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Original Article 6

Faunistic Notes on the Subfamily Tabaninae (Diptera: Tabanidae) in East Azarbaijan Province, Iran

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ABSTRACT. A faunistic survey of horse flies (Diptera: Tabanidae) was conducted between 2007 and 2017 in East Azarbaijan Province, northwestern Iran, with the primary aim of identifying the species present in this underexplored region. Specimens were collected using sweeping nets from various habitats, including grasslands, forest edges, and semi-aquatic zones across nine geographically diverse localities. In total, nine species belonging to six genera were identified. Among them, seven species - Atylotus flavoguttatus (Szilady, 1915), Atylotus fulvus (Meigen, 1804), Dasyrhamphis nigritus (Fabricius, 1794), Haematopota latebricala Austen, 1925, Hybomitra caucasica (Enderlein, 1925), Philipomyia aprica (Meigen, 1820), and Therioplectes tricolor Zeller, 1842 - are reported for the first time from Iran. These records significantly expand the known diversity of Tabanidae in the country and highlight the importance of continued sampling in ecologically rich but insufficiently studied areas. Notably, this study provides the first confirmed record of the genus Philipomyia in Iran. Additionally, an updated identification key to the genera of the subfamily Tabaninae in Iran is presented. These findings contribute to a better understanding of the distribution and taxonomy of Iranian Tabanidae and provide a baseline for future faunistic and epidemiological studies.

 $\textbf{KEYWORDS:} \ Horse \ flies, \ A tylotus, \ Dasyrhamphis, \ Haematopota, \ Hybomitra, \ Philipomyia, \ The rioplectes$

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INTRODUCTION

The family Tabanidae is one of the largest and most diverse groups of hematophagous insects, comprising approximately 4,455 described species in 144 genera (Mullens 2019; Baldacchino et al. 2014), of which about 550 species have been recorded from the Palaearctic region (Chvála 1988). These flies are well known for their role as blood-feeding pests and as vectors of various pathogens affecting domestic animals, wildlife, and humans (Altunsoy & Kılıç 2010). Taxonomically, Tabanidae is divided into four subfamilies, each comprising several distinct tribes: Chrysopsinae comprises Bouvieromyiini, Chrysopsini, and Rhinomyzini; Pangoniinae includes Mycteromyiini, Pangoniini, Philolichini, and Scionini; Tabaninae consists of Diachlorini, Haematopini, and Tabanini; and Scepsidinae is considered a distinct subfamily with limited tribal representation (Mackerras 1954; Mackerras 1955; Chvála et al. 1972). Among these, Tabaninae is the most species-rich and evolutionarily advanced subfamily. It includes the well-known horse flies, particularly those of the genus Tabanus, which are of considerable medical and veterinary importance (Mullens 2019). Members of this subfamily have no spurs in hind tibiae, and ocelli are non-

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functional (Chvála et al. 1972). Species of the subfamily are either effective pollinators or vectors of pathogenic agents responsible for diseases in domestic and wild animals, including trypanosomiasis, anaplasmosis, and tularemia, so they impact both biodiversity and veterinary public health (Krinsky 1976; Larson et al. 2001; Mullens 2019).

Some studies are devoted to the fauna of this family in the Middle East. For example, Muller et al. (2011) recorded three species, Atylotus quadrifarius (Loew, 1874), Dasyrhamphis nigritus (Fabricius, 1794), Haematopota pallens Loew, 1871, Philipomyia graeca (Fabricius, 1794) from Jordan. Alaa & Karim (2016) recorded Haematopota subcylindrica Pandelle, 1883, Atylotus agricola (Wiedemann, 1828), and Hybomitra peculiaris (Szilady, 1914) from Iraq. Al-Talafha & Amr (2024) listed the species of this family known from Arabian countries in the Middle East. The list included 110 species in four subfamilies and 13 genera. Altunsoy & Ayaz (2024) in their study on the fauna of Tabanidae in the Irano-Anatolian hotspot region of Turkey. Recorded four species, Chrysops divaricatus Loew, 1858; Haematopota csikii Szilady, 1922; Haematopota pallidula (Krober, 1922) and Haematopota turkestanica (Krober, 1922) for the first time from Turkey. In Iran, 73 species belonging to the subfamily Tabaninae are known (Abbassian-Lintzen 1964; Jezek 1990; Sadeghi & Zeegers 2005; Dousti et al. 2011; Zeegers & Müller 2014; Samiei et al. 2016; Moayyed et al. 2018; Doosti et al. 2022).

