

SHORT COMMUNICATION

Two new species of Heleomyzidae (Diptera) from Czech Republic and Crimea

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Accepted:
10th July 2018

Published online:
1st August 2018

Abstract. Two new species of Heleomyzidae are described. *Heleomyza kovali* sp. nov. is described based on material from the Czech Republic and Crimea and differs from other European *Heleomyza* species by the structure of male genitalia. *Eccoptomera nevrlyi* sp. nov. is described based on two males from Jeseníky Mts. and Šumava Mts. (Czech Republic) and differs from the most similar species, *E. ornata* Loew, 1862, by the hind femur having a distinct subbasal protuberance with a tuft of short setae and by the structure of male genitalia. The extreme rarity of both species is discussed.

Key words. Diptera, Sphaeroceroidea, Heleomyzidae, Heleomyzinae, Oecothelini, Heleomyzini, new species, Czech Republic, Crimea, Palaearctic Region

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Introduction

The family Heleomyzidae is subdivided in three subfamilies: Suillinae (with a single genus *Suillia* Robineau-Desvoidy, 1830 in the Palaearctic Region), Heteromyzinae (which includes a tribe Heteromyzini with the genera *Heteromyza* Fallén, 1820, *Tephrochlamys* Loew, 1862 and *Tephrochlaena* Czerny, 1924 in the Palaearctic Region) and Heleomyzinae (with 3 tribes and 12 genera in the Palaearctic Region) (PAPP 1998). There are 152 known species of Heleomyzidae in Europe (WOŽNICA 2014, PAPE et al. 2015); 84 species are recorded in the Czech Republic (DVOŘÁKOVÁ 2009). The classification of the family Heleomyzidae is not consistent among different authors (cf. GORODKOV 1962, 1970; GRIFFITHS 1972; McALPINE 1985, 2007; PAPP 1998), therefore the rather classical view of PAPP (1998) is followed in this paper. Central European species can be identified using the monograph of PAPP (1981).

Two new species described in this paper belong to subfamily Heleomyzinae in the genera *Heleomyza* Fallén, 1810 (tribe Heleomyzini) and *Eccoptomera* Loew, 1862 (tribe Oecothelini).

Species of Heleomyzidae are small to medium-sized flies (1.2–12 mm, usually 4–7 mm), varying in colour from yellow to reddish yellow or reddish brown to black. The

wings often have small but distinctly longer and thicker, well-spaced setae (spines) mixed with the shorter setae on costa and the cross-veins are often clouded by darker colour. They are usually forest species; larvae can be saprophagous, mycetophagous, coprophagous, necrophagous and in some species phytophagous. The larvae often develop in birds' nests and vertebrates' burrows. Most species are psychrophilous, and adults of some species regularly enter subterranean habitats during the warmest months. Some species are troglomorphic or even troglomorphic.

The genus *Heleomyza* is represented by eight species in Europe, one species belongs to the subgenus *Anypotacta* Czerny, 1924, viz. *H. (Anypotacta) setulosa* (Czerny, 1924), the remaining seven species belong to the nominotypical subgenus *Heleomyza* (WOŽNICA 2014). This genus is distributed in the Holarctic Region, 13 species (excl. *H. (A.) setulosa*) are known from the Palaearctic (PAPP 1998) and 9 from the Nearctic Region (GILL 1962, GILL & PETERSON 1987).

The genus *Eccoptomera* Loew, 1862 is represented by 19 species in Europe (WOŽNICA 2014). This genus is widespread in the Holarctic Region, 21 species are known from the Palaearctic (PAPP 1998) and 7 from the Nearctic Region (GILL 1962, GILL & PETERSON 1987).



Material and methods

The specimens were examined with an Olympus SZX10 binocular microscope. The photographs were taken by Canon 600D with MPE-65 macro lens and combined from multiple layers using Helicon Focus Pro 5.2. Smaller structures (internal genitalia) were photographed by a Nikon ECLIPSE TS-100F microscope equipped with a digital DS-Fi2 camera. The drawings and photographs were edited in CorelDRAW X6 and Corel PHOTO-PAINT X6 graphic software. Morphological terminology of non-genital characters follows CUMMING & WOOD (2009). Morphological terminology of the male genitalia is largely based on the ‘hinge’ hypothesis of the origin of the eremoneuran hypopygium, rediscovered and documented by ZATWARNICKI (1996), synonymous terms used by other hypotheses are in parentheses. The term ‘editum’ is used for a tubercle with group of short setae ventrally on epandrium following GORODKOV (1962). PAPP & WOŹNICA (1993) also used the term editum in their revision of *Gymnomus* Loew, 1863 (Heleomyzidae) naming as such a setose protuberance of the epandrium which is conjoined with the gonostylus (surstylus).

Examined material is now deposited in the National Museum, Praha, Czech Republic (NMPC); Zoological Institute, Russian Academy of Sciences, Russia, St. Petersburg (ZIN), and in personal collection of Jiří Preisler (JPLC).

