

Short Communication

First record of *Heteromyza atricornis* Meigen, 1830 (Dip., Heleomyzidae), a cavernicolous species new to the fauna of Iran

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Abstract. The family Heleomyzidae (Diptera), with 720 known species, is a small family widely distributed worldwide but more abundant in the cooler temperate regions of the Northern Hemisphere. In warmer areas, they are active mostly in autumn and winter or in caves. In this study, *Heteromyza atricornis* Meigen, 1830, as a cavernicolous species, is reported for the first time from Iran (West Azarbaijan Province, Mahabad-Bukan road, Sahoolan cave). The study presents the morphological and diagnostic characters of the species, accompanied by supporting photographs.

Keywords: Cave fauna, Northwestern Iran, True flies, Morphology, Type-species

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Cave ecosystems support unique and vulnerable species whose care requires effective conservation strategies. Species that are obligate cave dwellers have adapted to the harsh cave conditions, including constant darkness, high humidity, and constant temperatures. The lack of primary photosynthetic production within caves leads to their classification as incomplete and resource-limited ecosystems, and, due to the scarcity of food resources, the abundance of most cave-dwelling species is low (Culver & Pipan, 2019). Possibly due to the insular nature of cave ecosystems, these communities exhibit higher endemism than epigeal communities. Consequently, these ecosystems are vulnerable to direct human threats, including mining, cave tourism, and indirect threats, including groundwater pollution and climate change (Mammola *et al.*, 2019). The Heleomyzidae is a small family with about 720 described species that occur throughout the world, except Antarctica (Kahanpää, 2014). However, they are more numerous in areas with a cool, temperate climate. (Woźnica, 2008). In warmer areas, they are active mostly in autumn and winter or in caves (Erhard & Spötl, 2010). They are divided into three subfamilies: Suilliinae, Heteromyzinae, and Heleomyzinae (Mun & Suh, 2019). So far, only one species of Heleomyzidae, namely *Eccoptomera brandti* Collart, 1984 has been reported from Iran (Gorodkov, 1984). There is little study of the cave insect fauna of Iran. A checklist of subterranean arthropods of Iran was published by Malek-Hosseini & Zamani (2017). In a study of the insect fauna of Iranian caves, two new species of the genus *Acherontiella* Absolon, 1913 (Collembola, Hypogastruridae), namely *Acherontiella nezamdoosti* Mehrafrooz Mayvan & Kováč, 2025 and *Acherontiella palaciosi* Mehrafrooz Mayvan & Kováč, 2025 were described (Mehrafrooz Mayvan & Kováč, 2025). Also, two psocid species from the Liposcelididae and Psyllipsocidae families, namely *Liposcelis bostrychophila* Badonnel, 1931 and *Psyllipsocus ramburii* Selys-Longchamps, 1872, were collected and identified from caves in the North Khorasan and Khorasan-e Razavi provinces (Mehrafrooz Mayvan *et al.*, 2025). The purpose of this research was to identify a cavernicolous heleomyzid fly found among the collected insect fauna of Sahoolan Cave.

Sahoolan Cave (Fig. 1), located in the West Azarbaijan Province of northwestern Iran, is one of the country's most significant natural aquatic karst formations and has been officially designated a national natural monument since 2000. The cave lies at an elevation of approximately 1751 m and spans about 2 hectares, comprising interconnected water-filled chambers and dry passages shaped by long-term erosion of limestone and clay. Characterized by its stable microclimate, high humidity, and minimal light penetration, the ecosystem supports distinctive cave fauna, including bats (Vespertilionidae) and rock pigeon (Columbidae). Sahoolan is renowned for

its striking calcareous formations and unique speleothem structures, which contribute to its scientific, ecological, and geotouristic importance.

