Indian Journal of Ecology (2024) 51(4): 877-882
DOI: https://doi.org/10.55362/IJE/2024/4324

Manuscript Number: 4324
NAAS Rating: 5.38

Survey of Insects Fauna of Al-Tar Caves in Karbala, Iraq

Razzaq Shalan Augul, Hanaa H Al–Saffar and Hayder Badri Ali[1]

Iraq Natural History Research Center and Museum, University of Baghdad, Iraq
[1]Department of Biology, Collage of Science, University of Baghdad, Iraq
E-mail: dr.rsha@nhm.uobaghdad.edu.iq

***Abstract*:** The Al-Tar caves are geologically important sites due to their location in a semi-desert area and proximity to Al-Razzaza Lake in Karbala, Iraq. Multiple surveys were conducted from September 1, 2020, to November 15, 2020, to collect and identify the insect species that occur inside and around these caves. During this investigation, a variety of species were collected from different orders and families. These include Blattodea (Termitidae), Orthoptera (Acrididae), Odonata (Libellulidae), Diptera (Muscidae and Calliphoridae), Coleoptera (Meloidae and Tenebrionidae), and Hymenoptera (Formicidae and Sphecidae). Beetle species showed a high degree of diversity compared to the insect species in other groups during the study period.

Keywords: Al-Razzaza, Al-Sayed, Caves, Fauna, *Halothamnus*

The Tar Al-Sayed area, also known as the Al-Tar caves, is one of the important geological areas in Iraq. It is situated approximately 100km southwest of Baghdad, in the western part of Karbala Governorate, and to the south of Al-Razzaza Lake. Covering an area of about one square kilometer, this location possesses unique geological and historical features that make it a potential candidate for a Geopark (Al-Shakeri et al 2017) The caves can be strongly affected by even modest human changes in their environment. Furthermore, due to the high environmental stability of caves, such environments become highly vulnerable to external impacts, since this stable condition can often be easily unbalanced. Therefore, any direct or indirect impacts on caves can cause serious damage to the fauna and the physical integrity of these environments (Souza-Silva et al 2015). Surveys to identify invertebrate species, including insects, in this region and adjacent areas are lacking, except for a few studies that have primarily focused on the biological diversity of vertebrates, such as the works by Mohammad et al (2010) and Mohammad and Al-Zubaidi (2017). There is a lack of study regarding the insect species found in this area. Therefore, this study was aimed to conduct a survey on insect diversity in Al Tar Caves and adjacent areas, with the aim of identifying different insect orders, families, genera and species that belonging to it.

MATERIAL AND METHODS

Study area: The Al Tar Caves (32°28'54.6"N 43°46'37.4"E, elevation: 65 m) investigated in this study are located on the right side of the road that leads to Ain Al-Tamur District (32°34'08.5"N 43°29'06.1"E); they are situated 45 km from the city center of Karbala Province, towards the southwest, and 15 km northeast of Al-Ukhaydhir Fort (Fig. 1, 2). The area adjacent to the caves is characterized by low density and of plants cover in both diversity and density. The most prominent plant species is *Salsola kali* L., 1753 (Caryophyllales, Amaranthaceae) (Fig. 3). Other species found in the area are *Tamarix* sp. (Caryophyllales, Tamaricaceae) and *Capparis spinosa* L. (Brassicales, Capparaceae).

Sampling: Specimens were collected by diverse tools such as aerial net, aspirator, pitfall trap and forceps during the period from 1st September to 15th November 2020. The specimens are identified by the authors and verified through comparison with the collection of the Iraq Natural History Research Center and Museum, University of Baghdad. Species synonyms are provided according to Borowiec (2014) and the GBIF Secretariat (2019).

RESULTS AND DISCUSSION

In this particular study, a total of 16 species from 14 genera, nine families, and six orders were identified. The beetles were found to be the most abundant, particularly the Tenebrionidae family, in comparison to the flies. The species are listed below.

(1) Order: Blattodea
Family: Termitidae
Genus: *Amitermes* Silvestri 1901
Synonyms: *Hamitermes* Silvestri 1903
Monodontermes Silvestri 1909
Amitermes desertorum (Desneux 1902)
Common name: Desert subterranean termite
Synonym: *Hamitermes santschi* Silvestri 1911
Materials examined: 6 soldiers and 14 workers collected at 23.ix.2020.

