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Periscelis (*Myodris*) *haennii* sp. nov., a new species of Periscelididae (Diptera) from Ticino, Switzerland, with a new key to European species of the subgenus

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https://zoobank.org/492F060D-6C48-4F1B-B5A8-FE57EF43E4FC

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Abstract

A new Periscelididae species, *Periscelis* (*Myodris*) *haennii* **sp. nov.**, is described from Losone near Locarno, Canton Ticino (Southern Switzerland). It has been found during a biodiversity survey using attractant traps in a Querco-Castagnetum forest. This new species is closely related and very similar to *P.* (*M.*) *annulata* (Fallén, 1813) occurring syntopically in the same traps. Interestingly, also *P.* (*M.*) *piricercus* Carles-Tolrá & Verdugo Páez, 2009 co-occurred with these species; consequently, all European species of the subgenus *Myodris* Lioy, 1864 were found in this locality. A new illustrated key to males of these species is presented. The DNA sequences of the barcoding region of COI for all these species are given.

Key Words

new species, Querco-Castagnetum forest, Ticino, systematics, relationships, molecular barcoding

Introduction

In an effort to increase the knowledge on forest insect diversity of Canton Ticino, the recent entomological research program carried out by the Natural history museum of Canton Ticino (Museo cantonale di storia naturale, MCSN) in Lugano (Switzerland) has been focusing on the natural areas around the city of Locarno. During the sampling plan, aimed at testing different sampling methods, a large amount of specimens of Periscelididae was captured (Pollini Paltrinieri et al., unpublished data) in which many individuals appearing as *Periscelis* (*Myodris*) *annulata* (Fallén, 1813) when using available identification keys (most recent in Papp and Withers 2011), actually had different morphological characters of genitalia to the diagnostic ones, suggesting that it could be a new species of the subgenus *Myodris* Lioy, 1864. This incongruence of morphological features prompted taxonomic verification with international expertise (by the late László Papp, Budapest and Miguel Carles-Tolrá, Barcelona) that lead to the present study.

To verify validity of the new species the male terminalia of both other European species of the subgenus, viz. *P.* (*M.*) *annulata* and *P.* (*M.*) *piricercus* Carles-Tolrá & Verdugo Páez, 2009 have been examined in detail and those of *P.* (*M.*) *annulata* (the closest relative of the new species) were redescribed and illustrated. Moreover, DNA sequences of the barcoding region of COI of all these species have been obtained and their genetic distances tested.

The new species is treated within the subgenus *Myodris* of the genus *Periscelis* Loew, 1858 following the classification adopted by Mathis and Rung (2011) and supported by Roháček and Andrade (2017). Consequently, the elevation of *Myodris* to generic rank proposed by Papp and Withers (2011) is not here accepted. The taxonomic concept of *P.* (*M.*) *annulata* follows the redescription of this species by Papp and Withers (2011).

Materials and methods

Material

Three stations were surveyed in a Querco-castagnetum forest (Fig. 3) during a full year (July 2015–July 2016) using different kinds of traps; the 99.4% of Periscelididae have been caught with three slightly different attractant traps (transparent with wine – Fig. 1, transparent with beer, and yellow with wine – Fig. 2). A total of 305 males of the new species have been trapped. The material was preserved in ethanol but 53 specimens (type) have subsequently been dried and mounted on pins. The specimens are deposited in **MCSN** – Museo cantonale di storia naturale, Lugano (Switzerland) and **SMOC** – Silesian Museum, Opava (Czech Republic).

Drawing techniques and photography

Details of the male and female terminalia were drawn using Abbe's drawing apparatus on a compound microscope (JENAVAL). Whole adult (dry-mounted) specimens were photographed by means of a digital camera Canon EOS 5D Mark III with a Nikon CFI Plan 4× /0.10NA 30 mm WD objective attached to Canon EF 70–200mm f/4L USM zoom lens. The specimen photographed by means of the latter equipment was repositioned upwards between each exposure using a Cognisys StackShot Macro Rail and the final photograph was compiled from multiple layers (35) using Helicon Focus Pro 7.0.2. The final images were edited in Adobe Photoshop CS6. Wings were photographed on a compound microscope Olympus BX51 with an attached digital camera (Canon EOS 1200D). Photographs of male terminalia in

Figures 1–3. Attractant traps and habitat of *Periscelis* (*M.*) *haennii* sp. nov. **1.** Transparent trap with wine, hanging on tree branch; **2.** Same, yellow trap; **3.** Habitat of the species (where wine traps were installed), a Querco-castagnetum forest at Losone near Locarno. Photos by L. Pollini Patrinieri.

ethanol were taken with an Olympus UC50 camera mounted on a microscope Olympus SZX12, processed with Stream Essentials Olympus and by Auto Montage Software.

Barcoding

To demonstrate molecular differences between European *Myodris* species the barcoding region of COI was amplified (see below). One specimen of all three species and also that of *Periscelis* (s. str.) *winnertzii* Egger, 1862 (all from Switzerland, Canton of Ticino: Losone), preserved in 80% ethanol, were used for analysis. The DNA was extracted using NucleoSpin Tissue Kit (Macherey-Nagel, Düren, Germany) following manufacturer's protocols. Individual flies were rinsed in PBS buffer, placed in sterile Eppendorf tubes and incubated overnight at 56 °C with proteinase K. PCRs (total volume=20 µL) were performed using primers for barcoding region of COI gene LCO1490 LCO1490 (5′-GGTCAACAAATCATAAAGATATTGG-3′) and HC02198 (5′-TAAACTTCAGGGTGACCAAAAAAT-CA-3′) (Folmer et al. 1994). Amplified products were purified using the Gel/PCR DNA Fragments Extraction Kit (Geneaid, New Taipei City, Taiwan), following manufacturer's protocol. PCR products were sequenced by Eurofins genomics (Germany). Sequences of COI gene were assembled in SeqTrace 0.9.0 (Stucky 2012). GenBank accession numbers are as follows: *Periscelis* (*M.*) *haennii* sp. nov. – OM314931, *P.* (*M.*) *annulata* – OM314930, *P.* (*M.*) *piricercus* – OM314932, *P.* (s. str.) *winnertzii* – OM314933. Genetic distances of these species were calculated in MEGA version 11 (Tamura et al. 2021) using Kimura 2-parameter model (K2P) and they are presented in Table 1.

