JBAAR

Journal of Bioscience and Applied Research

https://jbaar.journals.ekb.eg

SPBH

A Survey of Insects Accompanying Animal Fecal from Different Regions of Iraq

[1]Razzaq Shalan Augul,[1]Hanaa H. Al-Saffar, [2]Haider Naeem Al-Ashbal

[1]Iraq Natural History Research Center and Museum, University of Baghdad, Baghdad, Iraq

[2]Department of Biology, College of Education for Pure Sciences, University of Kerbala, Kerbala, Iraq

*Corresponding author. Email: dr.rsha@nhm.uobaghdad.edu.iq

DOI:10.21608/jbaar.2025.418543

Abstract

This paper has been carried out to collect and identify insect species associated with animal feces from different localities in Iraq using a direct method that forceps during different months in 2023 and 2024. In total, 31 species and 25 genera into 10 families within 3 orders are identified. Among them, 4 genera: *Cilea* Jacquelin du Val, 1856, *Manda* Blackwelder, 1952, *Oxytelus* Gravenhorst, 1802 (Coleoptera: Staphylinidae), and *Melinopterus* Mulsant, 1842 (Coleoptera: Scarabaeidae), as well; there were 4 species including *Cilea silphoides* (Linnaeus, 1767), *Manda mandibularis* (Gyllenhal, 1827), *Melinopterus prodromus* (Brahm, 1790), and *Oxytelus piceus* Iraq is where (Linnaeus, 1767) are initially documented. Information about synonyms and the geographical distribution of the species has been gathered.

Keywords: Beetles, Coleoptera, Dung insects, Feces, New records.

Introduction

Numerous Muscidae species are among the primary species that grow on the excrement of confined cattle; coprophagous beetle species from the Scarabaeidae are also found on this material. These coleopterans make the soil unsuitable for colonization by several other species by aerating and mixing the feces with the soil and obstructing them (1,2). Insects belonging to the families Muscidae, Calliphoridae, Sarcophagidae, and many more are mechanical and biological carriers of infections that are dangerous to people and domestic animals. species of beetles (Coleoptera) stand out among insects and are of main medical and veterinary importance. Additionally, they may invade homes and workplaces, posing a nuisance to the populace and posing health risks (2-4). Because they spend a larger portion of their life cycle on cowpats, several insect groups are directly dependent on them. Eggs are laid in and on cow pats by beetles (Order, Coleoptera) and flies (Order, Diptera). After a few hours or days, the larvae emerge, eat on the dung, and grow until they pupate in the ground or litter nearby (5,6). Predatory insects such as rove-beetles (Family, Staphylinidae) are drawn to cow dung and consume the insects and larvae of the dung community in addition to coprophagous species and insects that rely on dung for reproduction (7,8).

Dung beetles have the potential to accelerate how nutrients go through the soil (9,10) and reduce the number of parasitic fly eggs and larvae found in fresh animal dung (11). Many participate during the organic regrowth of forests by serving as significant secondary dispersers for the seeds of many kinds of trees that are excreted by frugivorous animals (12-14). Furthermore, they serve as excellent markers of the effects of human-induced changes to forest ecosystems and big herbivores (15-17).

Numerous dung beetles also referred to as rollers, roll dung into spheres that are either utilized as food sources or as breeding grounds. Other species of dung beetles bury dung wherever they find it; these

Received: November 10, 2024. Accepted: February 21, 2025. Published: March 21, 2025

are called tunnelers. Another group, the dwellers, just live in dung; they don't roll or burrow. They are frequently drawn to the excrement that burrowing owls gather (18).

In Iraq, there were no specific studies on the presence and diversity of these species, in particular on fecal or dung matters, with the exception of some studies that mentioned a number of species that are also found on corpses, animals, and decomposing organic matter or scattered investigations on a species, for example, (19,20). Thus, identifying the faunal insects found on animal feces in various Iraqi locations was the study's objective.

Materials and Methods

The process of gathering samples of excrement and insect specimens during the different months in 2023 and 2024. So, these specimens were taken to Laboratory Entomology to Invertebrates for isolating and classifying them into orders and families.

Using forceps and brushes, the authors recognized the dipteran species after collecting the insects, and taxonomic keys were used to identify the dung beetles according to their genera (21-23), as well, the specimens were compared with the collections of the Iraq Natural History Research Center and Museum (INHM).

New record insects pictured with the aid of a Dino–lite digital microscope and Mobile. The scientific names were checked with the GBIF Secretariat (2023) and Schoolmeesters (2024). Furthermore, the new recode species were deposited at INHM.

Results and Discussion

31 species in all, spread throughout 25 genera, 10 families, and three orders were included in the current investigation. These species are as below:

A: Order :-Coleoptera

Family: -Anthicidae

Genus, :-*Anthelephila* Hope, 1833

Synonyms: *Anthelephilus* Hope, 1840

***Formicoma* Motschoulsky, 1845**

***Formicosoma* Motschoulsky, 1845**

***Myrmecosoma* Mannerheim, 1846**

***Anthelephila caeruleipennis* (La Ferte-Senectere, 1847)**

Basionym: *Anthicus caeruleipennis* La Ferte-Senectere, 1847

Materials: 7, 1.v.2023, Wasit Province, Al-Suwaira City, Prainej Village (32°52'18.2"N 45°01'19.4" E).

Distribution: It was captured in Iraq by Pic (1911) under nameis *Formicomus caeruleipennis* Laferte, 1849. Belgium (24); Algeria, Chad, Eritrea, Egypt, Ethiopia, Iraq, Jordan, Libya, Lebanon, Morocco, Mauritania, Oman, KSA, Spain, Somalia, Sudan, Tunisia, Türkiye, UAE, and Yemen (25).

Synonyms: ***Atholister*** **Reitter, 1909**

Peranus **Lewis, 1906**

A.bimaculatus **(Linnaeus, 1758)**

Synonyms: ***Attelabus bimaculatus*** **(Linnaeus, 1758)**

Hister bimaculatus **Linnaeus, 1758**

H. dilaniator **Voet, 1793**

H. obliquus **Say, 1825**

H. spissatus **Rey, 1888**

Materials: 6 specimens, 24.v.2023, Al-Anbar Province, Al-Fallujah City, Halabsa Village (33°20'12.5"N 43°43'08.5" E)

Distribution: Iraq (26), Palearctic and Canada (27), and Brazil (28).

Family: Hydrophylidae

Genus, ***Cercyon*** **Leach, 1817**

Synonyms: ***Arcocercyon*** **Hebauer, 2003**

Cercydion **Latreille, 1829**

Cerycon **Rey, 1886**

Conocercyon **Hebauer, 2003**

Cyceron **Shatrovskiy, 1992**

Epicercyon **Kuwert, 1890**

Ercycon **Rey, 1886**

Oedocercyon **d'Orchymont, 1942**

Prostercyon **Smetana, 1978**

Cercyon terminatus **(Marsham, 1802)**

Basionym: ***Dermestes terminatus*** **Marsham, 1802**

Synonyms: ***Cambrus exiguus*** **Grimmer, 1841**

Cercyon emarginatus **Baranowski, 1985**

C. lepidum **Wollaston, 1864**

C. nanum **F. E. Melsheimer, 1844**

C. plagiatum **Erichson, 1837**

C. scutellaris **Stephens, 1829**

Materials: 7 specimens, 1.v.2023. Wasit Province, Al-Suwaira City, Prainej Vill. (32°52'18.2"N 45°01'19.4"E).

