



## A faunistic study of Miscogastrinae, Ormocerinae and Spalangiinae (Chalcidoidea: Pteromalidae) in south of Kerman province with a new generic record from Iran

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**ABSTRACT.** The pteromalids fauna (Hymenoptera: Chalcidoidea: Pteromalidae) was studied in southern areas of Kerman province. The specimens were collected using Malaise traps and sweeping net during March 2016 to August 2017. Seven species of Pteromalidae collected and identified. Among them, four species viz. *Halticoptera andriescui* Mitroiu, 2005, *Ksenoplata quadrata* Bouček, 1965 (Miscogastrinae), *Systasis parvula* Thomson, 1876 (Ormocerinae) and *Spalangia nigroaenea* Curtis, 1839 (Spalangiinae) were recorded for the first time from Kerman province. The genus *Rhynocoelia* is newly recorded from Iran, represented by a single species, *Rhynocoelia impar* (Walker, 1836). A brief discussion is given for the Miscogastrinae, Ormocerinae and Spalangiinae fauna of Kerman province.

**Key words:** *Rhynocoelia impar*, Fauna, New record, Iran

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### Introduction

The Pteromalidae (Hymenoptera: Chalcidoidea) are small parasitic koinobiont wasps that attack other insect orders in their various stages of development as primary or secondary parasitoids. They play an important role in the biological control of serious insect pests and many species have been used successfully in biological control programs worldwide. Around 3,545 species in 513 genera are known worldwide which distributed in all zoogeographical regions (Noyes, 2019). Pteromalids fauna of Iran is not well investigated and it seems that many species need to be collected and identified in different regions of the country. The first checklist of the family was published by Lotfalizadeh & Gharali (2008) who presented the list of 78 species in different parts of Iran. Abolhasanzadeh et al. (2017) published updated checklist of 129 species in 62 genera belonging to 10 subfamilies. Recently more contributions were made for the fauna of Iran (Moravvej et al., 2018;

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Lotfalizadeh et al., 2019; Shojaey et al., 2019; Rahmani et al., 2019a, 2019b). The objective of the present paper is to report on our investigation of three subfamilies of Pteromalidae (Ormocerinae, Miscogastrinae and Spalangiinae) in south of Kerman province, Iran.

### Material and methods

During our collecting program of parasitic wasps in southern areas of Kerman province, some pteromalids species were collected by sweep net and Malaise traps. All specimens were collected during March 2016 to August 2017 (Fig. 1). Among collected material, 100 specimens belonging to three subfamilies: Ormocerinae, Miscogastrinae and Spalangiinae were identified. Specimens were preserved in 75% Ethanol until they were mounted on cards and identified. Prior to mounting the specimens were treated with Acetic acid' vapor in order to avoid collapsing. The morphological terminology and classification follows Gibson (1997) and Bouček (1988), respectively. The identifications were made using Graham's monograph (Graham, 1969) and Bouček & Rasplus (1991). External morphology was illustrated using an Olympus™ SZH, equipped with an Omax (18Mp) A35180U3 digital camera. The images were then processed using Combine ZM and Adobe ® Photoshop ® CS6 programs. The voucher specimens were deposited in Zoological Museum of Shahid Bahonar University of Kerman, Kerman, Iran (ZMSBUK).