Global distribution: Algeria and Egypt (E-Sebay et al 2010).
(2) Order: Orthoptera
Family: Acrididae
Genus: *Calliptamus* Serville 1831
Calliptamus deserticola Vosseler 1902
Materials examined: one male collected at 23.ix.2020.
Global distribution: Morocco (Defaut and François 2018), Tunisia, Algeria, Turkey and Iran (Tlili et al 2020).

(Source: https://www.google.com/maps/place/AL-Tar+Caves/)

Fig. 1. The Al- Tar Caves site, Iraq

Fig. 2. Al Tar Caves (see the dominant plants around caves)

Fig. 3. *Salsola kali* L., 1753

(3) Order: Odonata
Family: Libellulidae
Genus: *Crocothemis* Brulle 1832
Crocothemis servilia Drury 1773
Synonyms: *Crocothemis ferruginata* Fabricius 1781
Crocothemis flavostigma Navás 1932
Crocothemis indica Sahni 1965
Crocothemis novaguineensis Foerster 1898
Crocothemis reticulate Kirby 1886
Crocothemis soror Rambur 1842
Materials examined: 6 specimens- 3♂♂, 3♀♀, collected at 5. xi. 2020.
Global distribution: It is one of Asia's most widespread dragonfly species, ranging from the Arabian Peninsula in central Asia to Japan and Australasia in the Far East. It has been introduced into Hawaii, Caribbean Islands, Cuba and parts of the USA (Joshi et al 2020) and Armenia (Ananain and Tailly 2013). Native to east and southeast Asia and introduced to Jamaica, Florida, and Hawaii (Subramanian et al 2018), Kuwait (Amr 2021).
(4) Order: Diptera
Family: Muscidae
Genus: *Musca* Linnaues 1758
Musca albina Wiedemann 1830
Synonyms: *Musca speculifera* Bezzi 1911
Plaxemyia beckeri Schnabl & Dziedzicki 1911
Materials examined: 10 specimens, Karbala Province, Al Tar Caves 4♂♂, 6♀♀, 8.xi.2020.
Global Distribution: Namibia (Couri et al 2012), Middle East (Marshall and Pont 2013), Saudi Arabia (El-Hawagry et al 2013, 2016), Iran (Zielke 2017).
Musca domestica Linnaeus 1758
Synonyms: *Ascaris conosoma* Jordens 1802
Degeeria dawsoni Rainbow 1897
Limnophora vicaria (Walker 1853)
Musca analis Macquart 1843
Musca antiquissima Walker 1849
Musca atrifrons Bigot 1888
Musca aurifacies Robineau-Desvoidy 1830
Musca australis Macquart 1843
Musca basilaris Macquart 1843
Musca campicola Robineau-Desvoidy 1863
Musca chilensis Macquart 1843
Musca consanguinea Rondani 1848
Musca contigua Walker 1853
Musca cuthbertsoni Patton 1936
Musca determinata Walker 1853
Musca divaricata Awati 1916
Musca divisa Meigen 1975
Musca flavifacies Bigot 1888

Musca flavinervis Thomson 1869
Musca frontalis Rondani 1868
Musca harpyia Harris 1869
Musca minor Macquart 1851
Musca multispina Awati 1916
Musca nancauriensis Schiner 1868
Musca oceanica Le Guillou 1842
Musca pampasiana Bigot 1888
Musca pellucens Meigen 1835
Musca rufifrons Macquart 1843
Musca rufiventris Macquart 1846
Musca sordidissima Walker 1864
Musca soror Robineau-Desvoidy 1830
Musca taitensis Macquart 1843
Musca tiberina Sacca 1947
Musca umbraculata Fabricius 1805
Musca vaccina Robineau-Desvoidy 1863
Musca vagatoria Robineau-Desvoidy 1830
Musca vicaria Walker 1853
Musca vicina Macquart 1851

Materials examined: 31 specimens. 7specimens (3♂♂, 4♀♀), 12.ix.2020; 15 specimens (9♂♂, 6♀♀,), 8.x.2020; 9 specimens (5♂♂, 4♀♀), 27.x.2020.

Distribution: Cosmopolitan (World-wide distribution), it is found on every continent, with the exception of Antarctica (Bertone et al 2016).

The house fly, *Musca domestica*, is a well-known cosmopolitan pest of both farm and home; this species is always found in association with humans or the activities of humans. As a result, it is abundant almost anywhere people live. This common fly has its origins on the steps of central Asia. However, now it occurs on all inhabited continents, thriving in all climates from tropical to temperate, and adapting to a wide range of environments, from rural to urban settings (Sanchez-Arroyo and Capinera, 2018).

