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Research Article

Braconidae diversity (Hymenoptera: Ichneumonoidea) in alfalfa, *Medicago sativa* L., fields of some Western Desert Oases in Egypt

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Abstract: A total of 29 species in 16 genera and 8 subfamilies of the braconids (Hym., Braconidae) were collected from alfalfa fields in Bahariya and Farafra oases (Western Desert, Egypt) These species were identified, together with details of the sites where they were found and an indication of their relative abundance in each site. Among the samples, 4 species in 4 genera and 3 subfamilies are recorded as new to the Egyptian fauna. These are: *Aphidius asteris* Haliday, 1834, *Ephedrus plagiator* (Nees, 1811) (Aphidiinae), *Homolobus* (*Chartolobus*) *infumator* (Lyle, 1914) (Homolobinae) and *Opius lugens* Haliday, 1837 (Opiinae). Thirteen braconid species are also newly recorded in association with alfalfa fields, namely *A. asteris*; *Praon necans* Mackaeur, 1959 (Aphidiinae); *Habrobracon hebetor* (Say, 1836) (Braconinae); *Chelonus basalis* Curtis, 1837; *Ch. blackburni* Cameron, 1886; *Ch. oculator* (Fabricius, 1775); *Phanerotoma leucobasis* Kriechbaumeri, 1894 (Cheloninae); *Dinocampus coccinellae* (Schrank, 1802) (Euphorinae); *H.* (*C.*) *infumator* (Lyle, 1914) (Homolobinae); *Apanteles appellator* Telenga, 1949; *Cotesia glomerata* (Linnaeus, 1758) (Microgastrinae); *Psyttalia concolor* (Szépligeti, 1910) and *P. nilotica* (Schmiedeknechti, 1900) (Opiinae).

Keywords: Braconidae, alfalfa, Bahariya Oasis, Farafra Oasis, new records, Egypt

Introduction

The Western Desert or "Libyan Desert" covers an area of 680,000 km^2 (Sampsell, 2003), thereby accounting around two-thirds of Egypt's whole land area. It extends from the Nile Valley in the east to the Libyan borders in the west, and from the Mediterranean in the north to Egypt's southern borders. There are seven important depressions in the Western Desert; all are considered oases except the largest one, Qattara, the water of which is salty.

The Western Desert is divided into: a) The northern section which includes the coastal plane, the northern plateau and the Great Depletion, Natroun Valley, Bahariya Oasis and Siwa Oasis in the extreme west, and b) The southern section which includes four oases: Farafra, Dakhla, Kharga and Baris, in addition to Owainat in the extreme south-west. Their original vegetation would have been essentially Saharo-Sindian (Taglianti *et al*., 1999) with somewhat more diversity than the present deserts.

Alfalfa, *Medicago sativa* L., often called "Queen of the Forages", is one of the most important legumes used in agriculture. It is widely grown throughout the world as feed for all classes of livestock, and is most often harvested as hay, but can also be made into silage, grazed, or used as food. It has the highest feeding value of all common hay crops, being less frequently used as pasture. It is well known for its ability to improve soil structure, and as a legume, as an effective source of biological Nitrogen (Summers 1998; Parker and Parker, 2003).

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It has a long stand life, approaching five years or sometimes longer in some areas of the world, that afford ample time for the establishment and development of a diverse community structure by an abundance of organisms (Summers 1998). While most of alfalfa's inhabitants have little or no impact on it as a crop, a few are capable of causing extensive damage. These pests are attacked by many natural enemies including predators and parasites (Tawfik *et al*. 1976).

Within parasitic Hymenoptera, the family Braconidae is the second largest group. It is one of the most species-rich families of insects, with 29 subfamilies and about 40,000 species in the world, approaching the global number of species of vertebrates (van Achterberg, 1988; Fernandez and Sharkey, 2006).

Members of this family are cosmopolitan, in several different habitats (Wahl and Sharkey, 1993). The majority of the species are primary parasitoids of holometabolous larvae (especially those of Lepidoptera, Diptera and Coleoptera), but also including some of the hemimetabolous insects (particularly some of the suborder Heteroptera) (Wahl & Sharkey, 1993; Ghahari *et al.,* 2006). So, they are considered essential for the maintenance of the communities that include them (Scatolini and Penteado-Dias, 2003), owing to their potential role in controlling insect pests (Wharton, 1993; Wharton *et al.,* 1997; Elpino-Campos *et al*., 2007). Additionally they can indicate presence or absence of the host population (Matthews, 1974; LaSalle and Gauld, 1992).