Abbreviations of morphological terms used in text and figures:

ce – cercus;
Cs3, Cs4 – 3rd, 4th costal sector;
dp – distiphallus;
ea – ejacapodeme (= ejaculatory apodeme);
ed – editum (see GORODKOV 1962, PAPP & WOŹNICA 1993);
ep – epandrium (= perianthium);
fc – fulcrum of phallapodeme;
gs – gonostylus (= surstylus);
hy – hypandrium;
pg – postgonite (paramere);
pha – phallapodeme (aedeagal apodeme);
pp – phallophore (basiphallus);
S8 – 8th abdominal sternum;
T1–T8 – abdominal terga.

Taxonomy

Heleomyza kovali sp. nov.

(Figs 1–8)

Type locality. Czech Republic, Bohemia, Jizerské hory Mts., Smrk Mt., Ztracený potok stream, 50°53'43"N, 15°14'53"E, 690 m a.s.l.

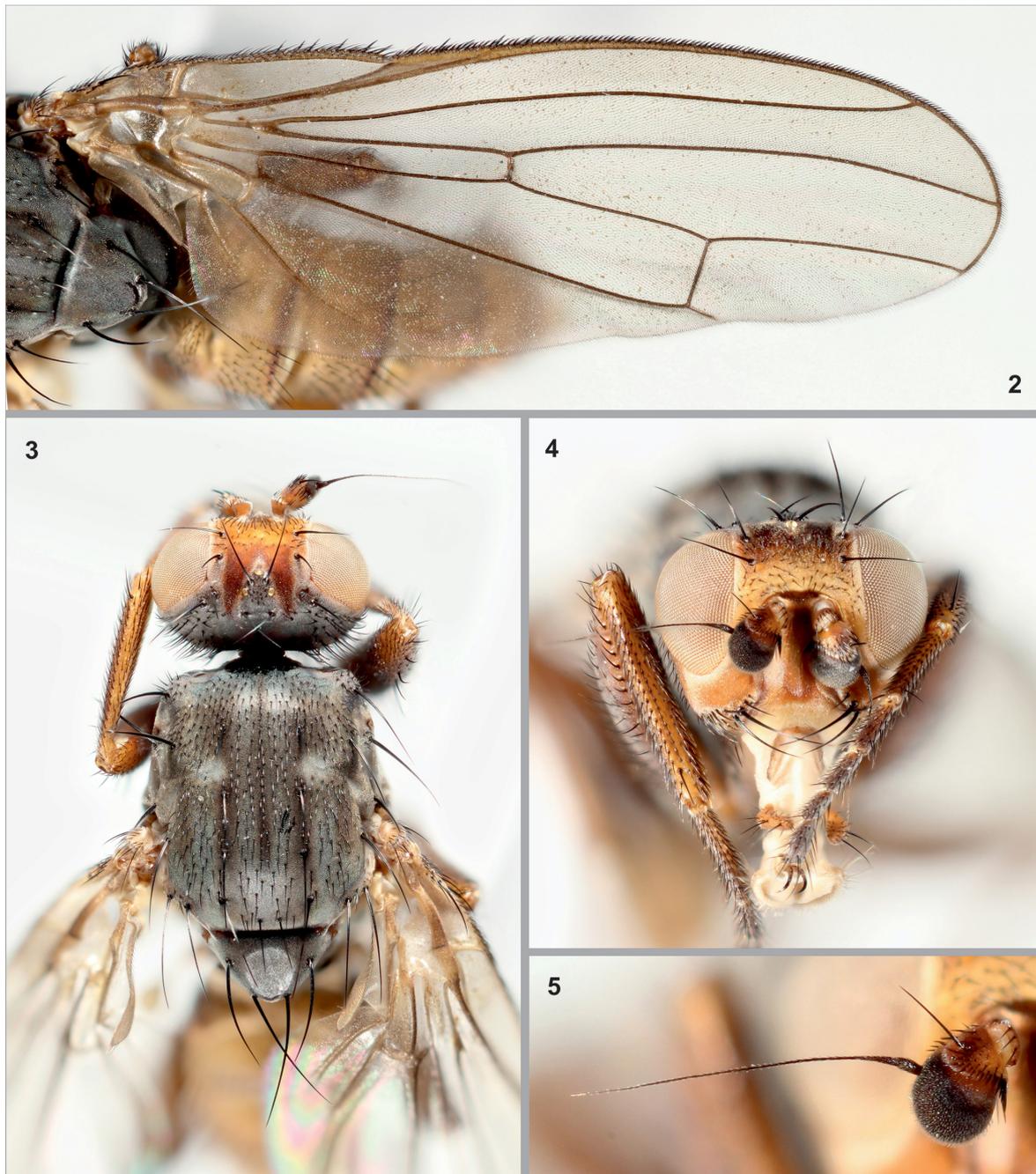
Type material. HOLOTYPE: ♂ (NMPC, genitalia prep.), ‘CZ-BOHEMIA b. (5157) Jizerské hory, / Smrk Mt. Ztracený potok- Libverdský / most (masová past) 23.9.-1.11.06 2006 / J. Preisler & Vonička lgt. // H O L O T Y P E [b] / *Heleomyza kovali* [b] / sp. nov. J. Preisler & / M. Tkoč det. 2016 / ♂ [red label]’. PARATYPES: 1 ♂ (JPLC, genitalia prep.): ‘CZ: Podyjí NP, Vrani skála / mixed wood, MT, 390 m / 48°51'03"N, 15°53'42"E / Meixnerová [lgt.], 28.x.[20]03-5.ii.[20]04 // *Scolioecentra / brachypterna* / det. V. Martinek // P A R A T Y P E [b] / *Heleomyza kovali* [b] / sp. nov. J. Preisler & / M. Tkoč det. 2016 / ♂ [yellow label]’; 3 ♂♂ (1 ♂ JPLC, 1 ♂ NMPC, 1 ♂ ZIN, all genitalia prep.): ‘Crimea, Ayu – Teshik 2 Cave / 21.VII.2001 – 13.VI.2002 / A.G. Koval lgt. // P A R A T Y P E [b] / *Heleomyza kovali* [b] / sp. nov. J. Preisler & / M. Tkoč det. 2016 / ♂ [yellow label]’.