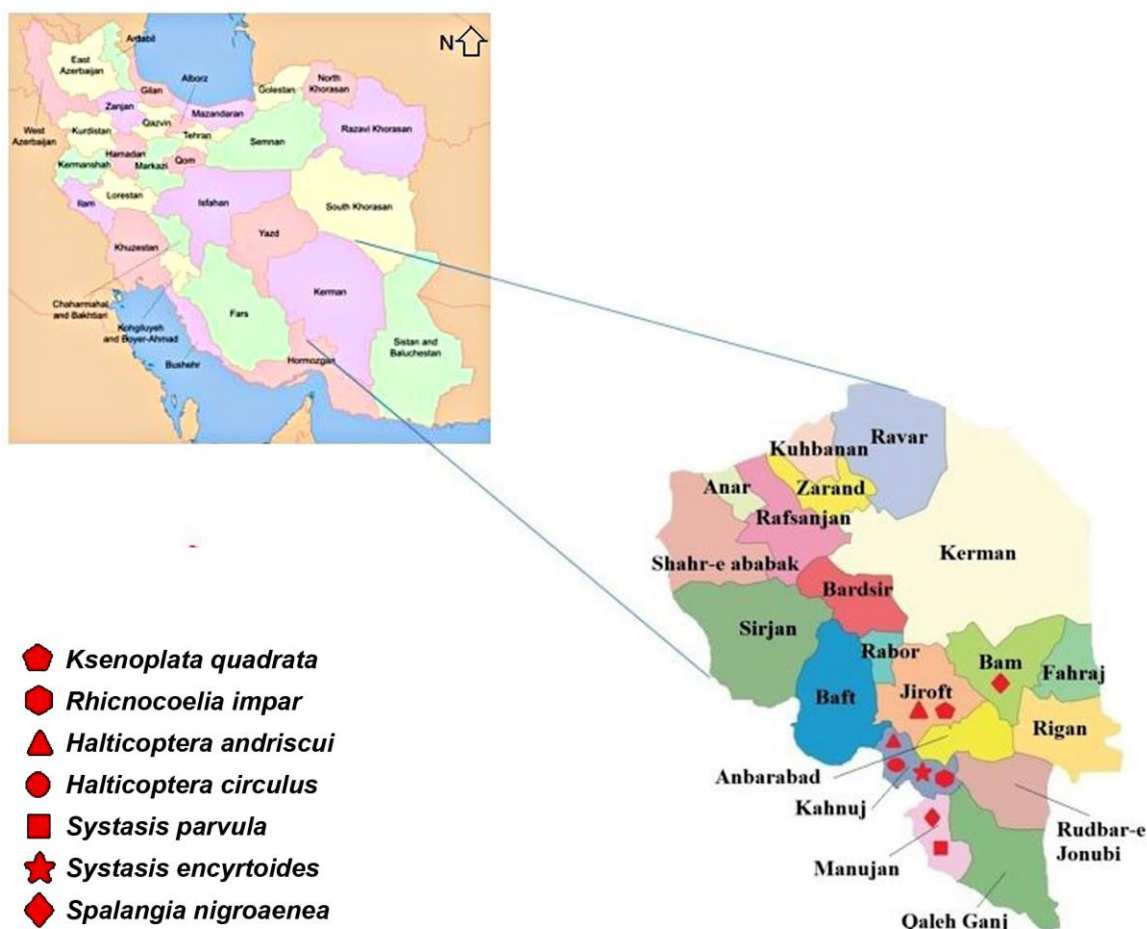


Figure 1. Distribution map of the pteromalids species collected in south of Kerman province.

## Results

### Family Pteromalidae Dalman, 1820

#### Subfamily Miscogastrinae Walker, 1833

#### Genus *Halticoptera* Spinola, 1811

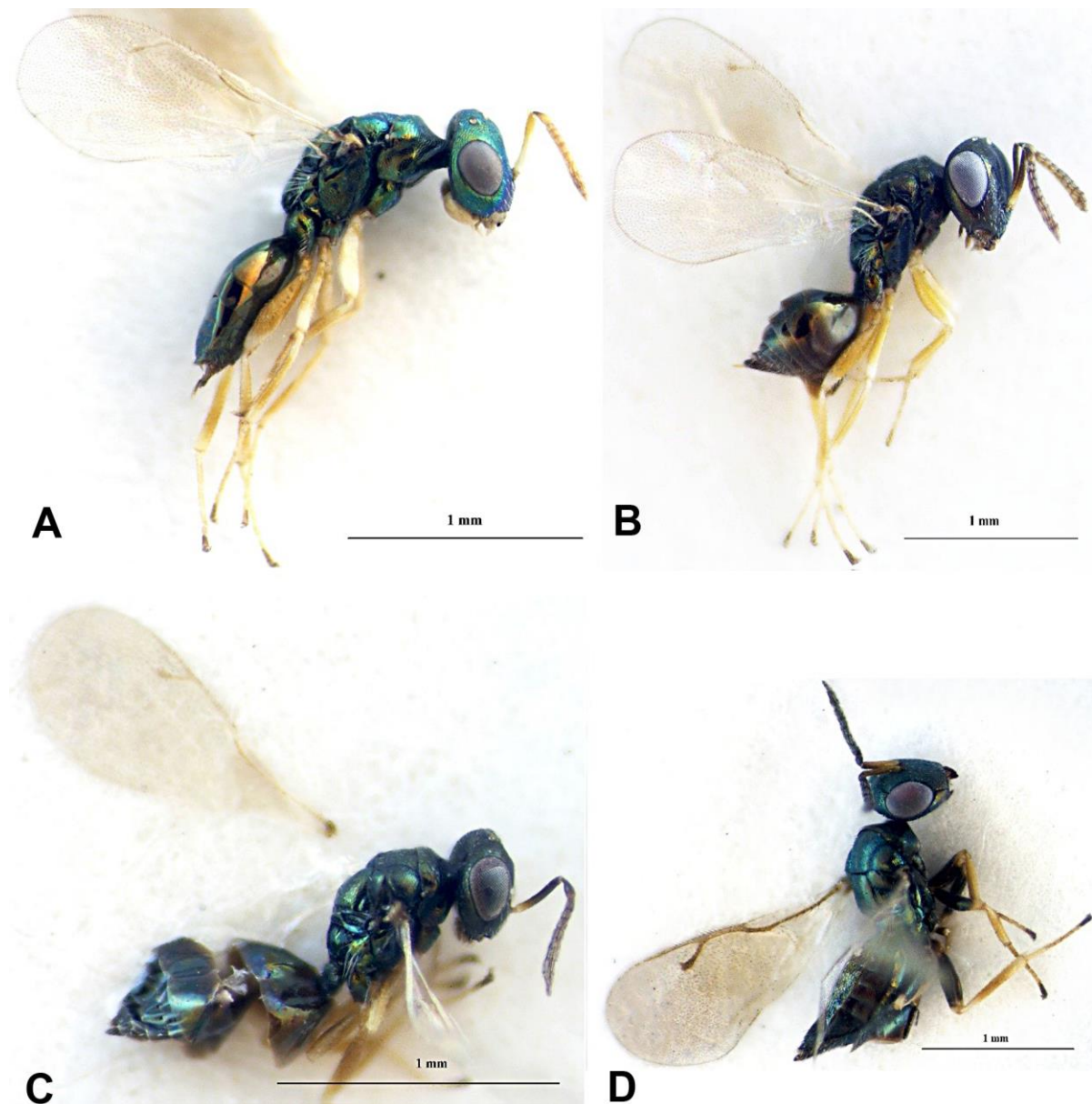
#### *Halticoptera andriescui* Mitroiu, 2005 (Fig. 2A, B)

