European Journal of Taxonomy 823: 48–63
https://doi.org/10.5852/ejt.2022.823.1813
ISSN 2118-9773
www.europeanjournaloftaxonomy.eu
2022 · Ježek J. *et al.*

This work is licensed under a Creative Commons Attribution License (CC BY 4.0).

Research article

urn:lsid:zoobank.org:pub:69BA2C5F-AC2D-471B-AA38-DC11D3A04BE1

New synonymy and two new species of Caucasian moth flies (Diptera, Psychodidae, Psychodinae) from Azerbaijan and Georgia

Jan JEŽEK [1], Jozef OBOŇA [2,*] & Peter MANKO [3]

[1] National Museum, Department of Entomology, Cirkusová 1740, CZ – 193 00 Praha 9 – Horní Počernice, Czech Republic.
[2,3] University of Prešov, Faculty of Humanities and Natural Sciences, Department of Ecology, 17. novembra 1, SK – 081 16 Prešov, Slovakia.

[*] Corresponding author: jozef.obona@unipo.sk
[1] Email: jan.jezek@o2active.cz
[3] Email: peter.manko@unipo.sk

[1] urn:lsid:zoobank.org:author:FB44ACB7-84CD-4787-B8B2-B2472384D6BC
[2] urn:lsid:zoobank.org:author:4A793E19-8C62-4897-81EF-29B2279059EB
[3] urn:lsid:zoobank.org:author:2989474D-09DB-4C6E-B2FA-71C9436EABC5

Abstract. Psychodid specimens from one of the world's biodiversity hotspots – the Caucasus region – were sorted from samples collected during field work in 2019. *Pneumia fuehzulii* sp. nov. (from two localities in Azerbaijan) and *Thornburghiella salihi* sp. nov. (from one locality in Azerbaijan and four sites in Georgia) are described from this material. Differential diagnoses are given and some morphological characters illustrated. *Sijaricia* Krek, 1999, syn. nov. of *Thornburghiella* Vaillant, 1982 is proposed and *T. erinacea* (Krek, 1971) comb. nov. from *Ulomyia* Walker, 1856 is suggested.

Keywords. Taxonomy, Pericomaini, *Thornburghiella*, *Pneumia*, *Ulomyia*, *Sijaricia*, Caucasus, Palaearctic region, biodiversity hotspot.

Ježek J., Oboňa J. & Manko P. 2022. New synonymy and two new species of Caucasian moth flies (Diptera, Psychodidae, Psychodinae) from Azerbaijan and Georgia. *European Journal of Taxonomy* 823: 48–63. https://doi.org/10.5852/ejt.2022.823.1813

Introduction

Biodiversity, as a key resource of the Earth, provides extremely important ecosystem functions that ensure sustainable life on our planet (e.g., Humphries *et al.* 1995). The Caucasus region with an exceptional richness of endemic species belongs to the top 35 biodiversity hotspots on earth and like other biodiversity hotspots, critically prone to biodiversity loss (e.g., Myers *et al.* 2000; Krever *et al.* 2001; Mumladze *et al.* 2019). Paradoxically, there are particularly large geographical gaps in biodiversity information in the Caucasus countries (Wetzel *et al.* 2018), and the dipterans of this region are exemplary in this respect (Oboňa *et al.* 2019). Much more attention should be devoted especially to preserved areas in nature reserves (NR), as evidenced, for example, by the high number of species

found at a single locality in the Batsara Nature Reserve (Ježek *et al.* 2021b). Another new species from this NR is described in this work.

In the Diptera Linnaeus, 1758 family Psychodidae Newman, 1834, the genus *Pneumia* Enderlein, 1935 has been placed in the tribe Pericomaini Enderlein, 1935 on the basis of both molecular and morphological studies, although the precise limits of this tribe remain unclear (Kvifte 2018). Many species of *Pneumia* were originally described in *Satchelliella* Vaillant, 1979. Omelková & Ježek (2012) discussed the history of synonymy in this genus and published a summary checklist of Holarctic species of *Pneumia*, but *P. reghayana* Boumezzough & Vaillant, 1986 (from Morocco), *P. pellucida* Wagner, 2013 (from Turkey, Wagner *et al.* 2013), and *Pneumia mladeni* Ježek & Oboňa, 2019, from Bulgaria, must be added. The genus *Pneumia* is now represented by 61 taxa in the Holarctic and Oriental Regions, and 58 taxa occur in the Palaearctic Region, including the species herein described (Omelková & Ježek 2012). The genus *Thornburghiella* Vaillant, 1982 now comprises 45 species from the Holarctic and Oriental Regions – see Oboňa *et al.* (2017), where the historical taxonomical problems of this genus are discussed. Ježek's (1992) list of species of *Thornburgiella*, including four new species from Turkey and Uzbekistan, was supplemented by eight species on the basis of Wagner & Joost (1985), Ježek (1993, 1994) and Wagner (1994, 2003) from Armenia, China, Kazakhstan, Mongolia, Russia (Far East) and Tajikistan.

The present paper increases the number of world species of *Thornburghiella* to 47, incl. *T. salihi* sp. nov. from Azerbaijan and Georgia, as well as *T. erinacea* (Krek, 1971) comb. nov. from Balkan (Bosnia and Herzegovina).

With the present paper, the checklist of psychodid flies increases to 83 species for Georgia and to 62 for Azerbaijan (compared with Ježek *et al.* 2018, 2021b and Oboňa *et al.* 2019).

Material and methods

Dipterans were collected by J. Oboňa, P. Manko (Slovakia), T. Kovács, D. Murányi (Hungary) and G. Vinçon (France) in two periods (Apr.–May and Jul. 2019) by sweep-netting from vegetation growing along watercourses and lakes.

The captured specimens were preserved in 75% ethanol in the field. In the laboratory, specimens of Psychodidae (cleared in chloralphenol, treated in xylol and mounted on glass slides in Canada balsam) were identified by J. Ježek and deposited at the National Museum (Natural History Museum), Department of Entomology, Prague, Czech Republic. The slides are numbered with two separate series of numbers: Inv. No. = Inventory Slide Number of the family Psychodidae, and Cat. No. = Catalogue Numbers of slides of types and historical specimens of Diptera and are included in the Diptera collection (National Museum Prague collections – NMPC, see Tkoč *et al.* 2014). The maximum wing length is approximately equal to the distance from the line connecting the base of the basal costal node and neala to the wing apex. The ratios of the lengths of the femur, tibia and first tarsal segment, and one of the fore, middle and hind legs are indicated by P_1, P_2 and P_3, respectively. Morphological terminology for Diptera generally follows that of Cumming & Wood (2009, 2017), Wagner & Ibáñez-Bernal (2009); hyaline sensillae on antennal flagellomeres are termed ascoids (e.g., Kvifte & Wagner 2017); the ventral epandrial plate or sclerite and gonocoxal apodemes are used as in Duckhouse (1990) and Quate & Brown (2004). Wing abbreviations CuA_1 and CuA_2 follow Stark *et al.* (1999). Male genital terminology for Pericomaini is used here mainly, sensu Kvifte *et al.* (2016), the distiphalic spatula = terminology of Kvifte *et al.* (2016: figs c–d). Spatula = terminal rounded region of aedeagal complex placed distally to parameral sheath. We use the term "Transcaucasia" (Armenia, Azerbaijan and Georgia) according to the Catalogue of Palaearctic Diptera; for more details, see Wagner (1990).

Results

Class Insecta Linnaeus, 1758
Order Diptera Linnaeus, 1758
Suborder Psychodomorpha Hennig, 1968
Family Psychodidae Newman, 1834
Subfamily Psychodinae Newman, 1834
Tribe Pericomaini Enderlein, 1935

Genus ***Pneumia*** Enderlein, 1935

Pneumia Enderlein, 1935: 247. Type species: *Pericoma palustris* Meigen, 1804, original designation.
Satchelliella Vaillant, 1979: 249. Type species *Pericoma mutua* Eaton, 1893, subsequent designation p. 255. (*Satchelliella* Vaillant, 1971, was unavailable without a designation of a type species).