Distribution: Iraq (29); North America (30); Europe, North Africa, China, Kazakhstan, Mongolia, West Siberia, and Russian Far East (31, 32), and Switzerland (33).

Family: Scarabaeidae

Genus *Acrossus* Mulsant, 1842

Synonym: *Hemicyclorhinus* Seabra, 1909

***Acrossus rufipes* (Linnaeus, 1758)**

Basionym: *Scarabaeus rufipes* Linnaeus, 1758

Synonyms: *Aphodius boum* Gistel, 1857

***A. capicola* Harold, 1862**

***A. juvenilis* Mulsant, 1842**

***A. matsuzawai* Yawata, 1943**

***A. muticus* Stephens, 1830**

***A. rufipes* (Linnaeus, 1758)**

***A. rufotestaceus* Dalla Torre, 1879**

***Scarabaeus capitatus* Degeer, 1774**

***S. oblongus* Scopoli, 1763**

Materials: 11 specimens, 8.v.2024. Diyala Province, Kan'an District, Kan'an Forests (33°38'22.1"N 44°51'59.2"E).

Distribution: Iraq (34); Europe, Tunisia, Kazakhstan, Transcaucasus, and Middle Asia and Russia (35). Korea (36).

Genus *Alocoderus* Schmidt, 1914

***Alocoderus hydrochaeris* (Fabricius, 1798)**

Basionym: *Scarabaeus hydrochaeris* Fabricius, 1798

Synonyms: *Aphodius cognatus* Stevens, 1866

***A.meridionalis* Villa, 1835**

Materials: 11 specimens, 21.x.2023, Wasit Province, Al-Suwaira City, Abdullah Village (32°52'20.9"N 44°57'16.2" E),

Egypt, France, Germany, Greece, Georgia, Hungary, Iraq, Iran, Israel, Italy, Kazakhstan, Libya, Lebanon, Malta, Madeira, Morocco, the Netherlands, Portugal, Poland, Romania, Russia, Slovakia, Siberia, Slovenia, Syria, Spain, Tunisia, Algeria, Austria, Armenia, Bulgaria, Belgium, Canary Islands, Cyprus, Croatia, Egypt, France (37-41).

Genus *Amidorus* Mulsant, 1870

***Amidorus thermicola* (Sturm, 1800)**

Basionym: *Aphodius thermicola* Sturm, 1800

Materials (27 specimens): 13, 23. iii.2024, Wasit Province, Badra City (33°05'18.4"N 45°58'35.7" E); 5, 7.iv.2024, Wasit Province, Aziziyah District (32°54'02.6"N 45°03'59.0" E. 9, 13.v.2024, Baghdad Province, Abu Ghraib (33°18'34.1"N 44°12'34.9" E).

Distribution: Iraq (Alwan, 2020); Austria, France, Italy, Spain, and Türkiye (42).

Genus *Aphodius* Hellwig, 1798

Synonym: *Platycephalus* Cuvier, 1798

***Aphodius biguttatus* Germar, 1824**

Synonyms: *Aphodius lutigradus* Gistel, 1857

***A. rusticus* Gistel, 1857**

***A. suturalis* Erichson, 1848**

***A. tyrolensis* Rosenhauer, 1847**

***A. rusticus* Gistel, 1857**

***Eudolus discoloratus* Schmidt, 1917**

***Scarabaeus sanguinolentus* Panzer, 1797**

Materials (19 specimens): 4, 20.vi.2023, Diyala Province, Al-Muqdadiya District (33°57'20.3"N 44°53'50.5"E). 9, 25.vi.2024, Wasit Province, Al- Al-Zubaidiyah District (32°45'29.4"N 45°10'57.2" E). 6, 2.v.2024, Baghdad Province, Al-Madain District (33°10'32.6"N 44°32'52.6" E).

Distribution: In Iraq, it was categorized under the *Aphodius suturalis* Redtnbachr, 1843 by (37). Morocco (38); Europe, Transcaucasus, Asia Minor, Turkmenistan, Kazakhstan, and Russia (39).

Aphodius lividus Olivier, 1789

Materials: 17 specimens were collected from donkey dung, 24.v.2024, Al-Anbar Province, Al-Fallujah City, Halabsa Village (33°20'12.5"N 43°43'08.5" E).

Distribution: Iraq (37). Albania, Algeria, Armenia, Australia, Austria, Belarus, Egypt, Belgium, Czech, Cyprus, Egypt, Germany, Iran, Saudi Arabia, Switzerland, Syria, Taiwan, Tajikistan, Turkmenistan, Turkey, Uzbekistan, Kazakhstan, Kuwait, Kyrgyzstan, Lebanon,

Madagascar, Magnolia, Namibia, Nepal, Oman (38).

***Aphodius fimetarius* (Linnaeus, 1758)**

Synonym: *Scarabaeus bicolor* Geoffroy, 1785

***S. fimetarius* Linnaeus, 1758**

Materials (4 specimens): 24.v.2024, Al-Anbar Province Al-Fallujah, Al-Sejar Village (33°23'52.0"N 43°51'02.4"E).

Distribution: Europe, North Africa, the eastern Mediterranean (Levant countries and Turkey), Iraq, Australia, Mexico, and the USA (43- 45).

Genus *Erytus* Mulsant & Rey, 1870

Synonym: *Eryptus* Mulsant & Rey, 1871

***Erytus cognatus* (Fairmaire, 1860)**

Basionym: *Aphodius cognatus* Fairmaire, 1860

Synonyms: *Aphodius brunneus* Klug, 1845

***A. klugi* Schmidt, 1910**

***A. unicolor* Lucas, 1846.**

Materials (19 specimens): 6, 23. iv.2023, Wasit Province, Aziziyah (32°54'02.6"N 45°03'59.0"E. 3, 29.iv.2023, Saladin Province, Balad District (34°00'24.3"N 44°08'15.0" E); 8, 2.v.2024, Al Ishaqi District (34°02'15.1"N 44°01'04.4" E). 2, 10. vi.2024. Babylon Province, Musayyib District (32°45'32.1"N 44°16'12.3" E).

Distribution: Iraq (Alwan, 2020); Afghanistan, Egypt, Lebanon, Morocco, Spain, Tunisia, Palestine, Algeria, Kazakhstan, and Turkmenistan (42).

Genus *Labarrus* Mulsant & Rey, 1869

Synonym: *Pseudocalamosternus* Balthasar, 1936

***Labarrus digitatus* (Harold, 1871)**

Basionym: *Aphodius digitatus* Harold, 1871

Synonym: *Aphodius matthiesseni* Reitter, 1907

Materials: 7 adults were collected from donkey dung, 24. May.2024, Al-Anbar Province Al-Fallujah, Halabsa (33°20'12.5"N 43°43'08.5"E).

Distribution: Iraq (46).

Labarrus pseudolividus (Balthasar, 1941)

Basionym: *Aphodius pseudolividus* Balthasar, 1941

Materials (17 specimens): 2.vi.2023, Wasit Province, Al-Suwaira City (32°58'27.2"N 44°47'16.2"E).

Distribution: Iraq (Alwan, 2020).