Table 1. Genetic distances for COI (Kimura 2-parameter) among *Periscelis* species. The barcoding region of COI has been 658 pb long.

Species	1	2	3	4
1 *P.* (*Myodris*) *annulata*				
2 *P.* (*Myodris*) *piricercus*	6.88%			
3 *P.* (*Myodris*) *haennii* sp. nov.	7.58%	9.12%		
4 *P.* (*Periscelis*) *winnertzii*	13.88%	14.23%	15.77%	

Morphological terminology follows that used for *Periscelis* spp. by Roháček and Andrade (2017). Morphological terms of the male genitalia are depicted in Figs 11–22.

Abbreviations of morphological terms used in text and illustrations

ac acrostichal (setae)
c costal cells
ce cercus
dc dorsocentral setae
dp distiphallus
dm-cu discal medial-cubital (= posterior, tp) cross-vein
ea ejacapodeme
ed ejaculatory duct
ep epandrium
hu humeral (seta)
hy hypandrium
M media
ma medandrium
npl notopleural (setae)
oc ocellar (setae)
ors fronto-orbital (setae)
pa postalar (seta)
pg postgonite
pha phallapodeme
pvt postvertical (seta)
r_1 1st radial cell
r_{2+3} 2nd radial cell
r-m radial-medial (= anterior, ta) cross-vein
S6 sternite 6
sa supra-alar (seta)
sc scutellar (seta)
ss surstylus
stpl sternopleural (= katepisternal) (seta)
vte external vertical (seta)
vti internal vertical (seta)

Results

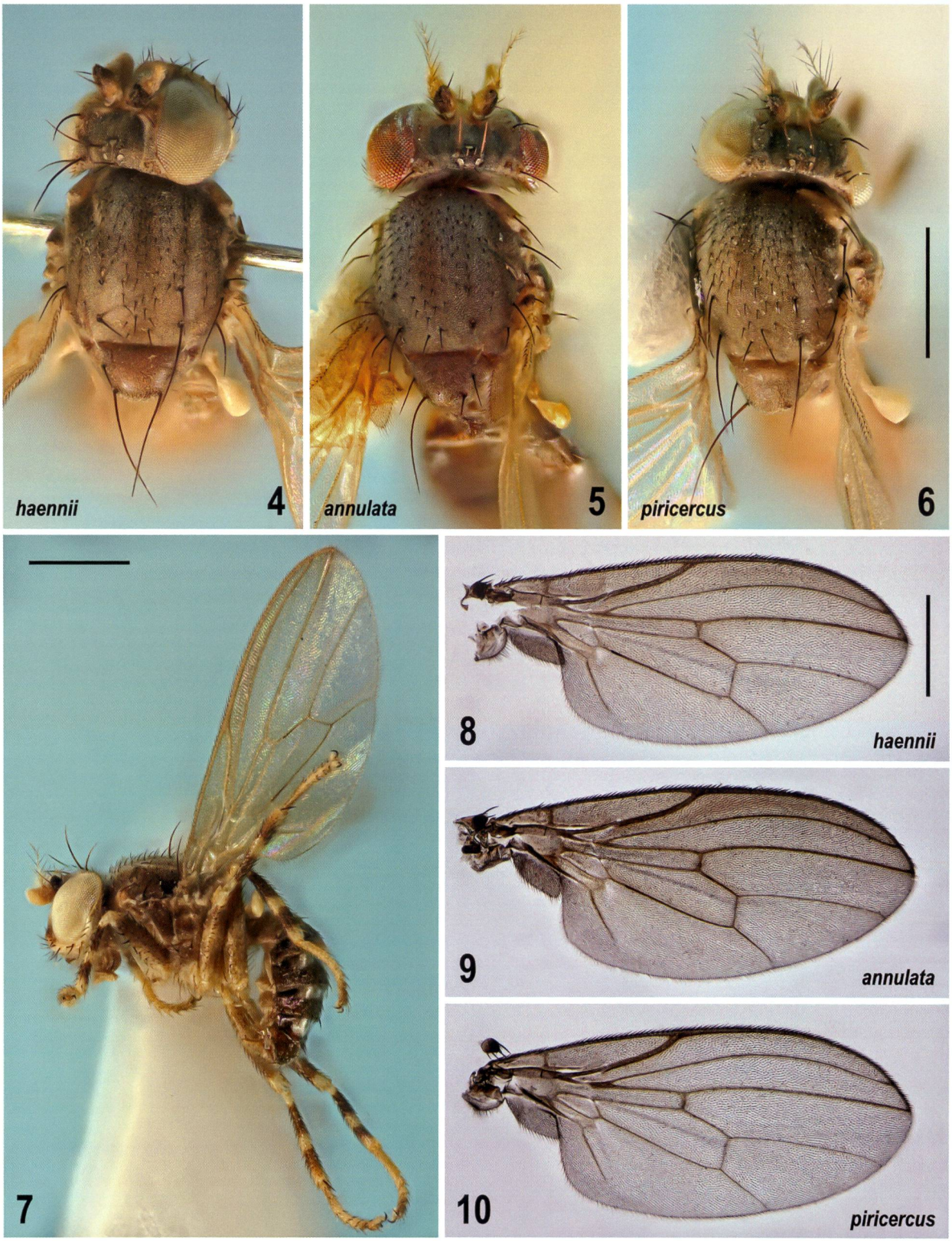
Periscelis (*Myodris*) *haennii* Pollini Paltrinieri & Roháček, sp. nov.

https://zoobank.org/55CCD6F7-85F3-4301-ACA5-3414E8CB2F00
Figs 4, 7, 8, 11–16, 23–26, 35