Specimens were collected from the walls of Sahoolan cave using an aspirator. The collected specimens were euthanized (or killed) with ethyl acetate and mounted on entomological pins for identification. Specimens were documented using a 14-megapixel Touptek L3CMOS-14000KPA digital microscope camera mounted on a Wild M5 stereomicroscope. Image processing and assembly were performed using Adobe Photoshop. Some specimens were sent to Dr. Verner Michelsen at the University of Copenhagen, Denmark, for identification. The morphological terminology follows Woźnica & Kirk Spriggs (2021) and Cumming & Wood (2017). Voucher specimens are deposited in the Department of Plant Protection, Faculty of Agriculture, Urmia University, and Hayk Mirzayans Insect Museum (HMIM), Tehran, Iran. Our sampling yielded 24 female and 16 male specimens of a heleomyzid fly, all belonging to the same species in the genus *Heteromyza*, as follows.

Genus *Heteromyza* Fallén, 1820

Type-species: *Heteromyza oculata* Fallen, 1820: l.c.: 1 (des. Westwood, 1840: Synopsis: 145). In the genus *Heteromyza*, the apex of the R1 vein is beyond the level of the r-m cross vein. Postsutural area with 4 or 5 dorsocentral bristles.

Heteromyza atricornis Meigen, 1830

Syns.

Heteromyza filiformis (Robineau-Desvoidy, 1830): Essai Myod.: 656 (*Thelida*). Type- locality: “Saint-Sauveur” (Yonne, France). *Heteromyza vespertilionea* (Robineau-Desvoidy, 1841): Annls Soc. ent. Fr. 10: 262 (*Thelida*). Type-locality: “dans les Grottes d’Arcy-sur-Eure” (Yonne, France).



Fig. 1: Sahoolan cave

Heteromyza delarouzei Bigot, 1858: Bull. Soc. ent. Fr., (3) 6(4): CCL (*Heteromyza*). Type-locality: “une grotte de la montagne Noire (département du Tarn)” (France). *Heteromyza diversa* (Rondani, 1867): Atti Soc. ital. Sci. nat., Milano, 10: 129 (*Thelida*). Type-locality: “in Insubria, forte alpina” (vic. of Milan, Italy).

Material examined

Iran, West Azarbaijan province, Mahabad – Bukan road, 35th km, Sahoolan cave, 36°65'46.2"N, 45°95'30.1"E, 1751m, 5.ix.2018, Karimpour, K. and Razmi, M. leg. 3♀1♂; Ibid., 12.ix.2025, 4♀9♂♂; Ibid., 12.ix.2025, 14♀6♂♂.

Diagnosis

Female: Body length, 7.1-7.2 mm, wing length 6.2-6.5 mm (Fig. 2A). Male: Body length, 7.1-7.3 mm, wing length 6.1-6.3 mm (Fig. 2B). Body with pale-yellow abdomen and silvery thorax; head with compound eyes separated at vertex (Figs. 2 A, B), ocellar triangle rather medium, darker in colour with very small setae and a pair of long divergent ocellar setae (Fig. 2E). Scape and pedicel deep black, Arista long, about 2.2–2.4 times as long as rest of antenna, with very short, almost indistinct cilia (Fig. 2E). Scutellum with two pairs of marginal scutellar setae; katapisternum with several microsetae and one katapisternal long seta, anepimeron bare and greyish, mesonotum with four pairs of postsutural dorsocentral bristles. Forelegs femur darkened, tarsus 1 to 5 covered with short dark spin-like bristles; hind and mid legs pale brown, and the apical part of tarsi covered by short black spin-like bristles. Anterior cross-vein (r-m) is subtly thicker than posterior cross-vein (m-m), and both cross-veins are slightly dark brown. Cross-vein dm-m is 3.2 times longer than cross-vein r-m, wing vein CuA+CuP is long, almost reaching the wing margin as a trace (Fig. 2D).

