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Razzaq Shalan Augul
Iraq Natural History Research
Center & Museum, University of
Baghdad, Baghdad, Iraq

Insect pollinators in different regions of Iraq

Razzaq Shalan Augul

Abstract

The aim of this study was to assess species diversity and population abundance of pollinating insects in some different regions of Iraq. There are 611 specimens were collected in the current study; these specimens belong to 5 orders, 25 families, 45 genera and 52 species. In total the percent of pollinator groups investigated were recorded; bees and wasps were the most abundant with 51.3% of the total number of individuals, followed by butterflies 16.03%, beetles 14.07%, flies 13.25% and hemipteran with less 5.23%. In this investigation the species of *Myathropa florum* (Linnaeus, 1758) was registered as a new record from Iraq.

Keywords: Bees, Diversity, Flowers, Iraq, Pollinators.

1. Introduction

Pollination by animals is an essential ecological process, which ensures plant reproduction in 60-90% of angiosperms^[1, 2, 3], and provides products and food for human mankind and animals^[3] In natural and semi-natural habitats up to 90% of all flowering plant species rely on pollination by animals, mainly insects such as bees^[1]. The most important pollinators for arable weeds are wild bees, honeybees and bumblebees, and sometimes flies and butterflies^[4]. Globally, there are 19.500 described species of bee; there are many other pollinating insects such as hoverflies and other flies, beetles, butterflies, moths and beetles. Many evidences that the diversity of insect pollinators encompassing the variety of different pollinator species, their abundance and their interactions with plants and other organisms is sensitive to many different anthropogenic environmental changes. Land-use change, agricultural intensification and urbanization often destroy and fragment the natural habitats that many pollinators rely on for food and nesting resources^[5, 6].

Insect pollination, mostly by bees, is necessary for 75% of all crops that are used directly for human food worldwide^[7]. Although many of the highest volume crops (e.g. rice and wheat) are wind-pollinated^[8], a large proportion of fruit crops for example: apple, melon and berry are potentially vulnerable to declines in apiculture and wild pollinator stocks.

Insect pollinators of crops and wild plants are threatened worldwide by, land-use intensification (including habitat destruction and pesticide use), climate change, invasive species and the spread of diseases and parasites^[9].

The aim of this study was to determine the prevalence of the insect pollinators and flowers visitors in different region of Iraq and provide additional information about these insects.

2. Materials and Methods

Specimen's collection

611 specimens were collected during the present study for period from 1.March. to 1.Nov.2015 from different regions of Iraq.

Bees, wasps, butterflies and flies were collected by aerial insect nets on flowering plants; beetles were collected by sweeping nets; held aspirator used to collect small hemipteran and coleopteran specimens.

Insect specimens of large and medium size were mounted on pin while small insects were preserved in 70% alcohol. Locality, families of plants and date of collection were provided.

New record species photographs were taken with a Samsung galaxy S4, GT-19500 and used binocular dissecting microscope (MB. MARIOBROMA.SRL, Roma) to magnificent the morphological features.

Correspondence
Razzaq Shalan Augul
Iraq Natural History Research
Center & Museum, University of
Baghdad, Baghdad, Iraq

Identification

Using many keys for identifying the specimens: [10-29]. In addition to comparing it with samples diagnosed earlier and stored at the Iraq Natural History Research Centre and Museum, university of Baghdad.

3. Results and Discussion

In this study, there are five orders, 26 families, 46 genera and 54 species of insects were recorded; In total the percent of pollinator groups investigated were recorded; bees and wasps were the most abundant with 51.3% of the total number of individuals, followed by butterflies 16.03%, beetles 14.07%, flies 13.25% and hemipteran 5.23%. A list of the species is given below:

(1) Order: Hymenoptera

Family: Apidae

Apis mellifera Linnaeus, 1758

This species depends wholly on plants for food; honeybee workers make thousands of visits to flowers in order to collect nectar and pollen, according to the families plant (trees and shrubs) can be visitor by this species: Fabaceae, Bombacaceae, Annonaceae, Meliaceae, Arecaceae, Capparaceae, Myrtaceae, Capparaceae, Rubiaceae, Acanthaceae, Euphorbiaceae, Lamiaceae, Bignoniaceae, Cucurbitaceae, Anacardiaceae, Nymphaeaceae, Poaceae, Verbenaceae, Combretaceae, Asteraceae or Compositae, Rhamnaceae, Olacaceae, Sapotaceae and Sterculiaceae [30]. In present study the specimens of this species were collected on flowers of Compositae, Rhamnaceae, Capparaceae, Myrtaceae, Lamiaceae, and Fabaceae.

Materials Examined (111 specimens): Baghdad province: Bab Al-Muadham, 17, 24.March.2015, 11, 24.April.2015; Al-Mada'in, 8, 18.April.2015, 7, 3.Aug.2015; 12, 10.Oct.2015; Wasit province: Kut, Ash Shahabi,10, 11.Jun.2015; Al-Zubaidya, 11, 16. Sep.2015, 8, 18.Sep.2015, 3, 23.Sep.2015; Al-Zubaidya - Sherhan village, 16, 23.Jul.2015; Maysan province: Hawizeh Marshes, Umm An-Ni'aaj, 8, 9.Jun.2015.

