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A new Cremifania species from Bulgaria (Diptera, Cremifaniidae), with a proposal for wing venation terms in higher Diptera

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Abstract – *Cremifania bulgarica* sp. n. is described from Bulgaria with a key for the known species of the genus. The species is the fourth representative of the family Cremifaniidae, a family new to Bulgaria. A proposal is made for wing venation terms (nomenclature of wing veins) in higher Diptera. With 11 figures.

Key words – *Cremifania*, Cremifaniidae, wing venation, new species, Bulgaria.

INTRODUCTION

The species of the family Cremifaniidae McAlpine, 1963 are peculiar small acalyptrate flies with a unique combination of characters. There is only one genus in the family, *Cremifania* Czerny, 1904. Formerly they were relegated to Chamaemyiidae as a subfamily (McAlpine 1963, 1981) but recently several authors have ranked them as a separate family (e.g. Tanasijtshuk 1986, 1992, Papp 1998). The differentiating features of the Cremifaniidae (or subfamily Cremifaniinae) are (as summarised by McAlpine (1963), who described them first) as follow: postocellar (postvertical) setae divergent or absent; proscutellum and posthumeral setae absent; male with strongly asymmetrical postabdominal sclerites and with a movable bipartite surstylus; aedeagus flexible, asymmetrical, possibly armed; aedeagal apodeme free, cuneiform; female with three spermathecae.

Cremifaniids are rare flies, except for places where – rarely – *C. nigrocellulata* Czerny, 1904 populations may become more numerous (cf.

CZERNY 1904, PSCHORN-WALCHER & ZWÖLFER 1960). *C. lanceolata* L. PAPP, 1994 was described on the basis of a single specimen (HNHM), and since that time it was captured only in the Czech Republic (ROHÁČEK & BARTÁK 2006). Also *C. nearctica* MCALPINE, 1963 was based on a single holotype. Much to our satisfaction, our colleague, Dr. MIHÁLY FÖLDVÁRI captured a specimen in Bulgaria. This species is described below (the holotype is in the collection of the Hungarian Natural History Museum, Budapest, HNHM). A key is constructed for the identification of all the four known species.

WING VENATION OF DIPTERA

It is felt timely to make a proposal towards a standardized nomenclature of the wing veins in Diptera (even in the modern Manual of Palaearctic Diptera (MERZ & HAENNI 2000) some of the wing venation terms are erroneous, except for the palaeontology chapter). Describing a cremifaniid fly seems to be a proper opportunity for doing that, since it has a complete venation of the higher (muscoid) flies.

Our proposal is based on three principles (trivialities):

a. In the ancient Diptera there were the following longitudinal veins: a subcostal vein, five radial veins, four medial veins, two cubital veins and two anal veins (not even a remnant of a third anal vein present in extant Diptera), see KRZEMIŃSKI & EVENHUIS (2001).

b. Branching of longitudinal veins means two longitudinal veins emerging (continued) from a single (shared) point. Consequently, names like CuA_1 and CuA_2 ("anterior branch of cubitus" and "posterior branch of cubitus") are nonsense.

c. It is easy to name all the longitudinal veins if we can name the cross-veins correctly (i.e. if we can tell what is a cross-vein and what is not).

It seems most probable that the cross-veins on the wing of the hypothetical stem species of Diptera were:

H

Sc-R (not Sc_2, since there is not more than 1 subcostal vein)

R_5-M_{1-2} (or R_5-M_1), shortly R-M

M_2-M_3, or M_{1-2}-M_3 (closing *d* cell)

M_3-M_4

So the "medial" cross-veins are bM-M: originally M_3-M_4 and dM-M: originally M_{1-2}-M_3, or, M_2-M_3.

M_4-Cu is a normal cross-vein, or, the very basic part of M_4 can be interpreted as this cross-vein

No Cu-A_1! This cross-vein is never developed, since basal connection must not be regarded as a cross-vein (e.g. Fig. 24 of KRZEMIŃSKI & EVENHUIS 2001).

A closed *cubital* cell is a consequence of shortening of Cu_1 and thus ending in A_1.

If I am right, the longitudinal veins of the higher Diptera must be named as follow (an important reference point is the cubital veins: they are a stronger and a thinner vein, running close and parallel to each other, at least most of their length):

Sc, R_1, R_{2+3}, R_{4+5}, M_1 (or M_{1+2}), M_4 (or M_{3+4}), Cu_1 (and a remnant of Cu_2), A_1 and A_2. Of course, they may be reduced (as it is in several families).

