New record of black fungus gnat (Diptera: Sciaroidea, Sciaridae) from Iran, with a first record for the fauna of the Middle East

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ABSTRACT. This paper presents new information on black fungus gnats (Sciaridae) based on field studies at seven localities in Iran. Five sciarid species from the genera Bradysia Winnertz, Corynoptera Winnertz and Lycoriella Frey were collected with Malaise traps, yellow sticky traps, sweep net and an aspirator between 2015 and 2021: Bradysia cellarum, 1948; B. ocellaris (Comstock, 1882); B. tilicola (Loew, 1850); Corynoptera fatigans (Johannsen, 1912); Lycoriella sativae (Johannsen, 1912). All species are first records for the Sistan and Baluchestan province. Bradysia tilicola (Loew) is new to Iran and was recorded for the first time in the Middle East. This brings the number of known sciarid species from Iran to seven. For five species are given a short morphological diagnosis and the global distribution. A map illustrates the distribution of all identified sciarid species in Iran.

Key words: Black fungus gnats, Asia, Middle East, Iran, diversity, distribution, new record

INTRODUCTION

The Diptera (two-winged flies) can be regarded as the most diverse order among holometabolan insects with approximately more than 169,000 described species (Pape et al., 2011). The Diptera have traditionally been divided into two suborders: "Nematocera" and Brachycera, which the latter sometimes divided further into the Orthorrhapha and Cyclorrhapha (Merritt et al., 2009). Phylogenetic studies in recent decades have shown that the former "Nematocera" (often also called nematocerous flies or lower Diptera) are not a monophyletic group. For this reason, the Diptera were temporarily divided into five accepted suborders (Wiegmann & Yeates, 2017): Bibionomorpha, Brachycera, Culicomorpha, Psychodomorpha and Tipulomorpha. The megadiverse family Sciaridae (black fungus gnats) belongs to the suborder Bibionomorpha and more narrowly to the superfamly Sciaroidea. The

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species-rich Sciaridae occurs in all zoogeographical regions and currently only a fraction of the actual species diversity is known, with more than 2,700 valid species worldwide (Menzel & Smith, 2017). The sciarid larvae are mostly phytosaprophagous or mycetophagous and the adults are usually encountered in moist, shady habitats (Steffan, 1974; Menzel & Mohrig, 2000).

Sciaridae is still one of the poorest known dipterous families in the Middle East especially Iran, while enormous progress has been made in investigating this group in the last two decades in Europe. This is supported by several studies from countries whose sciarid diversity is relatively well known: 440 species in Germany, 370 in Finland, 299 in Sweden, 261 in United Kingdom, 230 in the Czech Republic, 143 in Norway, 135 in Slovakia, 107 in Romania, and 100 in Ireland (summarized in Heller & Menzel, 2009; Heller et al., 2009; Kolcsár & Heller, 2019; Menzel, 2000, 2018; Menzel & Heller, 2007; Menzel et al., 2020b; Vilkamaa, 2014). Even in small European and North African countries, whose faunas are still poorly studied, more sciarid species have already been recorded than in Iran; e.g., Morocco (55 species), Albania (35), Estonia (28), Malta (24), Latvia and Lithuania (each with 22 species) (summarized in Ebëjer & Gatt, 2021; El Ouazzami et al., 2019; Menzel, 2000; Menzel & Heller, 2007; Menzel et al., 2020a, 2020b).

In recent years, the sciarid fauna of Iran has been studied only in four papers (Talebi et al., 2003; Barzegar et al., 2014; Heidari Latibari et al., 2016a, 2016b). Thus, the full distribution and taxonomic studies of many Iranian species is still unknown due to large gaps in sampling intensity (i.e., lack of funding). Improved sampling of black fungus gnats is needed to provide a sound basis for biodiversity conservation in areas of Iran where ecosystems are undergoing rapid change due to resource extraction and climate change. This work contributes to the improvement of knowledge on the diversity of black fungus gnats in the provinces of eastern Iran. Furthermore, the study of Iranian sciarids can make an important contribution to the knowledge of the fauna of the Middle East and also help to identify distribution patterns in the south-western Palaearctic as well as invasive alien species of economic importance.

MATERIAL AND METHODS

The material was collected from 2015 to 2021 with Malaise traps, yellow sticky traps, a sweep net or with an aspirator directly from the substrate (Fig. 1), and preserved in 2 ml vials with 96% ethanol. In the laboratory, all specimens were mounted on permanent slides in Euparal. They were then observed and measured using Olympus™ BH-2 phase-contrast microscope. The nomenclature and systematics of the genera and species follows the revisions of Palaearctic and Nearctic sciarids by Menzel & Mohrig (2000) and Mohrig et al. (2013). Diagnoses of the species are generally based on the keys and descriptions in Hippa et al. (2010), Menzel and Mohrig (2000), and Mohrig et al. (2013). The distribution data of the species discussed were compiled from the following publications: Arimoto et al. (2018), Babtyskiy et al. (2019), Broadley et al. (2018), Ebëjer and Gatt (2021), El Ouazzami et al. (2019), Heidari Latibari et al. (2016a), Heller and Menzel (2017), Hippa et al. (2010), Katumanyane et al. (2020), Menzel & Elsayed (2013), Menzel and Satayeva (2010), Menzel and Smith (2009), Menzel and Vilkamaa (2021), Menzel et al. (2003, 2013, 2020a, 2020b), Mohrig et al. (2001, 2013, 2019), Shin et al. (2015), Sohier et al. (2012), Steffan (1969, 1974), Suyoshi and Yoshimatsu (2019), Ye et al. (2017).