**Material examined:** (52♀♀, 39♂♂); Kerman province: Jiroft, Dalfard (29°00'27" N, 57°35'31.7" E, 2118m), 13-30.VIII.2016, 1♀, Malaise trap, Leg.: M. Changizi; Jiroft, Dalfard (29°00'26.7" N, 57°35'32.2" E, 2113m), 13-30.VIII.2016, 2♀♀, 1♂, Malaise trap, Leg.: M. Changizi; Jiroft, Dalfard (29°00'33" N, 57°35'32.4" E, 2121m), 13-30.VIII.2016, 1♀, Malaise trap, Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'48.2" N, 57°44'22.2" E, 528m), 15-28.III.2017, 1♂ & 28.III-5.IV.2017, 1♂, Malaise trap, Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'40.6" N, 57°42'02.8" E, 534m), 05-11.IV.2017, 1♀, Malaise trap, Leg.: M. Changizi; Kahnuj, Sar Gorich (28°07'33.5" N, 57°34'58.9" E, 685m), 27.III-02.IV.2017, 1♀, 1♂, Malaise trap, Leg.: M. Changizi; Kahnuj, Qooch Abad (28°02'38.5" N, 57°46'30.3" E, 531m), 28.III-06.IV.2017, 4♀♀ & 21.IV-8V.2017, 4♀♀, 3♂♂, Malaise trap, Leg.: M. Changizi; Kahnuj, Qooch Abad (28°03'37.2" N, 57°48'32.1" E, 492m), 06-21.IV.2017, 1♀, 3♂♂ & 18-26.V.2017, 1♂, Malaise trap, Leg.: M. Changizi; Kahnuj, Qooch Abad (28°03'39.4" N, 57°48'37.2" E, 495m), 18-26.V.2017, 2♀♀, Malaise trap, Leg.: M. Changizi; Kahnuj (28°09'55.8" N, 57°18'06.5" E, 654m), 05.IV.2017, 1♀, 1♂, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj (28°19'26.7" N, 57°42'52.6" E, 558m), 05.IV.2017, 3♀♀, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj (28°37'09" N, 57°43'00.1" E, 632m), 05.IV.2017, 2♀♀, 5♂♂, Swept on *Triticum* sp., Leg.: M. Changizi; Kahnuj, Amir Abad (28°01'56.8" N, 57°44'35.9" E, 449m), 08.V.2016, 1♂, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Amir Abad (28°00'41.3" N, 57°44'07.5" E, 447m), 01.XI.2016, 1♂, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Tvakkol Abad (28°56'58.2" N, 57°42'02.8" E, 534m), 15.IX.2016, 1♀, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Tvakkol Abad (27°56'59.8" N, 57°42'32.5" E, 539m), 07.XI.2016, 5♀♀, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'56.8" N, 57°44'35.9" E, 530m), 14.III.2016, 1♀, 3♂♂, Swept on *Lycopersicum* sp., Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'54.7" N, 57°44'33.9" E, 531m), 06.V.2016, 2♀♀, 1♂, Swept on *Triticum* sp., Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'54.7" N, 57°44'33.9" E, 531m), 07.V.2016, 3♀♀, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'56.8" N, 57°44'35.9" E, 531m), 26.IX.2016, 1♀, 2♂♂, Swept on *Mentha longifolia*, Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'47.8" N, 57°44'03.2" E, 518m), 08.V.2016, 2♀♀, 5♂♂, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'57.3" N, 57°44'36.8" E, 535m), 15.IV.2016, 1♀, 1♂, Swept on *Hordeum vulgare*, Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'56.7" N, 57°44'37.4" E, 537m), 28.III.2017, 3♀♀, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'32.8" N, 57°44'27.5" E, 522m), 2.XI.2016, 3♀♀, 1♂, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Tomgoran (28°01'32.8" N, 57°44'27.5" E, 522m), 23.X.2016, 1♂, Swept on *Mentha longifolia*, Leg.: M. Changizi; Kahnuj, Heidar Abad (28°19'26.7" N, 57°42'52.6" E, 502m), 26.III.2017, 1♀, 3♂♂, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Sar Gorich (28°09'16.3" N, 57°45'50.5" E, 687m), 05.XI.2016, 1♂, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Sar Gorich (28°09'17.8" N, 57°33'37.3" E, 682m), 27.III.2017, 1♀, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Qooch Abad (28°02'05.7" N, 57°46'27.1" E, 513m), 28.III.2017, 1♀, Swept on *Hordeum vulgare*, Leg.: M. Changizi; Kahnuj, Kelghanbar (28°24'08.6" N, 57°24'44.7" E, 1041m), 27.III.2017, 3♀♀, 2♂♂, Swept on *Mentha longifolia*, Leg.: M. Changizi; Kahnuj, Naser Abad (27°59'55" N, 57°41'30.1" E, 553m), 28.IX.2016, 1♀, Swept on *Medicago sativa*, Leg.: M. Changizi.

