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## ***Eonandeva* gen. nov., a new distinctive genus from Eocene Baltic amber (Diptera: Chironomidae)**

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### **Abstract**

A new fossil genus, *Eonandeva* **gen. nov.**, with two new species: *E. helva* **sp. nov.** (type for the genus) and *E. latistyla* **sp. nov.**, is described from Eocene Baltic amber (~45–40 Ma). Adult males of both new species show the wing venation pattern, shape and chaetotaxy typical for the tribe Tanytarsini. The characters defined as prior apomorphies for the new genus—the gonostylus with a subapical flattened lobe and the stout, strongly elongated superior volsella—separate *Eonandeva* from the closely related extant genus *Nandeva* Wiedenbrug, Reiss *et* Fittkau, 1998.

**Key words:** Diptera, Chironomidae, Tanytarsini, new genus, new species, Baltic amber

### **Introduction**

The tribe Tanytarsini is a monophyletic taxon within the chironomid subfamily Chironominae, which also includes the tribes Pseudochironomini and Chironomini, the latter traditionally treated as the sister group for the tribes Pseudochironomini + Tanytarsini (e.g. Sæther 1977), with suggestions for refining this concept by Cranston *et al.* (2012). In line with the current systematic division, based on morphological characters, the oldest known Eocene Tanytarsini are represented by genera, most of which are classified among both extant subtribes: Tanytarsina and Zavreliina, except for those with an unexplained subtribal position, herein treated as the stem group: the extinct—*Archistempellina* Giłka *et* Zakrzewska, 2013 and *Corneliola* Giłka *et* Zakrzewska, 2013 (Giłka *et al.* 2013, Zakrzewska & Giłka 2014), as well as the extant—*Nandeva* Wiedenbrug, Reiss *et* Fittkau, 1998 (Andersen *et al.* 2011). In this study two interesting species are described and assigned to a new genus that forms a possible common group with *Nandeva*. The two genera are thus recognized as a presumable part of the Tanytarsini or as a sister group to this tribe.

### **Material and methods**

The specimens examined are adult male chironomids found in Baltic amber (Eocene, ~45–40 Ma). The amber was cut into small pieces, ground and polished manually (Figs. 1A, 3A). Measurements of specimens are in µm, except for the total length (in mm, rounded off to the first decimal digit). The body length was measured from the antennal pedicel to the end of the gonostylus, and the wing from the arculus to the tip. Lengths of leg segments and palpomeres were rounded off to the nearest 5 and 1 µm, respectively. The antennal, leg and venarum ratios (AR, LR, VR) were calculated to the second decimal place. The morphological terminology and abbreviations follow Sæther (1980). The photographs were taken using the classic microscope PZO Biolar SK14 and Helicon Focus 6 image stacking software. The spatial greyscale illustrations were made using the technique by Giłka (2008). Both the specimens described in this manuscript are part of the private amber inclusions collection of Christel and Hans Werner Hoffeins (Hamburg), and are booked to be deposited at the Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany.

## Systematic review

**Family: Chironomidae Newman, 1834**

**Subfamily: Chironominae Newman, 1834**

**Tribe: Tanytarsini Zavřel, 1917**

**Stem group of the tribe**

**Genus: *Eonandeva* Gilka et Zakrzewska, gen. nov.**

Type species: *Eonandeva helva* Gilka et Zakrzewska **sp. nov.** (present designation).

Other species: *Eonandeva latistyla* Gilka et Zakrzewska **sp. nov.**

**Derivatio nominis.** We believe this Eocene genus is closely related to the extant *Nandeva*.

**Diagnosis.** Adult male. *Eonandeva* is treated as a possible member of the tribe Tanytarsini showing the RM vein as a continuation of M and R<sub>4+5</sub> or slightly oblique relative to them, the bare squama and the strongly reduced anal area of the wing with the anal lobe not developed. The new genus differs from all other genera of the tribe, including the presumably closest genus *Nandeva*, in the shape of the gonostylus, which bears a subapical flattened lobe on the median margin and a stout, strongly elongated and more or less parallel-sided superior volsella.