Pneumia – Enderlein 1937: 28. — Duckhouse 1987a: 231 (*Satchelliella* = syn. of *Pneumia*). — Ježek 1997: 63. — Wagner & Beuk 2002: 86. — Ježek & Omelková 2007: 252. — Salmela 2008: 13. — Svensson 2009: 186.
Satchelliella – Salamanna & Raggio 1984: 29. — Wagner 1990: 35. — Wagner & Masteller 1992: 105. — Krek 1999: 7, 304. — Bernotienė 2002: 4.

Only selected data are quoted here, for a complete list of synonymies, see Omelková & Ježek 2012, incl. differential diagnosis.

Pneumia fuehzulii sp. nov.
urn:lsid:zoobank.org:act:07B400D8-6775-4C2E-8B0B-E2BB2D7D4818
Figs 1–20

Differential diagnosis

Pneumia fuehzulii sp. nov. resembles *P. canescens* (Meigen, 1804) in body size, as well as wings, and less distinctly visible characters, such as the shape of aedeagal complex. It clearly differs by stronger CuA_2 (Fig. 13), M_3, CuA_1 and CuA_2 not touched basally. Hypandrium with two swellings in the middle and a deep cleft between them (Figs 8, 16). Gonostyli almost straight (Figs 8, 17–18), distiphallus straight, pointed, extending a little beyond the parameres (dorsal view). Parameres sickle-shaped (Figs 19–20). Apertures of the epandrium small, circular. Remainders of ventral epandrial plate V-shaped, conspicuous (Figs 7, 15). *Pneumia canescens* is readily distinguishable by CuA_2 not strengthened (Jung 1956: 235, fig. 128). M_3, CuA_1 and CuA_2 touched basally. Hypandrium broader in the middle (Jung 1956: 235, fig. 130; Vaillant 1979: tab. lxxxiv, fig. 9). Gonostyli bent (Vaillant 1979: tab. lxxxiv, fig. 9), distiphallus straight, pointed, as long as the parameres, not sickle-shaped. Basal two apertures of epandrium conspicuous (Vaillant 1979: tab. lxxxiv, fig. 9). Remainders of ventral epandrial plate not detected.

Etymology

This species is named in honour of the famous medieval Turkish-Azerbaijan poet Məhəmməd Süleyman oğlu Füzuli.

Material examined

Holotype

AZERBAIJAN • 1 ♂; Qəbələ district, Durca; 41.037750° N, 47.886583° E; 1310 m a.s.l.; 9 May 2019; J. Oboňa *et al.* leg.; Loc. AZE 28; sweep netting, forest edge and brook; slide with a dissected specimen, Cat. No. 34949, Inv. No. 26006; NMPC.

Paratypes

AZERBAIJAN • 3 ♂♂; same collection data as for holotype; slide, some specimens dissected, Cat. No. 34950 to 34952, Inv. No. 26007 to 26009; NMPC • 1 ♂; Balakən distr., Balakən, Mahamalar; 41.7370700° N, 46.4372111° E; 465 m a.s.l.; 9 May 2019; J. Oboňa *et al.* leg.; Loc. AZE 25; sweep netting, open small brook (clay, micro-, mesolithal) and marsh, pasture/forest; slide, Cat. No. 34953, Inv. No. 26010; NMPC.