Genus *Melinopterus* Mulsant, 1842

***Melinopterus prodromus* (Brahm, 1790) (Fig.1)**

Basionym: *Scarabaeus prodromus* Brahm, 1790

Synonyms: *Aphodius angustatus* Mulsant, 1842

***A. consputus* Fabricius, 1801**

***A. discoidalis* Gistel, 1857**

***A. flavogriseus* Mulsant, 1842**

***A. gisteli* Strand, 1917**

***A. griseolus* Mulsant, 1842**

***A. griseus* Dalla Torre, 1879**

***A. lunulatus* Eichler, 1922**

***A. mulsanti* Orbigny, 1896**

***A. obliquus* Mulsant, 1842**

***A. obscurus* Eichler, 1922**

***A. restrictus* Mulsant, 1842**

***A. semilunus* Mulsant, 1842**

***A. semipellitus* Solsky, 1876**

***A. syriacus* Mulsant & Rey, 1870**

***A. weberi* Reitter, 1906**

Materials (16 specimens): 11, 22.iv.2023, Wasit Province, Aziziyah (32°54'02.6"N 45°03'59.0"E; 5, 13.v.2023, Kadhumyia District (33°23'08.0"N 44°20'19.9"E).

Distribution: Algeria, Albania, Austria, Afghanistan, Armenia, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Corsica, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Mongolia, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sardinia, Sicily, Slovakia, Slovenia, Sweden, Switzerland, Syria, Ukraine, UK, USA, Georgia, Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Turkmenistan, and Uzbekistan (47,48). Newly recorded as genus and species from Iraq.

Genus *Teuchestes* Mulsant, 1842

***Teuchestes fossor* (Linnaeus, 1758)**

Basionym: *Scarabaeus fossor* Linnaeus, 1758

Synonyms: *Aphodius fossor* (Linnaeus, 1758)

***A. fossorius* Gistel, 1857**

***A. silvaticus* Ahrens, 1812**

***Teuchestes brunneus* Mulsant, 1842**

Materials (7 specimens): 20.ix.2023, Wasit Province, An-Numaniyah District (32°35'46.7"N 45°24'45.4"E). Distribution: Iraq (Alwan, 2020). Albania, Algeria, Armenia, Austria, Azerbaijan, Belarus, Hungary, Ireland, Italy, Kazakhstan, Korea, Kosovo, Kyrgyzstan, Latvia, Lithuania, Macedonia, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Siberia, Slovakia, Turkmenistan, Ukraine, Uzbekistan, Slovenia, Spain, Sweden, Switzerland, Canada, and the United States (42).

Genus *Volinus* Mulsant & Rey, 1869

***Volinus sticticus* (Panzer, 1798)**

Basionym: *Scarabaeus sticticus* Panzer, 1798

Synonyms: *Aphodius sticticus* (Panzer, 1798)

***Scarabaeus equestris* Panzer, 1798**

***S. nemoralis* Panzer, 1799**

Materials (11 specimens): 17.vi.2023, Baghdad Province, Radwaniyah District (33°11'18.3"N 44°16'21.3" E). Distribution: Iraq (Alwan, 2020); Europe and Asia (49).

Family: Staphylinidae

Genus *Cilea* Jacquelin du Val, 1856

Synonyms: *Astictus* C.G.Thomson, 1858

***Leucoparyphus* Roger, 1856**

***Cilea silphoides* (Linnaeus, 1767) (Fig. 2)**

Basionym: *Staphylinus silphoides* Linnaeus, 1767

Synonyms: *Cilea siphoides* (Linnaeus, 1767)

***Leucoparyphus koreanus* Bernhauer, 1935**

***L. silphoides* (Linnaeus, 1767)**

***Oxyporus suturalis* Panzer, 1794**

***Tachinus geminatus* Randall, 1838**

***T. marginalis* Gravenhorst, 1802**

***Tachyporus limbatus* Gravenhorst, 1806**

Materials: 6 Specimens, Wasit Province, Al-Suwaira City, Prainej Village (32°52'18.2"N 45°01'19.4" E), 1.v.2023.

Distribution: Germany, Austria, Denmark, Norway, Portugal, Russia, Finland, France, Hungary, Italy, Luxembourg, Myanmar Russia, Sweden, and the United Kingdom (42). recently recorded as a species and genus for Iraq.

Genus *Manda* Blackwelder, 1952

Synonym: *Acrognathus* Erichson, 1839

***Manda mandibularis* (Gyllenhal, 1827) (Fig. 3)**

Synonyms: *Acrognathus mandibularis* (Gyllenhal, 1827)

***Omalium mandibulare* Gyllenhal, 1827**

***O. mandibularis* Gyllenhal, 1827**

Materials: 13, 19.v.2023, Wasit Province, Aziziyah District (32°54'02.6"N 45°03'59.0" E). 5, 13.v.2023, Baghdad Province, Kadhumyia District (33°23'08.0"N 44°20'19.9" E).

Distribution: Denmark, Estonia, France, Germany, Hungary, Latvia, Luxembourg, Poland, Ukraine, Sweden, the UK, and Russia (42). Newly record for Iraq as a genus and species.

Genus *Oxytelus* Gravenhorst, 1802

Synonyms: *Anisopsidius* Fagel, 1960

***Anisopsis* Fauvel, 1904**

***Anisopsodes* Fagel, 1960**

***Basilewskyorus* Fagel, 1957**

***Caccoporus* Thomson, 1859**

***Hoplitodes* Fauvel, 1904**

***Oxyletus* Latreille, 1802**

***Paranisopsis* Cameron, 1938**

***Paroxytelopsis* Cameron, 1933**

***Oxytelus piceus* (Linnaeus, 1767) (Fig. 4)**

Basionym: *Staphylinus piceus* Linnaeus, 1767

Synonyms: *Anotylus piceus* (Linnaeus, 1767)

***Oxytelus defectivus* Normand, 1947**

***O. humilis* Heer, 1839**

***O. japonicus* Motschulsky, 1861**

***O. mamillatus* Hochhuth, 1851**

***O. sulcatus* Gebler, 1848**

***Staphylinus sulcatus* O.F.Müller, 1776**

Materials (21 specimens): 18.v.2023, Wasit Province, Aziziyah District, Zawait Az Zaraa Village (32°49'21.1"N 45°03'38.1" E).

Distribution: It is a common species in the Palearctic Region (Schülke and Smetana, 2015). It was recorded for the first time species from Iraq.

B. Order: Dermaptera

Family: Anisolabididae

Genus *Anisolabis* Fieber, 1853

Synonyms: *Anisobia* Scudder, 1878

***Apolabis* Burr, 1915**

***Forcinella* Dohrn, 1862**

***Gelotolabis* Zacher, 1911**

***Homoeolabis* Borelli, 1911**

***Horridolabis* Zacher, 1911**

***Labidurodes* Dubrony, 1879**

***Logicolabis* Zacher, 1911**

***Paralabis* Burr, 1915**

***Plancolabis* Steinmann, 1989**

***Spondox* Burr, 1914**

***Anisolabis* sp.**

Materials: 5 adults were collected from cow dung, 26.iv.2024, Karbala Province, Al-Jamaliah District (33°20'12.5"N 43°43'08.5"E).