Distribution: This species is most widespread, occurring throughout Europe, Africa, northern western Asia, Caucasia, and the Iranian Plateau [31-33], as well as adventives in the Americas and Australia [34-37].

***Xylocopa fenestrata* (Fabricius, 1798)** *Xylocopa* (large carpenter bees) is a cosmopolitan genus of approximately 470 species of medium to very large bees [19]. All *Xylocopa* are commonly associated with large and showy flowers with abundant pollen and nectar [38, 39] were collected the individuals visiting only flowers of the Fabaceae and Bignoniaceae families, while [40] were recorded visiting 160 species in 28 different plant families (where there are no other bees to compete with), and they may visit a broad range of flowers even within a single a day; For example, *Xylocopa gualeanensis* in Costa Rica was observed foraging on at least three different plant species, with peaks at different times, from sunrise to 4 p.m. [41].

Another species, *X. frontalis*, found in Central and South America has been recorded on the following plant families: Asteraceae, Bignoniaceae, Caesalpiniaceae, Fabaceae, Gesneriaceae, Lamiaceae, Melastomataceae, Meliaceae, Passifloraceae, Sapindaceae, Styracaceae, and Verbenaceae [42]. In our study the specimens belong to *Xylocopa* were collected on flowers of Capparaceae and Asteraceae together throughout day.

Distribution: Turkey [43]; Iraq [44]; Syria, Iran, Pakistan, Nepal, India, Israel, Burma, China, Madagascar, Reunion [23].

Material Examined: (8 specimens): Baghdad province: Bab Al-Muadham, 3, 23.Jun.2015, 5, 26.Jul.2015, 8, 17.Aug.2015, 2, 3.Sep.2015; Al-Mada'in, 2, 10.Oct.2015; Wasit province: Al-Zubaidya, 1, 16. Sep.2015; Al-Zubaidya - Sherhan village, 3, 23.Aug.2015; Maysan province: Hawizeh Marshes, Umm An-Ni'aaj, 3, 9.Jun.2015.

Peratina sp.

Many plants species belong to different families were visitors by species of *Ceratina*: Apiaceae, Asteraceae, Boraginaceae, Brassicaceae, Campanulaceae, Caryophyllaceae, Cistaceae, Convolvulaceae, Cistaceae, Cucurbitaceae, Dipsacaceae, Euphorbiaceae, Fabaceae, Geraniaceae, Lamiaceae, Liliaceae, Lythraceae, Malvaceae, Oleaceae, Oxalidaceae, Polygalaceae, Ranunculaceae, Resedaceae, Rosaceae, Salicaceae, Saxifragaceae, Scrophulariaceae, Valerianaceae and Verbenaceae [21]; in current study the members belong this genus are collected as visitors on flowers of *Mentha* sp. (Fam.: Lamiaceae).

Material Examined: (4 specimens): Wasit province: Al-Zubaidya, 20. Oct. 2015.

Distribution: Cosmopolitan [45].

Amegilla quadrifasciata (de Villers, 1790)

Amegilla species are foraging mainly flowers with long corollae, as Boraginaceae, Lamiaceae, Leguminosae, Scrophulariaceae and Compositae [46], also Myrtaceae [47]. In present study the members of *A. quadrifasciata* collected feeding on Capparaceae flowers.

Distribution: Palearctic region [48].

Materials Examined (8 specimens): Baghdad province: Bab Al-Muadham, 2, 26.Jun.2015, 1, 29.Jun.2015; Wasit province: Kut, 4, 30.Oct.2015.

Family: Halictidae

Halictus sp.

Many flowers of plants belong to families: Convolvulaceae, Papaveraceae, Asteraceae, Lamiaceae, Brassicaceae, Fabaceae, Boraginaceae, Euphorbiaceae, Malvaceae and Onagraceae are food for species of this family [49]; also Caryophyllaceae, Amaranthaceae and Rosaceae registered by [50]. Specimens in current study were collected on flowers of plants belong to families of Fabaceae and Amaranthaceae.

Materials Examined (9 specimens): Baghdad province: Bab Al-Muadham, 1, 21.Jun.2015, 2, 29.Jun.2015 Wasit province, Al Shahabi, 8, 10.Jun.2015.

Distribution: Palaearctic, South America [51]; East Asia[52]; from Africa to tropical Asia [19].

Pseudapis sp.

Materials Examined (8 specimens): Baghdad province: Maysan province, um Al Nijaj, 3, 9.Jun.2015. Wasit province, Al Shahabi, 5, 10.Jun.2015.

Distribution: *Pseudapis* is a widespread genus. It occurs in Europe, southern Russia, east to Turkey, central Asia, northern

China, Japan, throughout Africa, south Asia to India and Thailand^[53].

***Lasioglossum* sp.**

Species of genus *Lasioglossum* can visitors many flowers of plants belong to many families: Asteraceae, Boraginaceae, Amaranthaceae, Fabaceae, Lamiaceae Polygonaceae, Ranunculaceae and Rosaceae^[54]. The specimens collected from Asteraceae flowers in our investigations.