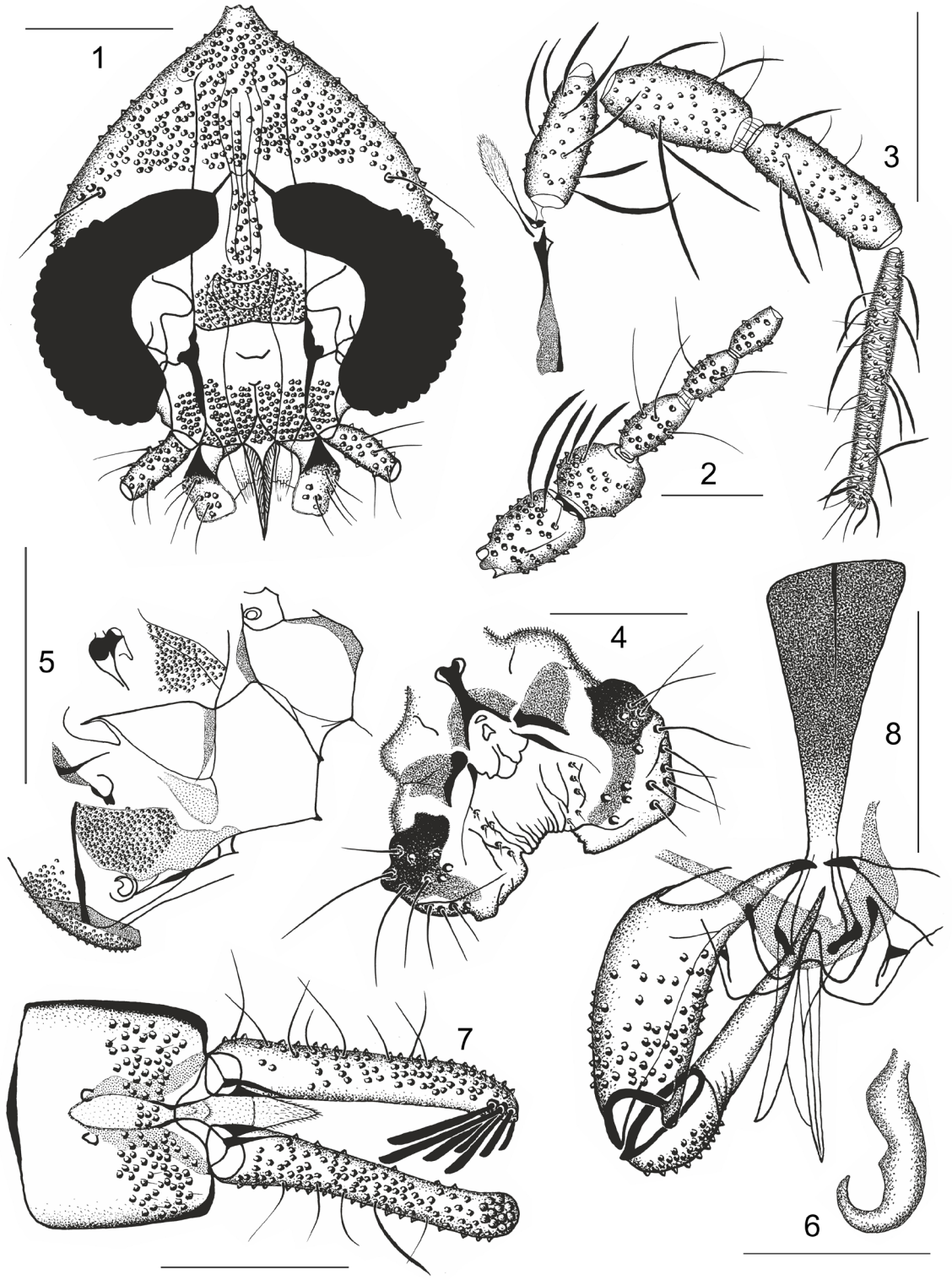
Description

Male

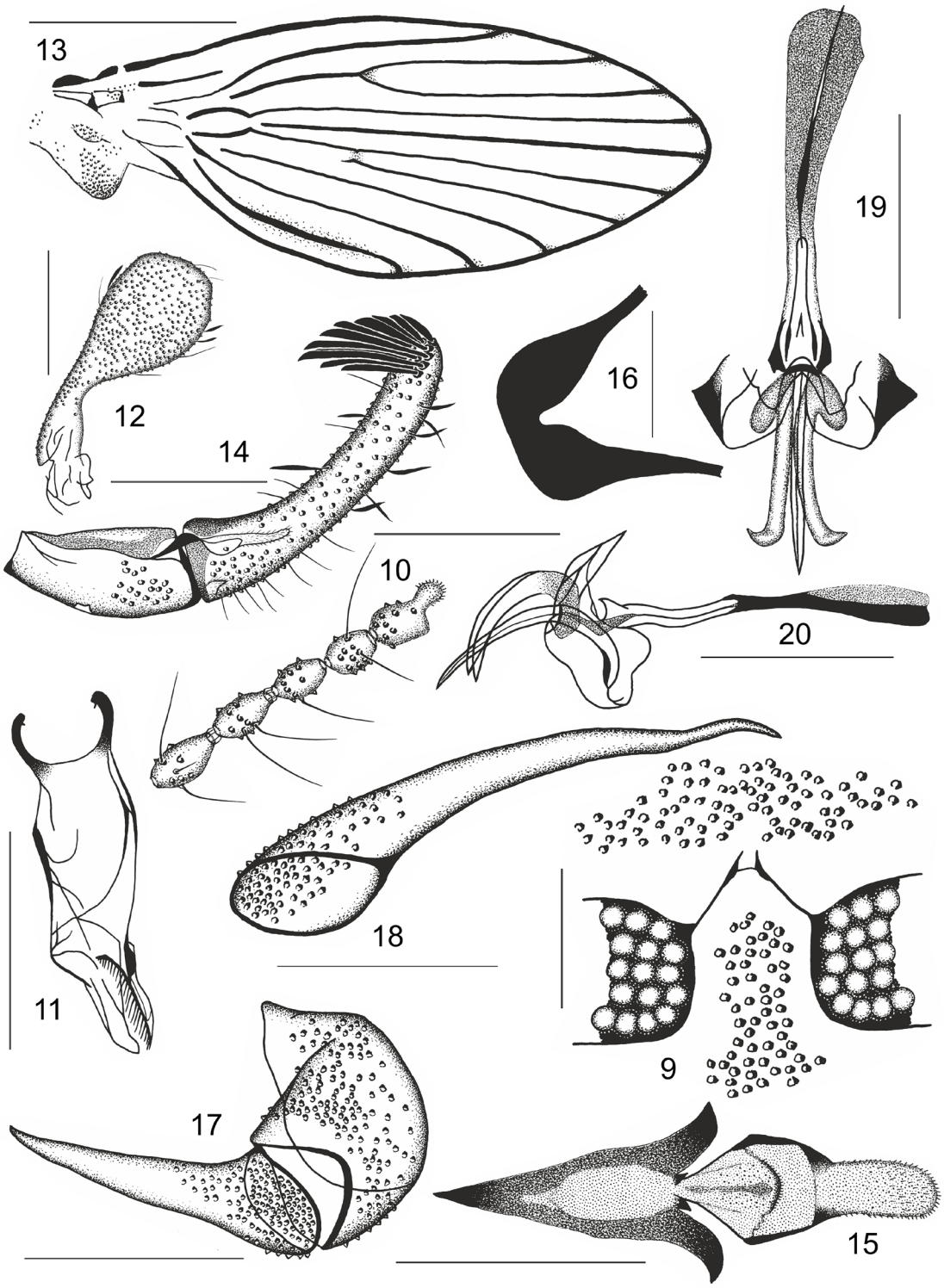
Head. As long as broad (Fig. 1); vertex conically inflated with numerous setae, alveoli almost irregularly spaced over its entire surface, with 3–4 supraocular bristles on dorsal margins of eyes on extreme lateral sides of head. Horizontal border of setae above the upper apices of the eyes developed, slightly convex in the middle. Eyes separated (Figs 1, 9); interocular suture conspicuously sclerotized, inverted V-shaped, sclerotized parts gradually tapering from eyes to median, not fused medially, connected by thin ligament. Eye bridge with 5 facet rows (Fig. 9), divided by the approximate width of 4 facet diameters. Ratio of distance of apices of eyes (tangential points) to minimum width of frons approximately 3.5:1. Frontoclypeus (Fig. 1) with a large almost oval central patch of irregular insertions of setae with narrow medial lobe prolonged to interocular suture. Antennae with scape, pedicel and 14-segmented flagellum (Figs 2, 10) haired. Sensory filaments (ascoids) not observed. Scape a little prolonged, barrel-shaped, 1.2 times as long as ovoid pedicel. Both parts with many narrow scales (for size, see Fig. 2). First flagellomere cylindrical (1.1 times as short as pedicel), medial flagellomeres decreasing in size, spindle-shaped. Apical progressively bulbous, with a globular apiculus (digit), excentric, 2.1 times as short as the bases bearing them. Mouthparts hardly extend beyond basal palp segments. Length ratios of palpus segments 1.0:1.0:1.2:1.8; last palp segment annulate (Fig. 3). For the terminal lobes of labium, as shown in Fig. 4, lines of spines between both lobes are developed, tongue protuberances in between distally are inconspicuous. Cibarium proximally with a pair of conspicuous bent sclerotized arms, ratio of maximum length of cibarium to length of epipharynx 2.4:1 (Fig. 11), labrum pointed.

Thorax. Anepisternum setae patch almost semicircular between spiracle and wing insertion (Fig. 5). Spiracles set high on mesothorax. No thoracic allurement organs, anepimeron with triangular setose patch. Wings (Fig. 13) ovoid, 3.3 mm long in holotype, 3.0–3.1 mm in paratypes, rounded distally, inconspicuously expanded at posterior margin. Membrane of wing generally clear; however, sometimes distal part of cell, fork areas, ends of all veins excl. Sc and middle part of CuA_2 clouded. Strengthened parts of veins: Sc, R_1 (not the start), R_{2+3}, basal cell, R_5, whole CuA_2 and almost all wing veins distally. Radial and medial forks arise at the same level, both forks conspicuously in a basal position to end of CuA_2. R5 ends slightly beyond wing apex. Bases of M_3, CuA_1 and CuA_2 are not connected. Wing index (wing length to width) 2.5. Halteres (Fig. 12) stick-shaped, symmetrical in longitudinal axis, bent and haired, with mass of sensory scales subapically. Ratio of maximum length of halteres to their maximum width 2.7:1. Length ratios of femora, tibiae and first tarsomeres: P_1 2.1:2.3:1.0, P_2 2.3:2.8:1.1, P_3 2.7:3.5:1.2. Paired tarsal claws of P_1 conspicuously backward hooked (Fig. 6) with ventral teeth.

Male genitalia. Basiphallus of the male aedeagal complex (Figs 8, 19–20) straight from dorsal view (incl. some small differences – Fig. 19), proximally spoon-shaped, triangular, narrowed and edging distally (Figs 8, 19), with longitudinal rib proximally, a little arched in lateral view (Fig. 20). Spatula modified from two broad rectangular bases to a parallel inner deep cleft (Figs 8, 19). Distiphallus straight, pointed, bent dorsally in lateral view (Fig. 20), extending a little beyond the parameres (however, distiphallus sometimes two times longer – see paratype Cat. No. 34953 and Inv. No. 26010 from AZE Loc. 25). Parameres sickle-shaped (Figs 19–20). Ratio of length of gonocoxites to length of aedeagal complex (incl. basiphallus) 1:1.9. Gonocoxites cylindrical (Figs 8, 17), approximately as long as the gonostyli from dorsal view. Gonostyli with circular base, almost straight, waving subapically



Figs 1–8. *Pneumia fuehzulii* sp. nov., ♂. **1**. Head, frontal view. **2**. Scape, pedicel and basal flagellomeres. **3**. Maxilla and palpus maxillaris. **4**. Terminal lobes of labium, dorsal view. **5**. Thoracic sclerites, lateral view. **6**. Tarsal claw of P_1, lateral view. **7**. Epandrium and epandrial appendages, dorsal view. **8**. Aedeagal complex, gonopod and hypandrium, dorsal view. Scale bars: 1, 3, 7–8 = 0.2 mm; 2, 4 = 0.1 mm; 5 = 0.5 mm; 6 = 0.03 mm.



