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The genus *Dasydorylas* Skevington in Iran, with the description of two new species (Diptera: Pipunculidae)

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Abstract. The genus *Dasydorylas* Skevington, 2001 is recorded from two provinces in Iran (Sistan-o Baluchestan and Kermanshah Provinces). *Dasydorylas derafshani* sp. nov. and *D. zardouei* sp. nov. are illustrated and characterized morphologically and by DNA barcoding of the mitochondrial COI gene. *Eudorylas antennalis* Kapoor, Grewal & Sharma, 1987 is transferred to *Dasydorlyas* (comb. nov.). An existing identification key to the males of the western Palaearctic species of *Dasydorylas* is complemented to include the newly described species.

Keywords. Taxonomy, big-headed flies, Middle East, DNA barcoding, identification key.

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Introduction

To date, more than 1400 species of Pipunculidae or big-headed flies are recognized, placed into four subfamilies and 20 genera (Rafael & Skevington 2010; Kehlmaier *et al.* 2014). However, the diversity is still considered to be poorly known and it is estimated that well over 2000 species exist on a world scale (Skevington & Yeates 2001). Similar to Syrphidae, adults are frequently seen hovering among vegetation. Male and female pipunculids primarily feed on honeydew, a sugar-rich secretion produced by many Hemiptera, but most of the energy necessary for reproduction is accumulated during the larval stage of the fly (Kehlmaier 2015). Pipunculid larvae develop as endoparasitoids in Tipulidae (*Nephrocerus* Zetterstedt, 1838) and in various families of Auchenorrhyncha (all other Pipunculidae), but information on host specificity is limited (Skevington & Marshall 1997; Koenig & Young 2007; Kehlmaier & Floren 2010). Females deposit a single egg into the host during flight (Williams 1918; Huq 1985; Rafael & Skevington 2010). Together with Dryinidae (Hymenoptera) and Strepsiptera, Pipunculidae are considered the most important parasites of Auchenorrhyncha (Freytag 1985). As many species of Auchenorrhyncha are known to transmit plant diseases, Pipunculidae may have the potential to become biological control agents of economically important pest species of leafhoppers.

The genus *Dasydoryas* Skevington, 2001 was first described in a comprehensive phylogenetic study of world Eudorylini by Skevington & Yeates (2001). Currently, the genus includes 30 species, occurring in the Afrotropical (nine species), Palaearctic (seven species), Australasian and/or Oriental (11 species) and in the Nearctic and/or Neotropic region (three species) (Skevington & Yeates 2001; Kehlmaier 2005a, 2005b; Földvári 2013). Being placed within the diverse Eudorylini, the genus can best be separated from other genera by a combination of characters such as the funnel-shaped ejaculatory apodeme, a rather strongly tapering flagellum and a well-developed apical hair fringe on the scutellum (Skevington & Yeates 2001). Kehlmaier (2005a, 2005b) revised part of the Palaearctic and Oriental faunas, whereas Földvári (2013) revised the Afrotropical members of the genus.

The Iranian fauna of pipunculid flies is poorly known. In previous studies, only 19 species were recorded. Becker (1913) described two new species from Sistan-o Baluchestan Province; Gharali *et al*. (2008) cited two species from Ilam Province; Kehlmaier & Majnon Jahromi (2015) listed 15 species from Alborz Province; Motamedinia *et al.* (2017) described two new species from Sistan-o Baluchestan and Southern Khorasan Provinces. Due to a wide range of habitat diversity, favouring the existence of more than 390 leafhopper species in Iran (Mozaffarian & Wilson 2016), it is estimated that well over 100 species of pipunculid flies should be present in the country. Collecting material of *Dasydorylas* from the Eastern (Sistan-o Baluchestan) and Western (Kermanshah) Provinces of Iran revealed two new species of this genus that are described below.

Material and methods

Specimens were collected by Malaise traps and by hand netting in the eastern and western provinces of Iran (Sistan-o Baluchestan and Kermanshah). The collecting sites are characterized by a warm and dry (Sistan-o Baluchestan Province) or a humid and temperate mountain climate (Kermanshah Province). The traps were situated among herbaceous plants between rows of a *Tamarix* plantation (*Tamarix aphylla* (L.) Karst.) (Sistan-o Baluchestan) and between oak trees (*Quercus brantii* Lindl. and *Q. infectoria* Oliv.) (Kermanshah) (Fig. 1A–B). Malaise traps were emptied every 14 days. Pipunculids collected by hand net were captured using an aspirator and dropped into 75% ethanol. After sorting, a series of voucher specimens was preserved in 100% ethanol and kept in a refrigerator for DNA extraction. Other specimens were dried using the AXA-method according to van Achterberg (2009). The examined material is deposited in the Hayk Mirzayans Insect Museum, Insect Taxonomy Research Department, Iranian Research Institute of Plant Protection, Tehran, Iran (HMIM) and the Senckenberg Natural History Collections Dresden, Museum of Zoology, Germany (SMTD). Male

genitalia was separated from the abdomen, heated in lactic acid (85%) for 30 minutes and then placed in a drop of glycerin on a microscopic slide. Illustrations were prepared using an Olympus™ AX70 microscope and a Motic™ SMZ-168 stereo microscope equipped with a Moticam™ 480 digital imaging system. A series of ten images were merged using the image-stacking software ZereneStacker v. 1.04. Line drawings of genitalia were traced using the software Inkscape®, based on digital photographs, and subsequently mounted in Adobe Photoshop CS3®.

