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Research Article

Faunistic study of the superfamily Bombylioidea (Diptera: Brachycera) in Alborz province- Iran, with a key to the species of Mythicomyiidae known from Iran

Rahim Abdolahi Mesbah[1], Jamasb Nozari[1*], Babak Gharali[2] and Mostafa Mirzaei[1]

1. Department of Plant Protection, Faculty of Agriculture and Natural Resources, University of Tehran, Karaj, Iran.
2. Department of Plant Protection, Research Center for Agriculture and Natural Resources, Qazvin, Iran.

Abstract: The fauna of the superfamily Bombylioidea was studied in Alborz province, Iran during 2012. Two families (Bombyliidae and Mythicomyiidae), eight genera and ten species were identified, of which two species, *Exoprospora dispar* Loew, 1869; *Parageron lutescens* (Bezzi, 1925), are new records for the Iranian fauna. An identification key for the species of the family Mythicomyiidae known from Iran is given.

Keywords: Bombylioidea, Alborz, Fauna, Iran

Introduction

Superfamily Bombylioidea Latreille, 1802 including two families, Bombyliidae and Mythicomyiidae, belongs to the suborder Brachycera (Evenhuis, 2002). This group constitutes a high diversity of flies in most deserts and has been frequently seen in arid and semiarid areas and is potentially a good indicator for biodiversity in these regions (Evenhuis and Greathead, 1999).

Bombylioidea have a diverse assemblage of brachycerous flies with more than 4800 species known worldwide. Adults of this group being considered as pollinators feed on pollen and nectar of flowers and they are the second most important pollinator insects after Apoidea. The larvae are parasitoid or predator of other insects specially beetles in soil and locust capsules. So, they are very important to balancing of insect populations (Yeates and Greathead, 1997; Evenhuis, 2002).

According to Hull (1973), the family Bombyliidae is characterized by hairy, stout and woolly body; their wings are easily recognized with distinct vein pattern, usually dark in colour; when at rest, wings are flat in outspread position. Either long Proboscis (in group Homophthalmae) or short (in group Tomophthalmae) are common for them (Greathead and Evenhuis, 2001). Mythicomyiidae or Microbombilidae consist of very small (1-3 mm) flies related closely to the Bombyliidae (Evenhuis, 2002). They are not common on farm, urban area and the tropic regions. Many of these "microbombyliids" have humpbacked thorax and lack the dense vestiture which is common in Bombyliidae. This family is separated from Bombyliidae by the unbranched wing vein R_{4+5} (branched in Bombyliidae), the extremely reduced or absent maxillary palpi (present in Bombyliidae), wings held together over the abdomen at rest (held at an angle in Bombyliidae), and the abdominal spiracles being placed in the tergites (Evenhuis, 2002).

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* **Corresponding author**, e-mail: Nozari@ut.ac.ir
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Although, 23 microbombyliids have been identified in some studies, there is not a full report of mythicomyiid flies of Iran.

Bombylioidea of Iran is poorly known. This group has been studied by Abbassian-Lintzen (1965, 1966a, b, 1968), Evenhuis (2002), Gharali *et al.* (2010 a, b, c, d; 2011 a, b) and Hakimian *et al.* (2012 a, b; 2014).

Considering the importance of these insects, faunistic studies of them is necessary as a basis for other entomological studies. Our study was conducted to discover the fauna of the superfamily in Alborz province as well as to present a comprehensive key to the species of Mythicomyiidae known from Iran.

Materials and Methods

Bee flies fauna was studied in Alborz province (including Karaj, Malard, Taleqan, Eshtehard and Koohsar) during April-August 2012. The studying area with around 1300 m elevation is located at 35°48'N, 50°58'E, in the north central Iran. The adult insects were collected from arid and semi-arid range lands in Alborz province by sweeping net and white pan traps (20 × 12 cm, diameter × depth). The samples were extracted from white pan traps at 2-3 days intervals, stored in 96% ethanol and others mounted by standard insect pins (numbers 0 and 1). The photos were taken by a Sony digital camera installed on Olympus SZX 9 binocular scope and images combined into plates using Adobe Photoshop CS3® software. All specimens were deposited in the insect collection of Department of Plant Protection, University of Tehran, Karaj, Iran.

Results

In this study two families, eight genera and ten species were identified, of which two species are new records for Iran fauna (marked with an asterisk). All species were new records for the province. An identification key for all species of Mythicomyiidae known from Iran is given.