The lack of sufficient information on the fauna of Tabanidae in northwestern Iran prompted us to conduct a faunistic survey in East Azarbaijan Province. Here, we present the results of this survey.

MATERIAL AND METHODS

Specimens were collected from diverse habitats, including grassland, semi-aquatic, and forest, across nine regions of East Azarbaijan Province during the years 2007–2017. Sweeping nets were used for specimen collection. After being killed in a cyanide bottle, the collected specimens were placed in a desiccator (with water at its bottom) and kept there for about 24 hours to soak and soften; then they were pinned and labeled to facilitate morphological studies. For identification, the keys published by Chvála et al. (1972) were consulted. All voucher specimens are deposited in the insect collection of the Department of Entomology, Tabriz University, Tabriz, Iran.

RESULTS

In total, nine species belonging to six genera of the subfamily Tabaninae were identified, of which *Atylotus flavoguttatus* (Szilady, 1915), *Atylotus fulvus* (Meigen, 1804), *Dasyrhamphis nigritus* (Fabricius, 1794), *Haematopota latebricola* Austen, 1925, *Hybomitra caucasica* (Enderlein, 1925), *Philipomyia aprica* (Meigen, 1820), and *Therioplectes tricolor* Zeller, 1842 are newly recorded from Iran.

Class Insecta Linnaeus, 1758

Order Diptera Linnaeus, 1758

Suborder Brachycera Schiner, 1862

Infraorder Tabanomorpha Hennig, 1948

Superfamily Tabanoidea Latreille, 1802

Family Tabanidae Latreille, 1802

Subfamily Tabaninae Latreille, 1802

Genus Atylotus Osten-Sacken, 1876

Type species. *Tabanus rusticus* Linnaeus, 1767.

Atylotus flavoguttatus (Szilady, 1915) (Fig. 1)

Material examined. East Azarbaijan province: 1♀, Arasbaran (Chichakli), 38°39'54"N, 46°31'15"E, 2140 m, 16-VII-2013, lgt.: S. Khaghaninia.

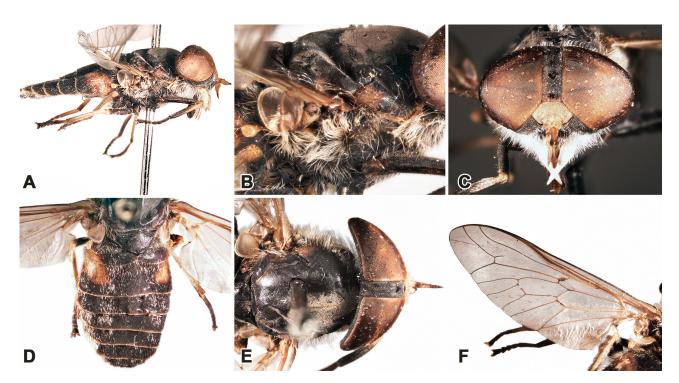


Figure 1. *Atylotus flavoguttatus* (Szilady, 1915) (female). **A.** General habitus, lateral view; **B.** Thorax, lateral view; **C.** Head, frontal view; **D.** Abdomen, dorsal view; **E.** Head and thorax, dorsal view; **F.** Wing.

Distribution. Algeria, Austria, Azerbaijan, France, Georgia, Hungary, Iran (new record), Kazakhstan, Portugal, Romania, Russia, Spain, Tajikistan, Turkey, Ukraine, Uzbekistan (Kılıç 1999a).

Diagnostic characters. 13 mm, Dark brown hairless eyes, lower callus dark brown rectangles, without median callus, sub callus dusted brown (Fig. 1C), antenna brownish- yellow, brown annulate (Fig. 1B), face whitish- grey, palps whitish (Fig. 1B), thorax black (Fig. 1E), pleura black with long whitish hairs (Fig. 1B), coxa and femora black, fore tibia and tarsi black (Fig. 1A), clear wings with a long appendix in vein R_4 (Fig. 1F), yellow halters (Fig. 1A), black abdomen, tergites 1–2 yellowish at side (Fig. 1D).

