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Research Article

Faunistic study of bee flies (Dip.: Bombyliidae) in some parts of northern west of Iran

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Abstact

The Bombyliidae family, commonly known as bee flies, is among the most species-rich families within Diptera. Despite their ecological importance as pollinators and parasitoids, their regional biodiversity remains poorly documented. This study presents new faunistic record of Bombyliidae from northern west of Iran. Field collections were conducted in May and July of 2021 and 2022, supplemented by the examination of archived specimens collected between 2006 and 2021. In total, 12 species were identified, which belonged to eight genera and five subfamilies: *Thyridanthrax perspicillaris*; *T. elegans*; *Bombylella atra*; *Phthiria gaedei*; *P. vagans*; *Chalcochiton holosericeus*; *C. pallasi*; *Lomatia abbreviate*; *Heteralonia* megerlei; *Hemipenthes velutina*; *Exoprosopa altaica* and *E. pandora*. Notably, the species *E. pandora* is recorded for the first time in Iran. These findings contribute to a recognition of Bombyliidae diversity in the region and provide essential baseline data for future ecological and taxonomic studies.

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Introduction

The family Bombyliidae, commonly known as bee flies, is a particularly diverse family of Diptera, including more than 5380 species (Roberts & ElHawagry 2024). These flies predominantly inhabit in arid and semi-arid regions across the globe (ElHawagry *et al.* 2022). Adult Bombyliidae are distinguished by dense body pilosity and coloration that mimics bees—an effective defensive strategy against predators. Their elongated proboscis is specialized for feeding on floral nectar and pollen, positioning some species as key pollinators in desert ecosystems (Greathead & Evenhuis 1999). Larvae of this family act as predators or parasitoids of various insect orders, including Coleoptera, Lepidoptera, Hymenoptera and Diptera (Yao *et al.* 2023). The first record of Bombyliidae in Iran dates back to the Becker's work in 1912, with reporting 44 species—24 of them were new to science. Since then, over 250 species have been reported from the country (Greathead & Evenhuis 1999; Greathead 2001; Hakimian *et al.* 2012; Moghbeli *et al.* 2021). According to their ecological importance, documenting the faunal composition of Bombyliidae in Iran is essential for both biodiversity assessment and biological control efforts. The present study aimed to identify and document the bee fly fauna in northern west of Iran, providing a foundation for their potential use in plant pest biological control programs.

Materials and Methods

This study was conducted in several locations in northern west of Iran. These regions exhibit diverse ecological conditions, providing suitable habitats for various Bombyliidae species. Geographical coordinates of each sampling areas were recorded using a Garmin Etrex HCX GPS device to ensure precise localization. Adult bee flies were collected during the peak of their activity, from early May to late July, in both 2021 and 2022, using a combination of active and passive sampling techniques. Active sampling involved random sweep netting over vegetation in cereal fields, meadows, and grasslands, while passive sampling was performed using Malaise traps strategically placed to intercept flying insects. Following collection, specimens were immobilized in cyanide jars to preserve key morphological features for accurate identification. For long-term storage, specimens were preserved in 75% ethanol with a small quantity of glycerin to prevent desiccation. Specimens were examined under a Nikon SMZ 1000 stereomicroscope and identified based on key morphological characteristics—including antenna structure, thoracic features, wing venation and genitalia—using established entomological keys (Evenhuis & Greathead 1999; ElHawagry & Evenhuis 2008). High-resolution diagnostic images were captured using a Nikon FI3 camera mounted on a Nikon D800 stereomicroscope to document distinguishing features. All examined specimens were deposited in the Insect Collection of Professor Hasan Maleki Milani (ICHMM), University of Tarbriz, Iran, serving as a permanent reference for future taxonomic and ecological studies.

Results

A total of 12 species of Bombyliidae, representing eight genera across five subfamilies, were identified during the present study. Remarkably, *Exoprosopa pandora* (Fabricius 1805) is recorded for the first time in Iran, expanding the known distribution of this species. The identified species are systematically arranged below by subfamilies and genera.