**Distribution in Iran:** West-Azarbaijan (Ranji et al., 2016) and Kerman province (Current study).

**General distribution:** Palaearctic region (Romania and Iran) (Ranji et al., 2016; Noyes, 2019).

**Biological association:** *Halticoptera andriescui* is reported as a parasitoid of *Chromatomyia horticola* (Goureau, 1851) (Dip.: Agromyzidae) in West-Azarbaijan and Urmia (Ranji et al., 2016) which is a polyphagous leaf miner of different crops. About 43 chalcid species have been reported as parasitoids of *C. horticola* (Noyes, 2019) from which 16 species were reported from Iran (Ranji et al., 2016).



**Figure 2.** Lateral view of collected species of Pteromalidae in south of Kerman province. **A.** *Halticoptera andriescui* Mitroiu, 2005 (male), **B.** *Halticoptera andriescui* Mitroiu, 2005 (female), **C.** *Halticoptera circulus* (Walker, 1833) (male), **D.** *Ksenoplata quadrata* Bouček, 1965 (female).

***Halticoptera circulus* (Walker, 1833) (Fig. 2C)**

**Synonyms:** *Dicyclus circulus* Walker, 1833; *Dicyclus fuscicornis* Walker, 1833; *Dicyclus tristis* Walker, 1833; *Halticoptera fuscicornis* (Walker, 1833); *Halticoptera suilius* (Walker, 1839); *Miscogaster daiphron* Walker, 1839; *Miscogaster suilius* Walker, 1839; *Pachylarthrus suilius* (Walker, 1839); *Pteromalus brevicornis* Zetterstedt, 1838; *Pteromalus lapponicus* Dalla Torre, 1898; *Pteromalus palpigerus* Zetterstedt, 1838.

**Material examined:** (1♂); Kerman province, Kahnuj, Qooch Abad (28°02'38.5" N, 57°46'30.3" E, 531m), 15-28.III.2017, 1♂, Malaise trap, Leg.: M. Changizi.

**Distribution in Iran:** East-Azarbaijan (Lotfalizadeh & Gharali, 2008) and Kerman provinces (Mitroiu et al., 2011).

**General distribution:** Afrotropical, Nearctic, Neotropical, Oriental and Palaeartic regions (Noyes, 2019).

**Biological association:** The hosts of this species in Iran are unknown. This species is recorded as a parasitoid of some species of Agromyzidae, Cecidomyiidae, Chloropidae and Opomyzidae (Diptera) and in association with many species of plants from several families such as Asteraceae, Fabaceae, Poaceae, etc (Noyes, 2019).

