

A Contribution to the Fauna of Opiinae (Hym.: Braconidae) of Kerman Province South-Eastern Iran

Mahnaz RANJBAR¹ Seyed Massoud MADJDZADEH²
Francisco Javier PERIS-FELIPO³ Majid ASKARI⁴ Ehsan RAKHSHANI⁵

^{1,2,4} Department of Biology, Faculty of Sciences, Shahid Bahonar University of Kerman, Kerman, IRAN

³ Bleichstrasse 15, CH-4058 Basel, SWITZERLAND

⁵ Department of Plant Protection, College of Agriculture, University of Zabol, Zabol, P.O. Box: 98615-538, I. R. IRAN

e-mails: ¹mahnazranjbar59@yahoo.com, ²madjdzadeh@uk.ac.ir, ³majidask@gmail.com, ⁴peris.felipo@gmail.com, ⁵rakhshani@uoz.ac.ir

ABSTRACT

The present paper provides information about the Opiinae (Hymenoptera: Braconidae) species captured in the South-Eastern of Iran. A total of 11 species belonging to four genera have been listed of which three species viz. *Biophthora bajula* (Haliday, 1837), *Opius circinus* Papp, 1979, and *Opius (Odontopoea) paranivens* Fischer, 1990 are reported for the first time from Iran.

Key words: Hymenoptera, Braconidae, Opiinae, new records, Iran.

INTRODUCTION

Braconidae is one of the largest families of the parasitoid wasps worldwide and is grouped into about 45 subfamilies (van Achterberg, 1993). The subfamily Opiinae contains approximately 1.968 catalogued species worldwide (Yu *et al.*, 2012). Opiines are small (1-3 mm) size insects, usually with a short body and relatively long forewings (Tobias *et al.*, 1986). They are considered as koinobiont parasitoids of mainly mining or fruit-infesting dipterous larvae (Yu *et al.*, 2012). Hosts are just known for approximately 300 species, mostly belonging to the dipteran families Agromyzidae, Anthomyiidae, Drosophilidae, Ephydriidae, Psilidae, Scatophagidae and Tephritidae (Fischer, 1971a, 1971b, 1972a, 1977, 1987; Shaw and Huddleston, 1991). Several species are considered as important biocontrol agents of leaf mining Agromyzidae and fruit-infesting Tephritidae (Fischer, 1971b; Wharton, 1984, 1997; Schuster and Wharton, 1993; Salvo and Valladares, 1995). There is currently little information about Opiinae and its fauna is poorly known in Iran. First records were made by Fischer (1960, 1963, 2001). Fallahzadeh and Saghaei (2010) recorded seven species belonging to four genera *Eurytenes*, *Fopius*, *Opius* and *Phaedrotoma*. Recently the number of known Opiinae species for Iranian fauna showed a significant growing (Ghahari *et*

al., 2009, 2010, 2011a, 2011b, 2012a, 2012b; Lashkari *et al.*, 2011; Rastegar *et al.*, 2012). Khajeh *et al.* (2014) published a checklist of 68 Opiinae species. Recently, Gadallah *et al.* (2016) have recorded 101 species for Iran.

The aim of the present contribution was to initiate a primary step to increase the knowledge of this large group of parasitoid wasps in Kerman province, South-Eastern of Iran.

MATERIAL AND METHODS

The specimens were collected by standard sweeping net from 2012 to 2013. Six different habitats located in Kerman province (South-Eastern Iran) were chosen: Gughar, Dashtkar, Lalehzar, Negar, Bardsir and Qal-eh-Askar. Sampling were carried out in dominant crop plants including *Hordeum vulgare* L., *Medicago sativa* L., *Triticum aestivum* L., *Solanum tuberosum* L., *Cucumis sativus* L., and *Lycopersium esculentum* Mill., as well as neighboring weeds and shrubs. The collected specimens were directly dropped into 75% ethanol and transferred to the laboratory where they were subsequently dried, card-mounted and labeled. The specimens were then softened in laboratory using AXA method and mounted on triangular point card. The external morphology of specimens was examined using a Nikon SMZ800 stereomicroscope. The identified material is deposited in the insect collection of the Department of Biology, Shahid Bahonar University of Kerman (Iran) and in the Entomological Collection of University of Valencia (ENV). Classification and nomenclature for each species follow Yu *et al.* (2012).

RESULTS

Four genera including 11 species of Opiinae (Hym., Braconidae) were identified from Kerman province. They include eight previously reported species and three new recorded species for the Iranian fauna. The new species records are marked with an asterisk in the text.

Biophthora bajula* (Haliday, 1837)

Material examined: Iran: 1♀, Kerman province, Negar, 33°4'10.1"N 47°92'42"E, 2092 m, 24.5.2013, swept on *Medicago sativa* L. (M. Ranjbar leg.).