I do not know any flies with closed *anal cell*. The lowest closed cell is the *cubital cell*, which usually includes (embraces) the reduced Cu_2 vein.

So I name the veins in the description of the new species according to the proposal made above.

Cremifania bulgarica sp. n.
(Figs 1–10)

Type material – Holotype, male (HNHM): "Bulgaria, Džanka reservoir of Beli, Iskăr, 07.09.2005, leg. Földvári, No 14 – N 42°7'31.26" E23°34'49.59", 2250 m, Iskăr basin, spring".

The holotype is double-mounted on a piece of paper card, its right wing has been prepared on a slide, its abdomen with genitalia are preserved in a plastic microvial with glycerol. Its thorax is slightly damaged: the minuten-pin almost broke it in two, so it was glued for safety; however, glue does not cover any important characters. The holotype was depicted prior to those preparations (see Fig. 6).

Description – Measurements in mm: body length 2.50, wing length 2.50, wing width 0.91. Body vividly coloured dark and yellow (see below, Fig. 6).

Male. Postfrons (frons) yellow, rather long, though shorter than its breadth. Frontal triangle (Fig. 8) very long, almost reaching lunule, dark grey with silvery reflex. Frontal triangle anteriorly – in contrast to all the other cremifaniids – with a pair of very long (0.22 mm) setae. No definite orbital plates, fronto-orbital setae emerge on small (low)

protuberances. Orbitalia with short (max. 0.05 mm) proclinate setulae. Two pairs of rather strong fronto-orbital pairs, both anterior and posterior *ors* reclinate and slightly latero-clinate (Fig. 9). Ocellar, inner and outer verticals are rather strong. No postocellars but ocellar triangle with 2 pairs of minute setae posterior to ocellars. Postocular setulae limited in number, short and thin. Facial plate (prefrons) whitish yellow. Eyes transverse ovoid (Fig. 9), gena much broader than height of eye. Gena with some short and thin setae only. Clypeus small, silvery grey, 0.11 mm high but only 0.165 mm broad (head slightly broader than 0.82 mm).

Antennae (Fig. 10) comparatively short, dark grey on all lateral half. Scape and pedicel fumose yellow on medial surface, with short setulae only; first flagellomere yellow on a basal semi-crescent area, otherwise fumose yellow on medial surface. Arista comparatively short (aristal length 0.34 mm); 1st and 2nd aristal segments very thick, 1st aristal segment very short, its 2nd segment cylindrical, 3rd segment not modified, aristal cilia max. 0.015 mm long (Fig. 9). Labellae and all proboscis short and yellow (cf. McAlpine 1963: fig. 8). Palpi short and yellow with very short setulae.

Postpronotum, notopleura and a supra- to post-alar spot yellow. Mesonotum, scutellum and metanotum dark brownish grey (almost black). Anepisternum yellow but with a narrow ventral brown band. Katepisternum dark with broad yellow parts both dorsally and anteriorly. Metepisternum dark. Scutellum much broader than long, 2 pairs of strong scutellars. No proscutellum or postscutellum. Two strong postsutural dorsocentral pairs present. i.e. 1 *pprnt*, 2 *np*, 1 *sa* (in the intra-alar row), 1 *pa*, 1 shorter posterior intra-alar, 2 *dc* and 2 *sc* pairs present. No prescutellar acrostichal pair. Proepisternum and anepimeron bare, anepisternum with 2 small dorsally curved setae near ventral posterior edge, 3 katepisternals but anterior 2 pairs short.

Legs. All femora and tibia dark in their dorsal half but yellow ventrally. All fore tibia dark. Mid coxa with a large (0.20 mm) perpendicular seta; hind coxa with a similar but shorter seta. Mid tibia with 2 strong ventroapical setae. Tarsi all black, 5th tarsomeres dilated and slightly flattened. Metatarsi (basitarsi) with anteroventral and posteroventral rows of rather strong setae. Pulvilli large, white.

