

## The genera *Meoneura* Nitzsch and *Carnus* Rondani (Diptera: Carnidae) in Israel, with the description of ten new species, new records and identification keys

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### ABSTRACT

The Carnidae of the genera *Meoneura* and *Carnus* from the collection of the Tel Aviv University have been investigated. Ten new species are described from Israel: *Meoneura bilboi* n. sp., *M. brakeae* n. sp., *M. davidi* n. sp., *M. goldemari* n. sp., *M. grimorum* n. sp., *M. lilliputensis* n. sp., *M. meszarosi* n. sp., *M. nilsholgerssoni* n. sp. (also from Egypt), *M. oskari* n. sp., and *M. wichtelorum* n. sp. Ten species—*M. acuticerca*, *M. furcata*, *M. glaberrima*, *M. hungarica*, *M. lacteipennis*, *M. maritima*, *M. moravica*, *M. neottiophila*, *M. prima*, and *M. triangularis*—are recorded in the country for the first time. Three new synonyms are introduced: *Meoneura palaestinensis* Hennig, 1937 = *Meoneura nitidiuscula* Collin, 1949 (n. syn.), *Meoneura moravica* Gregor & Papp, 1981 = *Meoneura pamphylica* Ozerov, 2008 (n. syn.) and *Meoneura prima* (Becker, 1903) = *Meoneura baluchistani* Duda, 1936 (n. syn.). A total of 22 species of *Meoneura* and one species of *Carnus* are now known from Israel. Four identification keys are presented for species of *Meoneura* species groups.

KEYWORDS: Diptera, Carnidae, *Meoneura*, *Carnus*, Filth flies, Israel, Egypt, new species, new synonymy, identification keys.

### RESUMEN

Los Carnidae de los géneros *Meoneura* y *Carnus* de la colección de la Universidad de Tel Aviv han sido investigados. Diez nuevas especies se describen desde Israel: *Meoneura bilboi* n. sp., *M. brakeae* n. sp., *M. davidi* n. sp., *M. goldemari* n. sp., *M. grimorum* n. sp., *M. lilliputensis* n. sp., *M. meszarosi* n. sp., *M. nilsholgerssoni* n. sp. (también desde Egipto), *M. oskari* n. sp. y *M. wichtelorum* n. sp. Diez especies se registran en el país por primera vez: *M. acuticerca*, *M. furcata*, *M. glaberrima*, *M. hungarica*, *M. lacteipennis*, *M. maritima*, *M. moravica*, *M. neottiophila*, *M. prima* y *M. triangulari*. Se proponen tres nuevos sinónimos: *Meoneura palaestinensis* Hennig, 1937 = *Meoneura nitidiuscula* Collin, 1949 (n. syn.), *Meoneura moravica* Gregor & Papp, 1981 = *Meoneura pamphylica* Ozerov, 2008 (n. syn.) y *Meoneura prima* (Becker, 1903) = *Meoneura baluchistani* Duda, 1936 (n. syn.). Un total de 22 especies de *Meoneura* y una especie de *Carnus* ahora se conocen en Israel. Se presentan cuatro claves de identificación para especies de grupos de especies de *Meoneura*.

PALABRAS CLAVE: Dípteros, Carnidae, *Meoneura*, *Carnus*, Israel, Egipto, moscas de la inmundicia, nuevas especies, nuevos sinónimos, claves de identificación.

## INTRODUCTION

The Carnidae, otherwise known as Bird flies or Filth flies, is a small family of acalyptrate flies with 116 described species worldwide. Only three genera—*Carnus*, *Hemeromyia*, and *Meoneura*—are known in the Palaearctic Region and all these occur in Israel (Freidberg 1988). The flies are only up to 2 mm long and mainly black. Due to their similarity to several other more common acalyptrates, the Carnidae are recognised only by experts and are easily overlooked in samples. Thus, it is not surprising that our knowledge of this group is grossly inadequate and that we are at the very beginning of a long road that leads to true appreciation of the filth fly species richness and distribution. The situation in Israel is similarly bleak, with only two publications (Freidberg 1988; Hennig 1937) mentioning three species, i.e. *Carnus hemapterus*, *Meoneura palaestinensis*, and *Meoneura perlamellata*. Usually only few specimens of the Carnidae are held in entomological collections and it is uncommon to get across a large and diverse collection of these insects. During the last five decades such a collection comprising approximately 30 species has been accumulated by the second author and his team. While a revision of the genus *Hemeromyia* Coquillett, 1902 is in progress, the two remaining Palaearctic genera, *Meoneura* and *Carnus*, are treated in this paper.

## MATERIALS AND METHODS

All specimens are pinned. In a very few specimens the diagnostic structures of the postabdomen could be identified without any preparation. Otherwise, the abdomen was dissected, macerated for about four hours in the aqueous solution of sodium hydroxide and stored in a microvial in glycerine together with the pinned specimen. Before detaching the abdomen off, the specimens were softened by putting them for two to three hours in an air-tight box with damp paper. The material is stored in the collection of the Steinhardt Museum of Natural History, Israel National Center for Biodiversity Studies, Tel Aviv University (SMNHTAU) with vouchers kept in the private collection of Stuke (PJHS).

The data are adopted from the labels with as few changes as possible. Transliterated names of localities in Israel follow the *Israel Touring Map* and *List of settlements* published by the Survey of Israel (2009). Where names of localities have changed since the labels were prepared, the most recent Hebrew names are cited, with other names given in square brackets, as in the following example: 'En Hemed [Aquabella]. Coordinates are added only if they are printed on the labels. The data given on the original labels of holotypes is rendered as follows: the labels are listed and numbered in the order found, commencing with the uppermost. Line breaks on labels are indicated by a slash mark ('/'). Names of regions in Israel are as in Theodor (1975).

Morphological terminology is adopted after Cumming & Wood (2009) and Buck & Marshall (2007) (Figs 1, 2, 13) The subepandrial sclerites lie within the epandrium, are more or less fused with each other, may be fused with the hypo-

proct and are connected with the hypandrial arms. The term ‘subepandrial plate’ is used if the subepandrial sclerites and the hypoproct are fused. An obvious structure protruding out of the epandrium and bearing several strong setae is an important diagnostic character of some *Meoneura*. This structure is interpreted as ‘process of the hypoproct’ by Wheeler (2010: 1102, fig. 5). Several *Meoneura* species have a structure close to the surstylus or fused basally with the surstylus. This structure is called ‘lamella’ by several authors (e.g. Collin 1930; Papp 1998, 2013; Ozerov 2011). The origin of this structure remains unresolved and there is a high variability concerning its shape and sclerotization within *Meoneura*. The situation is additionally complicated by the presence of species with a bifid surstylus. In these species it remains unclear if there is a bifid surstylus and no lamella, or if there is a strongly sclerotized lamella that is fused with the simple surstylus and can no longer be distinguished due to strong sclerotisation. In this paper we treat the lamella as an independent structure that is not part of the surstylus. If the surstylus is bifid and no differences in the sclerotisation of both arms of surstylus can be detected we assume a bifurcation and not a strongly sclerotized and fused lamella. The shape of the surstylus depends on the viewing angle. Because in several specimens the surstyli are medially directed they seem to be shorter when looking at the postabdomen in lateral view. Therefore, we include two lateral drawings of the surstylus, one illustrating the surstylus *in situ* within the epandrium and the other showing only the surstylus at its maximum length. A separate sclerite ventrally beneath the protandrium (syntergosternite 6–8 *sensu* Wheeler 2010: 1102, fig. 5) is called tergite 7 (Buck & Marshall 2007: 14, fig. 16).

As regards the setation pattern, the most anteroventral seta on the face is interpreted as the vibrissa, whereas those setae above the vibrissa are interpreted as supravibrissal setae and those setae posterior to the vibrissal seta, on the gena, are interpreted as genal setae. The number of setae refer to one body side only.

To describe the orientation of the postabdomen we use the term dorsal for the outer surface of the epandrium with the cerci.

Four ratios are used in descriptions of new species: (1) between the maximum length and maximum height of the eye, (2) between the posteroventral margin of the gena closest to the eye margin and the maximum eye height, (3) between the lengths of metatarsus and tibia in the midleg, and (4) between the maximum length dorsally in the middle of the epandrium (including cerci) and the maximum width of epandrium.

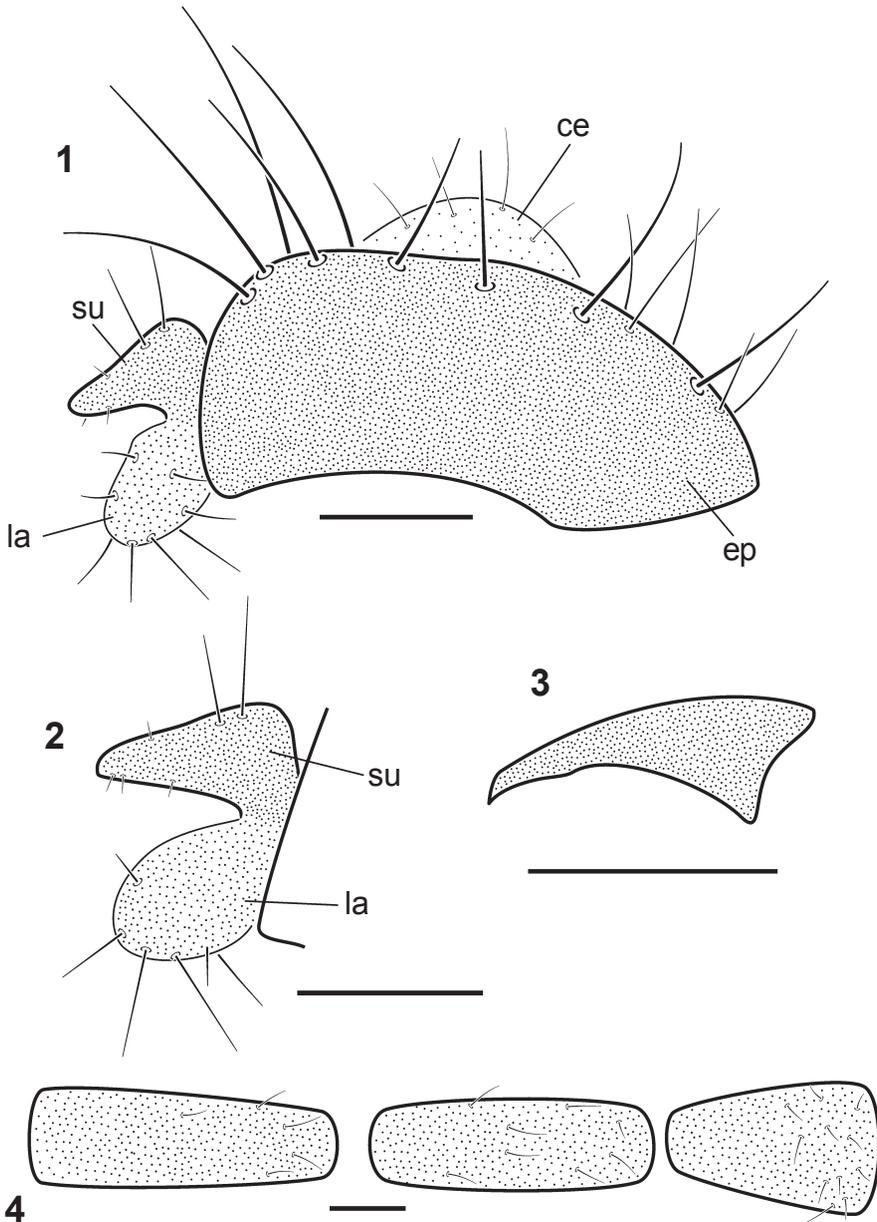
The three Palaearctic genera of the Carnidae can be identified with the keys of Brake (2011) or Papp (1998). The most important publications for species identification used during this study were the keys of Collin (1930) and Papp (1978*a*). Additionally, the original descriptions of all species published afterwards or not included in those papers are taken into account. Details of the identification of difficult species are thoroughly discussed below. The nomenclature is adopted from Brake (2011).

## TAXONOMY

Genus *Carnus* Nitzsch 1818*Carnus hemapterus* Nitzsch, 1818*Carnus hemapterus*: Nitzsch 1818: 306.**Material examined:** Israel: 4♀ 1.iv.1984, Kefar Yedidya, R. Singe (PJHS, SMNHTAU).**Remarks:** There are only two species known from the Palaearctic Region, *Carnus hemapterus* and *Carnus orientalis* Maa, 1968. Diagnostic characters of these two species are provided by Maa (1968) with minor additions by Iwasa *et al.* (2014).**Distribution:** Nearctic: Canada, USA. Neotropical: Mexico. Palaearctic: Austria, Czech Republic, Egypt, Germany, Great Britain, Hungary, Israel, Italy, Japan, the Netherlands, Romania, Russia, Saudi Arabia, Slovakia, Spain, Sweden, Switzerland.Genus *Meoneura* Rondani 1856*Meoneura acuticercus* Gregor, 1973*Meoneura acuticercus*: Gregor 1973: 138.**Material examined:** Israel: 1♂ 2.i.1997, Qalya, A. Freidberg (SMNHTAU); 10♂ 10.xii.2013, Sappir Park, A. Freidberg (PJHS, SMNHTAU).**Distribution:** Palaearctic: Andorra, Czech Republic, Israel (new record), Spain.*Meoneura bilboi* n. sp.

(Figs 1–4)

**LSID:** urn:lsid:zoobank.org:act:FCBBEE90-5DEE-4129-BC2E-4D19B32F6FB6.**Etymology:** The species is dedicated to Bilbo Baggins (*aka* Beutlin, *aka* Сумкин) who, being an ordinary hobbit, found the ring of power in J.R.R. Tolkien's fantasy novel *The Hobbit*.**Diagnosis:** *Meoneura bilboi* belongs to the *Meoneura flavifacies* Collin, 1930 species-group with a thin, moderately long surstylus and a distinct lamella. In the key of Stuke and Bächli (2015) it easily runs to *M. occulta* Stuke, 2015 due to the distinct dorsobasal setae on the surstylus, a large lamella that is almost as long as the surstylus and the completely black frons. However, the large lamella that is broader at the base than the surstylus and rounded apically (Figs 1, 2) distinguishes this species easily from *M. occulta* and other species of the *Meoneura flavifacies*-group.**Description** (holotype, male): Length 1.9 mm. Wing length 1.4 mm. Head height 0.4 mm.*Head* completely black. Antenna black. Arista with minute pubescence. Eye max. length : max. height ratio, 1.1. Posteroventral margin of gena : max. eye height ratio, 0.4. Frons subshining. Frontal triangle shining, distinct, reaching anteriorly two-thirds of distance from anterior ocellus to frontal margin. Face slightly microtomentose. Carina narrow. Postcranium slightly microtomentose. Prementum



**Figs 1–4:** *Meoneura bilboi* n. sp., holotype: (1) lateral view of epandrium and surstylus; (2) lateral view of surstylus; (3) lateral view of postgonite; (4) ventral view of sternite 3 (left) to sternite 5 (right). Abbreviations: ce – cercus, ep – epandrium, la – lamella, su – surstylus. Scale bars = 50  $\mu$ m.

longer and wider than labellum. Palpus black, about half as long as haustellum. Setation: 1 distinct ocellar seta, supralunular setae cruciate, 4 fronto-orbital setae (2 anterior mesocline, 2 posterior laterocline), 2 vertical setae, postocellar setae parallel, 1 strong vibrissal seta, 2 supravibrissal setae (ventral one distinctly smaller), 3 strong genal setae.

*Thorax.* Scutum subshining and covered with black setulae. Scutellum microtomentose. Pleura slightly microtomentose. Setation: scutum with 1 long dorso-central seta; additional dorsocentral setae cannot be discerned among black setulae on scutum; 1 postpronotal seta; 1 presutural seta; 2 notopleural setae; 1 supra-alar seta; 1 postalar seta; prescutellar seta not recognisable; 1 apical and 1 lateral scutellar seta; 1 seta at posterior margin of anepisternum; 1 dorsal seta and 1 ventral seta on katepisternum. Wing hyaline, veins light brown to whitish yellow. Costa with no obvious setulae beyond vein  $R_1$ . Haltere knob whitish yellow, base dark brown. Legs black. Coxae with no distinct setae. Fore femur apically with 2 strong posteroventral setae. Hind femur apically with 1 strong anteroventral seta. Hind metatarsus ventrally with dense golden yellow hairs. Lengths of midleg metatarsus : tibia ratio, 0.6.

*Abdomen.* Tergites with no obvious depressions or tufts of setulae. Pleura without setae. Segments 1–5 narrow, tergite 3 width : length, 2.6. Tergite 3 with a short lateral seta at the posterior margin, tergite 4 with a short lateral seta and additionally a submedial stronger seta, tergite 5 with 6 or 7 long setae at posterior margin. Sternite 5 trapezoid, longer than broad, with a few minute setae only (Fig. 4). Tergite 7 distinct. Protandrium distinct, about as long as epandrium and about 0.6 as long as tergite 5. Protandrium not fused ventrally. Epandrium with a few medium sized setae but no outstanding seta (Fig. 1). Epandrium max. length : max. width, 0.7. Cerci indistinct, not obviously projecting, and with a few setulae only. Subepandrial sclerites fused with each other and with hypoproct to form sclerotised subepandrial plate. Subepandrial plate with several small setulae laterally. Hypoproct not projecting laterally. No tooth on subepandrial plate. Surstylus (Figs 1, 2) short, broad-based, convex dorsally and slightly concave ventrally, dorsally with at least two distinct setulae, no medially directed seta recognised. Lamella (Fig. 2) broad, about as long as surstylus, slightly less sclerotized than surstylus. Lamella with several hairs, a few of these may be as long as lamella. Surstylus and lamella broadly fused basally (Fig. 2). Postgonite (Fig. 3) slightly sclerotised, elongated, pointed, apically hook-like. Distiphallus short, about as long as maximum length of epandrium, with sclerotized setulae and dorsally an area of long hyaline setae. Basiphallus distinctly sclerotised, long, narrow, slightly widened at base.

