

## New data on the fauna of Ichneumonidae from Kerman province with first records of two species to Iran

Abbas Mohammadi-Khoramabadi<sup>1,\*</sup>, Matthias Riedel<sup>2</sup>, Mahdi Ziaaddini<sup>3</sup> & Asieh Asadi<sup>3</sup>

1. Department of Plant Production, Darab College of Agriculture and Natural Resources, Shiraz University, Darab, Fars, Iran 2. Zoologische Staatssammlung München, Munich, Germany & 3. Department of Plant Protection, Faculty of Agriculture, Vali-e-Asr University of Rafsanjan, Rafsanjan, Iran.

\*Corresponding author, E-mail: Mohamadk@Shirazu.ac.ir

### Abstract

The fauna of Ichneumonidae in the upper half of Kerman province was surveyed. Six Malaise traps were installed in three localities, Anar, Shahr-e-Babak and Mahan regions during 2012. The collecting pot of each trap was emptied by an interval of two-four weeks. A total of nine species belonging to four subfamilies, Campopleginae, Cryptinae, Ichneumoninae and Tryphoninae, were identified. *Cymodusa rufiventris* Dbar, 1985 (Campopleginae) and *Netelia (Paropheltes) maculiventris* (Kokujev, 1915) (Tryphoninae) are reported for the first time from Iran. Six species are new records for Kerman province. Diagnostic morphological characters of the newly reported species are provided.

**Key words:** taxonomy, parasitoid, biological control

## داده‌های جدید برای فون Ichneumonidae استان کرمان با اولین گزارش دو گونه از ایران

عباس محمدی خرم‌آبادی<sup>۱\*</sup>، ماتیاس رایدل<sup>۲</sup>، مهدی ضیالدینی<sup>۳</sup> و آسیه اسدی<sup>۳</sup>

۱- بخش تولیدات گیاهی، دانشکده کشاورزی و منابع طبیعی داراب، دانشگاه شیراز، فارس، ایران، ۲- موزه جانورشناسی مونیخ، مونیخ، آلمان و ۳- بخش گیاه‌پزشکی، دانشکده کشاورزی، دانشگاه ولیعصر رفسنجان، رفسنجان، ایران.

\* مسئول مکاتبات، پست الکترونیکی: Mohamadk@Shirazu.ac.ir

### چکیده

فون Ichneumonidae در نیمه بالائی استان کرمان بررسی شد. شش تله مالیز در سه منطقه انار، شهر بابک و ماهان در سال ۱۳۹۳ نصب شد. ظروف جمع‌آوری هر تله به فاصله زمانی ۲ تا ۴ هفته تخلیه شدند. نه گونه متعلق به زیرخانواده‌های Campopleginae، Cryptinae، Ichneumoninae و Tryphoninae مورد شناسائی قرار گرفتند. گونه‌های *Cymodusa rufiventris* Dbar, 1985 و *Netelia (Paropheltes) maculiventris* (Kokujev, 1915) برای اولین بار از ایران گزارش می‌شوند. شش گونه نیز برای استان کرمان گزارش جدید محسوب می‌شوند. ویژگی‌های ریخت‌شناسی افتراقی گزارش‌های جدید ارائه می‌شوند.