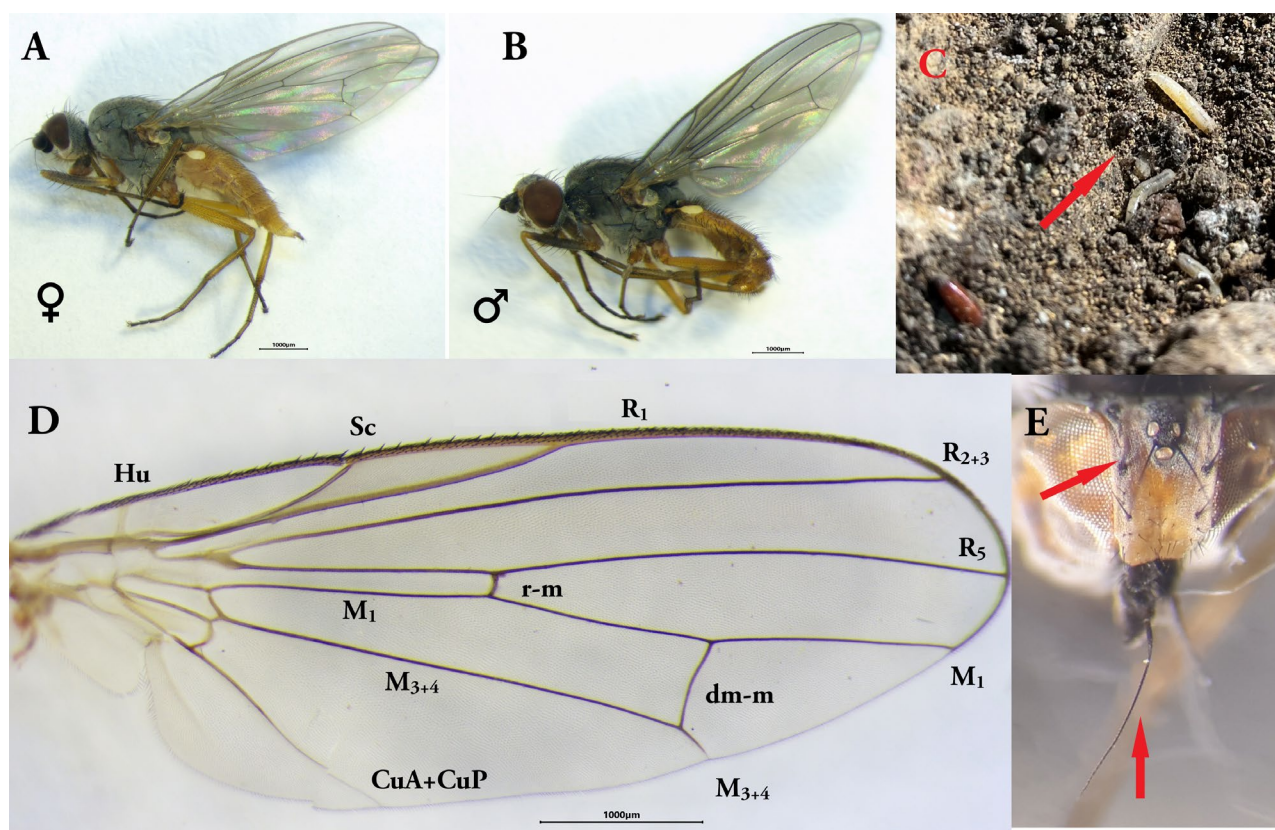


Fig. 2: *Heteromyza atrionis* Meigen, 1830, A. female General habitus, lateral view; B. male General habitus, lateral view, C. larvae and puparia in pigeons' droppings, D. wing, E. frontal view (arista and ocellar seta)