**Holotype:** ♂ (1) “Israel: Har / Hermon, 2200m / 27.v.1999 / A. Freidberg” [31°47'N 34°38'E]; (2) “Holotypus / *Meoneura bilboi* / n. sp. ♂ / det. Stuke 2017” (SMNHNTAU). The posterior part of the abdomen is dissected, macerated and stored in a glycerine microvial pinned underneath the specimen. The remainder of the specimen is pinned and is in an acceptable condition.

**Distribution:** The species is known only from Mt Hermon (Anti-Lebanon Ridge) in northern Israel.

*Meoneura brakeae* n. sp.

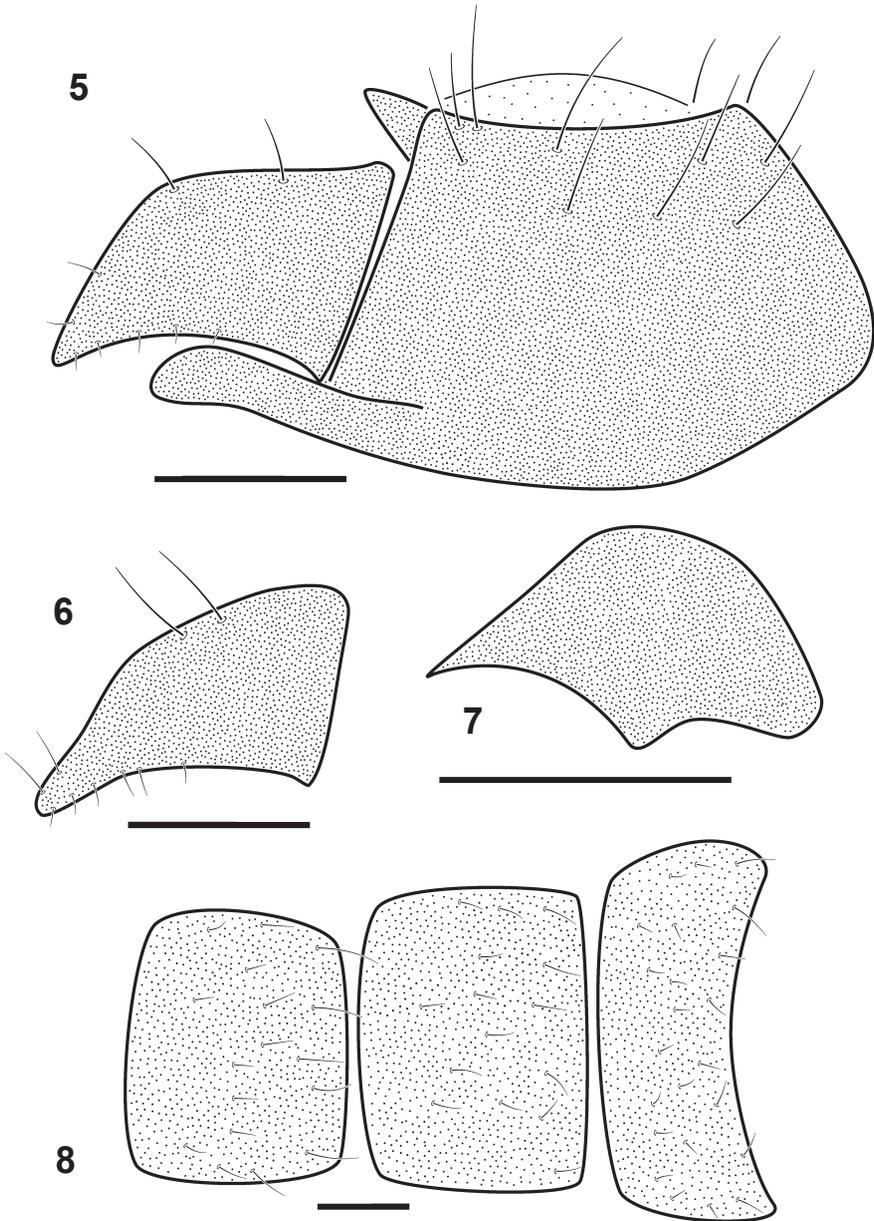
(Figs 5–7)

**LSID:** urn:lsid:zoobank.org:act:D0E5202F-82ED-459D-B8F6-5F2950AF7197.**Etymology:** The species is named in honour of Irina Brake (Hannover, Germany), who made a significant contribution to the knowledge of several Diptera families, especially Milichiidae and Carnidae, and supported the work of the first author for a long time and in various ways.**Diagnosis:** *Meoneura brakeae* is easily recognised by the shape of the male post-abdomen (Figs 5–7). The large, falcate surstylus is unique as is the narrow, long extension of the epandrium. Only *M. tschorsnigi* Carles-Tolrá, 2008 has a similar surstylus but that species has a very short lamella and strong setae on the epandrium. *Meoneura vikhrevi* Ozerov, 2011 has a large, falcate surstylus and no lamella, too, but the surstylus is ventrally more concave and there is no long extension of the epandrium. Other species with falcated surstyli have a distinct lamella and the surstylus is smaller.**Description** (holotype, male): Length about 1.5 mm. Wing length 1.4 mm. Head height 0.3 mm.

*Head* black, anterior part of frons orange brown. Antenna black. Arista with minute pubescence. Eye max. length : max. height ratio, 0.9. Posteroventral margin of gena : max. eye height ratio, 0.5. Frons with frontal triangle slightly microtomentose to subshining. Frontal triangle indistinct, due to shrivelled head. Face slightly microtomentose. Carina narrow. Postcranium slightly microtomentose. Prementum longer than labellum and wider. Palpus black, about half as long as haustellum. Setation: 1 distinct ocellar seta, supralunular setae slightly convergent, 4 fronto-orbital setae (2 anterior mesocline, 2 posterior laterocline), 2 vertical setae, postocellar setae parallel, 1 strong vibrissal seta, 2 supravibrissal setae (ventral one distinctly smaller), only 1 strong genal seta recognised.

*Thorax.* Scutum completely microtomentose and covered with black setulae. Scutellum microtomentose. Pleura, as far as can be seen in holotype, entirely microtomentose. Setation: scutum with 1 long dorsocentral seta, additional dorsocentral setae cannot be discerned among black setulae on scutum; 1 postpronotal seta; 1 presutural seta; 2 notopleural setae; 1 supra-alar seta; 1 postalar seta; 1 small pre-scutellar seta; 1 apical and 1 lateral scutellar setae; 1 seta at posterior margin of anepisternum; 1 dorsal seta and 1 ventral seta on katapisternum. Wing hyaline, veins light brown to whitish yellow. Costa with no obvious setulae beyond vein R<sub>1</sub>. Knob of haltere whitish yellow, base of haltere light brown. Legs black to brown. Coxae with no distinct setae. Fore femur apically with 1 strong posteroventral seta. No seta at right hind femur recognized. Hind metatarsus ventrally with dense golden yellow hairs. Lengths of midleg metatarsus : tibia ratio, 0.4.

*Abdomen.* Tergites with no obvious depressions or tufts of setulae. Abdominal pleura with scattered setae on segments 4–5. Segments 1–5 narrow, tergite 3



**Figs 5–8:** *Meoneura brakeae* n. sp., holotype: (5) lateral view of epandrium and surstylus; (6) lateral view of surstylus; (7) lateral view of postgonite; (8) ventral view of sternite 3 (left) to sternite 5 (right). Scale bars = 50  $\mu$ m.

width: length, 4.0. Tergites 3–5 each with short lateral seta at posterior margin, tergite 4 additionally with 3 small setae at posterior edge, and tergite 5 with 2 or 3 longer setae at posterior margin. Sternite 5 trapezoid, much broader than long (Fig. 8). Sternite 5 with a few short setae only (Fig. 8). Tergite 7 not recognised. Proandrium distinct, about as long as epandrium and about half as long as tergite 5, fused ventrally. Epandrium with a few small setae only (Fig. 5). Epandrium max. length: max. width, 0.8. Cerci indistinct, not obviously projecting, and with a few setulae only. Subepandrial sclerites fused with each other and with hypoproct into sclerotised subepandrial plate. Subepandrial plate with few small setulae laterally. Hypoproct not projecting laterally. No tooth on subepandrial plate. Surstylus (Figs 5, 6) falcate with a broad base, pointed, dorsally with isolated inconspicuous setulae, apically without medially directed seta. No lamella present, only long extension of epandrium. (This extension is not connected with the surstylus but clearly belongs to the epandrium and has no setae or setulae.) Postgonite (Fig. 7) slightly sclerotised, with broad base, falcate, not distinctly pointed apically. Distiphallus elongated, longer than maximum length of epandrium, with dense brown setulae and long hyaline setae dorsally. Basiphallus distinctly sclerotised, long, narrow, slightly widened at base.

**Holotype:** ♂ (1) “Israel / Nahal 'Ammud, / nr. 'En Zetim / 23.ix.1997 / A. Freidberg” [32°57'N 35°30'E]; (2) “Holotypus / *Meoneura brakeae* / n. sp. ♂ / det. Stuke 2017” (SMNHNTAU). The posterior part of abdomen is dissected, macerated and stored in a glycerine microvial pinned underneath the specimen. The remainder of the specimen is pinned and in an acceptable condition save for a shrivelled head and left hind leg missing.

**Distribution:** Northern Israel.

***Meoneura davidi*** n. sp.

(Figs 9–12)

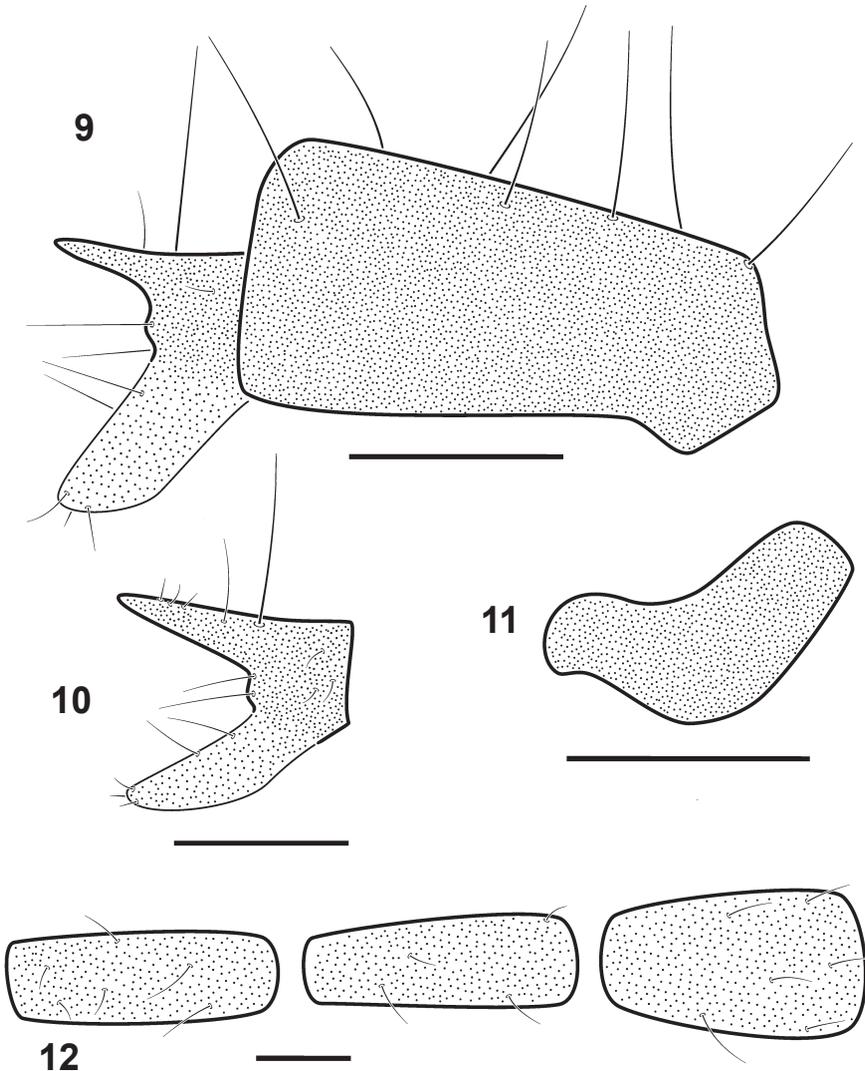
**LSID:** urn:lsid:zoobank.org:act:8D799EBE-A77F-4FC7-8A41-FAAD733E0BF6.

**Etymology:** The species is dedicated to David, a small Israeli shepherd who defeated the Philistine giant Goliath using a non-standard approach during the battle. David's lesson demonstrates that the real key to victory may be obscured by common misconceptions.

**Diagnosis:** At the first glance *M. davidi* resembles members of the *Meoneura bicuspidata*-group because of its large lamella that is broadly connected basally with the surstylus (Fig. 10); however, the degree of the lamellar sclerotisation is less than in the surstylus. Therefore, the species belongs to the *Meoneura flavifacies*-group with a thin, moderately long surstylus and a distinct lamella. Only two other species have (a) an obvious large basal connection of the surstylus and lamella and (b) a lamella that is about as long as the surstylus: *M. occulta* and *M. sublongisetosa* Carles-Tolrá, 2008. These two species have a broad dorsally convex surstylus, while *M. davidi* has a small surstylus with a straight dorsal margin. Additionally,

the lamella of *M. davidi* is clearly larger than the surstylus, with several distinct setae at the place of their connection (Fig. 10).

**Description** (holotype, male): Length about 1.5 mm. Wing length 1.2 mm. Head height 0.3 mm.



**Figs 9–12:** *Meoneura davidi* n. sp., holotype: (9) lateral view of epandrium and surstylus; (10) lateral view of surstylus; (11) lateral view of postgonite; (12) ventral view of sternite 3 (left) to sternite 5 (right). Scale bars = 50  $\mu$ m.

*Head* completely black. Antenna black. Arista without pubescence. Eye max. length : max. height ratio, 1.0. Posteroventral margin of gena : max. eye height ratio, 0.4. Frons with frontal triangle shining to subshining. Frontal triangle indistinguishable due to shrivelled head. Antennae hide face and therefore amount of microtomentum cannot be estimated. Carina narrow. Postcranium slightly microtomentose. Prementum as long as labellum and not significantly wider. Palpus brown, more than half as long as haustellum. Setation: 1 distinct ocellar seta, supralunular setae slightly convergent, 4 fronto-orbital setae (2 anterior mesocline, 2 posterior laterocline), 2 vertical setae, postocellar setae parallel, 1 strong vibrissal seta, 2 supravibrissal setae (ventral one distinctly smaller), 1 or 2 strong genal setae.

*Thorax.* Scutum completely subshining and covered with black setulae. Scutellum microtomentose. Pleura, as far as can be seen in holotype, slightly microtomentose. Setation: scutum with 1 long dorsocentral seta, additional dorsocentral setae cannot be discerned among black setulae on the scutum; 1 seta on postpronotum; 1 presutural seta; notopleural setae invisible due to pinning; 1 supra-alar seta; 1 postalar seta; no prescutellar seta recognised; 1 apical and 1 lateral scutellar seta, 1 seta at posterior margin of anepisternum, 1 dorsal seta on katepisternum, ventral seta on katepisternum not recognised. Wing hyaline, veins light brown to yellowish. Costa with no obvious setulae beyond vein  $R_1$ . Knob of haltere yellowish, base of haltere light brown. Legs black to brown. Coxae with no distinct setae. Fore femur apically with 3 strong posteroventral setae. Hind femur apically with 1 strong anteroventral seta. Hind metatarsus ventrally with dense golden yellow hairs. Lengths of midleg metatarsus : tibia ratio, 0.6.

*Abdomen.* Tergites with no obvious depressions or tufts of setulae. Abdominal pleura with scattered setae on segments 4–5. Segments 1–5 narrow, tergite 3 width : length, 3.8. Tergites 3–5 each with a short lateral seta at posterior margin, tergites 4–5 additionally with 2 smaller setae. Sternite 5 elongated, longer than broad, with few setae shorter than width of sternite 5 (Fig. 12). Tergite 7 not recognised. Protandrium distinct, about as long as epandrium and about 0.5 times as long as tergite 5. Protandrium not fused ventrally but this may be an artefact of preparation. Epandrium with a few medium sized setae but no outstanding seta (Fig. 9). Epandrium max. length : max. width, 0.7. Cerci indistinct, not obviously projecting, and with a few setulae only. Subepandrial sclerites fused with each other and with hypoproct into sclerotised subepandrial plate. Subepandrial plate with several small setulae on anterior margin. Hypoproct not projecting laterally. No tooth on subepandrial plate. Surstylus (Figs 9, 10) elongated, narrow, pointed, dorsally at base with 2 or 3 strong setae and several smaller setae, apically with medially directed seta. Lamella (Fig. 10) broad, distinctly larger than surstylus, slightly less sclerotized than surstylus. Lamella with several hairs, all shorter than lamella. Surstylus and lamella broadly fused basally, with some conspicuous setae at connecting part (Fig. 10). Postgonite (Fig. 11) distinctly sclerotised, with broad base, hardly elongated, pointed. Distiphallus elongated, longer than maximum

length of epandrium, with dense brown setulae arranged in two apically joined lines and with several long hyaline hairs. Basiphallus distinctly sclerotised, long, narrow, at base hardly widened.

**Holotype:** ♂ (1) “Israel Har / Hermon, 2200m / 27.v.1999 / A. Freidberg” [31°47'N 34°38'E]; (2) “Holotypus / *Meoneura davidi* / n. sp. ♂ / det. Stuke 2017” (SMNHHTAU). The posterior part of abdomen is dissected, macerated and stored in a glycerine microvial pinned underneath the specimen. The remainder of the specimen is pinned and in poor condition. The left wing and left hind leg are missing and the specimen is shrivelled.

**Distribution:** *Meoneura davidi* is known only from Mount Hermon of the Anti-Lebanon Mountains in northern Israel.

### *Meoneura furcata* Hennig, 1937

*Meoneura furcata*: Hennig 1937: 64.

