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THREE NEW SPECIES OF THE GENUS *HILARA* (DIPTERA, EMPIDIDAE) FROM THE NORTHWEST CAUCASUS

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ABSTRACT

Three new species of the genus *Hilara* are described from the Northwest Caucasus: *H. arkhyziensis* sp. nov., *H. caucasica* sp. nov., *H. pseguashae* sp. nov. COI barcodes are provided for the latter two species.

Key words: Diptera, Empididae, *Hilara*, new species, Palaearctic, Caucasus, Russia

ТРИ НОВЫХ ВИДА РОДА *HILARA* (DIPTERA, EMPIDIDAE) С СЕВЕРО-ЗАПАДНОГО КАВКАЗА

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РЕЗЮМЕ

В статье приводится описание трёх новых видов из рода *Hilara* с Северо-западного Кавказа: *H. arkhyziensis* sp. nov., *H. caucasica* sp. nov., *H. pseguashae* sp. nov. Даны результаты секвенирования (COI) для последних двух видов.

Ключевые слова: Diptera, Empididae, *Hilara*, новые виды, Палеарктика, Кавказ, Россия

INTRODUCTION

Species of *Hilara* Meigen, 1822 are well known flies usually associated with different sources of water where they hover over the surface picking up dead insects and often form large swarms. The group has

a worldwide distribution and is very speciose. Currently, about 250 species of *Hilara* are known from the Palaearctic Region, but the majority of them belong to the European fauna that has been intensively studied during the last years (Chvála 2005, 2008; Chvála and Merz 2009). Nevertheless, there are some large areas even in Europe where practically nothing is known about *Hilara*. This may be especially true for

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the Caucasus where only 22 species have so far been documented (Shamshev and Kustov 2006; Gladun and Kustov 2010). In contrast, *Hilara* is very diverse in the Alps and other central European mountains totalling 118 species (Chvála and Merz 2009). In this paper we describe three new species of *Hilara* collected from the Northwest Caucasus.

MATERIAL AND METHODS

This study is based on material deposited in Kuban State University, Krasnodar, Russia (KSU), Royal Belgian Institute of Natural Sciences (RBINS), and the Zoological Institute of Russian Academy of Sciences, St. Petersburg, Russia (ZIN). Terms used for adult structures primarily follow those of Cumming and Wood (2009), except for the antenna where the terms of Stuckenberg (1999) is used. In description of the male terminalia “dorsal” and “ventral” views refer to morphological positions. Scale bars equals to 0.1 mm. Label data for primary types are cited from the top downward, with the data from each label in quotation marks. Labels are cited in full, with original spelling, punctuation, and date, and label lines are delimited by a slash (/). Additional information is included in square [] brackets. The repository of each type is given in parentheses. Secondary type data are abridged and listed alphabetically. Pinned specimens were used for descriptions. To facilitate observations, the terminalia were macerated in 10% KOH and immersed in glycerine. Drawings of morphological features were made with a camera lucida attached to a compound microscope. The extracted specimens of the sequenced material are conserved in the tissue collection of Royal Belgian Institute of Natural Sciences at -18°C in a box (named e.g. Krasnodar 1) in a tube with a position number in the box; e.g. D3. Each tube bears a barcode that corresponds to the unique identifier for the voucher specimen as well as the COI sequence; e.g. AB31516426. The COI sequences have been submitted to GenBank.

SYSTEMATICS

Hilara arkhysiensis sp. nov.
(Figs. 1–5)

Etymology. The name of the new species refers to its type locality, Arkhyz.