Distribution

According to Papp & Soós (1981), *H. atricornis* is a West Palaearctic cavernicolous species. The following characters are present in flies of the subfamily Heteromyzinae: Mid tibia with 1 ventral apical bristle. Posterior gena often with a bristle, between the eye and the lower margin, that is thicker than neighboring bristles. In the Palaearctic Region, it includes one tribe, Heteromyzini, comprising the three genera *Heteromyza* Fallén, 1820; *Tephrochlamys* Loew, 1862; and *Tephrochlaena* Czerny, 1924 (Lo Giudice & Woźnica, 2020). Genus *Heteromyza* comprises 4 species worldwide, which are distributed in Europe. These species include *Heteromyza rotundicornis* (Zetterstedt, 1846), *H. oculata* Fallén, 1820, *H. commixta* Collin, 1901, and *H. atricornis*, which has been recorded from European countries (Lo Giudice & Woźnica, 2013; Soszynska-Maj & Woźnica, 2016). Also, 4 fossil species of this genus have been identified in the Nearctic region as follows: *Heteromyza senilis* Scudder, 1877, and *H. detecta* Scudder, 1877 (Scudder, 1877a, b), *H. dubia* Meunier, 1904 (Meunier, 1904), and *H. miocenica* (Cockerell, 1915) (Cockerell, 1915). The *H. atricornis* is classified as a eutroglophilous species by Kocot-Zalewska & Woźnica (2021). Its larvae are necrophagous and/or coprophagous (bat guano) (Papp & Soós, 1981). This species is rarely found outside caves, in cold, humid forest areas, and its cave populations are usually parthenogenetic (Dvořáková *et al.* 2009).

In this study, we found that in the Sahoolan cave, the larvae lived in pigeon and bat droppings (Fig. 2C). In the checklist provided by Malek-Hosseini & Zamani (2017), two families of Diptera, including Nycteribiidae Samouelle, 1819 and Streblidae Kolenati, 1863, have been reported from Iranian caves as bat ectoparasites. With the report of *H. atricornis* from Iran, the number of known species of Heleomyzidae in Iran increases to two. Among Iran's neighboring countries, 18 species of heleomyzid flies have been reported from Türkiye, among which no species of the genus *Heteromyza* have been observed (Woźnica & Koçak, 2009). No report on the insect fauna of Sahoolan cave has been published to date. The identification and report of *Heteromyza atricornis* from this cave is the first published document on biospeleology in the insect fauna of this unique biota.

Author's Contributions

Younes Karimpour: Conceptualization; methodology; formal analysis; investigation; draft preparation; final review and edit; visualization; supervision; project administration and funding acquisition; **Mehdi Razmi:** Conceptualization; methodology; investigation; draft preparation; final review and edit.

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Data Availability Statement

The specimens listed in this study are deposited in the Department of Plant Protection, Faculty of Agriculture, Urmia University, and Hayk Mirzayans Insect Museum, Tehran, Iran. They are available from the curator upon request.

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Ethics Approval and Consent to Participate

Insects were used in this study. All applicable international, national, and institutional guidelines for the care and use of animals were followed. This article does not contain any studies with human participants performed by the authors.

Conflict of Interest

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

Generative AI statement

The authors declare that no Generative AI tools were used in the writing, analysis, or preparation of this manuscript.

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اولین گزارش *Heteromyza atricornis* Meigen, 1830 (Dip., Heleomyzidae) یک گونه غارزی جدید برای فون ایران

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چکیده: خانواده Heleomyzidae Westwood, 1840 با ۷۲۰ گونه شناخته شده، خانواده کوچکی از دوبالان است که انتشار جهانی دارند اما بیشتر گونه‌های آن در نواحی معتدله سردسیری نیمکره شمالی یافت می‌شوند. در نواحی گرم‌تر اکثراً در پاییز، زمستان و یا غارها فعال هستند. در این بررسی، مگس غارزی *Heteromyza atricornis* Meigen, 1830 از دوبالان خانواده Heleomyzidae برای اولین بار از ایران (آذربایجان غربی، جاده مهاباد – بوکان، غار سهولان) گزارش می‌شود. در این مطالعه برخی ویژگی‌های ریخت‌شناسی و تشخیصی این گونه به همراه تصاویری از آن ارائه شده است.

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