

A survey on the fauna of Ichneumonidae (Hymenoptera) of Khorasan-e-Razavi Province

Barahoei, H.^{a*}, Rakhshani, E.^b, Fathabadi, K.^b, Moradpour, H.^b

^a Institute of Agricultural Research, University of Zabol, Iran

^b Department of Plant Protection, College of Agriculture, University of Zabol, Iran

(Received: 23 July 2014; Accepted: 26 October 2014)

In order to study the fauna of ichneumonid wasps (Hym., Ichneumonidae), a survey was carried out during 2010-2013 in various localities in Khorasan-e-Razavi province. Samples were collected using sweeping net by irregular patterns on the common field crops and in the orchards. In total, 234 specimens were collected and identified. They consisted of 26 species belonging to 25 genera of 12 subfamilies. Among them, 16 species were new for Khorasan-e-Razavi fauna including *Anomalon cruentatum* (Geoffroy, 1785) and *Baryhypha propugnator* (Geoffroy, 1785) (Anomaloninae); *Exetastes syriacus* Schmiedeknecht, 1910 and *Lissonota pleuralis* (Brischke, 1880) (Banchinae); *Diadegma semiclausum* (Hellen, 1949) and *Sinophorus xanthostomus* (Gravenhorst, 1829) (Campopleginae); *Dichrogaster longicaudata* (Thomson, 1884), *Dichrogaster sabarator* (Aubert, 1964) and *Trychosis legator* (Thunberg, 1822) (Cryptinae); *Enizemum ornatum* (Gravenhorst, 1829), *Homotropus signatus* (Gravenhorst, 1829) and *Promethes sulcator* (Gravenhorst, 1829) (Diplazontinae); *Diadromus collaris* (Gravenhorst, 1829), *Dicaelotus pumilus* (Gravenhorst, 1829) and *Ichneumon proletarius* Wesmael, 1848 (Ichneumoninae); *Orthocentrus strigatus* Holmgren, 1858 (Orthocentrinae). Three species including *Exetastes syriacus*, *Lissonota pleuralis* and *Dicaelotus pumilus* were new records for the fauna of Iran.

Key words: Alfalfa, fauna, Khorasan-e-Razavi, new record.

INTRODUCTION

The Ichneumonidae is the largest family in the order Hymenoptera bearing about 24,500 described species belong to 48 subfamilies. Many species are the parasitoids, attacking important agricultural insect pests (Yu et al., 2012). Khorasan-e-Razavi located in north - east of Iran. Both mountainous area and the fertile plains surrounded by the low hills in Khorasan-e-Razavi province favored the conditions for inhabiting the various vegetations and for development of agriculture. This can be a reason for variations in diversity of many insect groups to be investigated. Fauna of the ichneumonid wasps have recently been studied in various parts of Iran. A checklist was provided for all recorded species of this family by Barahoei et al. (2012b), which presented the occurrence of 502 species. Given the extent of the Khorasan-e-Razavi territory and the great variability of vegetations, very little is known about fauna and species diversity of the Ichneumonidae as the largest family of Hymenoptera. Up to now, 52 species belonging to 11 subfamilies have been reported from the whole Khorasan area (Barahoei et al., 2012b). Majority of the species are recorded from Khorasan-e-Razavi that include 40 species belonging 10 subfamilies (Kolarov & Ghahari, 2005, 2006, 2007, 2008; Masnadi & Jussila, 2009; Ghahari & Jussila, 2010, 2011b; Barahoei et al., 2012b; Ghahari et al., 2014). Only a single species has been recorded from South Khorasan province (Kolarov & Ghahari, 2008). On the same respect, only 11 species (Five subfamilies) have been cited from North Khorasan (Malkeshi & Kheiabani, 1997; Kolarov & Ghahari, 2005, 2007, 2008; Ghahari et al., 2014). In the course of an on-going research project, here we present the new data about occurrence of Ichneumonidae at this region, as well as new species records for the fauna of Iran.

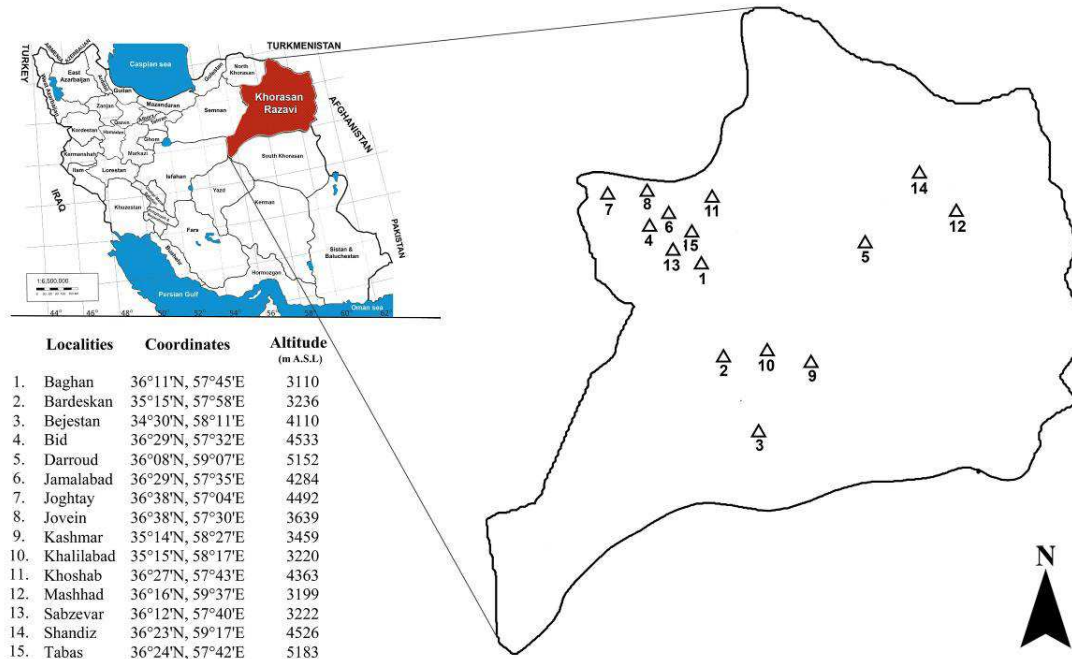


FIGURE 1. Map of the sampling localities at Khorasan Razavi Province.

MATERIAL AND METHODS

The specimens were collected in alfalfa fields and neighboring plants using standard sweeping net from different localities in Khorasan-e-Razavi province (Fig. 1) during 2010-2013.

The collected specimens were primarily dropped into the tube containing ethanol 75%, then dried, pinned, labeled, mounted and put into collection boxes, subsequently. The external morphology of specimens was studied using NIKON SMZ645 stereomicroscope. Illustrations were taken using a Sony™ digital camera. A series of 4-5 captured images were then merged into a single in-focus image using Zeren Stacker ver. 1.04. Terminology of morphological characters follows Townes (1969). Nomenclature and distribution data are mainly taken from Yu et al. (2012). The specimens were deposited in the Insect Collection at University of Zabol, Iran. Abbreviation for the collectors are as follows: H.M.: Hamid Moradpour, KH.F.: Khalil Fathabadi, E.R.: Ehsan Rakhshani, N.K.: Naeimeh Kazemi Rad.