The morphological terminology follows Skevington (2002) and Kehlmaier (2005a), with the following abbreviations being used throughout the paper:

LF:WF = ratio of length of flagellum to its width
LW:MWW = ratio of length of wing to maximum width of wing
LS:LTC = ratio of length of pterostigma to length of third costal segment
LTC:LFC = ratio of length of third costal segment to length of fourth costal segment
LT35:W5 = ratio of length of tergites 3–5 to maximum width of tergite 5
WT5:LT5 = ratio of width of tergite 5 to its length
T5R:T5L = ratio of length of right margin of tergite 5 to length of its left margin
LT35:WS8 = ratio of length of tergites 3–5 to width of syntergosternite 8
LS8:HS8 = ratio of length syntergosternite 8 to its height
MLE:MWE = ratio of maximum length of epandrium to its maximum width (viewed dorsally)
LP:LB = ratio of length of piercer to length of base (viewed laterally)
LDP:LPP = ratio of length of distal part of piercer to length of its proximal part (viewed laterally)

For DNA barcoding, a 658 bp fragment of the 5' end of the mitochondrial coding gene cytochrome oxidase subunit I (COI) was sequenced, using the primer pair LCO1490 and HCO2198 (Folmer *et al*. 1994). Laboratory procedures are outlined in Kehlmaier *et al*. (2012). Sequence accession numbers issued by the European Nucleotide Archive (ENA) are provided for each species. Specimens sampled for molecular analysis received an additional label stating an individual voucher number "DNA voucher CKxxx". Uncorrected pairwise genetic distances (p-distance) were computed with MEGA7 (Kumar *et al.* 2016) using all sites, transitions and transversions with uniform rates and pairwise deletion for missing data.

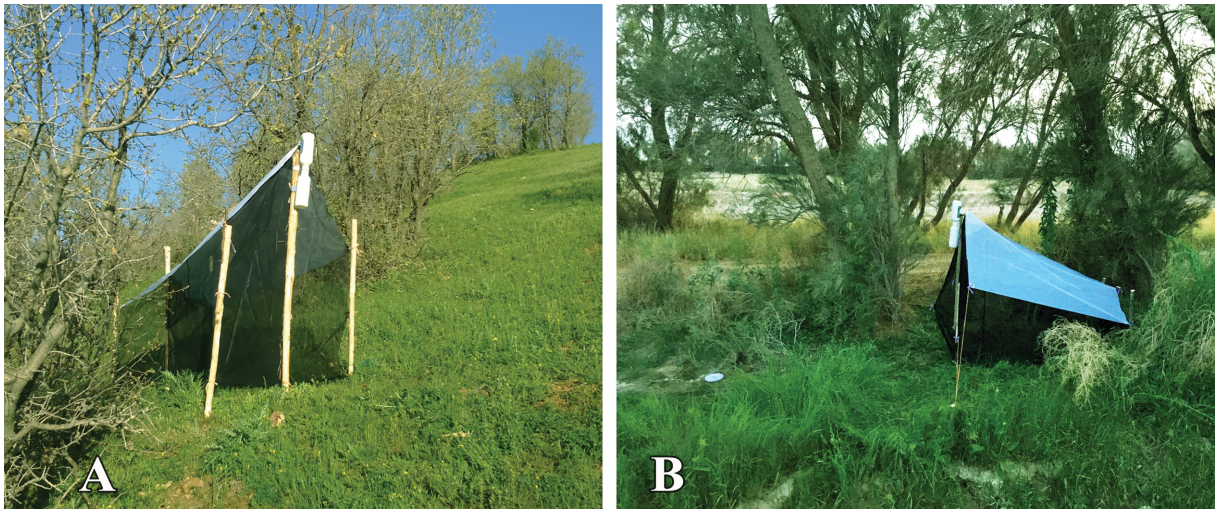

Fig. 1. Malaise traps at collection sites in Iran. **A**. Kermanshah, Kermanshah Province. **B**. Zabol, Sistan-o Baluchestan Province.

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Diptera Linnaeus, 1758
Suborder Brachycera Macquart, 1834
Superfamily Syrphoidea Latreille, 1802
Family Pipunculidae Walker, 1834
Subfamily Pipunculinae Walker, 1834
Tribe Eudorylini Rafael & De Meyer, 1992
Genus *Dasydorylas* Skevington, 2001

Dasydorylas derafshani Motamedinia & Kehlmaier sp. nov.
urn:lsid:zoobank.org:act:CCFE0068-C682-4C17-A45B-587D2F220575
Figs 2–3

Differential diagnosis

Dasydorylas derafshani sp. nov. is closely related to *D. setosus* (Becker, 1908), redescribed by Kehlmaier (2005a) and known from the Canary Islands, Morocco and Spain, and to *D. gradus* Kehlmaier, 2005, described from Israel by Kehlmaier (2005b). The males of all three species have long spines at the apex of the phallic guide that differ in number and direction between species, with *D. derafshani* sp. nov. having eight downward directed spines on either side. Additional diagnostic characters are the differently shaped surstyli and, compared to *D. setosus*, the shorter and more pilose scutellar hair fringe.

Etymology

This species is named in honour of Hossein Ali Derafshan, who collected the type series material. The surname is to be used as a noun in genitive case.

