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**A DESCRIPTION OF A NEW SPECIES OF WESTERN PALAEARCTIC
LONCHOPTERA MEIGEN
(DIPTERA, LONCHOPTERIDAE) FROM GEORGIA**

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A description of a new species of Western Palaearctic *Lonchoptera* Meigen
(Diptera, Lonchopteridae) from Georgia.

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ABSTRACT

The Worldwide family Lonchopteridae comprises a single extant genus, *Lonchoptera* Meigen, 1803 currently containing 69 species (including the new species), of which 33 are Palaearctic species. A description of a new Palaearctic species (*Lonchoptera pseudolutea* sp. nov.) from Georgia is provided. Diagnostic character states distinguishing the new species from congeneric European species are discussed and illustrated. The available generic name *Neolonchoptera* Vaillant, 1989 is newly synonymised with *Lonchoptera* Meigen, 1803 and *Lonchoptera nevadica* (Vaillant, 1989) reassigned as a new combination.

Key Words: Lonchopteridae, spear-winged flies, *Lonchoptera*, Palaearctic, new species.

INTRODUCTION

The Worldwide family Lonchopteridae comprises a single extant genus, *Lonchoptera* Meigen, 1803 currently containing 68 species. Other available generic names that have previously been proposed within this family are: *Dipsa* Fallén, 1810, *Lonchopteryx* Stephens 1829, *Neolonchoptera* Vaillant, 1989, *Homolonchoptera* Yang, 1998 and *Spilolonchoptera* Yang, 1998.

Of relevance in the Palaearctic context are *Dipsa*, *Lonchopteryx* and *Neolonchoptera*. The names *Dipsa* and *Lonchopteryx*, were both previously synonymised with *Lonchoptera*: *Dipsa* was synonymised by Latreille (1829: 526), and *Lonchopteryx* by Sherborn (1927: 3638). Contrarily, some authors (e.g. Vaillant 1989; Niklasson, *et al.*, 2004; & Tomiuk, *et al.*, 2004) continued to use the name *Dipsa* despite the synonymy and indeed, Vaillant (1989) reinstated it to full generic status. Chandler (1998: 103) rejected the reinstatement, an action with which we concur - see discussion by Klymko & Marshall (2008) for further details.

In agreement with Sinclair & Cumming (2006) and Klymko & Marshall (2008), extant Lonchopteridae are here treated as a single genus, *Lonchoptera* and the other generic names are not recognised in this paper. Consequently, the monotypic genus *Neolonchoptera* formerly distinguished from sibling genera by the following apomorphic characters: a long protrusion on section 3 of tarsus 1; femur 2, tibia 2 and first article of tarsus 2 with long ventral seti; a complex calculation of angles between branches and terminal points of wing veins; absence of setulae on m₂; anterior and posterior gonapophyses on the same side fused together ventrally; and aedeagus short and straight (Vaillant, 1989). These apomorphic characters are useful in diagnosing a single

European species (*Neolonchoptera nevadica* Vaillant, 1989), but in our interpretation are insufficient and unsubstantiated as generic characters. Consequently, *Neolonchoptera* Vaillant, 1989 is treated here as a junior subjective synonym of *Lonchoptera* Meigen, 1803, **syn. nov.** and *Neolonchoptera nevadica* Vaillant, 1989 is now considered to be reassigned as *Lonchoptera nevadica* (Vaillant, 1989), **comb. nov.** The synonymies of other generic names will be discussed in a future paper dealing with the World fauna.

Consequently, there are 32 Palaearctic species known to date. The description of a new Palaearctic species here increases the number of Palaearctic species to 33. Of the 15 European species (including the new species), Beuk (2021) keyed 13 species, omitting the Spanish *L. nevadica* (Vaillant, 1989) and excluding *L. vaillanti* Zwick 2004, which Barták (2020) considered doubtfully valid. For the purpose of this paper, we have not examined material for these two species, but until their status is further investigated we will treat them as valid. Given the unique characters of *L. nevadica* it is included in the update to the online key (see below). There seems no foundation for rejection of *L. vaillanti* as it has never been properly synonymised and it remains distinct from its congeners. Seven additional species are distributed in the Palaearctic part of China (as delimited by O'Hara & Cerretti (2016) and including the Xizang Autonomous Region, also known as Tibet). A further five species are known from the Russian Far East territory and five species are restricted to Japan and *L. stackelbergi* (Czerny, 1934) occurs in both the Russian Far East territory and Japan.

A considerable range extension for *Lonchoptera nitidifrons* Strobl, 1898 is worth noting. The species was synonymised by De Meijere (1906: 65) (not Strobl 1909: 95, who simply corrected his previous misidentifications based on discussion with De Meijere) and then was re-instated by Andersson (1991). The name has received subsequent use by Barták (1986, 2020), Beuk (2021), Vaillant (1989), Van Zuijlen (1996), Chandler (1998), Karpa (2008), Klymko & Marshall (2008), Dong & Yang (2011) and Kahanpää (2014). Dong & Yang (2011) published a record of a male and female from Nalati, Xinyuan County, Xinjiang, China, collected by Zhu Yajun & Huo Shan on 06.viii.2007, extending the range from Austria, Czech Republic, Denmark, Finland, France, Germany, Great Britain, the Netherlands, Norway, Russia: Soviet Middle Asia, Slovakia and Sweden, to now include also China.

During the course of contract work by the first author for Caucasus Barcode of Life (CaBol) a series of 65 specimens (36 males and 29 females) were examined for identification. Based on the European key to species (Beuk 2021) the specimens were found to belong to *Lonchoptera lutea* Meigen in Panzer, 1809 (9♂♂, 10♀♀) (Figure 1a & b) and a new species (27♂♂, 19♀♀), that keys to the place holder in couplet 9b, labelled *Lonchoptera* n.sp. [Caucasus: Georgia]. During the same period, the second author identified several Lonchopteridae samples collected in the Caucasus in 2019 and also recognized the same species. Both authors concluded independently that this species was not previously described and so it is described below (Figure 1c & d) as *Lonchoptera pseudolutea* **sp. nov.**

METHODS

Specimens were examined under a stereomicroscope (Motic or Wild) at magnifications between 6x and 50x and then compared with the On-line Key: *Lonchopteridae of Europe* (Beuk 2021). Given that this key is restricted to European species and because it has not yet been possible to construct a world key to species, a general check across as many non-European species as possible was made from the literature and by checking comparative descriptions, illustrations and specimens, none of which share the combination of character states given below.

Terminology and abbreviations concerning gross morphology generally follow Beuk (2021) and Cumming & Wood (2017). Male genitalia were removed from adult specimens, cleared in warm potassium hydroxide until soft tissues were dissolved, washed in 70%EtOH, then viewed in glycerine on a wetted microscope slide and returned to the cryovial along with the specimen preserved in 70%EtOH.

Drawings were made with the aid of a stereomicroscope and a drawing tube attached to the Motic binocular dissecting microscope. Photographs were produced with an Ash (Omni-core) digital photo-microscope using a Plan 1x objective lens.