Wings (Figs 6–7) rather narrow (length/width ratio 2.73). Veins dark brown. Basicosta and all costal vein with very small setulae only (sub-basal pair on costa 0.11 mm). No costal breaks. Costal vein slightly overruns apex of vein M_1 (!). Actually there is no stronger costal fringe between apices of R_{2+3} and R_{4+5}, setae there much thinner than anterior to R_{2+3}. Costal sections (in mm): H to Sc 0.47, Sc to R_1 0.36 (i.e. costal cell definitely longer than half-length of subcostal cell (cf. fig. 2.61 of McAlpine 1981), R_1 to R_{2+3} 1.075, R_{2+3} to R_{4+5} 0.20, R_{4+5} to M_1 0.225. As in the case of *C. nigrocellulata* Czerny, 1904, subcostal cell dark (Fig. 5) except for its very base, costal cell clear. Dark colour of subcostal cell continued in cell r1 sub-basally. Cells r_1, r_{2+3} and a small part of r_{4+5} darker than other parts of wing membrane. Basal medial cell is closed by the cross-vein bM-M and a short M_4-Cu_1. Sections of M_1 (in mm): bM-M to R-M 0.45, R-M to dM-M 0.39, terminal section of vein M_1 1.00. Basal M-M slightly oblique. Vein M_4 (or M_{3+4}) reaches wing margin, terminal section 0.35 mm. Cubital cell is closed by Cu_1 joining A_1 and embracing remnant of Cu_2. Both veins A_1 and A_2 are distinct, as in all Lauxaniidae and in most Chamaemyiidae. Alula very

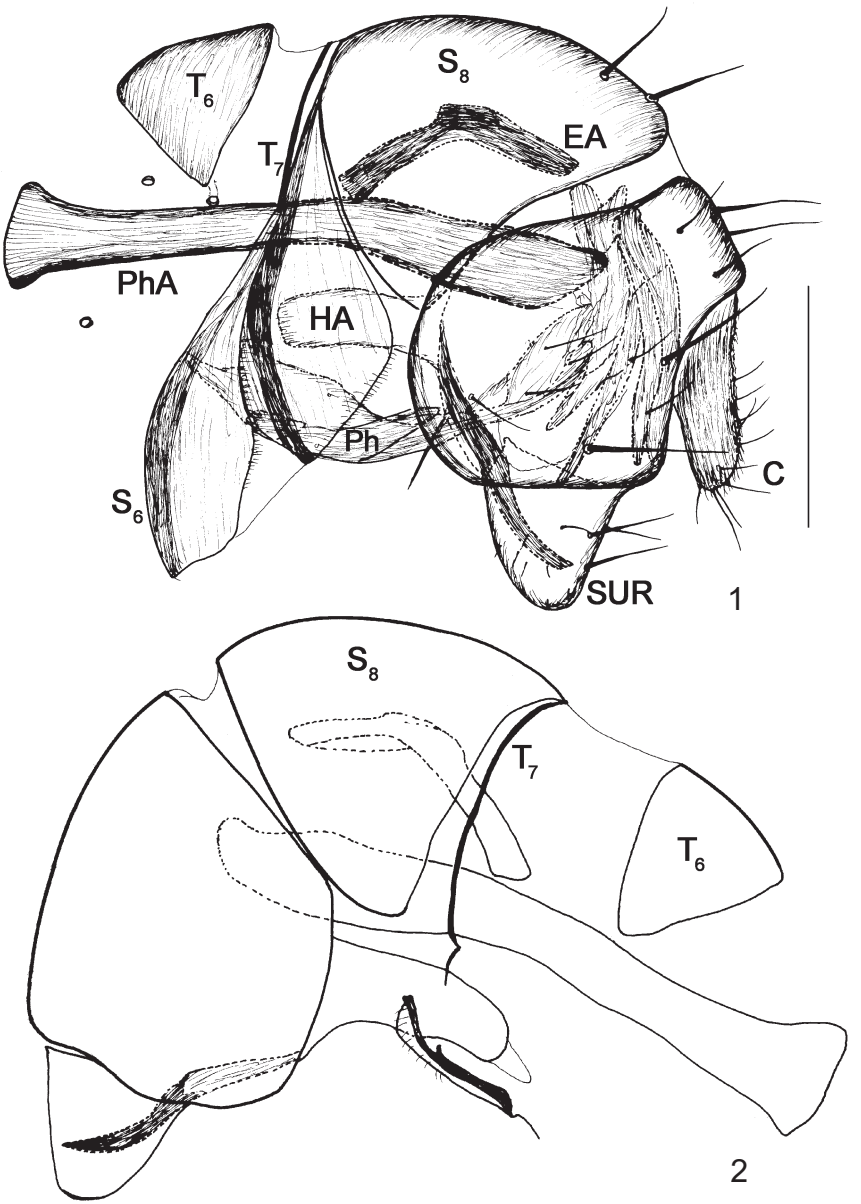
broad. Halteres comparatively short, wax-yellow. Calyptrae small, membranes as well as their fringes white.

