

Research Article

Records of species of *Megaselia* Rondani 1856 (Diptera: Phoridae) from West Azerbaijan province including new records for Iran

Roya Namaki Khameneh¹, Samad Khaghaninia^{1*} and R. Henry L. Disney²

1. Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.

2. Department of Zoology, University of Cambridge, Cambridge, UK.

Abstract: Among specimens collected from West Azerbaijan province- Iran, during 2011-2017, fourteen species of the genus *Megaselia* Rondani 1856 were identified. Twelve species (*Megaselia aculeata* (Schmitz, 1919), *M. annulipes* (Schmitz, 1921), *M. brevicostalis* (Wood, 1910), *M. giraudii* (Egger, 1862), *M. hendersoni* Disney, 1979, *M. hirticaudata* (Wood, 1910), *M. meconicera* (Speiser, 1925), *M. minuta* (Aldrich, 1892), *M. pleuralis* (Wood, 1909), *M. plurispinulosa* (Zetterstedt, 1860), *M. subnudipennis* (Schmitz, 1919) and *M. verralli* (Wood, 1910)) are being newly reported from Iran. A key to the studied species along with their geographical distributions and supplementary figures are given.

Keywords: Phoridae, *Megaselia*, New records, West Azerbaijan province, Iran

Introduction

Phoridae are considered as one of the most diverse families in the order Diptera, which include more than 4000 species. More than fifty percent of the species belong to the cosmopolitan genus *Megaselia* Rondani (Disney *et al.*, 2010). This giant genus has been defined as "the Diptera enfant terrible" (Smith, 1984). It can be actually considered that the genus "is one of the largest, most biologically diverse and taxonomically difficult genera in the entire animal kingdom" (Marshall, 2012). The genus *Megaselia* belongs to the subfamily Metopininae and the tribe Gymnophorini, which combines the Beckerinini plus Megaseliini (Disney, 2003). Around 1500 species have been identified so far, however, it is estimated to include at least 10,000 species. The occurrence of this genus was

recorded from the Palaearctic region with more than 400 described species (Disney, 1993; Disney and Druska, 2014). Previous studies from Iran have reported twelve species of this genus among which *Megaselia kermanshahensis* Disney, 2012 and *M. barzegarae* Disney, 2012 have been described from Kermanshah province (Zamani *et al.*, 2005; Talebi *et al.*, 2003, 2006; Ghahari and Disney, 2007; Disney *et al.*, 2012; Rabieh *et al.*, 2013; Sadeghi *et al.*, 2013). We add 12 species of this genus to the Iranian fauna.

Materials and Methods

Malaise trap and standard entomological hand net were used to collect specimens from the various regions of the West Azerbaijan province (Evogli, Miandoab, Pere) in the northwest of Iran, during 2011-2017. Hand net collections were made from the heads of various plants in grassland and wetland habitats of the regions. All specimens were kept in 75% ethanol. The material was deposited in the following collections: Insect Collection of Professor Hasan Maleki Milani,

Handling Editor: Aliasghar Talebi

*Corresponding author, e-mail: skhaghaninia@gmail.com

Received: 20 August 2018, Accepted: 10 June 2019

Published online: 15 June 2019

Tabriz, Iran (ICHMM) and, deposited as slide mounts in University of Cambridge, Museum of Zoology, Cambridge, England (UCMZ). The specimens were identified based on keys of Disney (1989). As further references for species determination, parts of the keys of Disney (2009) and Disney *et al.* (2010) have been also used. The photographs were taken using a Nikon SMZ 800N stereomicroscope equipped with a Nikon D5200 digital camera. Illustrations of the genitalia were taken from Disney (1989) and (2009). The distribution areas of the studied species mostly provided from Disney (1991).