**Description.** Adult male.

Small species, wing length c. 800–900 µm. Eyes bare, reniform, without dorsomedian extensions, broadly separated by frons. Antenna with 13 flagellomeres, AR c. 0.7, plume well developed. Frontal tubercles absent. Palp fully developed, 5-segmented. Clypeus with several (4–6) setae placed in row in proximal part. Thorax with dorsocentral setae arranged in small field anteriorly, 6 prealar setae in roundish field. RM vein as continuation of M and R<sub>4+5</sub> or slightly oblique relative to them, R<sub>4+5</sub> ending distally of M<sub>3+4</sub> towards tip of wing; squama bare; anal lobe not developed (Fig. 1C, D; 3C). Mid and hind leg tibia with two minute well separated combs, at least one comb bearing spur. Pulvilli absent. Gonostylus longer than gonocoxite, with subapical flattened lobe on median margin (Fig. 2, 4). Anal point styliform, slender, reaching far beyond apices of superior volsellae. Superior volsella stout, strongly elongated, parallel-sided, apically rounded (Fig. 2D, 4D). Digitus and median volsella not developed. Inferior volsella with enlarged apical part.

***Eonandeva helva* Gilka et Zakrzewska, sp. nov.**

Figures 1, 2

**Type material.** Holotype. Adult male (tarsi of all legs missing) preserved in 12 x 5 x 4 mm piece of amber (Eocene, ~45–40 Ma, Gulf of Gdańsk; CCHH 1754–1; Fig. 1A).

**Derivatio nominis.** The Latin adjective—amber, amber-coloured.

**Diagnosis.** RM relatively long, continuous with M, slightly oblique relative to R. R<sub>4+5</sub> ending slightly distally of M<sub>3+4</sub>. Gonostylus slender, parallel-sided, with small subapical flattened lobe on median margin. Anal tergite with strong setae on posterior margin, median setae absent. Superior volsella cylindrical, apex posteromedially directed. Inferior volsella with slightly enlarged apical part.

**Description.** Adult male (n = 1).

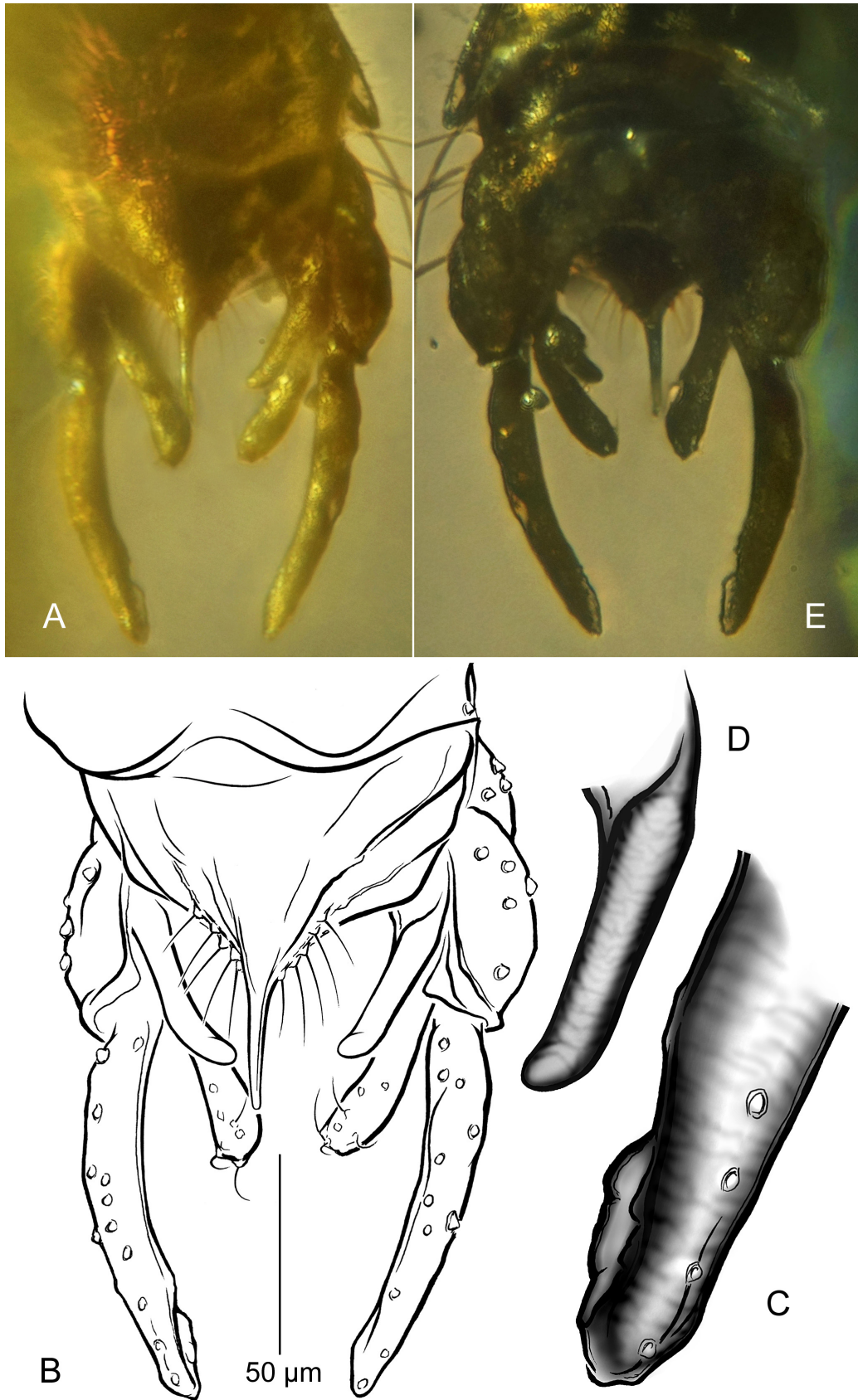
Total length 1.55 mm; wing length c. 900 µm.

