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***Periscelis stuckenbergi* sp. n., the first record of the genus from the Afrotropical Region (Diptera: Periscelididae: Periscelidinae)**

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ABSTRACT

A new species of the genus *Periscelis* Loew (*P. stuckenbergi*, Diptera: Periscelididae: Periscelidinae), the first from the Afrotropical Region, is described. Brief diagnoses of the family, subfamily, genus, subgenus and species are provided to facilitate identification of members of this uncommon family. A key to the subfamilies of the family and subgenera of *Periscelis* and habitus photographs and detailed illustrations of structures of the male terminalia are also included.

KEY WORDS: Diptera, Periscelididae, Periscelidinae, *Periscelis*, Afrotropical, Ethiopia, new species.

INTRODUCTION

Specimens of Periscelididae Oldenberg, 1914 are generally uncommon in collections, although numerous specimens, especially of the subfamily Periscelidinae, are sometimes common at preferred habitats, such as fluxes on deciduous trees. Thus it was of considerable interest to discover an undescribed species of the genus *Periscelis* Loew, 1858 from Ethiopia. The purpose of this paper is to document this species, which is the first of the subfamily Periscelidinae from the Afrotropical Region. Previously only species of *Cyamops* Melander, 1913 and *Stenomicro* Coquillett, 1900, both of the subfamily Stenomicroinae Papp, 1984, were known from the Afrotropics (Mathis & Rung 2011).

Because specimens are uncommon, we have included brief diagnoses of the family, subfamily and genus to facilitate their recognition and identification. To provide perspective and potential references for the Afrotropical fauna of Periscelidinae, we have included a few principal references about the Palaearctic fauna in the synonymy of the respective taxa.

MATERIAL AND METHODS

The descriptive terminology, with the exceptions noted in Baptista and Mathis (1994, 2000), is that published in the *Manual of Nearctic Diptera* (McAlpine 1981). The format for the species description adheres to Baptista and Mathis (1994, 2000). As specimens are small, less than 3 mm in length, study and illustration of the male terminalia requires use of a compound microscope. For most of the structures of the male terminalia we follow the terminology adopted previously (Baptista & Mathis 1994, 2000; Sueyoshi & Mathis 2004).

Three proportions in the wing used in the descriptions of new species are based on the largest, smallest, and one other specimen, and are defined as follows: (1) Wing proportion: straight-line distance between wing base and apex/greatest straight-line distance from anterior margin to posterior margin; (2) 1st costal proportion: straight-line distance between apices of R_{2+3} and R_{4+5} (costal section III)/distance between apices of R_1 and R_{2+3} (costal section II); (3) 2nd costal proportion: straight-line distance between

apices of R_{2+3} and R_{4+5} (costal section III)/distance between apices of R_{4+5} and M (costal section IV).

All specimens examined as part of this study were collected by Amnon Freidberg and colleagues and are deposited in Tel Aviv University (TAU) and the Smithsonian Institution (USNM).

Dissections of male and female terminalia and descriptions were performed using the method of Clausen & Cook (1971) and Grimaldi (1987). Microforceps were used to remove abdomens, which were macerated in a hot sodium hydroxide solution. Cleared terminalia were rinsed in distilled water and 70% ethanol and then transferred to glycerine for observation. For long-term storage, abdomens were placed in a plastic microvial filled with glycerine. Each microvial is attached to the pin supporting the remainder of the insect from which the abdomen was removed.

TAXONOMY

Family Periscelididae Oldenberg, 1914

Diagnosis: Adult. Small flies, body length 2.5–5.0 mm, moderately broad to slender. *Head*: Width equal to that of thorax, distinctly wider than high; frons wider than long, becoming narrower toward anterior margin, bearing 1 or 2 fronto-orbital setae; post-ocellar setae present and divergent or absent. Pedicel cap-like and with a dorsal cleft, bearing 1 or more dorsoapical setae; flagellomere 1 frequently sharply deflexed, extended from ventral surface of pedicel; arista bipectinate. Face uniformly sclerotised and arched, setose laterally. *Thorax*: Dorsocentral setae usually 2 (0+2), sometimes 1 (0+1), none presutural; posterior intra-alar seta reduced; scutellum with 1 or 2 pairs of marginal setae; scutellar disc bare; anepisternal seta usually lacking (present in *Planinasus* Cresson, 1914). *Wing*: Hyaline or with infusate markings. Subcosta rudimentary, not reaching costal margin, and not fused apically with R_1 ; no costal breaks (a weakness in the costa just apicad of the humeral crossvein in *Planinasus*); costa extended to vein R_{4+5} or M ; cell dm with shallow fold running entire length; cell cup present, although CuA_2 either well developed or extremely reduced. Mid tibia bearing prominent, apicoventral seta.