The list of species is as follows:

1- *Exoprosopa minos* (Meigen, 1804);
2- *Exoprospora dispar* Loew, 1869*;
3- *Thyridanthrax incanus* (Klug, 1832);
4- *Parageron lutescens* (Bezzi, 1925)*;
5- *Phthiria gaedii* Weidmann, 1820;
6- *Platypygus melinoproctus* Loew, 1873;
7- *Cyrtisiopsis maculiventris* (Loew, 1874);
8- *Cyrtosia persica*, Gharali and Evenhuis, 2010;
9- *Empididеicus amicus* Gharali and Evenhuis, 2010;
10- *Empididеicus formosus* Hakimian, Talebi, & Gharali, 2014.

Family Bombyliidae
Subfamily Anthracinae
Tribe exoprosopini
Genus *Exoprosopa* Macquart
***Exoprosopa minos* (Macquart, 1840)**
Material examined: Alborz province: Karaj, 2♂♂, 2♀♀, 27 May 2012; Karaj, Atashgah village, 1612 m asl., N 35° 51' 48" E 51° 00' 32", 2♂♂, 2♀♀; 4 June 2012.

***Exoprospora dispar* Loew, 1869* (Fig. 1A & 1B)**
Material examined: Alborz province: Karaj, Arange village, 1725 m asl., N 35° 52' 13" E 51° 03' 44", 3♀♀, 6 August 2012.
Diagnostic characters: frons and occiput covered with white scales; first and second flagellomeres dark brown, covered with dense black hairs, first flagellomere black and longer than the two basal segments combined, with long brown styli; pronotum black, laterally with dense and long yellowish hairs, scutellum dark brown, basal region of wing, costa, cross veins m-cu and r-m with brown spots, remainder transparent; alula brown hairless, squama brown, with black small hairs, abdomen long oval-shaped, tergites black covered with yellow and white scales, basal abdominal tergites with long white hairs laterally.

Figure 1 a) *Exoprosopa dispar* (female); b) *Exoprosopa dispar* (female wing); c) *Parageron lutescens* (male adult).

Subfamily Anthracinae
Tribe Anthracini
Genus *Thyridanthrax* Osten Sacken
***Thyridanthrax incanus* (Klug, 1832)**
Material examined: Alborz province: Karaj, Khozankolah village, 1856 m asl., N 35° 53' 23" E 51° 04' 10", 1♂♂, 7 Aug 2012.

Subfamily Usiinae
Tribe Usiini
Genus *Parageron* Paramonov
***Parageron lutescens* (Bezzi, 1925)* (Fig. 1C)**
Material examined: Alborz province: Karaj, Baraghan village, 1659 m asl., N 35° 53' 01" E 51° 00' 96", 3♂♂, 7 June 2012.
Diagnostic characters: ground color of head white, ocellar triangle black, two basal antennal segments white, first flagellomere long and brown, slightly longer than the two basal segments combined; frons medially with brown spot, mesonotum with three black stripes, median stripe connected to anterior margin of mesonotum, scutellum white, wings transparent, all veins brown, discal cell closed, halter white, abdominal tergites with short and small white hairs, half of abdominal tergites transversely brown, remainder white.
Subfamily Phthirinae
Tribe phthiriini
Genus *Phthiria* Meigen
***Phthiria gaedii* Weidmann, 1820**
Material examined: Markazi province (Adjacent neighbours to Alborz province): Avaj, Avaj Highway, 2115 m asl., N 35° 31' 54" E 49° 11' 50", 5♂♂, 5♀♀, 20 August 2012.

Family Mythicomyiidae
Subfamily Platypiginae
Genus *Platypigus* Loew
***Platypygus melinoproctus* Loew, 1873**
Material examined: Alborz province: Malard, Bibisakineh village, 1255 m asl., N 35° 41' 11" E 50° 59' 54", 2♂♂, 1♀, 22 April 2012; Atashgah village, 1612 m asl., N 35° 51' 48" E 51° 00' 39", 1♂, 4 June 2012.

Subfamily Platypiginae
Genus *Cyrtisiopsis* Séguy
***Cyrtisiopsis maculiventris* (Loew, 1874)**
Material examined: Alborz province: Taleqan, 1785 m asl., N 36° 16' 50" E 50° 33' 12", 1♂, 1♀, 30 Jun 2012; Malard, 1♀, 4 June 2012.
Subfamily Platypiginae
Genus *Cyrtosia* Perris

***Cyrtosia persica* Gharali and Evenhuis, 2010**
Material examined: Alborz province: Karaj, Baraghan village, N 35° 53' 00" E 51° 00' 89", 1♂, 5 Jun 2012.