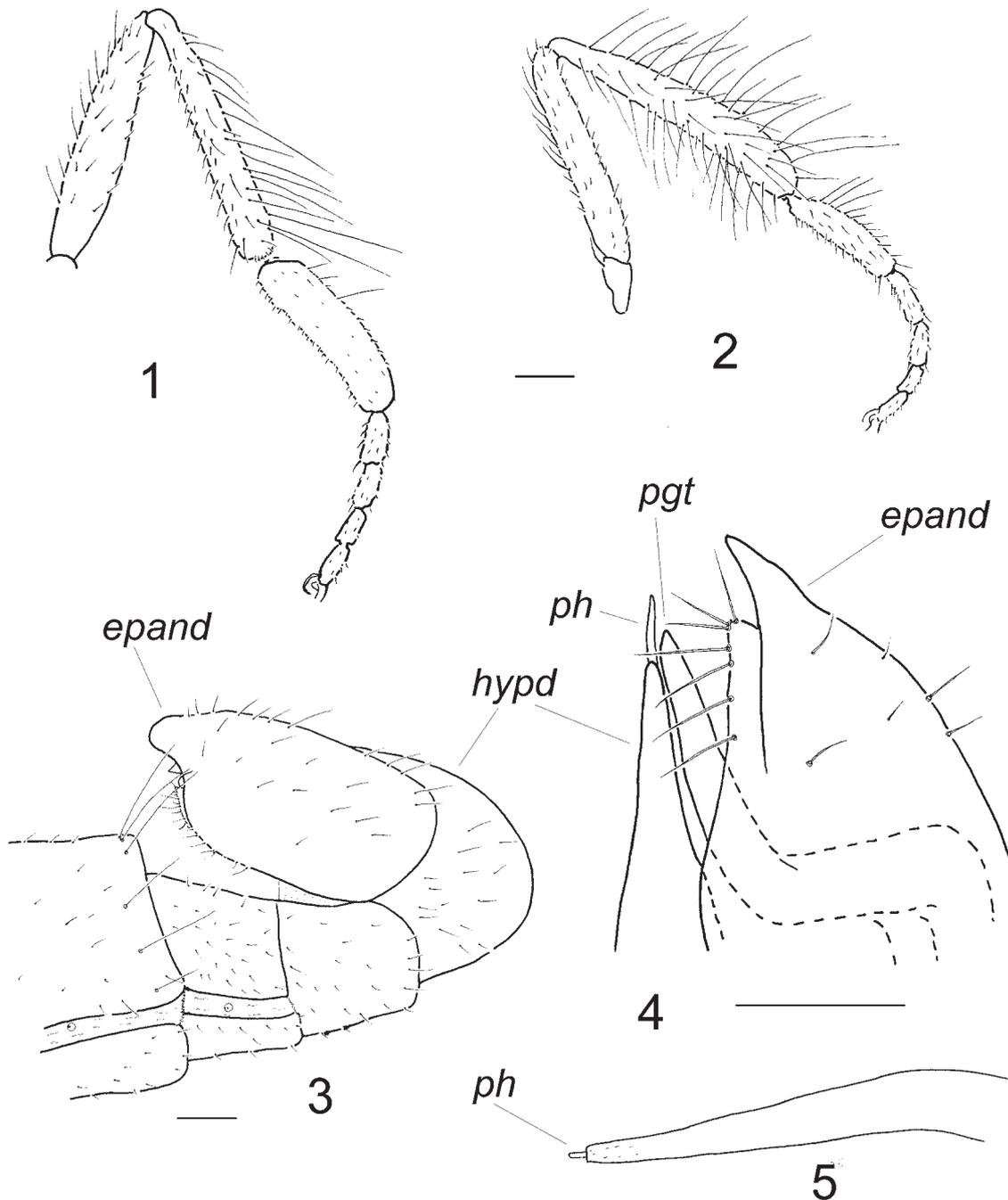
Type material. Holotype – male, Russia: [printed in Cyrillic], “Karachay-Cherkessia/ Republic, okr. pos. [environs of village] Arkhyz / Sofiyskie Waterfalls, 2400 m/ $43^{\circ}26'09''\text{N}$ $41^{\circ}16'43''\text{E}$ / 03.viii.2012, Kustov S.Yu.” (ZIN).

Paratypes: 7 males, same data as holotype (KSU, ZIN, RBINS). 1 male, Krasnodarskiy Territory, Sochi District, Caucasus State Nature Biosphere Reserve, env. of Kardyvach Lake, 1800 m, 2 August 2010, Gladun V.V. (KSU). 2 males, Sochi District, Caucasus State Nature Biosphere Reserve, env. of Verkhniy Kardyvach Lake, 2420–2470 m, 2 August 2010, Gladun V.V. (KSU).

Diagnosis. A species of *H. quadrivittata* group; recognised by the velvety black occiput; short stylus about half as long as postpedicel; short proboscis; scutum in dorsal view almost uniformly velvety black; legs entirely black, fore and mid tibiae with numerous very long setae; wing hyaline, halter brownish; abdomen densely bluish grey pollinose.

Description. *Male.* Head black in ground-colour. Frons broad, entirely velvety black (anterior view). Face brownish-grey. Occiput, vertex and ocellar triangle velvety black viewed dorsally, in posterior view occiput brownish. Ocellar and frontal bristles strong, subequally very long. Occiput with numerous black setae of different lengths, postoculars long, some pale to yellow hairs present behind mouth-opening. Antenna black; postpedicel nearly twice as long as wide; stylus about half as long as postpedicel. Proboscis with labrum black, about two-third as long as head height; palpus black, greyish tomentose ventrally, with 2 very long black bristles and numerous short hair-like setae.

