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Original Article

Review of the Iranian species of the genus *Pipizella* Rondani, 1856 (Diptera, Syrphidae), with description of a new species from Iran and Azerbaijan

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ABSTRACT. The species of the genus *Pipizella* Rondani, 1856, from Iran are reviewed. In this review, new records of three species are presented: *Pipizella baybaurtica* Claussen & Hayat, 1997, *P. ochreobasalis* van Steenis & Lucas 2011, and *P. orientalis* van Steenis & Lucas 2011. One new species, *Pipizella barbata* Mortelmans & van Steenis **sp. nov.**, is described based on type specimens collected from Iran and Azerbaijan. In total, nine species are mentioned to occur in Iran, however some identifications might concern other species for which no material was available for this study. Therefore, the correct number of Iranian species of the genus *Pipizella* is not clear, but in this study, we present seven confirmed species. Photographs of the new species, illustrations of its male terminalia, as well as an identification key to the known Iranian species, are provided. Finally, a discussion about the Iranian fauna and the possible number of *Pipizella* species is given.

KEYWORDS: Palaearctic, Hoverflies, Taxonomy, New species, Identification key

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INTRODUCTION

The family of hoverflies (Diptera: Syrphidae) is a large family with more than 6500 described species (Doyle et al. 2020; Pape & Evenhuis 2025). The adults are regular visitors to flowers, and the entire family is regarded as essential pollinators (Rotheray & Gilbert, 2011; Potts et al. 2021; Vujić et al. 2022). 44 valid species of *Pipizella* Rondani, 1856 have been documented (Violovitsh 1981; Kuznetzov 1987, 1990a, 1990b; van Steenis & Lucas 2011; Pape & Evenhuis 2025). The species of this genus have a predatory larval stage feeding on a wide range of ground aphids associated with plant roots of Apiaceae (Dixon 1960; Rotheray 1993).

Species of *Pipizella* are small, bronze-blackish hoverflies belonging to the subfamily Pipizinae, which is characterized by the flat face, the horseshoe-shaped clypeus, a relatively long postpedicel, a pilose postpronotum, a bare anterior part of the anepisternum, and distinctive wing venation features (crossvein r-m located before the middle of cell dm; vein R_{4+5} straight) and the terminalia with a post-anal hood. The genus *Pipizella* is separated from other genera within the Pipizinae by the following diagnostic characteristics: anterior anepisternum bare of pile, vein M_1 perpendicular to vein R_{4+5}, legs simple without any appendices (Thompson 1972; Hippa & Ståhls 2005; van Steenis & Lucas 2011; Vujić

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et al. 2013; Mengual et al. 2022). The larvae of *Pipizella* are characterized by the fusion or loss of sensilla 7 and 8 on the abdominal segments 1–7 (Rotheray & Gilbert 1989). Although the genus *Pipizella* is well-defined, its species identification remains challenging due to weak diagnostic external morphology. However, the structure of the male terminalia provides excellent and reliable distinctive diagnostic characteristics (e.g., Lucas 1976; Claussen 1991; Verlinden 1999).

The hoverfly fauna of Iran has not been investigated very intensively. The first checklist published in 2006 recorded only 124 species occurring in Iran (Dousti & Hayat 2006). Since then, numerous papers have been published, mostly focusing on restricted areas or short collecting expeditions, increasing the number of recorded species to 269 (Dousti 2023). The addition of 145 species is partly due to recently described species (Gilasian & Sorokina 2011; Gilasian et al. 2015, 2016, 2017, 2020, 2022; Vujić et al. 2017, 2019), and the estimated total number of hoverfly species occurring in Iran is now believed to exceed 400 (see Dousti 2023). The genus *Pipizella* has been little studied. Dousti & Hayat (2006) reported only two species, and since then, only three additional publications have focused exclusively on this genus (van Steenis & Lucas 2011; Khaghaninia & Shakeryari 2012; Hoseini & Khaghaninia 2015). In the present work, three species of *Pipizella* are reported for the first time from Iran, including one species that is newly described to science.

MATERIAL AND METHODS

During a collecting expedition in Iran in 2016, several specimens of *Pipizella* were collected from Alborz province. These specimens were compared to the *Pipizella* material deposited in the Syrphidae Foundation Zweefvliegen Museum (SFZM), as well as with descriptions provided by Violovitsh (1981) and van Steenis & Lucas (2011). Additional material obtained from a recent expedition to Azerbaijan included numerous specimens of the same undescribed species, which are included in the type series.

Morphological analyses and diagnoses of the specimens were performed using different brands of stereo-microscopes with magnifications ranging from 10×–160×. Two male specimens were dissected to enable examination of their terminalia in detail. For preparation, the abdomen containing the terminalia was first removed and then treated as follows: (1) soaked for 10 minutes in warm KOH, (2) soaked for 20 minutes in tap water, (3) soaked for 10 minutes in EtOH-HCl (acidified ethanol), and finally (4) soaked for 20 minutes in tap water. After examination, the macerated abdomen was preserved in a plastic microvial containing a few drops of glycerin, which was pinned beneath the corresponding specimen. Illustrations were produced using a camera lucida attached to a stereo-microscope. The outline of the terminalia was drawn with a pencil and subsequently redrawn in ink. Photographs of the adult and its morphological characteristics were taken using a Canon EOS D6 camera equipped with a Canon MP-E 1–5x zoom lens and a Yongnuo ring-flash. The images were stacked with Zerene Stacker 1.04. The final photographs and drawn figures were edited using the free GNU image manipulation program (GIMP 2.8.22). The information on the type labels is given verbatim, with "xx" indicating each label and // marking separate lines on the label.

The terminology used in this paper follows that of van Steenis et al. (2023), with terminalia terminology further explained in Figs 5–7, 18, 20, 22, and 25. The distribution map (Fig. 34) was created in QGIS 3.34 Prizren (https://qgis.org/) using the OSM standard world map and the EPSG:4326 WGS 84 projection. The material is deposited in the following collections:

DPUT	Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.
FMT	private collection of Frank Van de Meutter, Tessenderlo, Belgium.
HMIM	Hayk Mirzayans Insect Museum, Iranian Research Institute of Plant Protection, Tehran, Iran.
RBINS	Royal Belgian Institute of Natural Sciences, Brussels, Belgium.
JMO	private collection of Jonas Mortelmans, Ostend, Belgium.
SFZM	Syrphidae Foundation, Zweefvliegen Museum, Baarn, The Netherlands.
ZFMK	Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany.

RESULTS

Here, the new species is described, and records are presented for all mentioned Pipizella species for Iran. A revised identification key, based on van Steenis & Lucas (2011), is provided for *Pipizella* species occurring in Iran and neighbouring countries, e.g., Afghanistan, Azerbaijan, Georgia, Russia (Altai, Caucasus, Siberia), and Turkey.

Class Insecta Linnaeus, 1785

Diptera Linnaeus, 1758

Family Syrphidae Latreille, 1802

Genus *Pipizella* Rondani, 1856

Type species. *Pipizella virens* (Fabricius, 1805)

Pipizella barbata Mortelmans & van Steenis sp. nov.