Materials Examined (6 specimens): Baghdad province: Bab Al-Muadham, 2, 21.Jun.2015, 1, 29.Jun.2015 Wasit province, An Numaniyah, 3, 8.Jun.2015.

Distribution: Palaearctic, South America^[51], East Asia^[52], from Africa to tropical Asia^[19].

Family: Megachilidae

Megachile argentata (Fabricius, 1793)

Flowers of the Asteraceae, Brassicaceae, Lamiaceae, Euphorbiaceae and Fabaceae were visitors by different species of *Megachile*^[49]; Members of *Megachile leachella* were observed feeding on flowers of Asteraceae.

Mat: Baghdad province, Al- Madaen, 6, 4.Oct.2015. Wasit province: Al-Zubaidya, 2, 20.Oct.2015.

Distribution: Iraq^[44]; Europe^[55]; Syria and North Africa^[56].

***Coelioxys haemorrhoea* Forster, 1853**

In our study, the specimens were collected on Fabaceae flowers; although^[49] they mentioned that species *Coelioxys* as cleptoparasitic and have no needs to collect pollen and so flower visits are for nectar only.

Material examined (7specimens): Maysan province: Hawizeh Marshes, Umm An-Ni'aaj, 6, 9.Jun.2015. Baghdad province: Al Shurta Al Khamsa, 1, 4.Sept.2015.

Distribution: Species distributed southern Europe, from the Iberian Peninsula to Austria, and North Africa, to Central Asia^[57]; Iraq^[44].

***Sphecodes* sp.**

Khodaparast and Monfared^[49] registered Brassicaceae family as food plant for this species; this result is agreement with our result, wherein the specimens were collected as feeding on *Cardaria* (Brassicaceae) flowers.

Material Examined (2 specimens): Baghdad province; Bab-Al Muadham, 18.Jun.2015.

Distribution: Holarctic Region north to the subarctic^[58].

Family: Andrenidae

Andrena flavipes Panzer, 1799

The previous study stated the species belong *Andrena* can be fed on many divers of flowers under different families: Asteraceae, Brassicaceae, Rosaceae, Fabaceae, Boraginaceae, Rutaceae, Papaveraceae, Convolvulaceae and Lamiaceae^[49]. The current investigation found the members of *Andrena flavipes* species were visitors and fed on flowers of Brassicaceae.

Materials Examined (1specimen): Baghdad province, Al-Madaen, 1, 18.Apr.2015. Wasit province: Al-Zubaidya, 2, 20.Oct.2015.

Distribution: Iraq^[44]; China, Nepal, India, Kazakhstan, Uzbekistan, Asia Minor, European Russia, Europe, North Africa^[59].

Family: Sphecidae

Adults of Sphecidae are feeding on nectars^[60]; therefore, it is good for the wide diversity of pollinators. For example the genus of *Sphex* spp. registered as pollinator on Asclepiadeae flowers^[61]; *Stizus* sp. and *Cerceris* sp. on flowers of Pedaliaceae^[62].

In this study the species belong to *Sphex* genus are seen on flowers of *Mentha* Linnaeus (Family: Lamiaceae); the members of the genus *Ammophila* were recorded visiting on flowers belong to families: Fabaceae and Cucurbitaceae; *Liris* species on Asteraceae; *Stizus* and *Cerceris* species were collected on Malvaceae flowers.

Sphex zubaidiyacus Augul, 2013

Materials Examined (14 specimens): Wasit province: Al-Zubaidya, 3, 18.May.2015; Al-Zubaidya - Sher'han village 4, 28. May.2015, 7, 30. Jul.2011.

Distribution: This species was described as a new species to Iraq in 2013^[26].

Sphex pruinosis Germar, 1817

Materials Examined (27 specimens): Baghdad province: Madaen, 5, 23.Sep.2015, 3, 4.Oct.2015. Wasit province: Al-Zubaidya, 11, 18.Sep.2015; Al-Zubaidya - Sher'han village, 4, 28. Sep.2015, 1, 30. Sep.2015; Sek'ran village, 3, 23.Oct.2015.

Distribution: Mediterranean region, North Africa, Saudi Arabia, Iraq^[14,18].

Ammophila heydeni Dahlbom, 1845

Material (17 specimens): Baghdad province: Jaddria, 6, 29.Jul.2015; Madaen, 1, 4.Oct.2015. Wasit province: Al-Zubaidya, 8, 21.May.2010; Al-Zubaidya – Sher'han vill, 4, 16.8.2015; Aziziya, 7, 2.5.2015; Al Shahabi, 3, 10.Jun. 2015.

Distribution: Mediterranean region, Asia^[14, 18, 60].

Liris haemorrhoidalis (Fabricius)

Materials Examined (3 specimens): Baghdad; Bab – Al Muadham, 1, 6.May.2015; Wasit province, Al-Zubaidya - Sherhan village, 2, 29.May.2015.

Distribution: Iraq^[44]; Cape Verde Islands, Cameroon, Central African Republic, Eritrea, Ethiopia, Kenya, Mozambique, Oman, Socotra, Somalia, South Africa, Sudan, Tanzania, Zimbabwe, India, Afghanistan, Canary Islands, Egypt, Iran, Iraq, Israel, Italy, Kazakhstan, Libya, Morocco, Palestine, Saudi Arabia, Spain, Western Sahara^[18,63].