Despite the importance of these efficient parasitoids in almost all agro-ecosystems, their diversity has not been well studied in alfalfa fields of the world so far, except for very few studies, for example in Iran (Rakhshani *et al.* 2006; Ghahari *et al*., 2009). Additionally, the change in nature of the oases with the advent of cultivation and irrigation has resulted in the replacement of their natural habitats with crops and their associated flora. Therefore the aim of the present study is to determine the braconid fauna of alfalfa fields in Bahariya and Farafra Oases, where no studies were done previously, and to provide additional data and/or records on their distribution as the Egyptian fauna.

Materials and Methods

Study Area: Field studies were conducted in 10 sites of both Bahariya and Farafra Oases Western Desert (see Table 1; Fig. 1; 2):

a. Bahariya Oasis: An oval-shaped depression in the western desert, 360 km southwest of Cairo and 180km west of the Nile Valley [27° 48′ 00″ and 28° 35′ 00″ N, 28° 35′ 00″ and 29° 10′ 00″ E]. Agriculture is concentrated in the northern part of the depression where the main villages and former springs are.

b. Farafra Oasis: A triangle -shaped depression in the Western Desert, about 550 km southwest of Cairo, 200km southwest of Bahariya Oasis [26° 18′00″ and 27° 20′ 00″ N, 27° 20′ 00″ and 28° 59′ 00″ E].

The total area of cultivated alfalfa in the New Valley is more than 21,000 ha, of which 5040 ha are cultivated in Farafra Oasis (unpublished data).

Collection and Identification: Braconid specimens were monthly collected in alfalfa fields from 10 sites in both Bahariya and Farafra Oases (Western Desert). Collection was done using sweep netting during the period from October 2012 to September 2013. During each trip, 25 double beats were carried out. The collected specimens were kept in absolute alcohol.

Identification to subfamilies were made using van Achterberg (1993) and Sharkey (1993); identification to genus and species were possible using the following sources: Sharkey (2004) for Agathidinae; Starý (1976), Mescheloff and Rosen (1988, 1989, 1990a, b) for Aphidiinae; Quicke (1987), Papp (2008) for Baconinae; van Achterberg (1990), Edmardash *et al*. (2011) for Cheloninae; Aguirre *et al*. (2011), Steinberg and Fredrik (2011) for Meteorini (Euphorinae); van Achterberg (1979) for Homolobinae; Papp (1978, 1986) for Microgastrinae, Fischer (1972) and Ribes Escolá (2010) for Opiinae.

Voucher specimens of the new Egyptian records are kept in the Efflatoun Bey collection, Entomology Department, Faculty of Science, Egypt (CUE).

Table 1 Position of the studied alfalfa fields.

Location	Site name	Latitude (N)	Longitude (E)	Description
Bahariya Oasis	EL-Heiz- Ein eleza	28° 01′ 574	28° 38′ 338	Healthy plants 3 years old, attached by palm tree
	AL-Quser- Beir abo eagela	28° 20′ 881	28° 47′ 227	Healthy plants 2 years old, attached by palm tree
	Kasaa 3	28° 25′ 891	28° 57′ 202	Healthy plants 3 years old, attached by palm tree
	Mandisha- Ghaba	28° 21′ 909	28° 55′ 063	Healthy plants 3 years old, attached by palm tree
	Agoz- Gheit beaid	28° 20′ 793	28° 54′ 850	Healthy plants 1 years old,
	Al-Gafara	28° 18′ 073	28° 56′ 212	Healthy plants 3 years old, attached by palm tree
Farafra Oasis	Gelgam	27° 05′ 444	27° 58′ 830	Un Healthy plants 3 years old, attached by different fruit trees.
	Beir 5	27° 03′ 814	27° 55′ 470	Healthy plants 4 years old, attached by annual plants
	Grad	27° 03′ 160	27° 58′ 078	Healthy plants 3 years old, attached by palm tree
	Shimenara	27° 01′ 378	27° 56′ 642	Un Healthy plants 4 years old, attached by different fruit trees.