Results

Fourteen species of the genus *Megaselia* Rondani, 1856 from West Azerbaijan province were identified, of which twelve species *Megaselia aculeata* (Schmitz, 1919), *M. annulipes* (Schmitz, 1921), *M. brevicostalis* (Wood, 1910), *M. giraudii* (Egger, 1862), *M. hendersoni* Disney, 1979, *M. hirticaudata* (Wood, 1910), *M. meconicera* (Speiser, 1925), *M. minuta* (Aldrich, 1892), *M. pleuralis* (Wood, 1909), *M. plurispinulosa* (Zetterstedt, 1860), *M. subnudipennis* (Schmitz, 1919) and *M. verralli* (Wood, 1910), are newly reported from Iran. Species are listed in alphabetic order.

Key to the recorded species of *Megaselia* males

(Adapted from Disney, 1989, 2009 and Disney *et al.*, 2010)

Remarks. This is a very small subset of the Palearctic fauna so if there's any doubt reference should be made to more elaborate keys.

1. Hypopygium (Fig. 4H) is often largely straw yellow. The inner face of the epandrium comprises elaborate cavities lined with fine pale hairs *M. xanthozona*
– Hypopygium otherwise 2
2. Mesopleuron with hairs and sometimes with bristles as well 3
– Mesopleuron bare 7
3. Mesopleuron with uniform small hairs only 4

- Mesopleuron with some clearly differentiated bristles at rear of patch of hairs 5
4. The lower margin of right side of epandrium greatly extended downwards and curving under the hairless hypandrium (Fig. 4F)..... *M. verralli*
– Epandrium not modified in this way (Fig. 1D)..... *M. annulipes*
5. Knob of haltere somewhat darkened, being greyish to almost black in color. Hypopygium as in Fig. 1B *M. aculeata*
– Knob of haltere largely or entirely yellow. Hypopygium otherwise 6
6. Hairs below basal half of hind femur relatively short, or if a little longer not so crowded. Hypopygium as in Fig. 3H *M. pleuralis*
– Hairs below basal half of hind femur relatively long and somewhat crowded. Hypopygium as in Fig. 3D *M. meconicera*
7. Scutellum with two pairs of bristles 8
– Scutellum with a posterior pair of bristles and an anterior pair of hairs 9
8. Hind tibia with an antero-dorsal row of short black spines. Hypopygium as in Fig. 4B..... *M. plurispinulosa*
– Neither hind nor mid tibia with such spine-like antero-dorsals. Hypopygium as in Fig. 1H..... *M. giraudii*
9. Left side of epandrium with at least one bristle or strong hair which is more robust than hairs of cerci..... 10
– Hairs of left side of epandrium at most only as robust as hairs of cerci, usually weaker.... 12
10. Strong bristles on epandrium distinctly feathered 11
– No bristles on epandrium are obviously feathered (Fig. 2B) *M. hendersoni*
11. At most only one bristle on left side of epandrium is longer than those at rear margin of abdominal tergite 6 (Fig. 2D)... *M. hirticaudata*
– At least two (usually more) bristles on left side of epandrium are clearly longer than those at rear margin of abdominal tergite 6 (Fig. 3B) *M. halterata*
12. Antial bristles distinctly lower on frons than antero-laterals and positioned almost as close to eye margin, so that they lie almost directly below the latter. Hypopygium as in Fig. 3F..... *M. minuta*

– Antial bristles either little, if any, lower on frons than antero- laterals or if clearly lower they are well clear of eye margin and not situated nearly directly below the antero-laterals. 13
13. Knob of haltere dominantly yellowish. Hypopygium as in Fig. 1F *M. brevicostalis*
– Knob of haltere dominantly dark. Hypopygium as in Fig. 4D *M. subnudipennis*

Subfamily: Metopininae

Genus *Megaselia* Rondani 1856

Megaselia aculeata (Schmitz, 1919) (Figures 1-A-B)

Material examined: (1♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436' N 45°12.246' E, 968 m, Malaise trap, 26.iv.2013, S. Khaghaninia (1 male, UCMZ).

Distribution: Europe.

Megaselia annulipes (Schmitz, 1921) (Figures 1-C-D)

Material examined: (4♂♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436' N 45°12.246' E, 968 m, Malaise trap, 26.iv.2013, S. Khaghaninia (1 male, UCMZ; 3 males ICHMM).