**Material examined: Israel:** 7♂ 28.ii.1996, Bor Mashash, N. Dorchin & A. Freidberg (PJHS, SMNHHTAU); 1♂ 7.iii.2007, Ma'agar Yeroḥam, A. Freidberg (SMNHHTAU); 1♂ 9.xii.1941, Yerushalayim [Jerusalem], Har haZofim [Mount Scopus] (SMNHHTAU); 2♂ 25.x.1947, Yerushalayim, Har haZofim, O. Theodor (SMNHHTAU).

**Distribution:** Palaearctic: Algeria, Israel (new record), Spain.

**Remarks:** *Meoneura furcata* has unique genitalia with characteristically shaped surstylus as illustrated by Hennig (1937: 64, fig. 58).

### *Meoneura glaberrima* Becker, 1907

*Meoneura glaberrima*: Becker 1907: 548.

**Material examined: Israel:** 1♂ 18.v.2009, Har Hermon [Mt Hermon], 1600 m, A. Freidberg (SMNHHTAU); 1♂ 23.x.1986, Naḥal Bezet, Y. Livne (SMNHHTAU); 1♂ 4.iii.1975, Naḥal Oren, F. Kaplan (SMNHHTAU); 3♂ 6.v.1999, Naḥal Oren, A. Freidberg (PJHS, SMNHHTAU); 1♂ 16.iv.1993, Park Rosh ha'Ayin, A. Freidberg & F. Kaplan (PJHS).

**Distribution:** Palaearctic: Afghanistan, Austria, Czech Rep., France, Great Britain, Hungary, Israel (new record), Montenegro, Serbia, Spain, Switzerland, Tunisia.

### *Meoneura goldemari* n. sp.

(Figs 13–17)

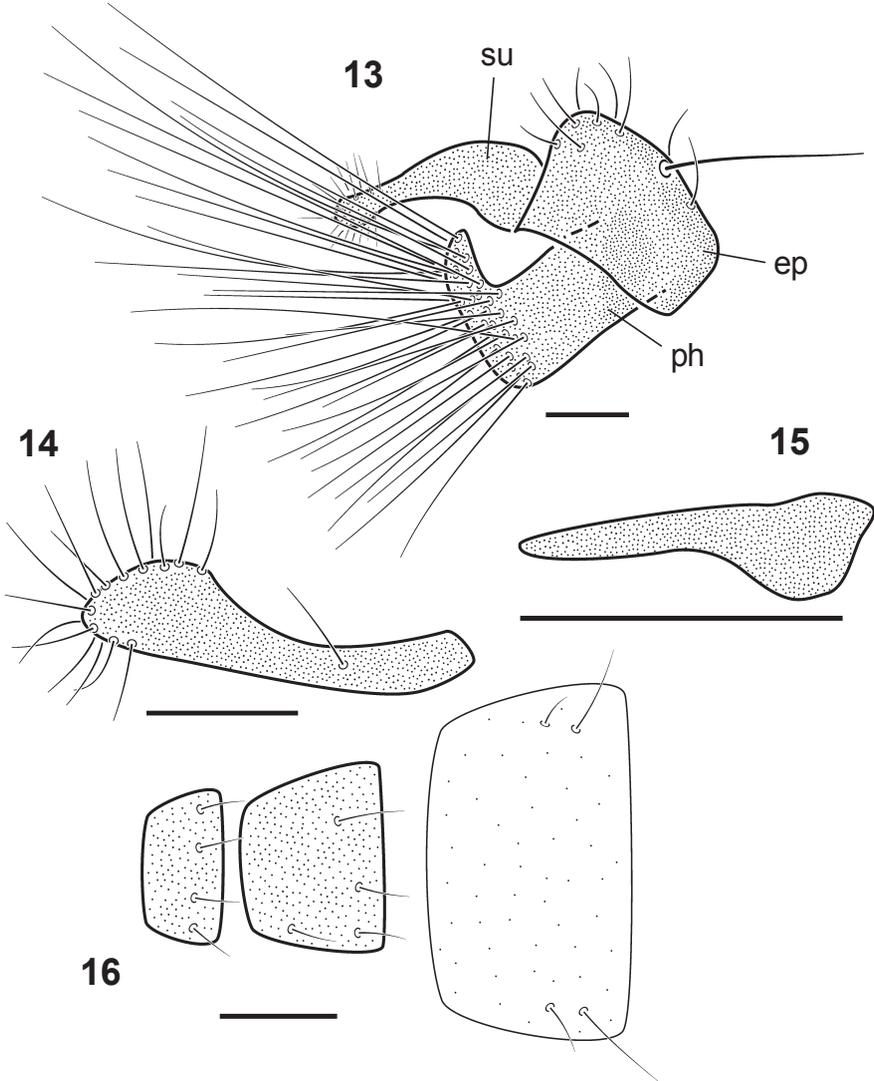
**LSID:** urn:lsid:zoobank.org:act:7CEFE1C1-DCA8-4713-9B89-15E47FE21FFD.

**Etymology:** The species is named after King Goldemar, a dwarf who imprisoned the maid Hertlin, who later became the wife of the gothic King Dietrich von Bern. The story was told in the poem by Albrecht von Kemenaten.

**Diagnosis:** *Meoneura goldemari* is similar to *M. prima*, and both species have been collected on the same date and at the same place. The first obvious character to identify *M. goldemari* is its short surstylus (Figs 13, 14). Additional characters include an inconspicuous dorsal seta at the base of the surstylus (Fig. 14), an apically extended process of the hypoproct (Fig. 13), the epandrium with one strong

seta (Fig. 13) and no hair tufts on the subepandrial plate. The species is included in key 1 (see p. 208).

**Description** (holotype, male): Length about 1.9 mm. Wing length 1.6 mm. Head height 0.4 mm.



**Figs 13–16:** *Meoneura goldemari* n. sp., holotype: (13) lateral view of epandrium and surstylus; (14) dorsolateral view of surstylus; (15) lateral view of postgonite; (16) ventral view of sternite 3 (left) to sternite 5 (right). Abbreviations: ep – epandrium, ph – process of hypoproct, su – surstylus. Scale bars = 50  $\mu$ m.

*Head* black, anterior part of frons slightly lighter, brown. Antenna black. Arista with minute pubescence. Eye max. length : max. height ratio, 0.9. Posteroventral margin of gena : max. eye height ratio, 0.4. Frons slightly microtomentose to subshining, frontal triangle subshining to slightly microtomentose. Frontal triangle distinct, reaching anteriorly two-thirds from anterior ocellus to frontal margin. Face microtomentose. Carina narrow. Postcranium slightly microtomentose. Prementum longer and wider than labellum. Palpus brown, more than half as long as haustellum. Setation: 1 distinct ocellar seta, supralunular setae slightly convergent, 4 fronto-orbital setae (2 anterior mesocline, 2 posterior laterocline), 2 vertical setae, postocellar setae parallel, 1 strong vibrissal seta, 2 strong supravibrissal setae, 2 strong genal setae.

*Thorax.* Scutum completely microtomentose and covered with black setulae. Scutellum microtomentose. Pleura, as seen in holotype, slightly microtomentose. Setation: scutum with 1 long posterior dorsocentral seta and 2 smaller anterior setae, 1 seta on postpronotum; 1 presutural seta; 2 notopleural setae; 1 supra-alar seta; 1 postalar seta; 1 prescutellar seta; 1 apical and 1 lateral scutellar seta; 1 seta at posterior margin of anepisternum; 1 dorsal seta and 1 ventral seta on katepisternum. Wing hyaline, veins light brown to whitish yellow. Costa with no obvious setulae beyond radial vein  $R_1$ . Knob of haltere whitish yellow, base of haltere invisible. Legs black to brown. All coxae with single indistinct black seta each. Fore femur apically with 1 strong posteroventral seta and basally with 2 or 3 indistinct posteroventral setae. Hind femur apically with 1 strong anteroventral seta. Hind metatarsus ventrally with dense golden yellow hairs. Lengths of midleg metatarsus : tibia ratio, 0.6.

*Abdomen.* Tergites with no obvious depressions or tufts of setulae. Abdominal pleura with scattered setae on segments 3–5. Segments 1–5 narrow, tergite 3 width : length, 3.2. Tergites 3–4 each with a short but distinct lateral seta at the posterior margin, and with 2 or 3 short setae at the posterior margin. Sternite 5 weakly sclerotised and therefore difficult to examine, probably trapezoid, longer than broad (Fig. 16). Sternite 5 with 2 indistinct lateral setae. Tergite 7 developed. Protandrium distinct, about as long as epandrium and about 0.6 as long as tergite 5. Protandrium not fused ventrally. Epandrium with 1 strong seta (Fig. 13). Epandrium max. length : max. width, 0.2. Cerci indistinct, not obviously projecting, and with a few setulae only. Subepandrial sclerites fused with each other and with hypoproct into sclerotised subepandrial plate. Subepandrial plate with at most 2 setae laterally, but these may be broken and not visible anymore. Process of hypoproct (Figs 13, 14) slightly elongated, with a broader base and becoming broader apically; dorsally and apically with isolated inconspicuous hairs; no medially directed seta. No lamella. Postgonite (Fig. 15) indistinct, slightly sclerotised, pointed, apically straight. Distiphallus elongated, longer than maximum length of epandrium, with dense brown setulae but completely membranous (Fig. 17). Basiphallus distinctly sclerotised, long, narrow, at base slightly widened.



**Figs 17, 18:** *Meoneura* spp., lateral view of distiphallus, holotypes: (17) *M. goldemari* n. sp.; (18) *M. wichtelorum* n. sp.

**Holotype:** ♂ (1) "ISRAEL / Ein-Boqeq / 4.ii.1981 / A. Freidberg" [31°12'N 35°21'E]; (2) "Holotypus / *Meoneura goldemari* / n. sp. ♂ / det. Stuke 2017" (SMNHNTAU). The posterior part of the abdomen is dissected, macerated and stored in a glycerine microvial pinned underneath the specimen. The remainder of the specimen is pinned and in good condition.

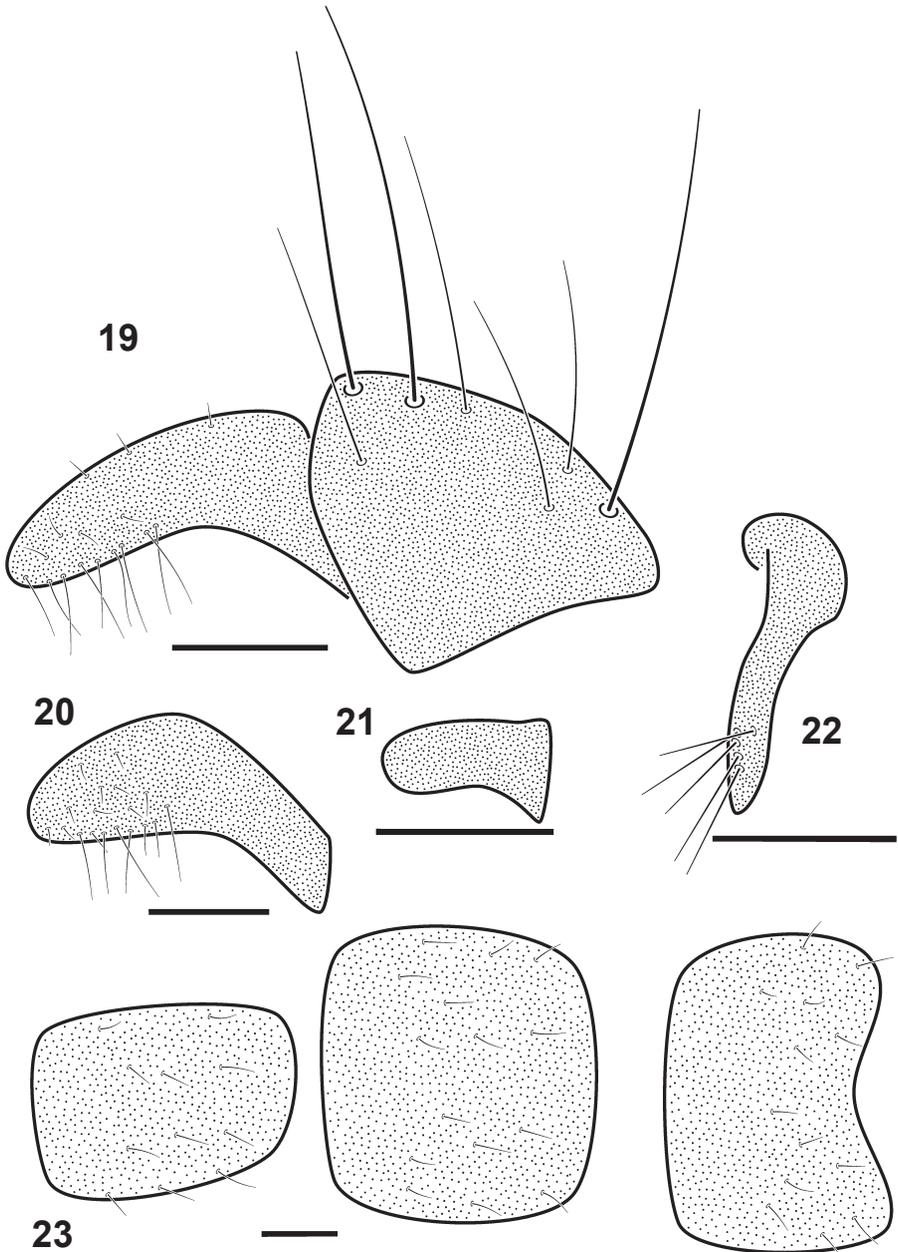
**Distribution:** *Meoneura goldemari* is known only from the type locality, 'En Boqeq [עין בוקק], a small town on the Dead Sea shore.

***Meoneura grimmorum* n. sp.**

(Figs 19–23)

**LSID:** urn:lsid:zoobank.org:act:B0F69896-7D03-4DFE-B516-617B1767A2F3.

**Etymology:** The species is dedicated to Jacob and Wilhelm Grimm, who collected and published the German folklore, and made dwarfs famous, for example in the fairytale *Snow white*.



**Figs 19–23:** *Meoneura grimmorum* n. sp., holotype: (19) lateral view of epandrium and surstylus; (20) lateral view of surstylus; (21) lateral view of postgonite; (22) lateral view of process of hypoproct; (23) ventral view of sternite 3 (left) to sternite 5 (right). Scale bars = 50  $\mu$ m.

**Diagnosis:** *Meoneura grimmorum* belongs to a species-group with a broad and anteriorly rounded surstylus, without a lamella. Due to the almost rectangular sternite 5 (Fig. 23) and long, erected setulae at the scutum it can be confused only with *M. palaestinensis*. However, *M. grimmorum* is easily recognised by (a) the epandrium with several strong setae and 3 outstanding long setae that are about as long as those on the posterior margin of tergite 5 (Fig. 19), (b) a surstylus that is not hyaline at the tip, which is tapering anteriorly and has several medially and ventrally directed hairs (Figs 19, 20), (c) a small proceeding of the hypoproct with about 5 setae (Fig. 22), and (d) a distinctly developed protandrium that is visible between tergite 5 and the epandrium. The new species is keyed below (p. 211).

**Description** (holotype, male): Length about 1.9 mm. Wing length 1.2 mm. Head height 0.4 mm.

*Head* black, anterior part of frons orange brown, face and dorsal part of gena dark orange brown. Antenna black. Arista bare. Eye max. length : max. height ratio, 1.2. Posteroventral margin of gena : max. eye height ratio, 0.6. Frons with frontal triangle slightly microtomentose. Frontal triangle distinct, reaching anteriorly two-thirds of distance from anterior ocellus to frontal margin. Microtomentum on face cannot be recognised. Carina broad, almost as broad as fore tibia. Postcranium slightly microtomentose. (The haustellum and palpi cannot be examined because they are almost completely hidden in the mouth cavity.) Setation: 1 distinct ocellar seta, supralunular setae parallel, not cruciate, 4 fronto-orbital setae (2 anterior mesocline, 2 posterior laterocline), 2 vertical setae, postocellar setae parallel, 1 strong vibrissal seta, 1 supravibrissal seta only, 2 strong genal setae.

*Thorax.* Scutum subshining and covered with scattered, erect black setulae. Scutellum subshining. Pleura, as far as can be seen in holotype, slightly microtomentose. Setation: scutum with 1 long dorsocentral seta, additional dorsocentral setae cannot be discerned among long black setulae on scutum; 1 seta on postpronotum; 1 presutural seta; only 1 notopleural seta recognised, second one might be broken off; 1 supra-alar seta; 1 postalar seta; no prescutellar seta recognised; 1 apical and 1 lateral scutellar seta; 1 seta at posterior margin of anepisternum; no setae on kat-episternum recognised. Wing hyaline, veins light brown to whitish yellow. Costa with no obvious setulae beyond radial vein  $R_1$ . Knob of haltere brown yellow, base of haltere light brown. Legs brown. Coxae with no distinct setae. Fore femur apically with 2 strong posteroventral setae. Hind femur apically with 1 strong anteroventral seta. Hind metatarsus ventrally with dense golden yellow hairs. Lengths of midleg metatarsus : tibia ratio, 0.7.

*Abdomen.* Tergites with no obvious depressions or tufts of setulae. Abdominal pleura with scattered setae on segments 3–5. Segments 1–5 narrow, tergite 3 width : length, 2.3. Tergites 2–5 each with short lateral seta at posterior margin, tergite 5 with 4 obvious long setae at posterior margin. Sternite 5 broad, distinctly broader than long, with few short setae in posterior half (Fig. 23). Tergite 7 developed. Protandrium small, about as long as epandrium medially and about 0.25 as long as tergite 5. Protandrium fused ventrally by indistinct barely sclerotized connection.

Epandrium with several strong setae, 1 outstanding long seta at anterior margin and 2 outstanding setae close to surstylus (Fig. 19). Epandrium max. length : max. width, 0.5. Cerci indistinct, not obviously projecting, and with a few setulae only. Subepandrial sclerites fused with each other and with hypoproct into sclerotised subepandrial plate. Subepandrial plate without setulae. Small process of hypoproct not projecting out of epandrium and with about 5 setae only (Fig. 22). No tooth on subepandrial plate. Surstylus (Figs 19, 20) elongated, with small base, tapering apically, with several hairs ventrally and medially. No lamella. Postgonite (Fig. 21) distinctly sclerotised, broad-based, slightly elongated, apically rounded. Distiphallus elongated, longer than maximum length of epandrium, with dense brown setulae but entirely membranous. Basiphallus distinctly sclerotised, long, narrow, at base barely widened.