Description. Male. Body length 5.45 mm (holotype), 5.20–5.45 mm (paratypes). Wing length 5.55 mm (holotype), 5.05–5.60 mm (paratypes). Body steel-grey and brownish-yellow to (ochreous) brown and/or yellow, dorsal part of frons and orbital plate reddish.

Head (Figs 2–4) wider than long, extended mouthparts of equal length as the height of head. Frons reddish-brown to yellow in dorsal view, brown to yellow in anterior view, covering 0.4–0.5 of the head width, with small setae denser in lower half of the frons, dorsal part of frons bare. Ocellar triangle large, of grey colour with short setae and two long divergent ocellar setae (Fig. 3), postverticals of medium length and convergent. Two long outer vertical setae, grey coloured median occipital sclerite bare, two clusters of short supracervical setae. Occiput grey, postgena ranging from grey to reddish brown, both with moderate setae, ventral part of postgena with longer setae. Posterior part of orbital plate brown to reddish brown, devoid of small setae, with two long fronto-orbital setae (Fig. 3). Anterior part of orbital plate with small setae continuing to frons, frons yellow to orange-yellow coloured. Face and parafacialia ochreous brown to orange-yellow, devoid of setae. Frontal lunule brown. Vibrissal angle ochreous brown,



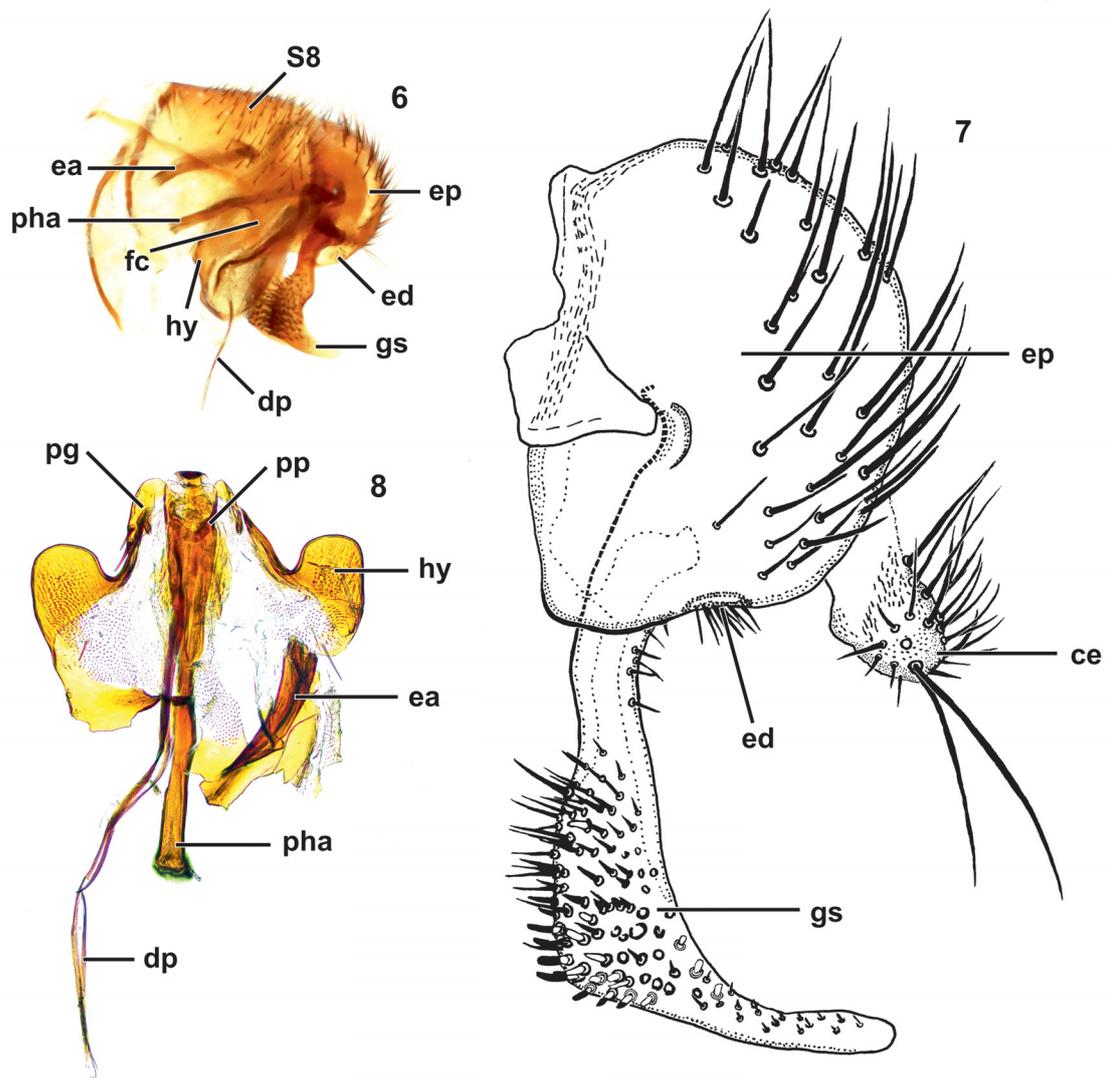
Fig. 1. *Heleomyza kovali* sp. nov., male, paratype (Czech Republic, Podyjí NP), lateral view of habitus.