Atylotus fulvus (Meigen, 1804) (Fig. 2)

Material examined. East Azarbaijan province: $1 \, \sigma$, Osku (Kandovan), $37^{\circ}45'00"N$, $46^{\circ}18'00"E$, $2840 \, m$, $2840 \, m$, 5-VIII-2011; 299, 19, Arasbaran (Aynali), $38^{\circ}35'17"N$, $46^{\circ}14'22"E$, $1532 \, m$, 28-IV-2014, 19t.: S. Khaghaninia.

Distribution. England, Iran (New record), Morocco, Russia, Scandinavia, Turkey (Chvála et al. 1972).

Diagnostic characters. Medium size, head in male large, eyes without patterns and with short pubescent, sub callus dusted yellow, lower callus in female shining black and hardly visible, median callus in female dark brown elongate and narrow (Fig. 2E), antenna yellowish- brown (Fig. 2C), thorax dusted black (Fig. 2D), pleura dusted- grey with long golden hairs (Fig. 2C), legs yellowish brown (Fig. 2B), palps whitish-yellow (Fig. 2C), wings clear with appendix in vein R₄ (Fig. 2F), halters yellow (Fig. 2B), abdomen black, anterior four tergites yellow at sides (Fig. 2A).

Genus Dasyrhamphis Enderlein, 1922

Type species. *Tabanus nigritus* Fabricius, 1794.

Dasyrhamphis nigritus (Fabricius, 1794) (Fig. 3)

Material examined. East Azarbaijan province: 1\(\phi\), Kaleybar (Abeshahmad), 38\(^{\phi}51'33''N\), 46\(^{\phi}59'00''E\), 1783 m, 1-VII-2017; 1\(^{\phi}\), Arasbaran (Chichakli), 38\(^{\phi}39'54''N\), 46\(^{\phi}31'15''E\), 2140 m, 6-VII-2017, lgt.: S. Khaghaninia.

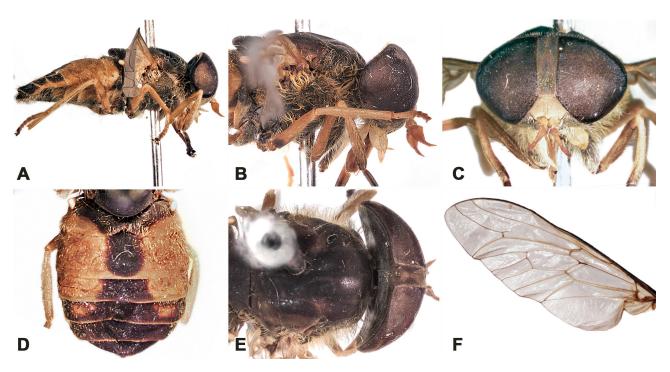


Figure 2. Atylotus fulvus (Meigen, 1804) (female). **A.** General habitus, lateral view; **B.** Head and thorax, lateral view; **C.** Head, frontal view; **D.** Abdomen, dorsal view; **E.** Head and thorax, dorsal view; **F.** Wing.

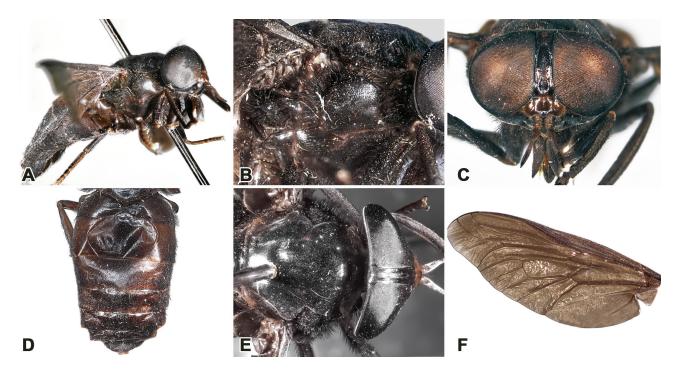


Figure 3. *Dasyrhamphis nigritus* (Fabricius, 1794) (female). **A.** General habitus, lateral view; **B.** Thorax, lateral view; **C.** Head, frontal view; **D.** Abdomen, dorsal view; **E.** Head and thorax, dorsal view; **F.** Wing.