Distribution: Europe, Nearctic Region.

Megaselia brevicostalis (Wood, 1910) (Figures 1-E-F)

Material examined: (32♂♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436' N 45°12.246' E, 968m, Malaise trap, 26.iv.2013. (8♂♂): West Azerbaijan province, Khoy city, Pere region, 38°34.220' N 44°50.896' E, 1305m, Montane grassland, 10.vi.2014. (5♂♂): West Azerbaijan province, Khoy city, Pere region, 38°36.722' N 44°53.336' E, 1323 m, grassland, 9.vii.2011, S. Khaghaninia (1 male, collected from Pere region, UCMZ; 44 males ICHMM).

Distribution: Europe, USSR, Israel, Canary Island, Nearctic and Neotropical Regions.

Megaselia giraudii (Egger, 1862) (Figures 1-G-H)

Material examined: (18♂♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436'

N 45°12.246' E, 968m, Malaise trap, 26.iv.2013, S. Khaghaninia (3 males, UCMZ; 15 males ICHMM).

Distribution: Holarctic and Oriental Regions.

Megaselia hendersoni Disney, 1979 (Figures 2-A-B)

Material examined (1♂): West Azerbaijan province, Khoy city, Pere region, 38°41.719' N 44°54.041' E, 1405 m, Montane grassland, 22.v.2012, S. Khaghaninia (1 male, UCMZ).

Distribution: Europe.

Megaselia hirticaudata (Wood, 1910) (Figures 2-C-D)

Material examined: (1♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436' N 45°12.246' E, 968 m, Malaise trap, 26.iv.2013, S. Khaghaninia (1 male, UCMZ).

Distribution: Europe.

Megaselia halterata (Santos Abreu, 1921) (Figures 3-A-B)

Material examined: (2♂♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436' N 45°12.246' E, 968 m, Malaise trap, 26.iv.2013, S. Khaghaninia (1 male, UCMZ; 1 male ICHMM).

Distribution: Europe, Israel, Egypt, Tunisia, Azores, Canary Is, Nearctic Region, Turkey, Yemen, Australia and Iran (Talebi *et al.*, 2006).

Megaselia meconicera (Speiser, 1925) (Figures 3-C-D)

Material examined: (1♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436' N 45°12.246' E, 968 m, Malaise trap, 26.iv.2013, S. Khaghaninia (1 male, UCMZ).

Distribution: Europe, Israel, Japan, Azores, Nearctic Region, Russian Far East and Korea.

Megaselia minuta (Aldrich, 1892) (Figures 3-E-F)

Material examined: (1♂): West Azerbaijan province, Khoy city, Pere region, 38°34.220' N 44°50.896' E, 1305 m, Montane grassland, 10.vi.2014, S. Khaghaninia (1 male, UCMZ).

Distribution: Europe, USSR, Tunisia, Nearctic Region.

***Megaselia pleuralis* (Wood, 1909) (Figures 3-G-H)**

Material examined: (16♂♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436' N 45°12.246' E, 968 m, Malaise trap, 26.iv.2013, S. Khaghaninia (1 male, UCMZ; 15 males ICHMM).

Distribution: Europe, China, Israel, Japan, Azores, Madeira, Canary Is, Nearctic Region, Russian Far East and Tasmania.

***Megaselia plurispinulosa* (Zetterstedt, 1860) (Figures 4-A-B)**

Material examined: (6♂♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436' N 45°12.246' E, 968 m, Malaise trap, 26.iv.2013, S. Khaghaninia (1 male, UCMZ; 5 males ICHMM).

Distribution: Europe, USSR, China.

***Megaselia subnudipennis* (Schmitz, 1919) (Figures 4-C-D)**

Material examined: (2♂♂): West Azerbaijan province, Miandoab city, Nasirkandy region, 36°56.84' N, 46°10.01' E, 1306 m, grassland, 12.vi.2016, S. Khaghaninia (1 male, UCMZ; 1 male ICHMM).

Distribution: Europe.