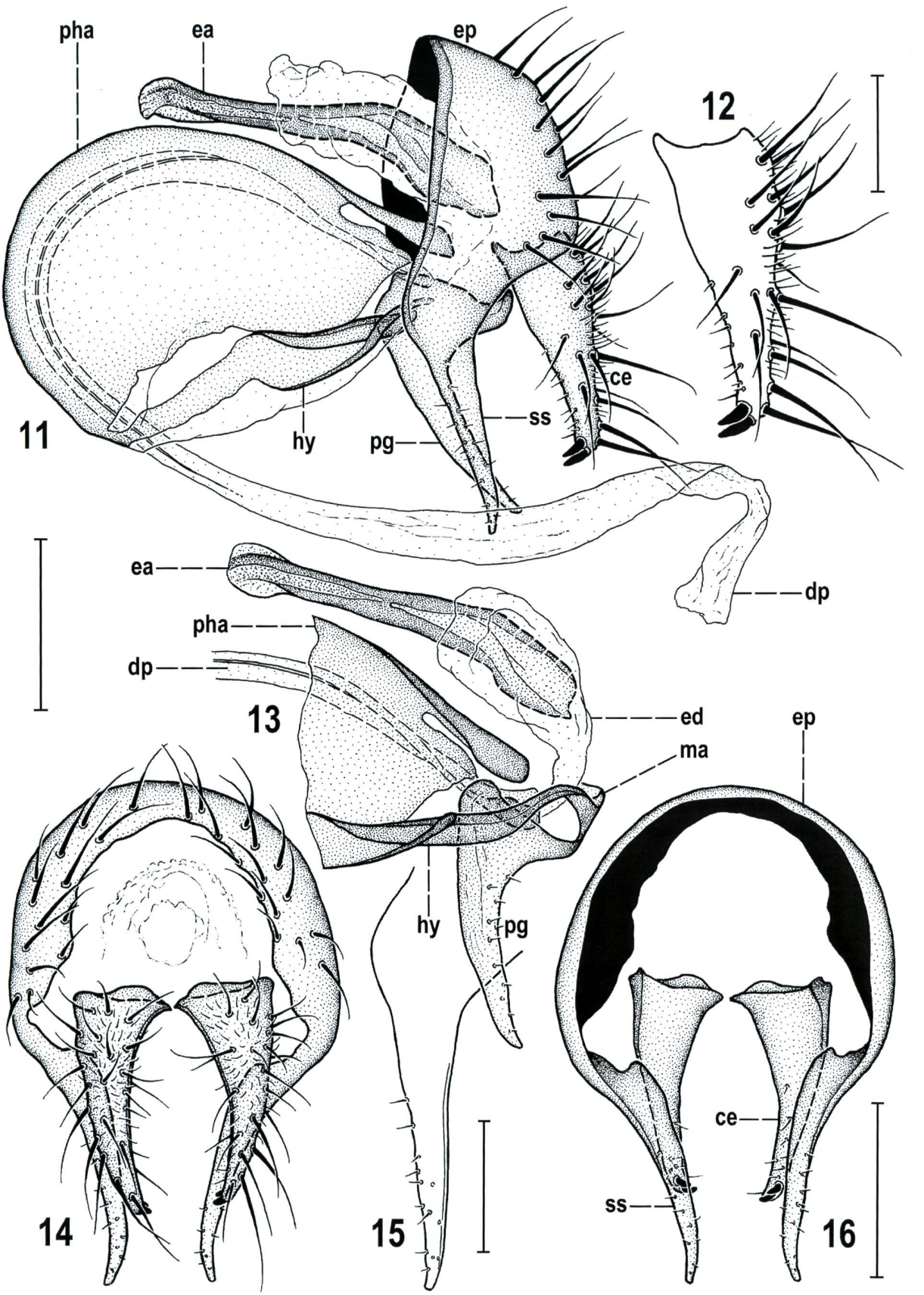
Type locality. Switzerland, Canton of Ticino, Municipality of Losone, Forest reserve of "Parco Collina di Maia", 46°09'53"N, 8°44'54"E, 419 m.

Holotype. • ♂, pinned, labelled "SVIZZERA – TI; 701.168/113.372; Losone, Arcegno, Collina di Maia; Castagneto con querce; 419 m; 21–28.07.2015, prd. 1; VINO Bianca; ARC 2; Leg: L. Pollini P.& M. Abderhalden; DIPT04008, GBIFCH00559684. [Switzerland, Ticino; Losone, Arcegno, Collina di Maia; chestnut and oak forest; 419 m; 46°09'53"N, 8°44'54"E Wine trap White] (deposited in MCSN).

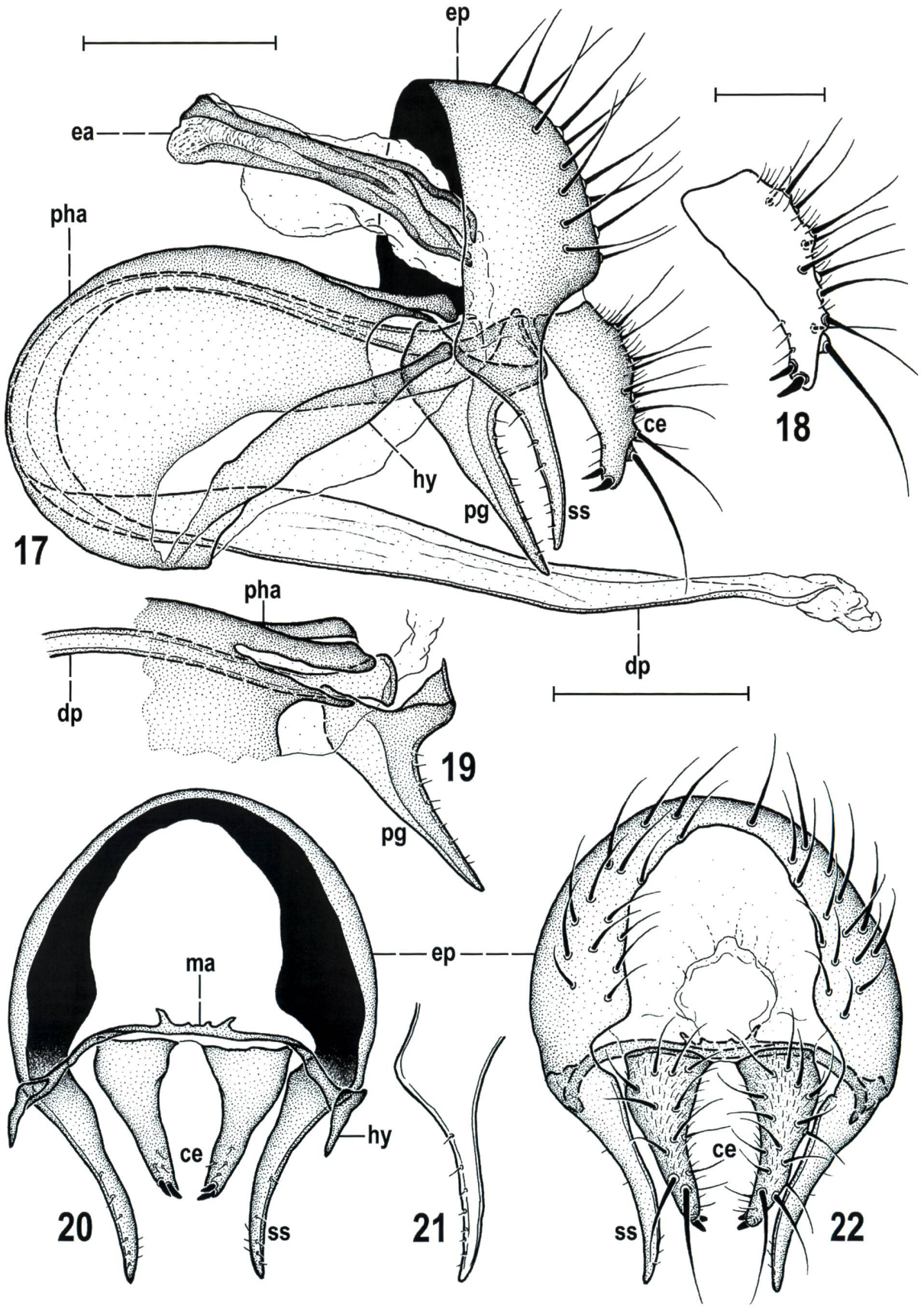
Paratypes. • 2♂♂; SVIZZERA – TI; Losone, Arcegno, Collina di Maia; Castagneto con querce; 420 m; 701.151/113.376 [46°09'51.337"N, 8°44'53.687"E]; ARC1; 20.05–06.06.2016; Vino Bianca. • 1♂; same, but 23.06–07.07.2016. • 1♂; same, but 701.013/113.741 [46°10'03.240"N, 8°44'47.535"E]; 411 m; ARC2; 20.05–06.06.2016. • 2♂♂ same but 06–23.06.2016; Vino gialla. • 2♂♂ same but, 701.307/113.196 [46°09'45.434"N, 8°45'00.812"E]; 366 m; ARC3; 21–28.07.2015. • 5♂♂ same but 20.05-06.06.2016; Vino Bianca. All L. Pollini & M. Abderhalden leg., all dried from ethanol and pinned (MCSN). • 15♂♂ Losone, Arcegno, Collina di Maia; Castagneto con querce; 411 m; 701.013/113.741 [46°10'03.240"N, 8°44'47.535"E]; ARC2; 06-20.05.2016. • 4 ♂♂; same but