The description is based on the newly assigned holotype and all specimens agreeing with it, following the procedures set out by 4th edition of the International Commission on Zoological Nomenclature (ICZN 1999). In accordance with that Code, the taxonomic acts referred to in this publication are made with the intention of providing new *nomina* (or onomatopoeies) for permanent use and nomenclatural purposes.

Bilaterally symmetrical features are described in the singular. Different types of vestiture are defined as follows: *macrosetae* are single large strongly sclerotised setae socketed in alveoli, with distinctive locations that may be diagnostically useful; *microsetae* are single shorter and/or finer setae widely distributed across the integument frequently in serial rows; while *pruinescence* refers to the fine dusting on the surface of sclerites, sometimes only visible in certain angles of light and referred to in older literature as pollinosity.

Chaetotaxy of the legs (Figure 2) is made with reference to the basal most dorsal (*d*) macroseta at the base of each leg segment (usually femur and tibia). Macrosetae directly in line with this dorsal (*d*) macroseta are also considered dorsal (*d*) and are usually clearly delimited by the serially arranged finer background setation arranged in line on either side. Macrosetae not in direct line with this basal macroseta are either anterior (*a*), anterodorsal (*ad*), anteroventral (*av*), posterior (*p*), posterodorsal (*pd*), posteroventral (*pv*) or ventral (*v*) to it. To maximise on orientation, the legs of pinned specimens (which agree with the holotype) were illustrated in preference to the alcohol-stored primary type, because it is easier to maintain the position of pinned specimens while illustrating.

Historically, the structures in the male genitalia have been named differently by various authors resulting in considerable confusion throughout the literature. Besides the obvious epandrium and cerci, there are four key elements that are variously named: epandrium, pregonite, postgonite and the sub-epandrial sclerite. The *epandrium* has been referred to as the ninth tergite or T₉ (Vaillant 1989; Zwick 2004) or periandrium (Beuk 2021). The *pregonite* has been referred to as the anterior gonapophysis (De Meijere 1906; Kertész 1914; Hennig 1976; Vaillant 1989, 1992; Zwick 2004), gonopod (Peterson 1987) or proximal gonapophysis (Rivossecchi 2002). The *postgonite* (Klymko & Marshall 2008) has been referred to as the posterior gonapophysis (De Meijere 1906; Kertész 1914; Hennig 1976; Vaillant 1989, 1992; Zwick 2004), paramere (Peterson 1987) or distal gonapophysis (Rivossecchi 2002). Finally the *sub-epandrial sclerite* has been referred to as the sub-anal plate (De Meijere 1906; Rivossecchi 2002), S₉ (Zwick 2004) or S₁₀ (Hennig 1976; Vaillant 1989).

The genitalic terms used here follow Cumming & Wood (2017). The *hypopygium* comprises the genital capsule, made up of the copulatory structures of the primary genital segment (segment 9) and the proctiger. The *epandrium* is a dorsal sclerite represented by T₉, aligned with the *hypandrium* (S₉). The *pregonites* are paired lobes derived from the *hypandrium*, positioned anteroventral to the *postgonites*. The *postgonites* are paired lobes derived from the gonocoxal portion of the *hypandrium*, positioned near the base of the *phallus*. Finally, the *sub-epandrial sclerite* is a sclerotized structure with multiple lobes located in the sub-epandrial membrane, apparently only well developed in some species of *Lonchoptera*, although this needs to be more definitively examined, as it may be that it is only lobed (and therefore attracting attention) in some species, yet plain and weakly developed in other species.

Measurements were made using the digital graticule in the Ash (Omni-core) digital photo-microscope. Body length was measured from the base of the antennae, in a straight line to the apex of the abdomen (extended post abdominal structures excluded). In cases where the head or abdomen was deflected, the head and thorax measurement was added to that of the long axis of the abdomen. Wing length was measured in a straight line from the apex of the basicosta to the wing apex; the *M*-ratio was the length of *M*₁₊₂ divided by the length of *M*₂. Student's *t*-tests were conducted at 99%

significance ($p = 0.01$) to test the hypothesis that there was no significant difference between body length, wing length and M -ratio, both within and between species.

Label data have been standardised to include country, region, province then locality (with latitude and longitude), followed by date, collection method, altitude and other relevant ecological data and finally collectors. Dates conform to the format ‘day.month.year’, with the day and year in Arabic numerals and the month in lower case Roman (e.g. 05.ix.2018).

The holotype specimen selected from the long series of CaBOL specimens (27 ♂♂ 19 ♀♀ from the same location), was the most complete male specimen, even though, many macrosetae from the head and notum are missing. Nearly all male CaBOL specimens examined lacked either the antennae or macrosetae of the head and notum or had damage to wings or legs. Variation among specimens is included in the description, mostly derived from other CaBOL specimens in the paratype series as listed below.

The holotype specimen was deposited in Zoological Research Museum Alexander Koenig, Germany (ZMFK) in 70%EtOH in a uniquely numbered cryovial (Figure 3), along with half the specimens of the type series each in uniquely numbered cryovials. The remaining type specimens were deposited at Ilia State University, Georgia (ISUG), the Canadian National Collections Insects, Arachnids & Nematodes, Ottawa, Canada (CNC; CNC database numbers noted for these specimens), the alcohol collection of the Maastricht Natural History Museum, Maastricht, the Netherlands (NHMM), the Laboratory and Museum of Evolutionary Ecology, Department of Ecology, University of Prešov (LMEE) and a pair of specimens of *L. pseudolutea* were pinned and stored in the first author’s private collection (AEWC).

TAXONOMY

Lonchoptera Meigen, 1803: 272. Synonymy with *Musidora* by Coquillett (1910: 377). Type species: *Lonchoptera lutea* Meigen in Panzer, 1809 by subsequent monotypy (Panzer 1809: 20), designated by Curtis (1839 [illustration plate 761]). Gender feminine (Melville 1960). *Neolonchoptera* Vaillant, 1989: 216. Type species: *Neolonchoptera nevadica* Vaillant, 1989: 216; **new synonymy**; consequently, *Lonchoptera nevadica* (Vaillant, 1989) is a **new combination**.

***Lonchoptera pseudolutea* sp. nov.**

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Figures 1c & d, 2 - 6

Etymology: *pseudolutea* - so named for the close similarity in gross morphology between this species and *L. lutea* Meigen.

Condition of the holotype: the description is based on the male holotype (type number: CaBOL ID: 1016542) (ZMFK). The specimen is generally in good condition - the legs are drawn backward and the wings held roof-like over the abdomen; it lacks the interfrontal and vertical macrosetae, arista, notal macrosetae excepting the left postpronotal, left posterior posthumeral, left posterior notopleural pair and lower posterior notopleural on the right; the wings are torn, but complete.

