

## LIST OF INSECTS ASSOCIATED WITH MACROFUNGI IN TIKRIT CITY, SALAHADIN GOVERNORATE, IRAQ

Ahmed Hamed Mahde Shugran\* Razzaq Shalan Augul\*\*  
and  
Talib Owaid Al-Khesraji\*

\*Department of Biology, College of Education for Pure Sciences, Tikrit  
University, Salahadin, Iraq

\*\*Department of Entomology and Invertebrate, Iraq Natural History  
Research Center and Museum, University of Baghdad, Baghdad, Iraq

\*\*Corresponding author: [razzaqshalan@gmail.com](mailto:razzaqshalan@gmail.com)

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### ABSTRACT

In this survey, there are 14 species belonging to 14 genera, nine families and two orders, collected on Macrofungi from Tikrit city, Salahadin Governorate, North Central of Iraq. The members of Coleoptera were more abundant than flies on Macrofungi.

The family of Ciidae and Leiodidae (Order, Coleoptera), Mycetophilidae (Order, Diptera), and 6 species are recorded for the first time for insect fauna of Iraq.

Key words: Coleoptera, Iraq, Macrofungi, Saladin governorate, Survey.

### INTRODUCTION

Insects, mainly dipteran and coleopteran species, are the most frequently utilized resources from fungi compared with other animals (Komonen, 2003; Amat-García *et al.*, 2004).

Fungi being rich in proteins and carbohydrates (Gooday, 1995), as well they have a large amounts of biologically important elements, such as phosphorous and nitrogen (Watkinson *et al.*, 2006), which may speed up the growth of the larvae of beetles (Martin, 1979). On the other hand, basidiomes may as well contain high concentrations of toxins, for example: phenols, pyrones, and heterocyclic nitrogen complexes; therefore, there is great selective pressure for coleopteran members to develop mechanisms to avoid intoxication against these substances, while using them as sources of food or habitat (Martin, 1979).

The two most important mycophagous insect orders: Diptera (Hackmann and Meinander, 1979) and Coleoptera (Hammond and Lawrence, 1989); the larvae of first order are dominant on the mushroom, especially the Sciaridae. Although they are wide food spectra, and cause damage to mushroom production in the world (Shin *et al.*, 2012).

Donisthorpe (1935) was the first author to list the proper names of the fungi with which beetles associate. Adult and larval stages can be fungivorous or mycophagous; in the

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superfamily Staphylinoidea, the following families include mycophagous species: Ptiliidae, Leiodidae, Staphylinidae and possibly Agyrtidae; probably many thousands of coleopteran species are exclusively mycophagous; much remains to be revealed, particularly in the tropical species, including the precise food source of at lesser facultative fungus-feeders, and dead-wood-associated beetles (Hammond and Lawrence, 1989).

Generally, the earlier studies on this matter have determined three categories of fungus-associated insects as follow: (1) obligatorily dependent species (2) regular but not obligate users of the fungal resource, including predators of mycophagous dipteran larvae (3) accidental species (Scheerpeltz and Höfler, 1948; Benick, 1952; Graves, 1960; Klimaszewski and Peck, 1987).

In Iraq, the insect fauna on fungi are unknown; therefore this study is proposed to identify the insects associated with Macrofungi.

### MATERIALS AND METHODS

The adult insects were collected by different tools: aerial net (flies), aspirator (small beetles) and forceps (big and small size beetles) from Tikrit city, Salahadin governorate, north of central Iraq, during the period from November 2016 to March 2017.

The big size specimens are mounted with insect pins, whereas the small and fine insects are preserved in 75% alcohol; complete information, including the localities and dates of corm the families, genera and species, we used many different keys; for the diagnosis of the beetles: Joy (1932), Crowson (1956), Klimaszewski and Watt (1997), El-Torkey *et al.* (2007), Telfer (2012), Hackston (2013; 2015; 2016a, b; 2017a, b, c); while in flies we utilized Tuomikoski (1966), (1970) and Hackston (2016c).

Also the identification of the current specimens was assured by comparison with collection of the Iraq Natural History Research Center and Museum, University of Baghdad.

The new recorded species are deposited in the collection of Entomology and Invertebrates Department, Iraq Natural History Research Center and Museum.

### RESULTS AND DISCUSSION

During the current investigation, there are 14 species belonging to 14 genera, nine families and two orders were identified; the beetles were the most abundant, especially the family of Staphylinidae compared with flies associated with Macrofungi.