Material examined

Holotype
IRAN: ♂, Sistan-o Baluchestan Province, Zabol County, Zabol, 31°55′10″ N, 61°31′17″ E, 485 m a.s.l., 14 May 2015, Malaise trap, H.A. Derafshan leg. (HMIM).

Paratypes
IRAN: 1 ♂, Sistan-o Beluchestan Province, Zabol County, Zabol, 31°05′04″ N, 61°26′04″ E, 482 m a.s.l., 22 Apr. 2015, Malaise trap, H.A. Derafshan leg. (SMTD; DNA voucher CK863, LT626249); 1 ♂, Sistan-o Beluchestan Province, Zabol County, Zabol, 31°09′23″ N, 61°23′57″ E, 450 m a.s.l., 20 Apr. 2016, swept from *Tamarix aphylla*, H.A. Derafshan leg. (HMIM).

Description

Male
Body length. 3.3–3.7 mm (excluding antennae).

Head. Face dark, silver-gray pollinose. Scape dark, pedicel brown with a pair of short upper bristles and one short lower bristle; flagellum yellow, short tapering and gray pollinose (LF:WF = 2–2.2); arista dark, flattened, with thickened base. Eyes converging but not meeting and separated by less than diameter of frontal facets (Fig. 2B). Frons dark, silver-gray pollinose; vertex dark, lacking pollinosity; occiput dark, gray pollinose.

Thorax. Pleura, prescutum, scutum and scutellum dark but prescutum light yellow at lateral margin. Pleura gray pollinose. Postpronotal lobe pale, gray pollinose and with 3–5 postpronotal setae along upper margin. Prescutum and scutum gray pollinose, with two uniseriate dorsocentral rows of conspicuous setae and supra-alar setae. Scutellum gray pollinose, with an apical fringe of up to ten pale setae (up to 0.1 mm). Subscutellum gray pollinose.

Wing. Length: 3.3–3.5 mm. LW:MWW = 3–3.2. Wing almost entirely covered with microtrichia. Only small basal cells of wings, e.g., bc, basal of cell c, br, cell bm, basal of cup with somewhat reduced microtrichia. Pterostigma brown and complete (LS:LTC = 1.0, LTC:LFC = 1.1). M_1 gently undulating.

Halter. Length: 0.4 mm. Base dark, stem narrowly white and knob paler than base, somewhat gray pollinose.

Legs. Coxae dark but yellow on apical margin, gray pollinose. Mid coxa with three brown anterior bristles. Trochanters light brown, partly gray pollinose. Femora dark, distinctly light brown at apex, gray pollinose. All femora bearing two rows of dark, smaller, peg-like anteroventral spines on apical one third. Tibiae light brown, distinctly dark on apical half, gray pollinose with three rows of brown setae on anterior and posterior sides, without apical spines. Hind tibia with a wrinkled indentation midanteriorly. Tarsi light brown and paler than apical half of tibiae, brown pollinose, with some black setae dorsally. Distitarsi brown. Pulvilli shorter than distitarsi.

Abdomen. Ground colour dark. Tergite 1 with four to five brown lateral bristles. Tergites 1–5 with brown setae. Tergites 1–2 gray pollinose laterally and dorsally, and tergites 3–5 gray pollinose laterally extending onto dorsal surface along posterior margin. Tergite 5 asymmetrical. LT35:WT5 = 1.4, WT5:LT5 = 2.1 and T5R:T5L = 1.1. Syntergosternite 8 dark, gray pollinose, without dorsal depression on side of left surstylus. LT35:WS8 = 2.2. Viewed laterally, syntergosternite 8 higher than long (LS8:HS8 = 0.6). Viewed caudally, membranous area about one third of the width of syntergosternite 8, vertically directed, broader in upper half.

Genitalia. Genital capsule in dorsal view: epandrium dark but brownish near surstyli and tergite 5, gray pollinose and longer than wide (MLE:MWE = 1.5). Surstyli paler than epandrium, gray pollinose and symmetrical (Fig. 3E). Both with a broad and rectangular base and a pair of finger-like projections at apices which are bent towards each other by 45° (Fig. 3E). Genital capsule in ventral view: gonopods

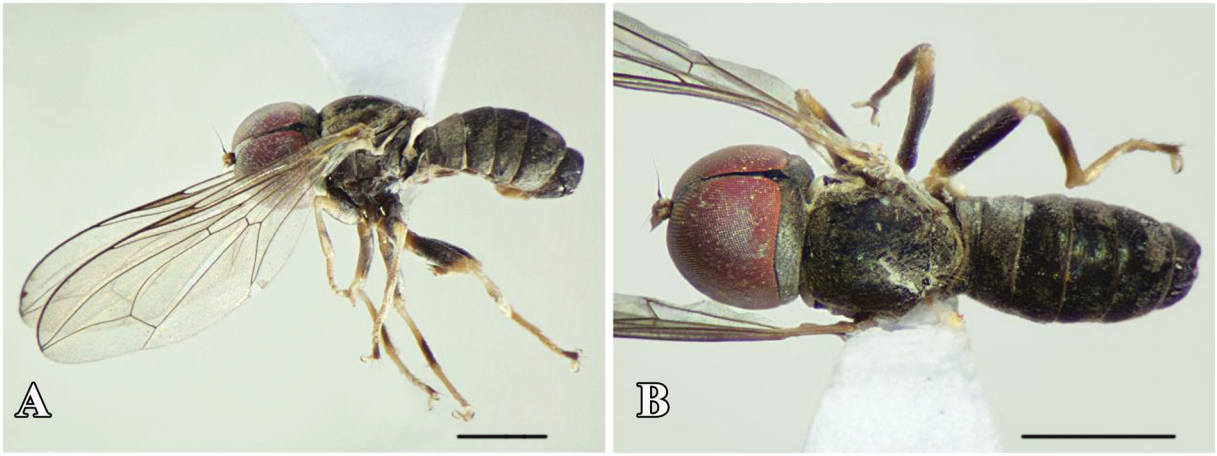

Fig. 2. *Dasydorylas derafshani* Motamedinia & Kehlmaier sp. nov., ♂, paratype. **A**. Lateral view. **B**. Dorsal view. Scale bars: 1 mm.