RESULTS

Totally, 26 species belonging to 25 genera and 12 subfamilies were collected and identified, of which, 16 species were new for the fauna of the studied regions, indicating by an asterisk (*). Three species including *Lissonota pleuralis*, *Exetastes syriacus* and *Dicaelotus pumilus* (marked by a dagger (†)) were reported for the first time for the fauna of Iran. The list of the taxa presented alphabetically.

Subfamily Anomaloninae Viereck, 1918

Anomalon cruentatum (Geoffroy, 1785)*

Material examined: (8♀♀ and 15♂♂): 2♀♀ and 1♂, swept on *Medicago sativa*, Bejestan, 17-IX-2012, leg. H.M.; 2♂♂, swept on *Medicago sativa*, Bejestan, 28-IV-2013, leg. H.M.; 3♀♀ and 2♂♂, swept on *Medicago sativa*, Bejestan, 08-IX-2013, leg. H.M.; 2♀♀ and 4♂♂, swept in mixed field, 26-V-2012, leg. H.M.; 1♂, swept on *Medicago sativa*, Kashmar, 17-X-2011, leg. KH.F.; 1♂, swept in cherry orchard, Sabzevar-Joghtay, 27-III-2011, leg. KH.F.; 2♂♂, swept on *Medicago sativa*, Sabzevar-

Jovein, 28-V-2011, leg. KH.F.; 2♂♂, swept on *Medicago sativa*, Sabzevar, 26-X-2013, leg. N.K.; 1♀, swept on *Medicago sativa*, Sabzevar, 26-V-2012, leg. H.M.

Distribution in Iran: Ardabil (Masnadi & Jussila, 2009), Yazd (Zarepour et al., 2009), East Azerbaijan (Ghahari & Jussila, 2011c), Sistan and Baluchestan (Barahoei et al., 2012a).

General distribution: Palaearctic, Oriental (Yu et al., 2012).

Barylypa propugnator* (Förster, 1855)

Material examined: (3♀♀ and 1♂): 1♀ and 1♂, swept on *Medicago sativa*, Khalilabad, 18-X-2011, leg. KH.F.; 2♀♀, swept on *Medicago sativa*, Bejestan, 08-IX-2013, leg. H.M.

Distribution in Iran: Sistan and Baluchestan (Barahoei et al., 2012a).

General distribution: Palaearctic (Yu et al., 2012).

Subfamily Banchinae Wesmael, 1845

***Exetastes syriacus* Schmiedeknecht, 1910 † (Figs. 2, 5B, C)**

Material examined: (1♀ and 2♂♂): 1♀, swept on *Medicago sativa*, Bardeskan, 28-IV-2013, leg. H.M.; 2♂♂, swept on *Medicago sativa*, Bejestan, 05-XI-2012, leg. H.M.

Distribution in Iran: new for the fauna of Iran.

General distribution: Nearctic, Palaearctic (Yu et al., 2012).

Diagnosis: Antenna with white middle segment (Figs. 5B, C), head black, edge of clypeus reddish, occipital carinae complete (Figs. 2A, B, C), tegulae black, but in end with white spots (Figs. 2D, E), scutellum almost entirely white, at the base in the middle reddish (Fig. 2D), forewing with areola, stigma brown, venation blackish (Fig. 2H), propodeum rugose, black (Fig. 2F), gaster reddish with black marks (Figs. 5B, C), all legs reddish with big coxa (Figs. 2E, 5B, C), in the hind leg, tarsomere 2 and 5 are blackish, 3rd and 4th white, first segment of gaster long, in end twice as wide as apex, ovipositor red, without node, as long as first segment of gaster (Figs. 2G, 5C), body length of 9-10 mm.

***Lissonota pleuralis* (Brischke, 1880) † (Figs. 3, 5D, E)**

Material examined: (2♀♀ and 2♂♂): 1♂, swept on *Medicago sativa*, Bejestan, 05-XI-2012, leg. H.M.; 1♂, swept on *Medicago sativa*, Bejestan, 08-IX-2013, leg. H.M.; 2♀♀, swept in cherry orchard, Mashhad-Shandiz, 09-VII-2013, leg. E.R.

Distribution in Iran: new for the fauna of Iran.

General distribution: Palaearctic (Yu et al., 2012).

Diagnosis: Head strongly narrowed backwards (Figs. 3A, C), head and thorax densely punctured, quite shiny (Figs. 3D, E), mouth and end of clypeus yellowish (Figs. 3A, B), vertex with white stripes to the lateral of ocellies (Figs. 3B, C), areola shortly stalked, behind radius it clearly curved, stigma brownish with white margins (Fig. 3H), tegulae white (Fig. 3D), mesoscutum punctured, scutellum black with red margins (Fig. 3E), femurs long and strong, gaster finely punctured wrinkled, rather shining (Figs. 5D, E), propodeum punctured, only with a lateral carinae in end (Fig. 3F), first segment of gaster twice as long as the back width, second and third segments much longer than wide (Figs. 5D, E), ovipositor longer than gaster and forewing (Fig. 5E), with node in end (Fig. 3G), body length of 8-9 mm.

Subfamily Campopleginae Förster, 1869

***Diadegma semiclausum* (Hellén, 1949) ***

Material examined: (74♀♀ and 22♂♂): 7♀♀ and 3♂♂, swept on *Medicago sativa*, Sabzevar-Baghan, 27-XII-2013, leg. N.K.; 2♀♀, swept on *Medicago sativa*, Sabzevar-Bid, 31-VII-2013, leg. N.K.; 14♀♀ and 2♂♂, swept on *Medicago sativa*, Sabzevar-Jovein, 20-VI-2013, leg. N.K.; 8♀♀ and 5♂♂, swept on *Medicago sativa*, Sabzevar-Jovein, 22-V-2013, leg. N.K.; 31♀♀ and 11♂♂, swept on

Medicago sativa, Sabzevar-Jovein, 31-V-2013, leg. N.K.; 7♀, swept on *Medicago sativa*, Sabzevar, 23-X-2013, leg. N.K.; 5♀♀ and 1♂, swept on *Triticum aestivum*, Sabzevar-Jamalabad, 24-XII-2013, leg. N.K.

Distribution in Iran: Isfahan (Kolarov & Ghahari, 2005; Ghahari, 2012), Qazvin (Ghahari & Schwarz, 2012), Sistan and Baluchestan (Barahoei et al., 2013a).

General distribution: Palaearctic, Ethiopian, Oriental, Australian (Yu et al., 2012).

***Sinophorus xanthostomus* (Gravenhorst, 1829) ***

Material examined: (2♀♀ and 9♂♂): 1♂, swept on Grape Garden, Bardeskan, 12-V-2011, leg. KH.F.; 1♀, swept on *Medicago sativa*, Kashmar, 11-IV-2011, leg. KH.F.; 1♂, swept on *Medicago sativa*, Sabzevar-Jovein, 25-IV-2011, leg. KH.F.; 3♂♂, swept in cherry orchard, Torghabe-Shandiz, 26-IV-2011, leg. KH.F.; 3♂♂, swept on *Triticum aestivum*, Sabzevar-Jovein, 30-IV-2011, leg. KH.F.; 1♀ and 1♂, swept on *Medicago sativa*, Sabzevar-Jovein, 22-V-2013, leg. N.K.

Distribution in Iran: Sistan and Baluchestan (Barahoei et al., 2013a).

General distribution: Palaearctic, Ethiopian, Oriental (Yu et al., 2012).