واژه‌های کلیدی: تاکسونومی، انگل‌واره، مهار زیستی

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## Introduction

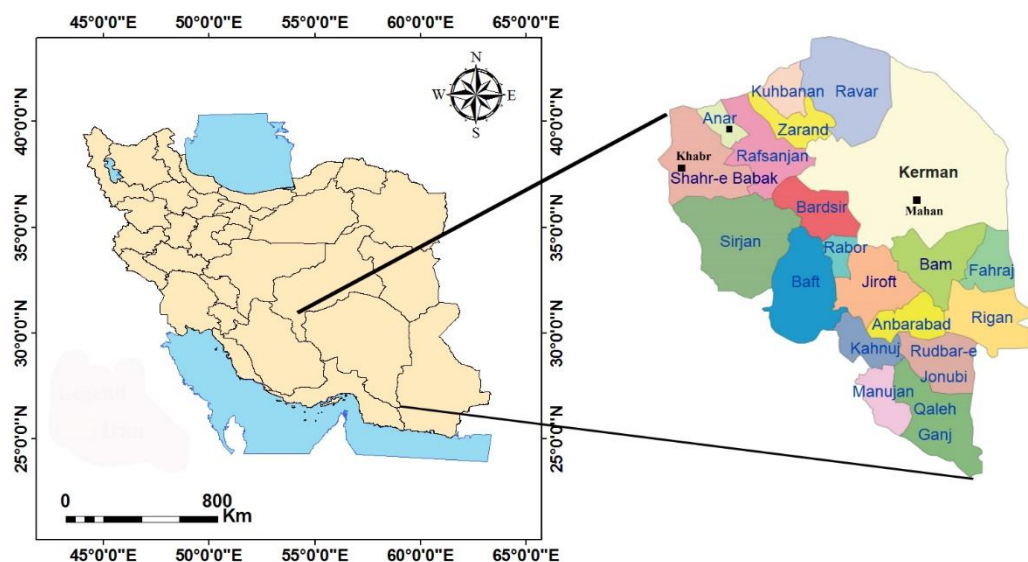
Kerman province is the second broadest province of Iran, including about 11% of the country's total area. Climatologically, this province can be divided in two divisions as the northern, northwestern and central parts of this province (upper half) that have dry and moderate weather whereas the south and southeastern ones (lower half) experience a warm and relatively humid climate (Fig. 1). The fauna of the parasitoid wasps of the family

Ichneumonidae in this vast and diverse province has been more intensively studied in recent years (Bakhtiarynasab *et al.*, 2014a, 2014b; Mohammadi-Khoramabadi *et al.*, 2014, 2016, 2018; Mohebban *et al.*, 2015, 2017, 2019; Schwarz, 2015; Ghahari & Jussila, 2016; Bahreman *et al.*, 2017a, 2017b; Mahyabadi *et al.*, 2018). Also some ichneumonid species have been discovered in this province through bioecological studies (Mehrnejad, 2002; Van Achterberg & Mehrnejad, 2002; Mehrnejad & Basirat, 2009; Schwarz, 2009, 2016; Ghahari *et al.*, 2010; Lotfalizadeh *et al.*, 2012).

A project on the fauna of Ichneumonidae in Kerman province, which a part of its findings were published earlier (Mohammadi-Khoramabadi *et al.*, 2014), has been carried out in 2012. Here, we provide new data on the fauna of Ichneumonidae collected from the upper half of Kerman province, Iran.

## Materials and methods

Materials for this study were collected from Anar (Anar: N= 30° 52', E=55° 16', 1409 m a.s.l.), Shahr-e-Babak (Khabr: N= 30° 32', E=54° 44', 1779 m a.s.l.) and Kerman (Mahan: N= 30° 03', E=57° 17', 1896 m a.s.l.) counties of Kerman province during 2012 (Fig. 1). Two malaise traps were installed in each locality. The collecting pot of each trap was emptied in an interval of two to four weeks. Ichneumonid specimens were then dried and pinned. Identified specimens are deposited in the private collection of Dr. M. Riedel and the Insect Collection of College of Agriculture and Natural Resources of Darab, Shiraz University.



**Fig.1.** Map of Iran, Kerman province and its counties boundaries. Sampling localities are shown by solid squares.

## Results

In a total, 72 ichneumonid specimens were collected from three sampling localities of Kerman province during 2012. They belonged to four subfamilies, Campopleginae, Cryptinae, Ichneumoninae and Tryphoninae, and were identified as follows. Those species indicated with an asterisk are newly recorded from Iran.