Family: Forficulidae

Genus *Forficula* Linnaeus, 1758

Synonyms: *Emiforficula* Menozzi, 1927

***Forfidula* Houlbert, 1924**

***Forficula lucasi* Dohrn, 1865**

Synonyms: *Forficula barroisi* Bolivar, 1893

***F. escherichi* Dohrn, 1865**

Materials: 11 adults were collected from cow dung, 26.v.2024, Karbala Province, Al-Jamaliah District (33°20'12.5"N 43°43'08.5"E).

Distribution: Iraq (Derwesh, 1965). East and eastward to Vietnam from West Africa, Central Asia, and East Asia (50,51); Turkey (50).

C. Order: Diptera

Family: Calliphoridae

Genus, *Calliphora* Robineau-Desvoidy , 1830

Synonyms: *Acronesia* Hall، 1948

***Acrophaga* Brauer & Bergenstamm، 1891**

***Sarcophaga* Swinderen، 1822**

***Somatomyia* Rye، 1879**

***Somomia* Rondani، 1862**

***Steringomyia* Pokorny، 1889**

***Calliphora vicina* Robineau Desvoidy,**

Common name: Blue blowfly

Synonyms: *Calliphora* (*Calliphora*) *erythrocephala* (Meigen, 1826)

***C. insidiosa* Robineau-Desvoidy, 1863**

***C. monspeliaca* Robineau-Desvoidy, 1830**

***C. musca* Robineau-Desvoidy, 1830**

***C. nana* Robineau-Desvoidy, 1830**

***C. rufifacies* Macquart, 1851**

***C. spitzbergensis* Robineau-Desvoidy, 1830**

***Musca aucta* Walker, 1853**

***M. erythrocephala* Meigen, 1826**

***M. thuscia* Walker, 1849**

Materials (40 specimens):14, 11.xi.2023, Diyala Province, Al Khalis District, (33°50'34.7"N 44°31'12.0"E). 7, 3.x.2023, Baghdad Province, Al Taji, (33°30'51.3"N 44°12'19.4" E). 8, 25.xi.2023, Wasit Province, Al-Zubaydiyah, (32°45'42.2"N 45°10'02.2"E). 11, 24.x.2023, Kerbala Province, Kerbala City, (32°36'20.7"N 44°01'02.5"E).

Distribution: Iraq (52); cosmopolitan species (53).

***Calliphora vomitoria* De Geer, 1776**

Common names: Orange-bearded blue bottle

Synonyms: *Calliphora affinis* Macquart, 1835

***C. fulvibarbis* Robineau-Desvoidy, 1830**

***Musca carnivora* Fabricius, 1794**

Materials: 12 specimens, 20. iii.2023. Baghdad City, Al-Taji (33°30'51.3"N 44°12'19.4" E).

Distribution: Iraq (Khalaf, 1957); Europe, south of Mexico, United States and southern Africa (54); Poland (55).

Genus, *Chrysomya* Robineau-Desvoidy, 1830

Synonyms: *Achoetandrus* Bezzi, 1927

***Pycnosoma* Brauer & Bergenstamm, 1894**

***Pycnosomops* Townsend, 1934**

***Chrysomya megacephala* (Fabricius, 1794)**

Common names: Oriental blue fly, Oriental latrine fly

Synonyms: *Chrysomya duvaucelii* Robineau-Desvoidy, 1830

***Ch. gratiosa* Robineau-Desvoidy, 1830**

***Lucilia macquartii* Rondani, 1875**

***Musca bata* Walker, 1849**

***M. combrea* Walker, 1849**

***M. megacephala* Fabricius, 1794**

***M. remuria* Walker, 1849**

***Somomya cyaneocincta* Bigot, 1888**

***Somomyia cyaneocincta* Bigot, 1888**

***S. saffranea* Bigot, 1877**

Materials (70 specimens): 20, 20. iii.2023, Wasit Province, Al- Zubaydiyah, (32°45'42.2"N 45°10'02.2"E); 15, 17.v. 2023, Al-Aziziyah (32°55'06.2"N 45°03'40.4"E). 20, 5.iv.2023, Baghdad Province, Al-Taji (33°30'51.3"N 44°12'19.4" E); 15, 22.vi.2023; Al-Mada'in (33°05'58.7"N 44°34'47.9"E)

Distribution: Global distribution, encompassing North America, Asia-Pacific, and Australasia (56). It was brought from the Old World to Brazil (55), and Malaysia (57).

Genus, *Lucilia* Robineau-Desvoidy, 1830

Synonyms: *Acrophagella* Ringdahl, 1942

Bufolucilia Townsend, 1914

Francilia Shannon, 1924

Caesariceps Rohdendorf, 1926

Chaetophaenicia Enderlein, 1936

Lucilla Gimmerthal, 1842

Phaenicia Robineau-Desvoidy, 1863

Lucilia sericata (Meigen, 1826)

Common names: Common green bottle fly, Sheep blow fly

Synonyms: *Chrysomya capensis* Robineau-Desvoidy, 1830

Lucilia barberi Townsend, 1908

L. capensis Robineau-Desvoidy, 1830

L. flavipennis Macquart, 1843

L. giraulti Townsend, 1908

L. lagyra Walker, 1849

L. latifrons Schiner, 1861

L. nobilis (Meigen, 1826)

L. pruniosa Meigen, 1838

L. sayi Jaennicke, 1867

Musca lagyra Walker, 1849

M. nobilis Meigen, 1826

M. sericata Meigen, 1826

M. tegularia Wiedemann, 1830

Phaenicia sericata (Meigen, 1826

Materials (26 specimens): 6, 24. iii.2023, Baghdad Province, Al-Taji (33°31'58.3"N 44°15'44.6" E). 5, 26.iv.2023, Saladin Province, Balad (34°00'30.0"N 44°08'54.3"E); 10, 3.v.2023, Al Ishaqi (34°06'12.2"N 44°01'31.7" E). 5, 12. vi.2023, Babylon Province, Al Musayab (32°45'57.1"N 44°16'53.3" E).

Distribution: Iraq (37); This species is widely dispersed, particularly in the Holarctic area, although it is also frequently found in Australia, a number of South and Central American nations (58), and Poland (55).

Family: Muscidae

Genus, *Haematobia* Lepeletier & Serville, 1828

Synonyms: *Haemathobia* Neave, 1939

***Haematobia* Robineau-Desvoidy, 1830**

***Priophora* Robineau-Desvoidy, 1863**

***Hoemotobia* Rondani, 1856**

***Lyparosia* Becker, 1908**

***Haematobia irritant* (Linnaeus, 1758)**

Synonyms: *Conops irritans* Linnaeus, 1758

***Haematobia serrate* Robineau- Desvoidy, 1930**

Materials (10 specimens): 20. iii.2023, 2023, Baghdad Province, Al-Taji (33°31'58.3"N 44°15'44.6" E). Distribution: Iraq (59), Nicaragua (60), Paraguay (61), Iran (62), and Saudi Arabia (63).

Genus, *Musca* Linnaeus, 1758

Synonyms: *Byomya* Robineau-Desvoidy, 1830

***Eumusca* Townsend, 1911**

***Plaxemya* Robineau-Desvoidy, 1830**

***Musca crassirostris* Stein, 1903**

Synonyms: *Musca inconstants* Wiedemann, 1830

***M. modesta* Meijere, 1904**

***Philaematomyia insignis* Austen, 1909**

Materials (10 specimens): 15. iii.2023from Baghdad Province, Al-Taji (33°31'58.3"N 44°15'44.6"E). Distribution: Iraq (37). Turkey and Cyprus (64), Saudi Arabia (64), India (65), Namibia (66), Iran (2017), and Malaysia (57).