Distribution in Iran: Kerman province.

General distribution: Australia, Germany, Iran (new record), Ireland, Iceland, Hungary, Netherlands and Turkey (Yu *et al.*, 2012).

***Biosteres (Chilotrichia) carbonarius* (Wesmael, 1835)**

Material examined: Iran: 1♂, Kerman province, Negar, 33°41'13.0"N 47°90'7"E, 2087 m, 19.4.2013, swept on *Descurainia sophia* L. (M. Ranjbar leg.).

Distribution in Iran: Lorestan: Alashtar and Khorramabad (Ghahari *et al.* 2012a) and Kerman provinces.

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General distribution: Albania, Austria, Belgium, Bulgaria, Croatia, Canada, Czech Republic, Denmark, England, Estonia, Faeroe Islands, Finland, France, Germany, Hungary, Iceland, Iran, Ireland, Italy, Japan, Korea, Lithuania, Montenegro, Netherlands, Norway, Poland, Russia, Serbia, Slovakia, Sweden, Switzerland, Turkey and U.S.A (Yu *et al.*, 2012).

Opius circinus* Papp, 1979

Material examined: Iran: 1♂, Kerman province, Bardsir, 33°10'82.9"N 46°30'95"E, 2064 m, 4.7.2013, swept on *Medicago sativa* L. (M. Ranjbar leg.).

Distribution in Iran: Kerman province.

General distribution: Hungary, Iran (new record), Finland, Korea and Slovakia (Yu *et al.*, 2012).

***Opius (Opiothorax) longicornis* Thomson, 1895**

Material examined: Iran: 1♂, 1♀, Kerman province, Negar, 33°4'37.4"N 48°77'64"E, 2125 m, 16.5.2013, swept on *Medicago sativa* L. (M. Ranjbar leg.); 1♂, Kerman province, Gughar, 32°59'74.1"N 44°36'30"E, 2594 m, 5.6.2013, swept on *Mentha longifolia* L. (M. Ranjbar leg.); 1♂, Kerman province, Bardsir, 33°12'42.7"N 46°13'17"E, 2054 m, 4.7.2013, swept on *Medicago sativa* L. (M. Ranjbar leg.).

Distribution in Iran: Guilan: Talesh (Ghahari *et al.*, 2012b) and Kerman provinces (present study).

General distribution: China and Iran (Yu *et al.*, 2012).

***Opius pallipes* Wesmael, 1835**

Material examined: Iran: 1♀, Kerman province, Negar, 33°4'37.4"N 48°77'64"E, 2125 m, 16.5.2013, swept on *Medicago sativa* L. (M. Ranjbar leg.).

Distribution in Iran: Guilan: Siyahkal (Ghahari *et al.*, 2012b), Sistan- Baluchestan: Zabol and Zahak (Khajeh *et al.*, 2014.) and Kerman provinces (present study).

General distribution: Austria, Belgium, Bulgaria, Canada, China, Croatia, Czech Republic, Denmark, England, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iran, Ireland, Israel, Italy, Kazakhstan, Korea, Lithuania, Mongolia, Montenegro, Netherlands, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, U.S.A., Ukraine and Uzbekistan (Yu *et al.*, 2012).

Opius (Odontopoea) paranivens* Fischer, 1990

Material examined: Iran: 1♀, Kerman province, Negar, 33°4'37.4"N 48°77'64"E, 2125 m, 16.5.2013, swept on *Medicago sativa* L. (M. Ranjbar leg.).

Distribution in Iran: Kerman province.

General distribution: Iran (new record), Island, Finland and Hungary (Yu *et al.*, 2012).

***Opius (Cryptonastes) pygmaeus* Fischer, 1962**

Material examined: Iran: 1♀, Kerman province, Negar, 33°4'13.0"N 47°90'07"E, 2087 m, 17.5.2013, swept on *Medicago sativa* L. (M. Ranjbar leg.); 1♀, Kerman province, Bardsir, 33°10'82.9"N 46°30'95"E,

2064 m, 4.7.2013, swept on *Medicago sativa* L. (M. Ranjbar leg.); 2♂, Kerman province, Negar, 33°4'18.7"N 47°89'68"E, 2087 m, 14.3.2013, swept on *Descurainia sophia* L. (M. Ranjbar leg.); 1♀, Kerman province, Bahramjerd, 33°5'63.8"N 49°63'20"E, 2092 m, 17.5.2013, swept on *Glycirhiza glabra* L. (M. Ranjbar leg.).