Figures 4–10. *Periscelis* (*Myodris*) species, adults. **4.** *P.* (*M.*) *haennii* sp. nov., male paratype (dried from ethanol), thorax dorsally; **5.** *P.* (*M.*) *annulata* (Fallén), male (dry mounted), thorax dorsally; **6.** *P.* (*M.*) *piricercus* Carles-Tolrá & Verdugo Páez, male (dried from ethanol), thorax dorsally; **7.** *P.* (*M.*) *haennii* sp. nov., male paratype (dried from ethanol), laterally; **8.** *P.* (*M.*) *haennii* sp. nov., male paratype, right wing; **9.** *P.* (*M.*) *annulata* (Fallén), male, right wing; **10.** *P.* (*M.*) *piricercus* Carles-Tolrá & Verdugo Páez, male, right wing. Only Fig. 5 is based on specimen from Slovakia, others are from specimens from Losone (Switzerland). All scales: 0.5 mm. Photos by J. Roháček.



Figures 11–16. *Periscelis* (*Myodris*) *haennii* sp. nov., paratype, male genitalia. **11.** Entire genitalia, laterally; **12.** Cercus, laterally; **13.** Aedeagal complex, laterally (only basal parts of distiphallus, phallapodeme and hypandrium depicted); **14.** External genitalia caudally; **15.** Surstylus, laterally; **16.** External genitalia cranially (setosity of epandrium and cerci largely omitted). For abbreviations see p. 41. Scales: 0.05 mm (**12, 15**); 0.1 mm (**11, 13, 14, 16**).



Figures 17–22. *Periscelis* (*Myodris*) *annulata* (Fallén), male genitalia (Slovakia). **17.** Entire genitalia, laterally; **18.** Cercus, laterally; **19.** Aedeagal complex, laterally (only basal parts of distiphallus, phallapodeme and hypandrium depicted); **20.** External genitalia cranially (setosity of epandrium and cerci largely omitted); **21.** Surstylus, laterally; **22.** External genitalia caudally. For abbreviations see p. 41. Scales: 0.05 mm (**18**); 0.1 mm (**17, 19–22**).

701.307/113.196 [46°09'45.434"N, 8°45'00.812"E]; 366 m; ARC3; 23.06-07.07.2016.; all L. Pollini & M. Abderhalden leg.; all preserved in ethanol (MCSN). • 18♂ (3♂ with genit. prep., 1 intact ♂ photographed) 701.168/113.372; 419 m; ARC2; 13-27.07.2017, prd. 25; Vino bianca. • 2♂ same data but 10-23.08.2017, prd. 27; all L. Pollini & M. Abderhalden leg., all dried from ethanol and 16 mounted on pinned triangular cards, 4 double-pinned (on minutia pin in pinned plastic bricket) (SMOC).

Not included in type series. all other specimens from the same locality preserved in ethanol (deposited in MCSN). Same locality, 701.168/113.372, 419 m, ARC2,13–27.07.2017, 13–27.07.2017, prd. 25, vino bianca, 1♂, L. Pollini & M. Abderhalden leg., but with blue label "JR32, OM314931" (handwritten) in addition; specimen used for molecular study, with body (after DNA extraction) preserved in glycerine in pinned plastic vial (SMOC).

Diagnosis. A small species (1.3 mm) (Fig. 7) closely resembling *Periscelis* (*Myodris*) *annulata* but with microtomentum of scutum and scutellum (Fig. 4) darker and more brownish, consequently, acrostichal and dorsocentral brown stripes are less contrasting (somewhat resembling mesonotal pattern in *P.* (*M.*) *piricercus*, cf. Fig. 6). Cerci longer and more slender (Figs 11, 12, 14, 24, 35) than those of *P. (M.) annulata* (Figs 17, 18, 22, 28, 36), with 2 short anteroapical black spines which are short and emerge close to each other; subapical posterior setae hardly longer than other posterior setae (Figs 12, 24). Surstylus more gradually tapering and rather straight distally (Figs 15, 25). Postgonite more elongate, with slender distal part longer and slightly bent (Figs 13, 26).