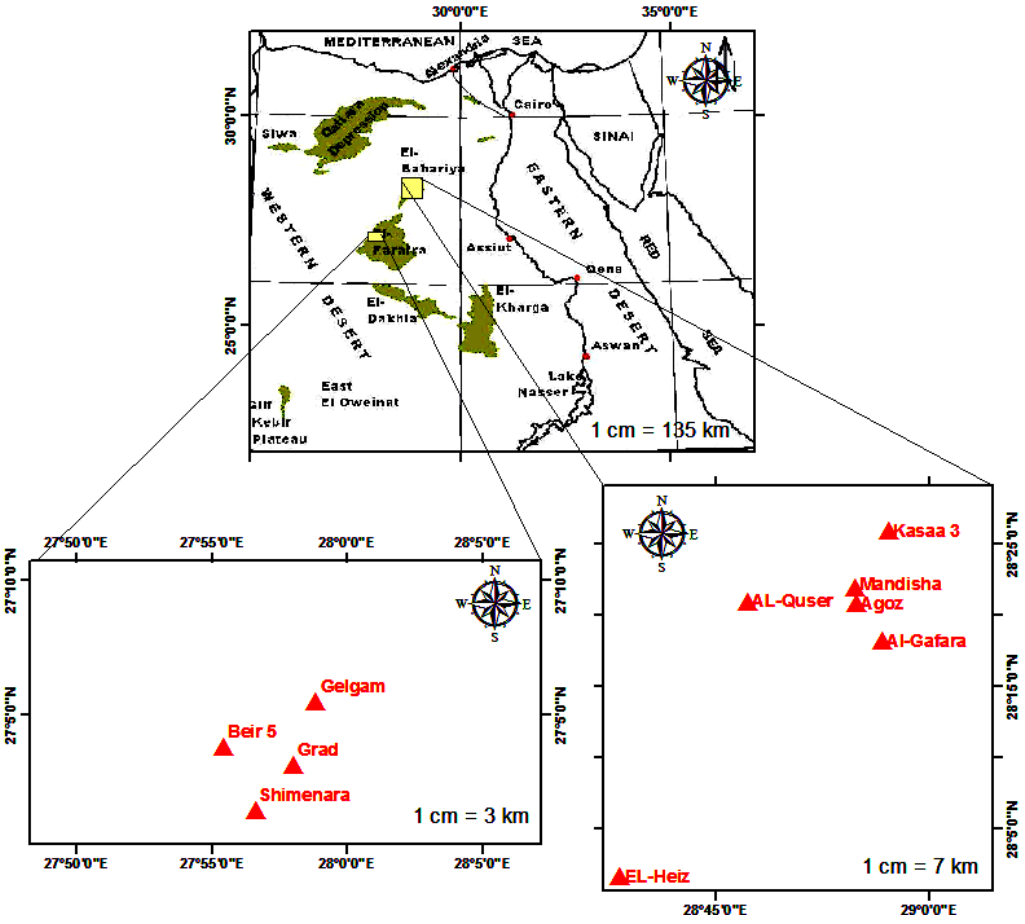

Figure 1 Map of Egypt showing the studied sites in Bahariya and Farafra Oases.

Figure 2 One of the collecting sites of alfalfa field (Beir 5, Farafra Oasis).

Results

In total, 583 braconid specimens were collected during 12 regular surveys (from October 2012 to September 2013) from all localities sampled by sweep netting. Twenty nine species were identified belonging to 16 genera and 8 subfamilies: Agathidinae (1 species), Aphidiinae (8 species), Braconinae (2 species), Cheloninae (6 species), Euphorinae (3 species), Homolobinae (2 species), Microgastrinae (4 species) and Opiinae (3 species). The presence of species *Aphidius asteris*, *Ephedrus plagiator* (Aphidiinae), *Homolobus* (*Chartolobus*) *infumator* (Homolobinae) and *Opius lugens* (Opiinae) in Egypt was reported for the first time (Table 2).

It was found that Bahariya Oasis represents the highest number of individuals with 394 (67.6%), while Farafra Oasis represents 189 specimens (32.4%). In contrast, 23 species were collected from Farafra Oasis and 21 species were collected from Bahariya Oasis.

In the present study, the subfamily Microgastrinae was predominant (36.2% represented by 211 specimens belonging to 4 species), followed by Opiinae (27.1% represented by 145 specimens belonging to 3 species) then Aphidiinae (14.2% represented by 83 specimens belonging to 8 species).

In Microgastrinae, *Apanteles litae* Nixon, 1972, was the most abundant species (54% of collected Microgastrinae) and the second most abundant species from the overall collected Braconidae (19.6%), it was found in 8 out of 10 sites, predominant in the 2 localities of Al-Quser and Al-Gafara, Bahariya Oasis. On the other hand, *A. appellator* (Microgastrinae) was the second most widespread species (in 9 out of 10 localities) with low relative abundance (7.2%).

In Opiinae, a total of 3 species were collected, of which *O. lugens* (new record to Egypt) represented by 88.9% of opiine species, and the most abundant of the collected Braconidae (22.1%), it was found in all (10) sites under study and it was the most abundant species in 5 localities out of 10 localities. Most of the specimens of *O. lugens* (17.8%) were obtained from El-Garad (Farafra Oasis).

Of the hymenopterous parasitoids of alfalfa aphids of the subfamily Aphidiinae, a total of 8 species were collected, of which *Adialytus* cf. *ambiguus* (Haliday, 1834) (parasitoid of a variety of aphid species), comprising 55.4% of the collected Aphidiinae in the present work was the most abundant species, it was collected from 5 localities (4 from Bahariya and 1 from Farafra Oases). This was followed by *Aphidius colemani* Viereck, 1912, comprising 19.3% of the collected aphidiine species. Two of the collected aphidiine species, *A. asteris* and *E. plagiator* are new to the fauna of Egypt. On the other hand, *A asteris*, and *P. necans* Mackaeur, 1959 are reported here as new records in alfalfa fields.