Size: ♂ Holotype body length: 3,10 mm; wing length: 3.10 mm (left) and 4,0210 mm (right). There is no significant difference between male and female dimensions for mean body length (mm), wing length (mm) and ratio between M_{1+2} and M_2 for the type series of *Lonchoptera pseudolutea* sp. nov. (Table 1) and, although wing length exceeded body length in all specimens examined, the difference in dimensions was found to be non-significant ($p > 0.01$).

	n = 46 ♂ & ♀	n = 27 ♂	n = 19 ♀	<i>t</i> -test outcome at <i>p</i> = 0.01
Mean body length:	3.16±0.21	3.07±0.23	3.29±0.18	ns
Mean wing length:	3.77±0.3	3.68±0.26	3.89±0.31	ns
Mean <i>M</i> -ratio:	0.62±0.09	0.63±0.09	0.6±0.08	ns

There is no significant difference between males and females for body length, wing length nor *M*-ratio (*p* > 0.01).

Table 1. Student's *t*-test comparison results for mean body length (mm), wing length (mm) and ratio between M_{1+2} and M_2 for the type series of *Lonchoptera pseudolutea* sp. nov.



Figure 1. Gross morphology of male *Lonchoptera lutea* Meigen in Panzer, 1809 (a & b), specimen CaBoL1016573 and *Lonchoptera pseudolutea* n.sp. (c & d) specimen CaBoL101542; a and c, dorsal views; b & d ventral views. Arrows indicate the katepisternum in ventral view.

Diagnosis: Vertical macrosetae black; antennae wholly dark brown; frontal macrosetae and anterior half of peristomal series black, the latter progressively becoming paler, brown laterally then yellowish posterior to the epistomal cavity; postocellar macrosetae pale brown, weakly developed; at most a few dorsal macrosetae of postorbital series dark brown to black, the remainder paler. Katepisternum entirely pale in ventral view (Figure 1d, arrow); scutellum pale brown, with a wide dark brown midline, not significantly contrasting with notum. Fore-tibia with 2 *d* macrosetae in males and 1 *pd* macroseta adjacent to dorsal-most of these, in females *pd* macrosetae adjacent to single *d* seta; preapical *ad* on fore-tibia absent. Mid-tibia with *pd* (shorter than the *d* macrosetae) inserted distal to or at the same level as uppermost of two *d* seta; *av* macroseta absent. Hind tibia with one short *pd* and one long *pv* preapical macrosetae. Wing: basicosta bearing two long microsetae, while base of the costa has one strong macrosetae, plus two smaller macrosetae and one of intermediate length (Figure 4 arrow); R_1 with dorsal microsetae of equal length and thickness throughout; female wings broadly ovate, not abruptly narrowing toward apex and anal vein usually ending at level of, or distal to, fork of vein *M*. Male: hypopygium large, more than half the overall post-abdominal length, reflexed and reaching level with middle of tergite 4 (T_4); cerci sub-triangular apically with distal margin angled, at approximately 30° to the horizontal, down toward

the lateral margin (Figure 5a); postgonite with paired apical macrosetae of nearly equal length, the inner macroseta being slightly more dominant and curved at the apex than the straight outer macroseta, and postgonite with basal extremity more distal to the apical macroseta than the length of the dominant apical macroseta (Figure 5a arrows).

Description. Colour: Overall impression: dorsally brown, laterally and ventrally pale yellowish-tan to pale yellowish-cream, with pale-tan legs and orange-tan fascia on notum. **Head:** frons, vertex and upper occipital sclerite brown; parafacial tan, face, peri-epistomal area, gena and lower occipital sclerite pale-tan; mouthparts pale yellowish-cream. **Thorax:** notum predominantly brown, with two irregularly margined orange-tan fascia positioned along dorsocentral macrosetae (Figure 1c); scutellum pale brown, not significantly contrasting with notum, with ill-defined yellow v-shape either side of dark brown midline; pleurites pale-tan with ill-defined brown smudges on anepisternum, anepimeron, laterotergite and posterodorsal margin of katepisternum - ventral katepisternum entirely pale; mediotergite and subscutellum brown; legs pale yellowish-tan with dense series of short black background microsetae besides longer macroseta used for chaetotaxy (see diagnosis); wings with pale brown veins and membrane suffused with pale brown; microsetae on wing veins short and black. **Abdomen:** *T*₁ pale and membranous at base, rest of abdomen brown dorsally, tergites having pale grey-brown pruinescence on basal and lateral margins; sternites pale yellowish-tan with fine brown microsetae; epandrium brown; cerci pale nearly translucent tan.

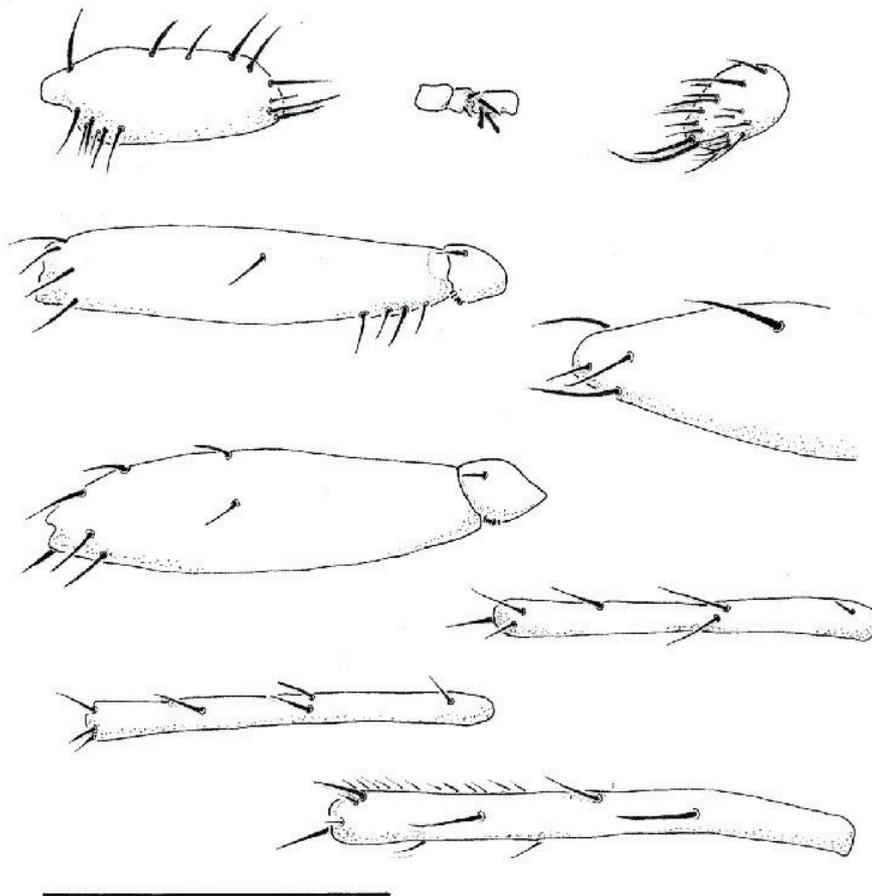


Figure 2. Chaetotaxy of legs, *Lonchoptera pseudolutea* n.sp., ♂ specimen CaBoL101655; a fore-coxa anterior view; b fore-tarsomeres t₁-t₃ ventral view; c mid-coxa ventral view; d - h anterior view; d fore-femur; e mid-femur; f apex of hind-femur; g fore-tibia; h mid-tibia; i hind-tibia dorsal view. Scale bar = 1mm.