Classification: The concept of Periscelididae, as adopted here, follows McAlpine (1978, 1983) and includes a few genera previously assigned to Aulacigastridae Duda, 1924 (*Cyamops*, *Planinasus*, *Stenocyamops* Papp, 2006 and *Stenomicra*). McAlpine characterised Periscelididae primarily by the cap-like pedicel, which has a dorsal cleft, and its relationship to the first flagellomere. Although these characters are common to all Periscelididae, they also occur in Neurochaetidae McAlpine, 1978 (Woodley 1982) and some other acalyprate genera. In a recent phylogenetic study of the Opomyzoidea Fallén, 1820, using 28S ribosomal DNA and CAD (rudimentary) genes (Winkler *et al.* 2010), *Stenomicra*, *Cyamops* and *Planinasus* grouped consistently with moderate support with the genus *Aulacigaster* Macquart, 1835 and not with Periscelidinae. Moreover, the same analysis failed to find any support for a sister-group relationship between Periscelididae and Neurochaetidae. Their results highlight the need to study the phylogeny of these groups in greater detail and using different suites of characters.

Key to Old World subfamilies and genera of Periscelididae

- 1 Fronto-orbital setae 2; ocellar setae absent. Costa long, extended to vein M ; vein CuA_2 usually well developed, usually with a distinct cell cup (weak or lacking in

- some *Stenomicro*); postpronotum lacking a well-developed seta (*Stenomicro*inae)2
- Fronto-orbital seta 1; ocellar setae present, well developed. Costa short, extended only to vein R_{4+5} ; vein CuA_2 weak or lacking, cell *cup* absent; postpronotum bearing a well-developed seta (*Periscelidinae*) **Periscelis** Loew
- 2 Fronto-orbital setae reclinate or occasionally mesocline, frons lacking a proclinate seta. Metanotum bulging; supra-alar seta lacking; scutellar setae 1 pair, apical. Wing with anal lobe greatly reduced; alula indistinct; vein CuA_2 weak or lacking; cell *cup* usually lacking **Stenomicro** Coquillett
- Fronto-orbitals comprising 1 proclinate and 1 reclinate seta. Metanotum not bulging; supra-alar seta present, well developed; scutellar setae variable, but usually 2. Wing with a distinct anal lobe and alula; vein CuA_2 present, well developed; cell *cup* present3
- 3 Medial vertical seta lacking. Face in profile shallowly arched. Hind tibia without large, ventroapical spur. Crossvein *bm-cu* present, cell *bm* at least partially separated if not distinct from cell *dm*. Abdominal sternites not very broad; male terminalia strongly asymmetrical, especially surstyli; ejaculatory apodeme very large **Cyamops** Melander
- Medial vertical seta present. Face in profile angulate. Hind tibia with a large, ventroapical spur. Crossvein *bm-cu* absent, making cells *bm* and *dm* confluent. Abdominal sternites very broad. Male terminalia nearly symmetrical, surstyli completely so; ejaculatory apodeme very small **Stenocyamops** Papp

Subfamily Periscelidinae Oldenberg, 1914

Periscelidinae: Oldenberg 1914: 41.

Diagnosis: Adult. *Head*: Eye microsetulose (sometimes sparsely so); occiput with a silvery-white, microtomentose area immediately adjacent to posterior margin of compound eye; frons with 1 fronto-orbital seta, reclinate; postvertical setae present, divergent; ocellar setae present, well developed; face uniformly sclerotized and transversely arched (shield-like in *Scutops* Coquillett, 1904); face setose laterally, strongly receded ventrally, extended laterally below gena; gena extended anterodorsally, bearing a row of setae, with anterior one inserted well above oral margin; mouth opening large. *Thorax*: Postpronotal seta well developed. Wing with costa extended to vein R_{4+5} ; cell *cup* present, although vein CuA_2 extremely reduced. *Abdomen*: 7th spiracle in sclerite, not free in membrane of female postabdomen. See Griffiths (1972) for discussion of male terminalia.