Subfamily Collyriinae Cushman, 1924

***Collyria coxator* (Villers, 1789)**

Material examined: (1♀ and 2♂♂): 1♀ and 2♂♂, swept on *Medicago sativa*, Sabzevar-Jovein, 05-V-2011, leg. KH.F.

Distribution in Iran: Kerman (Kolarov and Ghahari, 2005), Khorasan Razavi (Barahoei et al., 2012b).

General distribution: Palaearctic, Nearctic (Yu et al., 2012).

Subfamily Cremastinae Förster, 1869

***Temelucha tricolorata* Sedivy, 1968**

Material examined: (1♀ and 1♂): 1♀ and 1♂, swept on *Medicago sativa*, Sabzevar-Baghan, 27-XII-2013, leg. N.K.

Distribution in Iran: Mazandaran (Ghahari & Jussila, 2010, 2011a), Khorasan Razavi (Ghahari & Jussila, 2011b).

General distribution: Palaearctic (Yu et al., 2012).

Subfamily Cryptinae Kirby, 1837

***Cryptus inculcator* (Linnaeus, 1758)**

Material examined: (1♀ and 1♂): 1♂, swept on *Medicago sativa*, Sabzevar-Jovein, 22-IV-2011, leg. KH.F.; 1♀, swept in cherry orchard, Torghabe-Shandiz, 26-IV-2011, leg. KH.F.

Distribution in Iran: Alborz (Masnadi & Jussila, 2008a), Sistan and Baluchestan (Firuzi Jahantighi et al., 2012; Barahoei et al., 2013a), Yazd (Zarepour et al., 2008), Khorasan Razavi (Barahoei et al., 2012b).

General distribution: Palaearctic (Yu et al., 2012).

***Dichrogaster longicaudata* (Thomson, 1884) ***

Material examined: (1♀ and 1♂): 1♀ and 1♂, swept on *Medicago sativa*, Sabzevar-Jovein, 28-III-2011, leg. KH.F.

Distribution in Iran: Fars, Mazandaran (Kolarov & Ghahari, 2007), Sistan and Baluchestan (Barahoei et al., 2012b).

General distribution: Palaearctic, Nearctic (Yu et al., 2012).

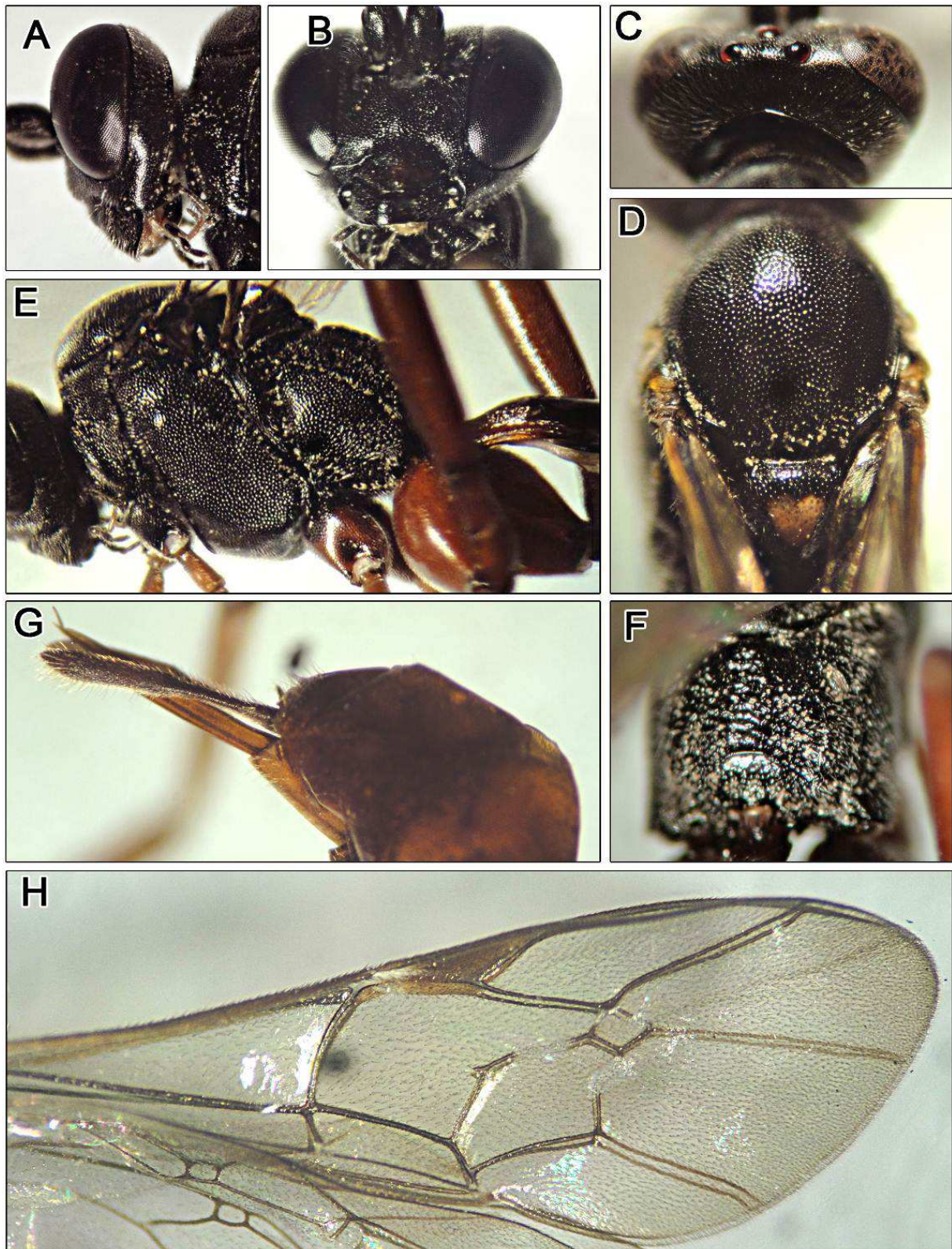


FIGURE 2. The external morphology of female specimen of *Exetastes syriacus* Schmiedeknecht: A) lateral view of head; B) frontal view of head; C) dorsal view of head; D) mesoscutum; E) thorax; F) propodeum; G) ovipositor; H) Forewing.