Abdomen with 6 unmodified (preabdominal) tergites, deep brownish grey as for their dorsal part, lateral margin and ventrally curved parts as well as sternites, yellow. Postabdominal sclerites less dark, grey. Male cerci and surstyli yellow. Tergite 2 desclerotised on a short but broad caudal section joining intersegmental membrane (tergite 2 complete on lateral edges). Tergites 3 to 5 large, touching each other, laterally reaching lateral margin of abdomen (i.e. laterally curved parts short. Marginal setae of tergites max. 0.12 mm long. Sternites 2 to 4 quadratic, their width less than half of tergal width. Sternite 5 trapezoid, ca. 3/4 as broad as tergite 5.

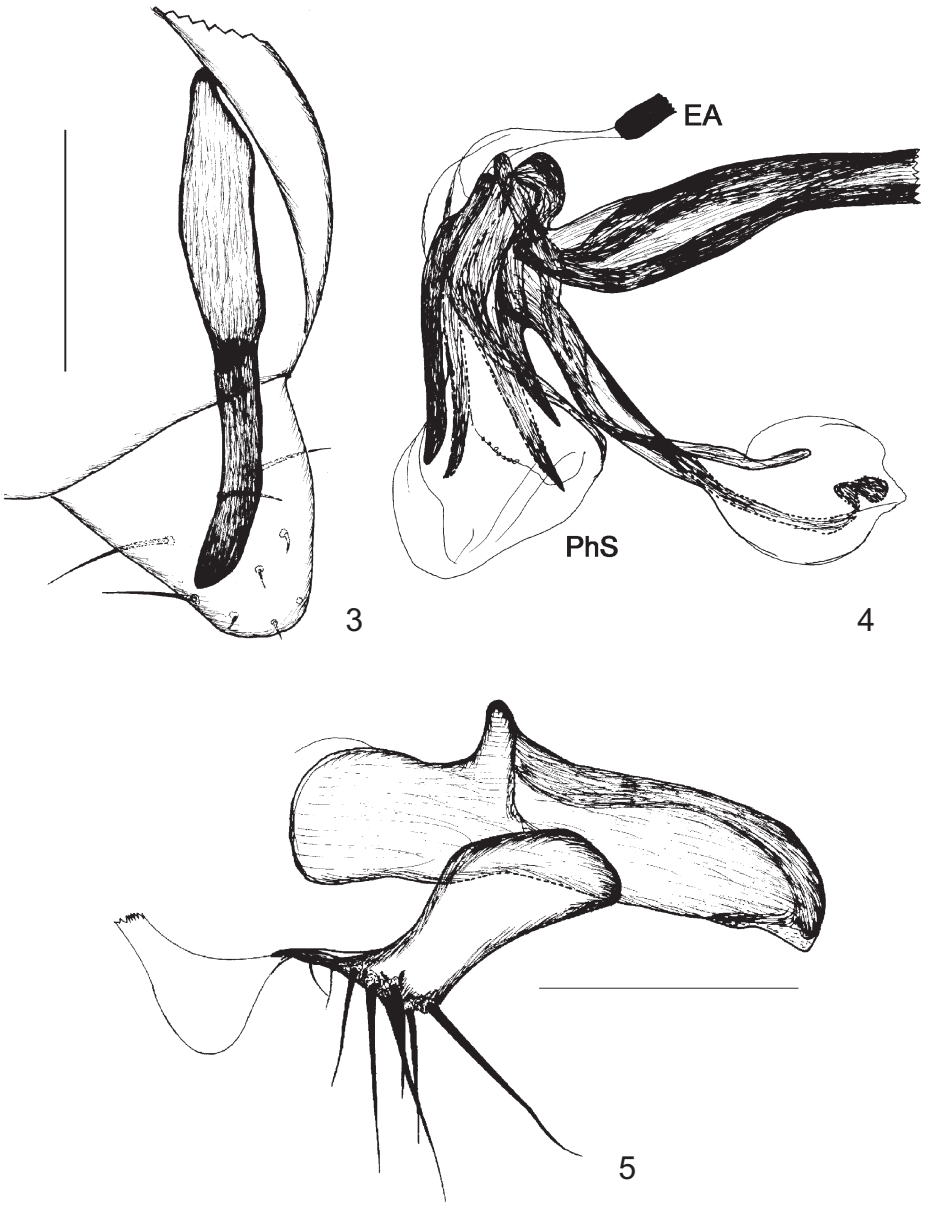
Tergite 6 dorsal and symmetrical. Sternite 6 and sternite 7 present as asymmetrical sclerites on left side of abdomen (Fig. 1), broad ventrally, their dorsal apices left lateral to sagittal line. Sternite 8 large, semiglobular bearing strong setae (see also below). There are two strongly sclerotised (black) narrow sclerites between tergite 6 and sternite 8: a very long curved one, more than half of a ring positioned left laterally, dorsally and right laterally, and, another shorter one rather ventrally on the right side (Figs 1–2). Two possible interpretations can be submitted: a. tergite 8 and sternite 8 are fused, consequently both sclerites are derivatives of tergite 7; b. the pregenital sclerite is sternite 8 alone, in this case the thin sclerites are tergite 7 and tergite 8. I think the second opportunity as more probable.

