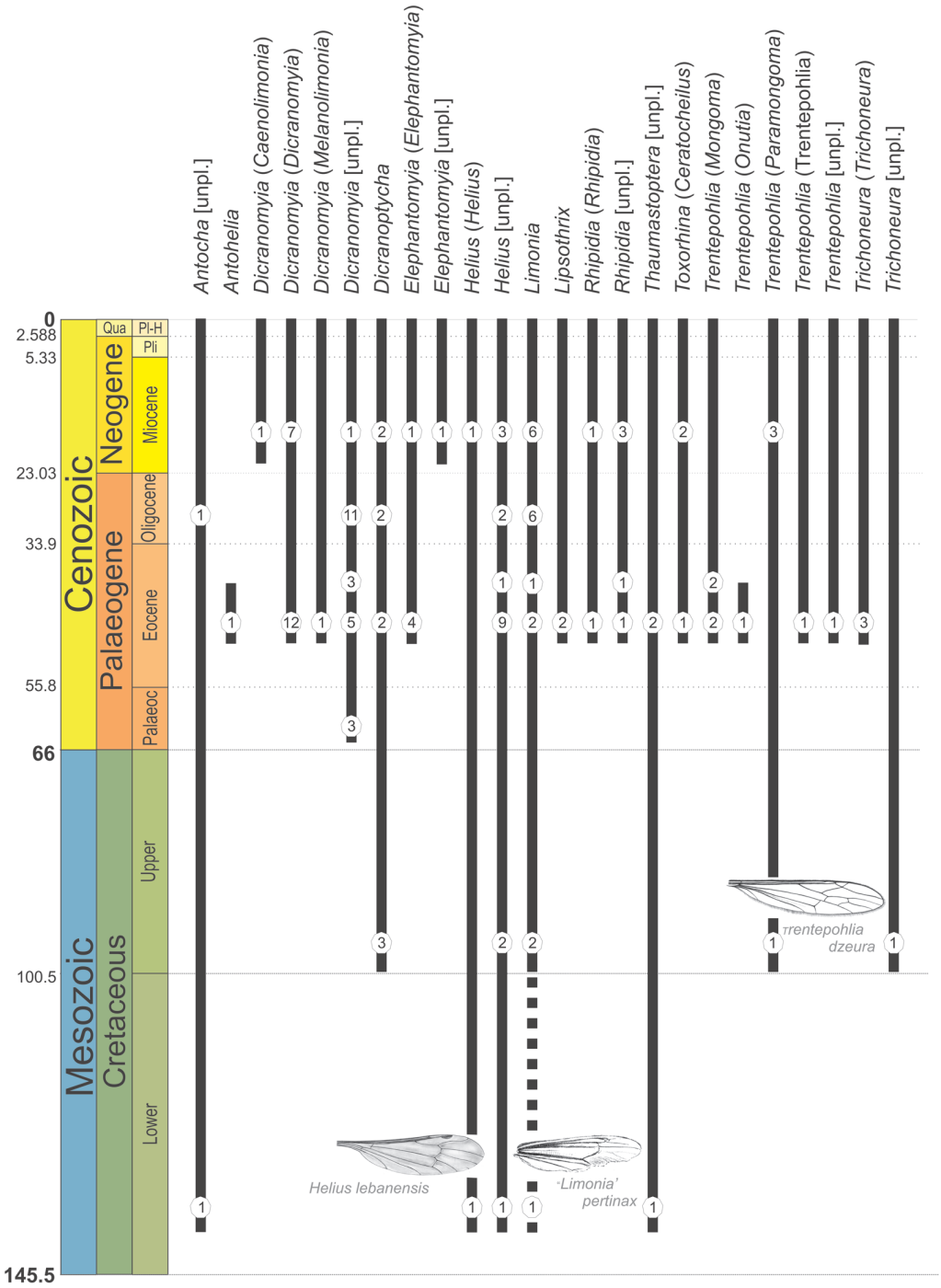

Fig. 15. Chronostratigraphic distribution of Limoniinae, fossil genera and subgenera. In white spots the number of species is given. The symbol [unpl.] means that species unplaced in subgenus. The drawings: *Helius lebanensis* KANIA, KRZEMIŃSKI & AZAR, 2013 after KANIA *et al.* 2013; *Trentepohlia dzeura* PODENAS & POINAR, 2009 after PODENAS & POINAR 2009; '*Limonia pertinax*' (WESTWOOD, 1854) after WESTWOOD, 1854.

additional small medial excision (Fig. 7C). In the new species *T.* (*T.*) *wegiereki* n. sp. the depression is very shallow and wide (Fig. 8C).

V. CONCLUSIONS

The genus *Trichoneura* is rare in the recent fauna, with only 10 known species from different parts of the world, especially from the Oriental Region (OOSTERBROEK 2015). In fossil material it is rather well represented. The most common, easily recognizable and characteristic for the Eocene period are *T.* (*T.*) *vulgaris* and *T.* (*T.*) *gracilistylus* and can even be treated as index fossils. It is surprising that among fossils, and especially in amber, we find mainly the males of these species; the females are much more rare. This phenomenon is possibly related to the male habit of swarming around the trees, observed also among other Diptera with similar effect on the rarity of the females (ex. Trichoceridae; KRZEMIŃSKA *et al.* (1992)).

Chronostratigraphy and distribution of genera and subgenera of Limoniidae is presented in Fig. 15. The oldest representatives of *Trichoneura* are known from one species, *Trichoneura* (*Trichoneura*) *canadensis* KRZEMIŃSKI & TESKEY, 1987, from the Upper Cretaceous Canadian amber (KRZEMIŃSKI & TESKEY 1997). About the same time there appear the first representatives of other genera like *Trentepohlia* with the oldest known representative *Trentepohlia dzeura* PODENAS & POINAR, 2009, and *Dicranoptycha* with the representatives: *Dicranoptycha* (*Dicranoptycha) europaea* ZEUNER, 1941; *Dicranoptycha fragmentata* KRZEMIŃSKI, 2004, and *Dicranoptycha burmitica* KANIA, WANG & SZWEDO, 2015. These fossil occurrences of the genus *Dicranoptycha* are slightly younger than the oldest fossils of related genera, such as *Antocha*, *Helius*, *Limonia* or *Thaumastoptera* from the Early Cretaceous with the oldest representatives of Limoniinae like *Antocha lapra* PODENAS & POINAR, 2009 and *Helius lebanensis* KANIA, KRZEMIŃSKI & AZAR, 2013, *Helius ewa* KRZEMIŃSKI, KANIA & AZAR, 2014, and *Thaumastoptera shinaqi* PODENAS, 2000. These genera probably originated and diversified during the Cretaceous times. All fossil genera of the subfamily Limoniinae are known from the Eocene, comprising 12 genera compared to the 24 known in the recent Limoniinae fauna. Among fossil Limoniidae we can find also the numerous representatives of Chioneinae e.g. *Cheilotrichia duplicata* ALEXANDER, 1931, *Cheilotrichia* (*Empeda*) *weitschati* KOPEĆ & KANIA, 2013, and *Erioptera* (*Erioptera*) *arcuata* ALEXANDER, 1931, Dactylolabinae (*Dactylolabis* (*Aurolabis*) *labis* PODENAS, 2003, *Dactylolabis* (*Dactylolabis*) *viduus* PODENAS, 2005, and *Dactylolabis* (*Eobotrophorus*) *hoffeinsorum* KRZEMIŃSKI, KANIA & KRZEMIŃSKA, 2010) and Limonophilinae (*Hexatoma minuta* ALEXANDER, 1931).

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