rather large and almost symmetrical (Fig. 3A); phallus trifid, narrow, with long and straight ejaculatory ducts (Fig. 3B); phallic guide of medium length, rather broad, on either side with eight downwards directed long spines at its apex (Fig. 3A). Genital capsule in lateral view: epandrium without projecting lobe on either side. Both surstyli distinctly convex and broad in basal two thirds, distally narrowed to form a pair of finger-like processes which are bent towards each other (Fig. 3F–G). Phallic guide broad, gently bent towards surstyli (Fig. 3C). Ejaculatory apodeme funnel-shaped (Fig. 3D).

Female

Unknown.

Distribution

Iran.

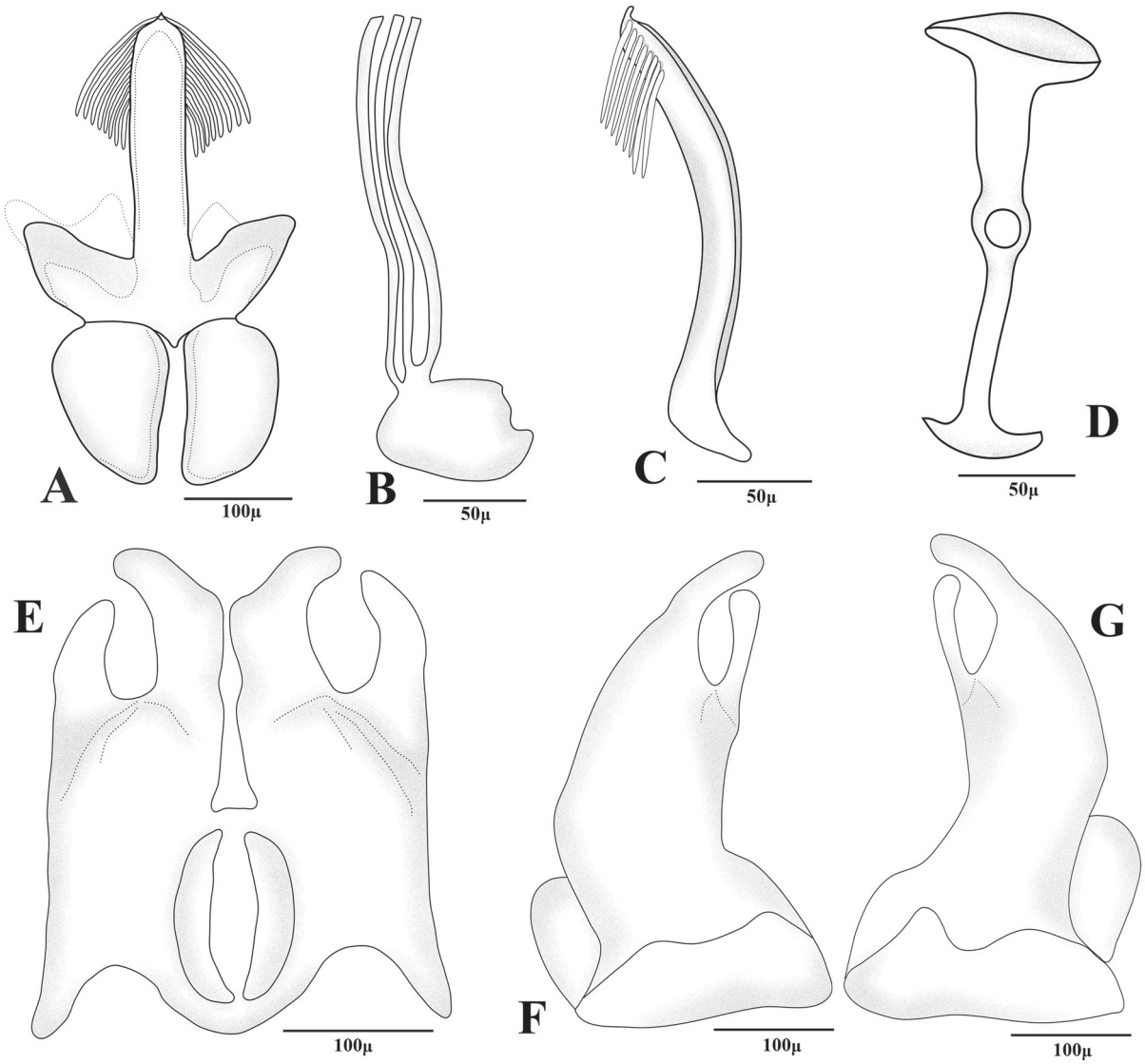

Fig. 3. Terminalia of *Dasydorylas derafshani* Motamedinia & Kehlmaier sp. nov., ♂, paratype. **A**. Phallic guide, gonopods and hypandrium in ventral view. **B**. Phallus and membranous sheet in lateral view. **C**. Phallic guide in lateral view. **D**. Ejaculatory apodeme. **E**. Surstyli in dorsal view. **F**. Left surstylus in lateral view. **G**. Right surstylus in lateral view.