Subfamily: Anthraciinae
Genus: *Exoprosopa* Macquart, 1840
Exoprosopa altaica Paramonovss, 1925
Material examined: Iran, East Azerbaijan, Miyaneh, Dave-Dashi, 37° 38' 14" N, 47° 59' 09" E, 1,924.9 m, 31.v.2021, 1♀ 2♂♂; leg.Y.Sadeghi.
*Distribution***:** Chad; Gambia; Mauritania; Niger; Nigeria; Pakistan; Senegal; Sudan; Yemen (Greathead & Evenhuis 1999); Iran (Hakimian *et al.* 2014).
Remarks: New record for East Azerbaijan province.

Exoprosopa pandora Fabricius, 1805 (Fig. 1)

Material examined: Iran, East Azerbaijan, Miyaneh, Dave-Dashi, 37° 38' 14" N, 47° 59' 09" E, 1,924.9 m, 31.v.2021, 1♀ 2♂♂; leg.Y.Sadeghi.
Diagnostic characters: Antennae long and slender (Fig. 1D); wings delicate and translucent, typically with intricate patterns and dark and light lines (Fig. 1C); body relatively small and slender, with the abdomen covered in fine, soft hairs (Fig. 1A); general body coloration dark with contrasting lighter patches and spotted markings (Fig. 1B).
Distribution: Algeria; Croatia; Egypt; France; Greece; Italy; Israel (occupied Palestine); Libya; Macedonia; Morocco; Slovenia; Türkiye; Yugoslavia (Yeates 2002).
Remarks: New record for Iran.

Genus: Hemipenthes Loew, 1869
Hemipenthes velutina Wiedeman, 1818
Material examined: Iran, East Azerbaijan, Miyaneh, Dave-Dashi, 37° 38' 14" N, 47° 59' 09" E, 1,924.9 m, 31.v.2021, 1♀; leg.Y.Sadeghi.
Distribution: France; Pakistan (Greathead & Evenhuis 1999); Iran (Karimpour 2012).

Genus: Heteralonia Rondani, 1863
Heteralonia megerlei Meigen, 1820
Material examined: Iran, East Azerbaijan, Khodafarin, Khomarlu, 39°09'35"N, 47°01'56"E, 306.39 m, 31.v.2013, 3♂; leg. S. Khaghaninia.
Distribution: Armenia; Azerbaijan; Iran; Tajikistan; Uzbekistan; Kyrgyzstan (Greathead & Evenhuis 1999).
Remarks: New record for East Azerbaijan province.

Genus: Thyridanthrax Osten Sacken,1886
Thyridanthrax elegans Wiedemann, 1820
Material examined: Iran, East Azerbaijan, Miyaneh, Tejaragh, 37°45'00"N, 47°59'00"E, 1,760.7 m, 21.viii.2021, 1♂; leg. Y. Sadeghi.
Distribution: Armenia; Azerbaijan; Greece; Egypt; France; Israel (occupied Palestine); Italy; Kazakhstan; Libya; Tajikistan; Syria; Türkiye (Greathead & Evenhuis 1999); Iran (Karimpour 2012).

Thyridanthrax perspicillaris Loew, 1869
Material examined: Iran, East Azerbaijan, Miyaneh, Tark, 37° 35' 57" N, 47° 45' 24" E, 1,428.24 m, 04.vi.2021, 1♀; leg.Y.Sadeghi.
Distribution: Canada; France; Germany; Greece; Italy; Spain; Syria; Türkiye (Greathead & Evenhuis 1999); Iran (Karimpour 2012).
Remarks: New record for East Azerbaijan province.