**Genus: *Ksenoplata* Bouček, 1965*****Ksenoplata quadrata* Bouček, 1965 (Fig. 2D)**

**Material examined:** (1♀); Kerman province, Jiroft, Dalfard (29°01'31.4" N, 57°36'56.1" E, 2390m), 17.VII-27.VIII.2017, 1♀, Malaise trap, Leg.: S. M. Madjdzadeh.

**Distribution in Iran:** East-Azarbaijan (Hadi et al., 2017) and Kerman provinces (Current study).

**General distribution:** Palaeartic (Noyes, 2019).

**Biological association:** *Ksenoplata quadrata* was collected on *Ephedra major* in East-Azarbaijan and is it considered as a parasitoid of Bruchinae (Coleoptera: Chrysomelidae) (Hadi et al., 2017).

**Genus: *Rhcnocoelia* Graham, 1956*****Rhcnocoelia impar* (Walker, 1836) (Fig. 3)**

**Synonyms:** *Doghmiella viridis* Delucchi, 1962; *Holcaeus impar* (Walker, 1836); *Pteromalus crotopus* Walker, 1839; *Pteromalus impar* Walker, 1836; *Rhcnocoelia viridis* (Delucchi, 1962).

**Material examined:** (1♀); Kerman province, Kahnuj, Heydar Abad (27°00'36.9" N, 57°44'0.69" E, 503m), 26.III.2017, Swept on *Medicago sativa*, Leg.: M. Changizi.

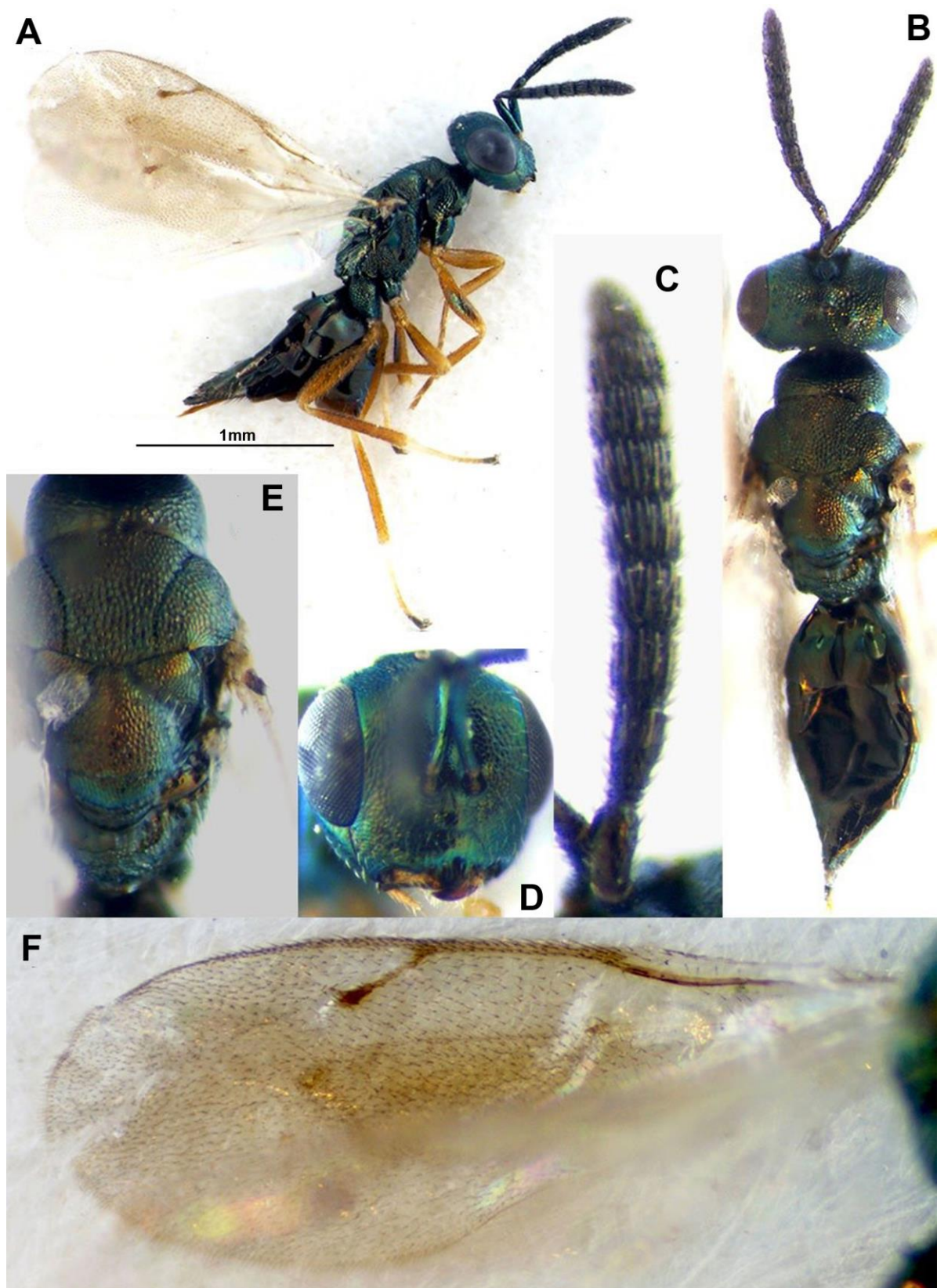
**Diagnosis:** Head and thorax dark green; antennal formula 1, 1, 2, 6, 3 (scape, pedicel, ring segments, funicle, clava) and inserted below center of face; clypeus with deep incision separating a single tooth on the right and 2 teeth on the left; pronotal collar with a bluntly subangular edge, notaul complete, propodeum with rather irregular sculpture and with plicae; hind tibia with one spur; marginal vein slender and shorter than postmarginal; metasoma sessile, all segments of metasoma except base of first segment (base of first segment metallic green) dark brown (Fig. 3).