Head: more-or-less oval in dorsal and ventral views consistent with generic character state, ocellar triangle slightly raised and protruding; antennae wholly dark brown, the pedicel and postpedicel closely attached, forming a globular association, with remaining segments forming thin arista; vertical macrosetae missing in holotype, but black in those specimens where these are present; 1 pair interfrontal macrosetae strongly curved; frontal macrosetae strongly developed curving over antennal bases; anterior half of peristomal series black, the latter progressively becoming paler, brown laterally then yellowish posterior to epistomal cavity; postocellar macrosetae pale brown, weakly developed; at most a few dorsal macrosetae of postorbital series dark brown to black, remainder paler. Palpus obscured by mouthparts retracted into epistomal cavity.



Figure 3. Cyrovial in which the holotype is stored.

Thorax: 3+3 dorsocentral (dc) macrosetae, first presutural situated well forward on notum directly behind median occipital sclerite and first postsutural situated close to suture; 1 postpronotal (*pprn*) macroseta, 2 posthumeral macrosetae inserted above and behind level of *pprn* in lateral view; 2 notopleural macrosetae inserted closer to suture than to posterior posthumeral macrosetae and anterodorsal notopleural twice as thick and more than 30% longer than the posteroventral seta; 1 postsutural intra-alar macroseta dorsal to wing base and 1 intra-alar adjacent to short suture anterior to scutoscutellar suture, 1 pair apical scutellar macrosetae. Wings: *C*, *R*₁, *R*₄₊₅, apical third of *M*₁, all of *M*₂, *M*₄ and *CuA*+*CuP* with short black evenly spaced dorsal microsetae, sparser on veins of the medial and cubital-anal sectors; membrane covered dorsally by dense, fine microsetae. Haltere oblong in shape, pale buff to creamy white in colour; about as long as apical aristomere; knob ob lanceolate, twice as long as stem and base combined.

Chaetotaxy of legs (Figure 2): fore-coxa with 4 basal macrosetae well developed and stronger than background microsetae present throughout rest of coxa, 1 strong *d* macroseta on basal third, 2 macrosetae midway, 2 beyond midway and 3 stronger marginal macrosetae at apex; fore- and mid-trochanters bear 1 short *ad* pre-apical macroseta and at the ventral apex, four short, thickened macrosetae; fore-femur with 3 *d* macrosetae (1 just beyond midway, 1 in apical third and 1 pre-apical), 1 small *a* macroseta just beyond midway, 1 pre-apical *a* seta, 1 pre-apical *v* macroseta and 1 stronger pre-apical *pv* macroseta; fore-tibia with 1 basal *d* seta, 2 *d* macrosetae at one third and two thirds positions, 1 *pd* macroseta adjacent to dorsal-most of these and three apicals (1 each of *d*, short *av* and long *v*); male fore-tarsus *t*₁ with 1 apical *pv*, *t*₂ with 1 short apical *pv* and *t*₃ with 3 stout blunt basal macrosetae (1 each of *av*, *v*, *pv*) (females lack stout blunt macrosetae); mid-coxa 1 strong *d* macroseta about midway, 2 *d* macrosetae beyond midway, 3 stronger marginal macroseta at apex and 1 long *pv* apical that curves outward apically; mid-femur with up to seven serial fine macrosetae of alternating lengths, with staggered insertions along ventral margin, 1 *a* macroseta midway, 1 *d*, 1 *ad* 1 *a* and 1 *v* pre-apically; mid-tibia with 1 short basal *d*, 1 long *ad* in basal third, 1 shorter *pd* a little beyond that, 1 *ad* at two thirds position, 1 pre-apical *ad*, 1 short *d* and 1 long *v*

apical to that; mid-tarsus with short *av* and *pv* apicals on each segment; hind-coxa with 4 laterals and an apical fringe of finer macrosetae; hind-femur 1 *ad* at two thirds position, 1 *d*, 1 *a*, 1 *av* pre-apically, 1 *a* apical to those; hind-tibia with two *d* macrosetae at one third and two third positions, 1 *pd* midway between the two *d*, 2 *pv* at midway and beyond two thirds position and row of about ten short serial *p* microsetae from midway to apex, 1 *pd* and 1 strong *v* pre-apical seta; hind-tarsus with strong basal *av* and *pv* macrosetae and weaker *av* and *pv* apicals.

Abdomen: *T*₁ pale and membranous at base, macrosetae short and black, slightly longer on posterior margins of tergites, each tergite with 1 long posterolateral macrosetae on each side, these longer on *T*₃₋₅. Epandrium surface scattered with short, black macrosetae; apex of cerci reach mid-*S*₃, marginal macrosetae dense and black, those at apex slightly curved ventrally (that is, dorsally in respect to cercus), cercus sub-triangular apically with distal margin angled, at approximately 30° to horizontal, down toward lateral margin (Figure 5a); postgonite with paired apical macroseta of nearly equal length (Figure 6), inner macroseta being slightly more dominant and curved at the apex than the straight outer seta; postgonite with basal extremity more distal to apical macroseta than length of dominant apical macroseta (Figure 5a arrows).