The list of species, distribution and with a short description of new records given below:

#### (A) Order, Coleoptera

##### (1) Family, Ciidae

The members of Ciidae are characterized by: head bent to downward or not clearly if it seen from above, with an obviously fronto-clypeal ridge, this is in male sometimes forming a tubercles or horns. Antennae is with 8-10 segments, with usually the last three segmented composing a club; pronotum somewhat hooded head from above; outer edge of tibiae often with spines. Previously, this family was not recorded in Iraq.

*Cis multidentatus* (Pic, 1917)

**Materials Examined** (3♂♂ specimens): Al-Difsha from Al-Alam district, 11.XII.2016.

**Distribution:** Germany, Italy and Malta (Lohse and Reibnitz, 1991; Lopes-Andrade, 2008); Iran (Amini *et al.*, 2014); it is newly recoded in Iraq.

**Diagnosis:** The male (Pl. 1) is with slightly dark brown color (*Cis chinensis* Lawrence, 1991 with obviously blackish brown color also the antennae and legs are light brown); anterior margin of front is composed of four strongly and elevated teeth; antennae with 10 segments, anterior margin of pronotum with two distinct horns; body length 2.1 mm.

**(2)Family, Cryptophagidae**

*Cryptophagus affinis* Sturm, 1845

**Materials Examined** (2♀♀ specimens): Al-Ifri Farm, Al-Alam district, 1 specimen at 11.XII.2016; 1 specimen, 11.I.2017.

**Distribution:** Australia, Europe, North Africa (Cotton and Good, 1937); Iraq (Derwesh, 1965).

**(3)Family, Erotylidae**

*Triplax scutellaris* Charpentier, 1825

**Materials Examined** (2♀♀ specimens): Al-Defsha Farm, Al-Alam district, 11.XII.2016.

**Distribution:** Europe and Middle Asia (Franc, 2001); newly record in Iraq.

**Diagnosis:** Length 4.5 mm; antennae black, with segments 1-4 paler; pronotum wholly reddish, with hind margin without a ridge; elytra with uniform black color and clearly narrowing towards the apex; abdomen red color under the elytra; ventral surface of body with reddish color (Pl.2).

**(4)Family, Leiodidae**

According to Newton (2016), this family is a worldwide distribution, moderately large and diverse group of some 4,135 species belonging to 374 genera organized into 6 subfamilies and 18 tribes; the species of these beetles are commonly called "round fungus beetles" because they have globular shape of many species, although some members are with more elongated shaped; generally, these beetles are small or very small beetles having body less than 10 mm in length; antennae clubbed shaped in most species. Adults and larvae of these beetles generally feed on fungi in rotting plant or animal material.

*Ptomaphagus* Hellwig, 1795

**Materials Examined** (2♂♂ specimens): Al-Difsha Farm, Al-Alam district, 11.XII.2016.

**Distribution:** Holarctic region, North Oriental and North Neotropical (Wang *et al.*, 2016); this genus is registered for the first time in Iraq, however, the specimen identified as *Tachinus* sp., because we need more additional specimens to recognize the species.

**Diagnosis:** Genus of *Ptomaphagus* Hellwig, 1795 is determined by: eight segment of antenna smaller than seven and nine segments; head directly behind the compound eyes sharply angled, broader than the anterior margin of pronotum; pronotum and elytra with a micro-sculpture that consist of distinct networks. Fore tarsi dilated in male, mid coxae divided by a process of the Mesosternum (Pl. 3).

**(5)Family, Nitidulidae**

*Carpophilus obsoletus* Erichson, 1843

**Materials Examined** (2♀♀ specimens): Al-Defsha Farm, Al-Alam district, 21.XII.2016.

**Distribution:** Africa: Algeria, Egypt, Morocco, and Tunisia. Europe: Croatia, Cyprus, Greece, Italy, Malta, Portugal, Spain, Turkey. Asia: Taiwan (Cotton and Good, 1937); Iran (Modarres Awal, 1997); China, India, Iraq, Israel, Japan, Lebanon, Saudi Arabia, Syria, UAE and Yemen (Lasoń and Ghahar, 2013).

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*Urophorus humeralis* (Fabricius, 1798)

**Materials Examined** (1♂, 2♀♀ specimens): Al-Defsha Farm, Al-Alam district, 11.XII.2016.

**Distribution:** Tropical and Africa, Tropical Asia, Europe, USA (Cotton and Good, 1937); Iran (Williams *et al.*, 1983); according to Mifsud and Audisio (2008) this species is sub-cosmopolitan, and cosmopolitan distribution (Lason and Ghahari, 2013).