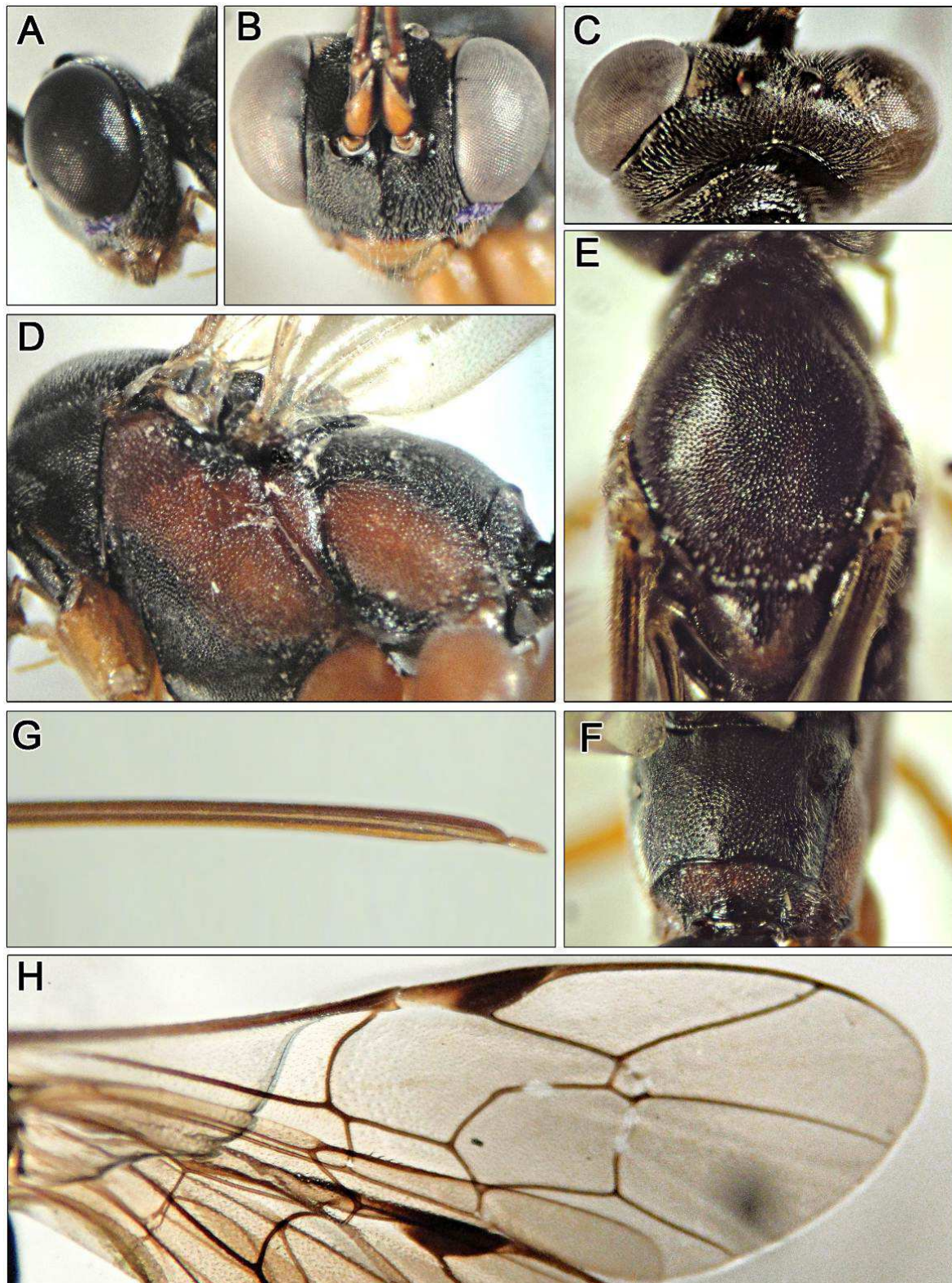


FIGURE 3. The external morphology of female specimen of *Lissonota pleuralis* (Brischke): A) lateral view of head; B) frontal view of head; C) dorsal view of head; D) thorax; E) mesoscutum; F) propodeum; G) ovipositor; H) Forewing.

***Dichrogaster saharator* (Aubert, 1964) ***

Material examined: (2♀♀ and 2♂♂): 1♀ and 1♂, swept on *Medicago sativa*, Sabzevar-Jovein, 20-VI-2013, leg. N.K.; 1♀, swept on *Medicago sativa*, Bejestan, 17-IV-2013, leg. H.M.; 1♂, swept on *Medicago sativa*, Bejestan, 08-IX-2013, leg. H.M.

Distribution in Iran: Ardabil, Fars, Khuzestan, Mazandaran, Tehran, Zanzan (Kolarov & Ghahari, 2007), Sistan and Baluchestan (Kolarov & Ghahari, 2007; Firuzi Jahantighi et al., 2012; Barahoei et al., 2013a).

General distribution: Palaearctic (Yu et al., 2012).

***Mesostenus transfuga* Gravenhorst, 1829**

Material examined: (2♂♂): 1♂, swept on *Medicago sativa*, Sabzevar-Jovein, 28-III-2011, leg. KH.F.; 1♂, swept on *Medicago sativa*, Sabzevar-Tabas, 10-VIII-2013, leg. N.K.

Distribution in Iran: Fars, Guilan, Isfahan, Khorasan Razavi, Mazandaran (Kolarov & Ghahari, 2007), Qazvin (Ghahari & Schwarz, 2012).

General distribution: Palaearctic (Yu et al., 2012).

***Trychosis legator* (Thunberg, 1822) ***

Material examined: (1♀ and 1♂): 1♀, swept on *Hordeum* spp., Bejestan, 14-IV-2013, leg. H.M.; 1♂, swept on *Medicago sativa*, Bejestan, 28-IV-2013, leg. H.M.

Distribution in Iran: Sistan and Baluchestan, West Azerbaijan (Kolarov and Ghahari 2007), Fars (Masnadi, 2005; Masnadi & Jussila, 2008a), Qazvin (Ghahari & Schwarz, 2012).

General distribution: Palaearctic (Yu et al., 2012).

Subfamily Diplazontinae Viereck, 1918***Diplazon laetatorius* (Fabricius, 1781)**

Material examined: (18♀♀): 2♀♀, swept on Grape Garden, Bardeskan, 12-V-2011, leg. KH.F.; 1♀, swept on *Medicago sativa*, Neyshabour-Darroud, 22-VII-2011, leg. KH.F.; 1♀, swept on *Medicago sativa*, Sabzevar-Baghan, 28-XII-2013, leg. N.K.; 3♀♀, swept on *Medicago sativa*, Sabzevar-Jovein, 16-V-2011, leg. KH.F.; 1♀, swept on *Medicago sativa*, Sabzevar-Jovein, 31-XII-2013, leg. N.K.; 1♀, swept on *Medicago sativa*, Sabzevar, 26-X-2013, leg. N.K.; 1♀, swept on *Medicago sativa*, Sabzevar-Tabas, 04-X-2013, leg. N.K.; 1♀, swept in cherry orchard, Torghabe-Shandiz, 26-IV-2011, leg. KH.F.; 4♀♀, swept in cherry orchard, Sabzevar-Joghtay, 02-V-2011, leg. KH.F.; 1♀, swept on Weeds, Mashhad, 11-VII-2011, leg. KH.F.; 1♀, swept on *Medicago sativa*, Sabzevar, 30-V-2012, leg. H.M.; 1♀, swept on *Triticum aestivum*, Sabzevar-Jamalabad, 24-XII-2013, leg. N.K.

Distribution in Iran: North Khorasan, West Azerbaijan (Malkeshi & Kheiabani, 1997), Mazandaran, Kerman (Kolarov & Ghahari, 2005), Chaharmahal and Bakhtiari (Nourbakhsh et al., 2008), Yazd (Zarepour et al., 2008, 2009), Sistan and Baluchestan (Barahoei et al., 2013a).

General distribution: Worldwide (Yu et al., 2012).

***Enizemum ornatum* (Gravenhorst, 1829) ***

Material examined: (3♀♀ and 8♂♂): 2♂♂, swept on *Medicago sativa*, Sabzevar, 27-V-2012, leg. H.M.; 4♂♂, swept on *Medicago sativa*, Sabzevar-Jovein, 22-V-2013, leg. N.K.; 3♀♀, swept on *Medicago sativa*, Sabzevar-Jovein, 20-VI-2013, leg. N.K.; 2♂♂, swept on *Medicago sativa*, Sabzevar, 24-XII-2013, leg. N.K.

