A survey on Ichneumonidae of Isfahan province, central Iran

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Abstract: Fauna of Ichneumonidae of Isfahan province was studied in 2012. Specimens were collected using sweep net and Malaise trap on various plants from different places in Isfahan. Totally, 18 species belong to 16 genera and 7 subfamilies were collected and identified as: Anomalon cruentatum (Geoffroy, 1785) (Anomaloninae); Exetastes syriacus Schmiedeknecht, 1910 (Banchinae); Diplazon laetatorius (Fabricius, 1781), Enizemum ornatum (Gravenhorst, 1829), Homotropus nigritarsus (Gravenhorst, 1829), Homotropus signatus (Gravenhorst, 1829), Promethes sulcator (Gravenhorst, 1829) and Syrphophilus bizonarius (Gravenhorst, 1829) (Diplazontinae); Anisobas cingulatellus Horstmann, 1997, Diadromus collaris (Gravenhorst, 1829), Heterischus filiformis (Gravenhorst, 1829) and Spilothyrateles nuptatorius (Fabricius, 1793) (Ichneumoninae); Exochus castaniventris Brauns, 1896 (Metopiinae); Itoplectis alternans (Gravenhorst, 1829), Itoplectis tunetana (Schmiedeknecht, 1914), Pimpla spuria Gravenhorst, 1829 and Zaglyptus multicolor (Gravenhorst, 1829) (Pimplinae) and Aneuclus incidens (Thomson, 1889) (Tersilochinae). All species are new record for Isfahan province except for Exochus castaniventris and Heterischus filiformis is newly recorded from Iran.

Keywords: Heterischus filiformis, distribution, new record, Isfahan

Introduction

The family Ichneumonidae is an extremely large group of insects with about 60,000 estimated species classified into 48 subfamilies (Yu et al., 2012). Species of this family are important biological control agents of insect pests in the orders Coleoptera, Diptera, Hymenoptera and Lepidoptera (Townes, 1971; Wahl, 1993; Gauld et al., 2002; Finch, 2005; Gauld and Dubois, 2006; Sugonyaev, 2006). Until now, 36 species of ichneumonids belonging to 11 subfamilies were reported with host from Iran including: Acaenitinae (1 species), Anomaloninae (2 species), Campopleginae (8 species), Cremastinae (2 species), Cryptinae (8 species), Diplazontinae (2 species), Ichneumoninae (7 species), Pimplinae (5 species) and Xoridinae (1 species) (Barahoei et al., 2012).

Yet, 540 species belonging to 24 subfamilies have been recorded for the fauna of Iran (Nikdel and Diller, 2011; Abbasipour et al., 2012; Barahoei et al., 2012, 2014a; Ghahtari and Schwarz, 2012; Mohammadi-khoramabadi and Talebi, 2013), of which 27 species have been reported from Isfahan province (Barahoei et al., 2012, 2014a). Two subfamilies, Ichneumoninae Latreille and Cryptinae Kirby have 199 and 99 reported species, respectively, comprising the most species-rich groups of the ichneumonids Iran.

In this paper we present new information on occurrence of some species of the subfamilies

Handling Editor: Dr. Ali Asghar Talebi

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Received: 28 June 2014, Accepted: 12 November 2014
Published online: 15 December 2014
Anomaloninae, Banchinae, Diplazontinae, Ichneumoninae, Metopiinae, Pimplinae and Tersilochinae from Isfahan province.

Materials and Methods

The sampling was carried out during June-November 2012 in several parts (Ahmadreza, Baba peerahmad-ben, Chamtagh, Darafshan, Filour, Flavarjan, Hoyeh, Jafarabad, Morghab, Najafabad, Nazhvan, Neysian, Sadeghabad, Tanbak) of Isfahan province (Fig. 1). Specimens were collected using sweep net and Malaise traps on various plants in different habitats including alfalfa, wheat and weeds. The specimens were extracted from the Malaise traps bi-weekly. The collected specimens were moved into ethanol 75%, then dried, pinned, mounted and labeled.

The external morphology of specimens was studied using NIKON SMZ645 stereomicroscope. Terminology of morphological characters follows Gauld (1991). Nomenclature and distribution data are mainly taken from Yu et al. (2012). The specimens were deposited in the Insect Collection at Zabol University, Zabol, Iran.