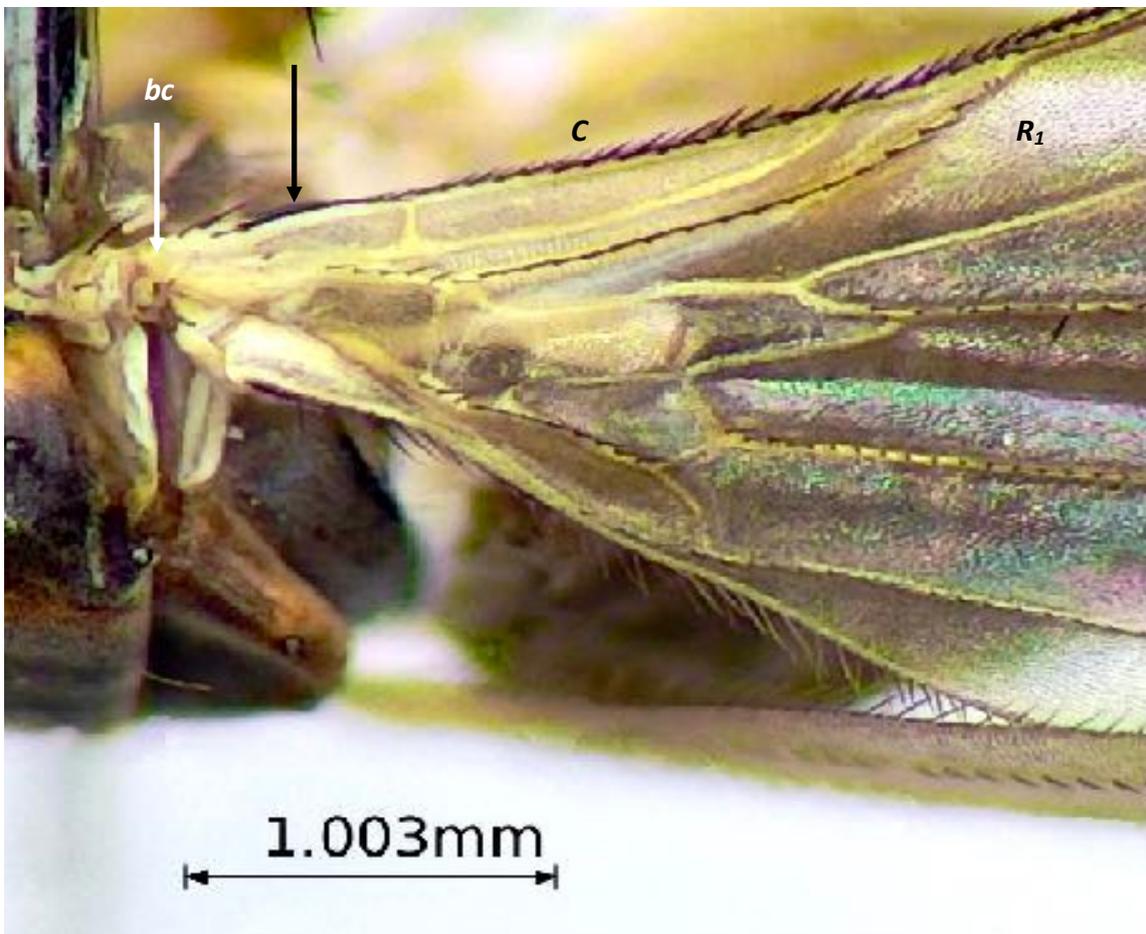


Figure 4. Wing base of ♂ *Lonchoptera pseudolutea* n.sp., specimen CaBoL101655; arrow indicates position of long basal seta on costal vein (C); bc = basicosta; R₁ = first radial vein.

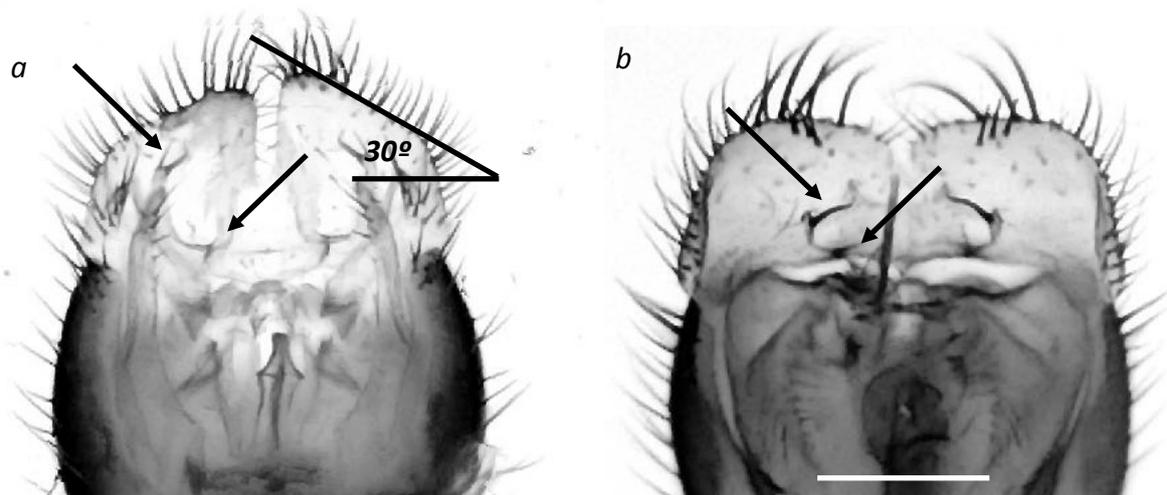


Figure 5. Ventral view of ♂ genitalia; a. *Lonchoptera pseudolutea* n.sp., holotype specimen CaBoL101542; b. *Lonchoptera lutea* Meigen in Panzer, 1809, specimen CaBoL101534; top arrow indicates position of paired apical setae and lower arrow indicates position of basal extremity on postgonite. Scale bar = 0.5mm.

Variation: overall colour ranges from notum and abdomen brown, with pale-tan legs and orange-tan fascia on notum to specimens with more extensive pale markings. Head: frons, vertex and upper occipital sclerite brown; parafacial tan, face, peri-epistomal area, gena and lower occipital sclerite pale-tan. Second and third presutural *dc* shorter than first, 3 postsutural *dc* better developed, longer than arista. **Female:** Based on 19 ♀♀ paratypes: similar to males, with the following differences: *v* or *pv* macrosetae near mid-point and preapical *ad* always absent, at most with small *av* macroseta one third before apex; fore-tarsomere three lacking blunt macrosetae; wings broadly ovate, not abruptly narrowing toward apex and anal vein usually ending at level of, or distal to, fork of vein *M*.

Material examined: The species is presently known only from Georgia.

Holotype ♂ CaBOL ID: 1016542: GEORGIA: Lesser Caucasus Region, Adjara Province, Kintrishi, 41°44'15.9684"E 41°58'42.888"E, 05.v.-20.v.2018., Malaise trap 8, 403m, river bank, leg. GGBC team [ZMFK].