Biology and behaviour: The immature stages, and to an extent the adults, are associated with sap from bleeding deciduous trees (oak, elm, cottonwood, etc.).

Classification: The genera comprising Periscelidinae are those that Hennig (1969) included in his more restricted concept of the family, viz. *Periscelis* Loew, *Marbenia* Malloch, 1931, *Neoscutops* Malloch, 1926, *Scutops* Coquillett and *Dioposoma* Malloch, 1932. These five genera comprise a well-established, monophyletic assemblage, with corroborative synapomorphies as follows: (1) mouth opening large; (2) occiput with a silvery-white, microtomentose area immediately adjacent to the posterior margin of the compound eye; (3) only one fronto-orbital seta, reclinate; (4) costal vein short, extended

only to vein R_{4+5} ; (5) vein CuA_2 reduced or absent; (6) several characters of the male terminalia (see Griffiths 1972).

Genus *Periscelis* Loew, 1858

Periscelis: Loew 1858: 113 (Type species: *Periscelis annulipes* Loew, 1858, by subsequent designation (Sturtevant 1923: 1)); Schiner 1863: 271 [revision European species]; Becker 1905: 217 [Palaeartic catalogue]; Duda 1934: 5 [revision Palaeartic species]; Papp 1984: 233–234 [Palaeartic catalogue]; 1988: 273–284 [discussion, figures]; Mathis & Rung 2011: 353–358 [world catalogue].

Diagnosis: *Head*: Face distinctly angulate or with a protruding, transverse carina (best seen in lateral view); dorsal half of face narrow, not distinctly and broadly flattened or shield-like, ventral half of face lacking transverse furrows. Eyes normal, not borne on conspicuous stalks. *Thorax*: Scutellum broadly rounded apically, lacking patch of long setae apically. Chaetotaxy as follows: 2 posterior dorsocentral setae; presutural seta lacking; prescutellar acrostichal setae variable, depending on species-group. Wing mostly hyaline; apical section of vein M straight or very shallowly arched; vein R_1 bare dorsally; vein R_{2+3} more-or-less evenly arched throughout, except for a small section just before apex. *Abdomen*: Male terminalia (based only on *P. wheeleri* (Sturtevant, 1923) and *P. occidentalis* Sturtevant, 1954): epandrium and surstyli connected with internal structures of terminalia; cercus moderately well sclerotised, longer than wide, porrect posteriorly, not narrowed apically, bearing several moderately long setae, but lacking stout, tooth-like setae at apex; surstyli fused with ventral margin of epandrium, asymmetrical or symmetrical, narrow and rounded apically, bearing sparse, short setulae on apical half; a well-sclerotised process joining base of surstylus; gonite distinct and comparatively long, tapered ventrally, shorter than surstylus.

Key to subgenera of *Periscelis*

- 1 Prescutellar acrostichal setulae moderately well developed, distinct from other acrostichal setulae; crossvein $dm-cu$ straight and well developed throughout its length; male terminalia lacking digitiform process at base of epandrium between surstylus and cercus **Myodris** Lioy, 1864
- Prescutellar acrostichal setulae undifferentiated; crossvein $dm-cu$ weakened to completely attenuate anteriorly, usually angulate or curved toward base, sometimes nearly straight; male terminalia with a ventrally-oriented, narrow process at ventral margin of epandrium between surstylus and cerci 2
- 2 Mesonotum mostly bare of microtomentum, shiny and with bicoloured pattern of dark brown and yellowish orange; cercus of ♂ bearing 5 stout, tooth-like setae along anteroventral surface; large species, body length 2.7 mm or longer **Notioscelis** Mathis, 1993
- Mesonotum invested with microtomentum, appearing somewhat dull, mostly unicolourous; cercus of ♂ bearing several long setulae, especially posteriorly, but not tooth-like setae; small species, body length 2.6 mm or smaller **Periscelis** Loew, 1858

Subgenus *Periscelis* Loew, 1858, *sensu stricto*

Periscelis: Loew 1858: 113 [as a genus]. Type species: *Periscelis annulipes* Loew, by subsequent designation (Sturtevant 1923: 1).