**(4) Family, Staphylinidae**

*Creophilus maxillosus* (Linnaeus, 1758)

**Materials Examined:** 1 ♀ specimen collected from Al-Ifri Farm, Al-Alam district at 11.I.2017.

**Distribution:** North America, West Indies and Palaearctic region (Newton *et al.*, 2000); Chile and Argentina (Navarrete-Heredia *et al.*, 2002); Peru (Asenjo and Clarke, 2007); in Iraq, this species is registered by Augul *et al.* (2015).

*Gabrius splendidulus* (Gravenhorst, 1802)

**Materials** (4♀♀ specimens): 3 specimens, Al-Ifri Farm, Al-Alam district, 11.XII.2016; 1 specimen, Al-Ifri Farm, Al – Alam district at 11.I.2017.

**Distribution:** Europe, Russia, Caucasus, Canada, USA (Herman, 2001a). In Iraq this species was registered by Hadi (2015).

*Phloeopora corticalis* (Gravenhorst, 1802)

**Materials Examined** (3♂♂ specimens): 2 specimens, Al-Difsha farm, Al-Alam district, 19. XI.2016; 1 specimen at 11.XII.2016.

**Distribution:** West Palaearctic region (Assing and Schülke, 2006). Europe: Turkey, Cyprus, Canary Islands and Madeira; Africa: Algeria and Morocco (Bordon, 2010); this species is registered for the first time in Iraq.

**Diagnosis:** Head is constricted at posterior margin forming a neck, somewhat narrower compared with anterior part of pronotum; body is with parallel sides; body surface from above with fine and densely punctures, according to Webster *et al.* (2012) this species with less pubescences especially on pronotum and more glossy than related species, body length 3.1 mm (Pl. 4).

*Lordithon trinotatus* (Erichson, 1839)

**Materials Examined** (3♂♂ specimens): 1 specimen, Al-Difsha farm, Al-Alam district, 11. XI.2016; 2 specimens, 11.XII.2016.

**Distribution:** Transpalaearctic (Bacal and Derunkov, 2010); newly recorded in Iraq.

**Diagnosis:** Body length is 4.2 mm; reddish- brown color, head blackish brown, first antennal segment with somewhat curved and narrower; elytra with darker wide spots and usually dilated towards apex; hind of body is strongly tapering, six sternite of male with a slightly longitudinal keel at middle (Pl. 5).

*Tachinus* Gravenhorst, 1802

**Materials Examined** (1♀ specimen): Al-Difsha farm, Al-Alam district, 11. XI.2016.

**Distribution:** Holarctic, Oriental region and less distribution in Neotropics (Herman, 2001b).

**Notes:** The specimen identified as *Tachinus* sp., because we need more additional specimens to recognize the species.

**(5) Family, Tenebrionidae**

*Tribolium castaneum* (Herbst, 1797)

**Materials Examined** (2 specimens): Al-Difsha farm, Al-Alam district, 11. XI.2016.

**Distribution:** Iraq (Derwesh, 1965); Cosmopolitan (Cotton and Good, 1937).

**(B) Order, Diptera**

**(1) Family, Mycetophilidae**

Mycetophilids are species of small fungus-gnats, generally with a combination of yellow, brown and black colors in adults (Hutson *et al.*, 1980). Adults are found in shady, damp woods, tunnels and root part of trees, and are especially common in cavities under tree roots; larvae usually feed on the mycelium and sporophores penetrating hyphae; but there are many species diverging biology, being associated with decaying organic matter (Hutson *et al.*, 1980; Ševčík, 2010).

Adults of this family are determined by having wings that consist of 9 longitudinal veins / branches attainment the wing margin. Delicate, humped-back flies; with long, threadlike antennae and all apex of tibia with a pair spurs (Hutson *et al.*, 1980).

*Anatella* Winnertz, 1863

**Materials Examined** (3♂♂, 5♀♀ specimens): 1 specimen, Al-Difsha farm, Al-Alam district, 11.XI.2016; 7 specimens: Al-Ifri Farm, Al-Alam district, 4 specimens, 11.XII.2016 and 3 specimens, 19.XII.2016.

**Distribution:** Holarctic region (Zaitzev, 1989).

**Diagnosis:** The species of this genus are small, 1.5-3 mm in length; color bright brown; antennae relatively long also with elongated legs compared with the body. Mesepimeron is without any black dot, strong bristles absent on Mesanepisternum; costa clearly produced beyond the tip of  $r_5$  (Pl. 6). In our investigation, the specimen is identified as *Anatella* sp., because we need more information about identification key to species about this genus to recognize the species.