Figs 9–20. *Pneumia fuehzulii* sp. nov., ♂. **9**. Frons and facets in detail. **10**. Apical flagellomeres. **11**. Cibarium, labrum and epipharynx, dorsal view. **12**. Halter, lateral view. **13**. Wing. **14**. Epandrial appendages, lateral view. **15**. Ventral epandrial plate in detail, dorsal view, epiproct, hypoproct (variability). **16**. Hypandrium in detail, dorsal view. **17**. Gonopod, lateral view. **18**. Gonostylus, lateral view. **19**. Aedeagal complex incl. parameres, dorsal view. **20**. Same, lateral view. Scale bars: 9–10, 16 = 0.1 mm; 11–12, 14–15, 17–20 = 0.2 mm; 13 = 1 mm.

(Fig. 18), pointed. Epandrium (Figs 7, 14) approximately quadrilateral, caudal half with numerous setae on both sides. Basal two apertures circular, divided, conspicuously bordered by sclerotized folds. Remainders of ventral epandrial plate V-shaped (Figs 7, 15), sclerotized laterally on both sides, with an approximately oval soft part inside, distally with two conspicuous external protrudent corners and near base of the epipropct with two miniature ones. Hypandrium narrow in connection with epandrium; however, the former broad, bar-shaped, with two swellings in the middle and a deep cleft between them (Figs 8, 16). Epiproct relatively small, with an almost semicircular caudal ending or fold, covered with short microsetae (Figs 7, 14–15). Hypoproct large, triangular or tongue-shaped, 0.4 times as long as the epandrial appendages, haired caudally (Figs 7, 14–15). Epandrial appendages (Figs 7, 14) about 1.8 times as long as the epandrium, curved slightly in the middle, and tenacula (numbers 9–12 are stable) restricted to clusters near the rounded apex, gradually becoming shorter towards top of epandrial appendages. Tenacula endings not fringed.

Female

Unknown.

Bionomics

Unknown. Adults (males) were collected in montane or hilly habitats, specifically swampy areas of pasture or forest brooks.

Distribution

Currently recorded only from Azerbaijan.

Genus ***Thornburghiella*** Vaillant, 1982

Thornburghiella Vaillant, 1973: 361 (unavailable name, type species not designated).
Thornburghiella Vaillant, 1982: 299; type species: *Psychoda albitarsis* Banks, 1895 (by subseq. des.).
Ulomyia sensu Krek 1999: 286, partim, nec Walker, 1856; type species: *Psychoda fuliginosa* Meigen, 1818: 107, by monotypy.
Sijaricia as subgenus of *Ulomyia* sensu Krek 1999: 281; type species *Pericoma erinacea* Krek, 1970 (by monotypy) = **syn. nov.**: as *Pericoma erinacea* as well Krek 1970a: 87; 1970b: 100; 1974: tab. 7, sp. 29. A new suggestion: *Thornburghiella erinacea* (Krek, 1970) **comb. nov.**

Thornburghiella – Vaillant 1983: 324. — Ježek 1992: 367; 1993: 32; 1994: 69; 2001: 64. — Wagner 1994: 75; 2003: 107. — Wagner & Joost 1985: 171.
Ulomyia sensu Krek 1999 – Krek *et al.* 1976: 31 (*U. erinacea*, see below).
Thornburghiella (*Stupkaiella* Vaillant, 1973, as subgenus), partim – Duckhouse 1987b: 85.

Thornburghiella salihi sp. nov.
urn:lsid:zoobank.org:act:B37FA190-53E9-4F00-9937-1DCA00B54BA0
Figs 21–42

Differential diagnosis

Thornburghiella salihi sp. nov. resembles *T. erinacea* (Krek, 1970) comb. nov. in body size, as well as wing shape. *Thornburghiella erinacea* is readily distinguishable by a scapus 2.4 times as long as the postpedicel. Flagellomere 1 (postpedicel) cucumber-shaped, straight, 3.2 times as long as the following flagellomere (Krek 1970a: 89, fig. 5). Postpedicel with 8 conspicuous, strong bristles arranged in a row. Terminal flagellomere twice as long as the foregoing one, with a little prolonged digit in the axis (Krek 1970a: 89, fig. 3). Gonostyli are with a conspicuous bulbous base (Krek 1970a: 89, fig. 1, sic!) and bent. Distiphallus narrower in the middle; for details, see Krek (1970a: 89, figs 1–2).

Table 1. Morphological comparison of *Thornburghiella* Vaillant, 1982 and *Ulomyia* Walker, 1856 in the tribe Pericomaini Enderlein, 1935.

	***Thornburghiella* Vaillant, 1982**	***Ulomyia* Walker, 1856**
flagellomere 1 (postpedicel)	pear- or cucumber-shaped	shortly ovoid
sensory setae of basal flagellomeres	in single row of 3–9 bristles	as irregularly spaced soft spines
apiculus of last flagellomere	mostly a little shorter than basal part	as long as or longer than basal part
aedeagal complex	ovoid, pipe-shaped, sometimes telescopic, angulate or divided into elongate, pointed or bizarre parameral sclerites with sclerotized distiphallic lateral margins	as truncated cone with two parameral sclerites inside
parameral sheath	shorter than distiphallic spatula, rudimental or quite missing	almost as long as distiphallic spatula
parameral joint	missing	developed and sclerotized
insertions of tenacula of epandrial appendages	mostly numerous in conspicuously prolonged field	only several in almost circular field

Table 1 with a morphological comparison shows that *Ulomyia erinacea* and the new species suggest their belonging to *Thornburghiella* rather than to *Ulomyia*.

Etymology

This species is named in honour of Salih Krek (University of Sarajevo), a famous taxonomist and collector of Psychodidae in the area of the Balkan Peninsula.

Material examined

Holotype

AZERBAIJAN • 1 ♂; Qəbələ district, Durca, Dəmiraparançay river; 41.0541119° N, 47.8868831° E; 1615 m a.s.l.; 10 May 2019; J. Oboňa *et al.* leg.; Loc. AZE 27; sweep netting, waterfall in canyon and steep fast brook (mega-, macrolithal) passing to a brook in a broad alluvium in a U-shaped valley; slide with a dissected specimen, Cat. No. 34954, Inv. No. 26011; NMPC.

Paratypes

AZERBAIJAN • 3 ♂♂; same collection data as for holotype; slides, some specimens dissected, Cat. No. 34955, 34956, Inv. No. 26012, 26013; NMPC.

GEORGIA • 1 ♂; Batsara Nature Reserve, Samkura River and Khadori waterfall on its tributary; 42.274323° N, 45.351664° E; 1250 m a.s.l.; 2 May 2019; J. Oboňa *et al.* leg.; Loc. GEO 33; sweep netting; Cat. No. 34957, 34958, Inv. No. 26014, 26015; NMPC • 1 ♂; Mtskheta-Mtianeti region, below Mejilaurni stream; 42.323233° N, 44.646100° E; 1210 m a.s.l., 28 Jun. 2019; J. Oboňa *et al.* leg.; Loc. GEO 12; sweep netting; Cat. No. 34959, Inv. No. 26016; NMPC • 1 ♂; Ukanamkhari; 42.332017° N, 44.607283° E; 1565 m a.s.l., 28 Jun. 2019; J. Oboňa *et al.* leg.; Loc. GEO 16; torrent; Cat. No. 34960, Inv. No. 26017; NMPC • 1 ♂; Gveleti village, Gveleti Waterfalls and Tibistskali stream; 42.704444° N,

44.620833° E; 1570 m a.s.l.; 6 Jul. 2019; P. Manko leg.; Loc. GEO 214; sweep netting; Cat. No. 34961, Inv. No. 26018; NMPC.