Subfamily: Bombyliinae
Genus: Bombylella Greathead, 1995
Bombylella atra Scoppoli, 1763
Material examined: Iran, East Azerbaijan, Khodafarin, Khomarlu, 39° 09' 35" N, 47° 01' 56" E, 306.39 m, 30.iv.2013, 3♂; Arasbaran, Makidi valley, 38° 50' 51" N, 46° 54' 54" E, 1,426 m, 13.iv.2013, 1♂; West Azerbaijan, Mahabad, Qalat-Shah, 36° 45' 01" N, 45° 46' 20" E, 1,679.72 m, 19.iii.2017, 1♀; Ardabil, Meshkin-Shahr, 38° 19' 15" N, 47° 37' 02" E, 1,646 m a.s.l., 21.iv.2013, 1♀; all leg. S. Khaghaninia
Distribution: Albania; Algeria; Armenia; Azerbaijan; Belarus; Egypt; France; Greece; Iran; Italy; Kazakhstan; Kuwait; Lebanon; Morocco; Poland; Romania; Russia; Saudi Arabia; Spain; Syria; Tajikistan; Türkiye; Turkmenistan; Ukraine; Uzbekistan (Evenhuis & Greathead 2003).

Subfamily: Cythereiinae
Genus: Chalcochiton Loew, 1844
Chalcochiton holosericeus Fabricius, 1794
Material examined: Iran, West Azerbaijan, Urmia, Ghasemlou Valley, 37°17'22"N 45°08'05"E, 1,472 m, 17.vi.2016, 1♂; leg. S. Khaghaninia.
Distribution: Brazil; Colombia; Morocco; Venezuela; Iran (Zaitzev 2008).

Chalcochiton pallasi Loew, 1856
Material examined: Iran, West Azerbaijan, Urmia, Ghasemlou Valley, 37°17'22"N 45°08'05"E, 1,472 m, 17.vi.2016, 1♀; leg. S. Khaghaninia.
Distribution: Armenia; Azerbaijan; Bulgaria; Greece; Gruzia; Italy; Macedonia; Moldova; Morocco; Poland; Romania; Russia; Slovenia; Syria; Tajikistan; Turkmenistan; Ukraine; Uzbekistan; Türkiye (Zaitzev 2008); Iran (Karimpour 2012).

Subfamily: Lomatiinae
Genus: Lomatia Meigen, 1822
Lomatia abbreviate Villeneuve, 1911
Material examined: Iran, Arasbaran, Makidi valley, 38°50.864'N, 46°54.901'E, 1426 m, 13.iv.2013, 1♂; leg. S. Khaghaninia.
Distribution: Algeria; Greece; Israel; Italy; Morocco; Romania; Spain; Syria; Tajikistan; Tunisia; Türkiye; Turkmenistan (Greathead & Evenhuis 1999); Iran (Hakimian *et al.* 2013).

Subfamily: Phthiriinae
Genus: Phthiria Meigen, 1820
Phthiria gaedei Wied, 1820
Material examined: Iran, East Azerbaijan, Kandovan, 37°44.254'N, 46°19.368'E, 3005 m a.s.l., 24.iii.2013, 1♂, 1♀; Kurdistan, Saqez, 36°04.824'N, 45°58.781'E, 1929 m, 09.iv.2013, 1♀; all leg. S. Khaghaninia.

Distribution: Afghanistan; Albania; Algeria; Austria; Belarus, Bulgaria; Egypt; France; Greece; Iran; Italy, Moldova; Morocco; Poland; Romania; Russia (Greathead & Evenhuis 1999).
Remarks: In Iran, the species is commonly distributed across various habitats and is frequently encountered on Asteraceae flowers (Greathead & Evenhuis 1999).

Phthiria vagans Loew, 1846
Material examined: Iran, Ardabil, Meshkinshahr, 38°19.256'N, 47°37.035'E, 1646 m a.s.l., 21.iv.2013, 1♂, 1♀; Kurdistan, Mahabad, Qalat Shah, 36°45'01"N, 45°46'20"E, 1679.72 m, 19.iii.2017, 1♂; all leg. S. Khaghaninia.
Distribution: Armenia; Azerbaijan; France; Greece; Iran; Italy; Spain; Tajikistan; Türkiye (Greathead & Evenhuis 1999).
Remarks: Larvae of *Phthiria* spp. are known as parasitoids on the Lepidopteran families; Gelechiidae and Tortricidae (ElHawagry *et al.* 2022).