Distribution in Iran: Sistan and Baluchestan (Barahoei et al., 2013a).

General distribution: Nearctic, Palaearctic, Oriental (Yu et al., 2012).

***Homotropus signatus* (Gravenhorst, 1829) ***

Material examined: (6♀♀ and 6♂♂): 2♀♀ and 1♂, swept on *Medicago sativa*, Sabzevar-Bid, 31-XII-2013, leg. N.K.; 2♀♀ and 2♂♂, swept on *Medicago sativa*, Sabzevar-Jovein, 20-VI-2013, leg. N.K.; 1♀, swept on *Medicago sativa*, Sabzevar-Jovein, 22-V-2013, leg. N.K.; 1♀ and 3♂♂, swept on *Medicago sativa*, Sabzevar, 24-XII-2013, leg. N.K.

Distribution in Iran: Isfahan (Barahoei & Nader, 2014), Kerman (Sarafi et al., 2014).

General distribution: Nearctic, Palaearctic (Yu et al., 2012).

***Promethes sulcator* (Gravenhorst, 1829) ***

Material examined: (3♀♀ and 11♂♂): 4♂♂, swept on *Medicago sativa*, Sabzevar-Jovein, 22-V-2013, leg. N.K.; 1♀ and 3♂♂, swept on *Medicago sativa*, Sabzevar-Jovein, 30-V-2011, leg. KH.F.; 2♀ and 1♂, swept on *Medicago sativa*, Sabzevar-Jovein, 20-VI-2013, leg. N.K.; 1♂, swept on *Medicago sativa*, Sabzevar-Jovein, 07-XI-2010, leg. KH.F.; 2♂♂, swept in cherry orchard, Torghabe-Shandiz, 26-IV-2011, leg. KH.F.

Distribution in Iran: Sistan and Baluchestan (Barahoei et al., 2013a).

General distribution: Nearctic, Palaearctic, Oriental (Yu et al., 2012).

Subfamily Ichneumoninae Latreille, 1802***Diadromus collaris* (Gravenhorst, 1829) ***

Material examined: (2♀♀ and 1♂♂): 1♀ and 1♂, swept on *Medicago sativa*, Sabzevar-Jovein, 20-VI-2013, leg. N.K.; 1♀, swept on *Triticum aestivum*, Sabzevar-Khoshab, 05-V-2011, leg. KH.F.

Distribution in Iran: Golestan (Kolarov & Ghahari, 2008; Ghahari & Jussila, 2011b), Sistan and Baluchestan (Firuzi Jahantighi et al., 2012; Barahoei et al., 2013a), Semnan (Ghahari, 2012).

General distribution: Australasian, Palaearctic, Ethiopian, Neotropical (Yu et al., 2012).

***Dicaelotus pumilus* (Gravenhorst, 1829) † (Figs. 4, 5A)**

Material examined: (3♂♂): 3♂♂, swept on *Medicago sativa*, Sabzevar-Jovein, 27-V-2011, leg. KH.F.

Distribution in Iran: new for the fauna of Iran.

General distribution: Palaearctic (Yu et al., 2012).

Diagnosis: Head black, not bulbous, frons slightly convex, with distinct punctuation, clypeus clearly separate from face, upper mandibular tooth longer than lower tooth (Figs. 4A, B), antennae reddish brown (Figs. 4A, 5A), forewing with long areola, 2m-cu with a long bulla, pterostigma brown (Fig. 4G), thorax completely black (Figs. 4C, D), metanotum with distinct areas, area supermedia transverse, propodeum areolated (Figs. 4D, 4E), legs partly black with red pattern (Figs. 4E, 5A), postpetiolus not smooth, gaster black, middle segments with reddish posterior margin (Figs. 4F, 5A), body length of 4-6 mm.

***Ichneumon proletarius* Wesmael, 1848 ***

Material examined: (2♂♂): 2♂♂, swept on *Medicago sativa*, Bejestan, 10-IX-2013, leg. H.M.

Distribution in Iran: Qazvin (Ghahari & Schwarz, 2012), Sistan and Baluchestan (Kolarov & Ghahari, 2008), Tehran (Masnadi & Jussila, 2008b).

General distribution: Palaearctic (Yu et al., 2012).

***Pseudoamblyteles homocerus* (Wesmael, 1854)**

Material examined: (2♀♀ and 1♂♂): 2♀♀, swept on *Triticum aestivum*, Sabzevar-Jovein, 01-VI-2011, leg. KH.F.; 1♂, swept on *Triticum aestivum*, Neyshabour-Darroud, 16-IV-2011, leg. KH.F.

Distribution in Iran: Semnan (Ghahari, 2012), Khorasan Razavi (Barahoei et al., 2012b).

General distribution: Palaearctic, Nearctic (Yu et al., 2012).