Thorax black in ground-colour; mesonotum in anterodorsal view with four black stripes; in dorsal view almost uniformly velvety black leaving postalar ridge and scutellum brownish grey, with somewhat paler narrow stripes between acrostichals and dorsocentral bristles; in anterior view brown with distinct subshining blackish brown stripes between acrostichals and dorsocentral bristles; in posterior view with narrow velvety black stripe along rows of acrostichals and broader stripes down dorsocentrals; pleuron densely brownish grey pollinose. Antepronotum with 2 long brownish bristles and several minute hair-like setae. Postpronotal lobe with 1 moderately long, black bristle and numerous, short, hair-like intermixed pale and black setae. Prosternum bare. Proepisternum with several pale hair-like setae. All long bristles



Figs 1–5. *Hilara arkhyziensis* sp. nov., male. 1 – fore leg, posterior view; 2 – mid leg, anterior view; 3 – postabdomen, lateral view; 4 – apical part of hypopygium, ventral view; 5 – apical part of hypandrium, lateral view. Abbreviations: epand – epandrium, hypd – hypandrium, ph – phallus, pgt – postgonite.

black. Mesonotum with 1 moderately long presutural intra-alar, 1 long presutural supra-alar, 1 moderately long thin postsutural supra-alar, 3 notopleurals (two posterior bristles very long), 1 long postalar and 4 scutellars of subequal length; additionally, notopleuron with several short black setae anteriorly, some short setulae present on supra-alar face; acrostichals arranged in 2 very close irregular rows, rather long (nearly as long as antennal stylus), thin; dorsocentrals uniserial, slightly longer than acrostichals, 2–3 pairs of long prescutellars. Fore spiracle black.

Legs entirely black including “knees”, densely dark grey pollinose. Coxae covered with pale to yellow setae. Fore femur with short, thin, black anteroventral and posteroventral setae, bearing long setae dorsally and posteriorly. Fore tibia (Fig. 1) slightly thickened towards apex; with numerous very long black setae dorsally and posteriorly (closer to apex of tibia). Fore basitarsus thickened but only slightly wider than fore tibia at apex, nearly 3 times as long as wide, mostly covered with short ordinary setulae, with 3 dorsal setae of different lengths on basal part (foremost seta longest, slightly longer than depth of basitarsus); tarsomeres 2–5 slender, longer than wide, with short setulae. Mid femur slender; numerous very long black setae anteriorly and short pale hair-like setae closer to base. Mid tibia (Fig. 2) thickened, clavate, entirely covered with very long, dense bristly hairs. Mid basitarsus slightly thickened, with rather long anterodorsal hair-like setae; remaining tarsomeres slender, clothed in short setae. Hind femur slender; with 5–6 short (at most as long as depth of femur), thin anteroventral subapical setae. Hind tibia slender; with several hardly prominent dorsal and anteroventral setae. Hind tarsomeres slender, covered with short setae.

Wing hyaline, all veins distinct; stigma indistinct, pale brownish; 1 short thin costal seta; vein R_1 thickened on apical section; radial fork long; anal vein mostly evanescent, reaching wing margin as fold; anal lobe right-angled. Calypter pale with brownish margins, bearing pale hairs. Halter brownish, knob somewhat paler on apex.

Abdomen black in ground-colour, entirely, almost uniformly, densely bluish grey pollinose (viewed dorsally with some brownish tinge), lighter than thoracic pleuron; almost entirely covered with pale to yellow setae, only some dorsal posteromarginal setae brownish to black; posteromarginal setae long. Hypopygium (Figs. 3–5) moderately large, mostly grey-

ish pollinose, epandrial lamella and hypandrium shining apically, with short black setae; epandrial lamella cleft apically, with dorsal lobe short, broadly rounded (lateral view), ventral lobe obscured in lateral view, viewed ventrally short, pointed, with short marginal setae; hypandrium viewed laterally not expanded posteriorly, evenly rounded, viewed ventrally conical on apical part, with smooth, straight margins, subapical part unmodified tubiform; postgonite digitiform, strongly sinuate.

Female. Unknown.

Length (mm). Body 3.7–3.9 (holotype 3.8), wing 3.8–4.0 (holotype 3.8).

Comparison. Among species of the *H. quadrivittata* group *sensu* Chvála, the new species is closely related to *H. hystricoides* Straka, 1979 described from Karachay River of Azerbaijan (Straka 1979; Chvála 2002). *Hilara arkhysiensis* sp. nov. differs from *H. hystricoides* by 4 scutellar setae (vs. 8), brownish halter (vs. yellow) and dense bluish grey pollinosity of the abdomen (vs. dark brown to velvety black).