Sphyroperiscelis Sturtevant, 1923: 1 [as a genus; Type species: *Sphyroperiscelis wheeleri* Sturtevant, 1923, by original designation]; 1954: 551 [synonymy with *Periscelis*].

Parliosцена Enderlein, 1936: 177 [Type species: *Periscelis winertzii* Egger, 1862: 780, by monotypy]; Papp 1984: 234.

Diagnosis: *Thorax*: Mesonotum usually unicolourous, not heavily microtomentose; prescutellar acrostichal setae undifferentiated. Colouration of wing variable; crossvein *dm-cu* incomplete, attenuate anteriorly, or very short (subequal to length of crossvein *r-m*). *Abdomen*: Male terminalia as for the genus.

***Periscelis stuckenbergi* sp. n.**

Figs 1–7

Etymology: It is a pleasure to dedicate this new species to the late Brian R. Stuckenberg who was an indefatigable student of Afrotropical Diptera. Brian not only conducted excellent research himself on the taxonomy of Diptera from the Afrotropics and elsewhere, but he also very actively promoted study of this diverse fauna, and we were often the direct recipients of his encouragement and enthusiasm.

Description:

Generally dark brown; body length 2.25–2.60 mm; wing length 2.20–2.60 mm; wing width 0.75–1.00 mm.

Head (Figs 1–3): Frons dark brown, shiny. Antenna generally brown, especially dorsally, yellowish brown to yellow ventrally; arista (Fig. 2) with 6 or 7 dorsal rays; 3 or 4 long ventral rays and 3 much shorter rays between longer rays. Face (Figs 1, 3) with dorsal three quarters generally brown, parallel-sided, with lateral and especially ventral margins yellowish, generally flat, ventral margin of this portion distinctly convex; ventral and ventrolateral portions shiny to subshiny, subshiny portions greyish microtomentose; gena with thin area immediately ventrad of eye whitish to silvery white, microtomentose; postoccipital thin area immediately posterior to posterior margin silvery white, microtomentose. Clypeus thin and narrow, colouration similar to ventral portion of face.

Thorax: Mesonotum (Fig. 5) mostly dark brown, mostly shiny, sparsely invested with grey microtomentum, postpronotum slightly lighter brown; pleura dark brown. Thoracic chaetotaxy: 1 postpronotal; 2 notopleurals; 1 supra-alar; 1 postalar; 2 dorsocentrals (0+2); 2 scutellars, apical 3–4× length of basal; 2 katapisternals, both near dorsal margin.