***Musca domestica* Linnaeus, 1758**

Common name: House fly

Synonyms: *Musca contigua* Walker, 1853

***M. soror* Robineau-Desvoidy, 1830**

***M. cuthbertsoni* Patton, 1936**

***M. determinata* Walker, 1853**

***M. gymnosomea* Rondani, 1862**

***M. multispina* Awati, 1916**

Materials (120 specimens): 45, 8.iii.2023, Baghdad Province, Al-Taji (33°31'58.3"N 44°15'44.6" E). 35, 10.iv.2023, Karbala Province, Al-Husaynyia District (32°36'14.5"N 44°00'57.6"E). 40, 15.v.2023, Wasit Province, Al-Suwaira City (32°55'33.2"N 44°46'21.5"E).

Distribution: this species was listed in Iraq by Patton (1919); Worldwide distribution (67); Poland (55).

***Musca sorbens* Wiedemann, 1830**

Common names: Bazaar fly, Eye-seeking fly

Synonyms: *Byomya alba* Malloch, 1929

***Musca dichotoma* Bezzi, 1911**

***M. eutaeniata* Bigot, 1888**

***M. humilis* Wiedemann, 1830**

***M. mediana* Wiedemann, 1830**

***M. efflatouni* Salem & EL-Sherif, 1960**

Materials (10 specimens): 8. iv. 2023, Baghdad Province, Al-Taji (33°31'58.3"N 44°15'44.6" E).

Distribution: Iraq (68), India (65), Malaysia (69), Namibia (66), Saudi Arabia (63), and Egypt (70).

Genus, *Muscina* Robineau-Desvoidy, 1830

***Muscina stabulans* (Fallén, 1817)**

Common name: False stable fly

Synonyms: *Cyrtonevra australis* Macquart, 1847

***Musca prodeo* Harris, 1780**

***M. tibialis* Walker, 1836**

***Muscina grisea* Robineau-Desvoidy, 1830**

***M. picaena* Robineau-Desvoidy, 1830**

***M. prodeo* (Harris, 1780)**

***Mydaea vomiturionis* Robineau-Desvoidy, 1849**

Materials (30 specimens): 15, 7. iii.2023, Baghdad Province, Al-Taji (33°31'58.3"N 44°15'44.6" E). 8, 5.v.2023, Najaf Province, Najaf City (32°02'03.2"N 44°19'17.5"E). 7, 5.x.2023, Karbala Province, Kerbala city (32°36'24.9"N 44°01'06.2"E).

Distribution: Iraq (52), Kuwait (72), Iran (73), Finland (71), Morocco (74), Armenia (74), Namibia (66), Egypt (70), Belarus (76), and Poland (55).

Genus: *Stomoxys* Geoffroy, 1762

Synonyms: *Stomoxis* Schaeffer, 1766

***Stomoxys calcitrans* (Linnaeus, 1758)**

Basionym: *Conops calcitrans* Linnaeus, 1758

Synonyms: *Musca calcitrans* Harris, 1780

***M. occidentis* Walker, 1853**

***M. pungens* De Geer, 1776**

***Stomoxis aculeata* Robineau-Desvoidy, 1830**

***S. aurifacies* Robineau-Desvoidy, 1863**

***S. aculeata* Robineau-Desvoidy, 1830**

***S. aurifacies* Robineau-Desvoidy, 1863**

***S. claripennis* Robineau-Desvoidy, 1863**

***Stomoxys cybira* Walker, 1849**

***S. dacnusa* Speiser, 1908**

***S. geniculata* Macquart, 1846**

***S. griseiceps* Becker, 1908**

***S. hovas* Brauer, 1899**

***S. infesta* Robineau-Desvoidy, 1830**

Materials (10 specimens): 10. iii.2023. Baghdad Province, Abu Ghraib (33°18'05.0"N 44°04'51.9" E).

Distribution: Iraq (77), Saudi Arabia (78); Armenia (75); India (65); Paraguay (61); Finland (71); Iran (62); Belarus (76); Poland(55) Malaysia (79); Morocco (74).

Family: Sarcophagidae

Genus, *Sarcophaga* Meigen, 1826

Synonyms: *Bulbostyla* Giroux and Wheeler, 2010

***Caledonicesa* Koçak and Kemal, 2010**

***Devriesia* Lehrer, 1995**

***Erichsonia* Robineau-Desvoidy, 1863**

***Heteronychia Brauer* and von Bergenstamm, 1889**

***Lehrera* Koçak and Kemal, 2009**

***Listeria* Robineau-Desvoidy, 1863**

***Pierretia* Robineau-Desvoidy, 1863**

***Sarcophaga carnaria* (Linnaeus, 1758)**

Common name: Common flesh fly

Synonyms: *Musca carnaria* Linnaeus, 1758

***Sarcophaga camaria* Villeneuve, 1905**

***S. cannaria* Doleschall, 1858**

***S. carinaria* Suzuki, 1915**

***S. dolosa* Lehrer, 1967**

***S. mehriina* Enderlein, 1928**

***S. schulzi* Müller, 1922**

Materials (27 specimens): 10, 5. iii.2023, Baghdad Province, Al-Taji (33°32'10.6"N 44°15'47.0" E); 5, 8. iv.2023. Jadriyah (36.4'16°33"N 44°22'46.8"E); (7), 19.iv.2023. Babil Province, Musayyib (32°45'57.1"N 44°16'53.3" E); 5, 22.vi. 2023. Diyala Province, Muqdadiya (33°57'04.3"N 44°54'54.7"E).

Distribution: Iraq (52); Palaearctic Region (80); Türkiye (81), and Georgia (82).