***Megaselia verralli* (Wood, 1910) (Figures 4-E-F)**

Material examined: (52♂♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436' N 45°12.246' E, 968m, Malaise trap, 26.iv.2013. (37♂♂): West Azerbaijan province, Khoy city, Pere region, 38°41.719' N 44°54.041' E, 1405 m, Montane grassland, 22.v.2012. S. Khaghaninia (3 males, collected from Pere region, UCMZ; 86 males ICHMM).

Distribution: Europe, USSR, Israel, Canary Is.

***Megaselia xanthozona* (Strobl, 1892) (Figures 4-G-H)**

Material examined: (14♂♂): West Azerbaijan province, Khoy city, Evogli region, 38°42.436' N 45°12.246' E, 968 m, Malaise trap, 26.iv.2013. (3♂♂): West Azerbaijan province, Khoy city, Pere region, 38°34.220' N 44°50.896' E, 1305 m, Montane grassland, 10.vi.2014. S. Khaghaninia (17 males ICHMM).

Distribution: Europe, Israel, Algeria, Egypt, Libya, Tunisia and Iran (Rabieh *et al.*, 2013; Sadeghi *et al.*, 2013).

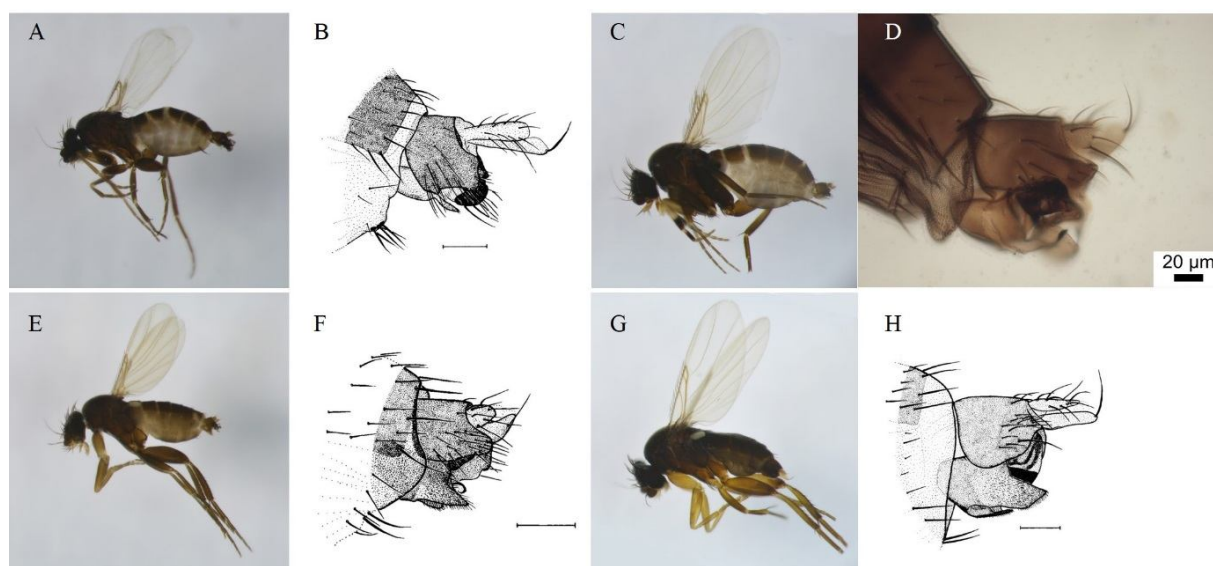


Figure 1 A, B *Megaselia aculeata* (Schmitz, 1919); C, D: *Megaselia annulipes* (Schmitz, 1921); E, F: *Megaselia brevicostalis* (Wood, 1910); G, H: *Megaselia giraudii* (Egger, 1862). A, C, E, G: Lateral view; B, D, F, H: Male hypopygium (Scale bar: 0.1mm).