Bionomics. High mountain species collected at 1800–2470 m at the beginning of August.

Distribution. Russia (Adygea, Krasnodar Territory).

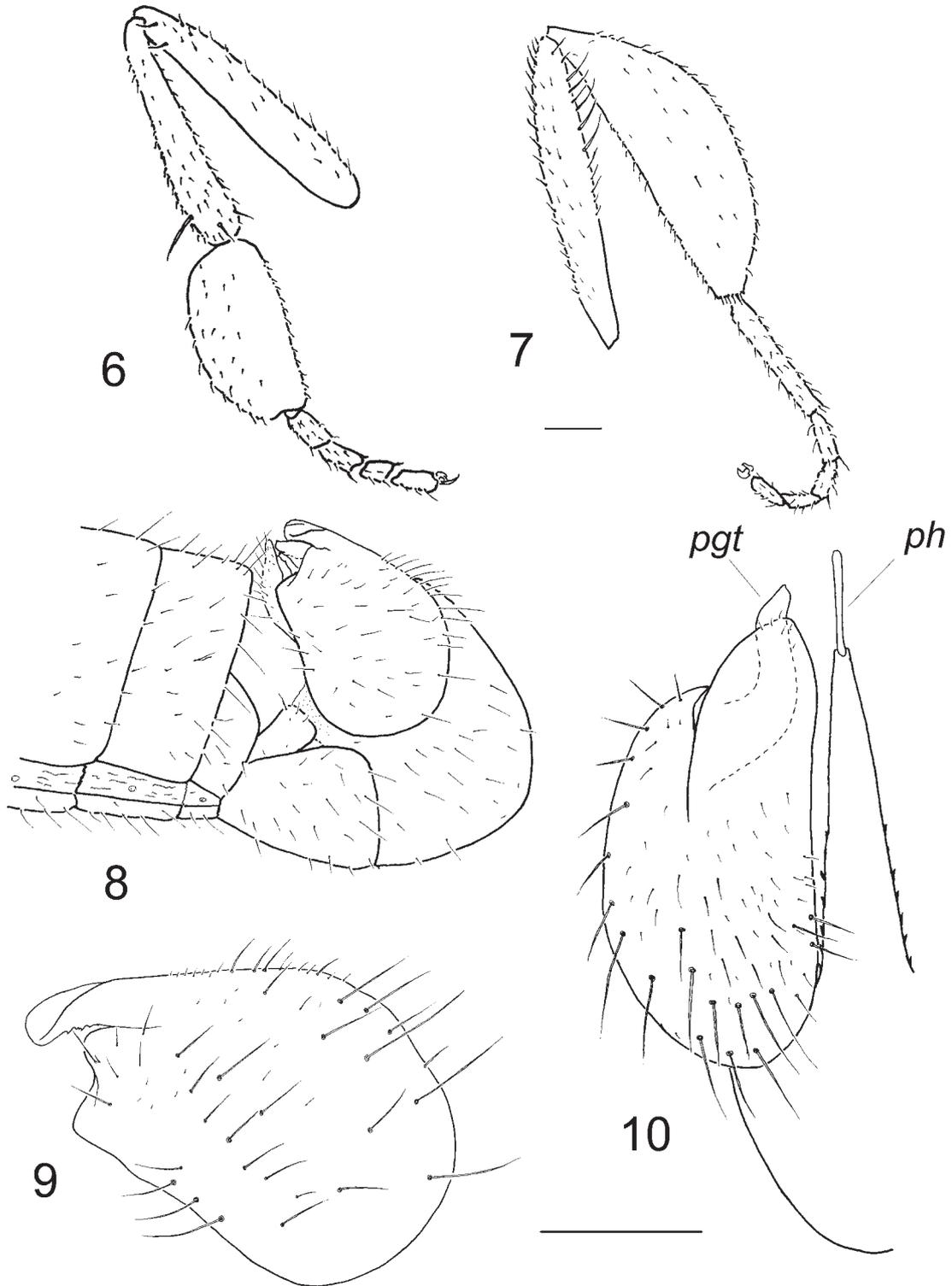
Hilara caucasica sp. nov.

(Figs. 6–10)

Etymology. The epithet refers to the whole region where the species was collected.

Type material. Holotype – male, RUSSIA: [printed in Cyrillic], “N Caucasus/ Krasnodarskiy Kray/ Kamyschanova Polyana /44°10′7″N, 40°2′43″E/ 18.vi.2010, Shamshev” (ZIN).