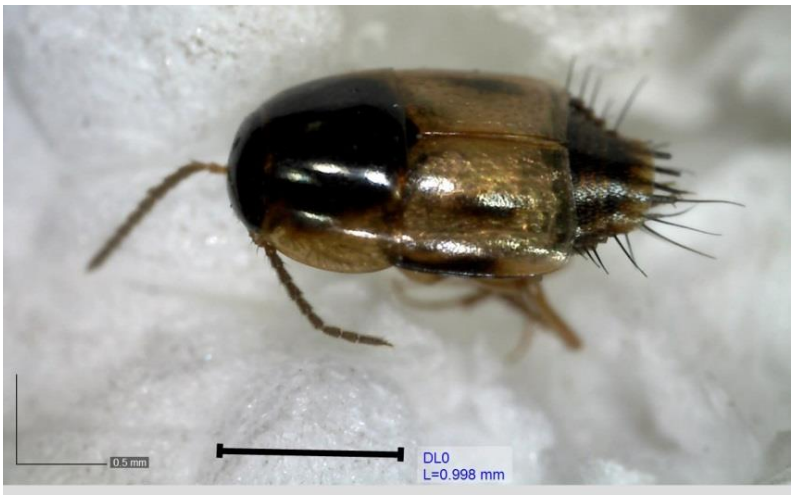

Fig. 1. *Dorsal view of Melinopterus prodromus.*

Fig. 2. *Dorsal view of Cilea silphoides.*

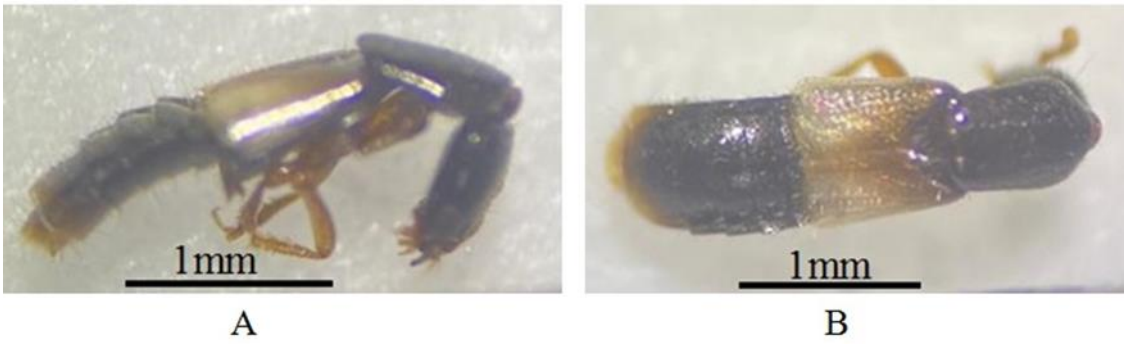

Fig. 3. *Manda mandibularis; (A) Lateral view, (B) Dorsal view.*

Fig. 4. *Dorsal view of Oxytelus piceus*

Conclusions

We can conclude that the insects found with animal feces, especially cow dung, have a good diversity in Iraq despite the few places visited. The study also proved the recording of new species or new records for the entomofuna of Iraq. Therefore, it is necessary to conduct studies in other areas of Iraq due to the importance of these insects in the environment in addition to their transmission of zoonotic diseases in addition to being intermediate hosts for many parasites. As well, we recommend choosing the feces of other animals and it is expected that additional species that were not previously known in Iraq will be recorded.

Conflict of interest: NIL

Funding: NIL

References

1- Wingo CW, Thomas GD, Clark GN, Morgan CE. Succession and abundance of insects in pasture manure: relationship to face fly survival. Annals of the Entomological Society of America. 1974 May 15;67(3):386-90.

2- Shakir Alkhafaji R, Muhsin Khalfa H, Lf Almsaid H. Rat hepatocellular primary cells: A cellular and genetic assessment of the chitosan nanoparticles-induced damage and cytotoxicity. Archives of Razi Institute. 2022 Apr 30;77(2):579-84.

3- Guimarães JH, Papavero N, Prado ÂP. As miíases na região neotropical (identificação, biologia, bibliografia). Revista Brasileira de Zoologia. 1982; 1:239-416.

4- Abo El-Ela, R., El Sawaf, B., El Hamouly, H., Sawaby, R., Abu El-Hassan, G. Effect of clozapine on the development and morphometry of Sarcophaga ruficornis Fabricius (Diptera: Sarcophagidae) and possible implications for forensic entomology. *Journal of Bioscience and Applied Research*, 2024; 10(4): 768-785. doi: 10.21608/jbaar.2024.320321.1084

5- Putman RJ. Carrion and dung: the decomposition of animal wastes. 1983.

6- El-Samad, L., Mashaal, H., Hussein, H., Radwan, E., Radwan, K., Kheirallah, N. Oxidative stress and X-ray metal assessment in ovarian tissues of the beetle, Calosoma olivieri (Coleoptera, Carabidae) collected from Kafr El

Zayat, Egypt. *Journal of Medical and Life Science*, 2024; 6(2): 202-217. doi: 10.21608/jmals.2024.363388

7- Skidmore, P. (1991). Insects of the British cow-dung community. *Field Studies Council*, 60(1), 1-166.

8- AL-Msaid HL, Waleed AH, AL-Sallami AS. Relationship Between Hyperviscosity and Sex Hormone in Azoospermia and Oligozoospermia Patients Compares with The Control Group. Int J Pharm Qual Assur. 2019;10(4):637-9.

9- Niero MM, Loss A, Brunetto G, Hernández MI. Efficiency of dung beetles (Coleoptera: Scarabaeidae) in improving soil and forage grasses by incorporating nutrients through the removal of cattle dung. Austral Entomology. 2025 Feb 1.

10- khalfa HM, al-msaid HL, abood AH, naji MA, Hussein SK. Cellular genetic expression of purinergic receptors in different organs of male rats injected with cyclophosphoamide. InAIP Conference Proceedings 2020 Dec 4 (Vol. 2290, No. 1, p. 020033). AIP Publishing LLC.

11- A Fatah AM, Elbanna SM, Gamal MM, Alharbi JS, Zalat S. The Influence of Agricultural Residues and Horse Manure on Chemical and Biological Properties of Soil. Assiut University Journal of Multidisciplinary Scientific Research. 2025 Jan 1;54(1):181-208.

12- Estrada A, Coates-Estrada R. Howler monkeys (Alouatta palliata), dung beetles (Scarabaeidae) and seed dispersal: ecological interactions in the tropical rain forest of Los Tuxtlas, Mexico. Journal of Tropical Ecology. 1991 Nov;7(4):459-74.

13- Feer F. Effects of dung beetles (Scarabaeidae) on seeds dispersed by howler monkeys (Alouatta seniculus) in the French Guianan rain forest. Journal of Tropical Ecology. 1999 Mar;15(2):129-42.

14- Vulinec, K. (2000). Dung beetles (Coleoptera: Scarabeiadae), monkeys, and conservation in Amazonia. *Florida Entomologist*, 83: 229-241.

15- Favila ME, Halffter G. The use of indicator groups for measuring biodiversity as related to community structure and function. Acta Zoológica Mexicana (ns). 1997 Dec 14(72):1-25.

16- McGeoch MA, Van Rensburg BJ, Botes A. The verification and application of bioindicators: a case study of dung beetles in a savanna ecosystem. Journal of applied ecology. 2002 Aug;39(4):661-72.

17- AL-Msaid HL, Khalfa HM, Rashid AA, Hussain NN. Relationship between Sperm DNA Fragmentation and Interleukin 17 in Patients with Leukocytospermia. Journal of Bioscience and Applied Research. 2024 Nov 21;10(4):809-15.

18- Griffiths HM, Louzada J, Bardgett RD, Barlow J. Assessing the importance of intraspecific variability in dung beetle functional traits. PloS one. 2016 Mar 3;11(3):e0145598.

19- Abdulzahra AI. TWO NEW RECORDS OF THE GENUS APHODIUS ILLIGE, 1798 (COLEOPTERA: APHODIIDAE) IN IRAQTWO NEW RECORDS OF THE GENUS APHODIUS ILLIGE, 1798 (COLEOPTERA: APHODIIDAE) IN IRAQ. Bulletin of the Iraq Natural History Museum (P-ISSN: 1017-8678, E-ISSN: 2311-9799). 2019 Jun 27;15(3):279-85.

20- Augul RS, Al-Saffar HH, Al-Ashbal HN. Survey and updating checklist of dipteran species with forensic importance. Bulletin of the Iraq Natural History Museum (P-ISSN: 1017-8678, E-ISSN: 2311-9799). 2022 Dec 20;17(2):303-24.