***Stizus* sp.**

Materials Examined (1 specimen): Baghdad; Bab – Al Muadham, 1, 20.Sep.2015.

Distribution: North America, Palearctic region, South Africa, Oriental region^[64].

***Cerceris* sp.**

Materials Examined (1 specimen): Baghdad; Bab – Al Muadham, 1, 25.Jun.2015.

Distribution: Palearctic Region, North America, Mexico and Central America, Australia ^[64].

Family: Scoliidae

Campsomeriella thoracica (Fabricius, 1787)

Materials Examined (31 specimens): Baghdad province: Jaddria, 2, 18.Sept.2015; Bab Al-Muadham, 5, 20.Sept.2015; Al- Madaen, 7, 3.8.2015; Wasit province: Al-Zubaidya, 1, 16. Sep.2015, 2, 23.Sep.2015, 3, 18.Sep.2015, Al-Zubaidya - Sherhan village, 6, 23.Jul.2015; Maysan province: Hawizeh Marshes, Umm An-Ni'aaj, 5, 9.Jun.2015.

Distribution: Saudi Arabia ^[65], Iran ^[66], Oman ^[67]; according to ^[68] this species found in: Crete, Cyprus, Dodecanese Is., Greek mainland, Italian mainland, Malta, North Aegean Is., North Africa (Morocco), Sicily, Spanish mainland, Syria, Turkey. In Iraq, it was previously recorded under the name of *Campsomeris thoracica eriophora* Klug ^[69].

Scolia turkestanica Betrem, 1935

Materials Examined (2): Maysan province: Hawizeh Marshes, Umm An-Ni'aaj, 9.Jun.2015.

Distribution: Iran ^[70]; Turkey ^[71]; Turkmenistan, Uzbekistan, Armenia and Iraq ^[72], Kirgizstan and Tadjhikistan ^[73].

Scolia flaviceps Eversmann, 1846

Material Examined (17 specimens): Baghdad province: Al-Madaen, 4, 18.Apr.2015; Wasit province: Aziziyah, 2, 8.Jun.2015; Al-Zubaidya - Sherhan village, 2, 21.May.2015; Maysan province, Hawizeh Marshes, Umm An-Ni'aaj, 9, 9.Jun.2015.

Distribution: Iran, Afghanistan, Iraq, Oman ^[74]; Turkey ^[75]; Crete, Tadjhikistan, Turkmenistan, Uzbekistan, Central Asia, Cyprus ^[76]; France, Italy, Egypt ^[77]; United Emirates ^[72]; Greece ^[78] and Saudi Arabia ^[18].

Family: Vespidae

In this family; members of *Vespa orientalis* visitors of *Allium cepa* L. (Family: Amaryllidaceae) flowers ^[79]; whereas ^[80] was recorded *Polistes wattii* Cameron on sunflowers (Family: Asteraceae). In our investigations, the species of *V. orientalis* was shown as visitor on sunflowers.

Vespa orientalis Linnaeus, 1771

Material Examined (7 specimens): Baghdad province: Bab-Al Muadham, 4, 17.Aug.2015; Al- Madaen, 1, 18.Sep.2015; Wasit province: Aziziyah, 2, 8.Jun.2015.

Distribution: The distribution of this species comprises northern part of Africa, South Eastern Europe, and Southwest Asia across Turkey and Arabian Peninsula to India and Nepal, the Sahara, Ethiopia and Madagascar ^[81], from the Mediterranean to Japan ^[82], Mexico ^[83] and Iraq ^[44].

Family: Chrysididae

Chrysis palliditarsis Spinola, 1838

Abdul Hannan ^[62] mentioned that members of *Chrysis* were flower visiting of Pedaliaceae plants; while in current

investigations the members of this species were collected of Asteraceae flowers.

Materials Examined (2 specimens): Baghdad; Al Shurta Al Khamsa, 2, 4.Sep.2015.

Distribution: North Africa, Egypt, Palestine, Turkestan ^[84]; Iraq ^[44]; Middle East, former USSR, Afrotropical ^[85].

(2) Order: Lepidoptera

Family: Papilionidae

Members of species belong to Papilionidae were found as pollinator on flowers of *Acacia bidwillii* (Fam.: Fabaceae) ^[86]; while ^[87] reported *Papilio demoleus* as pollinators of plants belong to Rubiaceae and Apocynaceae families. In the present study the specimens are collected on Malvaceae and Asteraceae.

Papilio demoleus Linnaeus, 1758

Materials Examined (16 specimens): Baghdad province: Madaen, 2, 24.Apr.2015; Bab- Al Muadham, 2, 17.May.2015, 3, 7.Jun.2015. Wasit: Aziziyah, 4, 30.Apr.2015; Shahabi, 2, 10.Jun.2015. Maysan province: Al-Kahla District, 3, 9.Jun.2015.

Distribution: India ^[88], Iraq ^[44]; widely distributed from Famosa to Arabia including Burma, Bangladesh, Ceylon, India and Pakistan ^[89], Iran ^[90], Australia ^[91], Oman ^[92], Indonesia ^[93], Turkey ^[94], Dominican Republic, Puerto Rico and Jamaica ^[95].