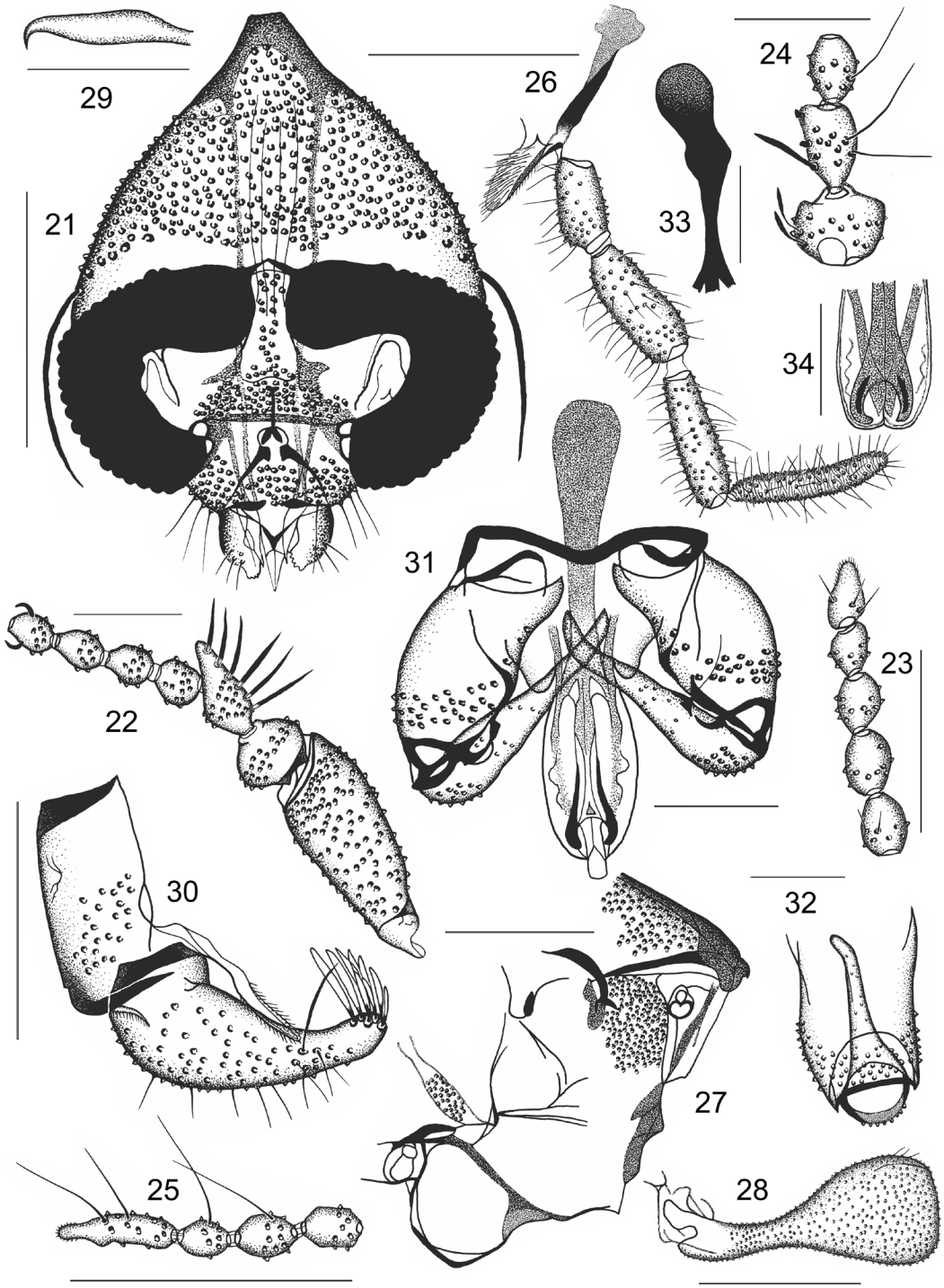
Description

Male

Head. Hardly as long as broad. Vertex conspicuously conically inflated dorsally, forming a V-inverted sclerotized hood with a cut top. The numerous setae alveoli are spaced almost regularly over the entire surface of the upper half of head, with 3–4 supraocular bristles near dorsal margins of the eyes on the extreme lateral sides, despite scar-free striped areas above C-shaped compound eyes medially and laterally. Dorsolateral margins of the eyes are undulant. Eyes separated, interocular suture broadly V-shaped, more sclerotized basally, with a tongue-shaped inconspicuous ligament (Figs 21, 35); eye bridge formed by five facet rows; inner rows of the eyes are reduced to three facets. Minimum distance between eyes corresponds approximately to 2.4 facet diameters; index of distance from tangential points of eye apices to minimum of frons 3.2. Setae alveoli of the frontoclypeus arranged in an almost semicircular, centrally placed patch near the base of the antennae, tapering to a dorsoventral irregular strip of hairs close below the frontal suture (Figs 21, 35). Antenna with 16 articles; scape club-shaped, cylindrical (Fig. 2), somewhat widened apically, 2.7 times as long as its maximum width, narrowed at base, 6.0 times as long as its minimum width. Pedicel almost globular, symmetrical. Flagellomere 1 (postpedicel) pear-shaped, as long as the two following flagellomeres together (Fig. 22), or shorter (Fig. 24, paratype Cat. No. 34955, Inv. No. 26012 from Loc. AZE 27), 1.3 times as long as the second flagellomere. Postpedicel with 3–6 conspicuous, strong bristles arranged in a row. Scape and pedicel with stiletto-shaped scales in contrast to needle-shaped macrosetae of flagellomeres. Flagellomeres 2–12 ovoid, with needle-shaped paired ascoids (Fig. 22), a little bent, shorter than the flagellomeres in which they are inserted; apical pear-shaped flagellomere a little longer than the previous one (Fig. 23), sometimes the last flagellomeres are fused with a long apiculus in the longitudinal axis (Fig. 25, paratype Cat. No. 34956, Inv. No. 26013 from Loc. AZE 27). Length ratio of maxillary palp segments 1.0:1.3:1.4:1.6; apical segment annulated (Fig. 26). Terminal labial lobes (Fig. 36) with diverging rows of spines between them, tongue distal protuberances are inconspicuous. Ratio of maximum length of cibarium (Fig. 37) to length of epipharynx approximately 1.4:1.

Thorax. Anepisternum setae patch almost semicircular between spiracle and wing insertion (Fig. 27), anepimeron with a striped setae patch. Spiracles set high on the mesothorax. Patagium not developed. Wings (Fig. 38) lanceolate, 2.7 mm in holotype, 2.4–3.1 mm in paratypes, rounded distally, a little expanded at the posterior margin. Ending of R_5 is beyond the tip of the wing. Wing membrane slightly infuscated only between Sc, R_1 and C. The following veins or their parts strengthened: Sc with conspicuously marked origin and end, R_1 (not the start), R_2, R_5, basal field, CuA_1 (conspicuously basally) and CuA_2. Radial fork complete in contrast to medial one. Both forks and the ending of CuA_2 are in one line (almost central area of wing). Wing index 2.5. Bases of M_3, CuA_1 and CuA_2 are not connected. Knob of halteres hardly globular, a little cut apically, with close sensory microsetae subapically, a prolonged stem as usually developed (Fig. 28). Ratio of maximum length of halteres to their maximum width approximately 2.5:1. Ratios of lengths of femora, tibiae and first tarsal segments P_1 2.2:2.4:1.0, P_2 2.4:2.8:1.2, P_3 2.6:3.4:1.3. Paired tarsal claws of P_1 almost straight, gradually tapering, hooked only subapically (Fig. 29).

Male genitalia. Basiphallus almost straight from dorsal view (Figs 31, 41), only sometimes strangulated proximally (Fig. 33), a little undulated from lateral view (Fig. 42). Spatula at the base of aedeagal complex shortly bilobed (Figs 31, 41), distiphallus keg-shaped, prolonged, with inner pipe bordered by indefinable parallel folds and a telescopic gonoporus strengthened by sclerotized, distally connected rounded folds (Figs 31, 34, 41–42). Gonocoxites almost cylindrical, without bulbose base (Figs 31–32, 40), as long as the gonostyli. Epandrium (Figs 30, 39) rectangular, with two divided areas of insertions



Figs 21–34. *Thornburghiella salihi* sp. nov., ♂. **21**. Head, frontal view. **22**. Scape, pedicel and basal flagellomeres, ascoids. **23**. Apical flagellomeres. **24**. Pedicel, basal two flagellomeres (variability). **25**. Fusion of apical flagellomeres (variability). **26**. Maxilla and palpus maxillaris. **27**. Thoracic sclerites, lateral view. **28**. Halter, lateral view. **29**. Tarsal claw of P_1, lateral view. **30**. Epandrial appendages, lateral view. **31**. Aedeagal complex, gonopods and hypandrium, dorsal view. **32**. Gonopod, lateral view. **33**. Basiphallus, dorsal view (variability). **34**. Distiphallus, dorsal view (variability). Scale bars: 21, 27–28 = 0.3 mm; 22–24, 31–34 = 0.1 mm; 25–26, 30 = 0.2 mm; 29 = 0.03 mm.