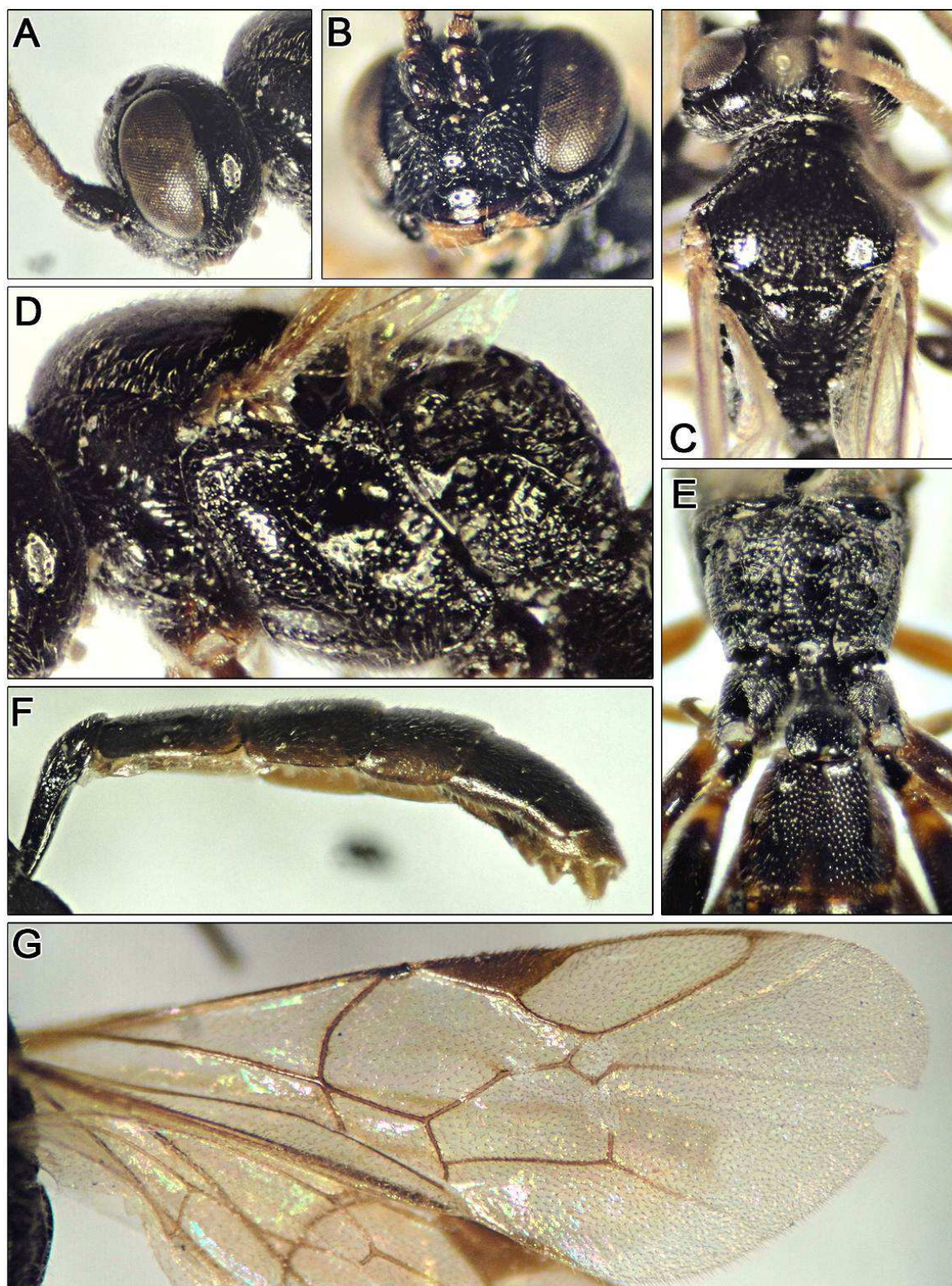


FIGURE 4. The external morphology of male specimen of *Dicaelotus pumilus* (Gravenhorst): A) lateral view of head; B) frontal view of head; C) dorsal view of head and mesoscutum; D) thorax; E) propodeum and first segment of gaster; F) gaster; G) Forewing.

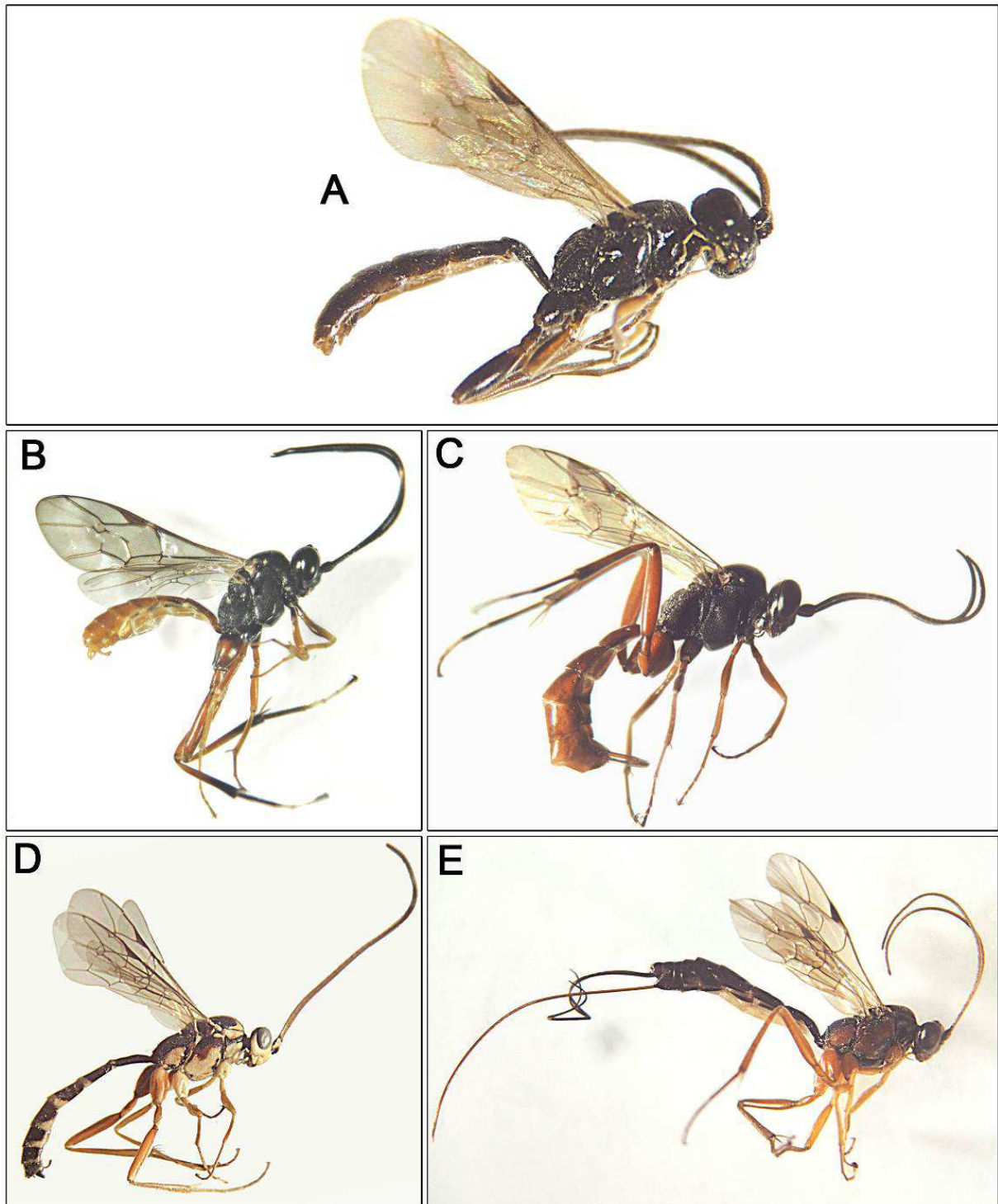


FIGURE 5. Lateral view of adult specimen A) male of *Dicaelotus pumilus* (Gravenhorst); B, C) male and female of *Exetastes syriacus* Schmiedeknecht; D, E) male and female of *Lissonota pleuralis* (Brischke).

Subfamily Metopiinae Förster, 1869***Exochus britannicus* Morley, 1911**

Material examined: (3♂♂): 2♂♂, swept in cherry orchard, Sabzevar-Joghtay, 27-III-2011, leg. KH.F.; 1♂, swept on *Medicago sativa*, Sabzevar-Jovein, 06-XI-2011, leg. KH.F.

Distribution in Iran: Khorasan Razavi (Barahoei et al., 2012b).

General Distribution: Palaearctic (Yu et al., 2012), Nearctic (Çoruh & Kolarov, 2012).

Subfamily Orthocentrinae Förster, 1869***Orthocentrus strigatus* Holmgren, 1858 ***

Material examined: (1♀ and 2♂♂): 1♀ and 2♂♂, swept on *Medicago sativa*, Sabzevar, 20-VI-2013, leg. N.K.

Distribution in Iran: Guilan, Tehran (Mohammadi & Talebi, 2013).

General distribution: Western Palaearctic (Yu et al., 2012).

Subfamily Pimplinae Wesmael, 1845***Itopectis tunetana* (Schmiedeknecht, 1914)**

Material examined: (1♀): 1♀, swept on *Medicago sativa*, Sabzevar-Joghtay, 08-IX-2011, leg. KH.F.

Distribution in Iran: Guilan (Mohammadi et al., 2013), Khorasan Razavi (Barahoei et al., 2012b).

General distribution: Palaearctic (Yu et al., 2012).

Subfamily Tersilochinae Schmiedeknecht, 1910***Aneuclis incidens* (Thomson, 1889)**

Material examined: (1♀ and 1♂): 1♀, swept on *Medicago sativa*, Sabzevar-Jovein, 20-VI-2013, leg. N.K.; 1♂, swept on *Medicago sativa*, Bardeskan, 29-X-2012, leg. H.M.