**Distribution in Iran:** Kerman province (New record).

**General distribution:** Palaeartic region (Noyes, 2019).

**Biological association:** The hosts of this species are unknown in Iran.

**Remark:** The genus *Rhcnocoelia* is recorded for the first time from Iran including one species, *R. impar*.



**Figure 3.** *Rhinocoelia impar* (Walker, 1836). Female: **A.** Lateral view, **B.** Dorsal view, **C.** Antenna, **D.** Head (frontal view), **E.** Mesosoma (dorsal view), **F.** Fore wing.

**Subfamily: Ormocerinae Walker, 1833*****Systasis encyrtoides* Walker, 1834 (Fig. 4A, B)**

**Synonyms:** *Hormocerus impletus* Walker, 1872; *Pteromalus geniculatus* Nees, 1834; *Systasis longicornis* Thomson, 1876; *Tridymus punctatus* Ratzeburg, 1852.

**Material examined:** (4♀♀, 1♂); Kerman province, Kahnuj, Tomgoran (28°01'42.6" N, 57°44'30.9" E, 531), 03-11.IV.2016, 1♀, Malaise trap, Leg.: S. M. Madjdzadeh; Kahnuj (28°37'09" N, 57°43' 00.1" E, 632m), 05.IV.2017, 1♀, 1♂, Swept on *Triticum* sp., Leg.: M. Changizi; Kahnuj, Sar Gorich (28°09'16.3" N, 57°45'50.5" E, 687m), 07.VI.2016, 1♀, Swept on *Medicago sativa*, Leg.: M. Changizi; Kahnuj, Sar Gorich (28°09'17.8" N, 57°33'37.3" E, 682m), 27.III.2017, 1♀, Swept on *Medicago sativa*, Leg.: M. Changizi.

**Distribution in Iran:** Kerman, Khorasan Razavi and Kordestan provinces (Abolhassanzadeh et al., 2017).

**General distribution:** Australasia, Nearctic and Palaearctic regions (Noyes, 2019).

**Biological association:** The hosts of this species are unknown in Iran. *Systasis encyrtoides* is reported mainly from species of Cecidomyiidae (Diptera) such as *Contarinia pisi* (Loew), *C. lentis* Aczel and *Dasineura affinis* (Kieffer) (Noyes, 2019).

***Systasis parvula* Thomson, 1876 (Fig. 4C)**

**Material examined:** (1♀); Kerman province, Manujan (27°29'53.1" N, 57°33'43.4" E, 358m), 07.IV-05.V.2017, 1♀, Malaise trap, Leg.: S. M. Madjdzadeh.

**Distribution in Iran:** Khorasan Razavi (Abolhassanzadeh et al., 2017) and Kerman province (Current study).

**General distribution:** Nearctic, Oriental and Palaearctic regions (Noyes, 2019).

**Biological association:** The hosts of this species are unknown in Iran. Dzhankmen (1996) reported this species from several species of Cecidomyiidae (Diptera).