Paratypes: 5 males, 3 females, same data as holotype (ZIN). Same locality as holotype: 2 males, 2 females, 12–14 June 2004, Kustov S.Yu. (KSU); 2 males, 1 female, 13–19 June 2011, Gladun V.V.; 1 male, 2 June 2011, Kustov S.Yu. (KSU); 1 male, 2 females, 4 June 2011, Kustov S.Yu. (RBINS); 2 males, 3 females, 9 June 2011, Kustov S.Yu. (KSU); 1 female, 9 June 2011, Gladun V.V. (KSU); 1 male, 1 female, 6 July 2007, Gladun V.V. (KSU); 1 male, 1 July 2011, Babichev M.M. (KSU); 7 males, 1 female, 9 July 2011, Babichev M.M. (KSU); 4 males, 6 females, 12 July 2011 Babichev M.M. (KSU); 1 male, Adygea Republic, Lago-Naki, Kamennoe more, 15 May 2005, Kustov S.Yu. (KSU); 1 male, Sochi District, Achishkho Mt., 2–10 June 2005, Kustov S.Yu. (KSU); 5 males,



Figs 6–10. *Hilara caucasica* sp. nov. 6 – male fore leg, anterior view; 7 – female hind leg, anterior view; 8 – male postabdomen, lateral view; 9 – epandrial lamella, lateral view; 10 – hypopygium, ventral view. Abbreviations: ph – phallus, pgt – postgonite.

Sochi District, Caucasus State Nature Biosphere Reserve, env. of Kardyvach Lake, 1800 m, 3 August 2008, Kustov S.Yu. (KSU); 1 female, Adygea Republic, Maykop District, Caucasus State Nature Biosphere Reserve, Abago ridge, 1775 m, 3 Aug. 2008, Kustov S.Yu. (KSU).

COI barcodes have been submitted to GenBank for the following voucher specimens: male, Kamyshanova Polyana, 2 July 2010, leg. P. Grootaert (swarm above riverbank in forest, RBINS), Box Krasnodar 1, C8: AB3151642 (GenBank accession number: BankIt1604136 AB31516426 KC589430); male, Kamyshanova Polyana, 4 June 2011, leg. P. Grootaert (above stream in forest, RBINS), Box Krasnodar 3, D8: AB32719803 (GenBank accession number: BankIt1604136 AB32719803 KC589431); male, Kamyshanova Polyana, 5 July, leg. P. Grootaert (swarm above pools on dirt road in forest, RBINS). Box Krasnodar 1, E4: AB31523073 (GenBank accession number: BankIt1604136 AB31523073 KC589432); male, Kamyshanova Polyana, 4 June 2011, leg. P. Grootaert (above stream in forest, RBINS), Box Krasnodar 3 D7: AB32719581 (GenBank accession number: BankIt1604136 AB32719581 KC589433).

Diagnosis. A small species of the *H. maura* group; recognised by short proboscis; subshining, faintly brownish pollinose scutum, very short, 4-serial acrostichals; entirely black legs with slender hind femur; male fore basitarsus strongly thickened; female hind tibia flattened and greatly expanded dorsally

Description. *Male.* Head black in ground-colour. Frons broad, mainly brownish grey (anterior view), only margins and narrow median strip on upper part velvety black. Face silvery grey, slightly darker on lower part and along middle. Occiput, vertex and ocellar triangle velvety black (dorsal view). Ocellar bristles long, frontal bristles slightly shorter. Occiput with rather long black postocular bristles, with some brownish yellow hair-like setae on lower part. Antenna entirely black; postpedicel 2–2.5 times as long as wide and about 2 times (2.3 times in holotype) longer than stylus. Proboscis with labrum short, markedly shorter than head height; palpus black, whitish pubescent ventrally, with black setae.

Thorax black in ground-colour; scutum viewed dorsally subshining, faintly brownish pollinose, viewed anteriorly brownish grey pollinose, viewed posteriorly with wide black median stripe and greyish brown pollinose laterally. Antepronotum with several short, brownish hair-like setae. Postprono-

tal lobe without strong bristles. Prosternum and proepisternum with short, hair-like, pale setulae. Mesonotum with 2 black moderately long notopleurals, 1 short postsutural supra-alar, 1 postalar and 2 scutellar bristles; acrostichals arranged in 4 irregular rows, very short; dorsocentrals uniserial, very short. Spiracles dark brown to black. Sensory pit before fore spiracle without hairs.