Distribution in Iran: Mazandaran (Ghahari & Jussila, 2011b), Kerman, Khorasan Razavi, Sistan and Baluchestan (Barahoei et al., 2013b).

General Distribution: Palaearctic (Yu et al., 2012).

***Diaparsis (Pectinoparsis) improvisator* Khalaim, 2005**

Material examined: (1♀): 1♀, swept on *Medicago sativa*, Sabzevar-Jovein, 05-VI-2011, leg. KH.F.

Distribution in Iran: Khorasan Razavi (Barahoei et al., 2013b).

General Distribution: Eastern Palaearctic (Khalaim, 2005, 2011; Yu et al., 2012).

DISCUSSION

The majority of specimens were collected from alfalfa fields, which can be occasionally visited by the ichneumonids and most probably as the natural habitats for their preferred hosts. Many insects of the order Lepidoptera belonging to the families Noctuidae, Pyralidae, Crambidae, Gelechiidae and Geometridae which feeds on alfalfa are considered as preferred hosts of the ichneumonids. Alfalfa fields contribute valuable habitats for diverse range of insects from different orders. Besides the parasitoids of common insects and the spiders (Finch, 2005) there are also species which previously recorded in association with stem sawflies (Carlson, 1979) and the gall wasps (Aubert, 1978). Both groups can be normally occurring on their weed host plants near the alfalfa fields.

Some species consisting *Anomalon cruentatum*, *Barylypa propugnator*, *Sinophorus xanthostomus*, *Ichneumon proletarius* are frequently recorded as parasitoids of the common noctuid pests of the genera *Agrotis* (Djanelidze, 1969; Sedivy, 1986; Okyar & Yurtcan, 2007) and *Helicoverpa* (Meyer, 1934). This parasitoid assemblage also attack the lepidopterous hosts of the families Arctidae, Sphingidae, Tortricidae and Nymphalidae (Yu et al., 2012) which are generally less common in alfalfa fields.

Species of the subfamily Diplazontinae are exclusively parasitoids of the syrphid flies (Thirion, 1994; Rotheray, 1984) and were quite common and diverse group in the studied alfalfa and adjacent fields.

They can have both negative and regulative effects on the populations of the syrphid flies, which are considered as important natural enemies of the pest aphids (Holland & Oakley, 2007). Additionally, species of the genus *Dichrogaster* which are parasitoids of the chrysopids are another important group of the insect natural enemies which feed on mites, aphids and other small body insects (Sedivy, 1986).

In general, a little has been known about host range patterns of the ichneumonids and there are no any host records for many species that we collected from the studied areas (*Exetastes syriacus*, *Temelucha tricolorata*, *Exochus britannicus*, *Orthocentrus strigatus* and *Diaparsis improvisator*). On the other hand, species of the same genera were found in association with the Lepidoptera, except the species of *Diaparsis* which attack the beetles, like other members of the subfamily Tersilochinae (Sedivy, 1983).

The assemblage of the identified species mostly represents the faunal elements of the Palearctic region, however some species have also been occurred in the oriental region (*Anomalon cruentatum*). Species of the subfamily Diplazontinae (*Diplazon laetatorius*, *Enixemum ornatum*, *Promethes sulcator*) have a wider distribution, which can be justified after their host range pattern on the syrphids (Thirion, 1994; Rotheray, 1984). *Diadromus collaris* (Ichneumoninae) and *Diadegma semiclausum* (Campopleginae) have also worldwide distribution. Both species are in association with *Plutella xylostella* (Linnaeus, 1758) (Lep. Yponomeutidae) (Yarrow, 1970; Chadwick & Nikitin, 1976) as the most important pest of the Cabbage, worldwide (Jankowska & Kazimierz, 2006).

In conclusion, expanding the knowledge about fauna of the ichneumonids associating with important field crops has a critical importance in developing the sustainable pest management systems. The parasitoids are the biological regulatory elements that need to be protected. This is the general force in the agro-ecosystems which inherited from their natural ecosystem (Footitt & Peter, 2007). Further studies both on their host associations and seasonal occurrence are also necessary.

ACKNOWLEDGMENTS

We are very grateful to Martin Schwarz (Eben 21, A-4202 Kirchschlag, Austria) and Matthias Riedel (Klinik Fallingbostal, Kolkweg 1 D-29683, Bad Fallingbostal, Germany) for identification of some specimens and N.K. for collecting some samples.

LITERATURE CITED

- Aubert, J.F. 1978. Les Ichneumonides ouest-paléarctiques et leurs hotes 2. Banchinae et Suppl. aux Pimplinae. Laboratoire d'Evolution des Etres Organises, Paris & EDIFAT-OPIDA, Echauffour. 318 pp.
- Barahoei, H., Nader, E. 2014. Fauna of Diplazontinae Viereck (Hym., Ichneumonidae) in Isfahan Province. The 1st National Conference on Stable Agriculture and Natural Resources. Tehran. 1-3.
- Barahoei, H., Rakhshani, E., Khajeh, N. 2012a. A survey on occurrence of Anomaloninae and Ophioninae (Hym., Ichneumonidae) in Sistan and Baluchestan province, with a new record for fauna of Iran. The 17th National and 5th International Conference of Biology of Iran. p. 167.
- Barahoei, H., Rakhshani, E., Riedel, M. 2012b. A checklist of Ichneumonidae (Hymenoptera: Ichneumonoidea) from Iran. *Iranian Journal of Animal Biosystematics* 8, 83-133.
- Barahoei, H., Rakhshani, E., Kasparyan, D.R., Schwarz, M., Riedel, M. 2013a. Contribution on the knowledge of Ichneumonidae (Hymenoptera) in the northern part of Sistan and Baluchestan province, Iran. *Acta Zoologica Bulgarica* 65, 131-135.
- Barahoei, H., Bani-Asad, R., Madjdzadeh, S. M. 2013b. First record of *Diaparsis improvisator* Khalaim, 2005 (Hymenoptera: Ichneumonidae: Tersilochinae) from Iran. *Journal of the Entomological Research Society* 15, 73-78.