Distribution. Algeria, Egypt, France, Iran (New record), Italy, Libya, Occupied Palestine, Spain, Syria, Tunisia (Chvála et al. 1972).

Diagnostic characters. 15 mm, eyes dark brown without pattern and hairs (Fig. 3D), lower callus large and black which is connected median callus, sub callus shining dark brown (Fig. 3D), antennae and palps dark brown (Fig. 3B), thorax dark brown (Fig. 3C), mesonotum with black hairs, pleura dark brown (Fig. 3B), coxa, femora and tibia black with whitish short hairs, tarsus dark brown (Fig. 3A), wings dark brown

with appendix in vein R₄, halters dark brown (Fig. 3C), abdomen shining black with pattern in four anterior tergites sides (Fig. 3E).

Dasyrhamphis umbrinus (Meigen, 1820)

Material examined. East Azarbaijan province: 1², Arasbaran (Uskulu), 38°52'21"N, 46°53'48"E, 1536 m, 22-V-2014, lgt.: S. Khaghaninia.

Distribution. Albania, Australia, Caucasus, Hungary, Lebanon, Occupied Palestine, Turkey, Turkmenistan (Chvála et al. 1972), Iran (Abbassian-Lintzen 1964).

Genus: Haematopota Meigen, 1803

Type species. *Tabanus pluvialis* Linnaeus, 1758 (now known as *Haematopota pluvialis*).

Haematopota latebricola Austen, 1925 (Fig. 4)

Material examined. East Azarbaijan province: 4 \(\frac{9}{2} \), Tabriz (Liqvan Valley), 37°39'00"N, 46°26'00"E, 2664 m, 28-VII-2008; 9 \(\frac{9}{2} \), Arasbaran (Chichakli), 38°39'54"N, 46°31'15"E, 2140 m, 16-VII-2013; 7 \(\frac{9}{2} \), Arasbaran (Chichakli), 38°39'54"N, 46°31'15"E, 2140 m, 6-VII-2017, lgt.: S. Khaghaninia.

Distribution. Iran (New record), Turkey (Chvála et al. 1972; Kılıç 1999b).

Diagnostic characters. 11 mm, Frons broad and whitish grey dusted and clothed with whitish hairs (Fig. 4C), paired velvety black spots almost circular, antenna segment 1 and segments 1 and 3 longer than segment 2 (Fig. 4A), palps whitish yellow covered with white hairs (Fig. 4B), thorax black, mesonotum with three whitish longitudinal stripes, scutellum black, pleura dusted grey (Fig. 4D), coxa and femora dusted black (Fig. 4A), sternite whitish grey dusted with whitish hairs (Fig. 4D).

Haematopota pallens Loew, 1871

Material examined. East Azarbaijan province: 1°, Arasbaran (Chichakli), 38°39'54"N, 46°31'15"E, 2140 m, 16-VII-2013, lgt.: S. Khaghaninia.

Distribution. Caucasus, Iraq, Jordan, Turkey, Ukraine (Chvála et al. 1972; Muller et al. 2012), Iran (Abbassian-Lintzen 1964).

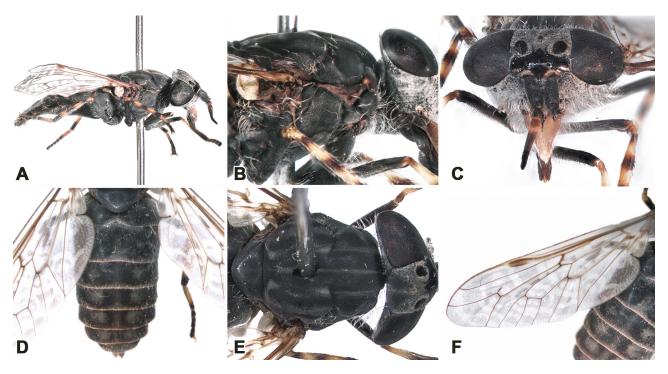


Figure 4. *Haematopota latebricola* Austen, 1925 (female). **A.** General habitus, lateral view; **B.** Thorax, lateral view; **C.** Head, frontal view; **D.** Abdomen, dorsal view; **E.** Head and thorax, dorsal view; **F.** Wing.