Subfamily Platypiginae
Genus *Empididеicus* Becker
***Empididеicus amicus* Gharali and Evenhuis, 2010**
Material examined: Alborz province: Eshtehard, 1216 m asl., N 35° 45' 69" E 50° 17' 75", 2♂♂, 2♀♀, 4 Jun 2012.

***Empididеicus formosus* Hakimian, Talebi, & Gharali, 2014**
Material examined: Alborz province: Koohsar, 2095 m asl., N 36° 05' 91" E 50° 56' 33", 1♂, 12 Jun 2012.

An update key to the species of Mythicomyiidae known from Iran is provided based on previous literature (Evenhuis, 2002; Gharali, 2010; Gharali* et al.*, 2010b, c, d; Gharali* et al.*, 2011a, b; Hakimian* et al.*, 2014)

A key to species of Mythicomyiidae known from Iran

1- Wing vein R_{2+3} curved upward into vein RI at or before costa forming triangular cell r_1 ……. *Glabellula humeralis* Gharali & Evenhuis
- Wing vein R_{2+3} free to wing margin or confluent with R_{4+5}; triangular cell rl absent…….... ….2
2- Vein R_{2+3} apparently absent, confluent with R_{4+5} ……..……..……..… 3
-Vein R_{2+3} present, ending in costa…..……15
3- Antenna1 stylus much reduced or absent; first flagellomere conical ……..... …….*Leylaiya aquilonia* Gharali & Evenhuis
- Antennal stylus prominent, not reduced; first flagellomere subcylindrical ….. *Empididеicus* 4
4- Discal cell closed (subgenus *Anomalopthilus* Hesse) ……....*E. turkestanicus* Paramonov
– Discal cell open 5
5- Occiput completely black 6
- Occiput yellow laterally 10
6- Scutellum mostly black with narrow yellow margin; mid coxa with sclerotised square flap-like projection basolaterally..... ……..*E. legulicoxa* Gharali & Evenhuis
- Scutellum completely yellow or yellow with black base..... 7
7- Dorsum of mesonotum completely black, without longitudinal stripes; prescutellar area completely black 8
– Dorsum of mesonotum with three black longitudinal stripes; if stripes joined together, prescutellar area and two interhumeral marks yellow..... 9
8- Upper half of frons black; scutellum black basally; aedeagal bulb with a pair of small lateral processes beside lateral aedeagal apodeme ……..... *E. sugonjaevi* Zaitzev
– Frons yellow with a small black mark medially; scutellum completely yellow aedeagal bulb with only lateral aedeagal apodeme …..……*E. persicus* Gharali and Evenhuis
9- Antennal pedicel dark brown; scutellum completely yellow; furca U-shaped with two clavate and mesally oriented processes; epiphallus with a finger-shaped process ventrally …*E. greatheadi* Gharali and Evenhuis
– Antennal pedicel yellow; scutellum with a brown mark medially…....*E. asiaticus* Zaitzev
10- Prescutellar area at least next to scutellum brown or black 11
– Prescutellar area completely yellow 12
11- Prescutellar area with a narrow blackish brown stripe joint to scutellum, spermathecal reservoir cylindrical, with narrow cylindrical invagination, externally striated..... ..... *E. formosus* Hakimian, Talebi & Gharali
- Prescutellar area completely brown or black, spermathecal reservoir subglobular, with shallow subcylindrical invagination, without any striation externally.....……. ……..*E. unicus* Gharali & Evenhuis
12- Longitudinal stripes on mesonotum orange; first antennal flagellomere large, more than 2.5 times second flagellomere; furca as two separate bars; common spermathecal duct much shorter than furca; basal aedeagal apodeme with