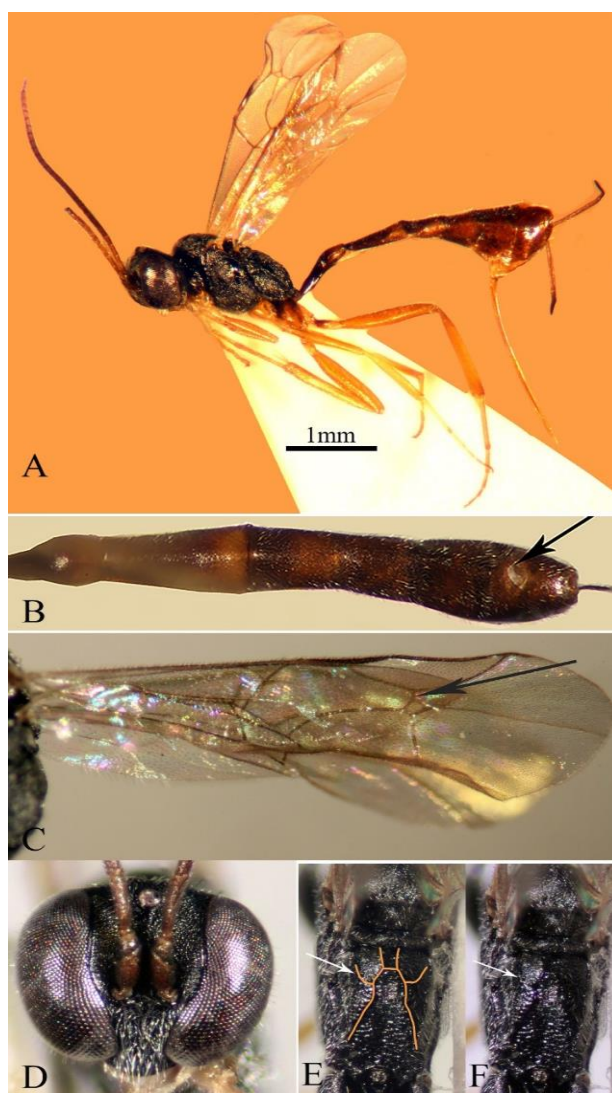
### Subfamily Campopleginae

#### *Cymodusa rufiventris* Dbar, 1985\* (Fig. 2A-F)

**Material examined:** Iran, Shahr-e-Babak county, Khabr, Malaise trap, 2♀, 10-24.V. 2012, leg. A. Asadi.

**Distribution:** Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan (Yu *et al.*, 2016) and Iran (Kerman province, current study).

**Diagnostic morphological characters:** *Cymodusa rufiventris* (Fig. 2A) belongs to the *Australis* group of Dbar (1985). This group is characterized by very narrow genae, extremely close to eyes (Fig. 2D); 6<sup>th</sup> and 7<sup>th</sup> tergites strongly incised (Fig. 2B); and vein 2m-cu meeting areolet before the middle (Fig. 2C). This species is very similar to *C. australis* but differs in having red metasomal tergites IV-VII (Fig. 2A-B) and turning forward costula of propodeum (Fig. 2E-F). The other main diagnostic morphological characters of *C. rufiventris* are as following: metasoma with first tergite having apical red spot, 2<sup>nd</sup> and 3<sup>rd</sup> tergites with apical half red (Fig. 2B); ovipositor sheath less than hind tibia (1:2.2); fore wing with stalked areolet (Fig. 2C); antenna with black flagellum; femora and tibiae red.



**Fig. 2.** *Cymodusa rufiventris*. A) female habitus; B) metasomal tergites (6<sup>th</sup> incised tergite is arrowed); C) wings (the stalked areolet of forewing is arrowed); D) face; E-F) propodeum (the turning forward costula of propodeum is arrowed).

### *Diadegma hispanicum* Horstmann 1973

**Material examined:** Iran, Kerman County, Mahan, 1♀, 3.VI. 2012, Leg.: A. Asadi.

**Distribution:** Spain (Yu *et al.*, 2016) and Iran (Sistan and Baluchistan (Barahoei *et al.*, 2013b) and Kerman (current study) provinces).

### Subfamily Cryptinae

#### *Dichrogaster perlae* (Doumerc, 1855)

**Material examined:** Iran, Anar County, Anar, Malaise trap, 1♂, 3-20.V. 2012, leg. A. Asadi.

**Distribution:** Western Palearctic (Yu *et al.*, 2016); Iran (Fras (Etemadi *et al.*, 2018) and Kerman (current study) provinces).