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Figs 1–7, 34

Material examined. **Holotype** ♂ (General condition of the type is good, although the abdomen is dissected and put in a microvial on the same pin): **Iran**: "(Iri) Alborz // prov. 1 km N of // Jazan 36.184, // 50.794 // 29.IV.2016", "Leg. Col. J. // Mortelmans", (RBINS); **Paratypes** 17♂♂, 9♀♀: **Iran:** Same labels as Holotype, 1♂, (SFZM); "(Iri) Alborz // prov. 1 km E of // Ebrhimabad. // 36°6'57.5994"N, 50°39'25.1994"E // 28.IV.2016", with abdomen and terminalia in a microvial on the same pin, 1♂ (JMO); same labels as previous, abdomen not dissected, 1♂ (RBINS); **Azerbaijan**: "AZ: Yardimli Avaş // 1329 m, 38°53'20.4"N, 48°5'9.5994"E // 9.v.2025 // leg. F. Van de Meutter", 4♂♂, 3♀♀ (FMT; SFZM); "AZ: W of Sim, 1389m // 38°29'20.4"N, 48°35'42"E // 12.v.2025 leg. F. Van // de Meutter", 3♂♂ (FMT, SFZM); "Azerbaijan Astava district // Sim, up to 38°29'25.0182"N, 48°35'39.1554"E // 1403 m // 12 May 2025 // hand net leg. X. Mengual" 2♂♂ (ZFMK); "Azerbaijan Yardimli district // Avaş 38°53'32.1966"N, 48°4'49.4394"E // 1311 m 9 May 2025 on white // Umbellifer, hand net // leg. X. Mengual" 5♂♂, 6♀♀ (ZFMK; SFZM).

Differential diagnosis. Similar to several other species of *Pipizella*, however it can be distinguished by the presence of a dense tuft of black setae apically on the ventro-posterior margin of the mesofemur (Fig. 4), a character unique within the genus and, even if weak, also present in the female. In *Pipizella virens* (Fabricius, 1805), some long black pile are present apically on the posterior margin of the mesofemur, while in *P. calabra* (Goeldlin, 1974), *P. cantabrica* Claussen, 1991, *P. speighti* Verlinden, 1999, and *P. viduata* (Linnaeus, 1758) there is a row of black setae-like pile apically on the posterior surface of the mesofemur. The male terminalia are similar to those of *Pipizella divicoi* (Goeldlin, 1974) and *P. pennina* (Goeldlin, 1974), sharing the hook-shaped ventral postgonite, the cocks-comb shaped postgonite, the epandrium with shoulders, and the elongate hypandrium with weak and rounded apico-dorsal process (Figs 5–14). However, *Pipizella barbata* Mortelmans & van Steenis **sp. nov**. and *P. pennina* differ from *P. divicoi* by having slightly larger and more triangular cerci (in *P. divicoi* more elongate); the shoulders of the epandrium are situated apically and roundish (in *P. divicoi* pre-apically and more triangular); the surstylus, in lateral view, is long and elongate (in *P. divicoi* it is much shorter and broadly triangular); the ventral margin of the hypandrium is curved with narrow flange (in *P. divicoi* this margin is straight and without flange); the pile on apex of hypandrium is found both on the rounded upper hypandrial process and on the medial part between the process and the flange (in *P. divicoi* more restricted, only found on the process). The terminalia of *Pipizella barbata* Mortelmans & van Steenis **sp. nov**. differ from *P. pennina* by the following characteristics: in *P. barbata* Mortelmans & van Steenis **sp. nov**., the shoulders are slightly weaker, the surstylus is longer and more elongate, the flange at the dorsal side of the hypandrium is much shorter and confined to the apical 1/4, and the pile on the dorsal surface of the hypandrium is more extensive towards the base. In both *Pipizella divicoi* and *P. pennina* the pile on the mesofemur is entirely yellow, and there are no setae present on the mesofemur. Furthermore, the eye-contiguity of *P. divicoi* is shorter (1: 2.0–2.5) than in both *P. barbata* Mortelmans & van Steenis **sp. nov**. and *P. pennina* (1: 1.6–2.1). Furthermore, sternum IV is smooth as in *P. divicoi*, while

in *P. pennina* there are two lateral rounded elevations of the cuticle. The only species not studied here is *Pipizella cauta* Violovitsh, 1981, and based on Violovitsh (1981), *P. cauta* is similar to *P. maculipennis* Meigen, 1822. Only differing by the non-infuscated wing (infuscated in *P. maculipennis*), postpedicel about twice as long as wide (three times in *P. maculipennis*), and postgonite with 5–6 teeth (4–5 in *P. maculipennis*). So in the key *Pipizella cauta* runs to *P. maculipennis* and thus clearly different from *P. barbata* Mortelmans & van Steenis **sp. nov**.

Description. — **Male** (Figs 1–7). Body length: 7.6–9.5 mm, wing length 5.1–6.2 mm.

Head (Figs 1–3). Face flat without any tubercle, black and shiny, with white pile, except anterolateral corner of frons along lunula with some black pile; lunula almost straight with very short but pointed medial extension; acetabula widely fused; ocellar triangle anteriorly on vertical triangle, entirely white pilose; head about 2.5 times wider than the face at antennal level; eyes white pilose, contiguity rather long, frons about 1.6 times longer than the eye contiguity; antenna slightly elongated and black to brownish-black; scape with black setae; pedicel basally with black and yellow setae-like pile, anterodorsally with white pile; postpedicel 1.5–1.8 times longer than wide; arista brownish-black, about 1.2–1.4 times longer than the postpedicel.

Thorax (Figs 1, 2). Black, slightly shiny bronze, weakly punctured and on pleurae with weak greyish pruinosity; pile light yellow on scutum and scutellum, rather long and weakly curved anteriorly; pleural pile present on proepimeron, katepimeron, posterior anepisternum, anepimeron and a dorsal and ventral patch on the katepisternum; pile on posterior anepisternum and anepimeron light yellow and about as long as the pile on the scutum, the other pleural pile white coloured and much shorter.

Wing (Figs 1, 2). Membrane hyaline, entirely microtrichose; crossvein r-m before the middle of cell dm; the extension of crossvein r-m ending at the wing margin where vein Sc is ending; vein R_{4+5} straight; vein M_4 with short appendix beyond crossvein dm-m; vein M_2 short; vein M_1 ending perpendicular to vein R_{4+5}. Haltere yellow; calypteres yellow with yellow pile fringe.

Legs (Fig. 4). Slender, without modifications, black and yellow to entirely black coloured; yellow coloured on apical 1/10 of femora, on basal 1/8 of pro- and mesotibiae, basal 1/5 of mesotibia and basitarsus of mesotarsus brownish to yellow; all pile yellow, except apex of mesofemur on postero-ventral margin with a row of yellow setae ending in a very dense tuft of black setae, in one specimen these black setae are missing (possibly worn off).

Abdomen (Figs 1, 2). Black coloured, copper shiny with groove punctuation; pile light yellow, on tergum IV antero-medially with short black pile, on lateral margins, and on the sterna, the pile is rather long. Sterna smooth, without modifications.