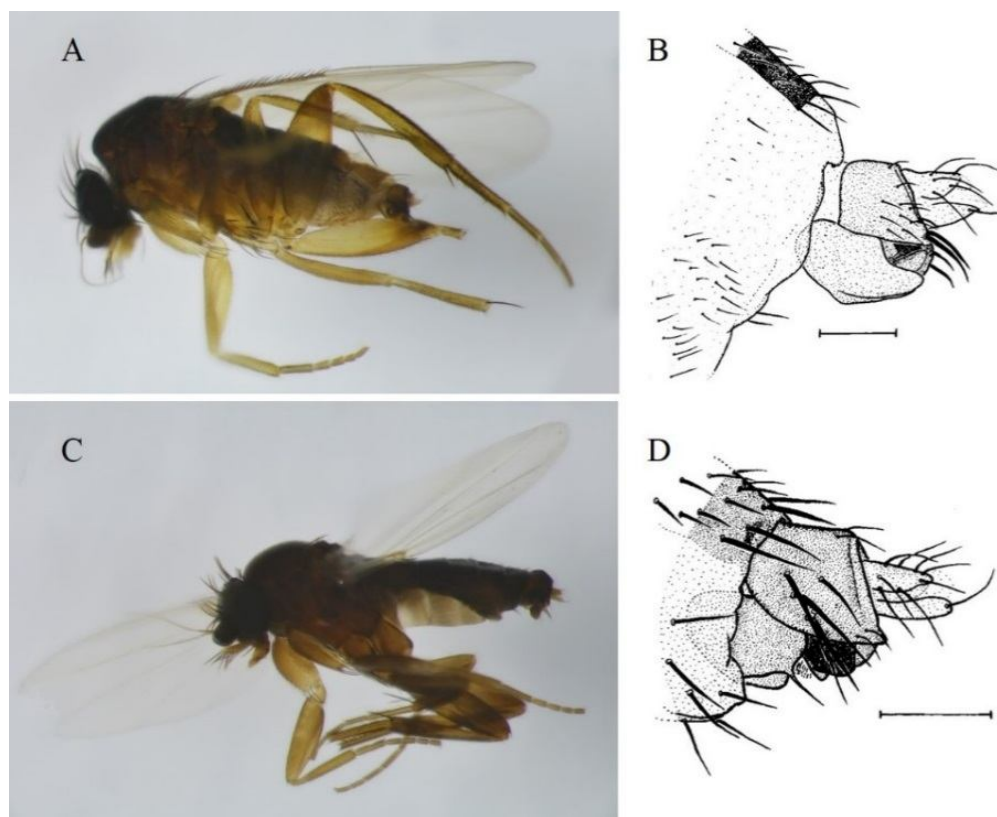


Figure 2 A, B *Megaselia hendersoni* Disney, 1979; C, D: *Megaselia hirticaudata* (Wood, 1910). A, C: Lateral view; B, D: Male hypopygium (Scale bar: 0.1mm).