Dasydorylas zardouei Motamedinia & Kehlmaier sp. nov.
urn:lsid:zoobank.org:act:C9BA2A47-D425-4FD6-8F6C-074EAAC7219B
Figs 4–5

Differential diagnosis

Dasydorylas zardouei sp. nov. is closely related to the western Palaearctic *D. holosericeus* (Becker, 1897) and *D. roseri* (Becker, 1897), both redescribed by Kehlmaier (2005a), to the Afrotropical *D. evanidus* (Hardy, 1949), redescribed by Földvári (2013), to the Oriental *D. orientalis* (Koizumi, 1959), redescribed by Kapoor *et al.* (1987), and, judging from the original figures, also to *D. antennalis* (Kapoor *et al.*, 1987) comb. nov. from southern India. Being morphologically hardly distinguishable from each other, the *D. holosericeus* species group is a good example of how challenging pipunculid taxonomy can be. The males of *D. zardouei* sp. nov. differ from those of the other species by a different sclerotization pattern of the gonopods and by the length of the phallus. The females can be separated by the shorter length of tergite 9 (piercer of ovipositor).

Etymology

The species is named in honour of Maryam Zardouei who collected the type series material. The surname is to be used as a noun in apposition.

Material examined

Holotype

IRAN: ♂, Kermanshah Province, Gheshlagh, 34°56′31″ N, 46°27′54″ E, 1533 m a.s.l., 17 Aug. 2015, Malaise trap, M. Zardouei leg. (HMIM).

Paratypes

IRAN: 1 ♂, same collection data as for holotype (HMIM); 1 ♂, Kermanshah Province, Dodan, 35°00′44″ N, 46°12′27″ E, 954 m a.s.l., 15 Jun. 2015, Malaise trap, M. Zardouei leg. (HMIM); 1 ♂, Kermanshah Province, Sarpolezahab, 34°28′10″ N, 45°49′31″ E, 546 m a.s.l., 1 Jun. 2015, Malaise trap, M. Zardouei leg. (SMTD; DNA voucher CK885, LT671746); 1 ♀, same collection data as preceding (SMTD; DNA voucher CK886, LT671747); 1 ♀, same collection data as preceding (HMIM).

Description

Male

Body length. 3.1–3.5 mm (excluding antennae).

Head. Face dark, silver-gray pollinose. Scape dark, pedicel brown with three short upper bristles and one short lower bristle; flagellum brown, short tapering and gray pollinose (LF:WF = 2.1–2.2); arista dark, with thickened base. Eyes meeting for twelve facets (Fig. 4B). Frons dark, silver-gray pollinose; vertex dark, lacking pollinosity, shining black; occiput dark, gray pollinose.

Thorax. Pleura, prescutum, scutum and scutellum dark, but prescutum light yellow at lateral margin. Pleura gray pollinose. Postpronotal lobe pale, gray pollinose and with 2–3 postpronotal setae along upper margin. Prescutum and scutum gray pollinose, with two uniseriate dorsocentral rows of setae and patches of supra-alar setae. Scutellum gray pollinose, with a fringe of up to six dark setae (up to 0.1 mm). Subscutellum gray pollinose, only in dorsocentral area with some brown pollinosity.

Wing. Length: 3.2–3.4 mm. LW:MWW = 3.1–3.3. Wing almost entirely covered with microtrichia. Only small basal cells of wings, e.g., bc, br, bm, basal of cup cell with somewhat reduced microtrichia. Pterostigma brown and complete (LS:LTC = 1.0, LTC:LFC = 1.1). M_1 straight.

Halter. Length: 0.5 mm. Base dark, stem narrowly white and knob yellow. Base and stem somewhat gray pollinose.

Legs. Coxae dark, gray pollinose. Front and mid coxae with two dark anterior bristles. Trochanters dark, partly gray pollinose. Femora dark, distinctly yellow at apex, gray pollinose. All femora bearing two rows of dark, smaller, peg-like anteroventral spines on apical one third. Tibiae dark, with basal third and sometimes also apices pale, gray pollinose, with three rows of setae on anterior and posterior side, without apical spines. Hind tibia with some weak wrinkles midanteriorly, bearing one or two stronger bristles. Tarsi brown and paler than tibiae, gray pollinose, with some brown setae dorsally. Distitarsi dark. Pulvilli longer than distitarsi.

Abdomen. Ground colour dark. Tergite 1 with four to five strong lateral bristles, arranged in one row. Tergites 1–5 with brown setae. Tergites 1–2 gray pollinose laterally and dorsally, tergites 3–5 gray pollinose laterally, extending onto dorsal surface along posterior margin. Tergite 5 symmetrical. LT35:WT5 = 1.5, WT5:LT5 = 1.3 and T5R:T5L = 1.0. Syntergosternite 8 dark, brown pollinose, without dorsal depression on side of right surstylus. LT35:WS8 = 2.5. Viewed laterally, as long as high (LS8:HS8 = 1.0). Viewed caudally, membranous area vertically directed, broader in upper half, occupying about a third of the width of syntergosternite 8.