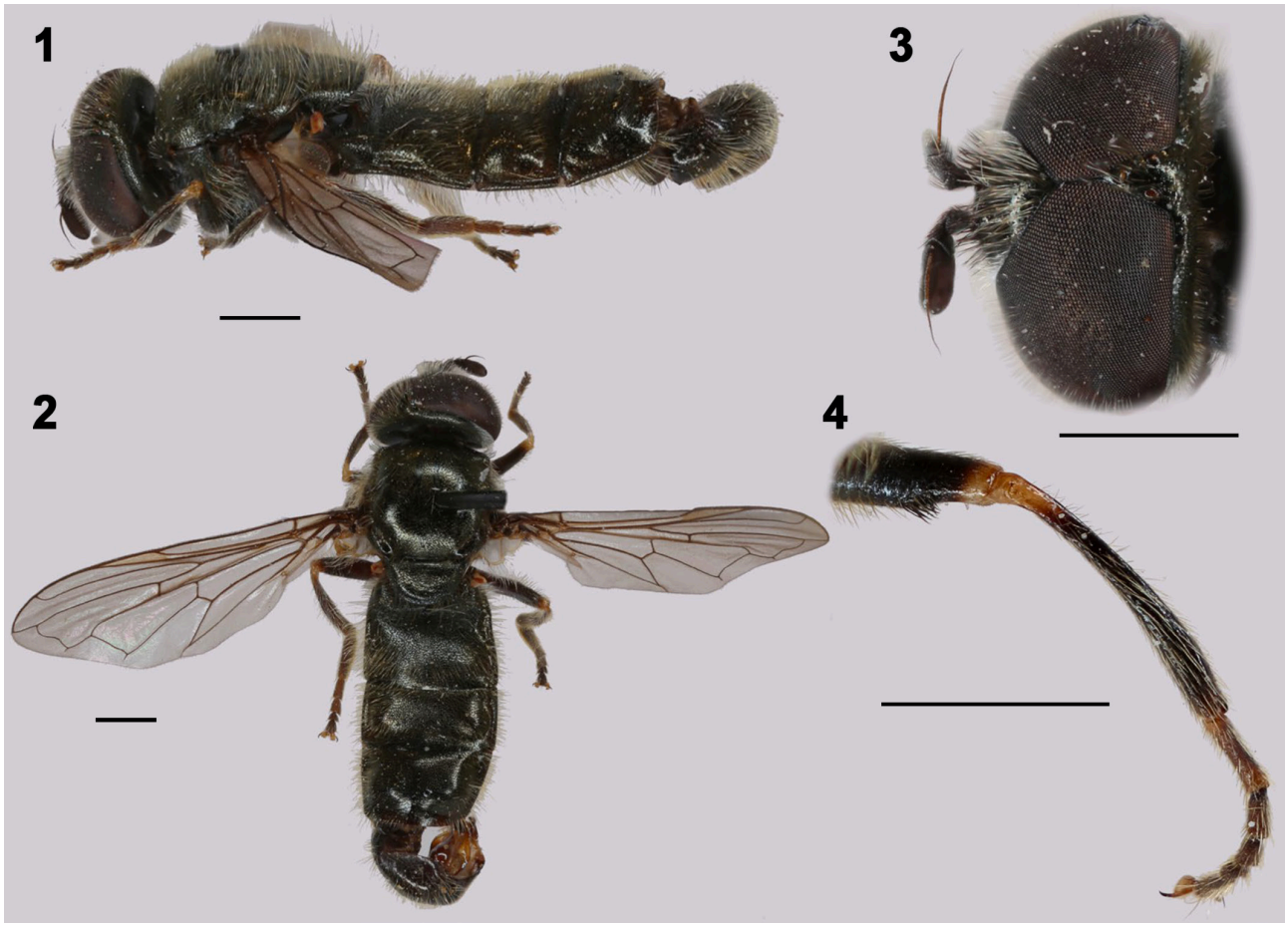
Male terminalia (Figs 5–7). Epandrium, in lateral view, lunulate without arms; surstylus semi-lunulate shaped and apically gradually narrowing; in dorsal view epandrium rectangular with shoulders almost absent and the apical part flattened with rounded fenestra; cerci roundish-triangular, light yellow pilose, pile about as long as width of cerci; surstylus with rounded base and elongate and rather straight apical part, ventro-basal pile long, as long as width of surstylus, towards the apex along ventral margin with much shorter yellow pile; post-anal hood elongate-oval shaped; hypandrium elongate with dorsal margin curved and with a hardly visible flange; hypandrial process rounded and weakly protruding, slightly serrated along dorsal margin and with scattered short yellow pile; phallus rectangular; postgonite cocks-comb shaped with 6 large and 1 small tooth; ventral postgonite hook shaped.

Female. Body length: 7.9–9.1 mm; wing 5.4–6.0 mm. Similar to the male, apart from normal sexual dimorphism, and the following:

Head. Head about 2.3 times wider than face at antennal level; head white pilose, except for an area anterior to the ocellar triangle with black pile at least laterally; sometimes black pile extending across the entire area between the eyes; postpedicel elongate, 1.4–1.6 times longer than wide.

Thorax. Pile rather short, on posterior half of the scutum mixed with scattered and 2–3 times longer pile.

Legs. Pile a little shorter; setae on postero-ventral apex of mesofemur fewer and weaker, but at least some black setae present in all specimens.



Figures 1–4. *Pipizella barbata* Mortelmans & van Steenis **sp. nov**. **1–3**. Paratype ♂ no 1; **4**. Paratype ♂ no 2. **1**. Adult, lateral view; **2**. Adult, dorsal view; **3**. Head, dorsal view; **4**. Mesofemur, dorso-lateral view. Scale bar 1.0 mm.

Etymology. The species has an extraordinarily dense tuft of setae-like pile on the apico-posterior margin of the mesofemur, resembling a beard, thus the specific epithet "barbata", which is to be regarded as an adjective.

Distribution. *Pipizella barbata* Mortelmans & van Steenis **sp. nov**. is known from its type localities in Azerbaijan and Iran (Fig. 34).

Remarks. The new species is implemented in the key provided by van Steenis & Lucas (2011) and given below.