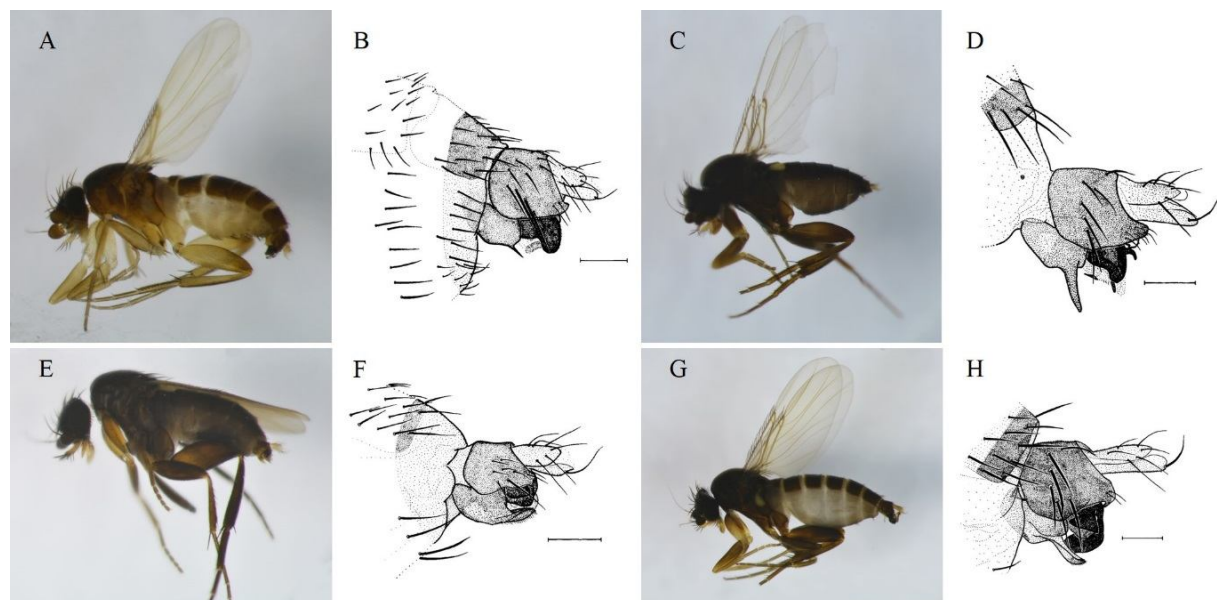


Figure 3 A, B *Megaselia halterata* (Santos Abreu, 1921); C, D: *Megaselia meconicera* (Speiser, 1925); E, F: *Megaselia minuta* (Aldrich, 1892); G, H: *Megaselia pleuralis* (Wood, 1909). A, C, E, G: Lateral view; B, D, F, H: Male hypopygium (Scale bar: 0.1mm).

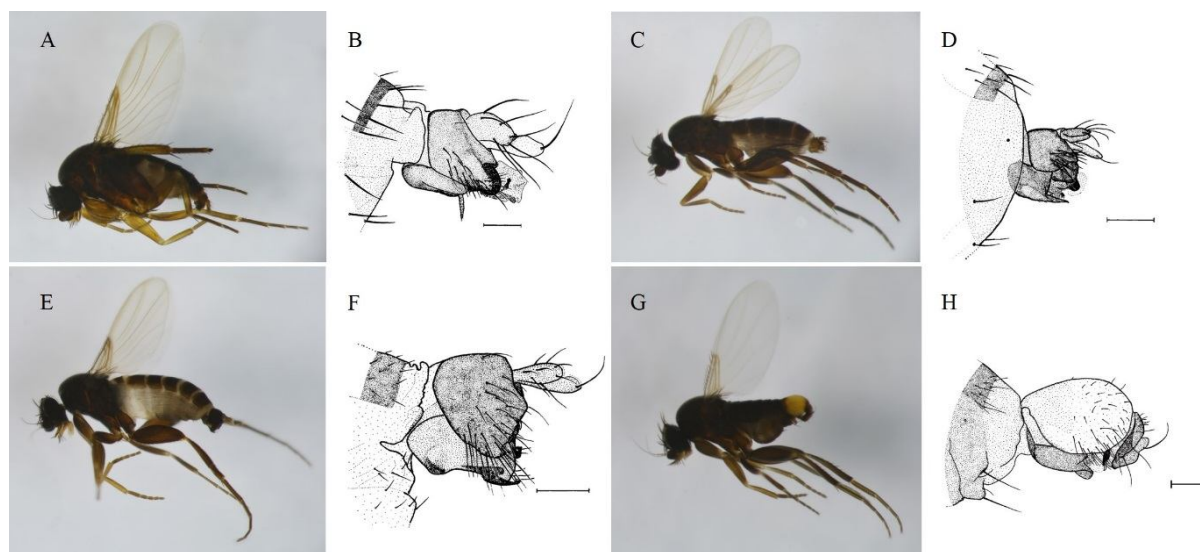


Figure 4 A, B *Megaselia plurispinulosa* (Zetterstedt, 1860); C, D: *Megaselia subnudipennis* (Schmitz, 1919); E, F: *Megaselia verralli* (Wood, 1910); G, H: *Megaselia xanthozona* (Strobl, 1892). A, C, E, G: Lateral view; B, D, F, H: Male hypopygium (Scale bar: 0.1mm).