**Hosts:** Members of this genus parasitize lacewing species of Chrysopidae (Neuroptera) (Townes, 1969). *Chrysopa carnea* Stephens, 1836; *Chrysopa perla* (L., 1758); *Cunctochrysa albolineata* (Killington, 1935) are reported as hosts of *D. perlae* (Yu *et al.*, 2016).

***Hoplocryptus heliophilus* (Tschek, 1871)**

**Material examined:** Kerman, Mahan, Malaise trap, 1♀, 4. V. 2012-1. VI. 2012, 1♀, 4-24.V.2012, leg. A. Asadi

**Distribution:** Western Palaearctic (Yu *et al.*, 2016); Iran (Fras (Etemadi *et al.*, 2018) and Kerman (current study) provinces).

**Subfamily Ichneumoninae**

***Anisobas cingulatellus* Horstmann, 1997**

**Material:** Iran, Kerman, Mahan, Malaise trap, 1♀, 4.V.-1.VI. 2012, leg. A. Asadi

**Distribution:** Western palaeartic (Yu *et al.*, 2016); Iran (Semnan (Kolarov & Ghahari, 2008), Tehran (Masnadi-Yazdinejad & Jussila, 2008), Isfahan (Barahoei *et al.*, 2015) and Kerman (current study) provinces).

***Anisobas rebellis* Wesmael, 1845**

**Material examined:** Iran, Rafsanjan, Khabr, Malaise trap, 1♀, 10-24.V. 2012, leg. A. Asadi

**Distribution:** Western Palaearctic (Yu *et al.*, 2016); Iran (Sistan and Baluchestan (Barahoei *et al.*, 2012), Khorasan (Ghahari & Jussila, 2014) and Kerman (current study) provinces).

***Barichneumon gaullei* (Berthoumieu, 1903)**

**Material examined:** Iran, Rafsanjan, Khabr, Malaise trap, 1♀, 10-24.V. 2012, leg. A. Asadi

**Distribution:** France, Spain (Yu *et al.*, 2016) and Iran (Kerman province (Mohebban *et al.*, 2017)).

**Subfamily Tryphoninae**

***Netelia (Netelia) dilatata* (Thomson 1888)**

**Material:** Iran, Kerman County, Mahan, Malaise, 2♀♀1♂, 3-18.V. 2012, Leg. A. Asadi.

**Distribution:** Palaearctic (Yu *et al.*, 2016); Iran (Kerman province (current study, previously not exactly defined)).

