

A study on the family Eulophidae (Hymenoptera: Chalcidoidea) from Iran

Изучение семейства Eulophidae (Hymenoptera: Chalcidoidea) Ирана

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Twenty-eight eulophid species from 12 genera of the Eulophidae are collected in Iran. Of them, 2 genera and 8 species are new record for Iranian fauna.

Двадцать восемь видов из 12 родов сем. Eulophidae собраны в Иране. Из них 2 рода и 8 видов из них – новые находки для фауны Ирана.

Key words: Eulophinae, Tetrastichinae, Entedoninae, fauna, Iran

Ключевые слова: Eulophinae, Tetrastichinae, Entedoninae, фауна, Иран

INTRODUCTION

The Eulophidae is one of the most diverse families of parasitoids wasps, currently containing over 4500 species placed in four subfamilies (Entedoninae, Entiinae, Eulophinae and Tetrastichinae) and 332 genera (Noyes, 2013). Eulophidae species are parasitoids of many insect families: Chrysomelidae, Curculionidae (Coleoptera), Agromyzidae, Cecidomyiidae, Drosophilidae, Tephritidae (Diptera), Aleyrodidae, Aphididae (Hemiptera), Cimbicidae, Diprionidae, Pamphiliidae, Tenthredinidae (Hymenoptera), Bucculatricidae, Coleophoridae, Gelechiidae, Gracillaridae, Heliozelidae, Lasiocampidae, Nepticulidae, Pyralidae, Yponomotidae (Lepidoptera) (Hansson, 1985, 1987, 1995; LaSalle and Schauff, 1992; Schauff et al., 1997; Yefremova, 2002; Noyes, 2013). Eulophids have provided a series of extremely valuable experimental model systems for investigating a wide variety of questions in ecology and evolution (Godfray, 1994).

The fauna of Iranian eulophids was studied rather well after reporting *Tetrastichus epilachnae* (Giard, 1896) by Kiryukhin (1948). Iranian eulophids were investigated by Davatchi & Chodjai (1969), Herting (1973), Doganlar (1992), Malekzadeh et al. (1998), Jafari (2000), Malekzadeh (2002), Alavi et al. (2002), Zahiri et al. (2003), Mahani et al. (2003), Rezaei et al. (2003), Rakhshani et al. (2003), Farrokhi et al. (2004), Talebi et al. (2005), Hesami et al. (2005, 2006a, 2006b, 2007, 2009, 2010), Asadi et al. (2006), Ghahari et al. (2006), Fallahzadeh et al. (2006), Fathipour et al. (2006), Haghani et al. (2007), Nazemi-Rafie et al. (2007), Yefremova et al. (2007), Dousti (2007, 2008), Dousti et al. (2008), Lotfalizadeh et al. (2008), Ebrahimi et al. (2009), Hesami (2009), Saeedifar et al. (2010), Fallahzadeh et al. (2011), Fathi (2011), Mahmoudi et al. (2011), Yegorenkova et al. (2011), and Ghahari (2012). Talebi et al. (2011) catalogued all the data on Iranian Eulophidae, and listed 106 species belonging to 37 genera. Later Hesami et al. (2011)

listed 122 species for the fauna of Iran. This study was carried out to determine Eulophidae species collected in various habitats of Iran.

This paper deals with a faunistic study of eulophid wasps from 14 regions of Iran. In total, 28 species from 12 genera were collected and identified. Two genera, *Neochrysocharis* Kurdjumov, 1912 and *Oomyzus* Rondani, 1870, and 8 species, *Aprostocetus pausiris* (Walker, 1839), *Cirrospilus diallus* Walker, 1838, *Hemiptarsenus ornatus* (Nees, 1834), *H. unguicellus* (Zetterstedt, 1838), *Neochrysocharis formosa* (Westwood, 1833), *Oomyzus sempronius* (Erdős, 1954), *Pediobius metallicus* (Nees, 1834) and *P. nigritarsis* (Thomson, 1878), are new records for the fauna of Iran.

MATERIALS AND METHODS

Specimens for this research were collected from 14 localities of 10 Iranian provinces by using sweeping net (53 specimens), or reared from some hosts in optimum condition (26 ± 2 °C, $65\pm 5\%$ RH, 14:10 L:D) in incubator (14 specimens). The host species and their parasitoids were collected from both cultivated and non-cultivated plants in different areas. For this purpose, we carried out field studies in different localities. Additionally, some specimens preserved in the collections of Islamic Azad University, Shahre Rey and Garmsar Branches, were included to this paper. Almost all specimens were identified by the second author; some specimens were identified by Hannes Baur (Switzerland). All specimens are deposited in the Zoological Institute of the Russian Academy of Science, St Petersburg.