In the present study, members of the subfamily Cheloninae are represented by 6 species (representing about 7.7% from the total number of the collected braconid specimens and 20.7% of the number of species). The most abundant and important of which was found to be *Chelonus curvimaculatus* Cameron, 1906, representing 66.7% of the total number of chelonine specimens. It was collected from 7 out of the 10 studied sites.

Braconines are here represented by two important species, *Bracon urinator* (Fabricius, 1798) and *Habrobracon hebetor*. Although common for the Egyptian fauna, in this study *H. hebetor* is recorded for the first time in alfalfa fields.

Table 2 Family Braconidae and individual numbers of sweeping net caught insects from alfalfa in some Oases in Western Desert during the period from 2012 to 2013.

Subfamily	Species	Bahariya Oasis					Farafra Oasis						
		EL-Heiz	AL-Quser	Kasaa 3	Mandisha	Agoz	Al-Gafara	Gelgam	Beir 5	Grad	Shimnara	Total insects	Replications
Agathidinae	*Coccygidium melleum* (Roman, 1910)	0	0	0	0	1	0	0	0	0	0	1	1
Aphidiinae	*Adialytus cf. ambiguus* (Haliday, 1834)	3	2	0	7	0	21	0	13	0	0	46	6
	Aphidius asteris Haliday, 1834 [1,2]	0	0	0	0	2	0	0	0	0	0	2	1
	Aphidius colemani Viereck, 1912	0	0	0	0	0	0	2	8	6	0	16	3
	Aphidius matricariae Haliday, 1834	0	0	0	0	0	0	1	0	0	0	1	1
	Ephedrus persicae Froggatt, 1904	2	0	0	0	0	0	0	0	0	2	4	2
	Ephedrus plagiator (Nees, 1811)[1]	2	0	0	0	0	0	0	0	0	0	2	1
	Praon necans Mackauer, 1959 [2]	4	0	0	0	0	0	0	4	0	0	8	2
	Praon volucre (Haliday, 1833)	0	0	0	0	0	0	0	0	0	6	6	1
Braconinae	*Bracon* (*Rostrobracon*) *urinator* (Fabricius, 1798)	0	0	1	0	10	0	0	0	0	6	17	3
	Habrobracon hebetor (Say, 1836) [2]	0	5	0	0	0	0	0	0	0	4	9	2
Cheloninae	*Chelonus* (*Microchelonus*) *basalis* Curtis, 1837 [2]	2	0	0	1	0	0	0	0	0	0	3	2
	Chelonus (*Microchelonus*) *blackburni* Cameron, 1886 [2]	1	0	0	0	0	0	0	0	0	0	1	1
	Chelonus (*Microchelonus*) curvimaculatus Cameron, 1906	5	3	1	3	0	1	0	14	0	3	30	10
	Chelonus inanitus (Linnaeus, 1767)	0	0	0	0	0	0	0	1	0	4	5	2
	Chelonus oculator (Fabricius, 1775) [2]	2	0	0	0	0	0	0	0	0	1	3	2
	Phanerotoma leucobasis Kriechbaumer, 1894 [2]	1	0	0	0	1	0	0	0	1	0	3	3
Euphorinae	*Dinocampus coccinellae* (Schrank, 1802) [2]	0	0	0	0	0	0	0	1	0	0	1	1
	Meteorus pendulus (Müller, 1776)	0	0	0	1	0	0	0	2	0	0	3	2
	Meteorus rubens (Nees, 1811)	0	0	0	0	0	0	3	1	2	0	6	4
Homolobinae	*Homolobus* (*Chartolobus*) *infumator* (Lyle, 1914) [1,2]	0	0	1	1	0	0	0	0	0	0	2	2
	Homolobus (*Apatia*) *truncator* (Say, 1829)	0	0	0	0	0	0	0	2	1	0	3	2
Microgastrinae	*Apanteles appellator* Telenga, 1949 [2]	3	3	6	7	4	9	4	2	0	4	42	18
	Apanteles litae Nixon, 1972	14	28	10	0	4	53	1	0	1	3	114	14
	Cotesia glomerata (Linnaeus, 1758) [2]	12	1	3	17	9	0	0	3	1	9	55	11
	Cotesia ruficrus (Haliday, 1834)	14	6	14	4	0	0	2	2	13	0	55	15
Opiinae	*Opius lugens* Haliday, 1837 [1]	18	14	1	19	15	19	5	1	23	14	129	21
	Psyttalia concolor (Szépligeti, 1910) [2]	0	0	0	0	0	0	2	0	1	0	3	2
	Psyttalia nilotica (Schmiedeknecht, 1900) [2]	0	2	0	3	0	0	0	0	8	0	13	3
	Number of collected species[3]	12	9	8	10	7	5	8	13	9	11	583	

[1]: New to the fauna of Egypt, [2]: New host records, [3]: Collected insects belong to 8 Subfamily, 16 Genera and 29 Species.