***Netelia (Paropheltes) maculiventris*\*(Kokujev 1915) (Fig. 3A-G)**

**Material examined:** Iran, Kerman province, Mahan, Malaise, 2♀♀, 3-18.V. 2012, Leg. A. Asadi.

**Distribution:** China; France; Mongolia; Turkey (Yu *et al.*, 2016) and Iran (Kerman province, current study).

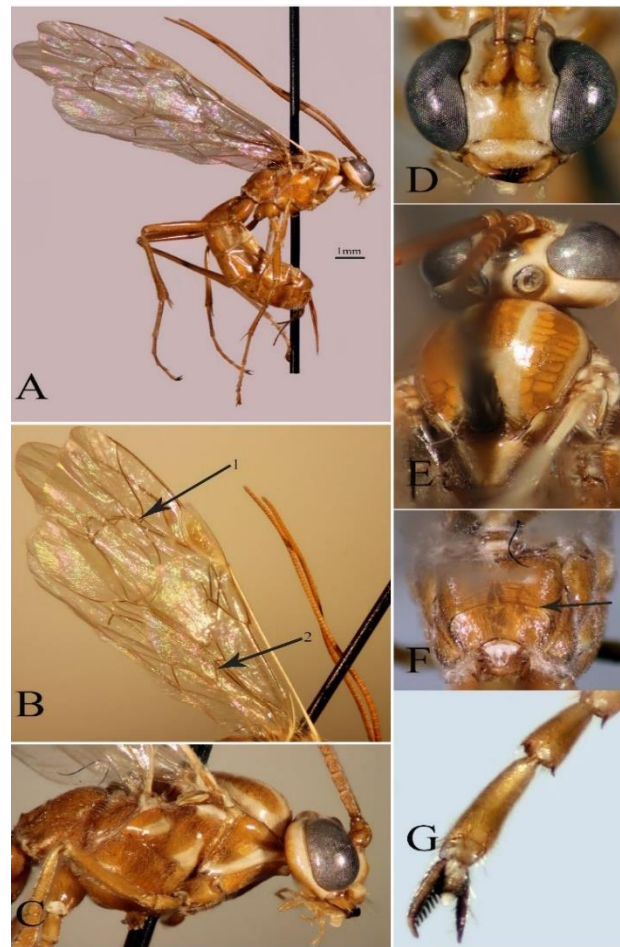
**Diagnosis:** *Netelia maculiventris* is very similar to *N. magic* Tolk. but differs in having square face (Fig. 3D) and lateral ocelli not touching the compound eyes (Fig. 3E). This species can be separated from other species of the genus by the combination of following characters: head and thorax with distinct whitish bands (Fig. 3A, C-D); head with occipital carina present, compound eyes not touching lateral ocelli (Fig. 3E); eyes not converging ventrally, face square, clypeus apically rounded (Fig. 3D); fore wing with closed areolet (Fig. 3B, arrow1), wings with long hairs, their length not shorter than the distance between them, hind wing with nervulus inclivous (Fig. 3B, arrow 2); hind pretarsus with teeth not very shorter than claw (Fig. 3G); propodeum with posterior transverse carina and fine transverse striated sculpture (Fig. 4F); ovipositor sheath longer than first metasomal tergite (1.4:1) (Fig. 3A).

## Discussion

The diversity of ichneumonid species captured in malaise traps mostly depended on vegetation type and climatic conditions of Kerman province. More extensive samplings using other sampling methods in different regions of Kerman province, especially in intact and protected regions may get more complete picture of the ichneumonid fauna as the largest family of parasitoid wasps. It seems that rearing is complementary informative and efficient method (Mehrnejad, 2002; Kishani Farahani *et al.*, 2010; Lotfalizadeh *et al.*, 2012; Hasanshahi *et al.*, 2014, 2015a, 2015b, 2015c; Pourian *et al.*, 2014; Hashemi-Khabir *et al.*, 2018; Talebi *et al.*, 2006).

With the exception of *D. perlae*, all reported species here are parasitoids of phytophagous insects. In addition to *D. perlae*, the genus *Dichrogaster* Doumerc includes four other species in Iran, *D. aestivalis* (Gravenhorst, 1829), *D. liostylus* (Thomson, 1885), *D. longicaudata* (Thomson, 1884) and *D. saharator* (Aubert, 1964) (Mahyabadi *et al.*, 2016), of which the latter two species have also been reported from Kerman province. Species of this genus are specialized parasitoids of the a few neuropteran predators (Townes, 1969), which are candidates for biological control programs. There is a lack of information about the host(s) of the Iranian species of *Dichrogaster*, but one species (*D. aestivalis*) has been collected from cotton fields (Ghahari & Jussila, 2010). Future studies need to reveal their role in population decrease of these useful predators in agricultural ecosystems.

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**Fig. 3.** *Netelia (Paropheltes) maculiventris*. A) female habitus; B) wings, arrows 1 and 2 indicate areolet of fore wing and nervulus of hind wing, respectively; C) head and mesosoma in lateral view; D) Face; E) vertex and mesonotum; F) propodeum, arrow shows hind transverse carina; G) hind pretarsus.

This study and several recent studies indicated that species richness of Ichneumonidae is rather diverse in Kerman province. With reporting 8 species from Kerman province in this study, the number of Kermanian ichneumonid species increased to 95 species (Mohebban *et al.*, 2016; Riedel *et al.*, 2019). Faunistic and ecological surveys are expected to result in new records from Kerman province, due to various climatic regions of this province.

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