**(2) Family, Phoridae**

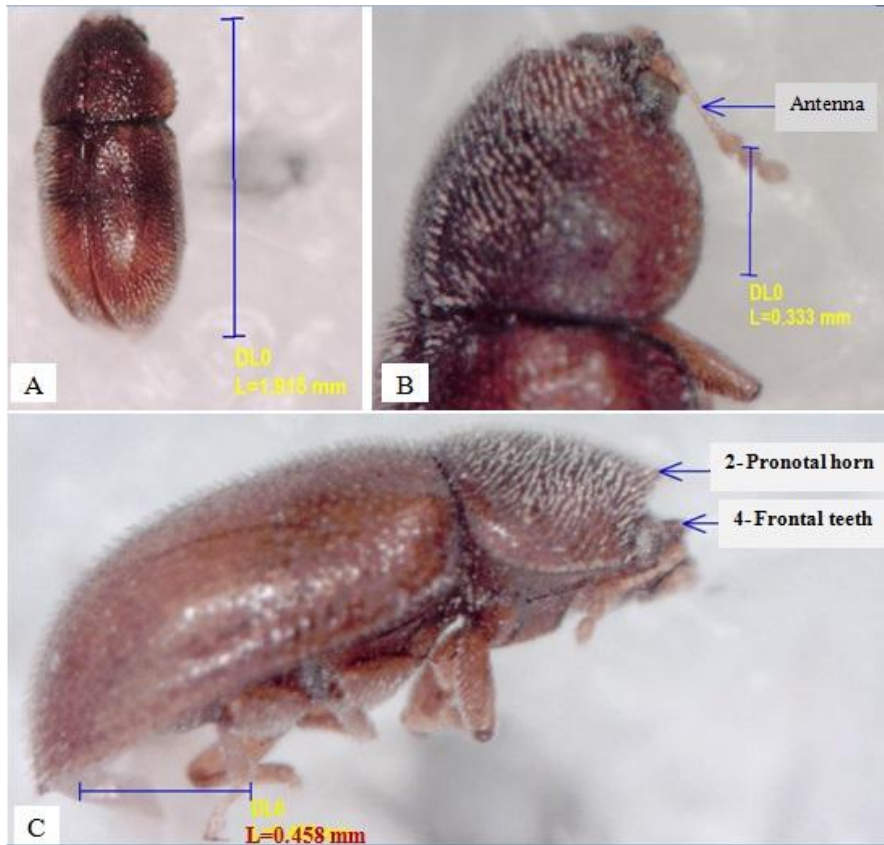
*Megaselia* Rondani, 1856

**Materials Examined** (12♂♂, 20♀♀ specimens): all specimens are collected from Al-Kharifi farm, Al-Alam district, 12.III.2017.

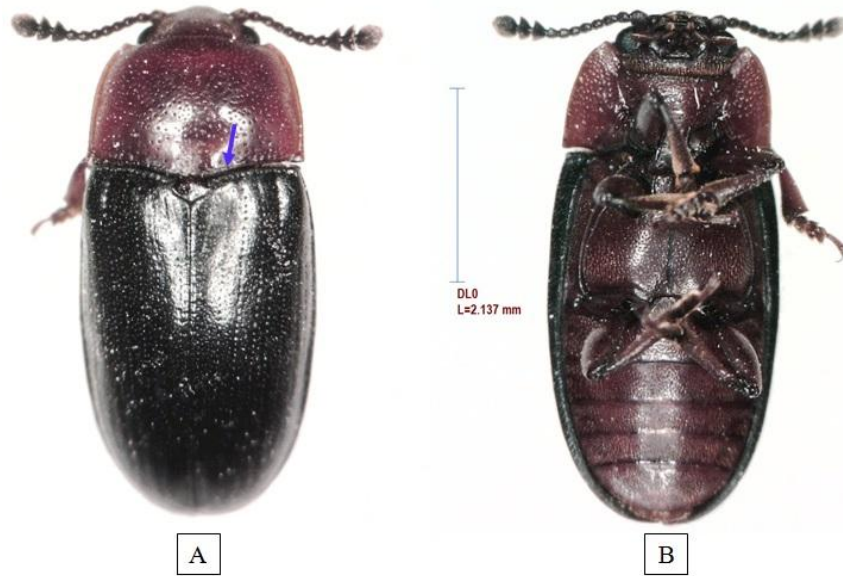
**Distribution:** Cosmopolitan (Zumpt, 1965).