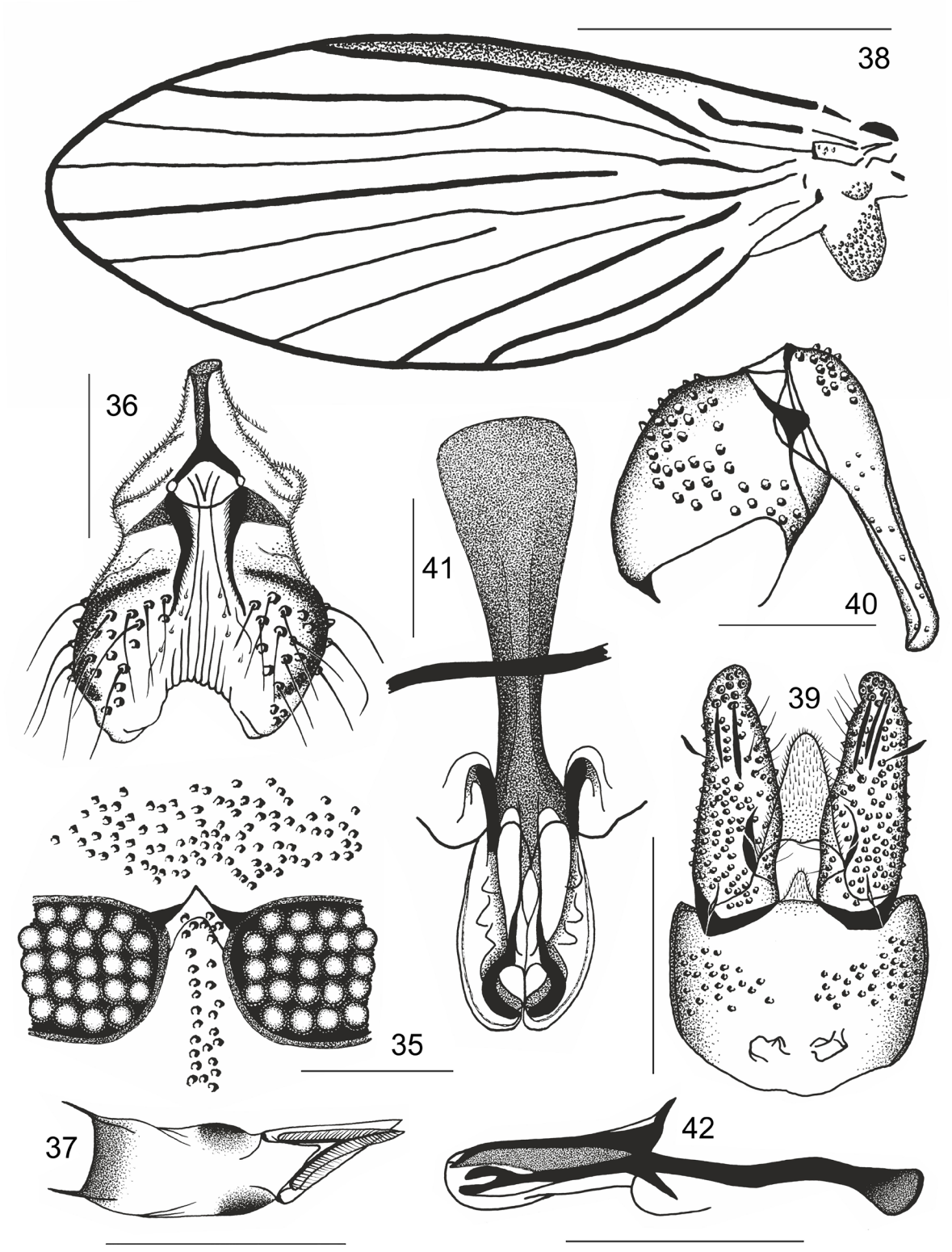


Fig 35–42. *Thornburghiella salihi* sp. nov., ♂. **35**. Frons and facets in detail. **36**. Terminal lobes of labium, dorsal view. **37**. Cibarium, labrum and epipharynx, dorsal view. **38**. Wing. **39**. Epandrium, epandrial appendages, epiproct and hipoproct, dorsal view. **40**. Gonopod, diagonal view. **41**. Aedeagal complex and hypandrium, dorsal view. **42**. Aedeagal complex in lateral view. Scale bars: 35–36, 40–41 = 0.1 mm; 37, 39, 42 = 0.2 mm; 38 = 1 mm.

of hairs distally). Basal paired apertures conspicuous, mostly separated with irregular margins; however, may be connected in a single oval aperture, see paratype from the site Loc. AZE 27, Cat. No. 34955, Inv. No. 26012 (only one male). Ventral epandrial plate not developed (Figs 30, 39). Hypandrium narrow without a lobulus in the middle (Figs 31, 41). Epiproct inconspicuous, triangular, covered with microsetae; hypoproct conspicuous, tongue-shaped, setose, rounded apically from dorsal view (Figs 30, 39), 1.1 times as long as the epandrium. Epandrial appendages strong, cylindrical and straight from dorsal view, enlarged a little basally in contrast to the top (Fig. 39), bent from lateral view (Fig. 30). Tenacula (numbers 9–12) restricted to a cluster near the rounded apex and gradually becoming shorter towards apex of the epandrial appendages (Figs 30, 39).

Female

Unknown.

Comments

Krek´s *Sijaricia* (as subgenus) must be synonymized with *Thornburghiella* because *T. erinacea* was established by him as type species (monotypy) of the genus *Ulomyia.*

Bionomics

Unknown; males were collected near montane waterfalls and streams or confluences of rivers, approximately 1200–1600 m a.s.l.

Distribution

Currently recorded only from Georgia and Azerbaijan.

Discussion

The Caucasus region, as a biodiversity hotspot, is known especially for its species diversity and endemicity of vertebrates (e.g., Tuniyev 2016; Litvinchuk & Kidov 2018; Tilba *et al.* 2018) and plants (e.g., Efimov 2020; Mursal *et al.* 2020). Entomological activities are relatively rare (e.g., Maslova *et al.* 2020). Therefore, adequate attention must be paid to insects and other invertebrates, because they serve important ecosystem services and their loss may affect the whole functioning of the ecosystem. The less disturbed and close to natural habitats and localities deserve great attention, especially in protected areas (e.g., the Batsara Nature Reserve) and their vicinity (e.g., Kazbegi National Park), where we find not only a high species diversity of the family Psychodidae but also new species for science, as presented in Ježek *et al.* (2021a, 2021b) and in this paper. The relatively large number of species new to science described on the basis of our recent sampling campaigns (e.g., Oboňa *et al.* 2017; Ježek *et al.* 2018, 2021a, 2021b), together with the high degree of endemism, point to the importance of research on the Psychodidae family in the Caucasus.

Acknowledgements

We are grateful to B. Japoshvili and L. Mumladze (Ilia State University, Tbilisi, Georgia) as well as N. Snegovaya and I. Kerimova (Azerbaijan National Academy of Sciences, Baku, Azerbaijan) for their kindness and help during the fieldwork and for providing permits for the collection and export of the material. Thanks are due mainly to T. Kovács (Mátra Museum of Hungarian Natural History Museum, Gyöngyös, Hungary), D. Murányi (Eszterházy Károly University, Eger, Hungary) and G. Vinçon (Grenoble, France) for providing extensive additional material from the Caucasus. Our thanks are also due to A- Bezděk (Czech Academy of Sciences, České Budějovice, Czech Republic) for new literature. Finally, we are indebted to two anonymous reviewers for their useful critical comments on an earlier version of the paper.