Description. Male (Fig. 7). Total body length (holotype) 1.31 mm, wing length 1.01 mm. General colour mainly brown and grey, microtomentose and dull; some parts of head and legs yellow and abdomen with small silvery white microtomentose spots in lateral margin of tergites. Head: face microtomentose, protruding in front of anteroventral eye margin; mainly brown but yellow ochreous on the concavities below the antennae and on carina. Darkened on the protrusion above mouth edge. Frons large, brown, ocellar triangle small, situated at posterior margin of frons; ocelli arranged in equilateral triangle. Gena relatively low, postgena expanded posteriorly, brown and becoming darker posteriorly, towards concave occiput. Eye margin with a thin yellow ochreous stripe. Clypeus brown, palpi yellow. Antennae divergent and largely yellow, only pedicel with dull black dorsal spot covering completely the outer lateral side and one third of the inner side; pedicel with a row of short setae. Pedicel cap-shaped, relatively large, larger than the first flagellomere; the latter with apex slightly curved upwards, yellow, covered with light short pilosity. Arista yellow, long-pectinate, dorsally with 7 rays (3 longer and 4 shorter), ventrally with 4–5 rays (2 longer and 2–3 shorter). Mouthparts and palpi yellow ochreous, clypeus brown. Cephalic chaetotaxy: all setae blackish brown; pvt well developed, divergent, situated at dorsal margin of occiput behind the inner margin of ocelli; 1 longer convergent and inclinate vti; 1 slightly divergent and lateroclinate vte; 1 reclinate ors, 1 proclinate oc; 3–4 microsetulae in front of ors. No vibrissae or pseudovibrissae but with 3–4 short ventro-reclinate setae on ventral side of vibrissal angle and anterior part of gena; a row of 4–5 pairs of inclinate setae on lateroventral margin of face; gena posteriorly to vibrissal part with a series of 5–6 thicker and longer ventro-clinate peristomal setae, becoming shorter posteriorly; expanded part of postgena and occiput behind eye with numerous short setae being stronger near posteroventral eye margin.

Thorax: dull, brown with a grey microtomentose pattern; mesoscutum grey with brown acrostichal and dorsocentral brown stripes little contrasting compared to the background colouring; pleural part of thorax brown, with an apical paler stripe on the anepisternum; scutellum distinctly (basally) wider than long, rounded trapezoidal.

Thoracic chaetotaxy: all setae and setulae blackish brown; ac setulae numerous and in 8 irregular rows, more numerous in the anterior half of scutum, 2 postsutural strong dc setae, the posterior one longer; 8–10 setulae in front of dc but no setulae between dc setae; 1 prescutellar ac; 1 strong hu (= postpronotal) seta plus 2 small setulae on humeral callus; 2 strong npl setae; 1 sa and 1 pa; 2 sc setae, the apical one very long; 2 stpl (= katepisternal) setae, the anterior one shorter, and numerous short setulae on sternopleuron (katepisternum).

Wing (Fig. 8) closely resembling that of *P. annulata*, pale brownish, cross-vein r-m and section between r-m and dm-cu cross-veins on M somewhat brown darkened; cells c, r_1, r_{2+3} light brown shadowed. Haltere light brown.

Legs yellow and brown variegated. Base of fore coxa brown, ventrally apically yellow, coxae 2 and 3 brown. Fore femur dark brown with base yellow. Femora 2 and 3 yellow with two not well bounded brown rings; tibiae with two dark brown rings, the distal one longer than the proximal; tarsi yellow with two last segments brown. Femur 1 with a series of 7–8 long and thicker distal posteroventral setae and other finer upright posterodorsal setae; femur 2 posteroventrally with a row of short and thicker setae; tibia 2 with 1 distinct and thicker ventroapical seta.

Abdomen brown, sternites lighter; tergites 3–6 with a pair of anterolateral small silvery spots. Postabdomen: pregenital sternite (sternite 6) simply transversely subobblong but posteromedially with small and shallow emargination (Fig. 23), generally pale brown but medially narrowly lighter, with setae restricted to posterior half of sclerite. Sternite 6 most resembling that of *P. annulata* except for all setae generally shorter, including longest lateral setae.

Male genitalia (Figs 11–16) most resembling those of *P* (*M.*) *annulata*. Epandrium (Figs 11, 14, 16) relatively small, formed as a short arch-shaped sclerite, thus distinctly higher than long (Fig. 11) and about as high as broad (cf. Fig. 14), with large anal opening (fissure). Setosity of epandrium relatively uniform, restricted to its posterior marginal area but (in contrast to that of *P. annulata*) with some setae also posteroventrolaterally. Anteroventral projection of epandrium (= surstylus) long, proximally broad but distally gradually tapered (not angulate basally anteriorly)

and very slender, in distal half with fine setulae at anterior margin (Fig. 15), and with apex somewhat blunt. Cerci relatively free, situated below anal opening as in all other *Periscelis* species but slender and elongate (longer than in any other known species of the subgenus *Myodris*), longer than height of anal opening (see Fig. 14). Each cercus (Fig. 12) tapering towards apex, the latter armed by a pair of closely arising robust, short and anteriorly directed spines; posterior and (partly) lateral sides of cercus with long setae and some micropubescence; posterior apical and subapical setae hardly longer than those situated more proximally (see Fig. 12). True gonostylus (as defined by Roháček and Andrade 2017) entirely absent (as in all *Myodris* species) and medandrium very reduced, forming a poorly visible strip-like sclerite situated posterior to hind part of hypandrium. Hypandrium (Fig. 11) frame-shaped but in contrast to that of *Periscelis* s. str. species more distinctly separated from phallapodeme (both sclerites only partly fused anteriorly and laterally). No appendages (= pregonites) of hypandrium. Aedeagal complex very large (compared to epandrium) and symmetrical, formed by voluminous phallapodeme, very long aedeagus and paired postgonites. Phallapodeme (Fig. 11) very similar to that of *P.* (*M.*) *annulata*, large, forming a single pocket-shaped (hood-like) capsule, thus with short and forked basal part completely fused to distal capsuliform part (in contrast to construction in *Periscelis* s. str. species, where these parts are separate, cf. Roháček and Andrade 2017, fig. 6). Aedeagus (Fig. 11) simple (without separate basal part = phallophore, thus formed only by distiphallus), weakly sclerotized to submembranous, forming slender and very long arched ribbon, partly hidden in capsule of phallapodeme; apex of distiphallus slightly widened, terminally blunt, unarmed, membranous. Postgonite (Fig. 13, pg) long and slender, about as long as surstylus (cf. Fig. 11), with short broad basal part and long, slender, slightly bent (often subterminally very slightly sinuate) distal part having subacute apex and series of setulae laterally and at posterior margin. Ejacapodeme (Figs 11, 13, ea) large and robust, relatively simple, basally somewhat wider than distally, longer and more elongate (about 5.5 times as long as its maximum width) than that of *P.* (*M.*) *annulata*.