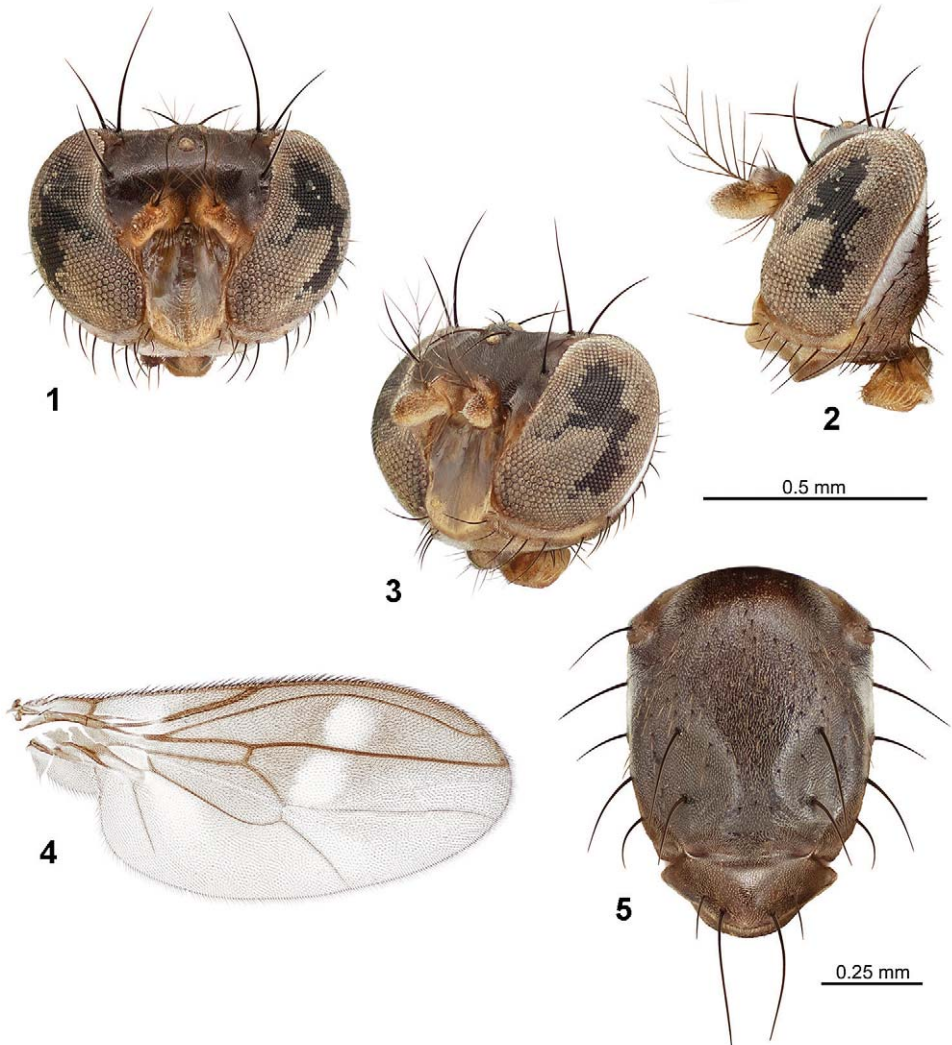
Wing (Fig. 4): Generally lightly brown on anterior portion and hyaline posteriorly; veins dark brown to ochreous; wing proportion 0.35–0.42 (last proportion from flattened, slide-mounted wing); 1st costal proportion 0.10–0.14; 2nd costal proportion 0.46–0.58; costal section I (humeral– R_1) 0.70–1.00 mm; costal section II (R_1 – R_{2+3}) 0.90–1.10 mm; costal section III (R_{2+3} – R_{4+5}) 0.09–0.15 mm; costal section IV (R_{4+5} – M) 0.20–0.30 mm; subcosta short, length about equal to width of cell, attenuated apically; vein R_{2+3} conspicuously arched; cell R_{2+3} with semiquadrate spot near middle; cell M with large, semiquadrate spot at basal third, aligned slightly basad of spot in cell R_{2+3} ; crossvein *dm-cu* short, subequal to length of crossvein *r-m*; vein M straight, nearly parallel with vein R_{4+5} .

Legs: Except tarsi, generally dark brown except for yellowish ventral portion of coxae, trochanters and bases of femora; fore tarsus with basitarsomere and sometimes

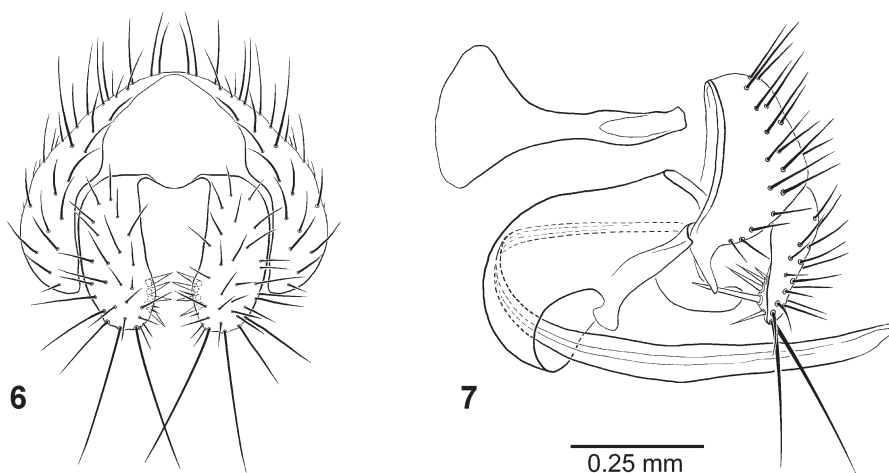
tarsomere 2 dark brown, apical tarsomeres yellow, but becoming slightly darker apically; tarsomeres of mid and hind legs yellowish basally, apical 2 or 3 tarsomeres sometimes darkened, colouration variable.