Paratype series: 48 ♂♂ 37 ♀♀ GEORGIA: 20 ♂♂ 13 ♀♀ Lesser Caucasus Region, Adjara Province, Kintrishi, 41°44'15.9684"E 41°58'42.888"E, 20.iv.-05.v.2018, Malaise trap 8, river bank 403m, leg. GGBC team [♂: CaBOL ID 1016557 & ♀: CaBOL ID 1016558 were relaxed and pinned [AEWC], the remainder stored in ethanol equally divided between ISUG & ZMFK]; 2 ♂♂ 2 ♀♀ same data but dated 05.v.-20.v.2018; 1 ♂ 1 ♀ same data dated 29.vi.-13.vii.2018; 1 ♀ same data dated 27.vii.-10.viii.2018; 1 ♂ 1 ♀ same data dated 21.ix.-05.x.2018; 1 ♂ same data dated 05.x.-19.x.2018; 1 ♂ 1 ♀ from 41°45'43.5456"E 41°58'42.5678"E, Malaise trap 7, river bank 318m, dated 20.iv.-05.v.2018. 1 ♂ 2 ♀: Lagodekhi Reserve, Mt. Kudigora, 41°52'57.84"N 46°19'18.66"E, 1841m, 3.v.2014. G. Japoshvili, H4 [♂: CNC474233; ♀♀: CNC489482, CNC474261]; 3 ♂ 1 ♀ same data but dated 5-15.v.2014 [♂♂: CNC1582480, CNC1778943, CNC1778943; ♀: CNC489467]. 1 ♂: Lagodekhi Reserve, Mt. Kudigora, 41°53'52.98"N 46°20'1.98"E, 2230m, 25.v-4.vi.2014, Malaise trap. G. Japoshvili, H5 [CNC1792301]; 1 ♀ same data but dated 4-14.vi.2014 [CNC487912]. 6 ♂ 5 ♀: Lagodekhi Reserve, Mt. Kudigora, 41°54'22.26"N 46°20'0.24"E, 2559m, 23.v-13.vi.2014. G. Japoshvili, H6 [♂♂: CNC473221, CNC474349, CNC474412, CNC488068, CNC1583232, CNC488080; ♀♀: CNC474351, CNC474353, CNC474358, CNC47441, CNC488072]; 3 ♂ 1 ♀ same data but dated 25.vi.-5.vii.2014 [♂♂: CNC473065, CNC473076, CNC1147319; ♀: CNC1777977]; 1 ♂ same data but dated 25.viii-4.ix.2014 [CNC479620]. 1 ♀: Kvemo Kartli region, Tskhrakudaani, Algeti River, 41°40.534N 44°22.772'E, 15.vii.2019, above (W of) the village 1010m, leg. Kovács, Murányi & Vinçon [NHMM]. 3 ♂ 1 ♀: Adjara, Khichauri, Chvanistskali River, 41°38.715'N 42°07.990'E, 25.ix.2019, at the bridge 350m, leg. P. Manko et al.

[LMEE: 1♂ 1♀; NHMM: 2♂]. 4♂ 6♀: Batsara Nature Reserve Batsara River and its sidebrook, 42°13.372'N 45°18.122'E, 2.v.2019, 810m, leg. J. Oboňa et al. [NHMM].

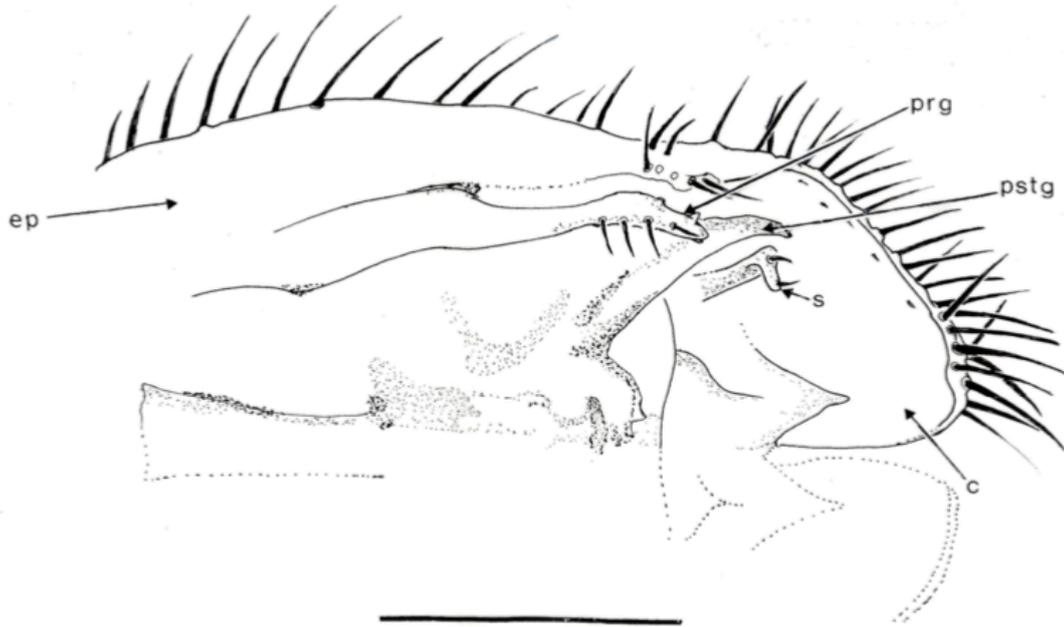


Figure 6. Ventral detail of left half of genitalia of *Lonchoptera pseudolutea* n.sp., holotype ♂ specimen CaBoL101542; c = cercus, ep = epandrium, prg = pregonite, pstg = postgonite, s = sub-epandrial sclerite. Scale bar = 0.5mm

REMARKS

Lonchoptera pseudolutea clearly shares a close affinity with *L. lutea*. Specimens of *L. lutea* (Figures 1a & b) can be distinguished from *L. pseudolutea* (Figures 1c & d) by the following character states: antennae wholly black; outer vertical macroseta yellow, rarely black; ventral katepisternum fasciate (exceptionally pale) (Figure 1b, arrow); fore-tibia with two *d* macrosetae, lacking *pd* seta, cerci truncate (sub-square) apically with distal margin at most slightly angled in toward the centre (Figure 5b); postgonite with paired apical macroseta unequal in length, the inner macroseta being strongly developed and more dominant and sinuously curved than the weaker outer macroseta that is curved in an arc toward the midline, and postgonite with basal extremity closer to the apical macroseta than the length of the dominant apical macroseta (Figure 5b arrows; also see Vaillant 1989, figure 5). There is little noticeable size comparison between the two species and *L. lutea* specimens examined are not significantly larger than the new species (Table 2) for body length, wing length nor *M*-ratio..

	<i>Lonchoptera pseudolutea</i> sp. nov. n = 46 ♂ & ♀	<i>Lonchoptera lutea</i> Meigen in Panzer, 1809 n = 27 ♂ & ♀	<i>t</i> -test outcome at <i>p</i> = 0.01
Mean body length:	3.16±0.21	3.23±0.31	ns
Mean wing length:	3.77±0.3	3.63±0.33	ns
Mean <i>M</i>-ratio:	0.62±0.09	0.57±0.06	ns

There is no significant difference between species for body length, wing length nor *M*-raCo (*p* > 0.01).

Table 2. Student’s *t*-test results for mean body length (mm), wing length (mm) and ratio between *M*₁₊₂ and *M*₂ for grouped males and females of *Lonchoptera lutea* Meigen in Panzer, 1809 compared with the type series of *Lonchoptera pseudolutea* sp. nov.

It is perhaps appropriate to compare the new species with *L. nitidifrons*, as it has certain similarities with the *L. lutea-pseudolutea* pair. For example, a single *pd* seta is present on the fore tibia of both *L. nitidifrons* and *L. pseudolutea*, whereas, it is absent in specimens of *L. lutea*. As noted in couplet eight of the on-line key (which now needs to be amended concerning the status of the *pd* macroseta on the fore tibia), *L. nitidifrons* is distinct from the *L. lutea-pseudolutea* pair in a number of ways. *L. nitidifrons* has the antennal scape and pedicel yellow, as opposed to entirely black or dark brown. The male hypopygium of *L. nitidifrons* is small, reaching only to the end of sternite 4 (compared to large in the *L. lutea-pseudolutea* pair, in which the hypopygium extends back to the end of sternite 3). In addition, the apical process of the postgonite of *L. nitidifrons* extends beyond the cerci and bears no macrosetae, whereas the *L. lutea-pseudolutea* pair, the postgonite has macrosetae and does not extend beyond the cerci. In female *L. nitidifrons* the wings narrow abruptly toward tip and the anal vein usually ends proximal to fork of vein *M*, whereas in the *L. lutea-pseudolutea* pair the wings broadly ovate toward tip and the anal vein usually ends at level of or distal to the fork of vein *M*.