Discussion

Of the 14 identified species, 12 (85%) are new records for Iran. Previous studies have reported the species of this genus from Mazandaran, Fars, Kermanshah and Markazi provinces of Iran. The mismatch of the numbers of species among the provinces, probably relates to different collecting efforts. The different climatic conditions and habitat types sampled. *Megaselia verralli* (Wood), was the most frequently collected species followed by *M. brevicostalis* (Wood), *M. giraudii* (Egger), *M. xanthozona* (Strobl) and *M. pleuralis* (Wood). These species have been reported from open sites of moist pine forests and visiting wide range of flowers as well (Disney, 1980; Durska, 2002; Disney, 2008; Disney *et al.*, 2010). All species were collected from various plants in grassland and wetland habitats of various regions in the West Azerbaijan province. Since the studied area featured various species of Astraceae, Apiaceae, Ronunculaceae, Caryophyllaceae and Lamiaceae as well as the existence of streams and rivers along with the presence of expanded wetlands, these species are common in this area. As indicated above, our knowledge of the species of Phoridae

occurring throughout Iran is clearly far from complete. Sampling different habitats, using different collecting methods and observing species visiting named flowers or attacking named hosts (e. g. ants, Coccinellidae beetle pupae, etc.), etc. will undoubtedly greatly extend the list of species.

Acknowledgements

RHLD's studies of Phoridae are currently funded by the Balfour-Browne Trust (University of Cambridge).

References

- Disney, R. H. L. 1980. Records of flower visiting by scuttle flies (Diptera: Phoridae) in the British Isles. *Naturalist, Hull*, 105 (953): 45-50.
- Disney, R. H. L. 1989. Scuttle Flies-Diptera Phoridae Genus *Megaselia*. *Handbooks for the Identification of British Insects*, 10 (8): 1-155.
- Disney, R. H. L. 1991. Family Phoridae. In: Soós, A. and Papp, L. (Eds.), *Catalogue of Palearctic Diptera. Volume 7 (Dolichopodidae-Platypezidae)*. Akademiai Kiado, Budapest, pp: 143-204.