**Holotype:** ♂ (1) "Israel / Ein Boqeq / 30.VII.1981 / A. Freidberg" [31°12'N 35°21'E]; (2) "Holotypus / *Meoneura grimmorum* / n. sp. ♂ / det. Stuke 2017" (SMNHTAU). The posterior part of abdomen is dissected, macerated and stored in a glycerine microvial pinned underneath the specimen. The remainder of the specimen is pinned and in good condition.

**Distribution:** Restricted to the type locality in south-eastern Israel.

### *Meoneura hungarica* Papp, 1977

*Meoneura hungarica*: Papp 1977a: 177.

**Material examined: Israel:** 1♂ 16.iii.1995, Bor Mashash, A. Freidberg (SMNHTAU); 1♂ 17.iv.2000, Har Meron, 1100 m, A. Freidberg (SMNHTAU); 1♂ 8.iii.1985, 'Immanu'el, I. Nussbaum (SMNHTAU); 1♂ 2.iii.1987, Montfort, I. Yarom (SMNHTAU); 3♂ 4.iii.1993, Montfort, A. Freidberg (PJHS, SMNHTAU); 1♂ same data but 5.iii.2008; 11♂ 19.iii.2002, Zomet Rantis, A. Freidberg (PJHS, SMNHTAU).

**Distribution:** Palaearctic: Andorra, Czech Republic, Hungary, Israel (new record), Slovakia, Spain, Tunisia.

**Remarks:** *Meoneura hungarica* belongs to a group of very similar species that have a more or less triangular and anteriorly pointed surstylus and no adjacent lamella. Key 2 (see p. 210) facilitates the identification of species belonging to this group. While typical *M. hungarica* and *M. triangularis* are easily separated by the shape of the surstylus, there are some intermediates that are difficult to distinguish.

### *Meoneura lacteipennis* (Fallén, 1823)

*Agromyza lacteipennis* Fallén, 1823: 4.

*Meoneura lacteipennis* (Fallén): Collin 1911: 233.

**Material examined: Israel:** 2♂ 14.ii.1976, Carmel, A. Freidberg (SMNHTAU); 12♂ 20.ii.1974, Central Nahal Tirza [Wadi Faria], A. Freidberg (SMNHTAU); 1♂ 3.viii.1985, 'Immanu'el, I. Nussbaum (SMNHTAU); 13♂ 10.iii.1981, Montfort, A. Freidberg (PJHS, SMNHTAU); 1♂ 9.iii.1982, Montfort, F. Kaplan (SMNHTAU); 2♂ 15.iii.1975, Nahal 'Iyyon Nature Reserve, HaTanur waterfall, A. Freidberg (SMNHTAU); 2♂ same data but 6.iii.1985 (PJHS, SMNHTAU); 1♂ 5.iii.2008, Nahal Keziv [33°02.7'N 35°13.6'E], A. Freidberg (SMNHTAU); 2♂ 4.iii.1975, Nahal Oren, F. Kaplan (SMNHTAU); 3♂ 22.ii.1981, Nahal Oren, A. Freidberg (SMNHTAU); 1♂ 1.iii.1973, Nahal Tirza [Wadi Faria], A. Freidberg (SMNHTAU); 2♂ 1.iii.1975, Nahal Tirza [Wadi Faria], F. Kaplan

(SMNHTAU); 2♂ 7.ii.1996, Nizzanim, I. Yarom & A. Freidberg (SMNHTAU); 1♂ 7.iii.1981, Qiryat Tiv'on, A. Freidberg (SMNHTAU); 4♂ 14.iii.1975, Qusbiye, F. Kaplan (SMNHTAU); 1♂ 4.iv.1981, Yaqqir, A. Freidberg (SMNHTAU); 1♂ 21.iii.1985, Zomet 'Arad, 5 km S Devira, A. Freidberg (SMNHTAU); 7♂ 14.iii.1975, Zomet Nappah, A. Freidberg (PJHS, SMNHTAU).

**Distribution:** Nearctic: Canada, USA. Palaearctic: Austria, Bosnia and Herzegovina, Czech Republic, Finland, France, Germany, Hungary, Israel (new record), Italy, Norway, Poland, Russia, Spain, Sweden, Switzerland, Tunisia.

*Meoneura lilliputensis* n. sp.

(Figs 24–27)

**LSID:** urn:lsid:zoobank.org:act:1D23313A-0023-47E5-BD61-F552549147E6.

**Etymology:** The species is named after the fictional island Lilliput that was introduced in the novel *Gulliver's Travels* by Jonathan Swift (1726). Lilliput is inhabited by tiny people, who are about one-twelfth the height of ordinary human beings.

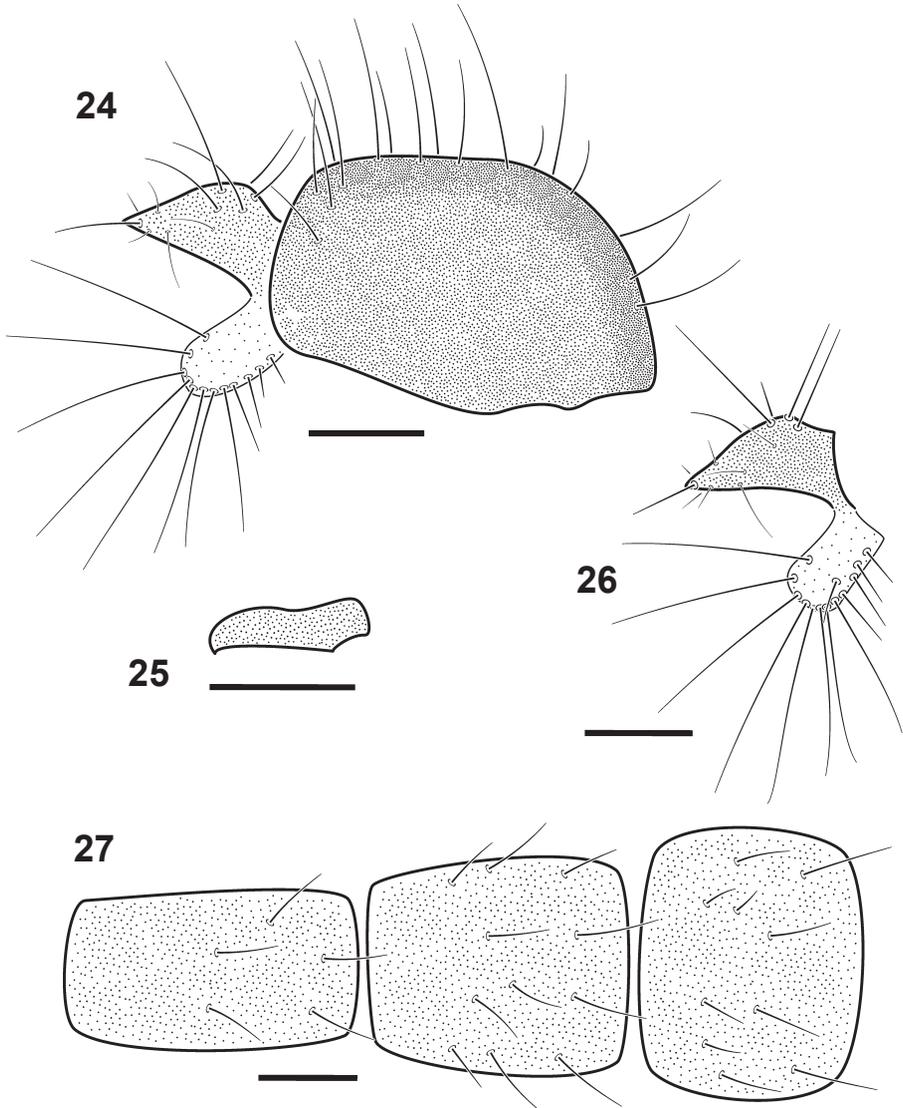
**Diagnosis:** *Meoneura lilliputensis* belongs to a group of species with a distinct large lamella that is about as long as surstylus, narrows basally, and has more than 10 long setae, of which several are twice as long as lamella (Fig. 26). Having over 10 distinct setae on the surstylus (Fig. 26), *M. lilliputensis* is closest to *M. helvetica* Papp, 1997 and *M. asiatica* Papp, 1976. The characteristic shape of the surstylus in the new species (Fig. 26) is very similar to *M. asiatica*, and *M. lilliputensis* can only be distinguished as a valid species if the shape of sternite 5 is taken into account. Contrary to *M. helvetica* and *M. asiatica*, the new species has a broad sternite 5 that is at least as broad as long (Fig. 27). The shape of sternite 5 in *M. asiatica* was not described originally but has been checked against a photograph of the holotype's abdomen kindly provided by Zoltán Soltész (Budapest, Hungary). *Meoneura lilliputensis* is included in key 3 (see p. 211).

**Description** (holotype, male): Length about 1.7 mm. Wing length 1.2 mm. Head height 0.4 mm.

*Head* black to dark brown, anterior part of frons slightly lighter orange brown. Antenna black. Arista without pubescence. Eye max. length: max. height ratio, 1.0. Posteroventral margin of gena: max. eye height ratio, 0.4. Frons slightly microtomentose to subshining, frontal triangle shining. Frontal triangle distinct, reaching anteriorly two-thirds of distance from anterior ocellus to frontal margin. Face slightly microtomentose. Carina narrow. Postcranium slightly microtomentose. Prementum as long as labellum and not significantly wider. Palpus brown, about half as long as haustellum. Setation: 1 distinct ocellar seta, supralunular setae convergent, 4 fronto-orbital setae (2 anterior mesocline, 2 posterior laterocline), 2 vertical setae, postocellar setae parallel, 1 strong vibrissal seta, 2 supravibrissal setae (ventral one distinctly smaller), 3 strong genal setae.

*Thorax.* Scutum shining to subshining and covered with black setulae. Scutellum slightly microtomentose. Pleura, as far as can be seen in types, slightly micro-

tomentose. Setation: scutum with 1 long and 2 distinctly smaller dorsocentral setae; 1 seta on postpronotum; 1 presutural seta; 2 notopleural setae; 1 supra-alar seta; 1 postalar seta; 1 indistinct prescutellar seta; 1 apical and 1 lateral scutellar seta; 1 seta at posterior margin of anepisternum; 1 dorsal seta on katepisternum,



**Figs 24–27:** *Meoneura lilliputensis* n. sp., holotype: (24) lateral view of epandrium and surstylus; (25) lateral view of surstylus; (26) lateral view of postgonite; (27) ventral view of sternite 3 (left) to sternite 5 (right). Scale bars = 50  $\mu$ m.

ventral seta cannot be recognised. Wing hyaline, veins light brown to whitish yellow. Costa with no obvious setulae beyond radial vein  $R_1$ . Knob of haltere whitish yellow, base of haltere brownish. Legs black to brown. Fore coxa with 1 outstanding strong seta, middle coxa with 2 strong setae, hind coxa without outstanding seta. Fore femur apically with 2 strong posteroventral setae. Hind femur apically with 1 strong anteroventral seta. Hind metatarsus ventrally with dense golden yellow hairs. Lengths of midleg metatarsus : tibia ratio, 0.6.

**Abdomen.** Tergites with no obvious depressions or tufts of setulae. Abdominal pleura with scattered setae on segments 4–5. Segments 1–5 narrow, tergite 3 width : length, 2.5. Tergites 3–5 each with short lateral seta at posterior margin, tergite 5 with several longer setae laterally and in addition with 3 submedial long setae at posterior margin. Sternite 5 broader than long (Fig. 27). Sternite 5 with several scattered setae (Fig. 27). Tergite 7 developed. Protandrium distinct, only slightly shorter than epandrium and about 0.7 as long as tergite 5. Protandrium widely separated ventrally. Epandrium with several setae but without prominent ones (Fig. 24). Epandrium max. length : max. width, 0.6. Cerci indistinct, not obviously projecting, and with a few setulae only. Subepandrial sclerites fused with each other and with hypoproct into sclerotised subepandrial plate. Subepandrial plate with about 8–10 setulae. Hypoproct not projecting laterally. No tooth on subepandrial plate. Surstylus (Figs 24, 26) dorsally convex, ventrally slightly concave, apically pointed, dorsolaterally with 8–11 strong setae, medially with a few less obvious setae, subapically with distinct medially directed seta. Lamella (Fig. 26) broad, almost as long as surstylus, apically rounded; lamella with several hairs, some of them about twice as long as lamella. Surstylus and lamella broadly fused basally (Fig. 26). Postgonite (Fig. 25) distinctly sclerotised, elongated, pointed, apically slightly hooked. Distiphallus short, about as long as epandrium, with dense brown setulae but completely membranous. Basiphallus distinctly sclerotised, long.

**Holotype:** ♂ (1) “Israel: / Mamshit / 28.ii.1996 / A. Freidberg” [31°14'N 34°46'E]; (2) “Holotypus / *Meoneura lilliputensis* / n. sp. ♂ / det. Stuke 2017” (SMNHTAU). The posterior part of the abdomen is dissected, macerated and stored in a glycerine microvial pinned underneath the specimen. The remainder of the specimen is pinned and in good condition.

**Paratypes:** **Israel:** 3♂ 28.ii.1996, Bor Mashash, N. Dorchin & A. Freidberg (PJHS, SMNHTAU); 10♂ 28.ii.1996, Horvat Mamshit, A. Freidberg (PJHS, SMNHTAU); 1♂ 21.ii.1977, Mash'abe Sade, A. Freidberg (SMNHTAU); 1♂ 27.xii.1982, Yevul, Pithat Shalom, A. Freidberg (SMNHTAU).

**Distribution:** To date this species is only known from four localities in southern Israel. Papp (1978*b*) reported *M. asiatica* from Tunisia and that record should be checked whether it could be in fact the very similar *M. lilliputensis*.

**Remarks:** From the original description, one can assume that *Meoneura sublongisetosa* Carles-Tolrà, 2008 also belongs to the *Meoneura helvetica*-group, but examination of two paratypes shows that this species is very similar to (and perhaps conspecific with) *Meoneura occulta* Stuke, 2015, and belongs to the *Meoneura flavifacies*-group with fewer setae on the lamella.

*Meoneura maritima* Ozerov, 1991

*Meoneura maritima*: Ozerov 1991: 11.

**Material examined:** Israel: 4♂ 10.iv.1976, 'En Gedi [31°27'N 35°23'E], ex. *Cucumis melo*, emerged 20.iv.1976, A. Freidberg (PJHS, SMNHTAU); 1♂ 10.iii.1983, Tel Aviv [32°06'N 34°48'E], A. Freidberg (SMNHTAU).

**Remarks:** The identification of this species is documented in key 1 (see p. 208). The present record is quite surprising, for only three males from the type locality in the Russian Far East—Primorsky Krai [Maritime Territory], Lazovsky District, environs of Lazo (Ozerov 2005)—have been recorded to date.

**Distribution:** Palaearctic: Israel (new record), Russia.

*Meoneura meszarosi* n. sp.

(Figs 28–31)

**LSID:** urn:lsid:zoobank.org:act:6DF8471C-36C5-453B-9D7C-CCBE726A6CB8.

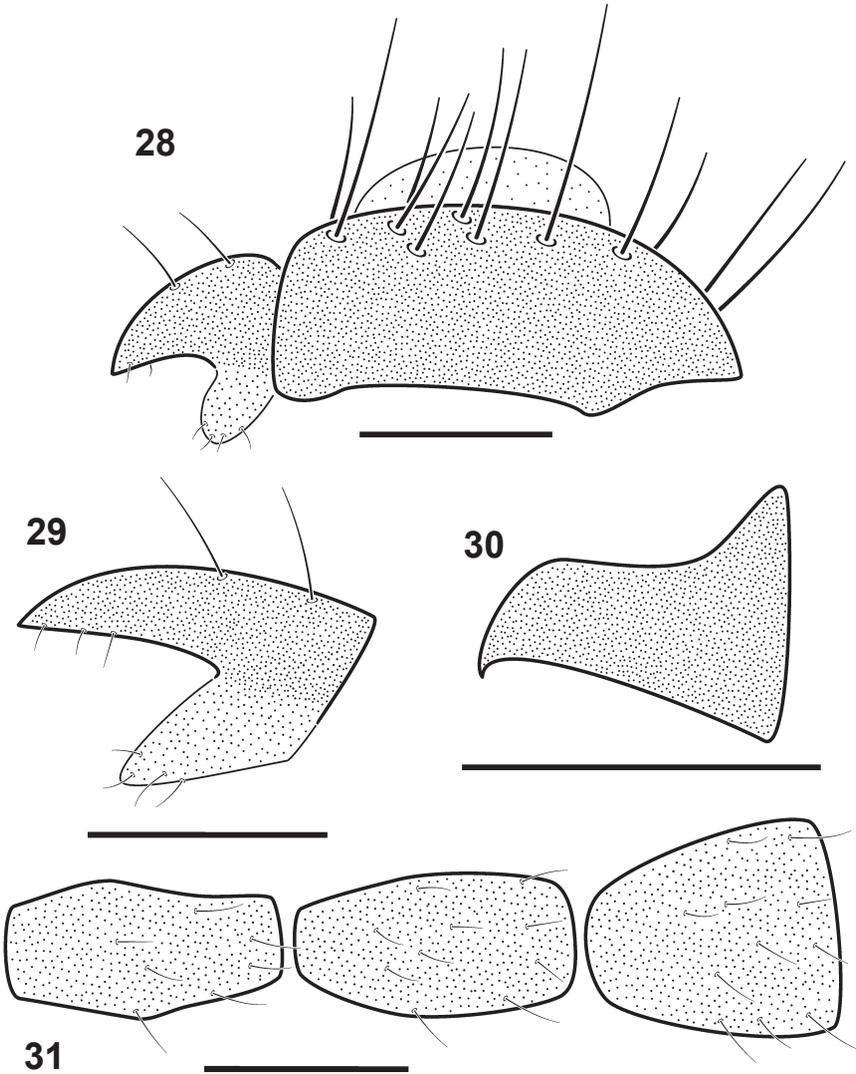
**Etymology:** The new species is dedicated to the Hungarian-born American actor Mihály 'Michu' Mészáros (1939–2016). Only 84 cm tall, he became famous as the “smallest man in the world” performing at the Ringling Bros. and Barnum & Bailey Circus and later as a TV and film actor. He played the role of the alien in the sitcom *ALF* and pictured a strange extraterrestrial creature as an adorable personage.