We compared high-quality photographs of a paralectotype of Bractysa tilicola (Loew, 1850) designated by sciarid experts (deposited in the Museum für Naturkunde, Leibniz Gesellschaft, Berlin, Germany – ZMHUB), which were sufficient to identify the Iranian material. The photographs of B. tilicola were taken with a Zeiss® Axiocam MRc5. Microscopic digitized photographs were stacked using Helicon Focus®. Images were processed using Adobe Photoshop® CC 2020 software. All Iranian specimens studied are kept at the Entomology Museum of Ferdowsi University of Mashhad, Iran (EMFUM). The following abbreviations and indices/ratios are used in the text: l/w index = length/width ratio; R1 = anterior branch of radius; x = basal part of Media (bM); y = Radius/Media sector (r-m) as basal part of third branch of radius (Rs).
Figure 1. Selected habitats, sampling techniques, and satellite maps of sites in the ongoing Iranian Sciaridae project. A. Malaise trap in Sarbaz, Sistan and Baluchestan province; B. Sweeping net in Rask, Sistan and Baluchestan province; C. Malaise trap in Zarabad, Chabahar, Sistan and Baluchestan province; D. Mellat Park, Mashhad province; E. Torqabeh, Mashhad province; F. Chehel Bazeh National Park, Mashhad province; G. Yellow sticky trap mounted over Cactus plants (Cactaceae) in a greenhouse in Sharoud, Semnan province; H. Insect sample in the collection bottle of a Malaise trap.

RESULTS

Following is a list of all species that were collected and could be identified to species level. This includes all collection information, as well as the current known geographic distribution and some morphological data. A total of five species are covered, including *Bradysia tilicola* (Loew, 1850), a new record for Middle East. Five new provincial distribution records viz., *Bradysia cellarum* Frey, 1948, *B. ocellaris* (Comstock, 1882), *B. tilicola* (Loew, 1850), *Corynoptera fatigans* (Johannsen, 1912), and *Lycoriella sativae* (Johannsen, 1912) are also presented.

Class Insecta Linnaeus, 1758
Order Diptera Linnaeus, 1758
Suborder Bibionomorpha Hennig, 1954
Superfamily Sciaroidea Billberg, 1820
Family Sciaridae Billberg, 1820
Genus Bradysia Winnertz, 1867
Bradysia cellarum Frey, 1948

Original description. Frey (1948): 66, 85; plate 19, fig. 108 [as Bradysia (Bradysia)].
New record for the sciarid fauna of the Middle East

Synonym. = odoriphaga Yang & Zhang, 1985.

Material examined. IRAN, Razavi Khorasan province, Mashhad county, Mellat Park (36°19′07.96″N, 59°32′22.02″E; Fig. 1D), 22.VI.2021, 2♂♂, directly collected with an aspirator on Robinia pseudoacacia L. (Fabaceae), M. Heidari Latibari leg. (EMFUM); Sistan and Baluchestan province, Sarbaz county (26°30′27.143″N; 061°02′56.427″E), 16.V.2015, 2♂♂, Malaise trap in an orchard (Figs 1A, H), M. Ghafouri Moghaddam leg. (EMFUM).

Diagnosis. (male) First palpal segment with more than 2 setae and a deep sensory pit; apex of fore tibia with a comb-like row of setae, without curved margin; hypopygium unicoloured dark brown, ventral base of hypopygium without intergonocoxal lobe or groups of setae; gonocoxites longer than gonostyli, inner ventral margin of gonocoxites short and densely setose; gonostylus rounded apically, apex of gonostylus protruded and curved, with 5–8 strong spines, mesial spines missing; tegmen trapezoid.

Distribution in Iran. (Fig. 3) Razavi Khorasan province (Heidari Latibari et al., 2016a), Sistan and Baluchestan province (new record).

Global distribution. Palaearctic (China, Finland, Germany, Iran, Japan).

Brady sia ocellaris (Comstock, 1882)

Original description. Comstock (1882):202–204; plate 17, figs 2–4 [as Sciara].

Synonyms. = disjuncta Yang, Zhang & Yang, 1993; = garretti (Shaw, 1952); = johannseni (Shaw, 1952); = lafooni (Shaw, 1952); = picticornis Yang & Zhang, 1987; = prothalliorum (de Meijere, 1946); = reynoldsi (Metz, 1938); = robusticalcar Alam, 1988; = rubicundula Frey, 1948; = trittici (Coquillett, 1895). Material examined. IRAN, Sistan and Baluchestan province, Rask county, 26°13′19.70″N, 61°24′31.53″E, 24.IV.2015, 3♂♂, sweep net over weeds in Date Palm (Phoenix dactylifera L., Arecaceae) and Mango orchards (Mangifera indica L., Anacardiaceae) (Fig. 1B), M. Ghafouri Moghaddam leg. (EMFUM).