Pipizella bayburtica Claussen & Hayat, 1997

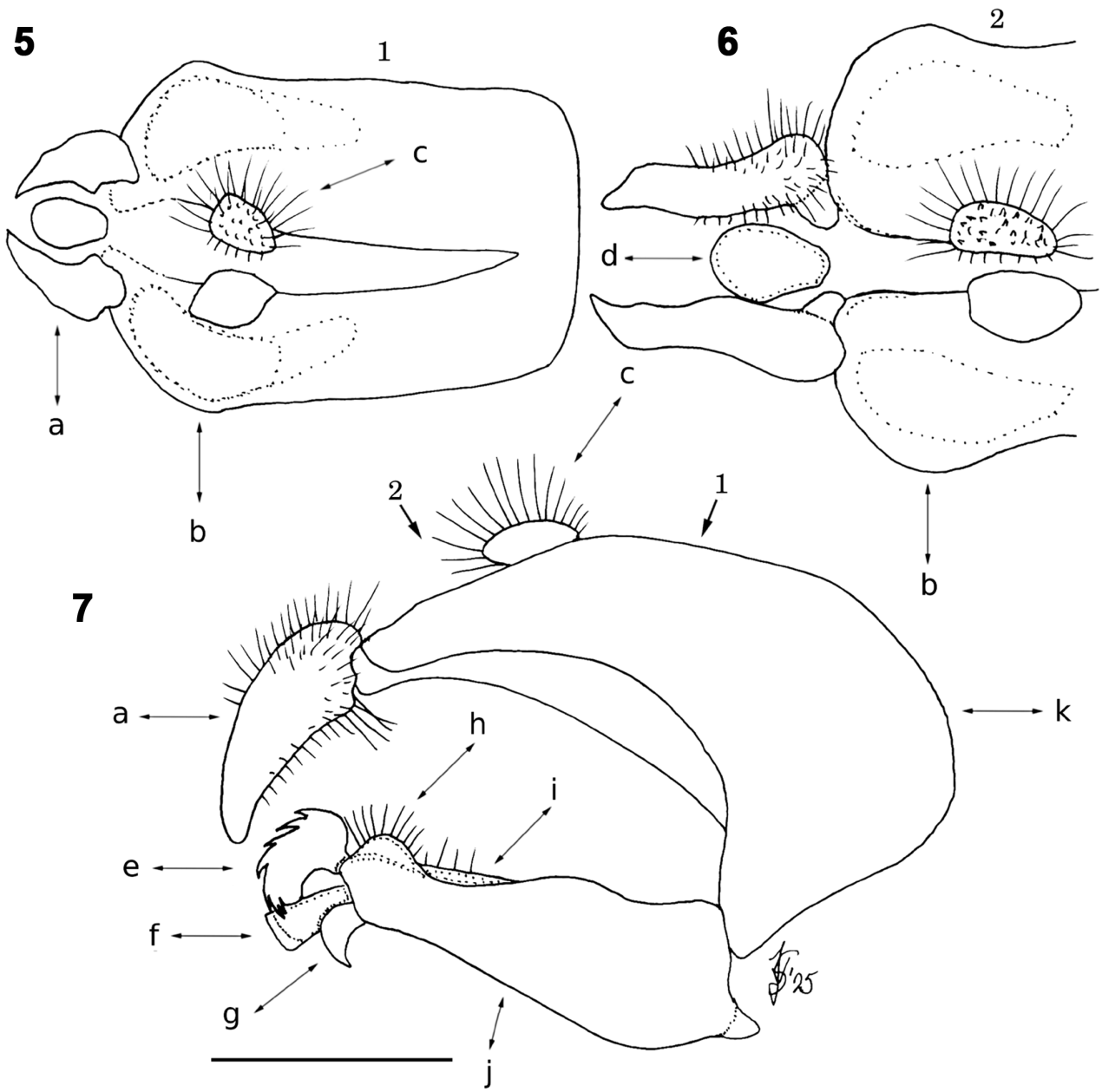
Figs 20, 21, 34

Pipizella bayburtica Claussen & Hayat, 1997:448.
Pipizella bayburtica: van Steenis & Lucas 2011.

Material examined. **Iran** (**New record**): Fars prov., 41 km N. W. of Sepidan, Komehr, 2000 m, 17. vi,1973, Czechoslovak-Iranian entomological expeditions to Iran, 1♂ (HMIM).

Distribution (Fig. 34). Further only known from Turkey (van Steenis & Lucas 2011).

Remarks. This species can be easily confused with *Pipizella caucasica*, *P. kuznetzovi,* or *P. orientalis* based on the extensively yellow legs and the general outline of the terminalia. The terminalia of this newly recorded specimen have been checked by the first author.



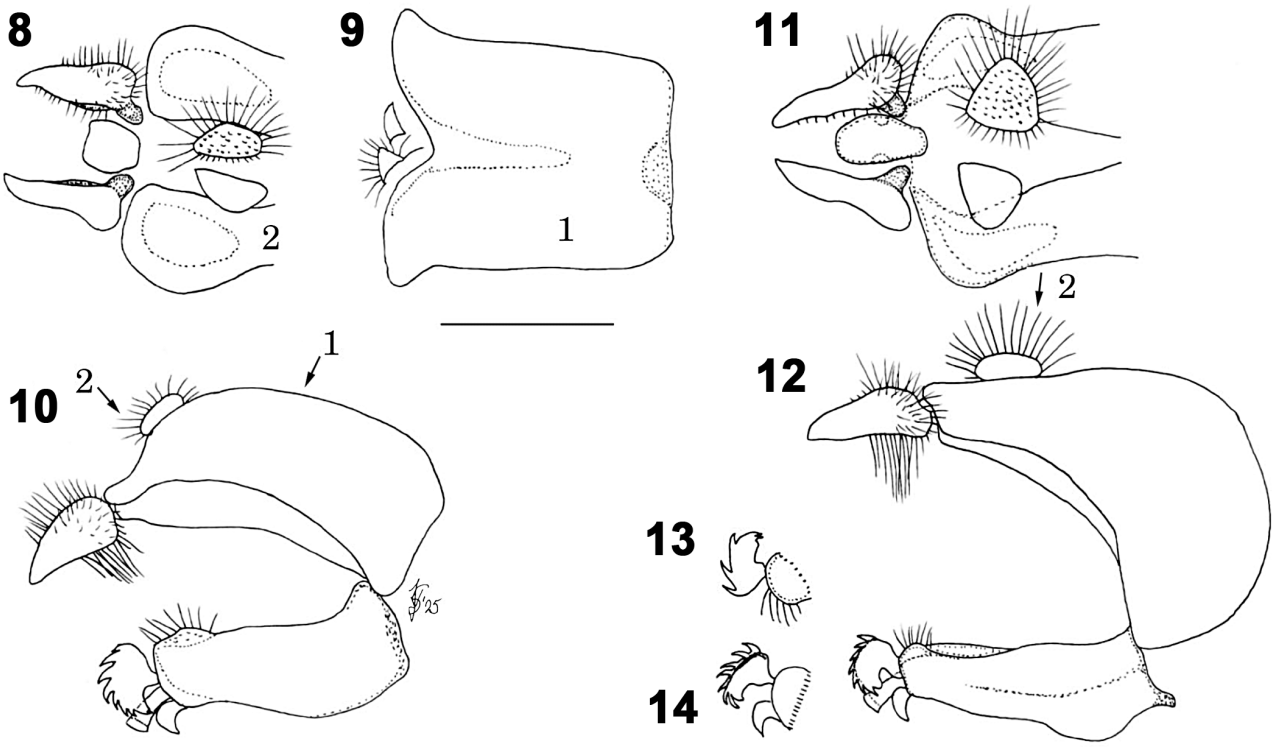
Figures 5–7. Terminalia *Pipizella barbata* Mortelmans & van Steenis **sp. nov**. holotype ♂. **5**. Epandrium "1", dorsal view. **6**. Epandrium apical part "2", dorsal view. **7**. Terminalia, lateral view. Scale bar 0.5 mm. **Legend. a**: surstylus, **b:** epandrial shoulders (very weak), **c:** cercus, **d:** post-anal hood, **e:** postgonite, **f:** phallus, **g:** ventral postgonite, **h:** hypandrial process, **i:** hypandrial lamina, **j:** hypandrium, **k:** epandrium.

Pipizella caucasica Skufjin, 1976

Figs 28, 29, 34

Pipizella caucasica Skufjin, 1976:932.
Pipizella caucasica: Claussen & Hayat 1997; Khaghaninia et al. 2010; van Steenis & Lucas 2011; Barkalov & Mutin 2018.

Material examined. **Iran**: Ardabil prov., Sabalan, Ghotur suei, 2300 m, 28.vi.1985, leg., H. Mirzayans/ A. Pazuki, 1♂, (HMIM); Alborz prov., Karaj, Azadbar, 2400 m, 7.v.1995, leg. A. Sarafrazi/ M. Badii/ R. E. Linnavuori, 1♂, (HMIM); all records from Gilasian (2004); Mazandaran Province (close to Caspian sea), Kandovan Road, 2600 m, 3.vii.1995, 1♂, leg Gilasian (HMIM).



Figures 8–14. Male terminalia. **8–10**. *Pipizella divicoi*. **11–14**. *P. pennina*. **8, 11.** Epandrium, latero-dorsal view, see number and arrow 2; **9.** Epandrium dorsal view, see number 1; **10, 12.** Lateral view, see number and arrow 1 and 2; **13.** Hypandrium, left apical part, lateral view; **14.** Hypandrium, right apical part, lateral view. Scale bar 0.5 mm.

Distribution (Fig. 34). Known from several localities in Iran: Zunuz, in northeastern of East Azerbaijan province, Iran, is located at 38°07'–38°56'N; 45°15'–45°50'E with varying latitude from 1650 m to 2300 m. Further known from Georgia, Russia (both Caucasus), and Turkey (van Steenis & Lucas 2011).

Remarks. This species is very similar to *Pipizella kuznetzovi* and might otherwise be misidentified as *P. orientalis*. All the above-mentioned specimens have been checked by the first author.

Pipizella curvitibia Stackelberg, 1960

Pipizella curvitibia Stackelberg, 1960:438.
Pipizella curvitibia: van Steenis & Lucas 2011; Hoseini & Khaghaninia 2015.