**Subfamily: Spalangiinae Haliday, 1833****Genus: *Spalangia* Latreille, 1805*****Spalangia nigroaenea* Curtis, 1839 (Fig. 4D)**

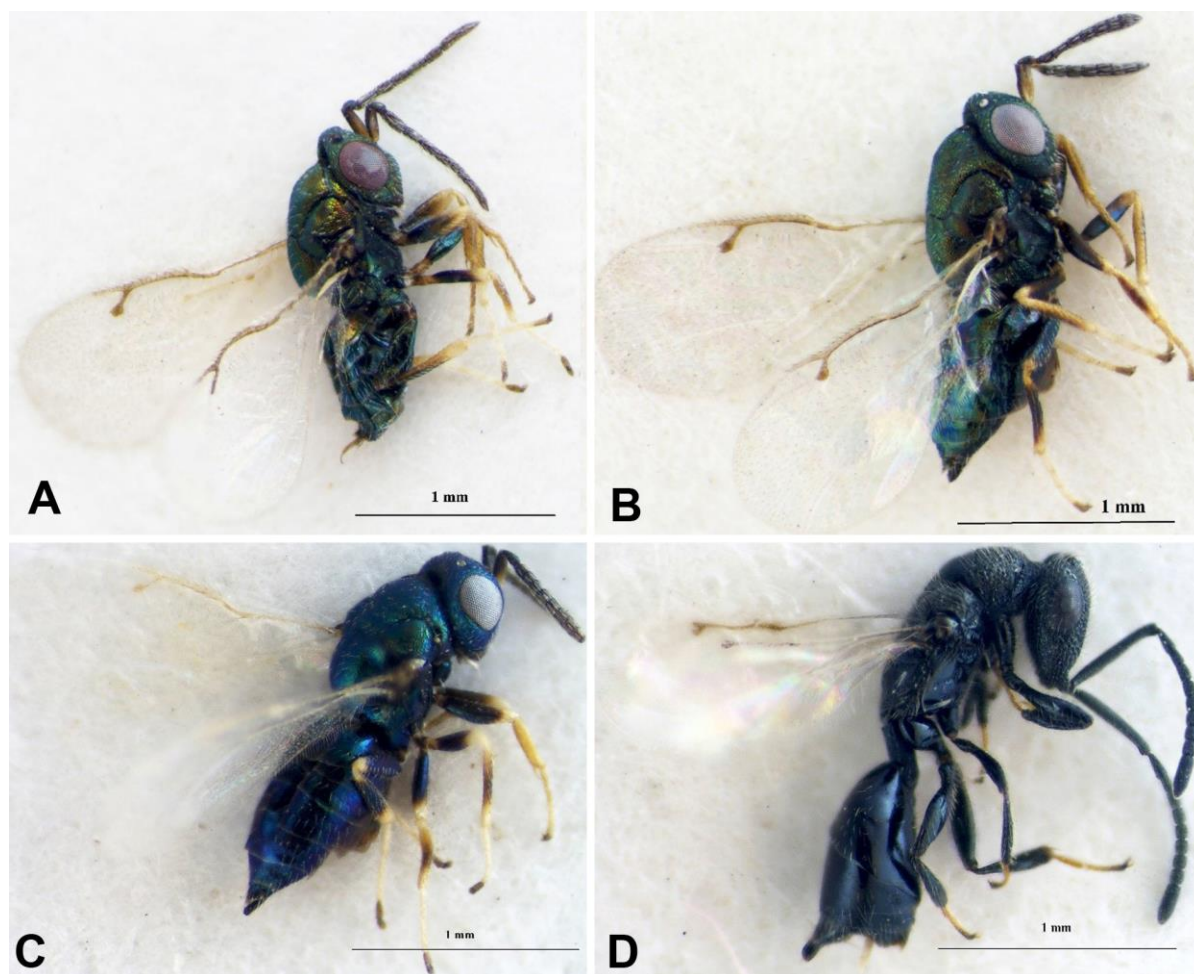
**Synonyms:** *Prospalangia platensis* Brethes, 1915; *Spalangia abenabooi* Girault, 1932; *Spalangia astuta* Foerster, 1851; *Spalangia homalaspis* Foerster, 1850; *Spalangia mors* Girault, 1933; *Spalangia muscidarum* Richardson, 1913; *Spalangia nigroaenea* Curtis, 1839; *Spalangia platensis* (Brethes, 1915); *Spalangia sundaica* Graham, 1932.

**Material examined:** (2♀♀); Kerman province: Bam (29°06'0.17" N, 58°19'44" E, 1111m), 22.V-04.VII.2017, 1♀, Malaise trap, Leg.: M. Purrezaali; Manujan (27°29'53.1" N, 57°33'43.4" E, 358m), 07.IV-05.V.2017, 1♀, Malaise trap, Leg.: S. M. Madjdzadeh.