**Diagnosis:** *Meoneura meszarosi* can be distinguished by the shape of the surstylus and lamella. The surstylus resembles that of *M. bicuspidata* Collin, 1930 due to the broad basal connection of the surstylus and lamella and the surstylus that is clearly longer than the lamella. However, the lamella in *M. meszarosi* is obviously less sclerotized than the surstylus. In *M. bicuspidata* and related species there is a homogenous sclerotisation and therefore it is unclear whether there is a surstylus and a lamella or only a bifid surstylus. The broad basal connection at the base of the surstylus and lamella is also a typical character of *M. occulta* and *M. sublongisetosa*. However, these two species have distinct setae on the lamella and can easily be separated. A similar-shaped surstylus can be found in *M. glaberrima* Becker, 1907 but this species has distinct long setae on the lamella, too. An additional important character of *M. meszarosi* is the shining area on the scutum in front of the scutellum.

**Description** (holotype, male): Length about 1.9 mm. Wing length 1.4 mm. Head height 0.3 mm.

*Head* mainly black to dark brown. Anterior part of frons, carina and small area of gena close to eye lighter orange brown. Antenna black. Arista with minute pubescence. Eye max. length: max. height ratio, 1.1. Posteroventral margin of gena: max. eye height ratio, 0.5. Frons subshining, frontal triangle shining. Frontal triangle distinct, reaching half distance from anterior ocellus to frontal margin. Face slightly microtomentose. Carina slightly enlarged. Postcranium slightly mic-

rotomentose. Prementum as long as labellum and not significantly wider. Palpus brown, about half as long as haustellum. Setation: 1 distinct ocellar seta, supra-lunular setae convergent, 4 fronto-orbital setae (2 anterior mesocline, 2 posterior



**Figs 28–31:** *Meoneura meszarosi* n. sp.: (28) lateral view of epandrium and surstylus, holotype; (29) lateral view of surstylus, paratype from Nizzanim; (30) lateral view of postgonite, paratype from Nizzanim; (31) ventral view of sternite 3 (left) to sternite 5 (right), holotype. Scale bars = 50  $\mu$ m.

lateroclinate), 2 vertical setae, postocellar setae parallel, 1 strong vibrissal seta, 2 supravibrissal setae (ventral one distinctly smaller), 4 strong genal setae.

**Thorax.** Scutum strongly microtomentose with obvious shining area in front of scutellum and covered with black setulae. Scutellum strongly microtomentose. Pleura, as far as can be seen in types, slightly microtomentose. Setation: scutum with 1 long and 1 distinctly smaller dorsocentral setae; 1 seta on postpronotum; 1 presutural seta; 2 notopleural setae; 1 supra-alar seta; 1 postalar seta; 1 indistinct prescutellar seta; 1 apical and 1 lateral scutellar seta; 1 seta at posterior margin of anepisternum; 1 dorsal and 2 or 3 ventral setae on katepisternum. Wing hyaline, veins light brown to whitish yellow. Costa with no obvious setulae beyond radial vein  $R_1$ . Knob of haltere whitish yellow, base of haltere light brownish. Legs black to brown. Coxae with no distinct setae. Fore femur apically with 2 strong posteroventral setae. Hind femur apically with 1 strong anteroventral seta. Hind metatarsus ventrally with dense golden yellow hairs. Lengths of midleg metatarsus: tibia ratio, 0.5.

**Abdomen.** Tergites with no obvious depressions or tufts of setulae. Abdominal pleura with scattered setae on segments 3–5. Segments 1–5 narrow, tergite 3 width: length, 3.6. Tergites 2–5 each with lateral seta at posterior margin. Tergite 4 additionally with 3 setae at posterior margin. Tergite 5 with several longer setae laterally and in addition with 3 setae at posterior margin. Sternite 5 slightly longer than broad (Fig. 31). Sternite 5 with few setae (Fig. 31). Tergite 7 developed. Protandrium distinct, slightly longer than epandrium and about 0.6 as long as tergite 5. Protandrium widely separated ventrally. Epandrium with several setae but without prominent ones (Fig. 28). Epandrium max. length: max. width, 0.6. Cerci indistinct, slightly projecting, and with a few setulae only. Subepandrial sclerites fused with each other and with hypoproct into sclerotised subepandrial plate. Subepandrial plate with about 8–10 indistinct setulae. Hypoproct not projecting laterally. No tooth on subepandrial plate. Surstylus (Figs 28, 29) dorsally convex, ventrally concave, apically pointed, with 2 distinct dorsolateral setae only. Lamella (Fig. 29) broad, short, with only a few minute setulae that are shorter than width of lamella. Surstylus and lamella broadly fused basally (Fig. 29). Postgonite (Fig 30) distinctly sclerotised, broad-based, elongated, pointed, apically slightly hooked. Distiphallus about twice as long as epandrium, basally with two lines of dense brown setulae that join anteriorly and almost hyaline apically. Basiphallus distinctly sclerotised, long.

**Variability:** Paratypes have three dorsocentral setae.

**Holotype:** ♂ (1) “Israel / Tel Qeshet / 13.x.2001 / A. Freidberg” [32°58'N 35°48'E]; (2) “under *Ziziphus* / and *Casuarina* / goat and sheep / dung on soil”; (3) “Holotypus / *Meoneura meszarosi* / n. sp. ♂ / det. Stuke 2017” (SMNHTAU). The posterior part of the abdomen is dissected, macerated and stored in a glycerine microvial pinned underneath the specimen. The remainder of the specimen is pinned and is in a good condition.

**Paratypes:** Israel: 3♂ 7.ii.1996, Nizzanim, I. Yarom & A. Freidberg (PJHS, SMNHTAU).

**Distribution:** To date this species is only known from two localities in Israel.

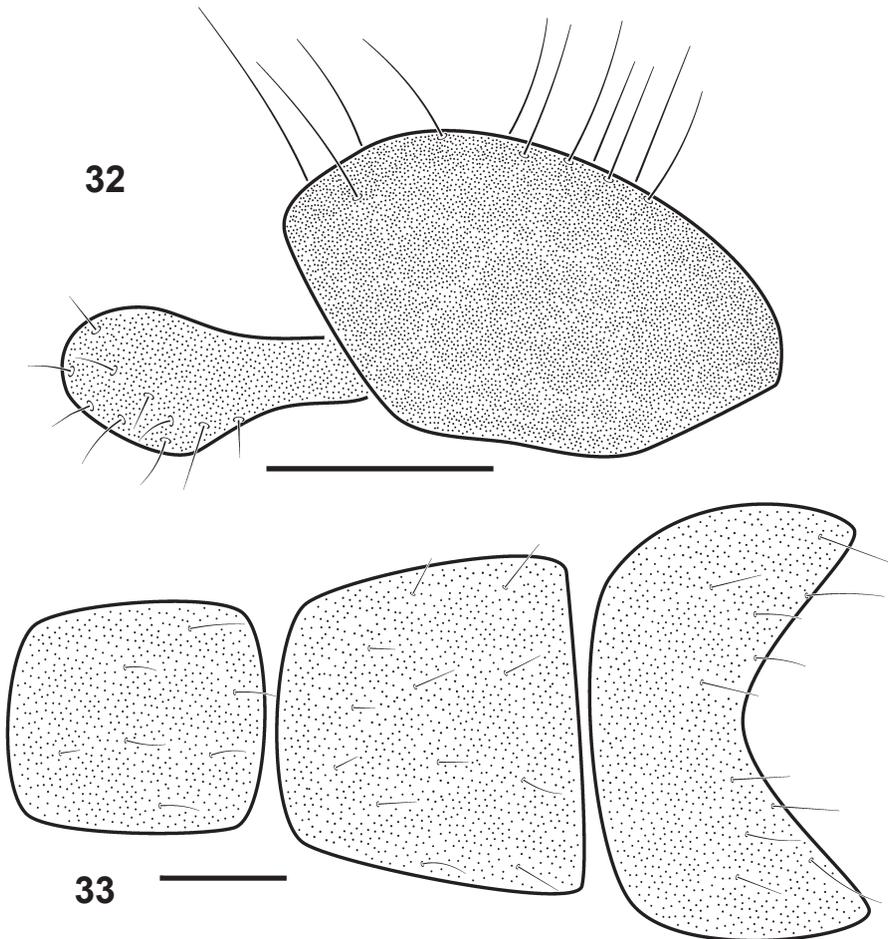
*Meoneura moravica* Gregor & Papp, 1981

(Figs 32, 33)

*Meoneura moravica*: Gregor & Papp 1981: 205.*Meoneura pamphylica* Ozerov, 2008: 491 (n. syn.).

**Material examined: Israel:** 6♂ 24.ix.1981, Migdal Afeq, F. Kaplan (PJHS, SMNHTAU); 2♂ 13.x.2001, Tel Aviv, University Zoo, A. Freidberg (SMNHTAU); 3♂ 13.x.2001, Tel Qeshet, A. Freidberg (PJHS, SMNHTAU); 1♂ 28.ix.1975, 'Xiyya', Herzliyya, hill [32°11'N 34°49'E], A. Freidberg (SMNHTAU).

**Distribution:** Palaearctic: Czech Republic, Israel (new record), Spain, Switzerland, Turkey.



**Figs 32, 33:** *Meoneura moravica* Gregor & Papp, 1981: (32) lateral view of epandrium and surstylus, specimen from Migdal Afeq; (33) ventral view of sternite 3 (left) to sternite 5 (right), specimen from Tel Qeshet. Scale bars = 50  $\mu$ m.

**Remarks:** *Meoneura moravica* belongs to the group of *Meoneura* species with (a) a long surstylus that is rounded (not pointed) anteriorly, (b) with no lamella, and (c) with no obvious long setae on the epandrium. Within this group the species is recognised easily by the U-shaped sternite 5 (Fig. 33) and the surstylus that narrows basally (Fig. 32) and that has a distinct dorsal keel. Additionally the species has a slightly microtomentose scutum with semi-addressed hairs and 1 distinct dorsocentral seta. *Meoneura moravica* is included in key 4 (see p. 211). The shape of the surstylus depends much on the viewing angle (cf. Ozerov 2008: 492, fig. 1 and Fig. 3) and the situation can be confusing because the surstyli are regularly directed medially (cf. Gregor & Papp 1981: 205, fig. 4).

Ozerov (2008) described *M. pamphylica* from Turkey. In the original description he compares his new species with *M. moravica* and the only difference between the species he mentioned is the length of the frontal triangle. This character is variable as shown, for example, by Stuke and Bächli (2015) and as can be seen in the material from Israel, too. There remains no character to distinguish both species and the specimens from Israel fit completely the original description of *M. pamphylica*. Therefore, *Meoneura pamphylica* Ozerov, 2015 has to be treated as junior synonym of *Meoneura moravica* Gregor & Papp, 1981.

#### *Meoneura neottiophila* Collin, 1930

*Meoneura neottiophila*: Collin 1930: 87.

**Material examined: Israel:** 1♂ 17.xi.1981, Herzliyya [32°11'N 34°49'E], A. Freidberg, Malaise trap (SMNHATAU); 6♂ 1.xii.2007, Herzliyya, hill [32°11'N 34°49'E], A. Freidberg (PJHS, SMNHATAU); 2♂ 26.ii.1978, Tel Aviv, Malaise trap, A. Freidberg (SMNHATAU); 2♂ 19.iii.2002, Zomet Rantis, A. Freidberg (SMNHATAU).

**Distribution:** Palaearctic: Czech Republic, Finland, Germany, Great Britain, Hungary, Israel (new record), Italy, Lebanon, Liechtenstein, Portugal, Spain, Switzerland.

#### *Meoneura nilsholgerssoni* n. sp.

(Figs 34–37)

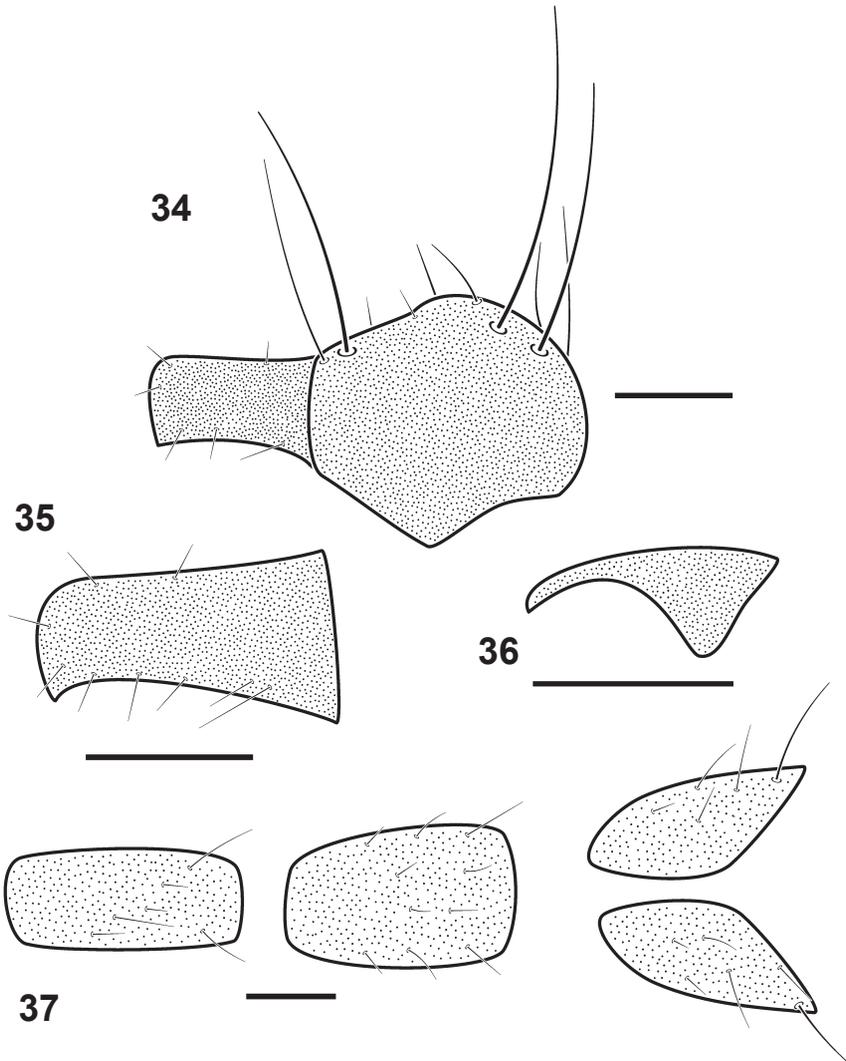
**LSID:** urn:lsid:zoobank.org:act:36A7EC77-7FD8-4616-9359-70CD71C733E9.

**Etymology:** This species is dedicated to Nils Holgersson, the main character of *The Wonderful Adventures of Nils* by Selma Lagerlöf. Nils was enchanted, shrunk to the gnome size and travelled with wild geese across Sweden.

**Diagnosis:** *Meoneura nilsholgerssoni* belongs to the *Meoneura palaestinensis*-group due to the broad and anteriorly rounded surstylus, the absence of the lamella, the lack of distinct broad setae on the epandrium and the shiny scutum. In *M. nilsholgerssoni* sternite 5 is divided (Fig. 37) and the surstylus has apically a small ventral hook (Figs 34, 35). If it turns out that the lack of the second latero-clinate fronto-orbital seta is a constant character, this may be another important character to distinguish this species. The protandrium is rudimentary and completely

hidden beneath tergite 5. The distiphallus is short and unsclerotized. *Meoneura nilsholgerssoni* is included in key 4 (see p. 211).

**Description** (holotype, male): Length about 2.4 mm. Wing length 1.7 mm. Head height 0.3 mm.



**Figs 34–37:** *Meoneura nilsholgerssoni* n. sp.: (34) lateral view of epandrium and surstylus, paratype from 'En Gedi; (35) lateral view of surstylus, holotype; (36) lateral view of postgonite, holotype; (37) ventral view of sternite 3 (left) to sternite 5 (right), holotype. Scale bars = 50  $\mu$ m.

*Head* mainly orange brown. Frontal triangle, postcranium and posterior part of gena black. Antenna black. Arista without pubescence. Eye max. length : max. height ratio, 1.0. Posteroventral margin of gena : max. eye height ratio, 0.4. Frons subshining, frontal triangle shining. Frontal triangle distinct, reaching anteriorly half distance from anterior ocellus to frontal margin. Face slightly microtomentose. Carina slightly enlarged. Postcranium slightly microtomentose. Prementum longer than labellum and significantly wider. Palpus brown, almost as long as haustellum. Setation: 1 distinct ocellar seta, supralunular setae cruciate, 3 fronto-orbital setae (2 anterior mesocline, 1 posterior posterocline), 2 vertical setae, postocellar setae parallel, 1 strong vibrissal seta, 2 supravibrissal setae (ventral one distinctly smaller), 4 strong genal setae.

*Thorax.* Scutum shiny and covered with scattered setulae. Scutellum shiny. Pleura shiny to subshiny. Setation: scutum with 1 long dorsocentral seta only; 1 seta on postpronotum; 1 presutural seta; 2 notopleural setae; 1 supra-alar seta; 1 postalar seta; 1 prescutellar seta; 1 apical and 1 lateral scutellar seta; 1 seta at posterior margin of anepisternum; 1 dorsal and 1 ventral seta on katapisternum. Wing hyaline, veins light brown to yellowish. Costa with no conspicuous setulae beyond radial vein  $R_1$ . Knob of haltere yellowish, base of haltere light brownish. Legs black to brown. Fore coxa with 1 prominent strong seta, middle coxa with 2 strong setae, hind coxa without outstanding setae. Fore femur apically with 2 strong posteroventral setae. Hind femur apically with 1 strong anteroventral seta. Hind metatarsus ventrally with scattered golden yellow hairs only. Lengths of midleg metatarsus : tibia ratio, 0.4.