Updates to the key to species of *Lonchoptera* of Europe (after Beuk 2021).

Some unique characters of *L. nevadica* (see below) enable us to include it in this update of the online key. No such unique characters were described for *L. vaillanti*, however, and until that species can be studied in more detail we refrain from incorporating it into the key. When all species have been studied it will be possible to publish a full key that, for example, will also include figures of the genitalia.

Replace couplet 1 with this couplet.

- 1. Vein *R*₁ with 1-2 dorsal macrosetae considerably enlarged, at least twice as long and thick as other microsetae along the vein and located either on the base or near the apex of vein *R*₁..... **2**
- Vein *R*₁ with dorsal microsetae of equal length and thickness throughout **3a**

Insert the following couplet after couplet 2.

- 3a. Arrangement of macrosetae on mid-femur elaborated to include 8 long serially arranged *v* macrosetae from femur base to midway where these merge in the distal third with a cluster of about 23 *v* to *pv* macrosetae (Vaillant 1989, figure 34); mid-tibia with 16-18 *v* in basal half

and 5 *d* in distal half, in addition to 5 pre-apical macrosetae; in addition: male tarsomere 3 of fore-tarsus with dorso-apical projecting lobe reaching midway along *t*₅ (Vaillant 1989, figure 32) ***L. nevadica* (Vaillant, 1989)**

- Mid-femur and mid-tibia with isolated and fewer macrosetae, not arranged in clusters as above; male tarsomere 3 of fore-tarsus without dorso-apical projecting lobe **3b**

Rename couplet 3 to couplet 3b.

Replace couplet 9 with this couplet.

9. Outer vertical macroseta yellow, rarely black; katapisternum fasciate (exceptionally pale) in ventral view (Figure 1*b*, arrow); fore-tibia with two *d* macrosetae, lacking *pd* seta. Male cerci truncate (sub-square) apically with distal margin at most a little angled in toward the centre (Figure 5*b*); postgonite with paired apical macrosetae unequal in length, the inner macroseta being strongly developed and more dominant and sinuously curved than the weaker outer macroseta that is curved in an arc toward the midline, and postgonite with basal extremity closer to the apical macroseta than the length of the dominant apical macroseta (Figure 5*b* arrows; also see Vaillant 1989, figure 5); antennae wholly black ***L. lutea* Panzer, 1809**

- Outer vertical macroseta black; katapisternum entirely pale in ventral view (Figure 1*d*, arrow); fore-tibia with *pd* macroseta adjacent to dorsal-most of 2 *d* macrosetae. Male cerci sub-triangular apically with distal margin angled, at approximately 30° to the horizontal, out toward the lateral margin (Figure 5*a*); postgonite with paired apical macrosetae of nearly equal length, the inner macroseta being slightly more dominant and curved than the straight outer macroseta, and postgonite with basal extremity more distal to the apical macroseta than the length of the dominant apical macroseta (Figure 5*a* arrows); antennae wholly dark brown.

***L. pseudolutea* sp. nov.**

Please note that the online key (Beuk 2021) will be edited in due course to reflect the above updates.

DISCUSSION

Few publications have dealt with Lonchopteridae from Georgia. At the time the Palaearctic Catalogue of Diptera was written (Andersson 1991), Georgia fell into the Transcaucasus geographical zone (TC) south of the main Caucasus ridge. Although further subdivisions were allocated (e.g. *Arm* for Armenia, *Az* for Azerbaijan and *Ge* for Georgia), Andersson (1991) did not apply them, listing *L. bifurcata* (Fallén, 1810) and *L. lutea* from TC with no further refinement. In clarification, Oboňa *et al.* 2019 listed *L. lutea* and *L. tristis* from Azerbaijan and only *L. lutea* from Georgia, the latter confirmed by the Caucasus Barcode of Life (CaBOL) project. The identity of a second species in Georgia is clarified in this paper.

Despite the ease with which members of the family can be quickly identified at the rank of family, the identification of specimens within the family is historically bedevilled with errors due to similarity of overall appearance (Figure 1) and variation of colour within species (Figure 7). This has led to numerous misidentifications and uncertainty about the correct placement of synonyms. And indeed, over one hundred years ago De Meijere (1906) wrote:

“Die Bestimmung der Lonchoptera-Arten ist noch immer mit bedeutenden Schwierigkeiten verbunden. Es wird dies durch verschiedene Ursachen veranlasst, an welchen teils die Natur selbst, teils die Autoren Schuld sind. Die Arten sehen einander zum Teil recht ähnlich, und die zunächst sehr auffallenden Unterschiede in der Färbung ergeben sich bei näherer Untersuchung zahlreicher Exemplare als zur Unterscheidung überhaupt wenig brauchbar. Gerade einige der häufigsten Arten zeigen bald hellere, grösstenteils gelbe, bald dunkle graue Formen, dazwischen allerhand Übergänge,

und bilden dadurch fast parallele Farbenreihen, was grosse veranlasst hat in einer Gattung, wo man die Arten meistens nach den Farben zu trennen geneigt war. Noch in 1899 meinte Bezzi, dass die Verschiedenheiten sich in dieser Gattung fast auf die Farben reducirten, indem auch die Beborstung bei den Arten ähnlich ist. Die Farben sind jedoch in hohem Grade variabel; dass sie sich nach dem Tode stark ändern, wie Schiner meint, glaube ich kaum."

[The identification of the *Lonchoptera* species is still associated with significant difficulties. This is caused by various issues, some of which are due to nature itself and partly to the authors. Some of the species look very similar to one another, and the initially very noticeable differences in coloration emerge on closer examination of numerous specimens as being of little use for differentiation. Some of the most common species in particular show lighter, mostly yellow, sometimes dark grey forms, with all sorts of transitions in between, and thus form almost parallel rows of colours, which has caused great confusion in a genus where most were inclined to separate the species according to colour. As late as 1899, Bezzi thought that the differences in this genus were reduced almost to the colours, since the bristles in the species are similar. The colours, however, are highly variable; I hardly believe that they change a lot after death, as Schiner thinks.] De Meijere (1906, p.44)

This is very clear in Plate LXVIII of Meigen's unpublished works (Morge 1975), reproduced here with permission (see Acknowledgements) as Figure 7, which superficially depicts ten species of *Lonchoptera* (Table 3), while in reality, taking the synonymies listed into account, only *L. bifurcata*, *L. lutea* and *L. tristis* are illustrated.