Family: Calliphoridae
Genus: *Chrysomya* Ronieau-Desvoidy 1830
Chrysomya albiceps (Wiedemann 1819)
Synonyms: *Chrysomya nubiana* (Bigot 1877)
Chrysomyia indica Patton 1934
Compsomyia flaviceps Seguy 1927
Compsomyia mascarenhasi Seguy 1927
Lucilia arcuata Macquart 1851
Lucilia testaceifacies Macquart 1851
Musca albiceps Wiedemann 1819
Musca bibula Wiedemann 1830
Musca elara Walker 1849
Musca emoda Walker 1849
Musca felix Walker 1853
Musca himella Walker 1849

Materials examined: 8 specimens, 2♂♂, 15.x.2020; 3♂♂, 3♀♀, 15.xi.2020.

Distribution: Argentina, Bermuda, Bolivia, Brazil, Colombia, Ecuador, Costa Rica, Guatemala, India, Iran, Mexico, Pakistan, Paraguay, Peru, Poland, Portugal, Puerto Rico, Ukraine, Venezuela (Verves and Khrokalo 2010, Bharti 2011, Hassan et al 2018).

(5) Order: Coleoptera
Family: Meloidae
Genus: *Mylabris* Fabricius 1775
Mylabris sp.
Materials examined+ 2♂♂, 5♀♀, specimens collected at 25.ix.2020 on *Salsola kali* L., 1753 plant.

Global distribution: It is endemic to the Palearctic region and includes over 170 species (Salvia et al 2018).

Family: Tenebrionidae
Genus: *Adesmia* Fisher 1833
Adesmia dilatata (Klug 1830)
Synonym: *Pimelia dilatata* Klug 1830

Materials examined: 2♀♀ specimens, specimens collected at 5.xi.2020.

Global distribution: Egypt, Israel, and Jordan (Bunalski, 2018); Saudi Arabia (Seufi et al 2019).

Genus: *Blaps* Fabricius 1775
Blaps hispanica Solier 1848

Materials examined: 2 ♀♀,specimens collected at 23.ix.2020.

Distribution: Iraq (Ismail and Husain, 2018); Portugal and Spain (GBIF Secretariat 2023).

Mesostena Eschscholtz 1831
Synonyms: *Comphosida* Dejean 1834
Mesostenopa Kraatz 1865
Platystena Koch 1940
Saxistena Koch 1940
Mesostena arabica (Gestro 1881)

Material examined: 1♂, specimen collected at 3.xi.2020.

Global distribution: British Isles (Guff 2012), Korea, UAE, Egypt, Algeria, KSA (GBIF Secretariat, 2023).

Genus: *Pimelia* Fabricius, 1775
Synonyms: *Agelarches* Gistl 1848
Amblyptera Solier 1836
Aphanaspis Wollaston 1864
Camphonota Solier 1836
Chaetotoma Motschoulsky 1860
Doderoella Schuster 1926
Ecphoroma Solier 1836
Eurypimelia Reitter 1915
Homalopus Solier 1836
Pimella Brullé 1832
Pimidia Rafinesque 1815

Pseudamblyptera Pierre 1985

The genus *Pimelia* Fabricius, 1775 is the most species in the tribe Pimeliini and consists of approximately 320 species distributed mainly in xeric environments in the western Palaearctic region and northern deserts in the Afrotropical region (Mas-Peinado et al 2018). They present a diverse array of sizes, a large variability in elytral morphology, nocturnal or diurnal habits, and occupy very different habitats in arid or semiarid zones (Soldati 2009), and dry forests (Caro Pintos 2015).

Pimelia arabica (Klug 1830)

Materials examined: 2♂♂, 1♀, 2♂♂, 23.ix.2020; 1 ♀, 30.x.2020.

Global distribution: Oman, UAE, and Qatar (GBIF Secretariat, 2023).

Genus: *Prionotheca* Dejean 1834

Synonym: *Prionotheca* Solier 1836

Prionotheca coronata Olivier 1795

Materials examined: 2 specimens (1♂+1♀), collected at 15.ix.2020.

Common name: Radian Sun Beetle

Distribution: Saudi Arabia (Abdel-Dayem et al 2017). Algeria, Chad, Egypt, Iran, Jordan, Kuwait, KSA, UAE, Morocco, Mauritania, Oman, Qatar, Sri Lanka, and Tunisia (GBIF Secretariat, 2023).