Genus: Hybomitra Enderlein, 1922

Type species: Tabanus aterrimus Meigen, 1820.

Hybomitra caucasica (Enderlein, 1925) (Fig. 5)

Material examined. East Azarbaijan province: 1° , Jolfa (Livarjan), $48^{\circ}49'00"N$, $45^{\circ}42'00"E$, 1158 m, 12-V-2013; 5° , Arasbaran (Aynali), $38^{\circ}35'17"N$, $46^{\circ}14'22"E$, 1532 m, 28-IV-2014, lgt.: S. Khaghaninia.

Distribution. Australia, Caucasus, Iran (New record), France, Germany, Italy, Romania, Spain, Switzerland (Chvála et al. 1972).

Diagnostic characters. 14mm, Frons greyish dusted, lower callus shining black triangular which connected to median callus, median callus black and narrow, sub callus dusted grey (Fig. 5C), 1th and 2th segment of antennae dusted grey, 3th segment of antennae black (Fig. 5B), face dusted grey, thorax black with black hairs (Fig. 5E), mesonotum with three longitudinal stripes, pleura black with black hairs (Fig. 5B), legs entirely black (Fig. 5A), clear wing (Fig. 5F), abdomen entirely black (Fig. 5D).

Genus: Philipomyia Olsufjev, 1964

Type species. Tabanus apricus Meigen, 1820.

Philipomyia aprica (Meigen, 1820) (Fig. 6)

Material examined. East Azarbaijan province: 12 ♀ ♀ , 1 ♂ , Bostanabad (Shahyordi), 37°43'00"N, 46°32'00"E, 2888 m, 21-VII-2007; 20 ♀ , Tabriz (Esparkhan), 37°48'00"N, 46°23'00"E, 2577 m, 4-VI-2009; 30 ♀ ♀ , 3 ♀ ♀ , Arasbaran (Chichakli), 38°39'54"N, 46°31'15"E, 2140 m, 2-VII-2012, lgt.: S. Khaghaninia.

Distribution. Australia, Caucasus, Czech Republic, France, Germany, Hungary, Iran (New record), Italy, Netherlands, Portugal, Slovakia, Spain, Switzerland, Turkey (Chvála et al. 1972).

Note. Until this record, its occurrence in Iran (Olsufjev 1937) has not been verified (Chvála et al. 1972).

Diagnostic characters. Eyes bare, unstriped, frontal calli shining black and joined, antenna reddish brown and terminal annulate black (Fig. 6A), palps in female yellowish and clothed with short black hairs (Fig. 6B), palps in male brownish yellow, thorax blackish brown (Fig. 6C), mesonotum and scutellum with pale and black hairs, pleura greyish dusted, tibia and tarsi mostly yellowish (Fig. 6A), wings clear and no appendix to vein R_4 (Fig. 6E), abdomen rather broad anterior three tergites brown with a broader, shining black median strips on tergites 2 and 3 (Fig. 6D).

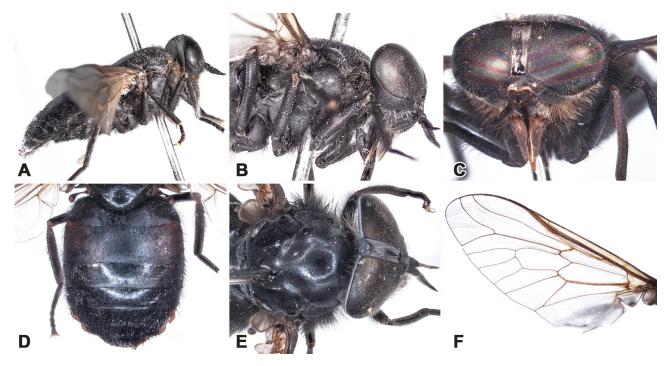


Figure 5. *Hybomitra caucasica* (Enderlein, 1925) (female). **A.** General habitus, lateral view; **B.** Thorax, lateral view; **C.** Head, frontal view; **D.** Abdomen, dorsal view; **E.** Head and thorax, dorsal view; **F.** Wing.