The relative abundance of the species: *Coccygidium melleum* (Roman, 1910), *Aphidius matricariae* Haliday, 1834, *Chelonus blackburni*, and *Dinocampus coccinellae* was each 0.17%, all was only found in one site (Agoz, Gelgam, El-Heiz and Beir 5 respectively).

For the other three new records to the fauna of Egypt the relative abundance of *A. asteris*, and *E. plagiator* (Aphidiinae)was found to be 0.34% for each, both were present in a single locality (Agoz for the former and El-Heiz for the latter, Bahariya Oasis), the former species was also recorded for the first time in alfalfa fields. The relative abundance of *H.* (*C.*) *infumator* (Homolobinae) wasfound to be 0.51%, it was recorded in two localities out of 10 localities (Beir 5 and El-Garad, Farafra Oasis). This species is also reported for the first time in alfalfa fields.

For those species that are recorded for the first time in alfalfa fields, it was found that *Cotesia glomerata* (Microgastrinae) was the most common, with high relative abundance (9.4%), it was widespread in 8 out of 10 localities. This was followed by *A. appellator*, (Microgastrinae), with 7.2% relative abundance, widespread in 9 localities out of ten. Then *Psyttalia nilotica* (Opiinae), with relative abundance 2.2 %, located in three out of ten localities. The least abundant of them were *Ch. blackburni* (Cheloninae)and *D. coccinellae* (Euphorinae) (0.17% for each), both were present in only a single locality out of ten.

Population density: In the present study, it was found that the maximum species density was reported in October, December and April, reaching 12, 10 and 9 species respectively. Meanwhile, the minimum number of species was recorded in February, June and August; each was represented by 2 braconid species. *O. lugens* and *Cotesia ruficrus* were the most abundant species in eight and seven months respectively.

As shown in Table 2, four species are singletons, *Coccygidium melleum* (Agathidinae), *matricariae* (Aphidiinae), *Chelonus blackburni* (Cheloninae), *D. coccinellae* (Euphorinae). On the other hand, three aphidiine species, namely, *A. asteris*, *E. plagiator* and *P. volucre*. were found to be unique.

The rank abundance plot (Fig. 3) revealed that, twenty braconid species were arranged in the first part of the curve possessing the lowest abundance, these are followed by fewer ones that increase in their abundance value (causing jagged rise), followed by sudden enhancement by two species, *A. litae* and *O. lugens*. Only three species had abundance values ranging between 9.6% and 22.5%.

Locality effect: Of the ten sites under study, it was found that Beir 5 (Farafra Oasis, with 4 years old healthy plants, adjacent to annual plants) was the site rich in braconid species (13 species). Coming in the second and third places were El-Heiz-Ein Eleza (Bahariya Oasis, with 3 years old healthy plants, surrounded by palm trees) and Shimenara (Farafra Oasis, with 4 years old healthy plant, adjacent to different kinds of fruit trees) (represented with 12 and 11 species respectively). On the other hand, Al-Gafara (Bahariya Oasis, with 3 years old healthy plants, surrended with palm trees) was symbolized by the least number of species (represented by 5 species) (Fig. 4). In the present study, four braconid species are first records from the Egyptian fauna, three of them were collected from Bahariya Oasis, namely *A. asteris*, *E. plagiator* (Aphidiinae) and *H. infumator* (Homolobinae), while *O. lugens* (Opiinae) was collected from the 10 studied sites.

Discussion

Braconid wasps represent one of the most diverse and abundant group of parasitic wasps (Shaw and Huddleston, 1991; LaSalle and Gauld, 1993). They occur in very diverse habitats and are highly abundant in cool temperate regions (LaSalle and Gauld, 1993; Wharton, 1993; Quicke and Kruft, 1995). In the present study their great abundance occurred in October, December and April, this is in accordance with the presence of their insect hosts that mostly belong to the orders Lepidoptera and Diptera. In the present

study, the extensive use of insecticides in Farafra Oasis may have contributed to the reduction in the number of braconid parasitoids collected from this area compared with those collected from Bahariya Oasis, in which no insecticides were used.