In the present study, the specimens are identified as *Megaselia* sp., because we need more information about identification key to species about this genus to recognize the species.

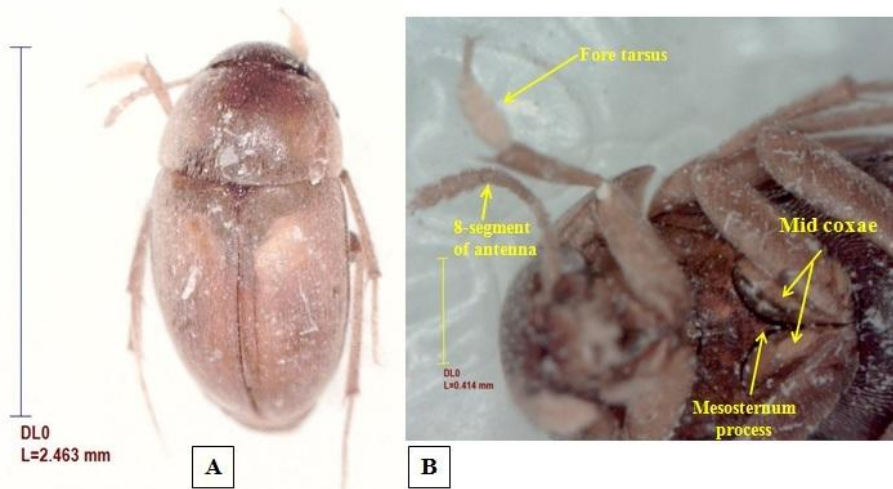
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**Plate (1):** Male of *Cis multidentatus*; (A) Dorsal view, (B) Lateral of anterior parts that shown antenna, (C) Lateral side of whole body showing processes.



**Plate (2):** Female of *Triplax scutellaris*; (A) Dorsal view (showing posterior margin of pronotum), (B) Ventral view.



**Plate (3):** Male of *Ptomaphagus* sp.; (A) Dorsal view, (B) Ventral view (showing that: antenna, fore tarsus and mid coxae).