Male genitalia (Figs 1–5) in main features seemingly similar to that of *Cremifania nearctica* McAlpine, 1963: aedeagus strongly asymmetrical, pregenital sternite (the pregenital sclerite must not be tergite 8 but sternite 8, in contrast to figs 4 and 12 of McAlpine, 1963) with strong setae, etc. However, differences are more prevailing. Epandrium broad ventrally but only 0.08 mm long dorsally. Cerci normal with short setae. Two pairs of surstyli (Figs 1, 3): anterior pair thin curved, medial to the posterior pair, anterior and posterior surstyli superposing in lateral view, posterior ones completely covering anterior surstyli (cf. *C. nearctica* McAlpine, 1963: fig. 12). Posterior surstyli broad, apex broadly rounded. Hypandrium (Figs 1–2, 5) well-formed, robust, U-shaped. Gonopods (pregonites) with 6 long and several more short setae, not connected to hypandrium but connected to each other through a horizontal fine sclerotised plate. Gonopods join phallobase through a thin membranous part. Hypandrium and gonopods are symmetrical (Fig. 5). Sternite 10 (subepandrial sclerite) present as a broad thinly sclerotised plate connecting base of cercus to posterior surstylus. Two pairs of parameres present, or if we name gonopod as pregonite, two pairs of postgonites are to be found. Not only phallus but also anterior parameres are asymmetrical (!) Posterior parameres are not fused with, and, caudal to the base of phallus (they seem to articulate there). There is an additional pair of thin sclerites embracing phallobase incl. anterior parameres (posterior parameres largely outside of them), phallus can move dorsally from them, see on Fig. 4. They may be named as phallic sheath or else but I was unable to find a true homology for them. Ejaculatory apodeme (Figs 1–2) large, strongly sclerotised.

Female unknown.



Figs 1–2. *Cremifania bulgarica* sp. n., holotype male, genitalia, 1 = left lateral view, 2 = contours in right lateral view. T: tergite, S: sternite, C: cercus, EA: ejaculatory apodeme, HA: hypandrium, Ph: phallus, PhA: phallapodeme, SUR: surstyli. Scale: 0.2 mm



Figs 3–5. *Cremifania bulgarica* sp. n., holotype male, genitalia, 3 = left surstyli, inner (medial) view, 4 = phallic complex, both anterior parameres depicted, right lateral view, 5 = hypandrium and gonopod, lateral view. EA: distal apex of ejaculatory apodeme, PhS: phallic sheath. Scales: 0.2 mm for Fig. 5, 0.1 mm for Figs 3–4

Fig. 6. *Cremifania bulgarica* sp. n., holotype male, lateral view, in situ (before wing and genitalia preparation)

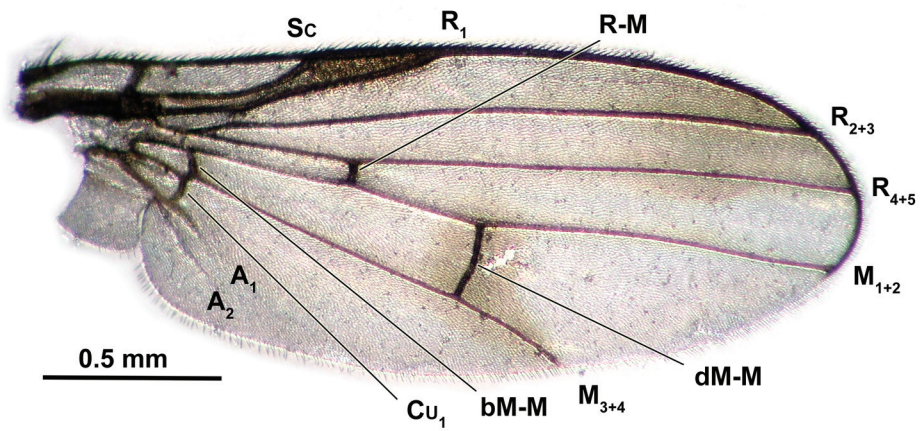


Fig. 7. *Cremifania bulgarica* sp. n., holotype male, right wing, Sc: subcostal vein, R: radial veins, R-M: radio-medial cross-vein, M: medial veins, bM-M: basal medio-medial cross-vein, dM-M: distal medio-medial cross-vein, Cu_1: first cubital vein, A: anal veins