Taxonomic remarks and relationships. Based on structures of male genitalia, *Periscelis* (*M.*) *haennii* sp. nov. is clearly different from all known Palaearctic relatives of the subgenus *Myodris* (cf. diagnosis above and Papp and Withers 2011). Although externally very similar to *P.* (*M.*) *annulata* (and most resembling the latter species also in genital characters) it proved to be distinctly different from both other European (and syntopically occurring) *Myodris* species in the DNA sequences of the barcoding gene COI (genetic distances are 7.58% from *P.* (*M.*) *annulata* and 9.12% from *P.* (*M.*) *piricercus*, respectively), see Table 1. Thus, not only the morphological characters of the male genitalia but also molecular features demonstrate the validity of this formerly cryptic species; as only one specimen has been barcoded for each species, in this context it is not possible to detect intraspecific variation.

The study of long series of all three European *Periscelis* (*Myodris*) species obtained from the same area and habitat revealed the formerly unknown external variability both in thoracic micropubescence and colour pattern, and, particularly, in clouding of wing membrane and veins. The latter was particularly variable in *P.* (*M.*) *annulata*. Based on these findings we found that these three species cannot be safely recognized from only external features and their identification should always be verified by study of male genitalia. Consequently, females of these species cannot be unambiguously recognized at present from morphology. However, they can now be identified by means of the molecular barcoding.

The new species seems to be the closest relative of *P.* (*M.*) *annulata*. The most obvious putative synapomorphy of these two species is the markedly elongated and slender male cercus (being distinctly shorter and basally more dilated in all other species of *Myodris*, including *P.* (*M.*) *piricercus* and *P.* (*M.*) *kabuli* L. Papp, 1988, see Papp and Withers 2011). However, it is to remark that *P.* (*M.*) *haennii* shares with *P.* (*M.*) *piricercus* similarly closely positioned anteroapical spines on male cercus (cf. Fig. 24 and Fig. 32) but this "feature" also occurs in more distant relatives, viz. in *P.* (*M.*) *kabuli* and even in the Nearctic *P.* (*M.*) *flinti* (Malloch, 1915), cf. Papp and Withers (2011, figs 27, 35). The close relationship of *P.* (*M.*) *haennii* and *P.* (*M.*) *annulata* is also indicated by the elongate (with long slender distal part) postgonite which can be another putative synapomorphy of this species-pair.

Biology. Unknown but probably similar to that of *P.* (*M.*) *annulata* which is associated with sap runs on wounded trees, particularly oaks and elms (most often in their crowns) having larvae developing in fermenting tree sap (cf. Papp 1998). The 305 specimens of *P.* (*M.*) *haennii* sp. nov. were collected by means of attractant traps (wine and beer, see Figs 1, 2) in a lowland forest of oaks and chestnuts (Fig. 3). Actually, in these traps also both other *Periscelis* (*Myodris*) and two *Periscelis* (s. str.) species were captured (Pollini Paltrinieri et al., unpublished data).

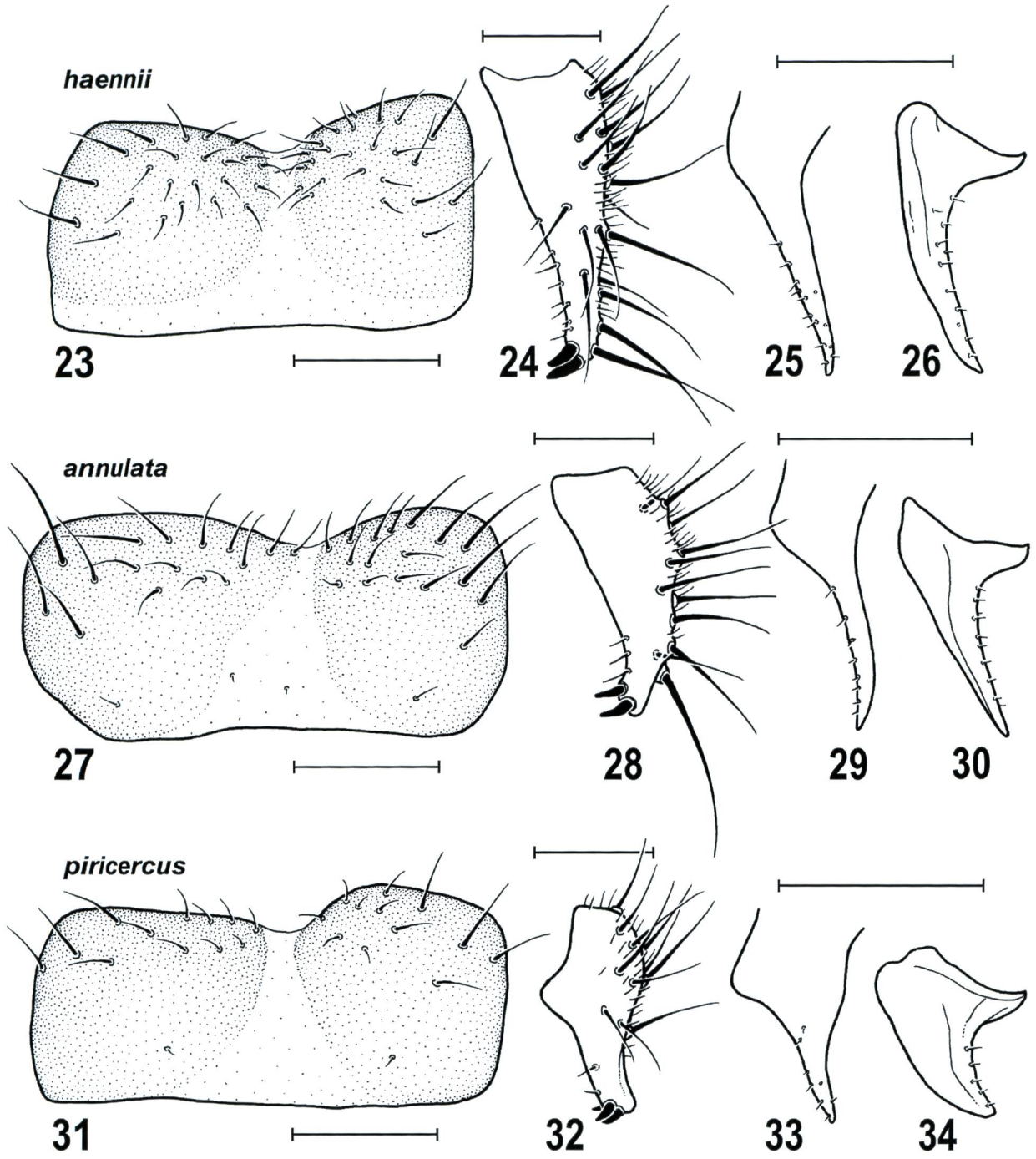
Distribution. Hitherto only known from southern Switzerland. However, it can be presupposed that *P.* (*M.*) *haennii* will also be found elsewhere in Europe, particularly in more southern areas simply because it has not been formerly distinguished from *P.* (*M.*) *annulata*.