Diagnosis. (male) First palpal segment with more than 2 setae and a deep sensory pit; apex of fore tibia with a comb-like row of setae, without curved margin; hypopygium conspicuously yellow to reddish-brown, with dark tips of gonostyli; inner ventral margin of gonocoxites short setose; gonostylus rounded apically, with a tooth dorsally, and 4–6 spines (2–3 subapical and 2–3 mesial spines isolated in the distal third); tegmen trapezoid.

Distribution in Iran. (Fig. 3) Kermanshah province (Barzegar et al., 2014), Razavi Khorasan province (Heidari Latibari et al., 2016a), Sistan and Baluchestan province (new record).

Global distribution. Afrotropical (Kenya, Seychelles, United Arab Emirates, Zimbabwe); Australasia (Australia [mainland, Tasmania], Hawaiian Islands (USA), Mariana Islands (USA), Marshall Islands, Micronesia [Kosrae Island, Pohnpei Island], New Zealand); Nearctic (Canada, United States); Neotropical (Argentina, Brazil, Chile, Costa Rica, Ecuador [Galapagos Islands], Panama); Oriental (Bangladesh, Cambodia, China, India, Indonesia, Malaysia, Taiwan, Thailand); Palearctic (Belgium, Bulgaria, China, Egypt, Germany, Iran, Ireland, Pakistan, Russia, Saudi Arabia, Spain [mainland, Canary Islands], Sweden, Switzerland, the Netherlands, Turkey, United Kingdom).

Brady sia tilicola (Loew, 1850)

Original description. Loew (1850): 18 [as Sciara].

Synonyms. = amoena (Winnertz, 1867); = alma (Winnertz, 1871); = caldaria (Lintner, 1895); = coprophila (Lintner, 1895); = domestica Frey, 1948; = incomta (Winnertz, 1867); = marcella (Hutton, 1902); = nanella (Frey, 1936); = selecta (Winnertz, 1871); = setigera (Winnertz, 1867); = silvatica (Meigen, 1818); = sedentata (Pettey, 1918); = triseriata (Winnertz, 1867); = turbida (Winnertz, 1867); = vana (Winnertz, 1871); = vividula (Winnertz, 1867); = volucris (Winnertz, 1867); = wendalinae (van Bruggen, 1954).
Material examined. **PARALECTOTYPE, male (Fig. 2C), GERMANY:** “Thuringia, Liebenstein” (Menzel & Heller, 2007); specimen mounted on slide in Canada balsam, with labels “tilicola Lw./ 189/8518/ Coll. H. Loew/ ♂/ Paralectotypos/ Bradysia/ tilicola/ (Loew, 1850)/ det. F. Menzel 2002/ Quick Response (QR) Barcode: http://coll.mfn-berlin.de/u/c2e421” (©ZMHUB). **IRAN:** Semnan province, Shahrroud county, Salehabad village (36°15’35.56"N, 54°48’13.52”E), 1.VII.2018, 1♂, yellow sticky trap, in a greenhouse over Cactus plants (Cactaceae) (Fig. 1G), B. Gharaei leg. (EMFUM); Razavi Khorasan province, Mashhad county, Torqabeh (36°18’22.17”N, 59°22’21.10”E) (Fig. 1E), 1.VII.2021, 1♂, sweep net over weeds, M. Heidari Latibari leg. (EMFUM); Sistan and Baluchestan province, Sarbaz county (26°30’27.143”N, 61°02’56.427”E), 16.V.2015, 1♂, Malaise trap in orchard (Figs 1A, H), M. Ghafouri Moghaddam leg. (EMFUM).

**Diagnosis. (male)** (Figs 2A–B) First palpal segment with more than 2 setae and with a deep sensory pit; apex of fore tibia with a comb-like row of setae, without curved margin; macrotrichia on the wing sections x and y present; 4th flagellomere with l/w index of 2.5; apex of fore tibia with a comb-like row of setae; R1 rather long; hypopygium unicoloured dark brown, ventrally without an intergonocoxal differentiation; inner ventral margin of gonocoxites short and setose; gonostylus rounded apically, protruded and curved, apex of gonostylus with a short tooth dorsally and with a dense group of 8–12 longer, apical/subapical spines; tegmen trapezoid.

**Distribution in Iran.** (Fig. 3) Razavi Khorasan province, Sistan and Baluchestan province (**new records**).

**Global distribution.** Afrotropical (South Africa, Tristan da Cunha archipelago); Australasia (New Zealand); Nearctic (Canada, United States); Neotropical (Chile); Palearctic (Austria, Belgium, Bulgaria, China, Czech Republic, Estonia, Finland, Greece, Germany, Hungary, Iran **[new record]**, Ireland, Italy, Lithuania, Morocco, the Netherlands, Nepal, Poland, Portugal **[Azores Islands]**, Russia, Slovakia, Spain [mainland, Canary Islands], Sweden, the Netherlands, Turkey, United Kingdom).