Figs 8–11. 8–10. *Cremifania bulgarica* sp. n., holotype male, 8 = head, dorsal view, 9 = head, lateral view, 10 = antenna, lateral view. 11 = *C. lanceolata* L. PAPP, holotype male, antenna in lateral view

Remarks – *Cremifania bulgarica* sp. n. is another conspicuous member of this genus, which is not closely related to any other known species. Its differentiating features are summarised in the key below. However, its large frontal triangle and extremely large supra-lunular setal pair, as well as its 2 ventro-apical setae on mid tibia, its richly patterned wing and peculiarities in male genitalia make it distant from the other extant (and described) species. I would like to mention that although I have seen even more intricate male genitalia than those of *C. bulgarica*, it has the highest number of

structural elements among the known male muscoid genitalia. The diagnostic value of the figures in GRIFFITHS (1972) is very low for the male genitalia in *Cremifania*. Some of the sclerites are obviously misinterpreted in MCALPINE (1963). Consequently, my interpretation of the genital parts is only a proposal.

Of the related species, *C. nigrocellulata* is an economically important larval predator of balsam woolly aphids, such as *Adelges piceae* (RATZEBURG, 1844), both in Central Europe and in Canada and the U.S.A., since it has been introduced to the New World (see DELUCCHI & PSCHORN-WALCHER 1954, MCALPINE 1963). *C. nearctica* was collected in New Mexico at high altitude among conifers. The collecting site of this new species is a very high altitude. Thus, its connection with conifers seems probable. The specimen was sweep-netted near a spring.

Etymology – The specific epithet "*bulgarica*" refers to its type locality.

KEY TO THE WORLD SPECIES OF *CREMIFANIA* CZERNY, 1904

1(2) With at least 4 pairs of postsutural dorsocentrals, shortening anteriorad. Wings completely clear. Anepisternum with several fine hair-like setae in upper front corner; anepimeron bare. Calyptrae entirely white. Body length 2.5 mm. U.S.A. (south)

C. nearctica MCALPINE, 1963

2(1) With 1 or 2 pairs of dorsocentral setae. Wings with dark markings at least in subcostal cell or also in costal cell, or, wing more richly patterned. Anepisternum bare in upper front corner; anepimeron with or without a setula in ventral middle.

3(4) Arista lanceolate (Fig. 11, also PAPP 1994: fig. 3), i.e. its 3rd segment flattened and broadened, but pointed apically. Costal cell with a central diffuse dark spot; subcostal cell with large black spot apically and with a separated small spot sub-basally confluent with dark spot in costal cell (PAPP 1994: fig. 4). Only 1 pair of dorsocentral setae. Anepimeron without a setula in ventral middle. Calyptrae and their fringes entirely whitish yellow. Body length 2.0 mm. Hungary, Czech Republic

C. lanceolata L. PAPP, 1994

4(3) Arista normal, or only basal part thickened (Figs 6, 8–10). Costal cell clear; subcostal cell wholly darkened (Figs 6–7, fig. 2.61 of MCALPINE 1981). Two pairs of dorsocentral setae.

5(6) Postfrons with normal frontal (ocellar) triangle, no supra-lunular setae. Wing membrane other than subcostal cell clear. Anepimeron with a setula in ventral middle. Calyptrae with dusky margins and fringes. Male genitalia (MCALPINE 1963: figs 4, 7, 11). Body length 1.5–2.0 mm. Central Europe, North America, introduced (U.S.A.: Oregon; Canada: New Brunswick, Newfoundland) *C. nigrocellulata* CZERNY, 1904

6(5) Postfrons with extremely large frontal triangle, most anteriorly with a pair of very strong supra-lunular setae (Fig. 8). Wing more richly patterned (Figs 6–7). Anepimeron without setulae (Fig. 6). Calyptrae and their fringes whitish yellow. Male genitalia (Figs 1–5). Body length 2.5 mm. Bulgaria **C. bulgarica** sp. n.

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