Genitalia. Genital capsule in dorsal view: epandrium dark, brown pollinose and wider than long (MLE:MWE = 0.8). Surstyli brown, narrowly pale at apices, brown pollinose and rather symmetrical. Both surstyli with a blocky base and a broad finger-like projection at its apical inner corner, bent outward

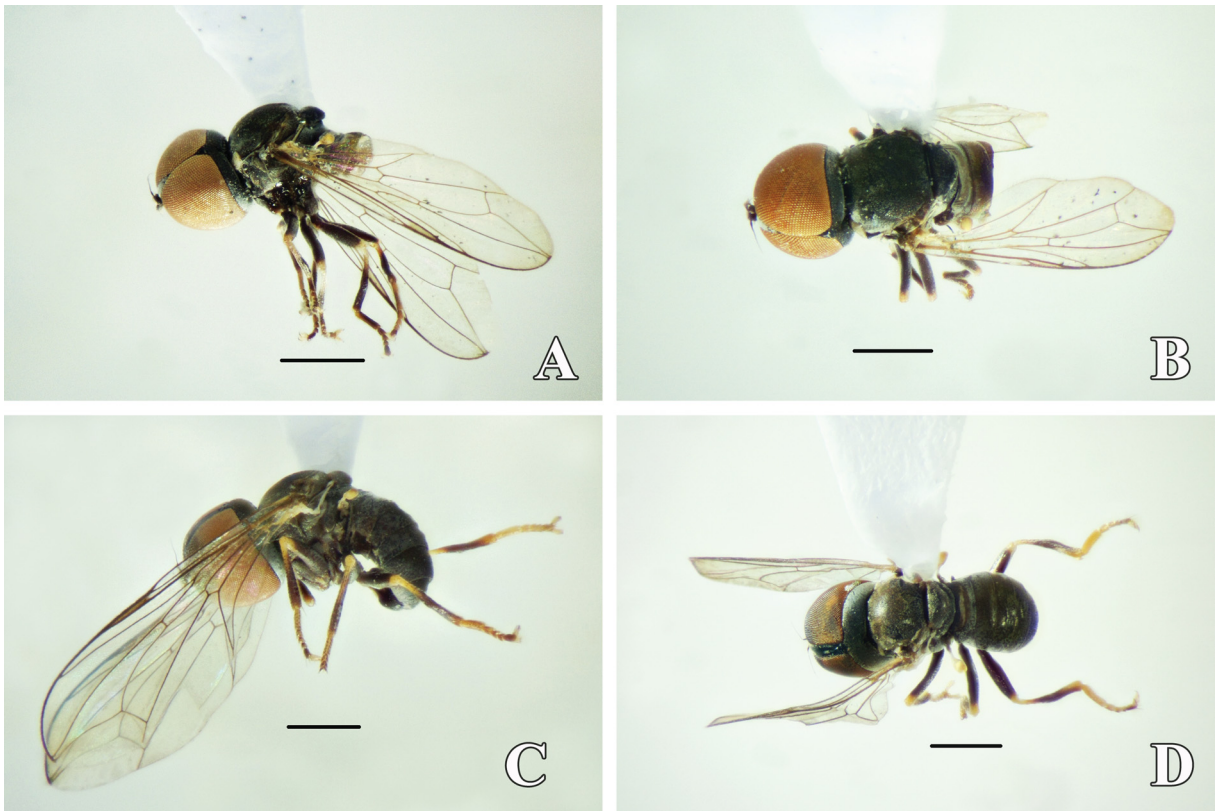

Fig. 4. *Dasydorylas zardouei* Motamedinia & Kehlmaier sp. nov. **A–B**. ♂, holotype. **A**. Lateral view. **B**. Dorsal view. **C–D**. ♀, paratype. **C**. Lateral view. **D**. Dorsal view. Scale bars: 1 mm.

distally by 90°; base of right surstylus slightly wider than left surstylus (Fig. 5G). Genital capsule in ventral view: gonopods minute and symmetrical, with elongated regions of distinctly stronger sclerotization (Fig. 5A); phallus trifid, straight and short (almost reaches apex of surstyli), with a membranous nose at