Legs almost wholly brown, only “knees” of fore and mid legs yellowish brown; faintly greyish pollinose. Fore coxa covered with pale setae of different lengths (some stronger subapical setae darker, brownish yellow). Fore femur slender, covered with short setae. Fore tibia (Fig. 6) evenly thickened toward apex; mostly covered with ordinary, short, thin setae, subapical cirlet including 1 thin anterodorsal and 1 similar posterodorsal setae. Fore basitarsus strongly thickened, nearly twice as broad as fore tibia at apex, elongate oval, covered with short ordinary setae; tarsomeres 2–5 slender, short, nearly of equal lengths. Mid femur with long thin ventral seta nearer to base, bearing row of 4–5 thin setae anteriorly. Mid tibia and tarsus simple, covered with setae. Hind femur slender, with several moderately long anteroventral setae on apical half (at most as long as width of femur), bearing moderately long setae along entire dorsal face. Hind tibia and tarsus simple, covered with short setae.

Wing slightly darkened; stigma brownish; all veins distinct, R_1 thickened on apical section; 1 short costal bristle; radial fork long; anal vein complete; axillary lobe right-angled. Calypter dark brown, with brownish hairs. Halter entirely brown.

Abdomen black in ground-colour, viewed dorsally tergites shining, except segment 1, covered with short, hair-like black setae (tergite 1 with some paler lateral setae, brownish to yellowish brown), posteromarginal setae prominent only on tergites of pregenital segments; sternites greyish pollinose. Hypopygium (Figs. 8–10) moderately large, nearly as broad as pregenital segments, faintly brownish grey pollinose, covered with black setae; cercus short, narrow, with short setulae; epandrial lamella cleft apically, with dorsal lobe short, broad, truncate (lateral view), ventral lobe narrower and longer, viewed laterally rather digitiform, viewed ventrally broad, narrowed apically, with scattered minute setulae; hypandrium viewed laterally not expanded posteriorly, evenly rounded, with serrate margins on about middle, its subapical part evenly narrowed, unmodified; postgonite digitiform, sinuate.

Female. Resembling male but fore tibia and fore basitarsus slender; hind tibia flattened and greatly expanded dorsally, at middle about 2–2.5 times as broad as hind femur (Fig. 7); wing slightly darker. Abdominal segments 7–8 densely brownish grey pollinose; cercus long.

Length (mm). Body 2.7–2.9 (holotype 2.9), wing 3.3–3.4 (holotype 3.4).

Comparison. Within the key compiled by Chvála (1997a) for species of the *H. maura* group, the new species would run to *H. clypeata* Meigen, 1822. However, the latter has biserial acrostichal setae, short radial fork and slender hind tibiae in the female.

Bionomics. Summer species occurring from the beginning of June to the beginning of August at mid to quite high altitudes (up to 1800 m).

Distribution. Russia (Adygea Republic, Krasnodarskiy Territory).

***Hilara pseguashae* sp. nov.**

(Figs. 11–15)

Etymology. The epithet refers to “Pseguash” (virgin of rivers), a pagan goddess of the pantheon of ancient Adygeans.

Type material. Holotype – male, RUSSIA: [printed in Cyrillic] “N Caucasus/ Krasnodarskiy Kray/ Kamyshanova Polyana/ 44°10′7″N, 40°2′43″E/ 18.vi.2011, Shamshev” (ZIN).

Paratypes: same data as holotype, 6 males, 1 female (ZIN). Same locality as holotype: 1 male, 3 June 2011, Kustov S.Yu. (KSU); 1 male, 4 June 2011, Kustov S.Yu. (KSU).

COI barcodes have been submitted to GenBank for the following voucher specimens: male, Kamyshanova Polyana, 4 June 2011, leg. P. Grootaert (above stream in forest, RBINS); Box Krasnodar 3, D4: AB32719569 (GenBank accession number: BankIt1604136 AB32719569 KC589434); male, Kamyshanova Polyana, 4 June 2011, leg. P. Grootaert (above stream in forest, RBINS), Box Krasnodar 3, D3: AB32719588 (GenBank accession number: BankIt1604136 AB32719588 KC589435).