Figs 2–5. *Heleomyza kovali* sp. nov., male, holotype (Czech Republic, Jizerské hory PLA). 2 – wing; 3 – head and thorax, dorsal view; 4 – head, anterior view; 5 – detail of right antenna, inner lateral view.

setose, with two long setae (vibrissa and subvibrissa) and 2–3 shorter setae. Gena ochreous brown to orange-yellow, its dorsal half bare, ventral half with short peristomal setae. Eye of normal size (Figs 3, 4), oval, its longest diameter about 1.25 times as long as shortest. Antenna (Fig. 5) dark brown, with paler scape and pedicel; scape short and conical, with uniserial setae surrounding distal margin; pedicel subtriangular in profile, with microsetae on distal margin and on dorsal part, and with one prominent seta dorsally; 1st flagellomere rounded, lenticular and densely finely microtomentose, its base of brighter colour (but dorsal side is dark). Arista (Fig. 5) long, about 2.5–3 times as long as rest of antenna, with very short, almost indistinct cilia.

Thorax (Fig. 3) steel grey to grey, dorsally completely microsetose, except for scutellum and sutural area. Pleural part of thorax bare, except for proepimeron, proepisternum and katepisternum. Postpronotal lobe with one postpronotal (humeral) seta. Notopleuron with two notopleural setae; one supraalar seta and two postalar setae. Acrostichal setae not differentiated from mesonotal microsetae, only pre-scutellar pair of medium length; 4 long dorsocentral setae (1 presutural, 3 postsutural). Scutellum devoid of short setae, with only two pairs of long scutellar setae. Proepimeron with very short setae. Anepisternum (mesopleuron) bare and subshining; katepisternum (sternopleuron) setose on dorsal margin (one long seta and 7–8 fine short setae) and



Figs 6–8. *Heleomyza kovali* sp. nov., male genitalia. 6 – paratype (Crimea), last two abdominal segments and genitalia sublaterally; 7 – holotype (Czech Republic, Jizerské hory PLA), genitalia laterally; 8 – paratype (Crimea), aedeagal complex and hypandrium, dorsal view. For abbreviations see page 268.

with fine long setae at posterodorsal corner. Anepimeron (pteropleuron), laterotergite (metapleuron) and meron (hypopleuron) bare and subshining, steel grey.

Legs brown to dark brown (Fig. 1). All femora and tibiae finely densely setulose with some macrosetae. Fore femur dark brown, thickened, with longer but hair-like setae in posteroventral and posterodorsal rows. Mid femur brown, with one larger posterior preapical seta posterolaterally and numerous short setae anteriorly and ventrally. Hind femur with one long dorsal seta in basal 2/3 of femur length. Tibiae each with 1 long erected dorsal preapical seta. Fore tibia covered with short setulae. Mid tibia shortly setulose and with subapical group of 5 anteroventral setae (3 long and stout, 2 short). Hind tibia with short setulae, two thicker anteroventral apical black setae (one short, one long) and 3–5 subapical posterior brushes of fine golden setae. Fore basitarsus with two basal posteroventral black setae and ventral row of light brown longer setae on basal half. Mid basitarsus with two larger black basal setae ventrally and two ventral rows of short black stout setae. Hind basitarsus and second tarsomere with posterior brushes of golden

hairs on entire length, additionally with 3 larger black basal setae on hind basitarsus. Other tarsi simply setose with short and long setae.

Wing (Fig. 2) with normal venation; membrane very lightly brownish tinted and veins pale brown to brown, veins in basal part of wing lighter in colour. Costa with 6–8 strong setae in front of and 14–16 beyond costal break. Wing measurements: width 1.75–2.00 mm, C-index ($Cs_3 : Cs_4$) = 1.6, r-m/dm-cu : dm-cu = 2.88. Haltere ivory yellow, knob not darker than stem.