Contrary to Bezzi (1899) who considered the colours to be important and the arrangement of bristles to be misleading, De Meijere (1906) began to suspect the numerous colour forms of *L. lutea* in particular were the result of large amounts of variation within the species. Andersson (1966) also noted an array of mixed identifications in the Zetterstedt collection, largely due to interpretation of colour varieties.

Becker (1915) - probably following De Meijere's (1906) lead - and Curran (1934a,b) - probably following Becker's (1915) lead - recognised that colour was not much help in diagnosing species. Becker (1915) preferred to use the number of dorsocentral macrosetae (now also known to be of little diagnostic value in this genus), while Curran (1934a,b) noted that leg and wing chaetotaxy, shape of the wing, colour of the vertical postorbital macrosetae were of far greater diagnostic value. These characters have been applied in later keys (e.g. Barták 1986, Beuk 2021) and are generally accepted in modern keys and diagnoses.

Characters derived from male (and in some cases female) genitalia have been added to most modern diagnoses providing further clarification of identity (see for example Klymko & Marshall 2008), but identification is still plagued by loss of macrosetae, as these appear to readily detach during collection of specimens, rendering near useless the chaetotaxy unless high magnification is used to carefully locate the alveoli, although this only solves the problem of the location of the lost macrosetae, not their colour. This is essential to good identification in this family.

Going forward, it is clear that chaetotaxy and genitalic characters combined are essential diagnostic features, sometimes supplemented by useful colour-based character states and occasional other structural characters. Morphometrics have not been generally applied and some characters (especially in the male genitalia) suffer from confusing terminology and lack of assessment across all species.

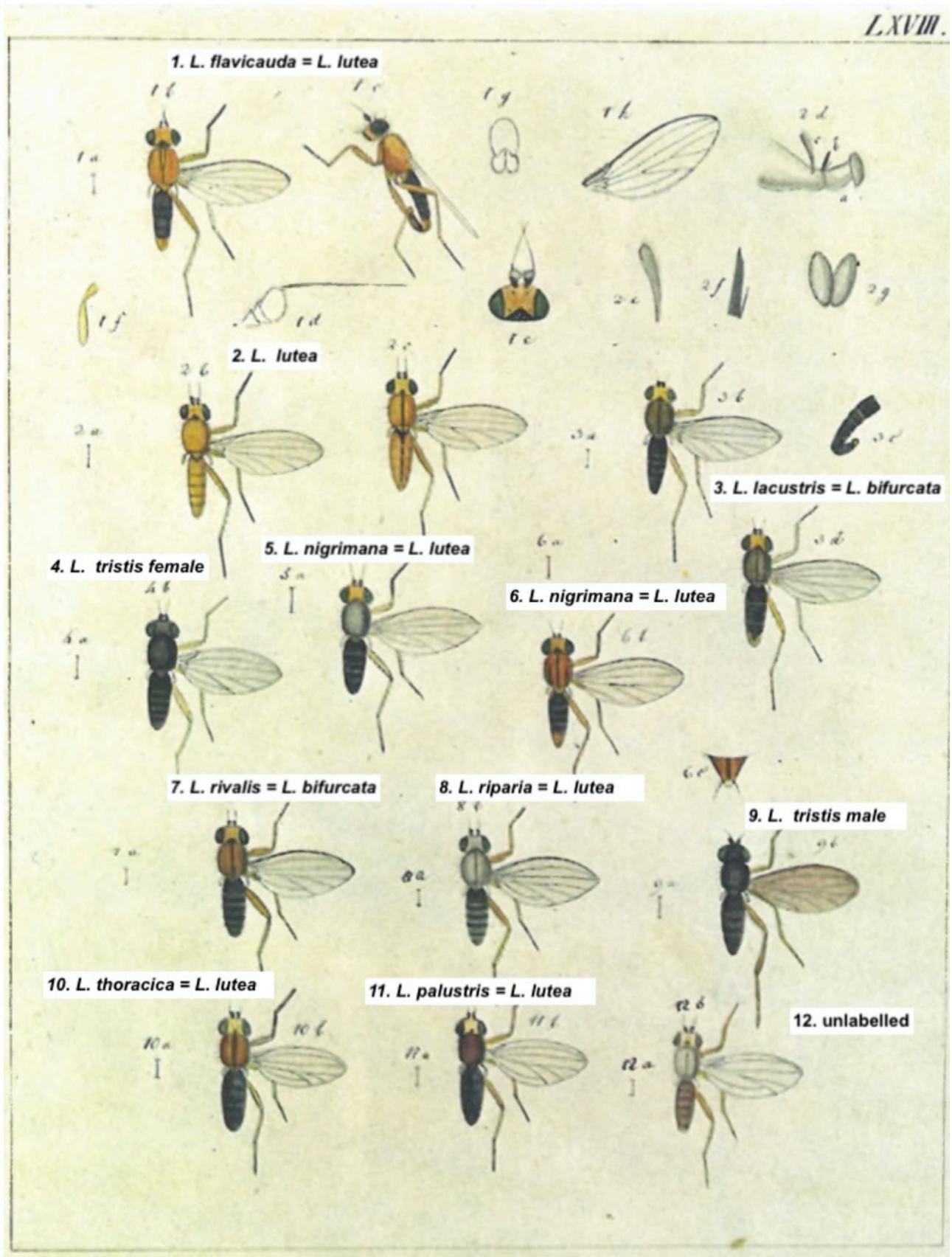


Figure 5. Ventral view of ♂ genitalia; a. *Lonchoptera pseudolutea* sp.nov., holotype specimen CaBoL101542; b. *Lonchoptera lutea* Meigen in Panzer, 1809, specimen CaBoL101534; top arrow indicates position of paired apical macrosetae and lower arrow indicates position of basal extremity on postgonite. Scale bar = 0.5mm.

Figure number	Meigen identification	Valid species	general colour form
1	<i>L. flavicauda</i>	<i>L. lutea</i>	brown & grey
3	<i>L. lacustris</i>	<i>L. bifurcata</i>	dark grey
2	<i>L. lutea</i>	<i>L. lutea</i>	brown
5	<i>L. nigrimana</i>	<i>L. lutea</i>	light & dark grey
11	<i>L. palustris</i>	<i>L. lutea</i>	dark grey
6	<i>L. punctum</i>	<i>L. lutea</i>	brown & grey
8	<i>L. riparia</i>	<i>L. lutea</i>	light grey
7	<i>L. rivialis</i>	<i>L. bifurcata</i>	brown & grey
10	<i>L. thoracica</i>	<i>L. lutea</i>	brown & grey
4♀, 9♂	<i>L. tristis</i>	<i>L. tristis</i>	dark grey
12	unlabelled	not possible to identify from figure	light grey & brown

Table 3: Valid names for figures of *Lonchoptera* species depicted in Plate LXVIII (=68); (Meigen, unpubl.; see Morge 1975) with an indication of the colour form for thorax and abdomen respectively.

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