**Head** (Fig. 1B). Eyes bare, reniform, without dorsomedian extensions, broadly separated by frons. Frontal tubercles absent. Antenna with 13 well discernible flagellomeres, AR 0.73, plume fully developed. Length of palpomeres 2–5 (µm): 32, 101, 117, 133. At least 6 setae placed in row in proximal part of clypeus.

**Thorax chaetotaxy.** Ac at least 12; Dc at least 16 (several setae arranged in small field anteriorly); Scts at least 5, minute; Pa 6 arranged in roundish field.



**FIGURE 1.** *Eonandeva helva* sp. nov., adult male, holotype CCHH 1754-1 (Eocene, ~45–40 Ma; Baltic amber, Gulf of Gdańsk). **A**—inclusion in amber; **B**—habitus; **C**—wing; **D**—RM vein area of wing.



**FIGURE 2.** *Eonandeva helva* sp. nov., adult male, holotype CCHH 1754-1 (Eocene, ~45–40 Ma; Baltic amber, Gulf of Gdańsk). Hypopygium and its structures in dorsal (A–D) and ventral aspect (E), photographed in reflected light (A), in transmitted light (E) and drawn (B–D); C—distal part of gonostylus; D—superior volsella (C and D magnified c. 2 times relative to B).

*Wing* (Fig. 1C, D). Slender, broadest at 2/3 length, width: 275  $\mu\text{m}$ , length/width ratio 3.27. Anal lobe not developed. RM relatively long, continuous with M, slightly oblique relative to R (Fig. 1D). Sc, R<sub>2+3</sub> and An not observed. FCu placed distinctly distally of RM; VR<sub>Cu</sub> 1.43. Veins ending as follows (in order from base to tip): Cu<sub>1</sub>, R<sub>1</sub>, M<sub>3+4</sub>, R<sub>4+5</sub>, M<sub>1+2</sub>. Squama bare.

*Legs*. Spur of fore leg tibia not observed. Mid and hind leg tibia with 2 minute well separated combs (teeth up to 10  $\mu\text{m}$  long), each comb bearing more or less curved spur (c. 15–20  $\mu\text{m}$  long), spurs of mid leg slightly unequal in length.

*Hypopygium* (Fig. 2). Gonostylus c. 100  $\mu\text{m}$  long, distinctly longer than gonocoxite, slender, arcuate, parallel-sided, with small subapical flattened lobe on median margin (Fig. 2C). Anal tergite subtriangular, with 5–6 strong setae on posterior margin on each side of anal point, median setae absent. Anal point long and slender, slightly tapering to apex. Superior volsella strongly elongated, parallel-sided, cylindrical, slightly curved, apex posteromedially directed (Fig. 2D). Digitus or digitiform extension not observed. Inferior volsella with slightly enlarged apical part armed with sparse setae.