Etymology. The specific name is dedicated to the eminent Swiss dipterist and our friend Jean-Paul Haenni.

Periscelis (*Myodris*) *annulata* (Fallén, 1813)

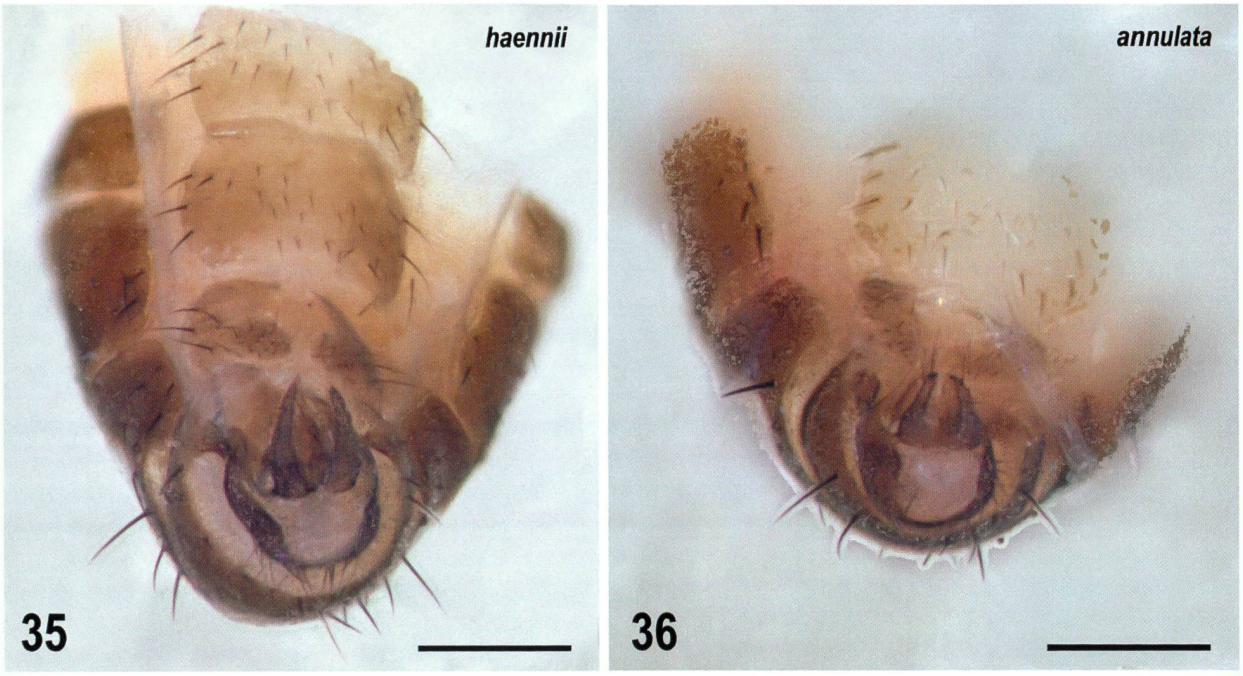
Figs 5, 9, 17–22, 27–30, 36

Redescription of male genitalia. Epandrium (Figs 17, 20, 22) small, shortly arch-shaped, distinctly higher than long (Fig. 17) but almost as broad as high (Fig. 22), with large (although slightly narrower than that of *P.* (*M.*) *haennii*) anal opening. Setae on epandrium relatively long but subequal in length and distributed only in posterior marginal area surrounding anal opening. Surstylus (Fig. 21) long, proximally



Figures 23–34. Male S6 and structures of genitalia of European *Periscelis* (*Myodris*) species. **23–26.** *P.* (*M.*) *haennii* sp. nov., paratype: **23.** S6; **24.** Cercus laterally; **25.** Surstylus laterally; **26.** Postgonite laterally; **27–30.** *P.* (*M.*) *annulata* (Fallén), Slovakia: **27.** S6; **28.** Cercus laterally; **29.** Surstylus laterally; **30.** Postgonite laterally; **31–34.** *P.* (*M.*) *piricercus* Carles-Tolrá & Verdugo Páez, Switzerland: **31.** S6; **32.** Cercus laterally; **33.** Surstylus laterally; **34.** Postgonite laterally. Scales: 0.05 mm (**24, 28, 32**); 0.1 mm (**23, 25–27, 29–31, 33, 34**).

broad but relatively suddenly (see somewhat angular anterobasal part) distally tapered. This slender distal part of surstylus slightly bent, provided with a row of fine setulae at anterior margin (Fig. 21) and with relatively acute apex. Cerci free and inserted below anal opening as in relatives. Each cercus slender and elongate but shorter than height of anal opening (see Figs 20, 22), tapered distally, with apex slightly bent anteriorly (Fig. 18) and provided with a pair of distinctly separate short anteroapical spines; posterior and posterolateral sides of cercus with some micropubescence and a row of long setae, the apical and (often) also subapical which are longer than others (see Fig. 18). True gonostylus lost; medandrium (see Fig. 20, ma) extremely reduced, forming a small transverse sclerite attached to posterior part of hypandrium. Hypandrium (Fig. 17) frame-shaped and relatively well separated from (dorsally attached) phal-