*Abdomen.* Tergites with no obvious depressions or tufts of setulae. Abdominal pleura without setae. Segments 1–5 narrow, tergite 3 width : length, 3.2. Tergites 2–4 each with minute lateral seta at posterior margin. Tergite 5 with 3 longer setae at posterior margin. Sternite 5 divided in two oval plates (Fig. 37), each bearing 2 long setae and additionally some smaller setae (Fig. 37). Tergite 7 not recognised. Protandrium rudimentary and completely hidden beneath tergite 5. Protandrium widely separated ventrally. Epandrium with 4 outstanding setae and a few smaller setae (Fig. 34). Epandrium max. length : max. width, 0.5. Cerci indistinct, slightly projecting, and with a few setulae only. Subepandrial sclerites fused with each other and with hypoproct into sclerotised narrow subepandrial plate. Subepandrial plate with about 4 indistinct setulae. Hypoproct not projecting laterally. No tooth on subepandrial plate. Surstylus (Figs 34, 35) parallel sided, broad, anterior rounded with a small anteroventral pointed tip, only ventrally with 2 or 3 minute setulae. No lamella. Postgonite (Fig. 36) distinctly sclerotised, broad-based, elongated, narrow, falcate, pointed. Distiphallus shorter than epandrium, unsclerotised and poorly distinct. Basiphallus well sclerotised, long and narrow.

**Variability:** One paratype has a third mesocline fronto-orbital seta that is distinctly smaller than the anterior one. The supralunular setae are cruciate or only convergent. A dorsal seta on the katapisternum is found in the paratypes.

**Holotype:** ♂ (1) "Israel / Herzliyya / Beach / 18.X.1986 / A. Freidberg / on dead fish" [32°09'N 34°50'E]; (2) "Holotypus / *Meoneura nilsholgerssoni* / n. sp. ♂ / det. Stuke 2017" (SMNHHTAU). The posterior part of the abdomen is dissected, macerated and stored in a glycerine microvial pinned underneath the specimen. The remainder of the specimen is pinned and is in a very good condition.

**Paratypes:** **Egypt:** 1♂ 11.iv.1973, Sinai, Wadi Hibran, A. Freidberg (SMNHHTAU). **Israel:** 1♂ 19.iii.1975, 'En Gedi, A. Freidberg (SMNHHTAU); 2♂ 21.viii.1976, Haifa, A. Freidberg (PJHS, SMNHHTAU); 3♂ 18.x.1986, Herzliyya, beach, on dead fish, A. Freidberg (PJHS, SMNHHTAU); 1♂ 24.ix.1981, Migdal Afeq, A. Freidberg (SMNHHTAU).

**Distribution:** *Meoneura nilsholgerssoni* is known so far from Israel and Egypt (Sinai Peninsula).

*Meoneura oskari* n. sp.

(Figs 38–41)

**LSID:** urn:lsid:zoobank.org:act:6406ABE5-45A1-4FA0-97AE-10497621C475.

**Etymology:** The species is named after Oskar Matzerath from the novel *The Tin Drum (Die Blechtrommel)* by Günter Grass. Born with the adult's level of spiritual development, Oskar decided at his third birthday never to grow up and stayed little for his whole life.

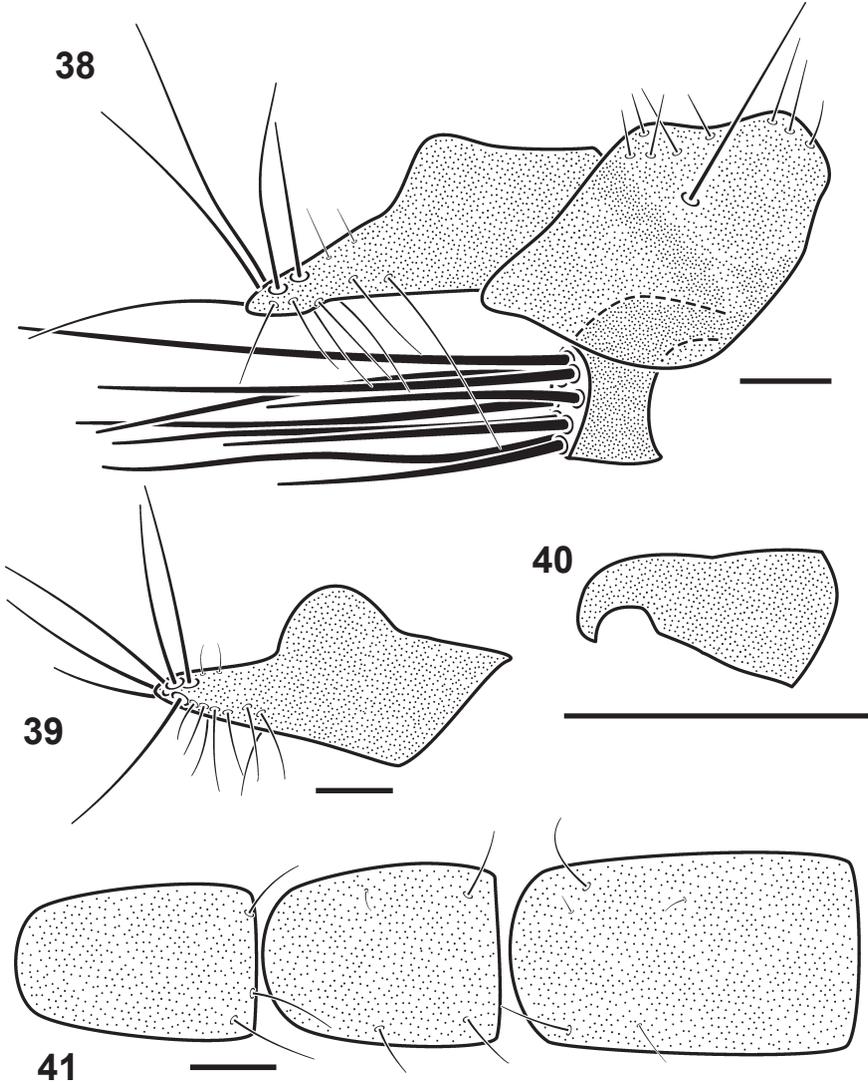
**Diagnosis:** *Meoneura oskari* is easily recognised by the following features of the male postabdomen: the apparent process of the hypoproct with several strong setae originating from a larger area and the simple surstylus with an obvious dorsal semi-circular extension (Fig. 39). The species is included in key 1 (see p. 208).

**Description** (holotype, male): Length about 2.3 mm. Wing length 2.0 mm. Head height 0.5 mm.

*Head* black with anterior half of frons, face, and anterodorsal half of gena yellow brown. Antenna black to dark brown. Arista without pubescence. Eye max. length : max. height ratio, 1.0. Posteroventral margin of gena : max. eye height ratio, 0.6. Frons slightly microtomentose to subshining, frontal triangle subshining. Frontal triangle distinct, reaching anteriorly one-third of distance from anterior ocellus to frontal margin. Face slightly microtomentose. Carina narrow. Postcranium slightly microtomentose. Prementum longer and wider than labellum. Palpus brown, about 0.25 as long as haustellum. Setation: 1 distinct ocellar seta, supralunular setae convergent, 4 fronto-orbital setae (2 anterior mesocline, 2 posterior laterocline), 2 vertical setae, postocellar setae parallel, 1 strong vibrissal seta, 2 supravibrissal setae (ventral one indistinct and much smaller), 1 genal seta.

*Thorax.* Scutum only slightly microtomentose and therefore subshining, covered with scattered black setulae. Scutellum weakly microtomentose. Pleura, as far as can be seen in holotype, slightly microtomentose. Setation: scutum with 3 long dorsocentral setae; 1 seta on postpronotum; 1 presutural seta; 2 notopleural setae; 1 supra-alar seta; 1 postalar seta; 1 prescutellar seta; 1 apical and 1 lateral scutellar seta; 1 seta at posterior margin of anepisternum; 1 dorsal and 1 ventral seta on katepisternum. Wing hyaline, veins light brown to whitish yellow. Costa with no obvious setulae beyond radial vein  $R_1$ . Knob of haltere whitish yellow, base of

haltere light brown. Legs black to brown. All coxae with isolated black setae. Fore femur apically with 1 and basally with 2 strong posteroventral setae. Hind femur apically with 1 strong anteroventral seta. Hind metatarsus ventrally with dense golden yellow hairs. Lengths of midleg metatarsus : tibia ratio, 0.5.



**Figs 38–41:** *Meoneura oskari* n. sp., holotype: (38) lateral view of epandrium and surstylus; (39) lateral view of surstylus; (40) lateral view of postgonite; (41) ventral view of sternite 3 (left) to sternite 5 (right). Scale bars = 50  $\mu$ m.

*Abdomen.* Tergites with no obvious depressions or tufts of setulae. Abdominal pleura with scattered setae on segments 3–5. Segments 1–5 narrow, tergite 3 width: length, 3.3. Tergites 3–4 each with short inconspicuous lateral seta at posterior margin, and with 2 indistinct setae at posterior margin. Sternite 5 rectangular, distinctly longer than broad, with few inconspicuous lateral setae (Fig. 41). Tergite 7 developed. Protandrium distinct, about as long as epandrium and about 0.5 as long as tergite 5. Protandrium widely separated ventrally. Epandrium with 1 strong seta (Fig. 38). Epandrium max. length: max. width, 0.3. Cerci indistinct, not obviously projecting, and with a few setulae only. Subepandrial sclerites fused with each other and with hypoproct and form sclerotised subepandrial plate. Subepandrial plate with tuft of 6–10 setae laterally. Distinct process of hypoproct with 10–12 strong setae on laterally projecting part (Fig. 38). No tooth on subepandrial plate. Surstylus (Figs 38, 39) broad and with dorsally directed semi-circular extension, dorsally with several conspicuous long setae, apically with several relatively short medially directed hairs. No lamella. Postgonite (Fig. 40) distinctly sclerotised, with broad base, elongated, pointed, apically hook-like. Distiphallus not particularly elongated, about as long as epandrium and surstylus combined, with dense slightly sclerotised setulae. Basiphallus distinctly sclerotised, long, narrow, at base not widened.

**Variability:** The head may be almost completely black to dark brown. The small supravibrissal seta may be missing and 2 genal setae can be present.

**Holotype:** ♂ (1) “Israel: / Yotvata / 4.xii.1995 / A. Freidberg” [29°53'N 35°03'E]; (2) “Holotypus / *Meoneura oskari* / n. sp. ♂ / det. Stuke 2017” (SMNHHTAU). The posterior part of the abdomen is dissected, macerated and stored in a glycerine microvial pinned underneath the specimen. The remainder of the specimen is pinned and is in a very good condition.

**Paratypes:** 11♂ same data as holotype (SMNHHTAU, 7 specimens; PJHS, 4 specimens).

**Distribution:** *Meoneura oskari* is only known from the type locality—Yotvata [יֹטְבָתָה], an oasis in the Arabah valley in the southern Negev.

### *Meoneura palaestinensis* Hennig, 1937

*Meoneura palaestinensis*: Hennig 1937: 70.

*Meoneura nitidiuscula* Collin, 1949: 224 (n. syn.).

**Type material examined:** *Meoneura palaestinensis* Hennig, 1937: abdomen of ♂ holotype and abdomen of 1♂ paratype, both in Canada balsam on a glass slide. The holotype has the following label glued on the slide: “Rehobot / bei Jaffa / 11.IX.1931 / J. Aharoni coll.”; paratype with this collecting information on a label glued on the slide: “Rehobot – / Palästina / 24.X.1931 / J. Aharoni coll.”. Specimens are deposited in the Staatliches Museum für Naturkunde (Stuttgart, Germany). Due to the bad condition of the remaining pinned holotype and paratype, only the slides were made available for examination.

*Meoneura nitidiuscula* Collin, 1949: abdomen of 2♀ syntypes and 1♂ syntype, all in Canada balsam on one plastic slide that is pinned and has the following labels on the same pin: (1) “*Meon- / nitidius / cula*”; (2) “Egypt: / Siwa. ‘ / 16.19. (sic!) viii.1935. / J. Omer-Cooper”; (3) “Armstrong College / Expedition. / B. M. 1935-454.”; (4) “*Meoneura nitidiuscula* / Collin, I. Brake 2010, / BMNH\_IBC\_3220148”; (5) “NHMUK010579865”. Specimens are deposited in the Natural History Museum (London, UK). Due to the oblique position of the abdomen and the wavy upper surface of the Canada balsam the examination of the abdomen is difficult.

**Material examined: Israel:** 1♂ 9.x.1995, 5 km S Rosh Zuqim, A. Freidberg (SMNHTAU); 1♂ 30.iv.1996, Deqel, A. Freidberg (SMNHTAU); 1♂ 7.v.2002, Elat [Eilat], Taba [29°29'N 34°54'E], A. Freidberg (SMNHTAU); 1♂ 5.iv.1997, Elifaz, sewage, A. Freidberg (SMNHTAU); 2♂ 23.vii.2000, Elot, on *Acacia* and *Suaeda*, A. Freidberg (SMNHTAU); 1♂ 8.viii.1977, 'En 'Aqev, A. Freidberg (SMNHTAU); 3♂ 30.vii.1977, 'En Boqeq, on *Acacia* and *Suaeda*, A. Freidberg (PJHS, SMNHTAU); 1♂ same data but 31.vii.1977 (SMNHTAU); 2♂ 19.ix.1995, 'En Boqeq, A. Freidberg (PJHS, SMNHTAU); 2♂ 16.viii.1995, 'En Hazeva, A. Freidberg (SMNHTAU); 4♂ 11.x.1994, 'Enot Zuqim, F. Kaplan & A. Freidberg (PJHS, SMNHTAU); 1♂ 7.vi.1996, 'Enot Zuqim, A. Freidberg (SMNHTAU); 1♂ 29.ix.2007, Herzliyya, hill [32°11'N 34°49'E], A. Freidberg (SMNHTAU); 1♂ 11.viii.1986, Nahal Qumeran, A. Freidberg (SMNHTAU); 15♂ 7.viii.1995, Ne'ot Semadar, A. Freidberg (PJHS, SMNHTAU); 1♂ 10.ix.1977, Tel Aviv, A. Freidberg (SMNHTAU); 1♂ 1.x.1984, Tel Aviv, University Zoo, A. Freidberg (SMNHTAU); 2♂ 10.x.1995, Timna', A. Freidberg (SMNHTAU); 1♂ 15.iv.1994, Yavne, Rt. 4, A. Freidberg & F. Kaplan (SMNHTAU).

**Distribution:** Afrotropical: Cape Verde, Ethiopia, Oman, Yemen. Palearctic: Egypt, Israel, Jordan, Saudi Arabia, Tunisia, United Arab Emirates.

**Remarks:** *M. palaestinensis* belongs to a group of species that is characterised by a broad and anteriorly rounded surstylus, postabdomen without a lamella, epandrium with no obvious broad setae, scutum shiny or at most slightly microtomentose (see key 4, p. 211). The shape of the surstylus of *M. palaestinensis* strongly depends on the viewing angle and the situation is exacerbated by a less sclerotised anterior margin of the surstylus. Given this, no character remains to distinguish *M. palaestinensis* and *M. nitidiuscula*. Collin (1949) did not even mention the former in his short description, perhaps because Hennig (1937) compared *M. palaestinensis* with *M. neglecta* Collin (= *M. glaberrima* Becker 1910). The sketch of the male postabdomen published by Deeming (1976) and the examination of the holotype by JHS do not show any differences of the postabdomen that cannot be explained by the orientation or broken setae. Therefore, we propose *Meoneura nitidiuscula* Collin, 1949 to be a junior synonym of *Meoneura palaestinensis* Hennig, 1937.

### *Meoneura perlamellata* Hennig, 1937

*Meoneura perlamellata*: Hennig 1937: 71.

**Material examined: Israel:** 1♂ 3.ii.1981, 'En Mor, F. Kaplan, PJHS; 1♂ 13.xii.1997, Migdal Afeq, A. Freidberg (SMNHTAU); 1♂ 6–7.iv.1992, Mizpe Ramon, A. Freidberg (SMNHTAU).

**Distribution:** Palearctic: Andorra, Israel, Spain. The species was described from “Jerusalem Scopus” (type locality) and from “Rehobot bei Jaffa” [= Rechovot], and is one of the very few Carnidae that were reported from Israel before.

**Remarks:** This species has an unique shaped surstylus as illustrated in the original description (Hennig 1937: 71).

### *Meoneura prima* (Becker, 1903)

*Psalidotus primus* Becker, 1903: 192.

*Meoneura prima* (Becker): Papp 1977b: 186.

*Meoneura baluchistani* Duda, 1936: 337 (n. syn.).