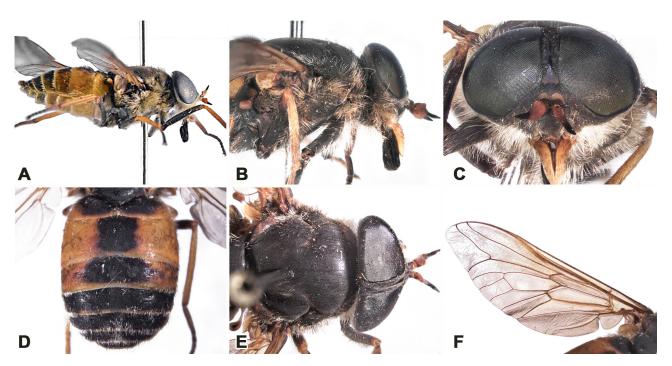


Figure 6. *Philipomyia aprica* (Meigen, 1820) (female). **A.** General habitus, lateral view; **B.** Thorax, lateral view; **C.** Head, frontal view; **D.** Abdomen, dorsal view; **E.** Head and thorax, dorsal view; **F.** Wing.



Figure 7. *Therioplectes tricolor* Zeller, 1842 (female). **A.** General habitus, lateral view; **B.** Thorax, lateral view; **C.** Head, frontal view; **D.** Abdomen, dorsal view; **E.** Head and thorax, dorsal view; **F.** Wing.

Genus: *Therioplectes* Zeller, 1842

Type species. Tabanus gigas Herbst, 1787.

Therioplectes tricolor Zeller, 1842 (Fig. 7)

Material examined. East Azarbaijan province: 3 $\stackrel{\circ}{}$ $\stackrel{\circ}{}$ Osku (Kandovan), 37 $\stackrel{\circ}{}$ 45'00"N, 46 $\stackrel{\circ}{}$ 18'00"E, 2840 m, 5-VIII-2011; 2 $\stackrel{\circ}{}$ $\stackrel{\circ}{}$ Arasbaran (Chichakli), 38 $\stackrel{\circ}{}$ 39'54"N, 46 $\stackrel{\circ}{}$ 31'15"E, 2140 m, 6-VII-2017, lgt.: S. Khaghaninia.

Distribution. Bulgaria, Iran (New record), Italy, Romania, Turkey (Chvála et al. 1972).

Diagnostic characters. Black and bare eyes, lower callus shining black and connected to black median callus (Fig. 7C), palps dark brown, antenna brown, face dark brown with long black hairs (Fig. 7A), coxa and femora black, fore tibiae on basal half whitish with pale hairs and apical half black, tarsi dark brown, mesonotum black, scutellum and pleura with long whitish grey hairs (Fig. 7B), wings clear with brown stain and with appendix to vein R_4 (Fig. 7E), halters light brown, abdomen shining black with whitish grey hairs (Fig. 7D), 3 terminal tergits with reddish hairs, 24 mm.

Key to the genera of Tabaninae known from Iran (modified from Chvála et al. 1972).

1	Flagellum of antennae consisting of 4 segments; antennal segment 3 formed by fusion of 5 flagellar segments, slender, lacking a dorsal tooth, wing patterned
_	segments and bearing a dorsal tooth of variable development, sometimes strongly hooked2
2	Basicosta bare; species rather robust, abdomen flat and broad; ocellar tubercle absent
_	Basicosta densely setulose; species of various sizes, abdomen usually elongated (except in <i>Therioplectes</i>); ocellar tubercle sometimes present
3	Eyes bare; in females, frontal calli fused into a single keel-shaped callus; wings always clear; abdomen yellowish-brown to dark brown
_	Eyes at least microscopically pubescent; frontal calli distinct and separated; species mostly blackish, wings more or less infuscated
4	Eyes in living specimens pale yellowish to green-gray, usually with a narrow incomplete band or unbanded; in dry specimens, eyes pale to reddish-brown; female frontal calli reduced or absent; generally smaller, light grey or yellowish-brown species
_	Eyes in living specimens bright green to dark reddish-brown, with 1 to 4 bands or unbanded; in dry specimens, eyes dark to blackish; female frontal calli well developed; species of various sizes and darker coloration
5	Posterior four tibiae very stout and densely covered with whitish hairs; eyes pubescent and unbanded; large, blackish and brightly colored species, densely covered with black, pale, and rufous hairs, resembling bumblebees
_	Posterior four tibiae slender and lacking dense whitish hairs; species smaller or larger, typically uniformly black, gray, or reddish-brown, rarely brightly colored
6	Vertex usually with a well-developed, shiny ocellar tubercle; eyes hairy, usually with three bands; mostly blackish species, often with distinct reddish-brown side markings on the anterior tergites
_	Ocellar tubercle absent; eyes bare, with 1 to 4 bands or unbanded; species usually grayish or brownish,