Figs 23, 24, 34

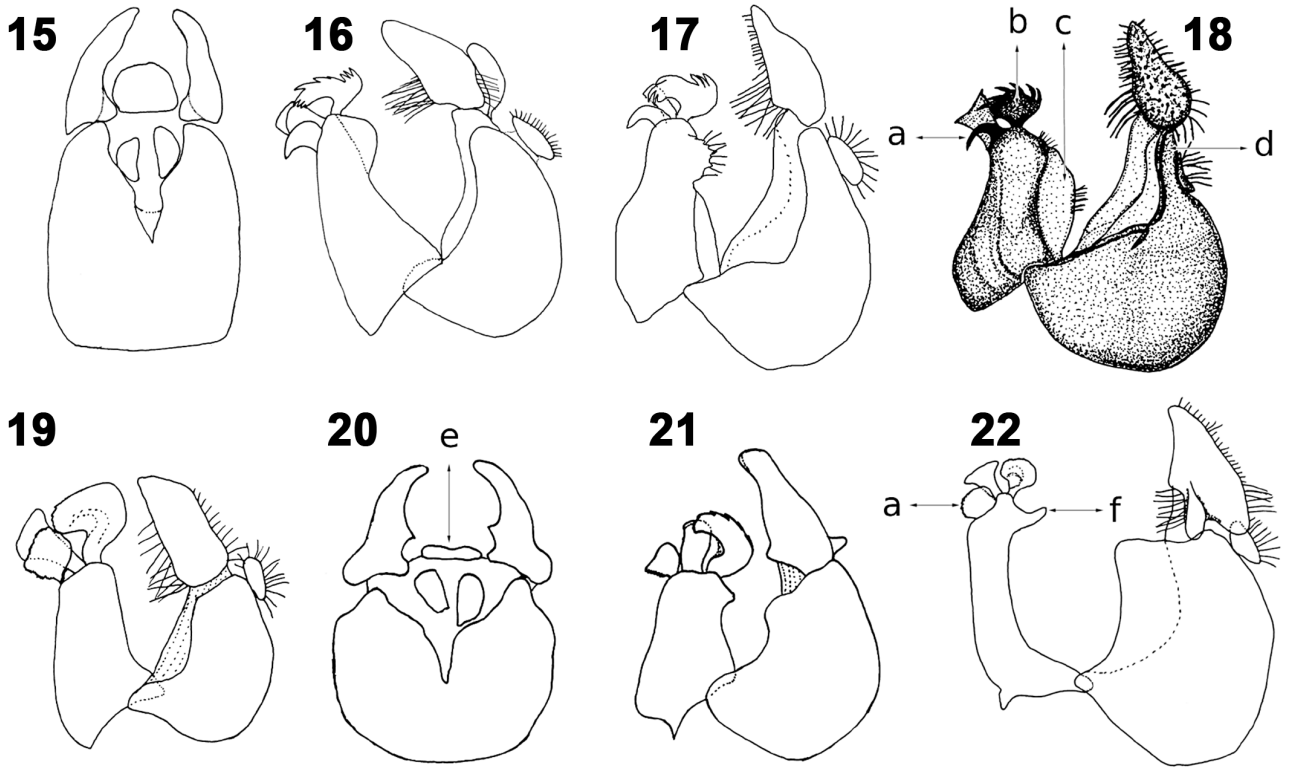
Distribution (Fig. 34). Hoseini & Khaghaninia (2015) recorded this species for the first time from Iran based on 2♂, det. J. van Steenis. This species is further known from Azerbaijan, Georgia, and Turkey (van Steenis & Lucas 2011).

Remarks. Easily identified species based on the large overall size, the extensively yellow legs with strongly modified mesotibia and mesobasitarsomere in both the male and the female. The identification of this species has been confirmed based on the figures provided by Hoseini & Khaghaninia (2015).

Pipizella divicoi (Goeldlin, 1974)

Heringia divicoi Goeldlin, 1974:238.
Pipizella absurdens Lucas, 1976:8 syn.
Pipizella opaca Violovitsh, 1981:76 syn.
Pipizella divicoi (Goeldlin, 1974): Lucas 1976.
Pipizella divicoi: Kuznetzov 1987; van Steenis & Lucas 2011; Grković 2021a; Barkalov & Mutin 2018.

Figs 8–10, 34



Figures 15–22. Male terminalia. **15, 16.** *Pipizella nataliae*. **15.** Epandrium, dorsal view; **16.** Epandrium, lateral view; **17.** *P. vandergooti*; **18.** *P. viduata*, lateral view; **19**. *P. antennata*, lateral view; **20, 21.** *P. bayburtica*; **20.** Epandrium, dorsal view; **21.** Epandrium, lateral view; **22.** *P. orientalis*, lateral view; **Legend.** a: ventral postgonite, **b:** postgonite, **c:** hypandrial flange, **d:** epandrial arm, **e:** post-anal hood, **f:** hypandrial process. After van Steenis & Lucas (2011).

Material examined. East Azerbaijan prov., Kaleybar, Oskolu, 1600 m., 22.v.2004, leg., E. Gilasian, 1♂ (HMIM).

Distribution (Fig. 34). Widespread in the Palaearctic region and also known from Iran.

In the following literature records from Iran are given: Khaghaninia et al. (2010); Naderloo et al. (2011); Hoseini & Khaghaninia (2015); Arbabi (2017).

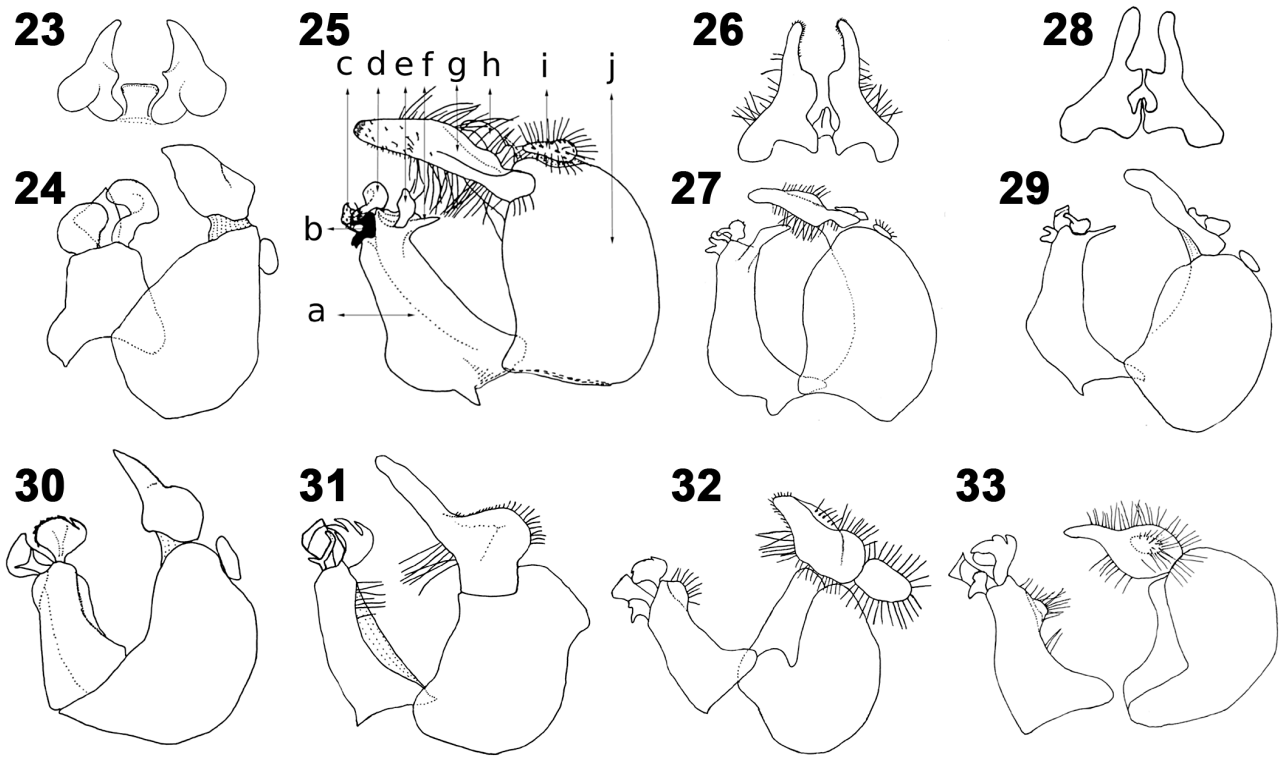
Remarks. A widespread species, similar to many of the darker-legged species, and separated by the features provided in the key. Photos of most of the specimens mentioned in the literature (see distribution) of the terminalia and mesofemur sent to the first author by Dr. Khaghaninia (Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran) were examined, but hardly any of these records could be validated here. It might be possible that some specimens belong to *Pipizella barbata* Mortelmans & van Steenis **sp. nov.**, but these are not identified as such. So all literature records are treated as *P. divicoi* for now and are shown on the map (Fig. 34).