Figure 1 Map of the sampling localities at Isfahan province.
Results

Totally, 144 specimens of Ichneumonidae belonging to six subfamilies, 16 genera and 18 species were collected and identified, of which _Heterischnus filiformis_ (Gravenhorst, 1829) (Ichneumoninae) is newly recorded from Iran. All species are new records for Isfahan province except _Exochus castaniventris_ Brauns, 1896. The data are sorted according to the valid name, author and year, material examined, distribution in Iran and general distribution.

**Subfamily Anomaloninae Viereck, 1918**

**Tribe Anomalonini Viereck, 1918**

_Anomalon cruentatum_ (Geoffroy, 1785)


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

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

**Subfamily Banchinae Wesmael, 1845**

**Tribe Atrophini Seyrig, 1932**

_Exetastessyriacus_ Schmiedeknecht, 1910


Distribution in Iran: Khorasan-e-Razavi (Barahoei et al., 2014b).

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

**Subfamily Diplazontinae Viereck, 1918**

_Diplazon laetatorius_ (Fabricius, 1781)


Distribution in Iran: West Azerbaijan, Khorasan-e-Shomali (Malkeshi and Kheiabani, 1997), Guilan, Mazandaran, Qazvin, Tehran (Mohammadi-Khoramabadi et al., 2013b), Kerman (Kolarov and Ghahari, 2005; Mohammadi-Khoramabadi et al., 2014), Chaharmahal-o-Bakhtiari (Nourbakhsh et al., 2008), Mazanderan (Kolarov and Ghahari, 2005; Mohammadi-Khoramabadi et al., 2013b), Sistan and Baluchestan (Barahoei et al., 2013a), Yazd (Zarepour et al., 2008, 2009).

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

_Enizemum ornatum_ (Gravenhorst, 1829)


Distribution in Iran: Guilan, Mazanderan, Qazvin, Tehran (Mohammadi-Khoramabadi et al., 2013b).

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

_Homotropus nigritarsus_ (Gravenhorst, 1829)


Distribution in Iran: Kerman (Mohammadi-Khoramabadi et al., 2014), Qazvin (Mohammadi-Khoramabadi et al., 2013b), Sistan and Baluchestan (Barahoei et al., 2013a).

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

_Homotropus signatus_ (Gravenhorst, 1829)


Distribution in Iran: Guilan, Mazandaran, Qazvin, Tehran (Mohammadi-Khoramabadi et al., 2013b).

General distribution: Nearctic, Palaearctic (Yu et al., 2012).
Promethes sulcator (Gravenhorst, 1829)
Material examined: 1 ♀, Malaise trap, Tanbak, 06-X-2012; 1 ♀, swept on Cercium sp., Nazhvan, 11-VI-2012; 1 ♀, swept on Poaceae weed, Chamtagh, 20-VIII-2012; 2 ♀♀ 1♂, swept on Medicago sativa L., Hoyeh, 16-VI-2012; 1 ♀ 1♂, Malaise trap, Nazhvan, 11-VI-2012, Leg. E. Nader.
Distribution in Iran: Guilan, Tehran (Mohammadi-Khoramabadi et al., 2013b), Sistan and Baluchestan (Barahoei et al., 2013a).
General distribution: Nearctic, Palearctic, Oriental (Yu et al., 2012).

Syrphophilus bizonarius (Gravenhorst, 1829)
Material examined: 1 ♀ 1♂, swept on Poaceae weed, Filour, 28-IX-2012; 1 ♀ 12♂♂, swept on Poaceae weed, Darafshan, 07-XI-2012; 2♂♂, Malaise trap, Flavarjan, 02-VI-2012; 1♂, Malaise trap, Najafabad, 01-VII-2012, Leg. E. Nader.
Distribution in Iran: Gilan, Mazanderan, Qazvin, Tehran (Mohammadi-Khoramabadi et al., 2013b).
General distribution: Nearctic, Palearctic, Oriental (Yu et al., 2012).

Subfamily Ichneumoninae Latreille, 1802
Tribe Ichneumonini Latreille, 1802
Spilothyrateles nuptatorius (Fabricius, 1793)
Material examined: 1♂, Malaise trap, Najafabad, 01-VII-2012, Leg. E. Nader.
Distribution in Iran: Golestan (Kolarov and Ghahari, 2005).
General distribution: Palearctic (Yu et al., 2012).