Distribution in Iran: Fars: Zarghan (Lashkari *et al.*, 2011), Lorestan: Sarab Doreh (Ghahari *et al.* 2012a) and Kerman provinces (present study).

General distribution: Algeria, Austria, Czech Republic, England, Estonia, Finland, France, Germany, Hungary, Iran, Italy, Kazakhstan, Lithuania, Russia, Slovakia, Spain and Turkey (Yu *et al.*, 2012).

Opius (Cryptonastes) tersus (Foerster, 1862)

Material examined: Iran: 1♀, Kerman province, Bardsir, 33°10'82.9"N 46°30'95"E, 2064 m, 4.7.2013, swept on *Medicago sativa* L. (M. Ranjbar).

Distribution in Iran: Guilan: Astaneh Ashrafyeh (Ghahari *et al.* 2012b) and Kerman provinces (present study).

General distribution: Algeria, Austria, Croatia, Czech Republic, Estonia, Finland, France, Germany, Hungary, Iran, Italy, Korea, Montenegro, Poland, Russia, Serbia, Slovakia, Spain, Turkey, Turkmenistan and Uzbekistan (Yu *et al.*, 2012).

Phaedrotoma biroi (Fischer, 1960)

Material examined: Iran: 1♀, Kerman province, Lalehzar, 32°64'07.5"N 48°22'96"E, 2910 m, 5.7.2013, swept on *Medicago sativa* L. (M. Ranjbar); 1♀, Kerman province, Bardsir, 33°10'82.9"N 46°30'95"E, 2064 m, 4.7.2013, swept on *Medicago sativa* L. (M. Ranjbar); 1♀, Kerman province, Negar, 33°4'28.9"N 47°87'46"E, 2096 m, 24.5.2013, swept on *Medicago sativa* L. (M. Ranjbar); 1♀, Kerman province, Negar, 33°41'13.0"N 47°90'7"E, 2087 m, 19.4.2013, swept on *Descurainia sophia* L. (M. Ranjbar).

Distribution in Iran: Golestan: Azadshahr (Ghahari *et al.*, 2011b), Sistan-Baluchestan: Zahak (Khajeh *et al.*, 2014) and Kerman provinces (present study).

General distribution: Iran and Turkey. (Yu *et al.*, 2012).

Phaedrotoma diversa (Szépligeti, 1898)

Material examined: Iran: 1♀, Kerman province, Lalehzar, 32°64'75"N 48°22'96"E, 2910 m, 5.7.2013, swept on *Medicago sativa* L. (M. Ranjbar); 1♀, Kerman province, Negar, 33°4'37.4"N 48°87'64"E, 2125 m, 16.5.2013, swept on *Medicago sativa* L. (M. Ranjbar); 1♀, Kerman province, Bardsir, 33°10'82.9"N 46°30'95"E, 2064 m, 4.7.2013, swept on *Medicago sativa* L. (M. Ranjbar).

Distribution in Iran: Guilan: Astara (Ghahari *et al.* 2012b), Sistan- Baluchestan: Hirmand and Zabol (Khajeh *et al.*, 2014) and Kerman provinces.

General distribution: Austria, Bulgaria, Czech Republic, Denmark, England, Estonia, Finland, France, Germany, Greece, Hungary, Iran, Israel, Italy, Poland, Romania, Russia, Slovakia, Spain, Sweden, Turkey and Uzbekistan (Yu *et al.*, 2012).

Phaedrotoma exigua (Wesmael, 1835)

Material examined: Iran: 1♀, Kerman province, Qal-eh-Askar, 32°66'86.4"N 46°68'45"E, 2617 m, 5.6.2013, swept on *Cicer arietinum* L. (M. Ranjbar).

Distribution in Iran: Lorestan: Chaghalvandi (Ghahari *et al.*, 2012a), Tehran: Tehran (Fischer 1990), Sistan- Baluchestan: Hirmand, Zahak (Khajeh *et al.*, 2014) and Kerman provinces.

General distribution: Afghanistan, Austria, Belgium, Bulgaria, Canary Islands, Czech Republic, Denmark, Egypt, England, Estonia, Ethiopia, Finland, France, Germany, Greece, Hungary, India, Iran, Ireland, Israel, Italy, Kazakhstan, Korea, Liechtenstein, Lithuania, Mongolia, Montenegro, Poland, Portugal, Russia, Serbia, Slovakia, South Africa, Spain, Sweden, Switzerland, Turkey, Turkmenistan and Uzbekistan (Yu *et al.*, 2012).