**Note.** This species is recorded for the first time from the Middle East.

**Genus Corynoptera Winnertz, 1867**

*Corynoptera fatigans* (Johannsen, 1912)

**Original description.** Johannsen (1912): 121, 132–133; plate 3, fig. 135; plate 6, fig. 241 [as Sciara].

**Synonym.** = *perpusilla* Winnertz, 1867 (preocc.).

Material examined. **IRAN,** Sistan and Baluchestan province, Chahbahar county, Zarabad (25°39’06.700”N, 59°20’01.396”E), 15.VI.2015, 3♂♂, Malaise trap on agricultural land surrounded by Date Palm (*Phoenix dactylifera* L., Arecaceae) (Fig. 1C), M. Ghafouri Moghaddam leg. (EMFUM).

**Diagnosis. (male)** (Figs 2A–B) First palpal segment with one long seta only, without deep sensory pit; fore tibia with an irregular row of setae, mostly with weakly developed, curved margin; hypopygium light yellow-brown, ventral base of hypopygium without intergonocoxal differentiation; inner ventral margin of gonocoxites longer and more densely setose; gonostylus slender, with a l/w index of 2.5, gonostylus tapered and pointed, with a dark tooth and 3 light hyaline spines which do not reach the end of the tooth; mesial, long whiplash seta missing; tegmen rounded.

**Distribution in Iran.** (Fig. 3) Kermanshah province (Barzegar et al., 2014), Razavi Khorasan province (Heidari Latibari et al., 2016a), Sistan and Baluchestan province (**new record**).

**Global distribution.** Nearctic (USA); Palearctic (Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Iran, Ireland, Italy, Morocco, Norway, Poland, Portugal **[Azores Islands, Madeira Islands]**, Romania, Russia, Slovakia, Slovenia, Spain [mainland, Balearic Islands, Canary Islands], Sweden, Switzerland, the Netherlands, United Kingdom).
Genus *Lycoriella* Frey, 1942

*Lycoriella sativae* (Johannsen, 1912)

**Original description.** Johannsen (1912): 121, 133; plate 3, fig. 120; plate 6, fig. 240 [as *Sciara*].

**Synonyms.** = *agarici* Loudon, 1978; = *auberti* (Séguy, 1940); = *brevipetiolata* (Shaw, 1941); = *castanescens* (Lengersdorf, 1940); = *difficilis* (Frey, 1948) (preocc.); = *fuscorum* (Frey, 1948); = *jeanneli* (Séguy, 1940), = *kaiser* (Shaw, 1941); = *kaiser* (Shaw, 1941); = *paucisetulosa* (Frey, 1948); = *rufotincta* Tuomikoski, 1959; = *similans* (Johannsen, 1925); = *solispina* (Hardy, 1956); = *trifolii* (Pettey, 1918).

**Material examined.** IRAN, Mashhad, Razavi Khorasan, Chehel Bazeh National Park (36°20′41.53″N, 59°28′04.77″E; Fig. 1F), 1.VI.2020, 1♂, directly collected with aspirator on *Pinus mugo* Turra (Pinaceae), M. Heidari Latibari leg (EMFUM); Sistan and Baluchestan province, Sarbaz county (26°30′27.143″N, 61°02′56.427″E), 16.V.2015, 2♂♂, Malaise trap in an orchard (Figs 1A, H), M. Ghafouri Moghaddam leg. (EMFUM).

**Diagnosis.** (male) First palpal segment with some setae and a deep sensory pit; apex of fore tibia with a depressed area of dense setae, with closed and clear curved margin; hypopygium brown; ventral base of hypopygium with a small group of 4–8 isolated setae on the intergonocoxal membrane; inner ventral margin of gonocoxites short and sparsely setose; gonostylus tapered and pointed, with apical tooth; distal half of gonostylus with 4–6 mesial spines above a long whiplash seta; tegmen rounded.

**Distribution in Iran.** (Fig. 3) Razavi Khorasan province (Heidari Latibari et al., 2016a), Sistan and Baluchestan province (new record).

**Global distribution.** Afrotropical (South Africa, Tristan da Cunha archipelago); Australasia (Australia [mainland, Tasmania, Norfolk Island], Hawaiian Islands (USA), New Zealand); Nearctic (Canada, United States); Palaeartic (Afghanistan, Austria, Belarus, Belgium, Bulgaria, China, Czech Republic,
Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Iran, Ireland, Italy, Japan, Malta, Mongolia, Morocco, Norway, Pakistan, Poland, Portugal [Azores Islands], Romania, Russia, Slovakia, South Korea, Spain [mainland, Balearic Islands, Canary Islands], Sweden, Switzerland, the Netherlands, Turkey, Turkmenistan, United Kingdom); Subantarctic (French Southern and Antarctic Lands [Kerguelen Island]).