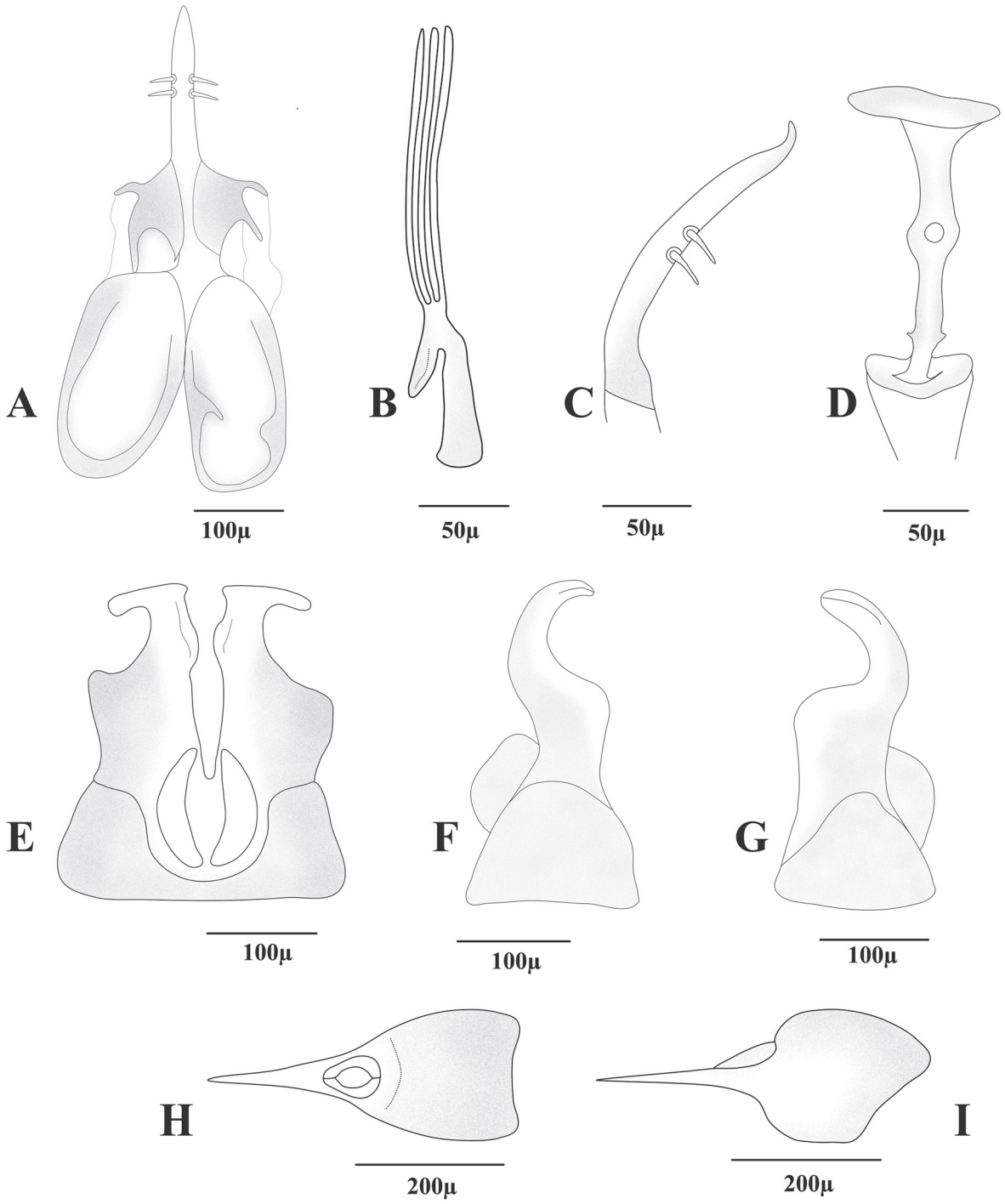

Fig. 5. Terminalia of *Dasydorylas zardouei* Motamedinia & Kehlmaier sp. nov. **A–G**. ♂, holotype. **A**. Phallic guide, gonopods and hypandrium in ventral view. **B**. Distiphallus with ejaculatory ducts in lateral view. **C**. Phallic guide in lateral view. **D**. Ejaculatory apodeme. **E**. Surstyli in dorsal view. **F**. Left surstylus in lateral view. **G**. Right surstylus in lateral view. – **H–I**. ♀, paratype. **H**. Ovipositor in dorsal view. **I**. Ovipositor in lateral view.

base (Fig. 5B); phallic guide narrow and straight, with two dorsolateral spines at the end of basal half on either side (Fig. 5C). Genital capsule in lateral view: epandrium without projecting lobe on either side. Both surstyli in basal half broad, in apical half narrowed to form a finger-like process which is bent towards the sternites by 90° (Fig. 5F–G). Phallic guide bow-like bent towards surstyli (Fig. 5C). Ejaculatory apodeme funnel-shaped (Fig. 5D).

Female (Figs 4C–D, 5H–I)

Body length. 3.2 mm (excluding antennae).

Head. Scape dark, with two upper bristles. Pedicel with three to four short upper bristles and a pair of short lower bristles. Flagellum paler than pedicel and long, tapering. LF:WF = 3.1. Eyes separated (Fig. 4D). Front facets enlarged (0.05 mm). Frons dark, lower half silver-gray pollinose, otherwise shining. Frons with a weak median keel, ending in a tubercle shortly before antenna. Occiput gray pollinose.

Thorax. Postpronotal lobe light yellow, gray pollinose with some light brown bristles. Pleura, prescutum, scutum and scutellum dark, gray pollinose.

Wing. Length: 3.1 mm. LW:MWW = 3.3. Pterostigma brown and complete (LS:LTC = 1.0, LTC:LFC = 0.8).

Legs. Hind coxa paler and larger than fore and mid coxae, with 4–6 black or brownish bristles. Mid femur with two small ventral rows of dark peg-like spines on apical half. Tibiae light brown, distinctly darkened on apical half, without apical spines. Pulvilli longer than distitarsi.

Abdomen. Tergites 1–5 gray pollinose laterally, extending onto dorsal surface along posterior margin. Tergites 2–5 with dark scattered bristles.

Ovipositor. Base of ovipositor dark, dorsally with some gray pollinosity. Viewed dorsally (Fig. 5H), base rather rectangular, without a median longitudinal furrow, longer than wide. Anal opening ovate. Suture between tergite 7 and 8 hardly visible. Piercer yellowish-brown. Proximal part of piercer narrow and triangular. Viewed laterally (Fig. 5I), base of piercer slightly curved, piercer straight and as long as base. LP:LB = 1.0. LDP:LPP = 1.9.

Distribution

Iran.