### *Eonandeva latistyla* Gilka et Zakrzewska, sp. nov.

Figures 3, 4

**Type material.** Holotype. Adult male (tarsi of left mid and hind legs missing) preserved in 8.5 x 7.5 x 3.5 mm piece of amber (Eocene, ~45–40 Ma, Gulf of Gdańsk; CCHH 1754–10; Fig. 3A).

**Derivatio nominis.** The Latin adjective derived from ‘*latus*’ and ‘*stylus*’, in reference to the broad gonostylus.

**Diagnosis.** RM slightly oblique relative to M and R<sub>4+5</sub>. R<sub>4+5</sub> ending distally of M<sub>3+4</sub>. Gonostylus broadest near apex, with large subapical flattened lobe on median margin. Anal tergite with numerous setae surrounding base of anal point, median setae present. Superior volsella with distinct anteromedian ridge, swollen in apical part, apex medially directed. Inferior volsella with enlarged head-like apical part.

**Description.** Adult male (n = 1).

Total length 1.70 mm; wing length c. 810  $\mu\text{m}$ .

*Head* (Fig. 3B). Eyes bare, reniform, without dorsomedian extensions, broadly separated by frons. Frontal tubercles absent. Antenna with 13 well discernible flagellomeres, AR 0.70, plume fully developed. Length of palpomeres 2–5 ( $\mu\text{m}$ ): 32, 113, 113, 133. At least 4 setae placed in row in proximal part of clypeus.

*Thorax chaetotaxy.* Ac at least 7; Dc at least 14 (several setae arranged in small field anteriorly); Scts at least 10; Pa 6 arranged in roundish field.

*Wing* (Fig. 3C). Slender, broadest at 2/3 length, width: 245  $\mu\text{m}$ , length/width ratio 3.31. Anal lobe not developed. RM slightly oblique relative to R and M. Sc, R<sub>2+3</sub> not observed, An vestigial, observed only in proximal part. FCu placed distinctly distally of RM; VR<sub>Cu</sub> 1.30. Veins ending as follows (in order from base to tip): Cu<sub>1</sub>, R<sub>1</sub>, M<sub>3+4</sub>, R<sub>4+5</sub>, M<sub>1+2</sub>. Squama bare.