This work was supported by the Ministry of Culture of the Czech Republic (DKRVO 2019–2023/5.I.d, National Museum, 00023272) and by the Cultural and Educational Grant Agency (Slovakia) under contract No. 005PU-4/2019, and by the Slovak Scientific Grant Agency under contract No. VEGA-1/0012/20.

References

Bernotienė R. 2002. Moth flies (Diptera, Psychodidae) new for Lithuanian fauna. *Ekologija, Vilnius* 2: 4–8.

Cumming J.M. & Wood D.M. 2009. Adult morphology and terminology. *In*: Brown B.V., Borkent A., Cumming J.M., Wood D.M., Woodley N.E. & Zumbado M.A. (eds) *Manual of Central American Diptera Vol. 1*: 9–502. National Research Council Press, Ottawa.

Cumming J.M. & Wood D.M. 2017. Adult morphology and terminology. *In*: Kirk-Spriggs A.H. & Sinclair B.J. (eds) *Manual of Afrotropical Diptera Vol. 1. Introductory Chapters and Keys to Diptera Families*: 89–13. South African National Biodiversity Institute, Pretoria.

Duckhouse D.A. 1987a. A revision of Afrotropical *Setomima*, elucidation of their genealogical relationships and descriptions of other Afrotropical Psychodinae (Diptera: Psychodidae). *Annals of the Natal Museum* 28 (2): 231–282.

Duckhouse D.A. 1987b. Observations on the Himalayan species of *Thornburghiella* (Diptera; Psychodidae). *Aquatic Insects* 9 (2): 85–92. https://doi.org/10.1080/01650428709361276

Duckhouse D.A. 1990. The Australasian genera of pericomoid Psychodidae (Diptera) and the status of related Enderlein genera in the Neotropics. *Invertebrate Taxonomy* 3 (6): 721–746. https://doi.org/10.1071/IT9890721

Efimov P.G. 2020. Orchids of Russia: annotated checklist and geographic distribution. *Nature Conservation Research* 5 (Suppl 1): 1–18. https://doi.org/10.24189/ncr.2020.018

Enderlein G. 1935. Zur Klassifikation der Psychodinen. *Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin* 1935: 246–249.

Enderlein G. 1937. Klassifikation der Psychodiden (Dipt.). *Deutsche Entomologische Zeitschrift* 3–4 (1936): 81–112.

Humphries C.J., Williams P.H. & Vane-Wright R.I. 1995. Measuring biodiversity value for conservation. *Annual Review of Ecology and Systematics* 26 (1): 93–111. https://doi.org/10.1146/annurev.es.26.110195.000521

Ježek J. 1992. New and little known Palaearctic *Thornburghiella* species (Diptera, Psychodidae). *Acta Entomologica Bohemoslovaca* 89 (5): 367–382.

Ježek J. 1993. *Thornburghiella kovari* sp. n. (Diptera, Psychodidae, Psychodinae) from Tajikistan. *Časopis Národního Muzea, Řada Přírodovědná* 161 (1992): 32–34.

Ježek J. 1994. Three new species of moth flies (Diptera, Psychodidae) from Asia. *Dipterologica Bohemoslovaca* 6: 1–126.

Ježek J. 1997. New and interesting taxa of moth flies (Diptera, Psychodidae) from different moist biotopes of the Palaearctic region. *Časopis Národního Muzea, Řada Přírodovědná* 166: 105–122.

Ježek J. 2001. New Palaearctic taxa of moth flies (Diptera: Psychodidae) from very small accidental spirituous samples of insects. *Acta Universitatis Carolinae Biologica* 45 (1–2): 53–66.

Ježek J. & Omelková M. 2007. Faunistic records of the Czech Republic and Slovakia. Psychodidae. *Dipterologica Bohemoslovaca* 14: 250–253.

Ježek J., Manko P. & Oboňa J. 2018. Checklist of known moth flies and sand flies (Diptera, Psychodidae) from Armenia and Azerbaijan. *ZooKeys* 798: 109–133. https://doi.org/10.3897/zookeys.798.26543

Ježek J., Oboňa J. & Manko P. 2021a. Two new Palaearctic species of moth flies (Diptera, Psychodidae, Psychodinae) from the Caucasus Mts. *Zootaxa* 4985 (4): 582–594. https://doi.org/10.11646/zootaxa.4985.4.11

Ježek J., Manko P. & Oboňa J. 2021b. Psychodidae (Diptera) of Azerbaijan and Georgia – faunistics with biodiversity notes. *ZooKeys* 1049: 15–42. https://doi.org/10.3897/zookeys.1049.66063

Jung H.F. 1956. Beiträge zur Biologie, Morphologie und Systematik der europäischen Psychodiden (Diptera). *Deutsche Entomologische Zeitschrift* 3: 97–257.

Krek S. 1970a. Description de cinq espèces nouvelles de Psychodidae de Yougoslavie. *Bolletino della Associazione Romana di Entomologia* 25 (4): 87–95.

Krek S. 1970b. Fauna Psychodidae (Diptera) u području planina Maglič, Volujak i Zelengora [Fauna of Psychodidae (Diptera) of the mountains Maglič, Volujak and Zelengora]. *Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu* 9: 93–106. [In Croatian.]

Krek S. 1974. Ekološka klasifikacija i cenotički odnosi Psychodidae u tekučicama jugoistočne Bosne [Ecological classification and coenotic relationships of Psychodidae in running waters of southeastern Bosnia]. *Godišnjak Biološkog Instituta Univerziteta u Sarajevu* (1973) 26: 57–95. [In Croatian.]

Krek S. 1999. *Psychodidae (Diptera Insecta) Balkanskog Poluotoka* [Psychodidae (Diptera Insecta) of the Balkan Peninsula]. Federacija Bosne i Hercegovine, Ministarstvo Obrazovanja, Nauke, Kulture i Sporta, Studentska Štamparija Univerziteta Sarajevo, Sarajevo. [In Croatian.]

Krek S., Kačanski D. & Tanasijevič M. 1976. Biocenološka analiza naselja insekata (Ephemeroptera, Plecoptera, Simuliidae i Psychodidae) sliva rijeke Sutjeske [Biocoenological analysis of insects (Ephemeroptera, Plecoptera, Simuliidae and Psychodidae) of the basin of Sutjeska River]. *Godišnjak Biološkog Instituta Univerziteta u Sarajevu* 29: 23–54. [In Croatian.]

Krever V., Zazanashvili N., Jungius H., Williams L. & Petelin D. 2001. *Biodiversity of the Caucasus Ecoregion. An Analysis of Biodiversity and Current Threats and Initial Investment Portfolio*. World Wide Fund for Nature, Baku, Erevan, Gland, Moscow, Tbilisi.

Kvifte G.M. 2018. Molecular phylogeny of moth flies (Diptera, Psychodidae, Psychodinae) revisited, with a revised tribal classification. *Systematic Entomology* 43 (3): 596–605. https://doi.org/10.1111/syen.12288

Kvifte G.M. & Wagner R. 2017. 24. Psychodidae (Sand Flies, Moth Flies or Owl Flies). *In*: Kirk-Spriggs A.H. & Sinclair B.J. (eds) *Manual of Afrotropical Diptera Vol. 2. Nematocerous Diptera and Lower Brachycera*: 607–632. Suricata vol. 5, South African National Biodiversity Institute, Pretoria.