- Carlson, R.W. 1979. Family Ichneumonidae. Stephanidae. In: Krombein K.V., Hurd Jr. P.D., Smith D.R. & Burks B.D. "Catalog of Hymenoptera in America north of Mexico." Smithsonian Institution Press. Washington. pp. 315-741.
- Chadwick, C.E., Nikitin, M.I. 1976. Records of parasitism in the families Ichneumonidae, Braconidae and Aulacidae. *Journal of the Entomological Society of Australia* 9, 28-38.
- Çoruh, S., Kolarov, J. 2012. Ichneumonidae (Hymenoptera) from North- Eastern Turkey. III. *Munis Entomology and Zoology* 7, 629-633.
- Djanelidze, B.M. 1969. Data on the relationship between Ichneumonflies (Hym., Ichneumonidae) and their hosts. Bulletin of the Academy of Sciences of the Georgian SSR 55, 445-448.
- Finch, O.D. 2005. The parasitoid complex and parasitoid-induced mortality of spiders (Araneae) in a central European woodland. *Journal of Natural History* 39, 2339-2354.
- Firuzi Jahantighi, F., Barahoei, H., Vafaei, Shooshtari, R., Rakhshani, E. 2012. New records of Cryptinae Kirby 1837 and Ichneumoninae Latreille, 1802 (Insecta: Hymenoptera: Ichneumonidae) for Iran. *Iranian Journal of Entomological Research* 4, 307-312.
- Footitt, R.G., Peter, H.A. 2007. Insect biodiversity science and society. John Wiley & Sons, Ltd., Publication. 642 pp.
- Ghahari, H. 2012. A study on the Ichneumonidae (Hymenoptera) from Jangal-e Abr, Semnan province, Iran. *Calodema* 201, 1-4.
- Ghahari, H., Jussila, R. 2010. A contribution to the knowledge of ichneumon wasps (Hymenoptera: Ichneumonidae) from Iranian cotton fields and surrounding grasslands. *Zoosystematica Rossica* 19, 357-360.
- Ghahari, H., Jussila, R. 2011a. A study on the subfamilies Cremastinae, Ichneumoninae, Pimplinae and Rhyssinae (Hymenoptera: Ichneumonidae) from the Mazandaran province, Iran. *Calodema* 140, 1-6.
- Ghahari, H., Jussila, R. 2011b. A study on the ichneumonid wasps (Hymenoptera: Ichneumonidae) from some regions of Iran. *Linzner Biologische Beiträge* 43, 753-758.
- Ghahari, H., Jussila, R. 2011c. A contribution to the knowledge of Ichneumonidae (Hymenoptera) from Arasbaran and vicinity, Iran. *Calodema* 166, 1-5.
- Ghahari, H., Schwarz, M. 2012. A study of the Ichneumonidae (Hymenoptera: Ichneumonoidea) from the Qazvin province, Iran. *Linzner Biologische Beiträge* 44, 855-862.
- Ghahari, H., Ostovari, H., Jussila, R., Behnood, S. 2014. A study on Ichneumonidae (Hymenoptera: Ichneumonoidea) from some regions of Khorasan province, north-eastern Iran. *Calodema* 296, 1-2.
- Holland, J.M., and Oakley, J. 2007. Importance of arthropod pests and their natural enemies in relation to recent farming practice changes in the UK. Research review. 64. HGCA: London, 105 pp.
- Jankowska, B., Kazimierz, W. 2006. The composition and role of parasitoids in reducing population densities of diamondback moth *Plutella xylostella* L. on different cabbage vegetables. *Journal of Plant Protection Research* 46, 275-284.

- Kolarov, J., Ghahari, H. 2005. A catalogue of Ichneumonidae (Hymenoptera) from Iran. *Linzer biologische Beitrage* 37, 503-532.
- Kolarov, J., Ghahari, H. 2006. A study of the Iranian Ichneumonidae (Hymenoptera): I. Pimplinae and Tryphoninae. *Zoology in the Middle East* 38, 63-68.
- Kolarov, J., Ghahari, H. 2007. A study of the Iranian Ichneumonidae (Hymenoptera): II. Brachycyrtinae and Cryptinae. *Zoology in the Middle East* 42, 79-82.
- Kolarov, J., Ghahari, H. 2008. A study of the Iranian Ichneumonidae (Hymenoptera) III. Ichneumoninae. *Acta Entomologica Serbica* 13, 61-76.
- Malkeshi, H., Kheiabani, N. 1997. The first record of *Diplazon laetatorius* T. (Hym., Ichneumonidae) in Iran. *Applied Entomology and Phytopathology* 64, 72, 25.
- Masnadi, A. 2005. First report of ten wasp species (Hym.: Ichneumonidae: Cryptinae) from Iran. *Journal of Entomological Society of Iran* 25, 79-81.
- Masnadi, A., Jussila, R. 2008a. A study to the Iranian Cryptinae (Hymenoptera: Ichneumonidae). *Journal of Entomological Society of Iran* 28, 1-11.
- Masnadi, A., Jussila, R. 2008b. Contribution to the knowledge of ichneumonid wasps of Iran. Subfamilies Ichneumoninae, Pimplinae and Diplazontinae (Hymenoptera, Ichneumonidae). *Entomofauna* 29, 293-320.
- Masnadi, A., Jussila, R. 2009. A contribution to ichneumonid wasps of Iran (Hym.: Ichneumonidae): Anomaloninae, Cremastinae, Ctenopelmatinae, Mesochorinae, Metopiinae and Orthopelmatinae). *Applied Entomology and Phytopathology* 76, 11-28.
- Meyer, N.F. 1934. Schlupfwespen die in Russland in den letzten Jahren aus Schädlingen gezogen sind. *Zeitschrift für Angewandte Entomologie* 20, 611-618.
- Mohammadi, A., Talebi, A.A. 2013. A study of the genus *Orthocentrus* (Hymenoptera: Ichneumonidae, Orthocentrinae) in Gilan and Tehran provinces of Iran, with first records of seven species and one subspecies. *Applied Entomology and Phytopathology* 80, 29-39.
- Mohammadi, A., Talebi, A.A., Zwakhals, K. 2013. A study of the subfamily Pimplinae (Hymenoptera: Ichneumonidae) in the north of Iran, with eleven new species records. *Entomofauna* 34, 29-56.
- Nourbakhsh, S.H., Soleymannejadian, E., Nemti, A.R. 2008. Biology and population dynamics of *Scaeva albomaculata* (Diptera: Syrphidae) in almond orchards of Shahrekord, Iran. (in Persian with English summary). *Journal of Entomological Society of Iran* 27, 93-108.
- Okyar, Z., Yurtcan, M. 2007. Phytophagous Noctuidae (Lepidoptera) of the western Black Sea region and their ichneumonid parasitoids. *Entomofauna* 28, 377-388.
- Rotheray, G. 1984. Host relations, life cycles and multiparasitism in some parasitoids of aphidophagous Syrphidae (Diptera). *Ecological Entomology* 9, 303-310.
- Sarafi, T., Barahoei, H., Madjdzadeh, S.M., Askari, M. 2014. New record of Diplazontinae (Hym.: Ichneumonidae), parasitoids of Syrphidae (Diptera) from Iran. Third National Conference of Pest Control. Kerman, 627.

- Sedivy, J. 1983. Tersilochinae as parasitoids of insect pests of winter rape (Hymenoptera: Ichneumonidae). *Contributions to the American Entomological Institute* 20, 266-276.
- Sedivy, J. 1986. The hosts of Ichneumon flies in Europe (Hymenoptera, Ichneumonidae). *Acta Entomologica Bohemoslovaca* 83,10-23.
- Thirion, C. 1994. Les Diplazontinae (Hymenoptera Ichneumonidae) en Belgique et dans les régions limitrophes. Deuxième contribution. *Notes Fauniques de Gembloux* 29, 3-100.
- Townes, H. 1969. The genera of Ichneumonidae, part 1. *Memoirs of the American Entomological Institute* 11, 1-300.
- Zarepour, A.R., Talebi, A.A., Loni, S. 2008. Fauna of Ichneumonid wasps from Yazd, Iran. *Journal of Entomological Research* 2, 13-20.
- Zarepour, A.R., Talebi, A.A., Vafaei Shoushtari, R. 2009. Three new species records of Ichneumonid wasps, (Hym., Ichneumonidae) from Yazd, Iran. *Journal of Entomological Research* 1, 67-77.
- Yarrow, W.H.T. 1970. Parasites of *Plutella xylostella* (L.) in south-eastern Queensland. *Queensland Journal of Agriculture and Animal Science* 27, 321-324.
- Yu, D.S., Van Achterberg, K., Horstmann, K. 2012. World Ichneumonidae 2011. Taxonomy, Biology, Morphology and Distribution. www.taxapad.com.