RESULTS

Totally 28 species from 12 genera belonging to 3 subfamilies of the Eulophidae were collected from different regions of Iran. The list of species is given below.

Order HYMENOPTERA

Family EULOPHIDAE

Subfamily EULOPHINAE

Genus *Cirrospilus* Westwood, 1832

C. diallus Walker, 1838

Material examined. Mazandaran province: Qaemshahr, July 2007, 1 female.

Distribution. Palaearctic. **New record for Iran.**

Hosts. Ectoparasitoid of the larva of leaf mining Lepidoptera (Gracillariidae, Leucopteridae, Stigmalidae, Tischeriidae) (Bouček & Askew, 1968).

C. lynceus Walker, 1838

Material examined. Kurdistan province: Kermanshah, March 2008, 2 females.

Distribution. Palaearctic.

Hosts. Ectoparasitoid of the larva of leaf mining Lepidoptera (Gracillariidae, Stigmalidae, Tischeriidae) (Bouček & Askew, 1968).

C. viticola Rondani, 1877

Material examined. West Azerbaijan province: Ourmieh, August 2007, 1 female.

Distribution. Palaearctic.

Hosts. Ectoparasitoid of the larva of leaf mining Lepidoptera (Gracillariidae, Heliozelidae, Leucopteridae, Stigmalidae, Tischeriidae) (Bouček & Askew, 1968).

Genus *Diglyphus* Walker, 1844

D. crassinervis Erdős, 1958

Material examined. Isfahan province: Isfahan, 18 July 2006, 5 females, 3 males.

Distribution. Palaearctic.

Hosts. Ectoparasitoid of the larvae of Diptera (Agromyzidae) (Hesami et al., 2006a).

D. isaea (Walker, 1838)

Material examined. Mazandaran province: Qaemshahr, 14 August 2005, 4 females. Isfahan

province: Khomeynishahr, August 2006, 1 female. Golestan province: Gorgan, 10 September 2007, 3 females, 2 males.

Distribution. Cosmopolitan.

Hosts. Ectoparasitoid of the larva of leaf mining Diptera (Agromyzidae) and Lepidoptera (Gracillariidae) (Bouček & Askew, 1968).

D. poppoea Walker, 1848

Material examined. Isfahan province: Isfahan, 18 July 2006, 1 female. Golestan province: Gorgan, 10 September 2007, 2 females, 1 male.

Distribution. Palaearctic.

Hosts. Ectoparasitoid of the larva of leaf mining Diptera (Agromyzidae) (Bouček & Askew, 1968).

Genus ***Hemiptarsenus*** Westwood, 1833

H. ornatus (Nees, 1834)

Material examined. Golestan province: Gorgan, ex *Liriomyza trifolii* (Burgess) (Diptera: Agromyzidae), 10 September 2007, 1 female.

Distribution. Palaearctic. **New record for Iran.**

Hosts. Ectoparasitoid of the larva of leaf mining Lepidoptera (Gracillariidae, Stigmalidae) and Diptera (Agromyzidae) (Bouček & Askew, 1968).

H. unguicellus (Zetterstedt, 1838)

Material examined. Isfahan province: Najaf-Abad, ex *Ostrinia nubilalis* (Lepidoptera: Pyralidae), 18 July 2006, 2 females. Golestan province: Gorgan, ex *Ceutorhynchus assimilis* Paykull (Coleoptera: Curculionidae), 10 September 2007, 3 females.

Distribution. Nearctic and Palaearctic regions. **New record for Iran.**

Hosts. Ectoparasitoid of Agromyzidae larva (Diptera) and Pyralidae (Lepidoptera) (Bouček & Askew, 1968; Hansson, 1987).

H. varicornis (Girault, 1913)

Material examined. Isfahan province: Najaf-Abad, August 2006, 1 female, 1 male. Isfahan

province: Khomeynishahr, August 2006, 1 male. Khorasan province: Mashhad, September 2006, 1 female.

Distribution. Afrotropical, Palaearctic, Oriental and Australian regions.

Hosts. Endoparasitoid of mining Agromyzidae (Diptera) (Yefremova et al., 2007).

Genus ***Hyssopus*** Girault, 1916

H. geniculatus (Hartig, 1838)

Material examined. Golestan province: Gorgan, March 2007, 1 female, 1 male.

Distribution. Palaearctic.

Hosts. Ectoparasitoid of the larva of Lepidoptera (Gelehiidae, Pyralidae, Tortricidae) (Bouček & Askew, 1968; Yefremova et al., 2007).

Genus ***Pnigalio*** Schrank, 1802

P. pectinicornis (Linnaeus, 1758)

Material examined. Isfahan province: Isfahan, 18 July 2006, 2 females.