Kvifte G.M., Stokkan M. & Wagner R. 2016. Review of the Psychodinae from Mallorca, Spain, with description of *Pericoma unipennata*, sp. n. (Diptera, Psychodidae). *ZooKeys* 577: 149–160. https://doi.org/10.3897/zookeys.577.7679

Litvinchuk S.N. & Kidov A.A. 2018. Distribution and conservation status of the Caucasian parsley frog, *Pelodytes caucasicus* (Amphibia: Anura). *Nature Conservation Research* 3 (1): 51–60. https://doi.org/10.24189/ncr.2018.053

Maslova O.O., Negrobov O.P. & Selivanova O.V. 2020. New records of *Rhaphium* (Dolichopodidae, Diptera) from Russian protected areas. *Nature Conservation Research* 5 (3): 139–144. https://doi.org/10.24189/ncr.2020.037

Meigen J.W. 1818. *Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten. Erster Teil.* F.W. Forstmann, Aachen. https://doi.org/10.5962/bhl.title.12464

Mumladze L., Japoshvili B. & Anderson E.P. 2019. Faunal biodiversity research in the Republic of Georgia: a short review of trends, gaps, and needs in the Caucasus biodiversity hotspot. *Biologia* 75: 1385–1397. https://doi.org/10.2478/s11756-019-00398-6

Mursal N., Mehdiyeva N.P. & Ibrahimova A.G. 2020. Population status and ecology of *Platanthera chlorantha* (Orchidaceae) in the Greater Caucasus (Azerbaijan). *Nature Conservation Research* 5 (Suppl.1): 114–124. https://doi.org/10.24189/ncr.2020.046

Myers N., Mittermeier R.A., Mittermeier C.G., da Fonseca G.A.B. & Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853–858. https://doi.org/10.1038/35002501

Oboňa J., Ježek J. & Manko P. 2017. A new Palaearctic *Thornburghiella* from Transcaucasia (Diptera: Psychodidae). *Acta Entomologica Musei Nationalis Pragae* 57 (1): 205–214. https://doi.org/10.1515/aemnp-2017-0069

Oboňa J., Dvořák L., Haenni J-P., Hrivniak Ľ., Japoshvili B., Ježek J., Kerimova I., Máca J., Murányi D., Rendoš M., Słowińska I., Snegovaya N., Starý J. & Manko P. 2019. New and interesting records of Diptera from Azerbaijan and Georgia. *Zoosystematica Rossica* 28 (2): 277–295. https://doi.org/10.31610/zsr/2019.28.2.277

Omelková M. & Ježek J. 2012. Two new species of *Pneumia* Enderlein (Diptera, Psychodidae, Psychodinae) from the Palaearctic region. *Zootaxa* 3180 (1): 1–18. https://doi.org/10.11646/zootaxa.3180.1.1

Quate L.W. & Brown B.V. 2004. Revision of Neotropical Setomimini (Diptera: Psychodidae: Psychodinae). *Contributions in Science: Natural History Museum of Los Angeles* 500: 1–117. https://doi.org/10.5962/p.210558

Salamanna G. & Raggio S. 1984. Synopsis of the Psychodinae from the Ligurian Alps and Apennines. *Annali del Museo Civico di Storia Naturale di Genova* 85: 1–42.

Salmela J. 2008. Semiaquatic fly (Diptera, Nematocera) fauna of fens, springs, headwater streams and alpine wetlands in the northern boreal ecoregion, Finland. *W-album* 6: 3–63.

Stark J., Bonacum J., Remsen J. & DeSalle R. 1999. The evolution and development of dipteran wing veins: a systematic approach. *Annual Review of Entomology* 44: 97–129. https://doi.org/10.1146/annurev.ento.44.1.97

Svensson B.W. 2009. Fjärilsmyggfaunan i ett hagmarksområde och en ladugård i östra Blekinges skogsland. Med en översikt av familjen Psychodidae:s morfologi, systematik och utforskande, samt särskilt de svenska *Psychoda* s. l. – arternas biologi. *Entomologisk Tidskrift, Uppsala* 130 (3–4): 185–208.

Tkoč M., Pecharová M. & Ježek J. 2014. Catalogue of the type specimens of Diptera deposited in the Department of Entomology, National Museum, Prague, Czech Republic. Moth flies (Psychodidae). *Acta Entomologica Musei Nationalis Pragae* 54 (2): 789–837.

Tilba P.A., Shagarov L.M. & Malandzia V.I. 2018. *Oxyura leucocephala* (Anatidae: Anseriformes) on the Black Sea coast of the Caucasus. *Nature Conservation Research* 3 (4): 73–77. https://doi.org/10.24189/ncr.2018.046

Tuniyev B.S. 2016. Rare species of shield-head vipers in the Caucasus. *Nature Conservation Research* 1 (3): 11–25. https://doi.org/10.24189/ncr.2016.023

Vaillant F. 1971–1983. Psychodidae–Psychodinae (not finished). *In*: Lindner E. (ed.) *Die Fliegen der palaearktischen Region* 287 (1971): 1–48; 291 (1972): 49–78; 292 (1972): 79–108; 305 (1974): 109–142; 310 (1975): 143–182; 313 (1977): 183–206; 317 (1978): 207–238; 320 (1979): 239–270; 326 (1981): 271–310; 328 (1983): 311–357.

Vaillant F. 1973. Some new Psychodidae Psychodinae from the United States (Diptera). *Annales de la Société entomologique de France* 9 (2): 345–379.

Vaillant F. 1982. Some comments on the classification of the Psychodidae Psychodinae (Diptera). *Bulletin de la Société entomologique de France* 87: 292–301.

Wagner R. 1990. Family Psychodidae. *In*: Soós A. & Papp L. (eds) *Catalogue of Palaearctic Diptera* 2: 11–65. Akadémiai Kiadó, Budapest and Elsevier Science Publishers, Amsterdam.

Wagner R. 1994. On a collection of Psychodidae (Diptera) from the Far East of Russia. *Studia Dipterologica* 1: 75–92.

Wagner R. 2003. Psychodiden aus Mittelasien und angrenzenden Gebieten (Insecta, Diptera, Psychodidae). *Beiträge zur Entomologie* 53 (1): 107–121. https://doi.org/10.21248/contrib.entomol.53.1.107-121

Wagner R. & Beuk P.L.T. 2002. Family Psychodidae. *In*: Beuk P.L.T. (ed.) *Checklist of the Diptera of the Netherlands*: 85–88. KNNV Uitgeverij, Utrecht.

Wagner R. & Ibáñez-Bernal W. 2009. Psychodidae (sand flies, and moth flies or owl flies) 19. *In*: Brown B.V., Borkent A., Cumming J.M., Wood D.M., Woodley N.E. & Zumbado M. (eds.) *Manual of Central American Diptera Vol. 1*: 319–335. National Research Council of Canada, Ottawa.

Wagner R. & Joost W. 1985. Bemerkungen zur Psychodiden-Fauna der Mongolischen Volksrepublik (Insecta, Diptera). *Entomologische Nachrichten und Berichte* 29 (4): 171–174.

Wagner R. & Masteller E.C. 1992. Long term population changes of Psychodidae (Diptera) from a stream recovering from sewage effluent and a control stream. *Limnologica* 22 (2): 105–113.

Wagner R., Koç H., Özgöl O. & Tonguç A. 2013. New moth flies (Diptera: Psychodidae: Psychodinae) from Turkey. *Zoology in the Middle East* 59 (2): 152–167.
https://doi.org/10.1080/09397140.2013.810880

Wetzel F.T., Bingham H.C., Groom Q., Haase P., Kõljalg U., Kuhlmannh M., Martin C.S., Penev L., Robertson T., Saarenmaa H., Schmeller D.S., Stoll S., Tonkin D.T. & Häuser C.L. 2018. Unlocking biodiversity data: prioritization and filling the gaps in biodiversity observation data in Europe. *Biological Conservation* 221: 78–85. https://doi.org/10.1016/j.biocon.2017.12.024

Manuscript received: 30 September 2021
Manuscript accepted: 23 March 2022
Published on: 9 June 2022
Topic editor: Tony Robillard
Section editor: Torbjørn Ekrem
Desk editor: Pepe Fernández

Printed versions of all papers are also deposited in the libraries of the institutes that are members of the *EJT* consortium: Muséum national d'histoire naturelle, Paris, France; Meise Botanic Garden, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Royal Belgian Institute of Natural Sciences, Brussels, Belgium; Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands; Museo Nacional de Ciencias Naturales-CSIC, Madrid, Spain; Real Jardín Botánico de Madrid CSIC, Spain; Zoological Research Museum Alexander Koenig, Bonn, Germany; National Museum, Prague, Czech Republic.