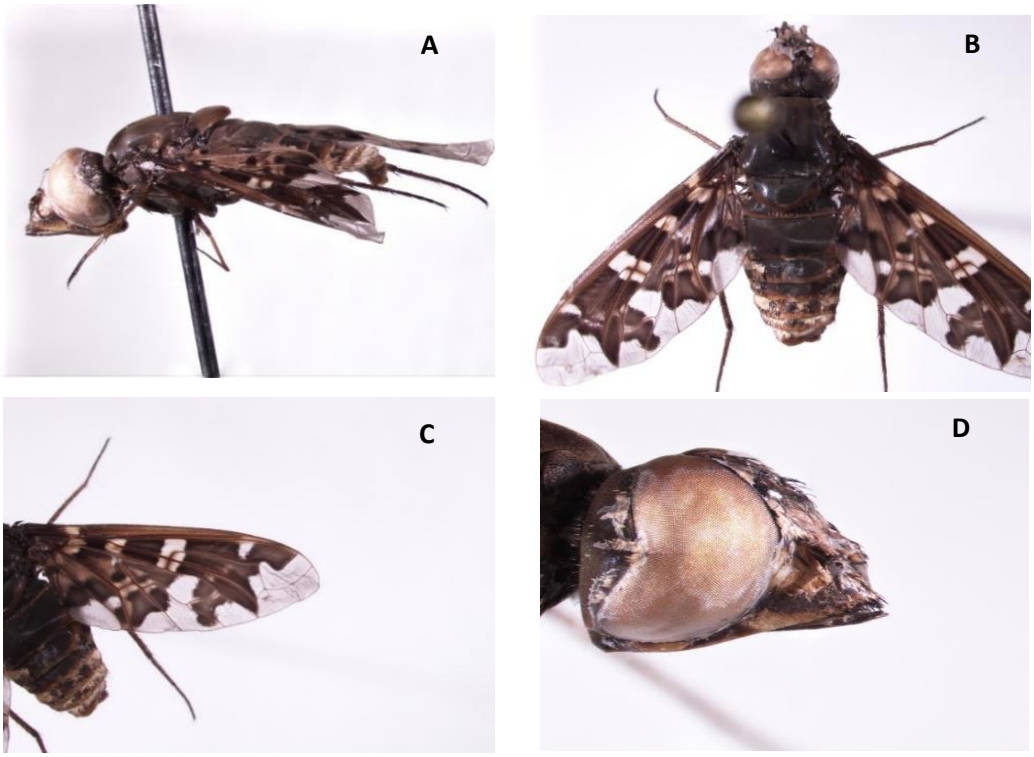

Figure 1. *Exoprosopa pandora* Fabricius 1805. **A:** Male, general habitus (lateral view), **B:** General habitus (dorsal view), **C:** Wing, **D:** Head (lateral view).