Abdomen: Dark brown.

Male terminalia (Figs 6, 7): Generally reduced, apparently through fusion. Epandrium as an inverted U (Fig. 6), wider than high, lateral margin in posterior view shallowly arched, in lateral view (Fig. 7) somewhat rectangular but widest just ventrad of midheight, thereafter tapered ventrally; surstylus apparently fused to ventral margin of epandrium as a tapered, ventral projection; cerci robustly developed, 2× as high as wide in posterior view (Fig. 6), digitiform, bearing numerous setulae, these elongate along ventral margin



Figs 1–5. *Periscelis stuckenbergi* sp. n.: (1–3) head, anterior (1), lateral (2) and anteroblique (3) views; (4) wing, dorsal view; (5) mesonotum, dorsal view.



Figs 6, 7. Genitalia of *Periscelis stuckenbergi* sp. n.: (6) epandrium and cerci, posterior view; (7) epandrium (and fused surstylus), cerci, ejaculatory apodeme, hypandrium (and fused phallapodeme) and aedeagus, lateral view.

and very stoutly developed, spine-like medially and medioventrally; aedeagus (phallus) in lateral view (Fig. 7) greatly elongate, slender, somewhat membranous, deeply U-shaped, arched medially, basal and apical sections nearly straight; gonite in lateral view slipper-like, tapered apically; subepandrial plate a narrow arch that is projected medially; ejaculatory apodeme well developed with narrow stem, distal portion fan-like; phallapodeme and hypandrium apparently fused indistinguishably, forming a relatively well-sclerotized, deep pocket or pouch (Fig. 7).

Holotype: ♂ “ETHIOPIA: GAMO GOFA, Arba Minch ‘forest’ [6°02’N 37°33’E], 1300m at tree resin 9.ii.2000. I. YAROM & A. FREIDBERG / Holotype ♂ *Periscelis stuckenbergi* Mathis & Freidberg TAU [red].” The holotype is double mounted (minuten in a block of plastic) and is in excellent condition (TAU).

Paratypes: ETHIOPIA: *Gamu-Gofa*: 5♂ 6♀ same label data as holotype (TAU, USNM); 1♀ 3 km NE Ārba Minch, 1300 m, 5.ii.2000, A. Freidberg & I. Yarom (TAU).

Remarks: The type locality is in southern Ethiopia, near the town of Ārba Minch. The specimens were collected in a disturbed habitat, just outside the Ārba Minch forest reserve, while they were moving around resin sap from a tree wound located 1.5–2.0 m above the ground.

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REFERENCES

- BAPTISTA, A.R.P. & MATHIS, W.N. 1994. A revision of New World *Cyamops* Melander (Diptera: Periscelidiidae). *Smithsonian Contributions to Zoology* **563**: 1–25.
 ————2000. Notes on the genus *Cyamops* Melander (Diptera: Periscelidiidae), including description of ten new species. *Proceedings of the Entomological Society of Washington* **102**: 481–506.