21- Ferreira MC. Os escarabídeos de África (Sul do Sáara), 1. Revta. ent. Mocamb.. 1972;11:5-1088.

22- Jessop L. Dung beetles and chafers. Handbooks for the identification of British insects. 1986;5(Part 11).

23- Komarek A. HYDROPHILIDAE: I. Checklist and key to Palearctic and Oriental genera of

aquatic Hydrophilidae. Water beetles of China. 2003;3:383-95.

24- DRUMONT A, CARRILLO JG. First interception of the anthicid beetle Anthelephila caeruleipennis (La Ferté-Sénectère, 1847) in Belgium (Coleoptera: Anthicidae: Anthicinae). Bulletin de la Société royale belge d'Entomologie. 2018; 154:143-5.

25- Kejval Z. Studies of the genus Anthelephila Hope (Coleoptera: Anthicidae) 20. A. caeruleipennis species-group. Acta Musei Moraviae, Scientiae biologicae. 2019;104(2):147-68.

26- Mazur S. Histeridae. Hydrophiloidea-Histeroidea-Staphylinoidea. 2004:68-102.

27- Bousquet Y, Laplante S. Coleoptera Histeridae. NRC Research Press; 2006.

28- Leivas FW, Moura DP, Caterino MS. Brazilian Histerini (Coleoptera, Histeridae, Histerinae): a new species, key to the genera, and checklist of species. Zootaxa. 2015 Apr 1;3941(3):437-44.

29- Abdul-Rassoul MS, Ouda NA, Al-Faisal AH, Zaiya HH. New records of aquátic insects from Iraq. J. Biol. Sci. Res. 1987;18(2):61-5.

30- Smetana A. Revision of the subfamily Sphaeridiinae of America north of Mexico (Coleoptera: Hydrophilidae). The Memoirs of the Entomological Society of Canada. 1978 Jan;110(S105):1-292.

31- Shatrovskiy AG. Family Hydrophilidae. Opredelitel'nasekomykh Dal'nego Vostoka SSSR. 1989:264-93.

32- Prokin YN, Przewoźny M, Ryndevich SK. Hydrophilidae. Catalogue of Palaearctic Coleoptera. 2015;2:1.

33- Cosandey V, Chittaro Y, Sanchez A. Annotated checklist of the Hydrophiloidea of Switzerland (Coleoptera). Alpine Entomology. 2023 Jun 10;7:167-84.

34- Nabit BI, Al-Anbari RH, Alwan IA. Identifying suitability rainwater harvesting zones in diyala watershed, iraq, using multi-criteria analysis and GIS modelling. InIOP conference series: earth and environmental science 2023 Apr 1 (Vol. 1158, No. 2, p. 022036). IOP Publishing.

35- Akhmetova LA, Frolov AV. A review of the scarab beetle tribe Aphodiini (Coleoptera, Scarabaeidae) of the fauna of Russia. Entomological review. 2014 Sep;94:846-79.

36- Lim C, Minkina Ł. A new species of genus Acrossus Mulsant, 1842 (Scarabaeidae, Aphodiinae, Aphodiini) from South Korea. ZooKeys. 2024 Sep 4; 1211:211.

37- Derwesh, A. I. (1965). A preliminary list of identified insects and some Arachnids [including mites] of Iraq.

38- Dellacasa M, Kirgiz T. Records of Aphodiinae (Coleoptera, Scarabaeoidea, Aphodiidae) from Edirne province and neighboring areas (European Turkey). Italian Journal of Zoology. 2002 Jan 1;69(1):71-82.

39- Akhmetova LA, Kurochkin AS, Frolov AV. Dung-beetles (Coleoptera, Scarabaeidae, Aphodiinae, Scarabaeinae) feeding on faeces of steppe marmots Marmotabobak (Rodentia, Sciuridae) in Middle Volga territory. Biodiversity Data Journal. 2024 Jun 18;12:e125090.

40- Abdel-Dayem MS, Fad HH, El-Torkey AM, Elgharbawy AA, Aldryhim YN, Kondratieff BC, Al Ansi AN, Aldhafer HM. The beetle fauna (Insecta, Coleoptera) of the Rawdhat Khorim National Park, Central Saudi Arabia. ZooKeys. 2017(653):1.

41- Zhang Z, Jiao N, Zhang Y. Global ocean microbiome catalogue: A gateway to unlock marine microbial resources and ecosystem functions. The Innovation Life. 2024 Oct 30;2(4):100099-.

42- GBIF Secretariat. 2023. GBIF Backbone Taxonomy. Checklist dataset accessed via GBIF.org on 2024-10-27.

43- Miraldo, A., Krell, F.-T., Smalen, M., Angus, R. B. & Roslin, T. (2014). Making the cryptic visible – re-solving the species complex of *Aphodius fimetarius* (Linnaeus) and *Aphodius*

pedellus (de Geer) (Coleoptera: Scarabaeidae) by three complementary methods. *Systematic Entomology*, 39, 531-547.

44- Baviera C, Altadonna G, Muscarella C, Ziani S. The Scarabaeoidea (Coleoptera) of the Nebrodi Mountains (North-Eastern Sicily, Italy). Atti della Accademia Peloritana dei Pericolanti-Classe di Scienze Fisiche, Matematiche e Naturali. 2024 Jul 25;102(2):1.

45- SOMMER D, HARMAN M, KRÁL D. Occurrence of Chilothorax conspurcatus (Coleoptera: Scarabaeidae: Aphodiinae) in Slovakia Výskyt hnojíka Chilothorax conspurcatus (Coleoptera: Scarabaeidae: Aphodiinae) na Slovensku.

46- Plewa R, Lasoń A, Sapieja M, Hilszczański J, Dziuk A, Tarwacki G, Sućko K, Jaworski T. Beetles (Insecta: Coleoptera) new for the fauna of the Białowieża Forest including two new species for Poland. Polish Journal of Entomology. 2024 Jan 1;93(1):81-92.

47- JUŘENA, D., LAUŠ, B., MANCI, C.O. and CSÉFALVAY, R., 2024. Results of ongoing mapping of Bolbelasmus unicornis (Schrank, 1789)(Coleoptera: Geotrupidae: Bolboceratinae): the second addendum to the biogeographical study from 2022, with a literature review and new records of B. keithi Miessen & Trichas, 2011 and B. nireus (Reitter, 1895). *Journal of Insect Biodiversity*, *53*(1), pp.1-68.

48- Langraf V, Petrovičová K, Brygadyrenko V. Structure of Beetles (Coleoptera) in the Conditions of Agriculturally Used Land and Natural Habitat of the European Important Territory of the Dunajské luhy. Contemporary Problems of Ecology. 2024 Apr;17(2):325-35.

49- Gordon, R. D. & Skelley, P. E. (2007). A monograph of the Aphodiini inhabiting the United States and Canada (Coleoptera: Scarabaeidae: Aphodiini). *Memoirs of the American Entomological Institute*, 79, 1-580.

50- Steinmann, H. (1989). World catalogue of Dermaptera. *Series Entomologica* (Dordrecht), 43, 1- 934.

51- Steinmann, H. (1993). Dermaptera: Eudermaptera II. Tierreich 108. Walter de Gruyter, Berlin - New York, 709 pp.