Discussion

This study provides one of the most comprehensive assessments of Bombyliidae diversity in northern west of Iran to date, contributing valuable baseline data for the Iranian Diptera fauna. The family Bombyliidae holds considerable potential for advancing ecological and faunistic research, particularly within the underexplored regions of Iran. Members of this family are of notable interest in biological control programs, as the vast majority of their larvae are predators or parasitoids of various developmental stages of insects across several orders, including Orthoptera, Neuroptera, Coleoptera, Lepidoptera, Hymenoptera and Diptera, as well as arachnids of the order Araneae (ElHawagry *et al.* 2022). This broad host range highlights their potential utility as natural enemies of agricultural and forest pests, supporting their integration into sustainable pest management strategies. The species documented in this study display distinctive morphological and ecological adaptations, enabling their persistence across a variety of environmental conditions. For instance, *T. perspicillaris* exemplifies successful adaptation to semi-arid ecosystems, corroborating observations by Kirk-Spriggs and Marais (2009). *Thyridanthrax elegans*, widely distributed across both tropical and temperate zones, is typically associated with flower-rich habitats, particularly in mountainous and temperate climates (Greathead & Evenhuis 1999). Its occurrence in diverse floristic landscapes underscores its ecological plasticity and suggest their ecological role as incidental or facultative pollinators in these habitats. Several species identified in this survey also serve as indicators of habitat quality and biodiversity. For example, *Phthiria vagans* is frequently observed visiting Asteraceae flowers and significantly contributes in pollination services (Evenhuis & Greathead 2003). Species of the genus *Chalcochiton*, such as *C. holosericeus* and *C. pallasi*, demonstrate dual ecological roles; in addition to their involvement in pollination, they have been recorded as parasitoids of beetle larvae, particularly jewel beetles (*Chrysobothris* spp.). Their preference for arid and semi-arid environments illustrates their ecological specialization, consistent with the findings of Bowden (1975), and reinforces the functional diversity within Bombyliidae. *Hemipenthes velutina*, characterized by its unique morphological features and habitat specificity, further illustrates the utility of bee flies as sentinels of environmental change. Comparable ecological functions have been observed in other *Hemipenthes* species (Yeates 2002), supporting the genus's broader relevance in biodiversity assessments. Members of the genus *Exoprosopa* were collected from high-elevation, xeric landscapes featuring intermittent wetlands and a high density of grasshoppers. These ecological conditions suggest that *Exoprosopa* species may function as parasitoids of grasshopper eggs, a role reported in other studies and indicative of their potential in the biological regulation of Orthoptera populations. Observations of adult Bombyliidae foraging on flowers of *Pulsatilla grandis*, *Potentilla*, and *Muscari* further highlight their importance as pollinators, especially in floristically diverse grassland ecosystems. This study underscores the multifaceted ecological roles of Bombyliidae as both pollinators and parasitoids, contributing to ecosystem functioning across a spectrum of habitat types in northern west of Iran. Given their ecological specificity, wide host range, and potential as bioindicators, future work should focus on habitat-targeted surveys and host association studies to clarify species-specific ecological roles and inform conservation and biological control strategies.

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مقاله پژوهشی

مطالعه فونستیک مگس‌های زنبورنما (Diptera: Bombyliidae) در برخی مناطق شمال‌غرب ایران

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چکیده

خانواده Bombyliidae که معمولا با عنوان مگس‌های زنبورنما شناخته می‌شوند، یکی از بزرگ‌ترین خانواده‌ها از نظر تعداد گونه‌ها در راسته دوبالان به شمار می‌رود. با وجود نقش زیست محیطی مهم آن‌ها به عنوان گرده افشان و انگل‌های پارازیتوئید، تنوع زیستی منطقه‌ای این خانواده هنوز به خوبی شناخته نشده است. این پژوهش گزارش جدیدی از حضور گونه‌های این خانواده در شمال غرب ایران ارائه می‌دهد. نمونه برداری در ماه‌های خرداد و تیر سال‌های ۱۴۰۱-۱۴۰۰ انجام شد و با بررسی نمونه‌های آرشیوی جمع‌آوری‌شده بین سال‌های ۱۳۸۵-۱۴۰۰ تکمیل گردید. در مجموع ۱۲ گونه شناسایی شد که به هشت جنس و پنج زیرخانواده تعلق دارند. این گونه‌ها عبارت‌اند از: *Thyridanthrax perspicillaris*، *T. elegans*، *Bombylella atra*، *Phthiria gaedei*، *P. vagans*، *Chalcochiton holosericeus*، *C. pallasi*، *Lomatia abbreviate*، *Heteralonia megerlei*، *Hemipenthes velutina*، *Exoprosopa altaica* و *E. pandora*. نکته قابل توجه این است که گونه *E. pandora* برای نخستین بار از ایران گزارش می‌شود. این یافته‌ها به شناخت بهتر تنوع زیستی مگس‌های زنبورنما در منطقه کمک کرده و داده‌های اساسی مهمی را برای مطالعات آینده در زمینه‌های بوم شناسی و رده‌بندی فراهم می‌سازد.

کلمات کلیدی: ایران، بومبیلیده، دیپتر، فون، گزارش‌های جدید