Pipizella maculipennis Meigen, 1822

Fig. 32

Pipiza maculipennis Meigen, 1822:254.
Pipiza varians Rondani, 1847:343, syn.
Pipizella sibirica Violovitsh, 1981:70, syn.
Pipizella maculipennis: Lucas 1976; Kuznetzov 1987; van Steenis & Lucas 2011; Grković 2021b; Barkalov & Mutin 2018.

Distribution. Khaghaninia & Shakeryari (2012), Shakeryari (2012), Vosughian (2013) and Mohammadzadeh (2017) mention this species from several localities in Iran. Its distribution encompasses Southern Europe, Afghanistan, Kazakhstan, Russia, and Turkey (van Steenis & Lucas 2011).



Figures 23–33. Male terminalia. **23, 24.** *P. curvitibia*; **23.** Surstylus, dorsal view; **24.** Surstylus, lateral view; **25.** *Pipizella ochreobasalis*, lateral view; **26, 27.** *P. kuznetzovi*; **26.** Surstylus, dorsal view; **27**. Surstylus, lateral view; **28, 29.** *P. caucasica*; **28.** Surstylus, dorsal view; **29**. Surstylus, lateral view; **30.** *P. virens*, lateral view; **31.** *P. cornuta*, lateral view; **32.** *P. maculipennis*, lateral view; **33.** *P. mongolorum*, lateral view; **Legend. a:** epandrium, **b:** ventral postgonites, **c:** phallus, **d:** postgonites, **e:** appendix of hypandrial process, **f:** hypandrial process, **g:** surstylus, **h:** post-anal hood, **i:** cercus, **j:** hypandrium. After van Steenis & Lucas (2011).

Remarks. The Iranian specimens have not been verified; however, the occurrence here is possible given the known distribution. The records are not incorporated in the map, and the presence in Iran needs to be verified.

Pipizella mongolorum Stackelberg, 1952

Fig. 33

Pipizella mongolorum Stackelberg, 1952:350.
Pipizella mongolorum: van Steenis & Lucas 2011; Grković 2021c; Barkalov & Mutin 2018.

Distribution. Shakeryari (2012) mentions this species from Iran. It is known from alpine areas in central Europe, from Mongolia, and from central and eastern Russia (van Steenis & Lucas 2011).

Remarks. This species is very similar to *Pipizella maculipennis,* and the Iranian specimen of *P. mongolorum* might be misidentified and thus not incorporated in the map. The presence in Iran needs to be verified. It is listed as Endangered on the IUCN Red List of European Hoverflies (Grković, 2021c).

Pipizella ochreobasalis van Steenis & Lucas, 2011

Figs 25, 34

Pipizella ochreobasalis van Steenis & Lucas, 2011:132.

Material examined. 1♂, Iran, Alborz prov., 1 km N of Jazan, 36°11'2.3994"N, 50°47'38.3994"E, 29.IV.2016, leg. J. Mortelmans (FMT).

Distribution (Fig. 34). One previous record known from Iran and further known from Georgia and Turkey (van Steenis & Lucas 2011).

Remarks. The coordinates, given in van Steenis & Lucas (2011) of the locality where Brandt collected many Diptera, are not correct; the place is roughly 40 km to the northwest at 30°9'1.8"N, 51°36'27"E, a site characterized by numerous springs and lush vegetation.

Pipizella orientalis van Steenis & Lucas, 2011

Figs 22, 34

Pipizella orientalis van Steenis & Lucas, 2011:134.
Pipizella orientalis: Mengual et al. 2020.

Material examined. **Iran (New record)**: Tehran prov., Tehran, Shemshak, 2700 m, 12.viii.1981, leg., Hashemi, 1♂ (HMIM); **Azerbaijan (New record)**: Astava district, Sim 38°29'25.0182"N, 48°35'39.1554"E 1403 m, 12 May 2025, hand net, leg. X. Mengual, 1♂ (ZFMK).

Distribution (Fig. 34). Previously only known from Georgia and Turkey (van Steenis & Lucas 2011; Mengual et al. 2020).

Remarks. Arbabi (2017) reported *Pipizella annulata* from Iran; the specimen was likely misidentified and probably belongs to *P. orientalis*.

Pipizella viduata (Linnaeus, 1758)

Fig. 18

Musca viduata Linnaeus, 1758:598
Pipiza campestris Fallén, 1817:59, syn.
Pipiza varipes Meigen, 1822:254 syn.
Pipiza melancholica Meigen, 1822:251 syn.
Pipiza obscuripennis Meigen, 1835:119 syn.
Pipiza tristis Meigen, 1838:119 syn.
Paragus nigritis Glimmerthal, 1842:668 syn.
Paragus fuscipennis Walker, 1849:545 syn.
Pipizella montana Šimić, 1987:121 syn.
Pipizella nigra Šimić, 1987:122 syn.
Pipizella varipes: Lucas, 1976.
Pipizella viduata: Thompson et al. 1982; Kuznetzov 1987; Verlinden 1999; van Steenis & Lucas 2011; Grković 2021d; Barkalov & Mutin 2018.

Distribution. Khaghaninia & Shakeryari (2012), Shakeryari (2012), Vosughian (2013), and Mohammadzadeh (2017) mention this species from several localities in Iran. It is widespread throughout Europe and further known from Algeria and Siberia (van Steenis & Lucas 2011).

Remarks. The identity of the Iranian specimens has not been validated, and other species are likely involved. The records are not incorporated in the map, and the presence in Iran needs to be verified.

Pipizella virens (Fabricius, 1805)

Fig. 30

Mulio virens Fabricius, 1805:186.
Pipiza interrupta Haliday, 1833:165 syn.
Pipiza morosa Loew, 1840:29 syn.
Pipizella virens: Lucas 1976; van Steenis & Lucas 2011; Grković 2021e; Barkalov & Mutin 2018; Mengual et al. 2020.

Distribution. Amirimoghadam & Sirjani (2004), Shakeryari (2012), Vosughian (2013), Shojaei Hesari et al. (2015), and Mohammadzadeh (2017) mention this species from several localities in Iran. It is known from Europe, with one record from North-East Turkey (van Steenis & Lucas 2011).

Remarks. Many of the records from Peck (1988) are almost certainly based on other species, as in early days, *P. virens* was the only species recognized within the genus *Pipizella,* and in many cases in concerns *P. viduata*. The more recent Iranian records might belong to this species. It is not incorporated in the map, and the presence in Iran needs to be verified.