Tribe Listrodromini Förster, 1869
Anisobas cingulatellus Horstmann, 1997
Material examined: 2♀ 2♂♂, Malaise trap, Tanbak, 06-X-2012, Leg. E. Nader.
Distribution in Iran: Semnan (Kolarov and Ghahari, 2008), Tehran (Masnadian Jussila, 2008).
General distribution: Palearctic (Yu et al., 2012).

Tribe Phaeogenini Förster, 1869
Diadromus collaris (Gravenhorst, 1829)
Distribution in Iran: Golestan (Kolarov and Ghahari, 2008; Ghahari and Jussila, 2011a), Semnan (Ghahari, 2012), Sistan and Baluchestan (Firuzi Jahantighi et al., 2012; Barahoei et al., 2013a).
General distribution: Neotropical, Ethiopian, Palearctic, Australasian (Yu et al., 2012).

Heterischus filiformis (Gravenhorst, 1829)
(Figs. 2, 3)
Distribution in Iran: new record from Iran.
General distribution: Europe (Yu et al., 2012).
Diagnostic characters: The three basal and the four apical flagellomeres black, others brown, white in the middle (Fig. 3A), flagellar segments with tyloid in male specimen, head black, without yellow drawing, gena weakly punctured, frons with dense and rough punctation, temple deep, occiput weakly punctured (Figs. 2A, B), notauli broad and shallow depressed (Figs. 2C, D), forewings with irregular pentagonal areola, 2m-cu with 2 bullae (Fig. 2E), trochanter brown (Fig. 3A), propodeum carinated, with central areola (Fig. 2F), second abdominal tergite long and wide (Figs. 3A, B), the last two metasomal tergites black with white posterior margins (Fig. 2G), ovipositor sheet short, white in basal 1/4 and black in remaining ¾ (Fig. 2G), body length: 8-9 mm in female and 6-7 mm in male (Fig. 3).
Figure 2 The external morphology of female specimen of *Heterischmus filiformis* (Gravenhorst): A- lateral view of head; B- anterior view of head; C- lateral view of thorax, propodeum and first segment of gaster; D- dorsal view of head and mesoscutum; E- forewing; F- dorsal view of propodeum and first segment of gaster; G- hind segments of gaster and ovipositor sheets.

Figure 3 Lateral view of *Heterischmus filiformis* (Gravenhorst): A) female specimen, B) male specimen.
Subfamily Metopiinae Förster, 1869

*Exochus castaniventris* Brauns, 1896


Distribution in Iran: Isfahan, Tehran (Masnadi and Jussila, 2009), Qazvin (Ghahari and Schwarz, 2012), Semnan (Ghahari, 2012).

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

Subfamily Pimplinae Wesmael, 1845

Tribe Ephialtini Hellén, 1915

*Zaglyptus multicolor* (Gravenhorst, 1829)

Material examined: 1♀ 1♂, Malaise trap, Ahmadreza, 19-VI-2012; 1♀, Malaise trap, Baba peerahmad-ben, 22-VI-2012, Leg. E. Nader.

Distribution in Iran: Kerman, Khorasan-e-Razavi, Mazandaran, Golestan (Kolarov and Ghahari, 2006), Guilan, Tehran (Mohammadi-Khoramabadi et al., 2013a).

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

Subfamily Tersilochinae Schmiedeknecht, 1910

*Aneuclis incidens* (Thomson, 1889)

Material examined: 1♀, swept on Poaceae weed, Filour, 28-IX-2012; 1♂, Malaise trap, Tanbak, 06-X-2012, Leg. E. Nader.

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

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

Discussion

During this survey eighteen species of six subfamilies of the family Ichneumonidae were collected and identified in association with general field crops of Isfahan province. The subfamily Diplazontinae with seven species (73 Individuals) was the most abundant subfamily in this area during the sampling period. They are koinobiont endoparasitoids of Syrphidae (Diptera) (Sugonyaev, 2006), and this is why they were more common at the middle to end of growing season, when many syrphid species are associating with aphids on field crops. Up to now, 19 species of the subfamily Diplazontinae are reported from Iran (Barahoei et al., 2012; Mohammadi-Khoramabadi et al., 2013b).