DISCUSSION

Five sciarid species are presented in this study, belonging to the genera *Bradysia* Winnertz (3 species), *Corynoptera* Winnertz (1 species) and *Lycoriella* Frey (1 species). Only one species, *Bradysia tilicola* (Loew), is new to Iran and the Middle East. This data shows that the Sciaridae fauna in Iran, as in the whole Middle East, is poorly studied. The insufficient data situation and our limited knowledge about this megadiverse dipteran family in Iran is mainly attributed to few, localised studies, through which only few adults have been captured in very short periods and unrepresentative habitats. Most sampling to date has been limited to Kermanshah, Razavi Khorasan and Alborz provinces (Talebi et al., 2003; Barzegar et al., 2014; Heidari Latibari et al., 2016a, 2016b), while other provinces have remained unexplored (e.g., Semnan and Sistan and Baluchestan in this study). Based on unpublished data and current fieldwork, we believe that the sciarid fauna is exceptionally rich and more species can easily be added to the Iranian checklist.

All the sciarid species in Iran listed in Table 1, which two species *Corynoptera perpusilla* (Det. Pekka Vilkamaa - University of Helsinki, Helsinki, Finland) and *Bradysia odoriphaga* (Det. Kai Heller - Heikendorf, Germany) removed from the list as they were synonymized to *Corynoptera fatigans* and *Bradysia cellarum*, respectively. *Corynoptera perpusilla* Winnertz is a valid synonym of *C. fatigans*, and is not identical with *Corynoptera perpusilla* (Walker, 1848) (further details in Mohrig et al. (2013): pp. 181, 183). The sciarid specialists have studied paratypes of *B. odoriphaga* in China, and Ye et al. (2017) have collected fresh material from the type locality of *odoriphaga*. They have confirmed *B. odoriphaga* as a synonymy of *B. cellarum* both morphologically and genetically, while Sueyoshi and Yoshimatsu (2019) did not accept the genetic studies done so far - *B. cellarum* and *B. odoriphaga* have the same Barcode Index Number (BIN)- and ignored in their article. On the other hand, Sueyoshi and Yoshimatsu (2019) used minute morphological deformations as "distinguishing characters", whereas all the type specimens of taxa discussed in that article were in very poor condition (as the published figures show) because the dry and pinned specimens have been transferred to permanent slides (pers. comm. F. Menzel). *Lycoriella auripila* (Winnertz, 1867) has already been recorded by Talebi et al. (2003; Det. Dr. Klaus Hövemeyer - University of Göttingen, Göttingen, Germany), which was a misidentification and reidentified as *Lycoriella sativae* (Heidari Latibari et al., 2016a). Accordingly, *L. auripila* has never been recorded from Iran.

As depicted in the distribution map (Fig. 3), sciarids presented in this study were mostly collected in the North-East (Razavi Khorasan) and South-East (Sistan and Baluchestan). To fill the knowledge gaps to the sciarid fauna of Iran the field work must be intensified in these provinces and extended to other Iranian regions. A significantly higher number of sciarid species can be detected in natural habitats during the entire vegetation period with the same (Malaise traps, pit fall traps, sweep net) and additional collecting methods (automatic light traps, photoelectors). All species identified in this study were caught in anthropogenically influenced habitats (agricultural areas, greenhouses, orchards, fallow land with weeds and palms) or detected on non-native trees (*Mangifera indica*, *Phoenix dactylifera*, *Pinus mugo*, *Robinia pseudoacacia*). For this reason, mostly were collected agricultural pests that are very common and widespread in the Holarctic region (*Bradysia ocellaris*, *B. tilicola*, *Lycoriella sativae*). Therefore, the results of this study may also be useful for Middle Eastern countries from the point of view of biological control. We hope that this paper will stimulate local interest in the study of Iranian sciarids and draw more attention of researchers to this dipteran family and its host associations.
Table 1. List all of Sciaridae Species in Iran.

| Species name               | Provincial distribution in Iran | Depository | Reference                          |
|----------------------------|---------------------------------|------------|------------------------------------|
| Bradysia cellarum Frey, 1948 | Razavi Khorasan                 | ZFMK       | Heidari Latibari et al. (2016a)   |
|                            | Sistan and Baluchestan          | EMFUM      | Current study                      |
| Bradysia ocellaris (Comstock, 1882) | Razavi Khorasan                 | Unknown    | Barzegar et al. (2014)            |
|                            | Sistan and Baluchestan          | ZFMK       | Heidari Latibari et al. (2016a)   |
|                            | Sistan and Baluchestan          | EMFUM      | Current study                      |
| Bradysia tilicola (Loew, 1850) | Razavi Khorasan                 | EMFUM      | Current study                      |
| Bradysia trivittata (Staeger, 1840) | Razavi Khorasan                 | ZFMK       | Heidari Latibari et al. (2016b)   |
|                            | Sistan and Baluchestan          | EMFUM      | Barzegar et al. (2014)            |
| Corynoptera fatigans (Johanssen, 1912) | Razavi Khorasan                 | Unknown    | Heidari Latibari et al. (2016a)   |
|                            | Sistan and Baluchestan          | ZFMK       | Current study                      |
|                            | Kermanshah                      | Unknown    | Barzegar et al. (2014)            |
| Lycoriella sativae (Johanssen, 1912) | Alborz province                 | Unknown    | Talebi et al. (2003)              |
|                            | Razavi Khorasan                 | ZFMK       | Heidari Latibari et al. (2016a)   |
|                            | Sistan and Baluchestan          | EMFUM      | Current study                      |
| Scatopsciara atomaria (Zetterstedt, 1851) | Razavi Khorasan                 | ZFMK       | Heidari Latibari et al. (2016b)   |

ZFMK: Zoologisches Forschungsmuseum Alexander Koenig’ in Bonn, Germany.