Figures 35–36. Distal part of male abdomen of two *Periscelis* (*Myodris*) species (photographed in situ in ethanol). **35.** *P.* (*M.*) *haennii* sp. nov., paratype; **36.** *P.* (*M.*) *annulata* (Fallén), Switzerland. Scales: 0.1 mm. Photos by L. Pollini Patrinieri.

lapodeme as characteristic for all *Myodris* species, without any trace of pregonites. Aedeagal complex very large, composed of large pocket-shaped phallapodeme, very long and slender submembranous aedeagus and distinctly sclerotized paired postgonites. Phallapodeme (Fig. 17) formed as in *P.* (*M.*) *haennii*, thus pocket-shaped and compact (= without separate basal part). Aedeagus (Fig. 17) also very similar (both in form and length, and formed only by distiphallus) to that of the latter species but its membranous apex rather spindle-shaped. Postgonite (Fig. 19) relatively large and distally slender, slightly longer than surstylus (cf. Fig. 17), with basal part short and broad, with distal slender part gradually tapered, straight and somewhat shorter than that of *P.* (*M.*) *haennii* having acute apex and a row of setulae at posterior margin. Ejacapodeme (Fig. 17) robust but relatively simple, basally hardly wider than distally, shorter and less elongate (about 4.5 times as long as its maximum width) than that of *P.* (*M.*) *haennii*.

Key to males of European *Periscelis* (*Myodris*) species

1 Pregenital sternum sparsely setose (Fig. 31). Cercus short, pyriform due to dilated proximal half (Fig. 32). Surstylus short, basally broad, distally shortly projecting (Fig. 33). Postgonite short and broad, with robust apex (Fig. 34)..... ..... *P.* (*M.*) *piricercus* Carles-Tolrá & Verdugo Páez, 2009

– Pregenital sternum more densely setose (Figs 23, 27). Cercus slender and elongate, never pyriform (Figs 24, 28). Surstylus long, basally narrower, distally very slender and long projecting (Figs 25, 29). Postgonite long and distally slender (Figs 26, 30) 2

2 Cercus longer (longer than anal opening of epandrium, cf. Figs 14, 35), with 2 short robust anteroapical spines closely attached and subapical posterior setae hardly longer than other posterior setae (Fig. 24). Surstylus more gradually tapering and rather straight distally (Fig. 25). Postgonite more elongate, with slender distal part longer and slightly bent (Fig. 26)..... *P.* (*M.*) *haennii* sp. nov.

– Cercus shorter (shorter than anal opening of epandrium, cf. Figs 22, 36), with 2 short robust anteroapical spines distinctly separated and 1 or (more often) 2 subapical posterior setae distinctly longer than other posterior setae (Fig. 28). Surstylus more abruptly tapered and slightly bent distally (Fig. 29). Postgonite more robust, with slender distal part shorter and straight (Fig. 30) ..... *P.* (*M.*) *annulata* (Fallén, 1813)

Discussion and conclusions

Periscelis (*Myodris*) *haennii* sp. nov. is a further cryptic species of Periscelididae in Europe. Similarly as *Periscelis* (*M.*) *piricercus* (cf. Carles-Tolrá & Verdugo Páez, 2009) and *P.* (*P.*) *fugax* (cf. Roháček and Andrade 2017), also this species has been unknown up to the present because it was hidden among externally very similar

relatives, differing only by detail in structures of the male terminalia. Considering these findings the Periscelididae can be more diverse in Europe; further unnamed species can particularly be expected in little explored eastern and southeastern parts of the continent.

The discovery of this new species highlights how natural environments in Switzerland can offer new discoveries and how important it is that basic biodiversity studies are funded. Other dipteran species, belonging to small families of Acalyptratae or to nematoceran families, probably remain to be discovered, but at present the main limiting factors are the lack of expert taxonomists and the material possibility of carrying out field studies involving different methodologies over relatively long periods of time.

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References

Bächli G (1997) Die Arten der Tanypezidae, Dryomyzidae, Periscelididae, Acarthophthalmidae, Aulacigastridae und Stenomicridae in der Schweiz (Diptera). Mitteilungen der Entomologischen Gesellschaft Basel 47: 29–34.

Carles-Tolrá M, Verdugo Páez A (2009) *Periscelis piricercus* sp. nov.: a new periscelid species from Spain (Diptera: Periscelididae). Heteropterus Revista de Entomología 9(2): 101–104.

Folmer O, Black M, Hoeh W, Lutz R, Vrijenhoek R (1994) DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. Molecular Marine Biology and Biotechnology 3: 294–297.

Papp L (1998) Life-habits of the Central European species of Periscelididae (Diptera). Folia entomologica hungarica 59: 115–119.

Mathis WN, Rung A (2011) World catalog and conspectus on the family Periscelididae (Diptera: Schizophora), 341–377. [In: Brake I, Thompson FC]

Myia 12 (1979) North American Dipterists Society & Pensoft Publishers, Washington – Sofia – Moscow, 564 pp.

Papp L (1988) *Periscelis kabuli* sp. nov. and *P. kaszabi* sp. nov. with notes on larvae and pupae of the families Aulacigastridae and Periscelididae (Diptera). Acta Zoologica Academiae Scientiarum Hungaricae 34(2–3): 273–284.

Papp L, Withers P (2011) A revision of the Palaearctic Periscelidinae with notes on some New World species (Diptera: Periscelididae). Annales historico-naturales Musei Nationalis Hungarici 103: 345–373.

Roháček J, Andrade R (2017) *Periscelis fugax* sp. nov., an overlooked European species of Periscelididae (Diptera), with notes on the morphology and terminology of terminalia. Acta Entomologica Musei Nationalis Pragae 57(1): 229–251. https://doi.org/10.1515/aemnp-2017-0071

Stucky B J (2012) SeqTrace: A graphical tool for rapidly processing DNA sequencing chromatograms. Journal of Biomolecular Techniques 23: 90–93. https://doi.org/10.7171/jbt.12-2303-004

Tamura K, Stecher G, Kumar S (2021) MEGA11: Molecular Evolutionary Genetics analysis version 11. Molecular Biology and Evolution 38: 3022–3027. https://doi.org/10.1093/molbev/msab120