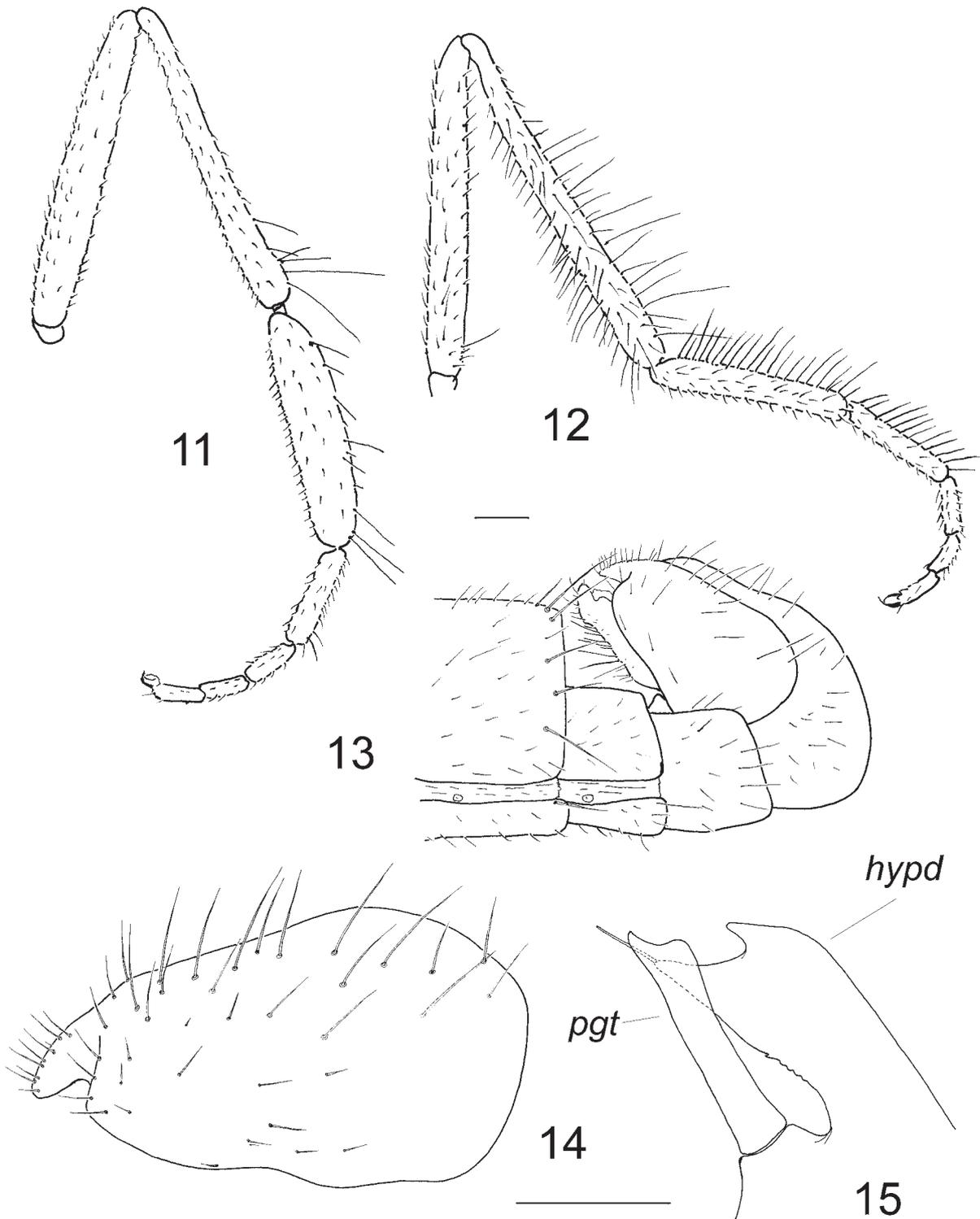
Diagnosis. A species of the *H. canescens* group; head and thorax greyish pollinose; palpus yellow; acrostichals biserial; legs almost entirely yellow, fore and mid tibiae somewhat thickened, clothed in long thin setae; wing very long, hyaline, halter yellow.

Description. *Male.* Head black in ground-colour. Frons, face, occiput, vertex and ocellar triangle

densely greyish pollinose. Frons broad. Ocellar and frontal bristles subequally very long. Occiput with rather sparse, thin, black setae of different lengths, bearing some scattered brownish yellow hairs behind mouth-opening; postocular setae moderately long. Antenna with scape and pedicel brown, postpedicel and stylus black; postpedicel nearly twice as long as wide, stylus about as long as postpedicel. Labrum black, short, at most half as long as head height. Palpus yellow, whitish tomentose ventrally, with short, scattered, black setae, bearing 1 very long, ventral subapical bristle.