(6) Order: Hymenoptera

Family: Formicidae

Genus: *Cataglyphis* Förster 1850

Among the most noticeable and distinctive ants found in the arid and semiarid regions of the Palearctic, which extend from Mauritania to the Gobi Desert (Amor and Ortega 2014). Due to their huge workers population and preference for open, they are relatively easy to find. Researchers are interested in a number of species because of their unique and varied reproductive strategies (Peeters and Aron 2017) and remarkable adaptations to hot conditions, such as the management of foraging activity and landmark navigation (Mangan and Webb 2012).

Cataglyphis bicolor (Fabricius 1793)

Synonym: *Formica bicolor* Fabricius, 1793

Materials examined: 32 workers, 9 specimens, 05.ix.2020; 14 specimens, 12.ix.2020; 7 specimens, 8.x.2020; 2 specimens, 27.x.2020.

Global distribution: Algeria, Egypt, Libya, Morocco, Israel, Syria, Spain, Canary Is. (Borowiec 2014).

Cataglyphis lividus (Andre 1881)

Synonym: *Myrmecocystus lividus* Andre 1881

Materials examined: 11 workers, 9 specimens, 8.x.2020; 2 specimens, 27.x.2020.

Global distribution: Armenia, Bulgaria, Egypt, Iran, Israel, Kuwait, Oman, Saudi Arabia, Turkey, United Arab Emirates and Yemen (Borowiec 2014).

Genus *Messor* Forel 1890

Messor arenarius (Fabricius 1787)

Synonyms: *Formica arenaria* Fabricius 1787

Myrmica amaurocyclia Förster 1850

Myrmica scalpturata Nylander 1856

Stenamma (*Messor*) *bugnioni* Forel 1904

Materials examined: 7 workers): 5 specimens, 8.x.2020; 2 specimens, 27.x.2020.

Global distribution: Algeria, Egypt, Iran, Israel, Kuwait, Libya, Morocco, Saudi Arabia, Syria, Tunisia (Borowiec 2014).

Family: Sphecidae

Genus: *Sceliphron* Klug 1801

Members of *Sceliphron* commonly referred to as mud daubers;they are solitary and build nests made of mud; this genus build aerial nests using mud collected from moist soil sources and transported to the appropriate location to build the nest (Chatenoud et al 2012). Salticidae are the most commonly collected prey among ground-hunting spiders, which are mostly preyed upon by specific species of the genus *Sceliphron*. This species takes its prey with a big body size. Furthermore, an unanticipated finding revealed that the enclosed mud nests offer a micro niche that is home to a diverse range of insects. We also talk about how these findings advance our understanding of the function of insects in urban ecosystems and their importance to research on ecology, biodiversity, and conservation (Yuan et al 2022).

Sceliphron arabs (Lepeletier de Saint Fargeau 1845)

Synonyms: *Pelopaeus arabs* Lepeletier de Saint Fargeau 1845

Pelopaeus caucasicus Ed. André 1888

Sceliphron caucasicum (Ed. André 1888)

Materials examined: 12 workers, 4 specimens, 05.ix.2020; 7 specimens, 23.ix.2020; 1 specimen, 8.x.2020.

Global distribution: Georgia, Azerbaijan, Turkey, Syria, and Iran (Maharramov et al 2020).

CONCLUSION

The current study provides some information on insect diversity. Inventory of 16 species belonging to 14 genera, nine families, and six orders; mostly represented by the house fly *Musca domestica* in this unique site. Our observation during the survey period stated that wild plants were very rare here significantly, which may be negatively affect insect diversity there. The order Coleoptera had a high level of the diversity at the species level compared with other insect groups, because it possesses a morphological characteristics that enable it to overcome unfavorable

environmental conditions such as high temperatures and dry.

AUTHORS CONTRIBUTION

The first author, Razzaq Shalan Augul, conceptualized the idea, wrote the manuscript, reviewed and finalized the manuscript. All authors performed the sampling and tabulation of the data. The second author, Hanaa H Al–Saffar, and the third author Hayder Badri Ali, identified the specimens and analyzed the results.

REFERENCES

Abdel-Dayem MS, Fad HH, El-Torky AM, Elgharbawy AA, Aldryhim YN, Kondratieff BC, Al Ansi AN and Aldhafer HM 2017. The beetle fauna (Insecta, Coleoptera) of the RawdhatKhorim National Park, Central Saudi Arabia. *Zookeys* **653**: 1-78.