Family: Hesperiidae

The members of species belong to this family were registered as visitors on flowers of Orobanchaceae ^[96]; in our study, the species of *Carcharodus alceae* was seen feeding on flowers of *Helianthus annuus* Linnaeus (Fam.; Asteraceae).

Carcharodus alceae (Esper, 1780)

Materials Examined: (2 specimens) Baghdad province: Madaen, 1, 3.Sept.2015; Bab Al-Muadham, 1, 9.Sept.2015.

Distribution: Iraq ^[44]; widely distributed in Southern and Central Europe up to 52°N and stretches eastwards across Turkey, the Middle East, the Caucasus, Iran, Turkmenistan, Uzbekistan, Kazakhstan, Afghanistan, Sinai and Yemen ^[97].

Family: Lycaenidae

In previous studies, there were divers flowers of plant belong to different families were visitors by species of Lycaenidae for example: Fabaceae, Asteraceae, Rosaceae, Boraginaceae, Rubiaceae, Caryophyllaceae and Lamiaceae ^[98]; in the present study the butterflies were collected on flowers of *Mentha* sp. (Family: Lamiaceae) and Convolvulaceae.

Cosmolyce boeticus (Linnaeus, 1767)

Materials Examined (50 specimens): Baghdad province: Al-Mada'in, 7, 18.April.2015; Bab Al- Muadham, 6, 11.May.2015; 10, 17.May.2015. Wasit province: Al-Zubaidya, 14, 16.Oct.2015; Al-Zubaidya - Sherhan, 9, 17.Oct.2015. Maysan province: Hawizeh Marshes, Umm An-Ni'aaj, 4, 9.Jun.2015.

Distribution: Southern Europe, Africa, tropical and subtropical Asia, Australia [99]; Iraq [44] was reported this species in the checklist.

Family: Nymphalidae

Junonia orithya (Linnaeus, 1758)

Members of this species were registered as flower visitors on Asteraceae and Verbenaceae plants [100], Euphorbiaceae [101]. The present study was recorded this species on flowers of Umbelliferae and Fabaceae.

Materials Examined (27 specimens): Wasit province: Al Shahabi, 16, 11.Jun.2015; Al-Zubaidya, 2, 16.Oct.2015; Al-Zubaidya - Sherhan, 3, 17.Oct.2015. Baghdad province: Bab Al- Muadham, 3, 17.Aug.2015; Al-Mada'in 3, 4.Oct.2015.

Distribution: Iraq [44]; widely distributed globally, ranging in the Oriental region, from Pakistan, Sri Lanka, India, North to South China and Formosa, through Malaysia and the Archipelago to Australia [22].

Danaus chrysippus (Linnaeus, 1758)

In Egypt, this species was recorded as pollinator on flowers of *Sesamum indicum* L. (Fam.: Pedaliaceae) [102]; whereas in our study, the butterflies were caught on flowers of Umbelliferae.

Materials Examined (3 specimens): Baghdad province; Bab Al- Muadham, 3, 18.Jun.2015.

Distribution: Iraq [44]; Iran [103]; this species native in Egypt and becomes the first record of butterflies in the world [104]; Canary Islands, northern Africa (western Morocco, northern Algeria and Tunisia), It is also recorded from mainly coastal districts of southern Spain, southern France, Corsica, Sardinia, Sicily, Italy, Montenegro, Albania, and Greece and becomes the first record of butterflies in the world [105], Benin [106].

(3) Order: Coleoptera

Family: Dermestidae

Anthrenus verbasci (Linnaeus, 1767)

This species was found feeding on flowers of the Asteraceae, Brassicaceae and Myrtaceae [86]; whereas in the current study the specimens collected in high density from the flowers of plants belong to Umbelliferae and lower on Convolvulaceae.

Materials Examined (51 specimens): Baghdad province: Bab Al- Muadham, 4, 28.Apr.2015; 18, 6.May.2015. Wasit province: Al-Zubaidya, 22, 30.Apr.2015; Aziziyah, 7, 2.May.2015.

Distribution: Cosmopolitan species [107].

Family: Bruchidae

Spermophagus sericeus (Geoffroy, 1785)

In our study the specimens were collected from flowers of Umbelliferae, Gramineae and Plantaginaceae and Convolvulaceae; current investigations agreement with [108]. In this study the members of *Spermophagus sericeus* were registered on flowers of *Convolvulus arvensis* (Fam.: Convolvulaceae).

Materials Examined (13 specimens): Baghdad province: Bab Al- Muadham, 6, 28.Apr.2015; 3, 18. Jun. 2015; 4, 25. Jun. 2015.

Distribution: widely distributed in Palearctic region [109], Iraq [44].

Family: Malachiidae

Malachius sp.

The result showed that members of genus *Malachius* was flowers visitors on Plantaginaceae and Asteraceae plants, whereas the species *Malachius bimaculatus* registered as pollinators on *Erysimum mediohispanicum* (Cruciferae) [110].