Figure 3. Distribution map of all sciarid species in Iran.
AUTHOR'S CONTRIBUTION

The authors confirm contribution to the paper as follows: MHL devised the project. MHL and MGM performed the field works. GHM and MGM supervised the findings of this work through MHL. MHL wrote the draft manuscript with support from MGM. MGM provided critical feedback and helped shape the research, and manuscript. All authors discussed the results and contributed to the final manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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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REFERENCES

Arimoto, M., Uesugi, R., Hinomoto, N., Sueyoshi, M. & Yoshimatsu, S.-I. (2018) Molecular marker to identify the fungus gnat, Bradysia sp. (Diptera: Sciaridae), a new pest of Welsh onion and carrot in Japan. Applied Entomology and Zoology, 53 (3), 419–424. https://doi.org/10.1007/s13355-018-0563-y

Babytskiy, A.I., Zuieva, O.A., Bezsmertna, O.O. & Dudiak, I.D. (2019) The first records of Corynoptera species (Diptera, Sciaridae) from Ukraine. Vestnik Zoologii, 53 (3), 227–236. https://doi.org/10.2478/vzoo-2019-0022

Barzegar, S., Zamani, A.A., Abbasi, S. & Vafaei Shoushtari, R. (2014) New report of two species of black fungus gnats (Dip.: Sciaridae) from Iran. Journal of Entomological Society of Iran, 34 (2), 5–6.

Broadley, A., Kauschke, E. & Mohrig, W. (2018) Black fungus gnats (Diptera: Sciaridae) found in association with cultivated plants and mushrooms in Australia, with notes on cosmopolitan pest species and biosecurity interceptions. Zootaxa, 4415 (2), 201–242. https://doi.org/10.11646/zootaxa.4415.2.1

Comstock, J.H. (1882) Report on miscellaneous insects. In: Riley, C.V. (ed.) Report of the Entomologist. Annual Report of the Department of Agriculture, 1882 (1881), 195–214.
Ebejer, M.J. & Gatt, P. (2021) A checklist of the Diptera of the Maltese Islands. Zootaxa, 5018 (1), 1–75. https://doi.org/10.11646/zootaxa.5018.1.1

El Ouazzani, N.E.H., Heller, K. & Kettani, K. (2019) The first checklist of black fungus gnats (Diptera: Sciaridae) of Morocco. Annales de la Société entomologique de France, nouvelle série, 55 (3), 274–290. https://doi.org/10.1080/00379271.2019.1570826

Frey, R. (1948) Entwurf einer neuen Klassifikation der Mückenfamilie Sciaridae (Lycoriidae). II. Die nordeuropäischen Arten. Notulae Entomologicae, 27 (2–4), 33–112.

Heidari Latibari, M., Moravvej, G., Heller, K., Rulik, B. & Sadeghi Namaghi, H. (2016a) New records of black fungus gnats (Diptera: Sciaridae) from Iran, including the reinstatement of Bradysia cellarum Frey. Studia dipterologica, 22 (1) (2015), 39–45.

Heidari Latibari, M., Moravvej, G. & Sadeghi Namaghi, H. (2016b) First report of three species of dark-winged fungus gnats (Diptera: Sciaridae), on Pinus mugo Turra, from Iran. Journal of Entomological Society of Iran, 35 (4), 75–76.

Heller, K. & Menzel, F. (2009): Sciaridae Billberg, 1820. In: Jedlička, L., Kúdela, M. & Stloukalová, V. (eds.) Checklist of Diptera of the Czech Republic and Slovakia. Electronic version 2, Comenius University, Bratislava, http://www.edvis.sk/diptera2009/families/sciaridae.htm [Accessed 12th January 2022].

Heller, K. & Menzel, F. (2017) Fauna Europaea: Sciaridae. In: Beuk, P.L.T. & Pape, T. (eds.) Fauna Europaea: Diptera, Nematocera. Fauna Europaea, Museum für Naturkunde, Leibniz-Institut für Evolutions- und Biodiversitätsforschung, Berlin, database version 2017.06, https://fauna-eu.org/cdm_dataportal/taxon/fbaa51a2-6eb4-46e6-ae1a-fbbd243a7950 [Accessed 12th January 2022].

Heller, K., Vilkamaa, P. & Hippa, H. (2009) An annotated check list of Swedish black fungus gnats (Diptera, Sciaridae). Sahlbergia, 15 (1), 23–51.