Abdomen with preabdominal terga broad, extended onto ventral side of abdomen, brown coloured, covered with fine setulae. T1 with longitudinal medial groove, devoid of setulae, T1 otherwise with setulae present, denser laterally. T2–T5 covered with setulae, on posterior margins and laterally with longer, thicker setae; posterior margins of terga darkened. Preabdominal sterna square shaped, light brown coloured, with fine short setae and few medium setae posteriorly on each sternum. Pleural membrane ivory yellow, well visible ventrally. Postabdominal sclerites well sclerotized, brown pigmented; 6th and 7th sterna asymmet-

rical and fused together. 8th sternum less asymmetrical, dorsally convex; its basal third bare, the remaining two thirds covered with short setae (Fig. 6).

Genitalia (Figs 6–8) brown coloured with elongate gonostyli. Epandrium convex, semiglobular in lateral view (Fig. 7), with long and medium long setae, mainly on its caudal half. Cerci protruding posteroventrally, partly fused with epandrium (Fig. 7), each cercus with 2 very long apical setae and a number of long fine setulae. Anal fissure higher than wide. Medandrium (= intraepandrial sclerite) not visible. Gonostylus (Fig. 7) elongated, thickening dorsoventrally, almost orthogonally bent to posterior direction (L-shaped) forming a long finger-like apex. Small tubercle, named editum (Fig. 7), with group of short setae ventrally on epandrium. Hyandrium with wide convex lobes of lateral arms (Fig. 8). Aedeagal complex (Fig. 8) with long phallapodeme connected with hyandrium by means of a ventral fulcrum, postgonite with 2 stout setae, pregonite having 2–3 fine setae. Distiphallus long and composed of two thread-like sclerites (Fig. 8). Ejaculatory apodeme normally developed, rod-like, hardly dilated proximally (Figs 6, 8).

Female. Unknown.

Differential diagnosis. *Heleomyza kovali* sp. nov. differs from other European *Heleomyza* species by the structure of its male genitalia. The male genitalia of *H. kovali* are most similar to those of the species *H. serrata* (Linnaeus, 1758) and *H. captiosa* (Gorodkov, 1962), cf. GORODKOV (1962: 661, as *Leria*). However, its semiglobular epandrium differs in lateral view from the epandrium of both *H. serrata* (having ventral part prolonged to form an orthogonal apex) and *H. captiosa* (having ventral part even longer than in *H. serrata* and forming a tapered rounded apex). The gonostylus is also of unique shape; it is L-shaped with rather long finger-like projection, in contrast to that of *H. serrata*, which is shorter, has no projection and is gradually bent. The gonostylus of *H. captiosa* is more similar to the *H. kovali* sp. nov., but also different: its basal part is of similar thickness as is the medial part, and it is gradually bent (not L-shaped) and the apical projection is shorter.

Etymology. This new species is named after the collector of three of the paratypes, the Russian cave entomologist Alexander G. Koval.

Biology. The holotype was collected by meat trap in spruce montane forest. Possibly a troglophilous (or trogloxenic) species.

Distribution. Czech Republic, Crimea.

Eccoptomera nevrlyi sp. nov.

(Figs 9–14)

Type locality. Czech Republic, Bohemia, Šumava Mts., Rokytecká slat', 49°00'59"N, 13°25'05"E, 1100 m a.s.l.