Material Examined (11 specimens): Baghdad province: Bab Al- Muadham, 4, 28.Apr.2015; Al-Mada'in, 2, 18.Apr.2015. Wasit province: Al-Zubaidya, 3, 24.Apr.2015; Aziziyah, 2, 2.May.2015.

Distribution: widely distributed in Palearctic region [111].

Family: Chrysomelidae

Adults of this family live on living plants, usually consuming leaves and flowers [112], in our investigations specimens of this species collected on flowers of Fabaceae, and we expected from their feeding behavior, can have a role in pollinating the flowers.

Clytra valeriana Menetries, 1832

Material Examined (2 specimens): Baghdad province: Al-Mada'in, 2, 18.Apr.2015.

Distribution: Iraq [44]; S Russia, Iran, Turkey, Greece [113]; S European Russia, E Mediterranean [114]; S Ukraine, Rostov Region, Stavropol Region, Caucasus, Transcaucasia, Balkan Peninsula [115]; Greece and Bulgaria, Central Asia, Caucasus [116].

Family: Cetoniidae

Oxythyrea cinctella (Schaum, 1841)

The adults are polyphagous and feed on plant host flowers and sometimes cause economic damage to fruit trees and other plants [117]. This species has been collected on rose, wheat, colza, apple, grapevine, peach, quince, citrus, malus, white-thorn, tung, black poplar, false acacia, alder, egyptian acacia and wild pear [118].

In our investigations specimens of this species collected on flowers of Asteraceae, and we expected from their feeding behavior, can have a role in pollinating the flowers.

Material Examined (2 specimens): Wasit province: Al-Zubaidya, 2, 24.Apr.2015.

Distribution: widely distributed in the Palearctic region. The species is reported from Croatia and Montenegro, Eastern Serbia, Macedonia, Albania, South Romania, Bulgaria, Greece, Cyprus, Georgia, Azerbaijan, Armenia, turkey, Russian Caucasus, China, Kazakhstan, Kyrgyzstan, Afghanistan, Uzbekistan, Turkmenistan, Tajikistan, Syria, Lebanon, Israel, Jordan and Iran, [119]; Egypt [120], Ukraine [121], Iraq [44], Pakistan [122].

Family: Coccinellidae

Despite their prey of choice, most predatory coccinellids include other non-prey items in their diet for example: honeydew, pollen, sap, nectar and various fungi [123, 124]. In current study we collected the adults of *Coccinella undecimpunctata* and *C. septempunctata* on flowers of Gramineae, *Hippodamia variegata* on Convolvulaceae, we expect the beetles move between flowers for the purpose of

feeding will contribute by transferring the pollen and they may completion of the process of pollination.

Coccinella undecimpunctata (Linnaeus, 1758)

Material Examined (2 specimens): Baghdad province: Al-Mada'in, 2, 18.Apr.2015.

Distribution: Palaearctic region ^[125].

C. septempunctata (Linnaeus, 1758)

Material Examined (2 specimens): Baghdad province: Al-Mada'in, 2, 18.Apr.2015.

Distribution: Cosmopolitan ^[126].

Hippodamia variegata (Goeze, 1777)

Material Examined (1 specimen): Baghdad province: Jaddria, 1, 15.Apr.2015.

Distribution: wide distribution range in the Palearctic and extends to Nearctic areas ^[127].

Family: Cantharidae

Cantharidae beetles feeding on flowers belong many family plants, previous studies registered many families can be visitors by these beetles ^[128]. In our investigations the species of *Cantharis melaspis* was collected from Asteraceae flowers, and the present results agree with a previous study.

Cantharis melaspis (Chevrolat, 1854)

Material Examined (2 specimens): Baghdad province: Al-Mada'in, 2, 18.Apr.2015.

Distribution: Armenia, Georgia, Turkey, Iran, Iraq, Lebanon, Turkey ^[129].

(4) Order: Diptera

Flowers of some species of plants are visited by a huge diversity of flies (not all of which may be pollinators); for example, *Saxifraga hirculus* L. (Saxifragaceae) in Switzerland was visited by 57 species of Diptera from 16 families ^[130]. In addition to drinking nectar, some flies also eat pollen ^[131], especially Syrphidae ^[132]; some Bombyliidae ^[133], Muscidae ^[134]. In present investigations bee flies (Bombyliidae) are collected on Asteraceae, while ^[135] found on flowers of Polygonaceae.

Many Rosaceous flowers are visited by Syrphidae; the fruit plants include apple, pear, strawberries cherries, plums, apricot, peach, mango and *Piper*, and visit a number of spices and vegetable plants of the family Apiaceae (Umbelliferae) ^[136], also in our study the syrphid flies were collected mainly on Umbelliferae and less on Convolvulaceae, Fabaceae and Lamiaceae flowers.

Family: Syrphidae

Eristalis tenax (Linnaeus, 1758)

Material Examined (4 specimens): Wasit province; Al-Zubaidya, 3, 24, Apr.2015. Baghdad province, Bab Al Muadham, 1, 28.Apr.2015.

Distribution: Cosmopolitan ^[137]; in Iraq ^[69] listed this species in the fauna of Iraq.