The predominance of Microgastrinae (36.2%) in all samples can be explained by the fact that this subfamily is considered the most common group of the most lepidopterous families larvae in the world (Wharton *et al*., 1997; Barbieri Junior and Dias, 2012), so they are very significant in biological control of such pests (Whitfield, 1995, 1997). The most abundant species in this subfamily was *A. litae* followed by *C. glomerata* (Linnaeus, 1758) that are reported as important parasitoids for a number of lepidopterous species (see Fig. 5B), especially *Spodoptera littoralis* Boisduval, 1833 (Yu *et al*., 2012) and the white cabbage worm *Pieris rapae* Linnaeus, 1758 (Le Masieur and Waage, 1993 in U.S.A; Bhat and Bhagat, 2009 in India; Kolaib *et al*., 2009 in Egypt) respectively. In Egypt, *A. litae* was reared from the 2nd larval instar of the diamond back moth *Plutella xylostella* (Linnaeus, 1758) (Abbas, 1989), it was also reported as a natural enemy of the potato tuber moth *Phthorimaea operculella* (Zeller, 1873) (Abbas *et al*., 1993; Abbas and Abdel-Samad, 2006).

The second most abundant family was Opiinae, representing 27.1% of the samples, it is distributed worldwide, common group of mainly mining Agromyzidae or fruit-infesting Tephretidae larvae (Diptera) (Li *et al*., 2013). One of the most abundant species here was *O. lugens* this species was recorded to parasitize larvae of the families Agromyzidae and Cecidomyiidae (Fischer, 1972). A large number of agromyzid specimens (especially *Liriomyza trifolii* (Burgess, 1880)) were collected in the present study and are considered important pest of alfalfa (Fig. 5A).

Among the alfalfa aphid natural enemies that were identified in the present work 8 species belong to the subfamily Aphidiinae, representing 27.6% of the overall species recorded here. They were found to be similar, to a large extent, to those reported from other parts of the world. Examples are those reported in the Mediterranean region (Aeschlimann, 1981), Bulgaria (Grigorov, 1982), different parts of Iran (Monajemi and Esmaili, 1981; Rasoulian, 1985; Rakhshani *et al*., 2006, 2010) and Egypt (Shebl *et al*., 2008).

Wasps of the subfamily Cheloninae are known to be solitary egg-larval parasitoids of many lepidopterous families, and may be considered as potential bio-control agents for this group of pests (Walker and Huddleston, 1987; Inayatullah and Naeem, 2004). In the present study, it was found that *Ch. curvimaculatus* is the predominant chelonine species. This species has been reported from different parts of the world, attacking many lepidopterous pest species. In Africa, it was reported attacking the egg stage of potato tuber moth (Broodryk, 1969; Watmough *et al*., 1973), *Spodoptera exigua* (Hübner, 1808), the armyworm *S. exempta* (Walker, 1856), the cotton leaf worm *S. littoralis* Boisduval, the African bollworm *Helicoverpa armigera* (Hübner, 1809), the Mediterranean flour moth *Ephestia kuehniella* Zeller, 1879, dried fruit moth *Ephestia cautella* (Walker, 1863), false codling moth *Cryptophlebia leucotreta* (Meyrick, 1913) (Broodryk, 1969), spotted stem borer *Chilo partellus* (Swinhoe, 1885) (Kfir, 1990), African stem borer *Busseola fusca* (Füller, 1901) (Mohyuddin and Greathead, 1970; Kfir, 1995) and the diamond back moth (Kfir, 1997), *Sesamia* sp. (Descamps, 1956; Risbec, 1956)and *Chilo diffusilineus* (Joannis, 1927) (Appert, 1964), *C. zacconius* Bleszynski, 1970 (Nickel, 1964; Brenière, 1969).

Braconinae are idiobiont ectoparasitoids of concealed larvae of xylophagous and stem-boring moth caterpillars or beetle larvae. Several species are known to parasitize concealed fly and sawfly larvae. Several genera are found to be gregarious

endoparasitoids of Lepidoptera pupae (van Achterberg, 1984). Accordingly, they represent a large and powerful biological weapon (e.g. Lewis *et al*., 1990) against various pests from holometabolous insect orders (Coleoptera, Diptera, Hymenoptera, Lepidoptera). *Bracon urinator* was reported as the parasitoid of a number of host species of the families Curculionidae (Coleoptera), *Tephritis pulchra* (Loew, 1844) (Diptera: Tephretidae), Gelechiidae (Lepidoptera) and *Chloridea* sp. (Hemiptera, Miridae) (Tobias, 1986; Falcó *et al*., 1993; Beyarslan *et al*., 2008). The cosmopolitan species, *H. hebetor* was reported attacking caterpillars of various lepidopteran families (Falcó *et al*., 1993; Stanković *et al*., 2010).