DNA barcoding

Uncorrected pairwise genetic distances (p-distance) were calculated from partial mitochondrial COI based on a dataset comprising five out of six European species of *Dasydorylas* – *D. filiformis* Kehlmaier, 2005 (n = 1), *D. holosericeus* (n = 1), *D. horridus* (Becker, 1897) (n = 4), *D. roseri* (n = 4) and *D. setosus* (n = 1) – and will be published in a forthcoming larger project (Kehlmaier *et al.* in prep.). Based on this, *Dasydorylas derafshani* sp. nov. stands closest to *D. setosus*, differing by 11.2%. The third Iranian species of the genus, *D. horridus*, differs by 14.3% (LK391738), whereas *D. zardouei* sp. nov. is differentiated by 12.6%. The latter species stands closest to *D. holosericeus*/*D. roseri*, differing by a minimum interspecific p-distance of 6.8% and 11.6% respectively. From *D. horridus* it is distinguished by 11.7%.

Key to males of West-Palaearctic Dasydorylas *Skevington, 2001*

For generic identification, follow the key in Kehlmaier (2005a) to couplet 18.

1 Abdominal tergites densely covered with rather long bristly hairs (♂♂: up to 0.07 mm). (Dorso-) lateral fan of tergite 1 with about 13 strong, dark bristles of different length. Male genitalia as in Kehlmaier 2005a: fig. 15a–h ..... ***D. horridus*** (Becker, 1897)
– Abdominal tergites less densely covered with shorter hairs (up to 0.05 mm). (Dorso-) lateral fan of tergite 1 with about 8 bristles at the most 2

2 Flagellum extremely long tapering, filiform (LF:WF > 5.5) (Kehlmaier 2005a: fig. l8i). Syntergosternite 8 without membranous area. Eyes meeting for about ten times diameter of ocellus. F:EM = 1:0.5–0.6. LTC:LFC = 0.6–0.8. Surstyli and genitalia as in Kehlmaier 2005a: fig. 18a–h ..... ***D. filiformis*** Kehlmaier, 2005
– LF:WF < 4.0. Syntergosternite 8 with membranous area. Eyes meeting for 15 to 20 times diameter of ocellus. F:EM = 1:1.0–1.2. LTC:LFC > 1.6 3

3 Scutellar hair fringe with 6 very strong bristles (up to 0.2 mm). Flagellum very long, tapering (LF:WF = 3.7–3.9) ..... ***D. setosus*** (Becker, 1908)
– Scutellar hair fringe with up to 14 shorter bristles (up to 0.07 mm). Flagellum shorter (LF:WF = 2–2.3) 4

4 Phallic guide with up to 14 long spines on each side, pointing upwards into different directions. Each surstylus distally with a single outward bent finger-like projection (Kehlmaier 2005b: fig. 12i) ..... ***D. gradus*** Kehlmaier, 2005
– Phallic guide with less than 10 long spines on each side 5

5 Phallic guide with 8 downwards directed long spines on each side. Each surstylus with a pair of finger-like projections which are bent towards each other (Fig. 3E) ..... ***D. derafshani*** Motamedinia & Kehlmaier sp. nov.
– Phallic guide with only 2 spines on each side 6

6 Gonopods with elongated regions of distinctly stronger sclerotization (Fig. 5A). Phallus short and length of ejaculatory ducts shorter than length of surstyli ..... ***D. zardouei*** Motamedinia & Kehlmaier sp. nov.
– Gonopods without elongated regions of stronger sclerotization. Ejaculatory ducts of phallus longer than surstyli 7

7 Dorsolateral spines of phallic guide rather strong, situated at end of basal half (Kehlmaier 2005a: fig. 14a–b). Surstyli as in Kehlmaier 2005a: fig. 14d, j–k. Phallus with long ejaculatory ducts (Kehlmaier 2005a: fig. 14h). Membranous area occupies about half the width of syntergosternite 8 (Kehlmaier 2005a: fig. 14e) ..... ***D. holosericeus*** (Becker, 1897)
– Dorsolateral spines of phallic guide somewhat smaller and situated after basal third (Kehlmaier 2005a: fig. 16a–b). Surstyli as in Kehlmaier 2005a: fig. 16d, j–k. Phallus with shorter ejaculatory ducts (Kehlmaier 2005a: fig. 16h). Membranous area occupies about a third of the width of syntergosternite 8 (Kehlmaier 2005a: fig. 16f) ..... ***D. roseri*** (Becker, 1897)

Discussion

Based on morphology and DNA barcoding, the present paper introduces two new species of *Dasydorylas* from Iran, increasing the number of known species of Pipunculidae from this country to 21. In previous studies of this family, only one species (*D. horridus*) was recorded from Alborz Province in northern Iran (Kehlmaier & Majnon Jahromi 2015). In general, *Dasydorylas* must be considered a species-poor genus, represented by only nine Palaearctic taxa. The discovery of the two newly described *Dasydorylas*

and other previously unnamed species (Motamedinia *et al.* 2017) is not very surprising, considering not only the limited amount of research carried out on big-headed flies in Iran, but also the geographic location of the Middle East in general and the large habitat diversity present in Iran in particular. Being situated at the "border triangle" of the Palaearctic, Afrotropical and Oriental zoogeographic regions, the Middle East and Iran act as a transition zone of these realms. An extensive and long-lasting survey would be essential in order to assess the true diversity of Pipunculidae and other taxa present in Iran.

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