Al-Shakeri AJ, Abdul-Qader SZ and Jasim HK 2017.Tar Al-Sayed Area Suıtabılıty as A GeoPark. Abstracts of the *70th Geological Congress of Turkey*, 10-14 Nisan/April 2017. Available at: https://www.jmo.org.tr/resimler/ekler/243955f3d88672b_ek.pdf Amr ZS 2021. *The state of biodiversity in Kuwait*. Gland, Switzerland: IUCN, The State of Kuwait, Kuwait: Environmental Public Authority, p 248.

Amor F and Ortega P 2014. *Cataglyphis tartessica* sp. n., a new ant species (Hymenoptera: Formicidae) in south-western Spain. *Myrmecological News* **19**: 125-132.

Ananain V Yu and Tailly M 2013. Additions to the dragonfly (Odonata) fauna of Armenia with new records of rare or uncommon species. *Russian Entomological Journal* **22**(4): 249-254.

Bertone MA, Leong M, Bayless KM, Malow TLF, Dunn RR, Trautwein MD 2016. Arthropods of the great indoors: characterizing diversity inside urban and suburban homes. *Peer Journal* **4**: e1582.

Bharti M 2011. An updated checklist of blowflies (Diptera: Calliphoridae) from India. *Halteres* **3**: 34-37.

Borowiec L 2014. Catalogue of ants of Europe, the Mediterranean Basin and adjacent regions (Hymenoptera: Formicidae). *Genus* **25**(1-2): 1-340.

Bunalski M 2018. Tenebrionidae (Coleoptera) of Nubia: annotatedcatalogue Of Species, with new data from the Bayada Desert. *The Coleopterists Bulletin* **72**(3): 465-470.

Caro Pintos F 2015. Descripción de una especie nueva del género *Pimelia* Fabricius, 1775 (Coleoptera, Tenebrionidae) de la Península Ibérica. *Boletín de La S.E.A.* **57**: 165-174.

Chatenoud L, Polidori C, Federici M, Licciardi V and Francesco Andrietti F 2012. Mud-ball construction by *Sceliphron* mud-dauber wasps (Hymenoptera: Sphecidae): A comparative ethological study. *Zoological Studies* **51**(7): 937-945.

Couri MS, de Carvalho CJB and Pont AC 2012. Taxonomy of the Muscidae (Diptera) of Namibia: A key to genera, diagnoses new records and description of a new species. *African Invertebrates* **53**(1): 47-67.

Defaut B and François A 2018. Évaluation densitaires des Orthoptères en moyenne-Moulouya (Maroc oriental) (Ensifera, Caelifera, Mantodea). *Matériaux Orthoptériques et entomocénotiques* **23**: 149-168.

Duff AG 2012. *Checklist of Beetles of the British Isles*, 2nd Edition. Pemberley Books (Publishing), United Kingdom, p 171.

El-Hawagry M, Khalil MW, Sharaf M R, Hadl HH and Aldawood, AS 2013. A preliminary study on the insect fauna of Al-Baha Province, Saudi Arabia, with descriptions of two new species. *ZooKeys* **274**: 1-88.

El-Hawagry MS, Abdel-Dayem MS, Elgharbawy AA and Al Dhafer HM 2016. A preliminary account of the fly fauna in Jabal Shada al-A'la Nature Reserve, Saudi Arabia, with new records and biogeographical remarks (Diptera, Insecta). *Zookeys* **636**: 107-139.

E-Sebay Y, El-Akkad MK, Abbass MK and El-Bassiouny AR 2010. A Revision and illustrated identification keys to soldiers and adult of Termite (Order: Isoptera) in Egypt. *Egyptian Journal of Agricultural Research* **88**(2): 381-418.

GBIF Secretariat 2023. *GBIF Backbone Taxonomy*. Checklist dataset https://doi.org/10.15468/39omei accessed via GBIF.org on 2024-06-21.

Hassan MA, Bodlah I, Bharti M and Mahmood K 2018. An updated checklist of blow fly fauna (Diptera: Calliphoridae) of Pakistan with new records for the country. *Halteres* **9**: 1-5.

Ismail SI and Husain RJ 2018. Description of five new species registered for Iraq for Family (Coleoptera: Tenebrionidae). *Journal of Misan Researches* **14**(27-4): 85-113.