Hippa, H., Vilkamaa, P. & Heller, K. (K) Review of the Holarctic Corynoptera Winnertz, 1867, s. str. (Diptera, Sciaridae). Zootaxa, 2695, 1–197. https://doi.org/10.11646/zootaxa.2695.1.1

Johannsen, O.A. (1912) The fungus gnats of North America, Part IV (conclusion). Bulletin of the Maine Agricultural Experimental Station, 200, 57–146. https://doi.org/10.5962/bhl.title.86614

Katumanyane, A., Kanzi, A.M. & Malan, A.P. (2020) Sciarid pests (Diptera: Sciaridae) from undercover crop production in South Africa. South African Journal of Science, 116 (3–4), 79–84. https://doi.org/10.17159/sajs.2020/6822

Kolcsár, L.-P. & Heller, K. (2019) First DNA barcodes and records of Sciaridae (Insecta, Diptera) from Romania. Turkish Journal of Zoology, 43 (3), 290–296. https://doi.org/10.3906/zoo-1801-6

Loew, H. (1850) Dipterologische Beiträge, Viertel Theil. J. J. Heine, Posen [Poznan], 40 p.

Menzel, F. (2000) Die Trauermücken-Fauna der Bundesrepublik Deutschland (Diptera: Sciaridae). Beiträge zur Entomologie, 50 (2), 317–355. https://doi.org/10.21248/entomol.50.2.317-355

Menzel, F. (2018) Neue Funde von Trauermücken (Insecta: Diptera: Sciaridae) in Deutschland nebst einigen Korrekturen zur Nomenklatur und Systematik. Vernate, 37, 401–433.

Menzel, F. & Mohrig, W. (2000) Revision der paläarktischen Trauermücken (Diptera: Sciaridae). Studia dipterologica Supplement, 6 (1999), Ampyx-Verlag, Halle (Saale), 761 p.

Menzel, F. & Heller, K. (2007) Bemerkungen zur Nomenklatur der Sciariden (Diptera, Bibionomorpha: Sciaridae). Studia dipterologica, 13 (2) (2006), 209–229.

Menzel, F. & Smith, J.E. (2009) Family Sciaridae. In: Gerlach, J. (ed.) The Diptera of the Seychelles islands. Pensoft Series Faunistica, 85, Pensoft Publisher, Sofia & Moscow, pp. 19–45.

Menzel, F. & Satayeva, A.R. (2010) Neue Trauermücken-Funde (Diptera: Sciaridae) aus Ägypten. Studia dipterologica, 16 (1–2) (2009), 241–242.

Menzel, F. & Elsayed, A.K. (2013) The first record of Bradysia ocellaris (Comstock) (Diptera: Sciaridae) from Egypt. Studia dipterologica, 19 (1–2) (2012), 139–140.

Menzel, F. & Smith J.E. (2017) 21 Sciaridae (Black Fungus Gnats). In: Kirk-Spriggs, A.H. & Sinclair, B.J. (eds.) Manual of Afrotropical Diptera, Volume 2. Nematocerous Diptera and lower Brachycera. Suricata, Volume 5. SANBI Graphics & Editing, Pretoria, pp. 557–580.
Menzel, F. & Vilkamaa, P. (2021) New species and records of *Lycoriella* Frey (Diptera, Sciaridae) from the Holarctic region. *Zootaxa*, 5072 (6), 501–530. https://doi.org/10.11646/zootaxa.5072.6.1

Menzel, F., Smith, J.E. & Colauto, N.B. (2003) *Bradysia difformis* Frey and *Bradysia ocellaris* (Comstock): two additional Neotropical species of black fungus gnats (Diptera: Sciaridae) of economic importance: a redescription and review. *Annals of the Entomological Society of America*, 96 (4), 448–457. https://doi.org/10.1603/0013-8746(2003)096[0448:BDFABO]2.0.CO;2

Menzel, F., Vilkamaa, P. & Smith, J.E. (2013) Overview of the black fungus gnats from the Tristan da Cunha archipelago, including a redescription of *Hyperlasion viridiventris* (Frey) (Diptera, Sciaroidea: Sciaridae). *Contributions to Entomology*, 63 (2), 283–296. https://doi.org/10.3897/zootaxa.957.4.1

Menzel, F., Salmela, J. & Vilkamaa, P. (2020a) New species and new records of black fungus gnats (Diptera: Sciaridae) from the Viidumäe Nature Reserve, Estonia. *European Journal of Taxonomy*, 720, 62–76. https://doi.org/10.5852/ejt.2020.720.1115

Menzel, F., Gammelmo, Ø., Olsen, K.M. & Köhler, A. (2020b) The Black Fungus Gnats (Diptera, Sciaridae) of Norway – Part I: species records published until December 2019, with an updated checklist. *ZooKeys*, 957, 17–104. https://doi.org/10.3897/zootaxa.957.46528

Merritt, R.W., Courtney, G.W. & Keiper, J.B. (2009) Diptera (Flies, Mosquitoes, Midges, Gnats). In: *Encyclopedia of insects*. Academic Press, pp. 284–297. https://doi.org/10.1016/B978-0-12-374144-8.X0001-X

Mohrig, W., Rulik, B., Papp, L. (2001) Sciaridae. In: Papp, L. (ed.) Checklist of the Diptera of Hungary. Hungarian Natural History Museum, Budapest, pp. 119–123.