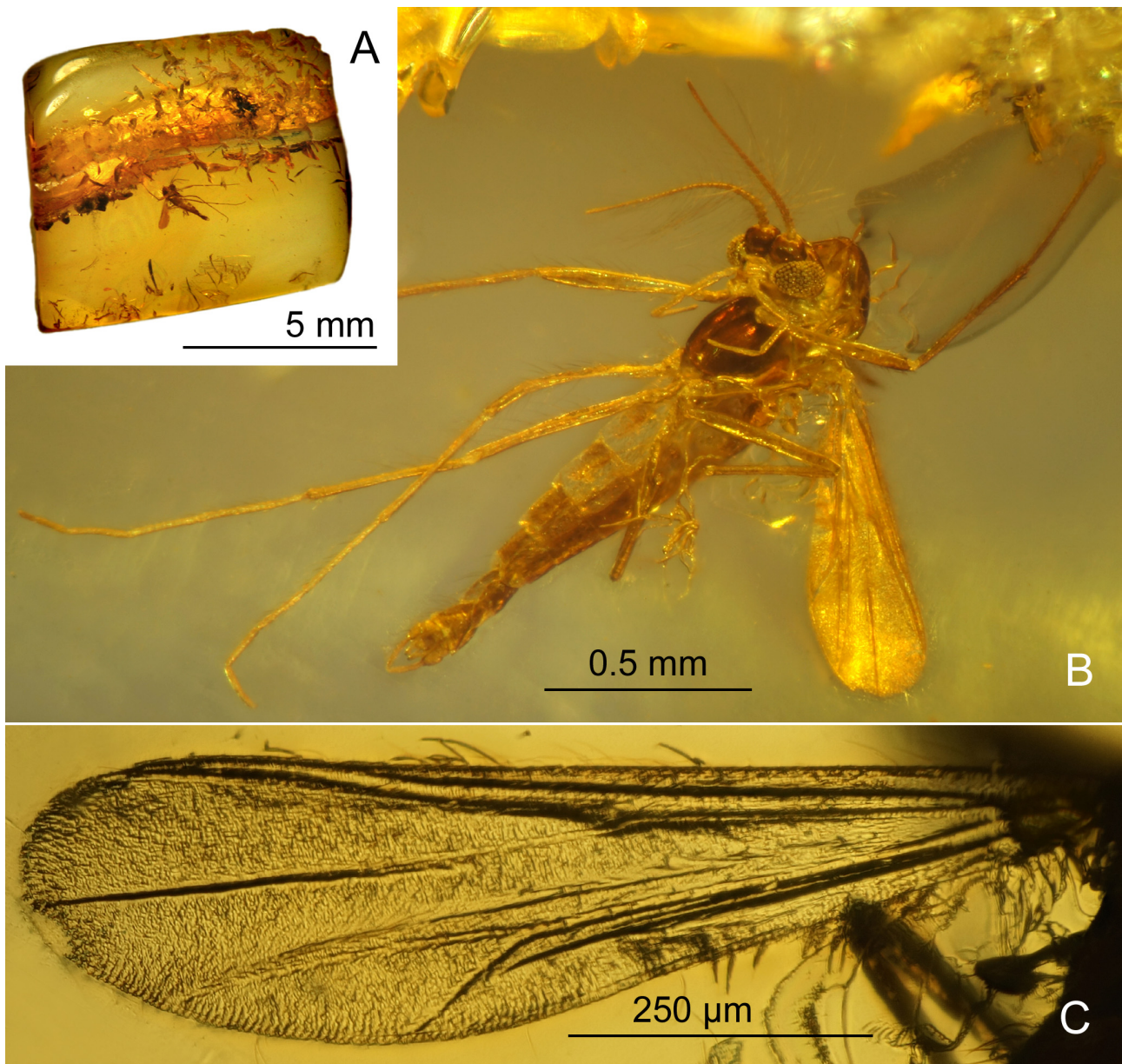
*Legs.* Spur of fore leg tibia not observed. Mid and hind leg tibia with 2 tiny separate combs (teeth up to 5  $\mu\text{m}$  long), at least one comb bearing minute spur (c. 10  $\mu\text{m}$  long). Sensilla chaetica on ta<sub>1</sub> of p<sub>2</sub> not observed. Pulvilli absent. For length of leg segments and leg ratios, see Table 1.

**TABLE 1.** Leg segment lengths ( $\mu\text{m}$ ) and leg ratios of male *Eonandeva latistyla* sp. nov.

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR
p <sub>1</sub>	435	395	345	225	160	90	55	0.87
p <sub>2</sub>	430	410	270	150	125	80	50	0.66
p <sub>3</sub>	460	465	300	185	165	95	50	0.65

*Hypopygium* (Fig. 4). Gonostylus c. 90  $\mu\text{m}$  long, longer than gonocoxite, slightly arcuate, broadest near apex, with large subapical flattened lobe on median margin (Fig. 4C). Anal tergite subtriangular, with numerous setae surrounding base of anal point, median setae present (strong setal tubercles observed). Anal point long and slender, tapering slightly to apex. Superior volsella strongly elongated, parallel-sided, bearing distinct anteromedian ridge,

swollen in apical part, slightly curved, apex medially directed (Fig. 4D). Digitus or digitiform extension not observed. Inferior volsella with enlarged head-like apical part armed with dense setae (strong setal tubercles observed).