Members of the subfamily Homolobinae are also endoparasitoids of lepidopterous larvae. However, because most of them are nocturnal, so in the present study, only two species, *Homolobus infumator* and *H. truncator* (Say, 1829) were collected in very few numbers. *Homolobus truncator* is found in all major biotic realms except Australia (van Achterberg, 1979). It was reported from numerous species of exposed lepidopterous larvae of the families Geometridae and Noctuidae (Boring *et al*., 2009). Among its recorded hosts are a number of economically important agricultural pests such as *Agrotis ipsilon* (Hufnagel, 1766), *Helicoverpa zea* (Boddie, 1850), *Spodoptera exigua* (Hübner) and *S. frugiperda* (Smith, 1797) (Yu *et al*., 2012).

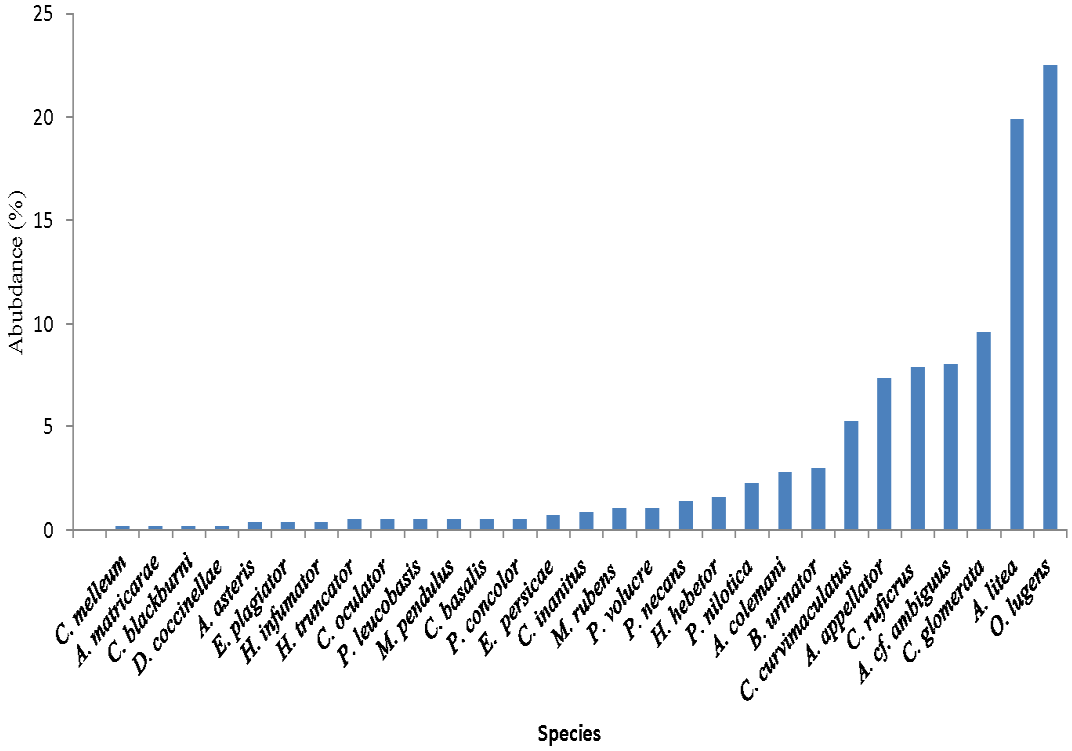

Figure 3 Ascending abundance of Braconidae species collected by sweeping net from alfalfa in Farafra and Bahariya Oasis during the period from November 2012 to October 2013.

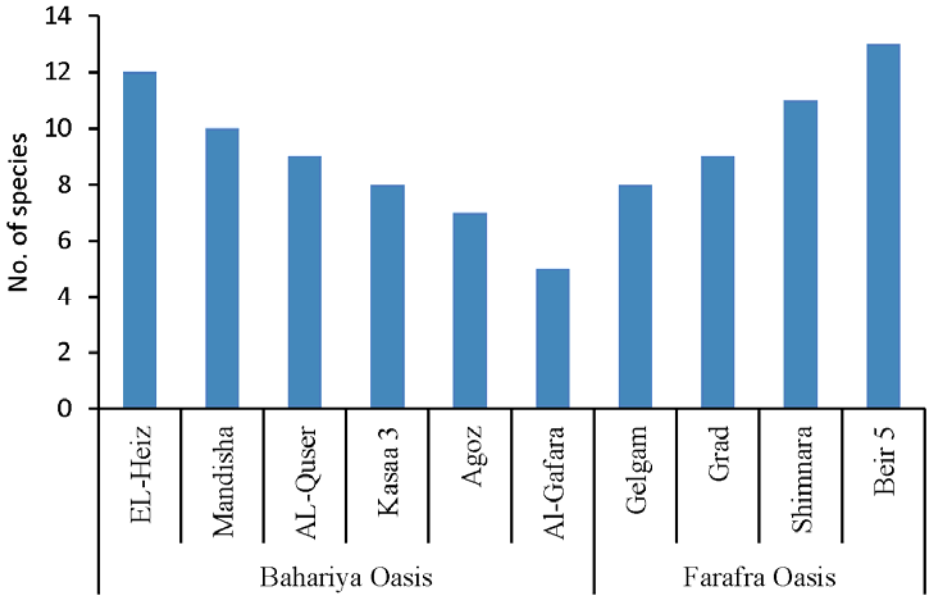

Figure 4 Number of Braconidae species collected by sweeping net from alfalfa in Farafra and Bahariya Oasis during the period from November 2012 to October 2013.