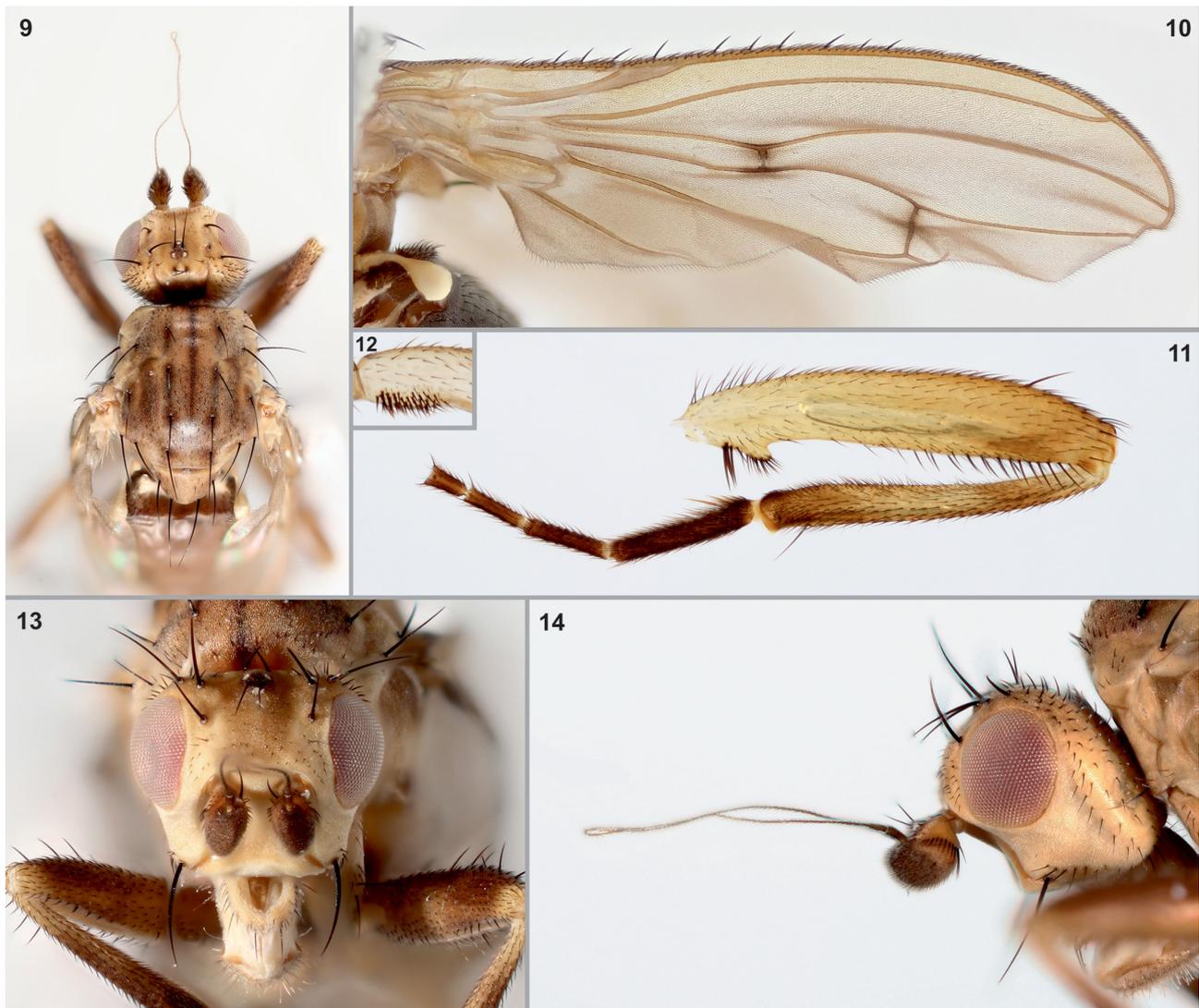
Type material. HOLOTYPE: ♂ (NMPC, genitalia prep.), 'CZ: Šumava Mts., 1100 m / Rokytecká slat', forest MT / 49°00'59"N, 13°25'05"E / M. Barták [lgt.], 16.vi.-21.vii.[19]99. // Eccoptomera [p] ♂ [hw] / ornata Loew / V.Martinek det. [p] 01[hw] // HOLOTYPE [b] / Eccoptomera nevrlyi [b] / sp. nov. J. Preisler & / M. Tkoč det. 2016 / ♂ [red label]'. PARATYPE: ♂ (NMPC, genitalia prep.): 'CZ-MORAVIA b. Jeseníky / Velký Kotel (náráz. past) / 14.7.-26.7.1994 / Grim lgt. // P A R A T Y P E [b] / Eccoptomera nevrlyi [b] / sp. nov. J. Preisler & / M. Tkoč det. 2016 / ♂ [yellow label]'.
 49°00'59"N, 13°25'05"E, 1100 m a.s.l.

Description. Male. Body length 4.25 mm (holotype), 4.35 mm (paratype). Wing length 3.90 mm (holotype), 3.85 mm (paratype). Body creamy yellow, brownish yellow to brown.

Head (Figs 9, 13, 14) wider than long, extended mouthparts shorter in height than the head itself. Frons yellowish brown to brown, very wide, covering more than half of the head width, with small setae arranged more densely in anterior half of the frons, posterior part of frons lacking small setae. Ocellar triangle rather small, of darker brown colour with very small setae and a pair of very long parallel (slightly divergent) ocellar setae (Figs 9, 13); postverticals of medium length and convergent. Two very long outer vertical setae, two long inner vertical setae. Occiput ivory yellow to brown, postgena ivory yellow, both with sparsely distributed short setae, ventral part of postgena with few longer setae. Posterior part of orbital plate ivory yellow to brown, devoid of small setae, only 1 long fronto-orbital seta (anterior fronto-orbital seta reduced to small setula, see Fig. 13). Anterior part of orbital plate with scattered short setae continuing to frons. Frons ivory yellow to brown coloured. Face and parafacialia ivory yellow, bare. Frontal lunule ivory yellow. Vibrissal angle ivory yellow, setose, with one long seta (vibrissa) and few shorter setae (Fig. 14). Gena high, ivory yellow, largely bare, with short (peristomal) setae along ventral margin. Eye relatively small (Fig. 14) suboval, its longest diameter about 1.27 times as long as shortest. Antenna (Fig. 14) yellowish brown, with paler scape, pedicel and basal third of first flagellomere; scape simple, with one short seta laterally; pedicel triangular in profile, with a row of setae at concave distal margin, microsetae on dorsal part and one prominent seta dorsally, two longer setae anteroventrally; 1st flagellomere rounded, ovoid, lenticular (laterally flattened) and finely microtomentose. Arista (Fig. 11) very long, about 3.5–4 times as long as rest of antenna, with 2 thicker basal segments brownish and terminal seta with very short yellow to white cilia.