DISCUSSION

Until this study, no Opiinae species had been recorded from Kerman province but in the present study 11 species were collected from Kerman province (South-Eastern Iran). Of them, three species were recorded for the first time for Iran increasing the number of known Opiinae from 101 to 104 species. Five species collected seem to be common and they have been reported once from other Iranian regions and neighboring countries: *Biosteres (Chilotrichia) carbonarius*, *Opius (Cryptonastes) pygmaeus*, *Opius (Cryptonastes) tersus*, *Phaerotoma biroi*, and *Phaerotoma diversa* (Ghahari *et al.*, 2012a, 2012b; Lashkari *et al.*, 2011; Fischer and Beyarslan, 2013). *Phaerotoma exigua* is widely distributed in several geographic regions such as Ethiopian, Oriental and Palaearctic especially in adjacent countries, Afghanistan, Russia and Turkey and so it is expected to occur widely in different regions of Iran. In Iran this species is reported from Tehran province, northern Iran (Fischer, 1990), Lorestan province (1660 m), South-Western Iran (Ghahari *et al.*, 2012a), and also in Sistan-Baluchestan, South-Eastern Iran where it was collected on *Brassica napus*, *Medicago sativa*, *Trigonella* sp. and *Melilotus officinalis* (Khajeh *et al.*, 2014). On the other hand, some identified species are widespread in Nearctic, Oriental and Palaearctic regions but they have been collected not so frequently in Iran as *Opius pallipes* collected from Northern (Ghahari *et al.*, 2012b) in elevation of 25 m and swept on *Cardaria draba*, *Malva sylvestris*, *Brassica napus* and *Lactuca oleracea* in Sistan-Baluchestan province, South-Eastern Iran (Khajeh *et al.*, 2014), while in the present study it was swept on *Medicago sativa* in higher elevation of 2013 m. It seems this species occurs in other parts of Iran. Species that are not distributed in adjacent countries but occur in far regions are likely to be complex species or probably are misidentified. This is the case with *Opius (Opiothorax) longicornis* which distributed in Iran and China. A few species seems to be very rare in Kerman province as they do not have a world-wide geographic distribution. *Opius (Odontopoea) paranivens* is distributed in Finland, Hungary and Spain (Yu *et al.*, 2012) while it was collected on *M. sativa* in elevation of 2125 m in current study and is reported for the first time from Iran. Members of the subfamily Opiinae are considered as important parasitoids of dipterous pests such as fruit flies (Tephritidae) and leaf-miner flies (Agromyzidae) so they play an important role in the control of these pests (Wharton, 1984; Schuster and Wharton, 1993). There is little information on host association of Opiinae in Iran. Several lines

of evidence have been shown the association of some dipteran species belonging to several families with some opiine species collected in the current study: Agromyzidae, Anthomyiidae, Drosophilidae, Scathophagidae, Tephritidae and Tortricidae (Fischer and Beyarslan, 2013). The host is still unknown for many species including *Opius paranivens*, *O. tersus*, *O. carbonarius*, *Biophtora bajula*, *Phaedrotoma biroi* and *P. diversa*. *Biosteres carbonarius* is considered as host for some species of Anthomyiidae (Diptera) such as *Pegomya betae* (Curtis) and *Pegomya hyoscyami* (Panzer) on *Beta vulgaris*, *Pegomya igratarsis* (Zetterstedt) on *Rumex acetosa*, *Pegomya nigrisquama* (Stein) on *Solidago virgaurea*, *Pegomya steini* Hendel, *Delia antiqua* (Meigen), *Delia brassicae* (Hoffmannsegg in Wiedemann) (Tobias, 2000).

Kerman province is situated on South-Eastern Iran and is the largest province of the country (11.15% of whole country). This region is one in which Zagros Mountains, central mountains and lowland deserts, meet. Extension of Zagros and central mountains has divided this place into two distinct sections, dry deserts and temperate valleys which meet together form three zones: desert and marginal desert, tropical zones and temperate mountain zones; therefore, it is among the rare regions possessing a variety of climates and different aspects of environmental forms. As a result of this geographic isolation, diversity of insect species and habitats is unique. Previous papers show that the major part of Opiinae species had been recorded in North, North-Western, North-Eastern and Southern Iran (Farrar *et al.*, 2009; Ghahari *et al.*, 2009, 2010, 2011a, 2011b, 2012a, 2012b; Lashkari *et al.*, 2011; Rastegar *et al.*, 2012; Khajeh *et al.*, 2014; Ameri *et al.*, 2014; Gadallah *et al.* 2016). This is the first record of the subfamily Opiinae in South-Eastern Iran and all the collected species are new records to Kerman province. It is concluded that the current study could be considered as only a small part of investigations aiming at completing knowledge on faunal diversity of this diverse group of parasitoids in Iran. Further taxonomic investigations together with host association data are necessary to increase the knowledge of diversity and applicability of this group of insects in Kerman Province and also other parts of Iran.

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