- BECKER, T. 1905. Drosophilinae. In: Becker, T., Bezzi, M., Kertész, K. & Stein, P., eds, *Katalog der paläarktischen Dipteren*. Vol. 4. Budapest: G. Wesselényi in Hódmezővásárhely, pp. 216–224.
- CLAUSEN, P.J. & COOK, E.F. 1971. A revision of the Nearctic species of the tribe Parydrini (Diptera: Ephydriidae). *Memoirs of the American Entomological Society* **27**: 1–150.
- DUDA, O. 1934. 58a. Periscelidae. In: Lindner, E., ed., *Die Fliegen der paläarktischen Region*. B. 6. Stuttgart: Schweizerbart'sche, pp. 1–13.
- EGGER, J. 1862. Dipterologische Beiträge. Fortsetzung der Beschreibungen neuer Dipteren. *Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien* **12**: 777–784, 1233–1236.
- ENDERLEIN, G. 1936. 22. Ordnung: Zweiflügler, Diptera. Abt. 16. In: Brohmer, P., Ehrmann, P. & Ulmer, G., eds, *Die Tierwelt Mitteleuropas*, 6 (2), Insekten, Teil III. Leipzig: Quelle und Meyer, pp. 1–259.
- GRIFFITHS, G.C.D. 1972. The phylogenetic classification of Diptera Cyclorrhapha, with special reference to the structure of the male postabdomen. *Series Entomologica* **8**: 1–340.
- GRIMALDI, D.A. 1987. Phylogenetics and taxonomy of *Zygothrica*. *Bulletin of the American Museum of Natural History* **186**: 103–268.
- HENNIG, W. 1969. Neue Gattungen und Arten der Acalypterae. *Canadian Entomologist* **101**: 589–633.
- LOEW, H. 1858. Ueber einige neue Fliegengattungen. *Berliner entomologische Zeitschrift* **2**: 101–122.
- MATHIS, W.N. & RUNG, A.R.P. 2011. World catalog and conspectus on the family Periscelididae (Diptera: Schizophora). *Myia* **12**: 341–377.
- MCALPINE, D.K. 1978. Description and biology of a new genus of flies related to *Anthoclusia* and representing a new family (Diptera, Schizophora, Neurochaetidae). *Annals of the Natal Museum* **23**: 273–295.
- 1983. A new subfamily of Aulacigastridae (Diptera: Schizophora), with a discussion of aulacigastrid classification. *Australian Journal of Zoology* **31**: 55–78.
- MCALPINE, J.F. 1981. Morphology and terminology—Adults. In: McAlpine, J.F., Peterson, B.V., Shewell, G.E., Teskey, H.J., Vockeroth, J.R. & Wood, D.M., eds, *Manual of Nearctic Diptera*. Vol. 1. Monograph 27. Ottawa: Agriculture Canada, Research Branch, pp. 9–63.
- OLDENBERG, L. 1914. Beitrag zur Kenntnis der europäischen Drosophiliden (Dipt.). *Archiv für Naturgeschichte* **80A** (2): 1–42.
- PAPP, L. 1984. Family Periscelididae. In: Soós, Á. & Papp, L., eds, *Catalogue of Palaearctic Diptera*. Vol. 9. Amsterdam: Elsevier Science Publishers, pp. 233–234.
- 1988. *Periscelis kabuli* sp. n. and *P. kaszabi* sp. n. with notes on larvae and pupae of the families Aulacigastridae and Periscelididae (Diptera). *Acta Zoologica Academiae Scientiarum Hungaricae* **34**: 273–284.
- SCHINER, I.R. 1863. Die Fliegen (Diptera). In: *Fauna Austriaca*. Vol. 2, parts 9–10. Wien: Carl Gerold's Sohn, pp. 81–288.
- STURTEVANT, A.H. 1923. New species and notes on synonymy and distribution of Muscidae Acalypterae (Diptera). *Novitates of the American Museum of Natural History* **76**: 1–12.
- 1954. Nearctic flies of the family Periscelidae (Diptera) and certain Anthomyzidae referred to the family. *Proceedings of the United States National Museum* **103** (3332): 551–561.
- SUEYOSHI, M. & MATHIS, W.N. 2004. A new species of *Cyamops* Melander, 1913 (Diptera: Periscelididae) from Japan and a review of the Japanese Periscelididae. *Proceedings of the Entomological Society of Washington* **106**: 74–84.
- WINKLER, I.S., RUNG, R. & SCHEFFER, S.J. 2010. Hennig's orphans revisited: testing morphological hypotheses in the "Opomyzoidea". *Molecular Phylogenetics and Evolution* **54**: 746–762.
- WOODLEY, N.E. 1982. Two new species of *Neurochaeta* McAlpine (Diptera: Neurochaetidae), with notes on cladistic relationships within the genus. *Memoirs of the Entomological Society of Washington* **10**: 211–218.