Mohrig, W., Heller, K., Hippa, H., Vilkamaa, P. & Menzel, F. (2013) Revision of the black fungus gnats (Diptera: Sciaridae) of North America. *Studia dipterologica*, 19(1–2) (2012), 141–286. https://doi.org/10.3897/zootaxa.4590.4.1

Pape, T., Blagoderov, V. & Mostovski, M.B. (2011) Order Diptera Linnaeus, 1758. In: Zhang, Z.-Q. (ed.) *Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness*. Zootaxa, 3148, Magnolia Press, Auckland, pp. 222–229. https://doi.org/10.3897/zootaxa.3148.1.42

Shin, S., Jung, S., Heller, K., Menzel, F., Hong, T.K., Shin, J.S., Lee, S.H., Lee, H. & Lee, S. (2015) DNA barcoding of *Bradysia* (Diptera: Sciaridae) for detection of the immature stages on agricultural crops. *Journal of Applied Entomology*, 139 (8), 638–645 + 8 p. https://doi.org/10.1111/jen.12198

Sohier, C., Dekoninck, W., Menzel, F., Versteirt, V. & Grootaert, P. (2012) Larval habitat characteristics along the Scheldt estuarium of *Bradysia ocellaris* (Comstock), a black fungus gnat (Diptera: Sciaridae) of economic importance. *Belgian Journal of Zoology*, 142 (2), 127–129.

Steffan, W.A. (1969) Insects of Micronesia. Diptera: Sciaridae. *Insects of Micronesia*, 12, 669–732.

Steffan, W.A. (1974) Laboratory studies and ecological notes on Hawaiian Sciaridae (Diptera). *Pacific Insects*, 16 (1), 41–50.

Sueyoshi, M. & Yoshimatsu, S.-I. (2019) Pest species of a fungus gnat genus *Bradysia* Winnertz (Diptera: Sciaridae) injuring agricultural and forestry products in Japan, with a review on taxonomy of allied species. *Entomological Science*, 22 (3), 317–333. https://doi.org/10.1111/ens.12373

Talebi, A.A., Zamany, A.A., Mohammadi Goltapeh, E. & Fathipour, Y. (2003) Biological notes on *Lycoriella auripila* (Dip.: Sciaridae) and *Coboldia fusipes* (Dip.: Scatopsidae), as important pests of button mushroom in Karadj. *Journal of Entomological Society of Iran*, 23 (1), 21–40. [in Persian with the English abstract]

Vilkamaa, P. (2014) Checklist of the family Sciaridae (Diptera) of Finland. In: Kahanpää J. & Salmela J. (eds.) *Checklist of the Diptera of Finland*. ZooKeys, 441, Pensoft Publisher, Sofia, pp. 151–164. https://doi.org/10.3897/zootaxa.441.7381

Wiegmann, B.M. & Yeates, D.K. (2017): Phylogeny of Diptera. In: Kirk-Spriggs, A.H. & Sinclair, B.J. (eds.) *Manual of Afrotropical Diptera. Volume 1. Introductory chapters and keys to Diptera families*. Suricata 4, SANBI Graphics & Editing, Pretoria, pp. 253–265.

Ye, L., Leng, R., Huang, J., Qu, C. & Wu, H. (2017) Review of three black fungus gnat species (Diptera: Sciaridae) from greenhouses in China: Three greenhouse sciarids from China. *Journal of Asia-Pacific Entomology*, 20 (1), 179–184. https://doi.org/10.1016/j.aspen.2016.12.012
New record for the sciarid fauna of the Middle East

گزارش جديد پشه سيامال قارچژي (Diptera: Sciaroidea, Sciaridae) خاورميانه

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چکيده: اين مقاله براساس مطالعات ميداني در هفت منطقه در ايران، اطلاعات جديدي در مورد پشههای سيامال قارچژي (Sciaridae) ارایه مي‌گردد. پنج گونه سردي با Lycoriella Frey و Corynoptera Winnertz Brdysia Winnertz از جنس هايز ته مالایی، تلههای تنينده زرد، تار جارو و یک دستگاه آسيب‌زا بين سال‌های 2015 و 2021 در جمع‌آري شدند: 1948 Corynoptera fatigans، B. tilicola (Loew، 1850) (Comstock، 1882) و همه گونه‌ها اولين Lycoriella sativa (Johannsen، 1912) و Brdysia tilicola (Loew) گزارش نوستیان، سيبستان و بلونگستان هستند. گونه برای ايران جديد مي‌باشد و برای اولين بار از خاورميانه گزارش مي‌شود. پرتاب تعداد گونه‌های پشه‌های سيامال قارچژي شناخته شده از ايران به هفت گونه رسيد. برای پنج گونه يک تشخيص رختشناسي گوتاه و پراکنش جهاني داده شده است. يك نفشه از پراکنش همه گونه‌های پشه‌های سيامال قارچژي شناسايي شده در ايران ارایه شد.

واژگان كليدي: پشه سيامال قارچژي، آسيا، خاورميانه، ايران، نوع، پراکنش، گزارش جديد