Joshi S, van der Poortenb N, Sumanapala A, Nielsend E, Patel J, Nielsen B, Sawant D and Sheri M 2020. New records of polymorphism in Asian Libellulid dragonflies (Insecta: Odonata). *International Journal of Odonatology* **23**(4): 337-356.

Joothi P, Arunagiri R, Ambalavanan S, Samidurai J, Kaliyamoorthy K and Pankirias RR 2021. Nest Characteristic Features and Prey Selection of Mud Dauber Wasp *Sceliphron madraspatanum* (Fabricius, 1781). *Entomology and Applied Science Letters* **8**(4): 52-58.

Marshall SA and Pont AC 2013. The kleptoparasitic habits of *Musca albina* Wiedemann, 1830 (Diptera: Muscidae). *African Invertebrates* **54** (2): 427-430.

Maharramov MM, Mokrousov MV and Proshchalykin M Yu 2020. New distributional records of the family Sphecidae (Hymenoptera) in Azerbaijan. *Caucasian Entomological Bulletin* **16**(1): 43-47.

Mangan M and Webb B 2012. Spontaneous formation of multiple routes in individual desert ants (*Cataglyphis velox*). *Behavioral Ecology* **23**: 944-954.

Mas-Peinado P, Buckley D, Ruiz JL and García-París M 2018. Recurrent diversification patterns and taxonomic complexity in morphologically conservative ancient lineages of *Pimelia* (Coleoptera: Tenebrionidae). *Systematic Entomology* **43**(3): 522-548.

Mohammad KM and Al-Zubaidi A 2017. Geodiversity and its importance on vertebrate diversity near Razzaza Lake, middle of Iraq. *Iraqi Geological Journal* **50**(1): 104-123.

Mohammad MK, Abd Ali BA and Ali HH 2010. Some aspects of changes in biodiversity in Al-Razzaza Lake due to water shortage. *Al-Usthath* **132**: 469-482 (In Arabic).

Peeters C and Aron S 2017. Evolutionary reduction of female dispersal in *Cataglyphis* desert ants. *Biological Journal Linnean Society* **122**: 58-70.

Sanchez-Arroyo H and Capinera J L 2018. House fly, *Musca domestica* Linnaeus (Insecta: Diptera: Muscidae) 1UF/IFAS Extension Gainesville, FL 32611. Available at: https://edis.ifas.ufl.edu/pdffiles/IN/IN20500.pdf

Seufi AM, Alkhaldi AA and Galal FH 2019. Morphological and Molecular Identification of Selected Coleoptera from Sakaka, Aljouf, North-Western Saudi Arabia: Comparative study. *The Indian Veterinary Journal* **96**(04): 19-23.

Soldati L 2009. *The Darkling Beetles (Insecta: Coleoptera: Tenebrionidae) of Qatar*. Natura optima dux Foundation, Warszawa, p 101.

Souza-Silva M, Martins RP and Ferreira RL 2015. Cave Conservation Priority Index to Adopt a Rapid Protection Strategy: A Case Study in Brazilian Atlantic Rain Forest. *Environmental Management* **55**: 279-295.

Subramanian KA, Emiliyamma KG, Babu R, Radhakrishnan C and

Talmale SS 2018. *Atlas of Odonata (Insecta) of the Western Ghats.* Zoological Survey of India, Kolkata, p 420.

Tlili H, Abdellaoui K, Chintauan-Marquier IC, Ben Chouikha M, Moussi A, Ammar M and Desutter-Grandcolas L 2020. Checklist and taxonomic updates in grasshoppers (Orthoptera: Caelifera) of central and southwestern Tunisia with new records and a key for species identification. *Zoosystema* **42**(31): 607**-**738.

Verves YG and Khrokalo LA 2010.The new data on Calliphoridae and Rhinophoridae (Diptera) from Ukraine. *Ukrainska Entomofaunistyka* **1**(1): 23-54.

Yuan D, Beckman J, Fernandez JF and Rodriguez J. 2022. Nest Ecology and Prey Preference of the Mud Dauber Wasp *Sceliphron formosum* (Hymenoptera: Sphecidae). *Insects* **13**(12): 1136.

Zielke E 2017. Some new records of the muscid fauna from Iran, with the description of *Helina irani* spec. nov (Diptera: Muscidae). *Journal of Entomology and Zoology Studies* **5**(5): 442-446.

Received 22 February, 2024; Accepted 22 July, 2024