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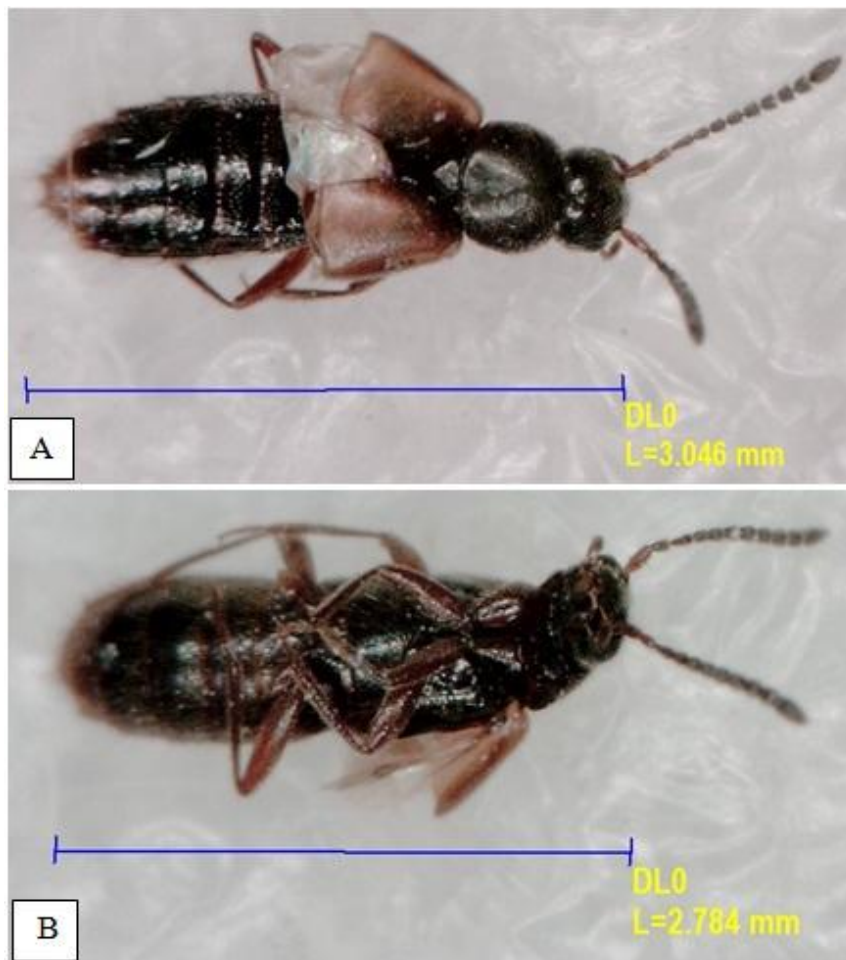
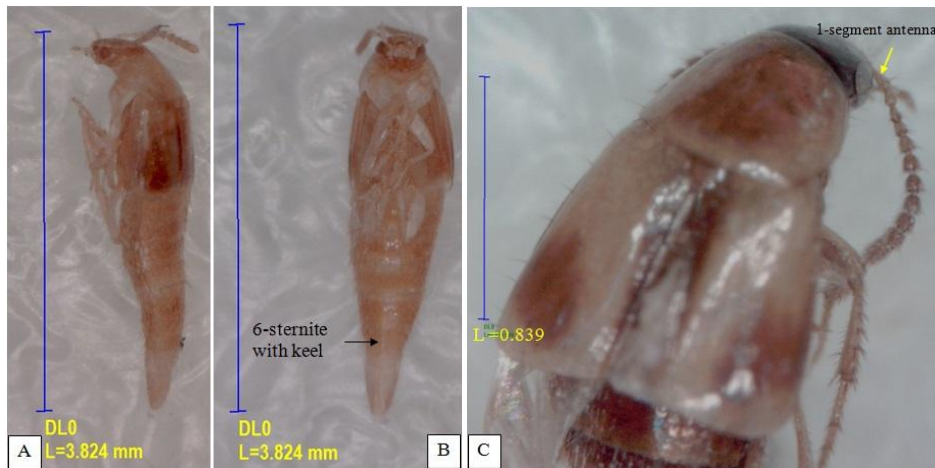
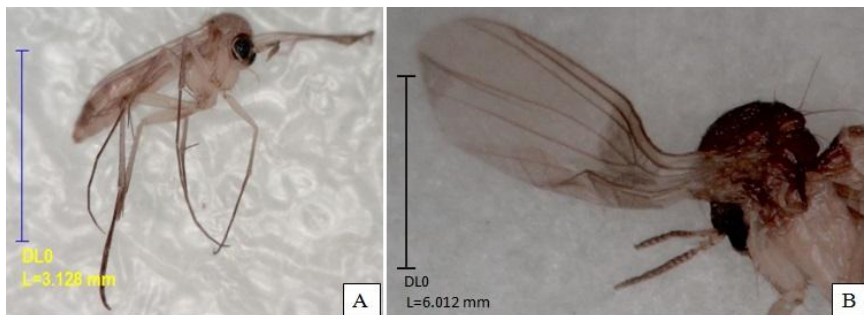


Plate (4): Male of *Phloeopora corticalis*; (A) Dorsal view, (B) Ventral view.





**Plate (5):** Male of *Lordithon trinotatus*; (A) Lateral view, (B) Ventral view, (C) Dorsal view of the body at anterior parts.



**Plate (6):** Female of *Anatella* sp.; (A) Lateral view of habit, (B) Lateral view of the body at anterior parts with fore wing.

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قائمة بالحشرات المرافقة للفطريات الكبيرة في مدينة تكريت، محافظة صلاح الدين، العراق

احمد حامد مهدي\*، رزاق شعلان عكل\*\* و طالب عويد الخزرجي\*  
\*قسم علوم الحياة، كلية التربية للعلوم الصرفة، جامعة تكريت  
\*\*قسم الحشرات و اللافقرات، مركز بحوث و متحف التاريخ الطبيعي  
العراقي، جامعة بغداد

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الخلاصة

اظهرت الدراسة ١٤ نوعا تنتمي إلى ١٤ جنساً، تسعة عوائل و رتيبتين من الحشرات، جمعت على الفطريات الكبيرة من مدينة تكريت، محافظة صلاح الدين، العراق؛ وجدت التحريات ان التنوع بالخنافس كان بوفرة عالية مقارنة بأنواع الذباب.

سجلت العوائل Ciidae و Leiodidae (رتبة غمدية الاجنحة)،  
Mycetophilidae (رتبة ثنائية الاجنحة)، وستة أنواع من مجموع الانواع الكلي لأول مرة للمجموعة الحشرية العراقية.