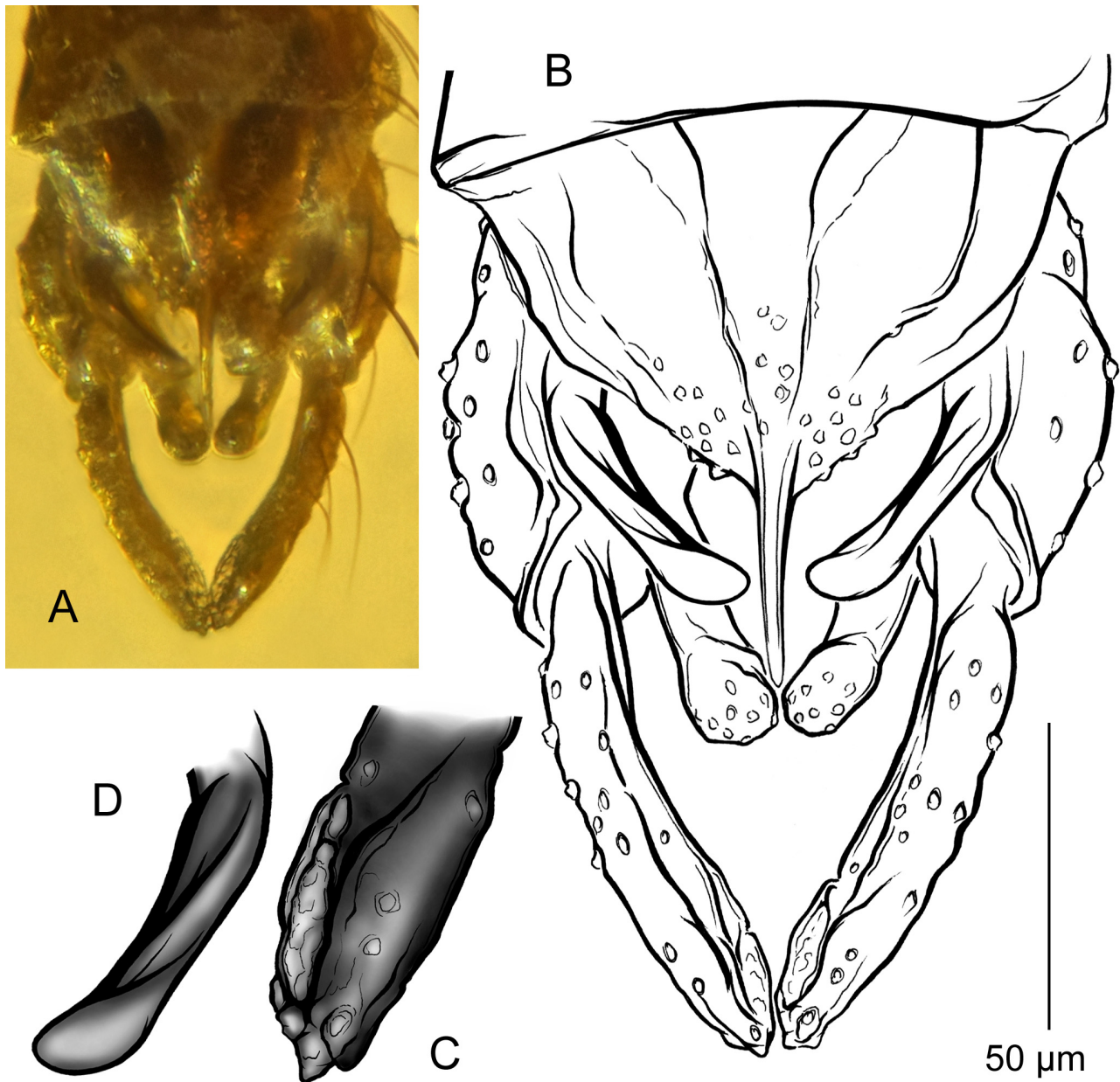
**FIGURE 3.** *Eonandeva latistyla* sp. nov., adult male, holotype CCHH 1754–10 (Eocene, ~45–40 Ma; Baltic amber, Gulf of Gdańsk). **A**—inclusion in amber; **B**—habitus; **C**—wing.