two large, rectangular lateral vanes ..... ……..*E. aurantiacus* Gharali & Evenhuis
– Longitudinal stripes on mesonotum brown or blackish brown; first antennal flagellomere at most 2 times the second flagellomere, furca U-shaped; common spermathecal duct much longer than furca; basal aedeagal apodeme without or with minute lateral vans 13
13- Vein R_{4+5} turn upward, meeting Costa at the level of CuA1; vein M1+2 shorter than half of M2 ..... *E. ebellicus* Gharali & Evenhuis
–Vein R_{4+5} straight, meeting Costa well beyond the level of CuA1; vein M1+2 longer than half of M2 14
14- Second antennal flagellomere as long as or longer than the first flagellomere; furca with well sclerotised plates around genital orifice..... *E. amicus* Gharali & Evenhuis
– Second antennal flagellomere much shorter than the first flagellomere; furca without sclerotised area around genital orifice .....*E. matricarius* Gharali & Evenhuis
15- Discal cell closed apically by cross-vein..16
- Discal cell open apically, no cross-vein at apex ……..……...… *Cyrtosia* 21
16- Postgena produced posteriorly into prominent gular process ending in paired spine-like projections either side of gular opening …… *Cyrtisiopsis maculiventris* Loew
- Postgena normal, not produced posteriorly into prominent processes ...……...*Platypygus*17
17- Halteres with a black spot on dorsal surface ….……..*P. lativentris* Loew
- Halteres completely yellow, without any black mark…….18
18- Mesonotum completely bare; antennae completely black; female genitalia with furca without sclerotized plates next to genital orifice ……*P. kurdorum* Paramonov
- Mesonotum hairy; antennal scape yellow or black; female genitalia with furca with two sclerotized plates next to genital orifice.....19
19- Hairs on mesonotum completely black, frons yellow with a black, medially Y-shaped mark.…….……..…….. *P. chrysanthemi* Loew
- Hairs on mesonotum completely yellow, frons yellow, at most with a narrow black line medially ……..…… 20
20- Mesonotum with two black spots next to transverse suture; black median stripe on mesonotum mostly reaching to scutellum; abdominal tergites with fine and long pale hairs; male genitalia huge and well exposed; spermathecal reser-voirs acorn-shaped, with an obvious cap ....*P. titanomedea* Gharali & Evenhuis
- Mesonotum without black spots; black median stripe on mesonotum ending much before scutellum with straight pos-terior margin; scape yellow; abdominal tergites with short, dense and black bristly hairs on disc; male genitalia very small; spermathecal reservoirs oboval, without cap ….....*P. melinoproctus* Loew
21- Coxae, scutellum and pleura predominantly black ……..... 22
- Coxae and pleura predominantly yellow; scutellum yellow with a small black spot basomedially ...…….. *C. meridionalis* Rondani
22- Frons predominantly blackish brown..... *C. pusilla* Loew
- Frons yellow with a small black spot medially..... *C. persica* Gharali & Evenhuis

Discussion

The results showed that the highest and lowest densities of Bombylioid flies in sampling related to July and August, respectively. The highest density of the Bombylioid flies was collected in Atashgah village and *Exoprosopa minos* Macquart, 1840 had the highest density among them.

Mythicomyiid flies have been studied poorly in the world so that 337 species belonging to Mythicomyiidae have been reported from the world (Evenhuis, 2002). However, to date, 34 species have been reported in Iran which compared with the number of described species in the world, it represents the high diversity of these insects in Iran. Many species of Mythicomyiidae are localised and they were collected from few countries. Species of Iran have low distribution in the world and many of them were collected only from Iran. This predicts uniqueness of locality and special fauna of mythicomyiidae of Iran.

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بررسی فونستیک بالاخانواده Bombylioidea در استان البرز و کلید شناسایی گونه‌های Mythicomyiidae شناخته شده از ایران

رحیم عبدالهی مصباح[1]، جاماسب نوذری[1*]، بابک قرالی[2] و مصطفی میرزایی[1]

۱- گروه گیاهپزشکی، دانشکده کشاورزی، دانشگاه تهران، کرج، ایران.
۲- بخش گیاهپزشکی، مرکز تحقیقات کشاورزی و منابع طبیعی، قزوین، ایران.
* پست الکترونیکی نویسنده مسئول مکاتبه: Nozari@ut.ac.ir
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چکیده: فون مگس‌های بالاخانوده Bombylioidea در استان البرز در سال ۱۳۹۱ مورد مطالعه قرار گرفت. دو خانواده (Bombyliidae و Mythicomyiidae)، هشت جنس و ده گونه مورد شناسایی قرار گرفتند که در این بین دو گونه *Exoprospora dispar* Loew, 1869 و *Parageron lutescens* (Bezzi, 1925)، گزارش‌های جدید برای فون ایران محسوب می‌شوند. کلید شناسایی گونه‌های خانواده Mythicomyiidae ایران نیز تهیه گردید.

واژگان کلیدی: Bombylioidea، البرز، فون، ایران