DISCUSSION

The biogeographical distribution of the newly recorded Tabanidae species in Iran reveals distinct patterns. For instance, *Atylotus flavoguttatus*, *Dasyrhamphis nigritus*, and *Hybomitra caucasica* exhibit broad Palearctic distributions, having been reported from multiple countries across Europe, Central Asia, and North Africa (Kılıç 1999a; Chvála et al. 1972), which suggests high ecological adaptability. In contrast, *Haematopota latebricola* appears to have a more restricted range, previously known only from Turkey (Chvála et al. 1972; Kılıç 1999b), possibly indicating local endemism or underreporting. Among the genera recorded, *Atylotus*, with six species reported before this study, shows moderate diversity in Iran. *Haematopota* and *Hybomitra* are similarly represented by seven and five species, respectively (Abbassian-Lintzen 1964; Sadeghi & Zeegers 2005; Doosti et al. 2022). In contrast, *Dasyrhamphis* was previously known from only one species, and *Therioplectes* from two (Abbassian-Lintzen 1964). These patterns suggest that the apparent species-poverty of some genera may reflect limited faunistic exploration rather than true ecological scarcity. Importantly, *Philipomyia aprica* represents the first confirmed species of its genus reported from Iran. Although it was previously listed by Olsufjev (1937), its presence was not corroborated in subsequent comprehensive works such as Chvála et al. (1972), making this study the first validated record of *Philipomyia* in the country.

Several tabanid species are known mechanical vectors of pathogens affecting domestic animals and occasionally humans (Foil & Hogsette 1994; Krčmar et al. 2011). Among the newly recorded species, *P. aprica* is of particular concern. It is not only a persistent biting pest but also a suspected mechanical vector of various pathogens, including *Trypanosoma evansi* (Krinsky 1976; Krčmar et al. 2011). Likewise, *Atylotus flavoguttatus* has been implicated in the transmission of *Francisella tularensis*, the causative agent of tularemia (Krinsky 1976). In addition, *Haematopota pallens*, previously recorded from Iran and reconfirmed in this study, is suspected of transmitting *Listeria monocytogenes* and *Leptospira* spp. (Krinsky 1976). Although direct studies on vector competence in Iran are lacking, the ecology and behavior of these species warrant further investigation in the context of veterinary disease transmission. While most newly recorded species are native to the Palaearctic Region and are not typically considered invasive, some—such as *Hybomitra caucasica* and *P. aprica*—demonstrate broad ecological tolerance and wide geographic ranges. These traits, in combination with environmental changes and livestock movement, may facilitate natural or passive expansion into new territories (Lehane 2005; Foil & Gorham 2000). Therefore, continuous surveillance is essential to monitor potential shifts in distribution and to assess their roles in disease epidemiology.

Finally, the Arasbaran forests and adjacent highland zones of East Azarbaijan appear to serve as a significant ecological corridor for Tabanidae in northern Iran. The discovery of these new records underscores the importance of ongoing faunistic surveys and taxonomic updates in the region. Given the potential veterinary importance of several species, future research should urgently address their seasonal dynamics, host preferences, and vectorial capacity.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: F. Moayyed Mazraeh: Providing data and drafting the manuscript; S. Khaghaninia: Supervising the project and collecting the specimens; Sh. Iranipour: Co-supervising the project, editing and revising the manuscript; A.Y. Kılıç: Taxonomic work and identification of specimens; R. Namaki-Khameneh: Writing and revising the manuscript; Y. Sadeghi: Assistance in the collection of specimens and photography. All authors read and approved the final version of the manuscript. The authors read and approved the final version of the manuscript.

FUNDING

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AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the insect collection of Professor Hassan Maleki Milani (ICPHMM) in Tabriz, Iran, and 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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