## Discussion

The two species described above and placed in the new genus *Eonandeva* clearly indicate a close relationship with the extant *Nandeva* (Wiedenbrug *et al.* 1998, Cranston 1999, Sæther & Roque 2004, Andersen *et al.* 2011). Comparing the emended diagnostic description of *Nandeva* (Andersen *et al.* 2011) with that of *Eonandeva*, the two genera show distinct similarities in the structure of the head, wing, thorax chaetotaxy and, particularly, in the adult male hypopygium. Among several extant *Nandeva* species, *N. digitifer* Andersen, Sæther *et* Contreras-Ramos, 2011 shows hypopygial characters most similar to those found in *Eonandeva helva* or *E. latistyla* (*cf.* Andersen *et al.* 2011, figs. 7–9). These two genera, except for the characters treated as prior apomorphies for *Eonandeva* (the shape of the gonostylus and the superior volsella), differ in the size of the tibial combs and spurs (minute in

*Eonandeva*), and in the slightly different configuration of veins  $R_{4+5}$  and  $M_{3+4}$  ( $R_{4+5}$  ending distally of  $M_{3+4}$  in *Eonandeva*).

The systematic position of *Nandeva* and the argumentation in favour of treating the genus as part of the tribe Tanytarsini or as part of the sister group to Tanytarsini were recently presented and discussed in detail by Andersen *et al.* (2011) based on the revised parsimony analysis by Sæther and Roque (2004). Following that concept we treat *Nandeva* and *Eonandeva* as a presumable common group in the Tanytarsini or, possibly, a sister group to this tribe. Our current results may support this hypothesis, indicating that *Nandeva* also appears in amber dating back to the early Eocene (authors' forthcoming data).



**FIGURE 4.** *Eonandeva latistyla* sp. nov., adult male, holotype CCHH 1754–10 (Eocene, ~45–40 Ma; Baltic amber, Gulf of Gdańsk). Hypopygium and its structures in dorsal aspect, photographed in reflected light (A) and drawn (B–D); C—distal part of gonostylus; D—superior volsella (C and D magnified c. 2 times relative to B).

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## References

- Andersen, T., Sæther, O.A. & Contreras-Ramos, A. (2011) New species and records of *Nandeva* Wiedenbrug, Reiss *et* Fittkau (Chironomidae: Chironominae). *Zootaxa*, 3136, 45–60.
- Cranston, P.S. (1999) Two unusual Chironomini (Diptera: Chironomidae) from Australian rainforest streams: one new genus and a neotropical genus new for the region. *Australian Journal of Entomology*, 38, 291–299.  
<http://dx.doi.org/10.1046/j.1440-6055.1999.00121.x>
- Cranston, P.S., Hardy, N.B. & Morse, G.E. (2012) A dated molecular phylogeny for the Chironomidae (Diptera). *Systematic Entomology*, 37, 172–188.  
<http://dx.doi.org/10.1111/j.1365-3113.2011.00603.x>
- Gilka, W. (2008) A rapid technique of producing spatial colour illustrations of diagnostic structures in small dipterans. *Dipteron, Bulletin of the Dipterological Section of the Polish Entomological Society*, 24, 8–10.
- Gilka, W., Zakrzewska, M., Dominiak, P. & Urbanek, A. (2013) Non-biting midges of the tribe Tanytarsini in Eocene amber from the Rovno region (Ukraine): a pioneer systematic study with notes on the phylogeny (Diptera: Chironomidae). *Zootaxa*, 3736 (5), 569–586.  
<http://dx.doi.org/10.11646/zootaxa.3736.5.8>
- Sæther, O.A. (1977) Female genitalia in Chironomidae and other Nematocera: morphology, phylogenies, keys. *Bulletin of the Fisheries Research Board of Canada*, 197, 1–209.
- Sæther, O.A. (1980) Glossary of chironomid morphology terminology (Diptera: Chironomidae). *Entomologica scandinavica*, 14 (Supplement), 1–51.
- Sæther, O.A. & Roque, F.O. (2004) New Neotropical species of *Nandeva* (Diptera: Chironomidae), with a phylogeny of the Tanytarsini. *Tijdschrift voor Entomologie*, 147, 63–80.  
<http://dx.doi.org/10.1163/22119434-900000141>
- Wiedenbrug, S., Reiss, F. & Fittkau, E.J. (1998) *Nandeva*, gen. nov., a new genus of Chironomini (Insecta, Diptera, Chironomidae). *Spixiana*, 21, 59–68.
- Zakrzewska, M. & Gilka, W. (2014) The oldest known chironomids of the tribe Tanytarsini (Diptera: Chironomidae) indicate plesiomorphic character states. *Geobios*, 47, 335–343.  
<http://dx.doi.org/10.1016/j.geobios.2014.07.004>