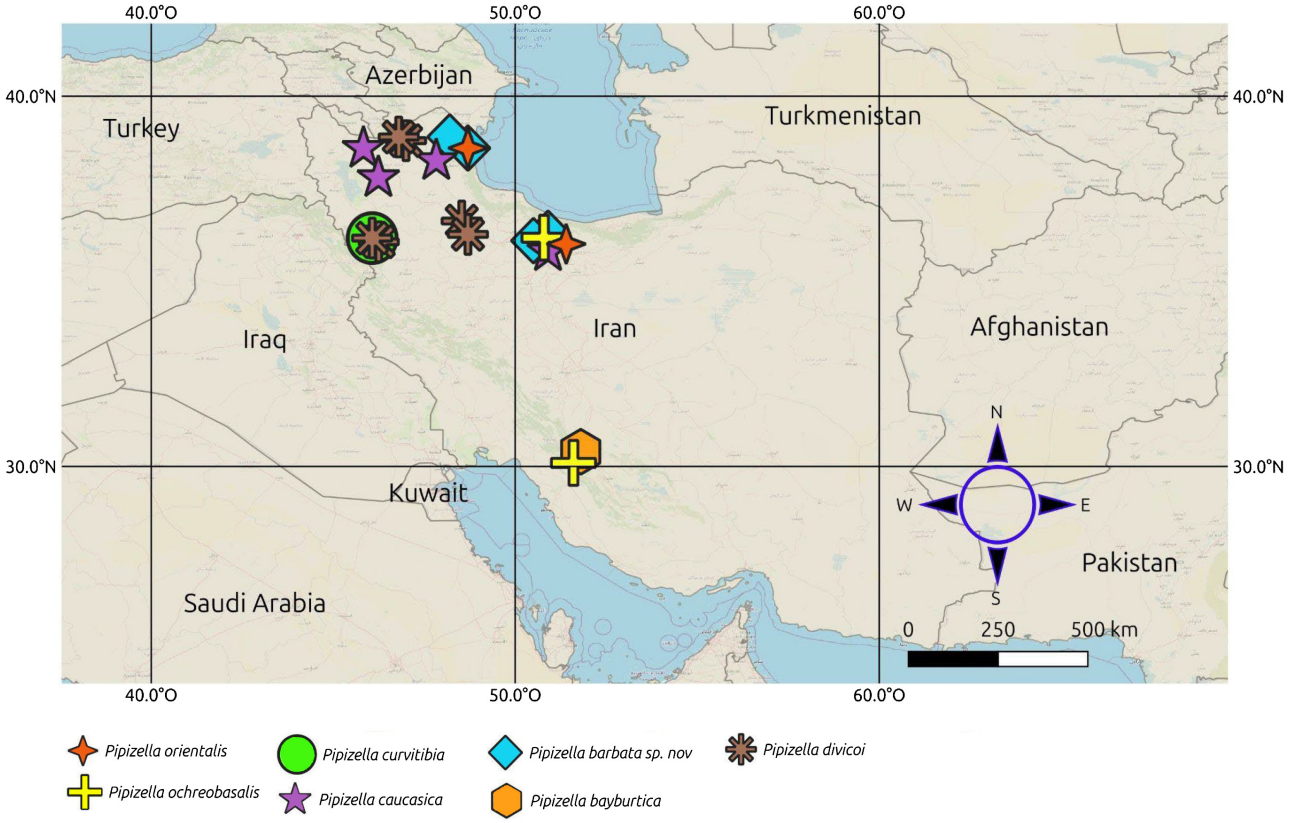


Figure 34. Distribution of *Pipizella barbata* Mortelmans & van Steenis **sp. nov**. and the other *Pipizella* species recorded in Iran and Azerbaijan.

Key to the male *Pipizella* species from Iran and neighbouring countries.

1 Ventral postgonite hook-shaped (e.g., Figs 7, 10, 12, 16–18). **2**

– Ventral postgonite otherwise (e.g., Figs 19, 21, 22, 30–33). **6**

2 Epandrium with shoulders (Figs 5, 6, 8, 9), without arms. **3**

– Epandrium without shoulders (e.g., Figs 15, 20), epandrial arms can be present (Figs 17, 18). **4**

3 Epandrium with wide shoulders; surstylus small, triangular, slightly irregular shaped; cerci elongate (Figs 8–10); eye contiguity long (1:2.0–2.5); mesofemur with yellow pile only. ..... ***P. divicoi*** (Goeldlin)

– Epandrium with very weak shoulders; surstylus more elongate and regular in shape; cerci of an irregular triangular shape (Figs 5–7); eye contiguity very long (1:1.6); mesofemur apically on postero-ventral surface with a row of yellow setae ending apically in a dense tuft of black setae (Fig. 4). ..... ***P. barbata*** **Mortelmans & van Steenis sp. nov.**

4 Hypandrium without flange (Fig. 16); epandrial arms missing (Figs 15, 16); epandrium relatively small, about the same size as the hypandrium, in dorsal view squarish (Fig. 15); postpedicel short, 1.7 times longer than wide; eye contiguity very short (1:5.0). ..... ***P. nataliae*** **Kuznetzov**

– Hypandrium with flange and epandrial arms present (Figs 17, 18); postpedicel 2.0–2.5 times longer than wide; eye contiguity 1: 2.3–3.2. ..... **5**

5 Hypandrial flange widest at base and confined to the basal half of the hypandrium and hypandrium with narrow base, almost straight (Fig. 17); metatibia with long setae, 1.8 times longer than width of tibia. ..... ***P. vandergooti*** **van Steenis & Lucas**

– Hypandrial flange widest in medial part and extending beyond the basal half of the hypandrium and hypandrium with wide base, medially much narrower (Fig. 18); metatibia with shorter setae, 1.3–1.5 times longer than width of tibia. ..... ***P. viduata*** **(Linnaeus)**

6 Ventral postgonite squarish to rectangular-shaped (Figs 19, 21, 22). **7**

– Ventral postgonite otherwise (Figs 24, 25, 27, 29, 30–33). **9**

7 Hypandrium with elongate apico-dorsal process and epandrium very wide, upper-medial corner angled (Fig. 22). ..... ***P. orientalis* van Steenis & Lucas**

– Hypandrium with short, wide, triangular apico-dorsal process (Fig. 21), or without upper process (Fig. 19). **8**

8 Post-anal hood a narrow plate, hardly visible in dorsal view (Fig. 20), hypandrium with short, wide, triangular apico-dorsal process (Fig. 21); pro- and mesotarsi with first and last tarsomeres yellow; postpedicel long, 2.2–2.6 times longer than wide. ..... ***P. bayburtica* Claussen & Hayat**

– Post-anal hood a wide plate, hypandrium without dorsal process (Fig. 19); pro- and mesotarsi never with last tarsomere yellow; postpedicel very long, 3.5–3.7 times longer than wide. .....*P. antennata* Violovitsh

9 Ventral postgonite circular and hypandrium very wide, base at least as wide as entire length of hypandrium (Fig. 16); mesoleg (in both sexes) with club-like tibia and elongate basitarsus. ..... ***P. curvitibia* Stackelberg**

– Ventral postgonite otherwise and hypandrium more elongate (Figs 27, 29–33); mesoleg without modifications. **10**

10 Ventral postgonite shaped as a bifurcate plate (Figs 25, 27, 29–31); upper hypandrial process hardly visible (Figs 30, 31), or with long elongate process (Figs 25, 27, 29). **11**

– Ventral postgonite otherwise and upper hypandrial process semi-circular (Figs 32, 33). **15**