Eristalis aeneus (scopoli, 1763)

Material Examined (6 specimens): Baghdad province: Bab Al- Muadham, 3, 6.May.2015, 3, 11.May.2015. Wasit province; Al-Zubaidya, Sherhan village, 3, 16.Oct.2015.

Distribution: Europe and former USSR, Asia, North Africa: Morocco, Algeria, Tunisia, Afrotropical, Oriental Regions, Australia and Hawaii ^[138]; Iraq ^[44].

Eristalis sepulchralis (Linnaeus, 1758)

Material Examined (3 specimens): Wasit province; Al-Zubaidya - Sherhan village, 3, 16.Oct.2015.

Distribution: Fennoscandia south to Iberia and the Mediterranean, including North Africa; from Ireland through most of Europe into Turkey and European parts of Russia; through Siberia to the Pacific coast; Japan; China; India ^[139].

Syritta pipiens (Linnaeus, 1758)

Material Examined (16 specimens): Baghdad province: Bab Al-Muadham, 1, 28.Apr.2015, 4, 6.May.2015, 8, 11.May.2015, 1, 29.Jun.2015; Al-Shurta Al Khamsa, 2, 4.Sep.2015.

Distribution: This hoverfly is present in all regions of the world except Australia ^[16].

Melanostoma scalare (Fabricius, 1794)

Material Examined (7 specimens): Baghdad province: Al-Mada'in, 6, 18.April.2015; Bab Al- Muadham, 1, 11.May.2015.

Distribution: From Iceland and Fennoscandia south to Iberia, the Mediterranean and North Africa; from Ireland eastwards through most of Europe into European parts of Russia; in Siberia from the Urals to the Pacific coast; in eastern parts of the Afrotropical region south to Zimbabwe; throughout the Oriental region to New Guinea ^[139].

Sphaerophoria rueppellii (Wiedemann, 1830)

Material Examined (4specimens): Baghdad province: Al-Mada'in, 4, 18.April.2015.

Distribution: present in all the Palaearctic Region and very common in the Mediterranean region ^[140].

Sphaerophoria scripta (Linnaeus, 1758)

Material Examined (1specimen): Baghdad province: Al-Mada'in, 1, 18.April.2015.

Distribution: Mediterranean region, Canary Islands, North Africa, Asia ^[139].

Eupeodes corollae (Fabricius, 1794)

Material Examined (3specimens): Baghdad province: Al-Mada'in, 1, 18.April.2015. Wasit province; Al-Zubaidya – Sherhan village, 3, 16.Oct.2015.

Distribution: According to [141] the distribution of this species from Iceland, Fennoscandia and the Faroes south to Iberia, the Mediterranean, Madeira, the Canary Isles and N Africa; coastal States of Africa down to and including South Africa; Mauritius; from Ireland eastwards through most of Europe into European parts of Russia; through Siberia from the Urals to the Pacific coast; Japan; China; Formosa, Iran. Iraq [44].

Paragus bicolor (Fabricius, 1794)

Material Examined (1 specimen): Baghdad province: Bab Al-Muadham, 1, 11.May.2015.

Distribution: From Belgium (extinct) south to the Mediterranean and North Africa; from France eastwards through central and southern Europe to Mongolia; Iran and Afghanistan; North America [139].

Myathropa florea (Linnaeus, 1758)

Identification:

One female visits flowers of *Cardaria* sp. (Fam. Brassicaceae) was collected;

Length: 13 mm, color: latera face yellow, median parts of frons and vertex shining black, antennae black; Scutum yellow with distinct black pattern; scutellum yellowish – gray; abdomen yellow with black banded; legs bright brown with exception: fore and mid coxae and trochanters black, and dorsal surface of tarsomeres 2-4 in all legs with black color. Body with brownish yellow, densely and moderately length hairs with exception on scutellum become black and, short and little. The important characters to diagnostic the species are (figure 1): special pattern color on scutum, hind femur simple; abdominal tergites with yellow markings; cell r1 open; vein R4+5 sinuous; arista bare; face with concave on upper and lower parts.

Material Examined (1specimen): Wasit province; Al-Zubaidya, Sherhan village, 1, 22.Oct.2015.

Distribution: From Fennoscandia south to Iberia and the Mediterranean, the Canary Isles and North Africa; from Ireland eastwards through Eurasia to the Pacific coast, Iran [141]. Newly record in Iraq.