Three subfamilies Anomaloninae, Banchinae and Metopiinae were only represented by only a single species in alfalfa fields. They were recorded as parasitoids of Lepidoptera larvae (Townes, 1971; Wahl, 1993). *Anomalon cruentatum* has been well recorded as parasitoid of
noctuid moth pests like *Agrotis ipsilon* (Hufnagel), which is common in alfalfa and other field crops (Okyar and Yurtcan, 2007). Until now, 13 species from the subfamily Anomaloninae (Nikdel and Diller, 2011; Barahoei et al., 2012; Ghahari and Schwarz, 2012) and 10 species of Banchinae and seven species of Metopiinae are reported from Iran (Barahoei et al., 2012).

The subfamily Ichneumoninae is one of the largest groups of the ichneumonids (Yu et al., 2012), with only 169 recorded species from Iran, of which seven species had already been reported from Isfahan province (Kolarov and Gahhari, 2005, 2008; Masnadiad Jussila, 2008; Gahhari and Jussila, 2011b; Barahoei et al., 2012; Gahhari and Schwarz, 2012). In the present survey, we found two species of Ichneumoninae, of which *Heterischnus filiformis* is newly recorded for the fauna of Iran. This is also the first record of this species outside Europe. It has also been recorded in association with the noctuid moths (Rudow, 1917).

The recorded species of the subfamily Pimplinae are all considered to have a complicated biology ranging from parasitoid to hyperparasitoid of various insect groups (Aubert, 1969; Pisiaand Diacou, 2000). *Zaglyptus multicolor* is a parasitoid of the spiders (Aubert, 1969). Among 62 recorded species of Pimplinae, none has been yet reported from Isfahan province (Barahoei et al., 2012; Gahhari and Schwarz, 2012; Mohammad-Khoramabadi et al., 2013a). The relatively small subfamily Tersilochinae with worldwide distribution comprises 234 species in 13 genera, represented with only four recorded species from Iran (Barahoei et al., 2012). They are parasitoids of Coleoptera (Curculionidae), Lepidoptera (Eriocraeiidae) (Jordan, 1998) and sawflies (Tenthredinidae and Xyelidae) (Al-Saffar and Aldrich, 1997; Khalaim and Blank, 2011). *Aneuclis incidens* has been recorded as a parasitoid of Anobiidae and Nitidulidae (Starke, 1956; Sedivy, 1983) which can be commonly encountered on flowering weeds within the field crops.

The results of this survey indicates existence of diverse range of the ichneumonids in Isfahan province, many of them are waiting for subsequent explorations. Furthermore, it is necessary to complement these finding with the biological data, especially on host association and seasonal occurrence.

**Acknowledgements**

We express our gratitude to Martin Schwarz (Eben 21, A-4202 Kirchschlag, Austria) and Matthias Riedel (Klinik Fallingbostel, Kolkweg 1, D-29683 Bad Fallingbostel, Germany) for identification of some species.

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بررسی زنبورهای خانواده Ichneumonidae در استان اصفهان، مرکز ایران

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چکیده: فون زنبورهای خانواده Ichneumonidae در استان اصفهان در سال 1391 مورد بررسی قرار گرفت. نمونه‌ها به‌وسیله نور حشره‌گیری و تله مالز روى گیاهان مختلف از مناطق مختلف در استان اصفهان جمع‌آوری گردید. در مجموع 18 گونه متعلق به 16 جنس و 7 زیرخانواده جمع‌آوری و شناسایی شد که عبارتند از: (1785) Anomalon cruentatum (Geoffroy) از زیرخانواده Anomaloninae، (1810) Exetastes syriacus Schmiedeknecht از زیرخانواده Banchinae، (1781) Diplazon laetatorius Fabricius از زیرخانواده Diplazoninae، (1829) Anisobas cingulatellus Horstmann از زیرخانواده Ichneumoninae، (1829) Diadromus collaris Gravenhorst از زیرخانواده Diplazoninae، (1829) Anisobas cingulatellus Horstmann از زیرخانواده Ichneumoninae، (1829) Diplazon laetatorius Fabricius از زیرخانواده Diplazoninae، (1829) Enizemum ornatum (Gravenhorst)، (1829) Jaetatorius (Fabricius)، (1829) Anisobas cingulatellus Horstmann، (1829) Diplazoninae

کلیدی: Heterischinus filiformis

واژگان کلیدی: Heterischinus filiformis