11 Epandrium with baso-lateral hump; hypandrium with elongate upper process and surstylus in lateral view elongate and curved (Figs 25, 27, 29). **12**

– Epandrium without baso-lateral hump; hypandrium without apico-dorsal process and surstylus in lateral view, widest at base, tapering toward apex (Figs 30, 31). **14**

12 Epandrium very large; hypandrium broad, widest at base; upper hypandrial process with large, oval appendage (Fig. 25); postpedicel long, 2.6–2.9 times longer than wide; wing base extensively yellow..... ***P. ochreobasalis* van Steenis & Lucas**

– Epandrium smaller; hypandrium narrow, widest at a third from base; upper hypandrial process with at most an inconspicuous hump (Figs 27, 29); postpedicel moderately long, 2.0-2.5 times longer than wide; wing base at most slightly yellow. **13**

13 Arista with at least basal three quarters yellow; basitarsus of pro- and mesotarsi yellow, sometimes second tarsomere of mesotarsus yellow; surstylus, in lateral view, widest at medial part of its length (Fig. 27); hypandrial process straight; postgonite club-like, with shaft narrow and toothed at base, and with wide apex; eye contiguity short (1:2.4–2.9). ..... ***P. kuznetzovi* van Steenis & Lucas**

– Arista entirely dark-brown to black; at most basitarsus of mesotarsus yellow; surstylus in lateral view almost parallel-sided (Fig. 29); eye contiguity very short (1:2.9–4.1). ..... ***P. caucasica* Skufjin**

14 Postgonite cockscomb-shaped, with one large tooth and several small ones; ventral postgonite T-shaped; surstylus, in lateral view, wide at base, gradually tapering towards apex (Fig. 30); postanal hood rectangular; tergum IV long, 1.4–1.7 times longer than sternum IV. ..... ***P. virens* (Fabricius)**

– Postgonite cockscomb-shaped, with four large teeth; ventral postgonite very widely bifurcate; surstylus, in lateral view, very wide at base, heavily constricted in the basal half and with the apical part elongate (Fig. 31); post-anal hood sharply triangular; tergum IV very long, 2.0–2.1 times longer than sternum IV. ..... ***P. cornuta* Kuznetzov**

15 Ventral postgonite songbird-head shaped; postgonite with one large and four smaller teeth (Fig. 32); post-anal hood widely triangular; eye contiguity very long (1:1.6–2.0); postpedicel long, 2.5–3.0 times longer than wide; terga III & IV with predominantly black hairs. ..... ***P. maculipennis* (Meigen)**

– Ventral postgonite hammer-shaped; postgonite with one large tooth (Fig. 33); postanal hood small, semi-circular; eyes not touching; postpedicel short, 1.5–1.7 times longer than wide; terga III & IV with predominantly (golden) yellow hairs. ..... ***P. mongolorum* Stackelberg**

DISCUSSION

The present study contributes to the understanding of the fauna of the family Syrphidae in Iran, particularly within the genus *Pipizella*. Through field expeditions and the analysis of specimens housed at the Hayk Mirzayans Insect Museum, seven species of the genus *Pipizella* were studied. Among them, one species was identified as new to science, while two species were documented for the first time in Iran. These discoveries underscore the richness of Iran's hoverfly fauna. Iran, with its vast geographical area and varied climate zones (Najafi & Alizadeh 2023), offers an array of diverse habitats that support a wide range of insect species. The climatic diversity, which includes temperate, arid, and mountainous regions, creates favorable conditions for a unique hoverfly diversity, which plays essential ecological roles in pollination and as biological control agents. The presence of regionally endemic *Pipizella* species in various parts of Iran, especially in some major mountain ranges, including the Hyrcanian ice age refuge in the Alborz mountains, further emphasizes the significance of this region as a critical area for entomological research, particularly for species that may be endemic or yet undiscovered.

Before this study, nine species of *Pipizella* had been recorded from Iran (Dousti 2023). The identification of *Pipizella* still is challenging despite the revision of van Steenis & Lucas (2011). This is especially true without a good reference collection with specimens identified by a specialist in this genus. Some literature references are most likely based on misidentifications. In order to know the correct number of *Pipizella* species recorded in Iran, it is necessary to study all published records. Unfortunately, it has not been possible to study all the material published. At present, four of the nine mentioned species have been confirmed here. Two species (*Pipizella mongolorum* and *P. viduata*) of the five not confirmed species may not occur in Iran at all, while two others (*P. maculipennis* and *P. virens*) might occur in Iran. One other species, *Pipizella annulata*, is unlikely to be an Iranian species, and most likely concerns *P. orientalis,* which replaces *P. annulata* in the Transcaucasus and Iran (see van Steenis & Lucas 2011). The removal of *Pipizella annulata* and the identification of another three species, including one new to science, increases the total number of identified *Pipizella* species in Iran to seven. This finding not only expands the taxonomic knowledge of this genus in the region but also contributes to a broader understanding of hoverfly diversity in Iran. Given the presence of additional species incorporated in the key, in neighbouring countries such as Georgia, Russia, Tajikistan, and Turkey, it is likely some of these species will occur within Iran's borders. The discovery of new species and the extension of known distributions further emphasize the importance of continued entomological surveys in Iran. Given the ecological significance of hoverflies (Rotheray & Gilbert 2011) and the worldwide awareness of pollinator decline (Hallman et al. 2021; Vujić et al. 2022; Zeegers et al. 2024), it is crucial to document the species diversity and their roles within local ecosystems. Future studies focusing on the distribution, ecology, and behavior of *Pipizella* and other Syrphidae species will provide valuable insights into the biodiversity of Iran and potentially offer new avenues for conservation efforts and pest management strategies.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: J. van Steenis finalized the entire text, the description, and made the figures; E. Gilasian provided specimens and wrote part of the text; S. Mohamadzade Namin helped J. Mortelmans with fieldwork and reviewed the text; J. Mortelmans provided the material of the undescribed species and part of its description and made the draft version of the text. The authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The list of the museum and collections, where the specimens are deposited are listed in the section Materials and Methods. The specimens are available from the curator upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

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بازبینی گونه‌های جنس *Pipizella* Rondani, 1856 (Diptera, Syrphidae) در ایران و توصیف یک گونهٔ جدید از ایران و آذربایجان

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چکیـده: گونه‌های جنس *Pipizella* Rondani, 1856 در ایران مرور شدند. در این بررسی گزارش حضور سه گونه شامل *Pipizella baybaurtica* Claussen & Hayat, 1997، *P. ochreobasalis* van Steenis & Lucas 2011 و *P. orientalis* van Steenis & Lucas 2011 برای اولین بار ارایه شد. یک گونهٔ جدید به نام *Pipizella barbata* Mortelmans & van Steenis **sp. nov.** بر اساس نمونه‌های مرجع جمع‌آوری شده از ایران و کشور آذربایجان توصیف شد. در مجموع، حضور نُه گونه در ایران مشخص شد، اما در مورد برخی گونه‌ها که ابهاماتی در تشخیص آن‌ها وجود دارد، نمونه‌ای برای بررسی در دسترس نبود. بنابراین تعداد دقیق گونه‌های متعلق به جنس در ایران *Pipizella* نامشخص است، اما تعداد هفت مورد از آنها در این تحقیق محرز شدند. تصاویر گونه جدید و ترسیم بخش انتهایی بدن حشره نر، به همراه کلید شناسایی گونه‌های شناخته شده از ایران ارایه شد. در نهایت، فون ایران به لحاظ پیش‌بینی تعداد گونه‌های موجود از جنس *Pipizella* مورد بحث قرار گرفت.

واژگـان کلیدی: دنیای قدیم، مگس‌های گل، تاکسونومی، گونهٔ جدید، کلید شناسایی