**Distribution in Iran:** East-Azarbaijan (Abolhassanzadeh et al., 2017) and Kerman provinces (Current study).

**General distribution:** Cosmopolitan (Noyes, 2019).

**Biological association:** The hosts of *S. nigroaenea* are unknown in Iran. Some species of Muscidae, Calliphoridae and Sarcophagidae has been recorded as hosts of this species (Lotfalizadeh & Gharali, 2008).



**Figure 4.** Lateral view of collected species of Pteromalidae in south of Kerman province. **A.** *Systasis encyrtoides* Walker, 1834 (male), **B.** *Systasis encyrtoides* Walker, 1834 (female), **C.** *Systasis parvula* Thomson, 1876 (female), **D.** *Spalangia nigroaenea* Curtis, 1839 (female).

### Discussion

As there was little information on the pteromalids fauna of south of Kerman province, a recent complementary study of the pteromalids fauna of this region has locally been performed. Unfortunately, from the viewpoint of faunistic studies, southeastern Iran has been paid less attention and examination. So the present activity focused on this area. In the course of this survey of Pteromalidae in south of Kerman province, specimens belonging to three subfamilies (*e.i.*, Miscogastrinae, Ormocerinae and Spalangiinae) were studied which resulted to identification of seven species. Among the identified specimens, one genus including one species, *Rhincocoelia impar* (Miscogastrinae) was recorded for the first time from Iran and four species (*i.e.* *Halticoptera andriescui*, *Ksenoplata quadrata* (Miscogastrinae), *Systasis parvula* (Ormocerinae) and *Spalangia nigroaenea* (Spalangiinae)) were new provincial records for Kerman province.

It seems the species belonging to Miscogastrinae and Ormocerinae have been distributed in most of Palearctic region (Noyes, 2019). Among the collected species, three species: *Halticoptera andriescui*, *Ksenoplata quadrata* and *Rhincocoelia impar* (Miscogastrinae) are found



only in the Palaearctic region (Noyes, 2019). It is interesting that the first species is recorded only from Romania (Noyes, 2019) and this is the second record of this species from the Palaearctic region. Other species are distributed in the Palaearctic and other zoogeographic regions. *Spalangia nigroaenea* is distributed extensively in all zoogeographic regions (Noyes, 2019). All collected species except *Halticoptera andriescui* are also found in neighbouring countries (Noyes, 2019).

To date 12 species belonging to three genera of Miscogastrinae, seven species belonging to one genus of Ormocerinae and five species belonging to one genus of Spalangiinae have been reported from Iran (Abolhassanzadeh et al., 2017; Moravvej et al., 2018). Prior to this study one species belong to one genus of each of the subfamilies, Miscogastrinae and Ormocerinae are known from Kerman province. No species of Spalangiinae have been recorded from Kerman and this is the first record of *Spalangia nigroaenea* from Kerman province. The total number of pteromalids species reported from Iran including the present study increased to 143 species in 67 genera.

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### Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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## مطالعه فونستیک زیرخانواده‌های *Miscogastrinae*، *Ormocerinae* و *Spalangiinae* (Chalcidoidea: Pteromalidae) در جنوب استان کرمان با گزارش یک جنس جدید برای ایران

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**چکیده:** فون خانواده *Pteromalidae* (Hymenoptera: Chalcidoidea) در نواحی جنوبی استان کرمان بررسی شد. نمونه‌ها با استفاده از تله مالیز و تور حشره-گیری از اسفند ماه ۱۳۹۴ تا شهریور ماه ۱۳۹۶ جمع‌آوری شدند. هفت گونه از خانواده *Pteromalidae* جمع‌آوری و شناسایی شد. چهار گونه شامل *Halticoptera Ksenoplata quadrata* Boucek, 1965 *andriescui* Mitroiu, 2005 *Systasis parvula* Thomson, 1876 (*Ormocerinae*)، (*Miscogastrinae*) و *Spalangia nigroaenea* Curtis, 1839 (*Spalangiinae*) برای اولین بار از استان کرمان گزارش می‌شوند. جنس *Rhynocoelia* با گونه‌ی *Rhynocoelia impar* (Walker, 1836) رکورد جدید برای ایران محسوب می‌شود. بحث مختصری درباره فون زیرخانواده‌های *Miscogastrinae*، *Ormocerinae* و *Spalangiinae* در استان کرمان ارائه شد.

**واژگان کلیدی:** *Rhynocoelia impar*، فون، گزارش جدید، ایران.