**Material examined: Israel:** 1♂ 14.iv.2015, 0–1 km S Ma'on, 750–800 m, A. Freidberg (SMNHTAU); 1♂ 12.iv.1963, Arad, Margalit (SMNHTAU); 1♂ 11.iv.1975, Avedat, A. Freidberg (SMNHTAU); 1♂

25.iii.1987, Bor Mashash, A. Freidberg (SMNHTAU); 1♂ 28.iii.1996, Bor Mashash, N. Dorshin & A. Freidberg (SMNHTAU); 1♂ 19.iv.1975, 'En Mor, A. Freidberg (SMNHTAU); 2♂ 4.ii.1981, 'En Boqeq, A. Freidberg (SMNHTAU); 2♂ 9.i.1984, Ḥaspin, I. Nussbaum (SMNHTAU); 4♂ same data but 16.i.1984; 4♂ 27.ii.1996, Hazeva, A. Freidberg (PJHS, SMNHTAU); 1♂ 22.xii.1981, Herzliyya, A. Freidberg, Malaise trap (SMNHTAU); 6♂ 23.iii.1977, Horvat Shivta, A. Freidberg (SMNHTAU); 1♂ 14.ii.1942, Jiftlik, Jordan Valley (SMNHTAU); 4♂ 3.iii.1981, Kalia, A. Freidberg (SMNHTAU); 3♂ 7.iii.2007, Merhav 'Am, A. Freidberg (PJHS, SMNHTAU); 2♂ 24.ix.1981, Migdal Afeq, A. Freidberg (PJHS, SMNHTAU); 1♂ 25.iii.1976, Nahal Perat, A. Freidberg (SMNHTAU); 22♂ 5.iii.1981, Nu'eima, A. Freidberg (PJHS, SMNHTAU); 1♂ 19.iii.1973, Tel Aviv, A. Freidberg (SMNHTAU); same data but 2♂ 20.i.1982; 3♂ 5.ii.1974, Yagur, A. Freidberg (SMNHTAU); 2♂ 8.iii.1976, Yeriḥo [Jericho], A. Freidberg (SMNHTAU); 4♂ 12.iv.1940, Yerushalayim [Jerusalem] (SMNHTAU); 1♂ 9.xii.1941, Yerushalayim [Jerusalem], Bet haKerem (SMNHTAU); 2♂ same data but 13.xii.1941; 1♂ no date, Yerushalayim [Jerusalem], Har haZofim [Mt Scopus], O. Theodor (SMNHTAU); 2♂ 4.iii.1965, Yerushalayim [Jerusalem], Mishor Adummim, M. Weichselfish (SMNHTAU); 1♂ same data but 9.iii.1965; 2♂ 19.ii.1984, Zomet Peza'el, I. Nussbaum (SMNHTAU).

**Distribution:** Afrotropical: Ghana, Namibia, South Africa, Sudan, Yemen. Nearctic: Canada, USA. Oriental: Pakistan. Palaearctic: Afghanistan, Canary Islands, Czech Rep., Egypt, Germany, Great Britain, Greece, Hungary, Iran, Israel (new record), Italy, Jordan, Malta, Morocco, Spain, Switzerland, Tunisia.

**Remarks:** Contrary to Papp (2013), the characters separating *M. prima* and *M. australis* given in key 1 work well and we do not see any reason for synonymy. *M. baluchistani* on the other hand cannot be distinguished from *M. prima*. The original description of *M. baluchistani* fits completely with *M. prima* and so do the illustrations of the genitalia of the holotype (Deeming 1976). Neither Duda (1936) nor Deeming (1976) compared these two species. Duda, who did not prepare the genitalia and who discussed the distinction of *M. baluchistani* and *M. obscurella*, obviously overlooked *M. prima* that was re-surrected from synonymy under *M. obscurella* by Papp (1977b). As a result, *Meoneura baluchistani* Duda, 1936 has to be treated as a junior synonym of *Meoneura prima* (Becker, 1903).

### *Meoneura triangularis* Collin, 1930

*Meoneura triangularis*: Collin 1930: 88.

**Material examined:** **Israel:** 2♂ 3.x.2001, Har Meron, 900 m [33°01'N 35°24'E], A. Freidberg (PJHS, SMNHTAU); 1♂ 23.ix.1986, Nahal Bezet, A. Freidberg (SMNHTAU); 1♂ same data but 25.x.1994; 3♂ 13.x.2001, Tel Qeshet, A. Freidberg (PJHS, SMNHTAU); 1♂ 29.x.1972, Yerushalayim [Jerusalem], Har haZofim [Mt Scopus], O. Theodor (SMNHTAU).

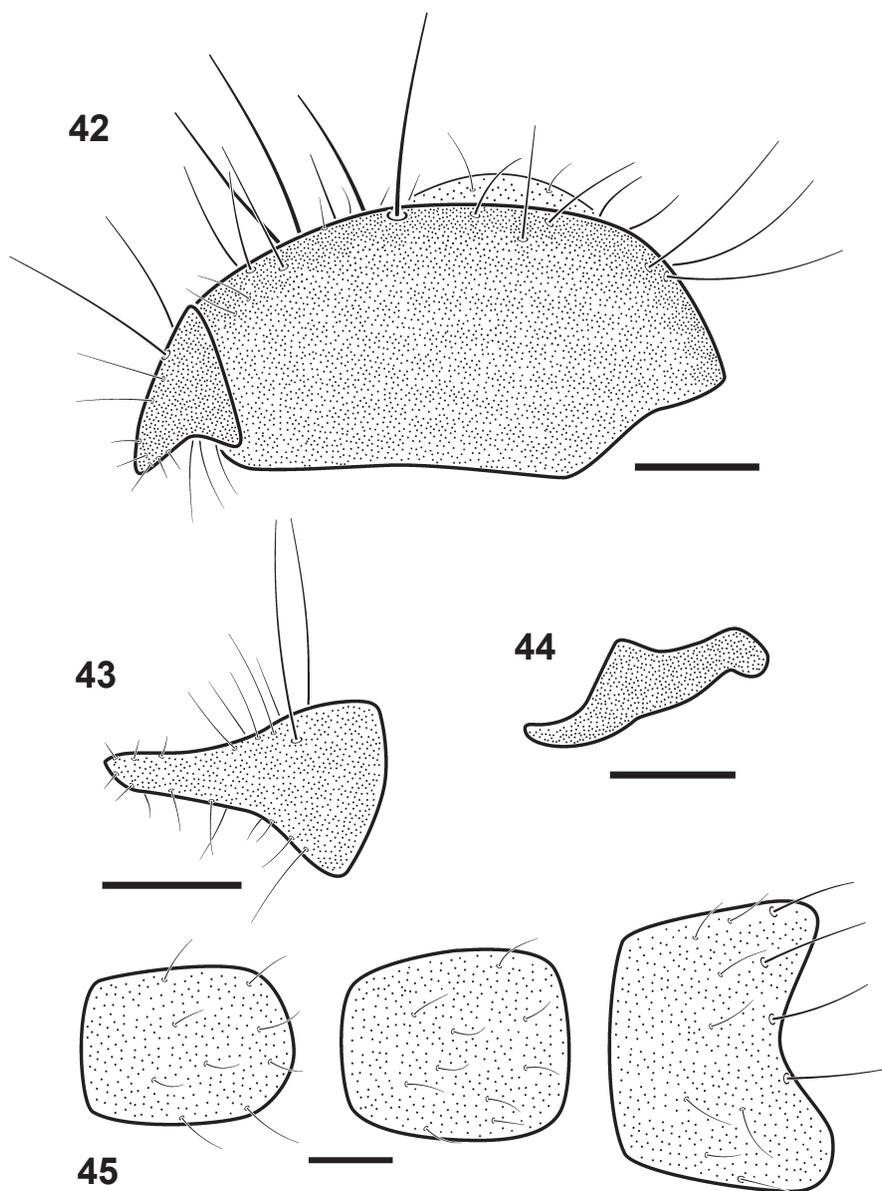
**Distribution:** Nearctic: Canada, USA. Palaearctic: Andorra, Czech Rep., Germany, Great Britain, Hungary, Israel (new record), Italy, Lebanon, Mongolia, Morocco, the Netherlands, Russia, Spain, Sweden, Switzerland.

### *Meoneura wichtelorum* n. sp.

(Figs 18, 42–45)

**LSID:** urn:lsid:zoobank.org:act:1A877BF1-617E-48BB-8EF8-70E6FBEF4A8D.

**Etymology:** The species is dedicated to the Wichtelmänner (the Elves), small folklore house spirits who help clean up and remove dirt as the Carnidae do.



**Figs 42–45:** *Meoneura wichtelorum* n. sp., paratype from Enot Zukim (42–44) and holotype (45): (42) lateral view of epandrium and surstylus; (43) lateral view of surstylus; (44) lateral view of postgonite; (45) ventral view of sternite 3 (left) to sternite 5 (right). Scale bars = 50  $\mu$ m.

**Diagnosis:** *Meoneura wichtelorum* belongs to the *Meoneura triangularis*-group that is characterized by a more or less triangular, anteriorly pointed surstylus with no lamella. The new species is distinguished from other members of this group by the following characters: (a) frons anteriorly yellow, (b) distiphallus with strongly sclerotised setae that occupy a large basal area and a separate smaller distal area (Fig. 18), and (c) sternite 5 obviously broader than long, usually trapezoid (Fig. 45). *Meoneura wichtelorum* is included in key 2 (see p. 210).

**Description** (holotype, male): Length about 1.8 mm. Wing length 1.6 mm. Head height 0.4 mm.

*Head* black with anterior half of frons, face and anterodorsal half of gena yellow brown. Antenna black. Arista bare. Eye max. length : max. height ratio, 0.9. Posteroventral margin of gena : max. eye height ratio, 0.4. Frons subshining, frontal triangle shining. Frontal triangle indistinct, reaching anteriorly about half distance from anterior ocellus to frontal margin. Face slightly microtomentose. Carina distinctly enlarged. Postcranium microtomentose. Prementum longer than labellum and significantly wider. Palpus brown, almost half as long as haustellum. Setation: 1 distinct ocellar seta, supralunular setae convergent, 4 fronto-orbital setae (2 anterior mesocline, 2 posterior laterocline), 2 vertical setae, postocellar setae parallel, 1 strong vibrissal seta, 2 supravibrissal setae (ventral one distinctly smaller), 2 strong genal setae.

*Thorax.* Scutum microtomentose, close to scutellum shining, and covered with black setulae. Scutellum microtomentose. Pleura microtomentose. Setation: scutum with 3 long dorsocentral setae; 1 seta on postpronotum; 1 presutural seta; 2 notopleural setae; 1 supra-alar seta; 1 postalar seta; no prescutellar seta recognised; 1 apical and 1 lateral scutellar seta; 1 seta at posterior margin of anepisternum; 1 dorsal and 1 ventral seta on katapisternum. Wing hyaline, veins light brown to yellowish. Costa with no obvious setulae beyond radial vein  $R_1$ . Knob of haltere yellowish, base of haltere light brownish. Legs black to brown. Fore coxa with 1 outstanding strong seta, middle coxa with 2 strong setae, hind coxa without outstanding seta. Fore femur apically with 2 strong posteroventral setae. Hind femur apically with 1 strong anteroventral seta. Hind metatarsus ventrally with scattered golden yellow hairs only. Lengths of midleg metatarsus : tibia ratio, 0.4.

*Abdomen.* Tergites with no obvious depressions or tufts of setulae. Abdominal pleura with scattered setae on segments 4–5. Segments 1–5 narrow, tergite 3 width : length, 3.2. Tergites 2–5 each with small lateral seta at posterior margin. Tergite 5 with 4 longer setae at posterior margin. Sternite 5 trapezoid, slightly wider than long (Fig. 45). Sternite 5 with scattered setae (Fig. 45). Tergite 7 developed. Protandrium distinct, longer than epandrium and about 0.8 as long as tergite 5. Protandrium widely separated ventrally. Epandrium with several long setae and a few smaller setae (Fig. 42). Epandrium max. length : max. width, 0.3. Cerci inconspicuous, slightly projecting, and with a few setulae only. Subepandrial sclerites fused with each other but separated from narrow distinctly sclerotised

hypoproct. No setulae recognised on subepandrial plate. Hypoproct not projecting laterally, with few barely visible setulae. No tooth on subepandrial plate. Surstylus (Figs 42, 43) triangular, dorsally slightly concave, with indistinct bulging base, dorsally and laterally with 5 or 6 strong setae and about 4 minute setulae ventrally. No lamella. Postgonite (Fig. 44) strongly sclerotised, elongated, narrow, apically not bent. Distiphallus distinctly longer than epandrium, with strongly sclerotised setae that occupy large basal area and separate smaller distal area. Basiphallus distinctly sclerotised, long, narrow, conspicuously widened at base.

**Holotype:** ♂ (1) "Israel / N. Qidron / Rd. Ein Gedi / 16.XII.1984 / A. Freidberg" [31°43'N 35°20'E]; (2) "Holotypus / *Meoneura wichtelorum* / n. sp. ♂ / det. Stuke 2017" (SMNHTAU). The posterior part of the abdomen is dissected, macerated and stored in a glycerine microvial pinned underneath the specimen. The remainder of the specimen is pinned and in good condition.

**Paratypes: Israel:** 1♂ 24.xii.1974, 'En Gedi, A. Freidberg (SMNHTAU); 1♂ 24.xii.1974, 'Enot Qane [Ein Tureiba], A. Freidberg (SMNHTAU); 7♂ 7.xii.1992, Enot Zukim, A. Freidberg (PJHS, SMNHTAU); 1♂ 8.xii.1980, Horvat Shivta, A. Freidberg (SMNHTAU); 4♂ 26.xi.1984, Mash'abe Sade, A. Freidberg (PJHS, SMNHTAU); 13♂ 16.xii.1984, Nahal Qidron, Rt. 90, A. Freidberg (PJHS, SMNHTAU); 6♂ 24.xi.1998, Qalya, A. Freidberg (PJHS, SMNHTAU); 5♂ 10.xii.2013, Park Sappir, A. Freidberg (PJHS, SMNHTAU).

**Distribution:** *Meoneura wichtelorum* is widely distributed in southeastern and southern Israel.

### Identification key 1: *Meoneura obscurella*-group

Species with distinct process of hypoproct that has long distinct setae. (Based on our data and those of Papp (1976) and Deeming (1998).)

- 1 Surstylus bifurcate; process of hypoproct elongated and longer than epandrium, with several long hairs originating at one point (Collin 1930: pl. 3, fig. 4).....  
..... *neottiophila* Collin, 1930
- Surstylus simple; process of hypoproct shorter and long hairs originating from larger area..... 2
- 2 Surstylus with 4 or 5 strong black medially directed setae at its medial side; shape of surstylus as shown in Gregor (1971: pl. 2, figs 2, 3) and Papp (1976: 372, figs 5, 6, as *inversa*, 2013: 220, figs 22, 21)..... 3
- Surstylus without strong medially directed setae at its inner side; shape of surstylus different..... 4
- 3 Long setae on epandrium not restricted to ventral part. [Afghanistan, Egypt, Mongolia, Pakistan] ..... *hennigi* Gregor, 1971
- Epandrium only ventrally with several long setae. [Vietnam] .....  
..... *subinversa* Papp, 2013
- 4 Sternite 5 with obvious long and strong seta; frons completely dark. Surstylus as shown in Papp (1976: 377, figs 10, 11). [Mongolia]..... *paraseducta* Papp, 1976
- Sternite 5 with no distinct long and strong setae; frons usually anteriorly orange to yellow (may be darker in *obscurella*) ..... 5

- 5 Surstylus apically with long hairs or setae that are distinctly longer than height of base of surstylus and with several medially directed hairs ..... 6  
 – Surstylus apically at most with short inconspicuous hairs that are shorter than height of base of surstylus and without medially directed hairs ..... 8
- 6 Surstylus apically with setae clearly longer than maximum length of epandrium; shape of surstylus as shown in Papp (1976: 383, figs 19, 20). [Mongolia] .....  
 ..... *setipyga* Papp, 1976  
 – Surstylus apically only with hairs shorter than maximum length of epandrium ..... 7
- 7 Surstylus (Fig. 39) broad and with dorsally directed semi-circular extension.....  
 ..... *oskari* n. sp.  
 – Surstylus with broad base and elongated anteriorly, without a dorsally directed extension (Papp 1976: 380, figs 15, 16). [Mongolia].....  
 ..... *pseudoseducta* Papp, 1976
- 8 Surstylus triangular, with a few long hairs dorsally (Collin 1930: pl. 3, fig. 1; Hennig 1937: 69, fig. 68 left). [Holarctic] ..... *obscura* (Fallén, 1823)  
 – Surstylus long and slender, without long hairs dorsally..... 9
- 9 Base of surstylus broad and distinctly separated from long and slender part of surstylus; cercus conspicuous and large (Ozerov 1991: 10, figs 1–3) .....  
 ..... *maritima* Ozerov, 1991  
 – Base of surstylus neither obviously broad nor distinctly separated from remaining part of surstylus; cercus smaller..... 10
- 10 Setae on process of hypoproct shorter than surstylus (Deeming 1997: 135, fig. 1); frontal triangle extending three-quarters distance from anterior ocellus to fore margin of frons. [South Africa]..... *australis* Deeming, 1997  
 – Setae on process of hypoproct longer than surstylus; frontal triangle extending three-quarters distance from anterior ocellus to fore margin of frons..... 11
- 11 Surstylus elongated (Collin 1937: 251, fig. 1, as *seducta*; Sabrosky 1959: 21, fig. 5, as *seducta*; Deeming 1976: 31, fig. 1, as *baluchistani*); base of surstylus without dorsal seta; process of hypoproct not obviously broadened apically; epandrium with one outstanding seta; subepandrial plate close to cerci with submedian pair of hair tufts; postgonite distinct and hooked apically.....  
 ..... *prima* (Becker, 1903)  
 – Surstylus less elongated (Fig. 13); base of surstylus with one inconspicuous dorsal seta (Fig. 14); process of hypoproct obviously extended apically (Fig. 13); epandrium with one strong seta (Fig. 13); no hair tufts detected on subepandrial plate ..... *goldemari* n. sp.

### Identification key 2: *Meoneura triangularis* group

Species with more or less triangular, anteriorly pointed or slightly rounded surstylus and without lamella. (Based on our data and those of Papp (1976, 2013).)