Thorax black in ground-colour (postpronotal lobe and postalar callus translucent yellowish); scutum (dorsal view) densely dark grey pollinose, with darker, indistinct, narrow stripes between rows of acrostichals and dorsocentrals setae; viewed anteriorly or posteriorly almost uniformly densely dark grey pollinose; pleuron with some sutures translucent yellowish, densely greyish pollinose. Postpronotum with 1 long brownish seta and several minute hairs on each side. Postpronotal lobe with 1 thin, rather long black and 2–3 short setae. Prosternum bare. Proepisternum with several minute pale hairs. Mesonotum with 0–1 presutural intra-alar, 1 usually long presutural supra-alar (length varying), 1–2 moderately long postsutural supra-alars (with 1–2 short additional setae anteriorly), 3 notopleurals of different lengths (middle bristle long), 1 long postalar and 4 scutellars (apical pair slightly longer); acrostichals arranged in 2 almost regular rows, sparse, short (about half stylus length), thin, slightly latero-clinate; dorsocentrals uniserial, 10–11 per row, slightly longer than acrostichals, 2 pairs of long prescutellars; additionally notopleuron with several short black setulae anteriorly. Spiracles brown.

Legs almost wholly yellow, tibiae darkened on apical part, tarsi black; subshining, faintly greyish pollinose; femora not pubescent ventrally. Coxae with black setae of different lengths. Fore femur slender, covered with ordinary short setulae. Fore tibia (Fig. 11) slightly thickened toward apex, with several long thin subapical setae of different lengths dorsally and posteriorly (1 longest posterodorsal seta nearly 3 times as long as apical width of tibia). Fore basitarsus thickened but only slightly broader than fore tibia at apex, elongate oval, nearly 3/4 as long as fore tibia, with several long thin setae dorsally (including 2 very long subapicals); remaining tarsomeres slender, tarsomere 2 with longer setulae dorsally.



Figs 11–15. *Hilara pseguashae* sp. nov., male. 11 – fore leg, anterior view; 12 – mid leg, anterior view; 13 – postabdomen, lateral view; 14 – epandrial lamella, lateral view; 15 – hypandrium and postgonite, lateral view. Abbreviations: hypd – hypandrium, pgt – postgonite.

Mid femur slender, with 1 long thin ventral seta near base and 4–5 similar setae anteriorly. Mid tibia (Fig. 12) slightly thickened (except base), covered with numerous, very long, thin setae on about apical 3/4 dorsally, anteriorly and posteriorly, densely pubescent with moderately long setulae ventrally. Mid tarsomeres 1–2 slender, covered with dense, long, thin setae (except ventral face); tarsomeres 3–5 slender, with short setulae. Hind femur slender, covered with short setae. Hind tibia slender, with several short dorsal setae on apical part. Hind tarsus with slender tarsomeres covered with short setulae.

Wing unusually long, hyaline, veins distinct, brownish; stigma indistinct, light brownish; costal seta moderately long, black; vein R_1 thickened on apical section; radial fork long; discal cell long; anal vein incomplete; axillary angle obtuse. Calypter yellow with pale hairs. Halter yellow.

Abdomen with segments 1–3 rather yellowish brown to brown in ground-colour, remaining segments black; subshining, uniformly faintly greyish pollinose; covered with short black setae; tergites with moderately long, thin posteromarginal setae (longer on tergite 6). Hypopygium (Figs. 13–15) rather small, covered with black setae; hypandrium concolorous with sternites of pregenital segments on basal part, shining apically, epandrium subshining, faintly greyish pollinose; epandrial lamella cleft apically, with dorsal lobe short, broadly ovate (lateral view), ventral lobe narrower and longer, viewed laterally rather digitiform, somewhat narrowed apically, with scattered minute setulae; hypandrium with apical part of complicated structure, viewed ventrally broad, with slightly convex, serrate lateral margins and two short digitiform lateral apical projections; postgonite digitiform, viewed laterally pointed apically.

Length (mm). Body 3.4–3.5 (holotype 3.4), wing 5.3–5.5 (holotype 5.3).

Female. Similar to male but fore and mid legs slender, covered with ordinary setulae; hind tibia slender; abdominal segments 7–8 entirely densely pollinose; cercus black, long, slender.

Comparison. In having long setose male fore and mid tibiae, *H. pseguashae* sp. nov. could be compared with *H. nigratarsis* Zetterstedt, 1838, *H. setosa* Collin, 1927 and, especially with *H. cuneata* Loew, 1873. *Hilara nigratarsis* differs from the new species by the black palpus, stronger setae on the fore tibia and longer setae on the hind tibia. *Hilara setosa* has black

palpi and halteres (Chvála 2005). *Hilara cuneata* can be distinguished from the new species by very narrow frons and face and brownish palpi (Chvála 1997b, 2008).

Bionomics. Collected at the beginning of the summer, swept above water surface of a stream in broad-leaved forest (altitude about 1200 m).

Distribution. Russia (Krasnodarskiy Territory).

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