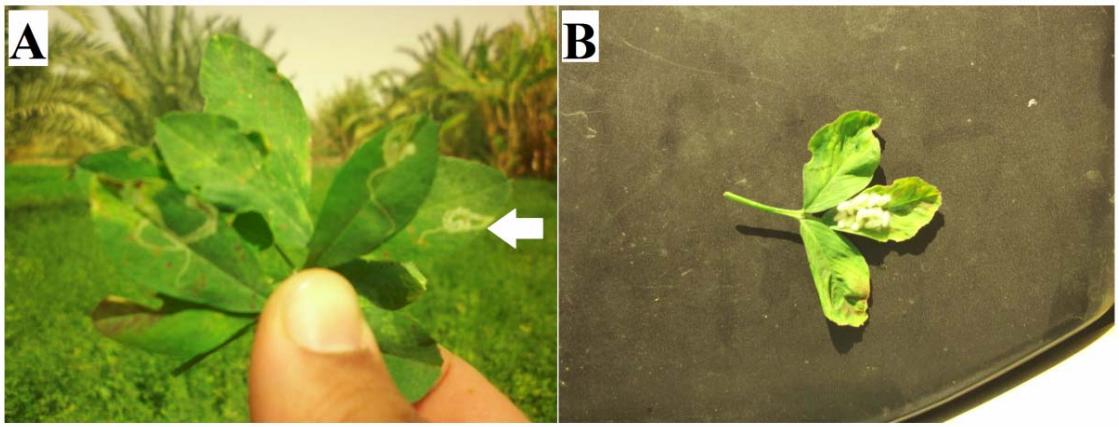

Figure 5 A, Clover leaves infested with *Liriomyza* sp. (Diptera: Agromyzidae); **B,** A cluster of *Apanteles litae* pupae on the upper surface of clover leaf.

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تنوع زنبورهای خانواده Braconidae (Hymenoptera: Ichneumonoidea) در مزارع یونجه، *Medicago sativa* L. در برخی آبادی‌های صحرای غربی مصر

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چکیده: در مجموع ۲۹ گونه از ۱۶ جنس و ۸ زیرخانواده از زنبورهای براکونید (Hym.: Braconidae) از آبادی‌های باهاریا و فارافرا (صحرای غربی، مصر) در مزارع یونجه، *Medicago sativa* L. جمع‌آوری شد. گونه‌های جمع‌آوری شده شناسایی و اطلاعات مربوط به هر محل و فراوانی نسبی آنها در هر محل ارائه شد. از مجموع گونه‌ها، چهار گونه، سه جنس و زیرخانواده برای اولین بار از مصر گزارش شد. گونه‌های گزارش شده برای اولین بار از مصر عبارتند از: *Aphidius asteris* Haliday, 1834، *Ephedrus plagiator* (Nees, 1811) از زیر خانواده Aphidiinae، *Homolobus* (*Chartolobus*) *infumator* (Lyle, 1914) از زیر خانواده Homolobinae و *Opius lugens* Haliday, 1837 از زیر خانواده Opiinae. همچنین سیزده گونه برای اولین بار در ارتباط با مزارع یونجه شناسایی شد که عبارتند از: *A. asteris* و *Praon necans* Mackaeur, 1959 از زیر خانواده Aphidiinae؛ *Habrobracon hebetor* (Say, 1836) از زیر خانواده Braconinae؛ *Chelonus basalis* Curtis, 1837، *Ch. blackburni* Cameron, 1886، *Ch. oculator* (Fabricius, 1775) و *Phanerotoma leucobasis* Kriechbaumeri, 1894 از زیرخانواده Cheloninae؛ *Dinocampus coccinellae* (Schrank, 1802) از زیرخانواده Euphorinae؛ *Apanteles appellator* Telenga, 1949 و *Cotesia glomerata* (Linnaeus, 1758) از زیرخانواده Microgasterinae؛ *Psyttalia concolor* (Szépligeti, 1910) و *P. nilotica* (Schmiedeknechti, 1900) از زیر خانواده Opiinae.

واژگان کلیدی: Braconidae، یونجه، آبادی باهاریا، آبادی فارافرا، گزارش جدید، مصر