Thorax (Fig. 9) ochreous brown to dark brown, dorsally covered by short setae, except sutural area. Mesonotum with 5 dark longitudinal, partly interrupted dark brown stripes (1 medial, 2 on dorsocentral lines, 2 lateral) and also a small area around supraalar seta darkened. Pleural parts of thorax bare, except for proepimeron, proepisternum and katepisternum. Postpronotal lobe with only 6 small setae. Notopleuron with two notopleural setae (posterior half length of anterior); one supraalar seta and two postalar (anterior longer) setae. No acrostichal macrosetae; 4 long dorsocentral setae (1 presutural, 3 postsutural). Scutellum with a few microsetae on disc and two pairs of long marginal scutellar setae (apical almost twice longer than laterobasal). Proepimeron with three very short setae. Anepisternum (mesopleuron) bare, ivory yellowish brown and subshining; katepisternum (sternopleuron) with two long setae and several microsetae, setose also on anteroventral margin. Anepimeron (pteropleuron), laterotergite (metapleuron) and meron (hypopleuron) bare, ivory yellowish brown and subshining.

Legs brown to ivory yellow. All femora and tibiae finely densely setulose in addition to some macrosetae. Fore fe-



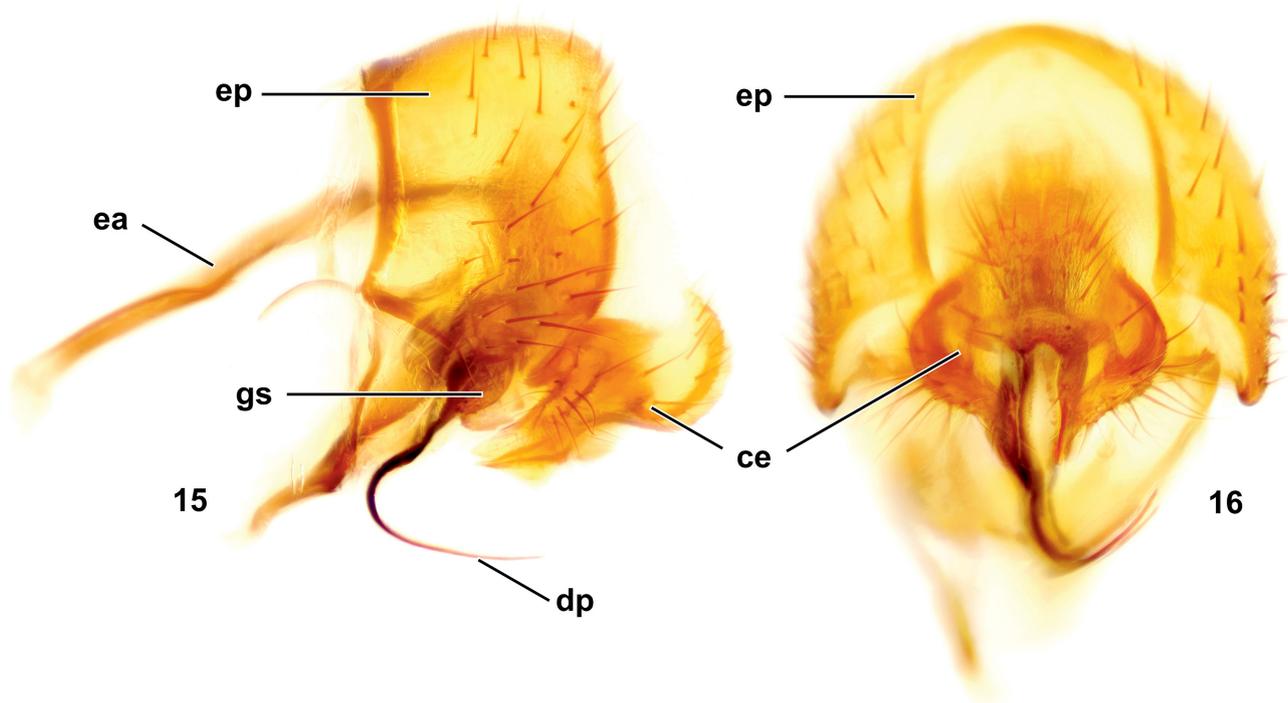
Figs 9–14. Comparison of males of *Eccoptomera nevryli* sp. nov. and *E. ornata* Loew, 1862. 9–11, 13–14 – *Eccoptomera nevryli*: 9 – head and thorax, dorsal view; 10 – left wing, lateral view; 11 – hind leg, inner lateral view; 13 – head, anterior view; 14 – head and antennae, lateral view. 12 – *E. ornata*, basal part of hind leg of *E. ornata*, inner lateral view.

mur brownish yellow, with longer setae in posteroventral and posterodorsal rows. Mid femur brownish yellow, with a few longer setae anteriorly (in distal half) and a row of thicker setae posteroventrally. Hind femur of subequal thickness along entire length (in lateral view), bearing ventrally a species-specific subbasal protuberance and setation (Fig. 11). Setation consists of two tufts, the basal one composed of 6–8 long setae directed posteroventrally, the distal one (placed on a protuberance) formed by about 18–20 short setae directed ventrally (Fig. 11). Hind femur also provided with two long dorsal setae in its distal fifth (one missing in Fig. 11) and two rows of long setae ventrally in distal half. All tibiae with 1 long dorsal preapical seta. Fore tibia covered with short setae. Mid tibia with short setae and with apical crown of thicker setae. Hind tibia darkened in apical third, with short setae, and one subapical posterior brush of fine golden setulae. All tarsi dark brown. Fore basitarsus with several longer posteroventral setae on basal half. Mid basitarsus posteroventrally with thicker setae, one longer subbasal seta and apically with a crown of thicker setae. Hind basitarsus with several

longer posteroventral setae in basal third. Other parts of tarsi simply setose with short and long setae.