Distribution. Palaearctic.

Hosts. Ectoparasitoid of the larva of leaf mining Lepidoptera (Gracillariidae, Leucopteridae, Tischeriidae), *Rynchanus* sp. (Coleoptera) and Diptera (Agromyzidae) (Bouček & Askew, 1968).

P. soemius (Walker, 1839)

Material examined. East Azerbaijan province: Arasbaran, 21 June 2006, 1 female. Isfahan province: Najaf-Abad, August 2006, 1 female.

Distribution. Palaearctic.

Hosts. Ectoparasitoid of the larva of leaf mining Lepidoptera (Gelehiidae, Gracillariidae, Leucopteridae, Tischeriidae), *Rynchanus* sp. (Coleoptera) and Diptera (Agromyzidae) (Bouček & Askew, 1968; Hansson, 1987).

Genus ***Sympiesis*** Förster, 1856

S. gordius (Walker, 1839)

Material examined. Guilan province: Lahijan, September 2006, 1 male.

Distribution. Palaearctic.

Hosts. Ectoparasitoid of the larva of leaf mining Lepidoptera (Gracillariidae, Tischeriidae) (Bouček & Askew, 1968; Hansson, 1987).

Subfamily TETRASTICHINAE

Genus *Aprostocetus* Westwood, 1833

A. (*Aprostocetus*) *ceroplastae* (Girault, 1916)

Material examined. West Azerbaijan province: Ourmieh, August 2007, 3 females.

Distribution. Afrotropical, Nearctic and Palaearctic regions.

Hosts. Endoparasitoid of Hemiptera (Coccidae) (Wakgari & Giliomee, 2001).

A. (*Aprostocetus*) *forsteri* (Walker, 1847)

Material examined. Golestan province: Gorgan, 10 September 2007, 1 female.

Distribution. Palaearctic.

Hosts. Endoparasitoid of Tephritidae (Diptera) and *Aylax* sp. (Hymenoptera: Cynipidae) (Jennings, 2009).

A. (*Aprostocetus*) *lachares* (Walker, 1839)

Material examined. West Azerbaijan province: Ourmieh, August 2007, 1 female.

Distribution. Palaearctic.

Hosts. Unknown.

A. (*Aprostocetus*) *pausiris* (Walker, 1839)

Material examined. East Azerbaijan province: Arasbaran, 21 June 2006, 2 females.

Distribution. Nearctic and Palaearctic regions. **New record for Iran.**

Hosts. Parasitoid of Cecidomiidae (Diptera) (Graham, 1987).

A. (*Aprostocetus*) *zosimus* (Walker, 1839)

Material examined. Mazandaran province: Qaemshahr, 14 August 2005, 1 female.

Distribution. Nearctic and Palaearctic regions.

Hosts. Parasitoid of Cecidomiidae (Diptera) (LaSalle, 1994).

Genus *Baryscapus* Förster, 1856

B. *erynniae* (Domenchini, 1965)

Material examined. Golestan province: Gorgan, March 2007, 1 female. Kurdistan province: Kamyaran, March 2008, 2 females.

Distribution. Nearctic, Palaearctic regions.

Hosts. Endoparasitoid, gregarious, larval or nymphal, pupal of Chrysomelidae (Coleoptera) (Domenchini, 1966).

B. *oophagus* (Otten, 1942)

Material examined. West Azerbaijan province: Ourmieh, August 2007, 2 females.

Distribution. Palaearctic.

Hosts. Parasitoid of Diprionidae (Hymenoptera) (Domenichini, 1966; Yefremova et al., 2007).

Genus *Oomyzus* Rondani, 1870

O. *sempronius* (Erdős, 1954)

Material examined. Guilan province: Lahijan, September 2006, 3 females.

Distribution. Palaearctic. **New record for Iran.**

Hosts. Endoparasitoid of Chrysopidae (Neuroptera) (Graham, 1991).

Subfamily ENTEDONINAE

Genus *Chrysocharis* Förster, 1856

Ch. *laomedon* (Walker, 1839)

Material examined. Isfahan province: Khom-eynishahr, August 2006, 2 females.

Distribution. Palaearctic.

Hosts. Endoparasitoid of the larvae and pupae of Lepidoptera (Gracillariidae, Stigmatalidae) (Hansson, 1987).

Genus *Neochrysocharis* Kurdjumov, 1912

N. *formosus* (Westwood, 1833)

Material examined. Mazandaran province: Qaemshahr, ex *Tetralicia erianthi* Danzig (Hemiptera: Aleyrodidae), July 2007, 3 females.