- 1 Base of surstylus broad and parallel sided (Papp 1976: 383, figs 17, 18); dorsal and ventral margins with distinct setae. [Mongolia] ..... *pseudotriangularis* Papp, 1976  
 – Base of surstylus may be broad but never parallel sided; only dorsally with distinct setae ..... 2
- 2 Frons (except for frontal triangle), face and partly gena yellow; frontal triangle reaching almost anterior margin of frons; posterior fronto-orbital setae much reduced, about as long as postvertical setae; 1 dorsocentral seta only; male postabdomen as figured in Lyneborg (1969: 43, figs 24, 25). [Malta, Portugal, Spain] ..... *granadensis* Lyneborg, 1969  
 – At most anterior half of frons yellow; frontal triangle usually not reaching anterior margin of frons; posterior fronto-orbital setae not reduced, longer than postvertical setae; 3 distinct dorsocentral setae ..... 3
- 3 Frons anteriorly yellow; distiphallus with strongly sclerotised setae that occupy large basal area and separate smaller distal area (Fig. 18); sternite 5 obviously broader than long, usually trapezoid (Fig. 45) ..... *wichtelorum* n. sp.  
 – Frons black; distiphallus with strongly sclerotised setae that occupy only one large area without separate distal area (Fig. 17); sternite 5 about as long as broad or narrower, parallel sided ..... 4
- 4 Dorsal margin of surstylus obviously concave, ventral margin almost straight (Papp 1977a: 177, fig. 8); base of surstylus small, less than half of maximum height of epandrium; dorsal margin of surstylus with at most 3 distinct setae .... *hungarica* Papp, 1977  
 – Dorsal margin of surstylus almost straight, ventral margin slightly concave (Collin 1930: pl. 3, fig. 5; Papp 2013: 220, fig. 17); base of surstylus broad, can be more than half of maximum height of epandrium; dorsal margin of surstylus can have more than 4 distinct setae ..... 5
- 5 Surstylus strongly narrowing distally, apex broadly rounded; surstylus with stronger and longer setae (Papp 2013: 220, fig. 17); epandrium with pair of subtriangular processes below cerci (Papp 2013: 220, fig. 16). [India] ..... *simplex* Papp, 2013  
 – Surstylus triangular, apex pointed; surstylus with less strong and shorter setae (Collin 1930: pl. 3, fig. 5); epandrium with no subtriangular processes. [Holarctic] ..... *triangularis* Collin, 1930

**Identification key 3: *Meoneura helvetica*-group**

Species with large lamella that is about as long as surstylus, narrows basally, and has more than 10 long setae (several setae longer than lamella). (Based on our data and those of Papp (2006) and Sabrosky (1961).)

- 1 Surstylus with at most 5 inconspicuous setae ..... 2
- Surstylus with more than 10 distinct setae ..... 4
- 2 Scutum shiny; male postabdomen as shown in Sabrosky (1961: 230, fig. 1). [California, USA] ..... *californica* Sabrosky, 1961
- Scutum microtomentose. [mainly Palaearctic species] ..... 3
- 3 Frons yellow anteriorly; 3 distinct dorsocentral setae; inter crossvein section between crossveins r–m and dm–cu 1.5 times as long as crossvein dm–cu; male postabdomen as illustrated in Collin (1930: pl. 3, fig. 7). [Holarctic] ..... *lamellata* Collin, 1930
- Frons black; only 1 distinct and 2 indistinct dorsocentral setae; inter crossvein section between crossveins r–m and dm–cu as long as crossvein dm–cu; male postabdomen as illustrated in Papp (2006: 225, figs 1–4). [Hungary] ..... *sabroskyi* Papp, 2006
- 4 Sternite 5 broad, distinctly broader than long (Fig. 27) ..... *lilliputensis* n. sp.
- Sternite 5 narrow, distinctly longer than broad ..... 5
- 5 Ventral margin of surstylus straight to slightly concave; surstylus broadest before base and therefore dorsal margin more convex (Papp 1976: 372, figs 3, 4). [Mongolia, Tunisia] ..... *asiatica* Papp, 1976
- Ventral margin of surstylus distinctly concave; surstylus broadest at base (Papp 1997: 155, figs 5–7). [Montenegro, Spain, Switzerland] ... *helvetica* Papp, 1997

**Identification key 4: *Meoneura palaestinensis*-group**

Species with broad and anteriorly rounded surstylus without lamella, epandrium with no obvious broad setae, scutum shiny or at most slightly microtomentose. (Based on our data and those of Ozerov & Krivosheina (2014).)

- 1 No dorsocentral seta; distiphallus longer than epandrium and surstylus combined (Ozerov & Krivosheina 2014: 12, figs 1, 2). [Thailand] ..... *thaica* Ozerov & Krivosheina, 2014
- One dorsocentral seta ..... 2
- 2 Scutum slightly microtomentose, with short semi-adpressed hairs and 1 distinctly longer dorsocentral seta; sternite 5 U-shaped (Fig. 33); epandrium with no long setae but with short hairs only; surstylus narrows basally (Fig. 32) ..... *moravica* Gregor & Papp, 1981

- Scutum shiny with longer and more erected hairs; sternite 5 different; epandrium with long setae, surstylus not narrowing basally ..... 3
- 3 Sternite 5 divided (Fig. 37); surstylus apically with small ventral hook (Fig. 35); distiphallus short and unsclerotized ..... *nilsholgerssoni* n. sp.
- Sternite 5 undivided; surstylus apically without hook; distiphallus longer than epandrium and with distinctly darkened hairs ..... 4
- 4 Epandrium with several strong and 3 particularly long setae about as long as those on posterior margin of tergite 5 (Fig. 19); surstylus tapering anteriorly, with several medially and ventrally directed hairs, not hyaline at the tip; hypoproct with small proceeding bearing about 5 setae (Fig. 22) ..... *grimmorum* n. sp.
- Epandrium with no seta as long as those on posterior margin of tergite 5; surstylus not tapering anteriorly but with rounded end, bare, hyaline at the tip (Hennig 1937: 70, fig. 69); hypoproct without proceeding ..... *palaestinensis* Hennig, 1937

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#### REFERENCES

- BECKER, T. 1903. Ägyptische Dipteren. *Mitteilungen aus dem Zoologischen Museum in Berlin* **2** (3): 67–195.  
<https://www.biodiversitylibrary.org/item/95638#page/309>
- 1907. Die Dipteren-Gruppe Milichiinae. *Annales Historico-Naturales Musei Nationalis Hungarici* **5**: 507–550.  
[http://publication.nhmu.hu/pdf/annHNHM/Annals\\_HNHM\\_1907\\_Vol\\_5\\_2\\_507.pdf](http://publication.nhmu.hu/pdf/annHNHM/Annals_HNHM_1907_Vol_5_2_507.pdf)
- BRAKE, I. 2011. World catalog of the family Carnidae (Diptera, Schizophora). *Myia* **12**: 113–169.  
[http://diptera.myspecies.info/sites/diptera.myspecies.info/files/MYIA12\\_Carnidae.pdf](http://diptera.myspecies.info/sites/diptera.myspecies.info/files/MYIA12_Carnidae.pdf)
- BUCK, M. & MARSHALL, S.A. 2007. *Enigmocarnus chloropiformis* gen. et sp. nov., and parallel evolution of protandrial symmetry in Carnidae (Diptera). *Annals of the Entomological Society of America* **100**: 9–18.  
[https://doi.org/10.1603/0013-8746\(2007\)100\[9:ECGESN\]2.0.CO;2](https://doi.org/10.1603/0013-8746(2007)100[9:ECGESN]2.0.CO;2)
- COLLIN, J.E. 1911. Additions and corrections to the British list of Muscidae Acalypratae. *Entomologist's Monthly Magazine* **47**: 229–234.  
<https://www.biodiversitylibrary.org/item/36033#page/299>
- 1930. Some species of the genus *Meoneura* (Diptera). *Entomologist's Monthly Magazine* **66**: 82–89.  
[http://diptera.myspecies.info/sites/diptera.myspecies.info/files/Collin\\_JE\\_1930.pdf](http://diptera.myspecies.info/sites/diptera.myspecies.info/files/Collin_JE_1930.pdf)
- 1937. Two new species of the genus *Meoneura* (Diptera, Carnidae). *Entomologist's Monthly Magazine* **73**: 250–252.
- 1949. Results of the Armstrong College Expedition to Siwa Oasis (Libyan Desert), 1935, under the leadership of Prof. J. Omer-Cooper. Diptera Empididae, Dolichopodidae, Aschiza and Acalypratae. *Bulletin de la Société Fouad Ier d'Entomologie* **33**: 176–225.
- 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. NRC Research Press, Ottawa, pp. 9–50.

- DEEMING, J.C. 1976. Three new species of *Meoneura* Rondani (Diptera: Milichiidae) from Northern Nigeria. *Nigerian Journal of Entomology* **2**: 29–34.
- 1997. The first endemic species of *Meoneura* Rondani (Diptera: Carnidae) to South Africa. *Annals of the Natal Museum* **38**: 133–136.  
[http://journals.co.za/content/annals/38/1/AJA03040798\\_169](http://journals.co.za/content/annals/38/1/AJA03040798_169)
- 1998. Milichiidae and Carnidae (Diptera: Cyclorrhapha) from the Arabian Peninsula. *Fauna of Arabia* **17**: 147–157.  
[http://milichiidae.info/sites/milichiidae.info/files/Deeming\\_1998\\_147\\_Cyclorrhapha.pdf](http://milichiidae.info/sites/milichiidae.info/files/Deeming_1998_147_Cyclorrhapha.pdf)
- DUDA, O. 1936. Weitere neue afrikanische und orientalische Musciden (Dipt.) des British Museum. *Annals and Magazine of Natural History, Ser. 10* **18**: 337–351.  
<https://doi.org/10.1080/00222933608655200>
- FALLÉN, C.F. 1823. *Agromyzides Sveciae. Quorum descriptionem venia Ampl. Facult. Philos. Acad. Lund. ... In Lyceo Carolino d. XX Maji MDCCCXXIII.* Berlingianus, Lundae [= Lund]. 10 pp.
- FREIDBERG, A. 1988. 10. Zoogeography of the Diptera of Israel. In: Yom-Tov, Y. & Tschernov, E. (Eds.), *The zoogeography of Israel*. Dr. W. Junk Publishers, Dordrecht, pp. 277–308.
- GREGOR, F. 1971. New species of *Mycetaulus* Loew (Piophilidae) and *Meoneura* Rond. (Milichiidae) from Hindukush (Diptera). *Acta Entomologica Bohemoslovaca* **68**: 52–57.
- 1973. Two new species of the genus *Meoneura* Rondani from Czechoslovakia. *Acta Entomologica Bohemoslovaca* **70**: 137–141.
- GREGOR, F. & PAPP, L. 1981. Czechoslovak species of the genus *Meoneura* (Diptera, Carnidae) with description of *Meoneura moravica* sp. n. *Acta Entomologica Bohemoslovaca* **78**: 199–207.
- HENNIG, W. 1937. 60a. Milichiidae et Carnidae. In: Lindner, E. (Ed.), *Die Fliegen der palaearktischen Region*. VI.1. Schweitzerbartsche Verlagsbuchhandlung, Stuttgart, pp. 1–91.  
<http://milichiidae.info/sites/milichiidae.info/files/Hennig1937.pdf>
- IWASA, M., SAKAMOTO, H. & ASAHI, K. 2014. Discovery of a Bird-parasitic fly, *Carnus orientalis* (Diptera: Carnidae), in Japan, with bionomic remarks and a key to *Carnus* species. *Journal of Medical Entomology* **51**: 484–488.  
<https://doi.org/10.1603/ME13087>
- LYNEBORG, L. 1969. Some Micropezidae, Psilidae, Platystomatidae, Otitidae, Pallopteridae, Odiniidae, Aulacigasteridae, Asteiidae and Milichiidae (Diptera) collected in Southern Spain, with descriptions of six new species. *Entomologiske Meddelelser* **37**: 27–46.
- MAA, T.C. 1968. A new *Carnus* from Malaya (Diptera: Milichiidae). *Pacific Insects* **10**: 33–36.  
[http://hbs.bishopmuseum.org/pi/pdf/10\(1\)-33.pdf](http://hbs.bishopmuseum.org/pi/pdf/10(1)-33.pdf)
- NITZSCH, C.L. 1818. Die Familien und Gattungen der Thierinsekten (Insecta epizoica) als Prodromus einer Naturgeschichte derselben. *Magazin der Entomologie* **3**: 261–316.  
<https://www.biodiversitylibrary.org/item/81951#page/273>
- OZEROV, A.L. 1991. New species of Micropezidae, Piophilidae and Carnidae (Diptera) from the USSR. *Vestnik Zoologii* **6**: 7–12. [in Russian, English abstr.]  
<http://mail.izan.kiev.ua/vz-pdf/1991/6/VZ%201991-6-02-Ozerov.pdf>
- 2005. Primary types of Diptera (Insecta) in the Zoological Museum of Moscow State University (ZMUM). I. Families Acartophthalmidae, Asilidae, Carnidae, Conopidae, Dryomyzidae, Ephyridae, Lauxaniidae, Micropezidae, Milichiidae, Neottiophilidae, Pallopteridae, Piophilidae, Scathophagidae, Sepsidae. *Russian Entomological Journal* **14**: 125–137.  
[http://zmmu.msu.ru/files/images/spec/Russ%20Ent%20J/ent14\\_2%20125\\_137%20Ozerov.pdf](http://zmmu.msu.ru/files/images/spec/Russ%20Ent%20J/ent14_2%20125_137%20Ozerov.pdf)
- 2008. Three new species of Carnidae and Piophilidae (Diptera) from Turkey and Russia. *Russian Entomological Journal* **16**: 491–493.  
[http://zmmu.msu.ru/files/images/spec/Russ%20Ent%20J/ent16\\_4%20491\\_493%20Ozerov.pdf](http://zmmu.msu.ru/files/images/spec/Russ%20Ent%20J/ent16_4%20491_493%20Ozerov.pdf)
- 2011. Three new species of the genus *Meoneura* Rondani, 1856 (Diptera, Carnidae) from Asia. *Far Eastern Entomologist* **221**: 1–4.  
<http://www.biosoil.ru/Files/FEE/00000323.pdf>
- OZEROV, A.L. & KRIVOSHEINA, M.G. 2014. The first record of the family Carnidae (Diptera) in Thailand with the description of a new species. *Far Eastern Entomologist* **279**: 11–12.
- PAPP, L. 1976. Milichiidae and Carnidae (Diptera) from Mongolia. *Acta Zoologica Academiae Scientiarum Hungaricae* **22**: 369–387.
- 1977a. New species and records of Hungarian Odiniidae, Milichiidae and Carnidae (Diptera). *Acta Zoologica Academiae Scientiarum Hungaricae* **23**: 171–181.

- 1977b. Notes on some Becker's types (Diptera, Carnidae and Risidae fam. n.). *Annales Historico-Naturales Musei Nationalis Hungarici* **69**: 185–189.  
[http://publication.nhmus.hu/pdf/annHNHM/Annals\\_HNHM\\_1977\\_Vol\\_69\\_185.pdf](http://publication.nhmus.hu/pdf/annHNHM/Annals_HNHM_1977_Vol_69_185.pdf)
- 1978a. 72a. család: Carnidae. In: Dely-Draskovits, Á. & Papp, L., *Odiniidae – Chloropidae*. Vol. 15, Diptera II, part 9. *Fauna Hungariae*. Vol. 133. Akadémiai Kiadó, Budapest, pp. 32–50.
- 1978b. Species of nine acalyptrate fly families from Tunisia (Diptera). *Folia Entomologica Hungarica* **31** (2): 197–203.  
[http://publication.nhmus.hu/pdf/foleptom/FoliaEntHung\\_1978\\_Vol\\_31\\_2\\_197.pdf](http://publication.nhmus.hu/pdf/foleptom/FoliaEntHung_1978_Vol_31_2_197.pdf)
- 1998. 3.15. Family Carnidae. In: Papp, L. & Darvas, B. (Eds.), *Contributions to a Manual of Palaearctic Diptera*. Vol. 3. Higher Brachycera. Science Herald, Budapest, pp. 211–217.
- 1997. Three new species and a new subspecies of *Meoneura* from the Alps (Diptera, Carnidae). *Annales Historico-Naturales Musei Nationalis Hungarici* **89**: 151–156.  
[http://publication.nhmus.hu/pdf/annHNHM/Annals\\_HNHM\\_1997\\_Vol\\_89\\_151.pdf](http://publication.nhmus.hu/pdf/annHNHM/Annals_HNHM_1997_Vol_89_151.pdf)
- 1998. Family Carnidae. In: Papp, L. & Darvas, B. (Eds.), *Contributions to a Manual of Palaearctic Diptera*. Vol. 3. Higher Brachycera. Science Herald, Budapest, pp. 211–217.
- 2006. New records of Diptera species from Hungary, with the list of the Hungarian Scathophagidae. *Folia Entomologica Hungarica* **67**: 221–228.  
[http://publication.nhmus.hu/pdf/foleptom/FoliaEntHung\\_2006\\_Vol\\_67\\_221.pdf](http://publication.nhmus.hu/pdf/foleptom/FoliaEntHung_2006_Vol_67_221.pdf)
- 2013. New species and records of *Meoneura* Rondani, 1856 from the Old World tropics (Diptera, Carnidae). *Acta Zoologica Academiae Scientiarum Hungaricae* **59**: 213–227.  
[http://actazool.nhmus.hu/59/3/ActaZH\\_2013\\_Vol\\_59\\_3\\_213.pdf](http://actazool.nhmus.hu/59/3/ActaZH_2013_Vol_59_3_213.pdf)
- SABROSKY, C.W. 1959. The Nearctic species of the Filth Fly genus *Meoneura* (Diptera, Milichiidae). *Annals of the Entomological Society of America* **52**: 17–26.  
<https://doi.org/10.1093/aesa/52.1.17>
- 1961. Three new Nearctic acalyptrate Diptera. *Entomological News* **72**: 229–234.  
<https://www.biodiversitylibrary.org/page/2666635#page/279>
- STUKE, J.-H. & BÄCHLI, G. 2015. Faunistical data of Carnidae (Diptera) from Switzerland and additional countries with the description of three new *Meoneura* species. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* **88**: 379–401.  
<http://doi.org/10.5281/zenodo.34003>
- SURVEY OF ISRAEL. 2009. *Israel – Touring map. North & South sheets. List of settlements, antiquity sites and road distances. Scale 1:250,000*. The Survey of Israel, Tel Aviv.
- THEODOR, O. 1975. *Fauna Palaestina. Insecta I. Diptera Pupipara*. The Israel Academy of Sciences and Humanities, Jerusalem. 168 pp.
- WHEELER, T.A. 2010. Carnidae (Carnid Flies). 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. 2. NRC Research Press, Ottawa, pp. 1101–1104.