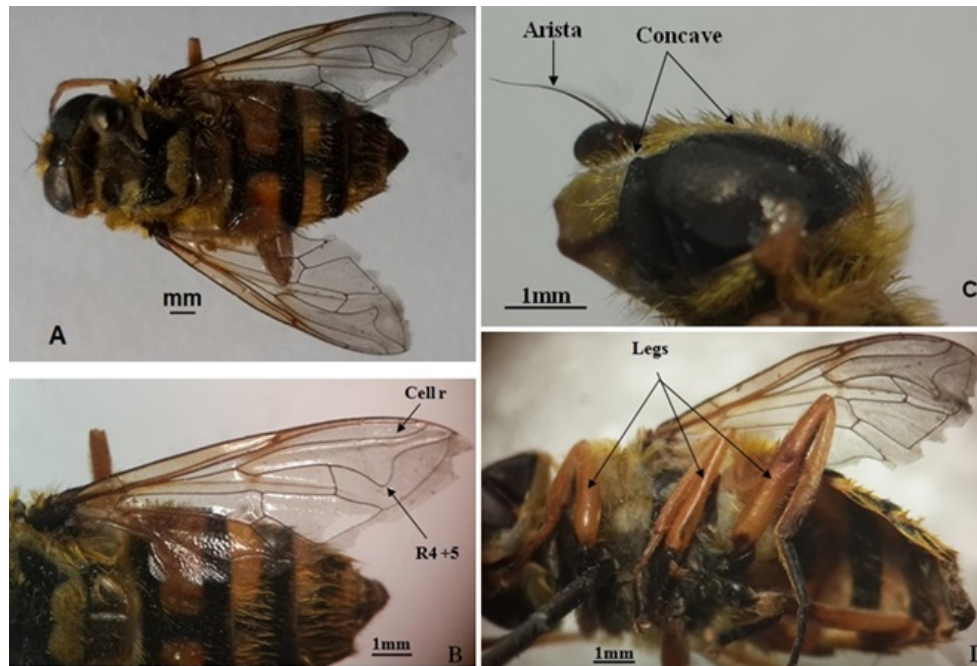


Figure 1: *Myathropa florea* A. habit, dorsal view B. head, lateral view C. wing D. ventral view of habit showing legs

Family: Bombyliidae
Spogostylum sp.

Material Examined (2specimens): Baghdad province; Bab-Al Muadham, 1, 18.Jun.2015. Wasit province; Al-Zubaidya, 1, 22.Oct.2015.

Distribution: Old world [142].

Family: Calliphoridae

Chrysomya albiceps (Wiedemann, 1819)

Materials Examined (15 specimens): Baghdad province: Al-Mada'in, 2, 18.April.2015; Bab Al- Muadham, 4,

11.May.2015. Wasit province: Al Shahabi. 2, 11.Jun.2015; Al-Zubaidya, 7, 16.Oct.2015.

Distribution: Widely distributed in the Southern Palearctic, Northern Oriental and Afrotropical regions and Central and South America [143-146].

Chrysomya megacephala (Fabricius, 1794)

Materials Examined (3specimens): Baghdad province: Al-Mada'in, 3, 24.April.2015.

Distribution: Australia, Africa, Palearctic Region, South and North America [10, 147, 148].

Family: Muscidae

Musca domestica Linnaeus, 1758

Materials Examined (9 specimens): Baghdad province: Al-Mada'in, 2, 18.April.2015; Bab Al- Muadham, 4, 17.May.2015. Wasit province: Aziziya, 3, 2.May.2015.

Distribution: Europe, America, Asia: Lebanon, Syria, Iraq, Palestine, Turkey, Iran, Afghanistan, Mongolia, Korea, China, Japan, North Africa: Morocco, Algeria, Tunisia, Libya, Egypt, Azores, Madeira, Canary Islands [15, 149].

Atherigona soccata Rondani, 1871

Materials Examined (2 specimens): Baghdad province: Bab Al- Muadham, 2, 17.May.2015.

Distribution: Europe, Asia: Iraq, Palestine, Turkey, Afghanistan, China, North Africa: Morocco, Libya, Egypt, Oriental and Afro tropical Regions [149].

Family: Sarcophagidae

Ravinia pernix (Harris, 1780)

Materials Examined (4 specimens): Baghdad province: Bab Al- Muadham, 2, 17.May.2015, 2, 23.Jun.2015.

Distribution: Austria, Belarus Belgium, Britain, Bulgaria, Canary Is., Corsica, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, Netherlands, Turkey, Ukraine [150].

Order: Hemiptera

This family is rarely pollinators, and then typically only incidentally; Most of mirids are plant feeders, some species are almost exclusively predacious [151]; but The bugs' status-injurious or beneficial on a crop can depend on locality, season, host cultivar and stage of growth, availability of prey or alternative food sources such as nectar and pollen [152]. In our investigation we were collected the specimens of *Deraeocoris* sp. on Asteraceae flowers, although this species is herbivorous species but can it play in pollination flowers.

Family: Lygaeidae

Although the species of Lygaeidae are visitors on flower of Asclepiadeae, but its bad pollinators, and carry less pollen, that may be mismatched morphological such as having a few hairs on the legs [153] and on Asteraceae, Fabaceae and Chenopodiaceae [154]. In present results, the adults of *Nysius ericae* were collected on flowers of Apiaceae and Asteraceae.

Nysius ericae (Schilling, 1829)

Materials Examined (32 specimens): Wasit province; Al-Zubaidya, 13, 24.Apr.2015, 3, 17.May.2016. Baghdad province: Bab Al- Muadham, 11, 17.May.2015, 5, 23.Jun.2015.

Distribution: Holopalaeartic, extending to tropical Africa [154].

4. Conclusion

From the results, we can conclude that the species which were registered as pollinators and visitors have lower diversity and density;

the reason may be due to several factors, including: the shortness of the period of collection, the collection limited to certain areas, the wide use of chemical control.

We recommend through the results to expand in this area and conduct surveys to other regions of Iraq and an emphasis on taxonomic studies for wild because of economic and agricultural importance.

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