Distribution. Palaearctic and Afrotropical regions. **New record for Iran.**

Hosts. Endoparasitoid of the larvae and pupae of Coleoptera (Chrysomelidae) and Lepidoptera (Tortricidae, Pyralidae, Yponomeutidae) (Hansson, 1995).

Genus *Pediobius* Walker, 1846

P. cassidae Erdős, 1951

Material examined. Isfahan province: Isfahan, 18 July 2006, 3 females.

Distribution. Palaearctic.

Hosts. Endoparasitoid of the larvae and pupae of Lepidoptera (Gracillariidae, Gelechiidae, Yponomeutidae, leucopteridae, Lymantriidae, Tortricidae) (Bouček, 1965).

P. metallicus (Nees, 1834)

Material examined. East Azerbaijan province: Arasbaran, ex *Liriomyza cicerina* (Rondani) (Diptera: Agromyzidae), 21 June 2006, 2 females. Golestan province: Gorgan, ex *L. trifolii* (Burgess), 10 September 2007, 3 females.

Distribution. Palaearctic. **New record for Iran.**

Hosts. Endoparasitoid of the larvae and pupae of Lepidoptera (Gracillariidae, Stigmatalidae, Tortricidae) and Diptera (Agromyzidae) (Hansson, 1987).

P. nigritarsis (Thomson, 1878)

Material examined. Mazandaran province: Qaemshahr, 14 August 2005, 2 females, 1 male.

Distribution. Palaearctic and Nearctic regions. **New record for Iran.**

Hosts. Endoparasitoid of the larvae of Cephidae (Hymenoptera) (Bouček, 1965).

P. pyrgo (Walker, 1839)

Material examined. Isfahan province: Khomeynishahr, August 2006, 3 females, 3 males. Guilan province: Lahijan, September 2006, 6 females. Mazandaran province: Ramsar, September 2006, 5 females, 4 males. Golestan province: Gorgan, March 2007, 2 females, 3 males. Mazandaran province: Qaemshahr, July 2007, 2 males. West Azerbaijan province: Ourmieh, August 2007, 7 females. Khuzestan province: Ahwaz, March 2008, 1 male. Kurdistan province: Kamyaran, March 2008, 3 females, 2 males.

Distribution. Palaearctic and Nearctic regions.

Hosts. Endoparasitoid of the larvae and pupae of Curculionidae (Coleoptera) and Tachinidae (Diptera) (Bouček, 1965).

P. saulius (Walker, 1839)

Material examined. East Azerbaijan province: Khodafarin, June 2006, 4 females. Isfahan province: Najaf-Abad, August 2006, 3 females, 2 males. Isfahan province: Khomeynishahr, August 2006, 8 females. Khorasan province: Mashhad, September 2006, 8 females. Guilan province: Lahijan, September 2006, 6 females. Golestan province: Gorgan, March 2007, 2 females. Golestan province: Gorgan, 10 September 2007, 2 females. West Azerbaijan province: Ourmieh, August 2007, 11 females. Khuzestan province: Ahwaz, March 2008, 14 females. Kerman province: Jiroft, April 2008, 24 females.

Distribution. Palaearctic.

Hosts. Endoparasitoid of the larvae and pupae of Curculionidae (Coleoptera) (Bouček, 1965).

DISCUSSION

Upon the several conducted researches on Iranian Eulophidae, the species diversity of these beneficial insects was studied rather well in Iran (see the references). Almost all the Iranian eulophid species were recorded from Fars province, and a few others were collected and identified from northern and central parts of Iran. Our additions to the checklist of Iranian Eulophidae (Talebi et al. 2011; Hesami et al. 2011) were collected in provinces East Azerbaijan, Kurdistan and West Azerbaijan where the species has never been collected before. After this investigation, the fauna of Iranian Eulophidae increases to 128 species and 40 genera. However, Iran is a large country incorporating various geographical regions and climates, and we expect that a large number of species remain to be discovered.

Eulophid wasps are powerful parasitoids of several important agricultural pests, especially Agromyzidae (Diptera). Sampling surveys by the first author in different re-

gions of Iran indicates that application of wide spectrum pesticides (especially Diazinon) damage to these parasitoids severely. Conserving these natural enemies will be resulted to decreasing of the pest population density. We believe that eulophids can control their host pests if they are conserved upon the IPM programs.

ACKNOWLEDGEMENTS

The authors are grateful to H. Baur (Natural History Museum Berne, Switzerland) and Z. Bouček (United Kingdom) for identification of some specimens, and J. La Salle (Australia) for sending the necessary papers. This study was supported by the Shahre Rey Islamic Azad University (Iran) and Ul'yanovsk State Pedagogical University (Russia).

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Received October 23, 2012 / Accepted November 20, 2013