- Disney, R. H. L. 1993. Notes on European Phoridae (Diptera). *British Journal of Entomology and Natural History*, 6: 107-118.
- Disney, R. H. L. 2003. The dorsal abdominal glands and the higher classification of the Phoridae (Diptera). *Zootaxa*, 293: 1-16.
- Disney, R. H. L. 2008. Order Diptera, family Phoridae. In: van Harten, A. (Ed.), *Arthropod Fauna of the United Arab Emirates*. Volume 1, Dar al Ummah, Abu Dhabi, pp: 604-635.
- Disney, R. H. L. 2009. Insects of Arabia scuttle flies (Diptera: Phoridae) Part II: the genus *Megaselia*. In: Krupp, F. (Ed.) *Fauna of Arabia 24*. Senckenbergische Naturforschende Gesellschaft, Frankfurt A.M, Germany and King Abdulaziz City for Science and Technology, Ryadah, Kingdom of Saudi Arabia. pp: 249-357.
- Disney, R. H. L. and Durska, E. 2014. A new species of *Megaselia* Rondani (Diptera: Phoridae) and two newly found species from Poland. *Fragmenta Faunistica*, 51: 63-66.
- Disney, R. H. L., Barzegar, S., Zamani, A. A., Abbasi, S. and Vafaei Shoushtar, R. 2012. Two new species of *Megaselia* Rondani (Diptera, Phoridae) reared from fungi in Iran. *Fragmenta Faunistica*, 55 (1): 41-48.
- Disney, R. H. L., Prescher, S. and Ashmole, N. P. 2010. Scuttle flies (Diptera: Phoridae) of the Canary Islands. *Journal of Natural History*, 44: 107-218.
- Durska E. 2002. The phenology of dominant scuttle-fly (Diptera: Phoridae) species in the Bialowieza Forest. *Entomologica Fennica*, 13: 123-127.
- Ghahari, H. and Disney, R. H. L. 2007. *Megaselia scalaris* (Loew) (Diptera, Phoridae) invading insect cultures in Iran. *Entomologist's Monthly Magazine*, 143 (1718-1720): 164.
- Marshall, S. A. 2012. *Flies: The Natural History and Diversity of Diptera*. New York, Firefly Books, 615 pp.
- Rabieh, M. M., Prescher, S., Alikhani, M. and Arkani, T. 2013. Review of scuttle flies (Diptera: Phoridae) from Iran, with first records for Iran and Asia. *Studia Dipterologica*, 20 (1): 23-30.
- Sadeghi, S., Weber, G., Fallahzadeh, M. and Dousti, A. F. 2013. Introduction to the Scuttle Flies Fauna (Diptera: Phoridae) of Fars Province, Iran. *Linzer Biologische Beiträge*, 45 (2): 2019-2024.
- Smith, K. G. V. 1984. Review of Disney 1983, *HIBI* 10 (6). *Entomologist's Monthly Magazine*, 120: 196.
- Talebi, A. A., Zamani, A. A. and Goltapeh Mohammadi, E. 2003. Identification and description of some Diptera pest of white button mushroom, *Agaricus bisporus*. *Applied Entomology and Phytopathology*, 71: 91-102.
- Talebi, A. A., Zamani, A. A., Mohammadi Goltapeh, E., Moharrampour, S. and Fathipour, Y. 2006. Biological Characteristics of *Megaselia halterata* (Dip.: Phoridae) as important pest of button mushroom in Karaj, Iran. *Agricultural Science*, 15 (4): 53-61.
- Zamani, A. A., Talebi, A. A., Mohammadi Goltapeh, E. and Fathipour, Y. 2005. Investigation on morphological and biological characteristics of *Megaselia scalaris* (Dip.: Phoridae), as an important pest of button mushroom in Karaj, Iranian *Scientific Journal of Agriculture*, 27 (2): 45-58.

گزارش‌های جدید از جنس (*Megaselia* Rondani 1856 (Diptera: Phoridae) از استان آذربایجان غربی همراه با رکوردهای جدید برای ایران

رویا نمکی خامنه^۱، صمد خاقانی نیا^۱ و هنری دبزنی^۲

۱- گروه گیاه‌پزشکی، دانشکده کشاورزی، دانشگاه تبریز، تبریز، ایران.

۲- بخش جانورشناسی، دانشگاه کمبریج، کمبریج، انگلستان.

پست الکترونیکی نویسنده مسئول مکاتبه: skhaghaninia@gmail.com

دریافت: ۲۹ مرداد ۱۳۹۷؛ پذیرش: ۲۰ خرداد ۱۳۹۸

چکیده: از میان نمونه‌های جمع‌آوری شده طی سال‌های ۱۳۹۶-۱۳۹۰ از استان آذربایجان غربی-ایران، تعداد ۱۴ گونه از جنس *Megaselia* Rondani 1856 شناسایی شد. تعداد ۱۲ گونه شامل *Megaselia* *M. brevicostalis* (Wood, 1910)، *M. annulipes* (*aculeata*) (Schmitz, 1919)، *M. hirticaudata* (Wood, 1910)، *M. hendersoni* (Disney, 1979)، *M. giraudii* (Egger, 1862)، *M. pleuralis* (Wood, 1909)، *M. minuta* (Aldrich, 1892)، *M. meconicera* (Speiser, 1925)، *M. verralli* (Wood, 1919) و *M. subnudipennis* (*plurispinulosa*) (Zetterstedt, 1860) برای فون ایران جدید می‌باشند. کلیدی برای شناسایی گونه‌های مورد مطالعه به‌همراه پراکنش جغرافیایی و تصاویر آن‌ها ارائه شده است.

واژگان کلیدی: *Megaselia*, Phoridae، گزارش‌های جدید، استان آذربایجان غربی، ایران