Wing (Fig. 10) with normal venation; membrane equally covered by microtrichia, very lightly yellowish (wing base) and brownish tinted (rest of the wing membrane); colour pattern very similar to that of *E. ornata* Loew, 1862, with diffuse brownish darkening surrounding both cross-veins. Veins pale brown to brown, those in basal part of wing lighter. Base of costa bearing cluster of longer setae, one seta longer and stouter, rest of costa with 2–4 strong spine-like setae in front and 11–13 beyond costal break. Wing measurements: width 1.10–1.20 mm, C-index ($Cs_3 : Cs_4$) = 1.6, $r-m \backslash dm-cu : dm-cu = 2.4$. Haltere whitish to ivory yellow, knob not darker than stem.

Abdomen with preabdominal terga broad, extending to ventral side of abdomen, brown coloured, covered with fine setulae. T1 about one third of length of T2, narrowed medially. T2–T5 setulose, with longer setae at posterior margin; posterior margins of lighter colour. Preabdominal sterna light brown, with fine short setae. Pleural membrane pale brown, well visible laterally.



Figs 15–16. *Eccoptomera nevrlyi* sp. nov., male genitalia, holotype (Czech Republic, Šumava). 15 – genitalia laterally; 16 – genitalia caudally. For abbreviations see page 268.

Genitalia (Figs 15, 16) brown coloured with short gonostyli. Epandrium convex, of trapezoidal outline in lateral view (Fig. 15) with medium long setae, mainly on its caudal half. Cerci large, protruding posteroventrally, not fused to epandrium (Fig. 15), each cercus with several setae dorsally and ventrally (Fig. 16). Medandrium (= intraepandrial sclerite) not visible. Gonostylus small, rounded, situated ventrally (Fig. 15). Distiphallus of medium length, very slender, composed of two thread-like sclerites (Fig. 15). Ejacapodeme normally developed, relatively large, long, rod-like (Fig. 15).

Female. Unknown.

Differential diagnosis. *Eccoptomera nevrlyi* sp. nov. differs from the most similar species, *E. ornata*, by the following characters: hind femur ventrally with long setae (only setae of medium length present in *E. ornata*) and with a distinct subbasal protuberance (Fig. 11) with a tuft of short setae (no such protuberance is present in *E. ornata*, cf. Fig. 12); hind femur of equal thickness along its entire length in lateral view (distal half of hind femur thickened in *E. ornata*). The genitalia are differently formed than in *E. ornata*: the apical part of cercus (Figs 15, 16) is tapered in caudal view (apical part of cercus rounded in *E. ornata*); gonostylus very small (gonostylus markedly larger in *E. ornata*).

Etymology. This new species is named in honour of Dr. Miloslav Nevrlý, zoologist, writer, traveler and long-time member and head of the Department of Natural Science of the North Bohemian Museum in Liberec (Czech Republic).

Biology. Unknown. Probably montane species, the holotype was collected by Malaise trap in forested peat-bog and the paratype by a flight interception trap in montane forest; in both cases above 1000 m a.s.l.

Distribution. Czech Republic.

Discussion

Both newly described species are considered to be very rare in their natural habitats. *Heleomyza kovali* is probably associated with subterranean habitats (including caves), while *Eccoptomera nevrlyi* is most likely a montane species. To illustrate their rarity, we provide the numbers of identified males of similar species from the database of the senior author. Hitherto 4,276 males of similar *Heleomyza* species were identified: 2,619 males of *Heleomyza captiosa* (Gorodkov, 1962), 1,652 males of *H. serrata* (Linnaeus, 1758), and only 5 males appeared to be a different species – the herein described *H. kovali*. In the case of *Eccoptomera* it was 31 males; 29 males were identified as *E. ornata* and only 2 males proved to belong to the new species – *E. nevrlyi*.

Acknowledgements

László Papp (Magyar Természettudományi Múzeum, Budapest, Hungary) and Jindřich Roháček (Slezské zemské muzeum, Opava, Czech Republic) are acknowledged for the reviews and constructive comments improving quality of this paper. For provision of the specimens we thank Alexander G. Koval (All-Russian Institute for Plant Protection, St. Petersburg, Russia), Miroslav Barták (Česká zemědělská univerzita, Praha, Czech Republic) and Olga Komzárková (Meixnerová) (Brno, Czech Republic). We thank our friend Pavel Vonička (Severočeské muzeum, Liberec, Czech Republic) for his long-time assistance in the field. This work was supported by the Ministry of Culture of the Czech Republic (DKRVO 2018/13, National Museum, Prague, 00023272) and by the Institutional Research Support grant of the Charles University, Prague (SVV No. 260 434 / 2018).

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