52- Khalaf, K. T. (1957). Diptera from Iraq. *Iraq Natural History Museum, Publication no.* 13, 13 – 15.

53- Zumpt, F. (1965). Myiasis in man and animals in the Old World. Butterworths, London. xv + 267 pp.

54- de Jong, Y., Verbeek, M., Michelsen, V., de Place Bjørn, P., Los, W., Steeman, F. Bailly, N., Basire, C., Chylarecki, P., Stloukal, E., Hagedorn, G., Wetzel, F. T., Glöckler, F., Kroupa, A., Korb, G., Hoffmann, A., Häuser, C., Kohlbecker, A., Müller, A., Güntsch, A., Stoev, P. & Penev, L. (2014). Fauna Europaea - all European animal species on the web. *Biodiversity Data Journal*, 2, e4034.

55- Nosal, P., Kowal, J., Weglarz, A. & Wyrobisz-Papiewska, A. The occurrence and diversity of flies (Diptera) related to ruminant farming in southern Poland. *Annals of Parasitology*,2019: 65(4), 357-363.

56- Wells, J. D. *Chrysomya megacephala* (Diptera: Calliphoridae) has reached the continental United States: review of its biology, pest status and spread around the world. *Journal of Medical Entomology*,1991: 28 (3), 471-473.

57- Khofar, P. N., Kurahashi, H., Zainal, N. S., Isa, M. S. & Heo, C. C.. Diversity of coprophilic Diptera associated with buffalo dung in Selangor, Malaysia. J*ournal of Wildlife Park,2019:* 34, 63-80.

58- Rueda, L. C., Ortega, L. G., Segura, N. A., Acero, V. M. & Bello, F. *Lucilia sericata* strain from Colombia: experimental colonization, life tables and evaluation of two artificial diets of the blowfly *Lucilia sericata* (Meigen) (Diptera: Calliphoridae), Bogota, Colombia strain. *Biological Research*, 2010:43 (2): 197-203.

59- Pont, A. C. (1986). Family Fanniidae and Family Muscidae. p . 41 – 215. In : A . Soos and L. Papp (Eds .) , Catalogue of Palaearctic Diptera .,Volume 11 . Scathophagidae – Hypodermatidae . – Budapest , 346 pp.

60- Nihei, P. S. Sh., Schühli, G. S. and De Carvalho, C. J. B. Fanniidae and Muscidae (Diptera) from Nicaragua. *Revista nicaraguense de entomología*, 2009: 69:1-10.

61- Schühli, G. S., Nihei, S. S. & de Carvalho, C. J. B. (2011). A survey of the family Muscidae (Diptera) (except for Coenosiinae) from Mbaracayú forest, Paraguay. *Rev. Soc. Entomol. Argent*, 70 (1-2), 129-136.

62- 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.

63- Alikhan, M., Al Ghamdi, Kh., Mahyoub, J. M. & Alanazi, N. Public health and veterinary important flies (Order: Diptera) prevalent in Jeddah Saudi Arabia with their dominant characteristics and identification key. *Saudi Journal of Biological Sciences*,2017: 25, 1648-1663.

64- Pont, A. C. A. (1991). Review of the Fanniidae and Muscidae (Diptera) of the Arabian Peninsula. *Fauna of Saudi Arabia*, 12, 312-365.

65- Bharti, M.. Current status of family Muscidae (Diptera) from India. *Journal of Entomological Research*, 2008:32 (2), 171-176.

66- Couri, M. S., de Carvalho, C. J. B. & Pont, A. C. (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.

67- Hewitt, C. G. The house-fly: *Musca domestica* Linn.: its structure, habits, development, relation to disease and control. Cambridge University Press,2011: p. 5-6.

68- Patton, W. S. Some notes on the Arthropods of medical and veterinary importance in Mesopotamia, and on their relation to disease. Part II. Mesopotamian house flies and their allies. *Indian Journal of Medical Research*,1920: 7, 751-777.

69- Chin, H. C., Ahmad, N. W., Kian, C. W., Kurahashi, H., Jeffery, J., Kiang, H. S. & Omar, B. A study of cow dung Diptera in Sentul Timur, Kuala Lumpur, Malaysia. *The Journal of Tropical Medicine and Parasitology*,2010: 33(2), 53-61.

70- Sawaby, R. F., El Hamouly, H., Abo-El Ela, R. H. (2018). Diagnosis and keys of the main dipterous families and species collected from rabbit and guinea pig carcasses in Cairo, Egypt. *The Journal of Basic and Applied Zoology*, 79 :(10), 1- 14.

71- Kahanpää, J. & Haarto, A.Checklist of the families Scathophagidae, Fanniidae and Muscidae of Finland (Insecta, Dipter). *Zookeys*,2014: 441, 347-367.

72- Al-Houty, W. Insect fauna of Kuwait. 1st Edition, Fahad Al-Marzouk Printing & Publishment, 1989:pp 186.

73- Khoobdel, M. & Davari, B. Fauna and abundance of medically important flies of Muscidae and Fanniidae (Diptera) in Tehran, Iran. Asian Pacific *Journal of Tropical Medicine*, 2011:4(3), 220-223.

74- Kettani, K., Ebejer, M. J., Ackland, D. M., Bächli, G., Barraclough, D., Barták, M., Carles-Tolrá, M., Černý, M., Cerretti, P., Chandler, P. & Dakki, M. (2022). Catalogue of the Diptera (Insecta) of Morocco—an annotated checklist, with distributions and a bibliography. *ZooKeys*, 1094, 1-466.

75- Pont, A. C., Werner, D. & Kachvoryan, E. A. (2005). A preliminary list of the Fanniidae and Muscidae (Diptera) of Armenia. *Zoology in the Middle East*, 36, 73-86.

76- Makovetskaya, E. V. & Vikhrev, N. E. A preliminary list of the Fanniidae and Muscidae (Diptera) of Belarus. *Russian Entomological Journal*, 2019:28 (1), 93-101.

77- Hussain, A. A. (1963). Provisional list of Insect pests and Bibliography of Insect fauna of Iraq. *Bulletin of the College of Science, Baghdad*, 7: 43 - 83

78- Pont, A. C. A. (1991). Preliminary list of the Fanniidae and Muscidae (Insecta: Diptera) from Turkey and the Middle East. *Zoology in the Middle East*, 5, 63-112.

79- Ola-Fadunsin, S. D., Gimba, F. I., Abdullah, D. A., Abdullah, F. F. J., & Sani, R. A. Dataset on the diversity and distribution of biting flies collected from cattle farms in Peninsular Malaysia. *Data in Brief*, 2020:29, 105315.

80- Pape, T. Catalogue of the Sarcophagidae of the world (Insecta: Diptera). Memoirs on Entomology, International. Volume 8, Associated Publishers, 1996: pp 557.

81- Verves, Y., Barták, M. & Kubík, Š. (2018). Checklist of flesh flies of Turkey (Diptera, Sarcophagidae). *ZooKeys*, 743, 95-136.

82- Japoshvili, G., Gordiashvili, N., Injia, S., Tsiklauri, K., Sulamanidze, G. 2022. Updated annotated checklist of insects from Lagodekhi protected areas, Sakartvelo (Georgia). *Munis Entomology and Zoology*, 17 (2), 792-841.