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The subfamily Pteromalinae (Chalcidoidea: Pteromalidae) in South-Eastern Iran

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Abstract. A faunistic survey on the parasitic wasps of the subfamily Pteromalinae Dalman, 1820 (Hym., Chalcidoidea, Pteromalidae) of South-Eastern Iran (Kerman province) was done. In total 46 specimens representing 10 genera and 16 species are identified, among them, *Dinarmus altifrons* (Walker, 1862) and *Syntomopus incurvus* Walker, 1833 are recorded for the first time for the fauna of Iran. Previously recorded species of Pteromalinae from this area are also reviewed and listed. Faunistic analysis of the known species according to their distribution both in Iran and in a broader biogeographical sense is also discussed.

Keywords. Parasitoids, Iran, fauna, new records, distribution, map.

INTRODUCTION

Pteromalidae is one of the most diverse families of the parasitic wasps with a worldwide distribution, comprising 33 subfamilies with a wide variety of taxonomic complications (Noyes 2019). About 98% of Pteromalidae are recognised as parasitoids on various stages of insects of many orders or rarely, of spiders, therefore they play a significant role in the control of many pests in agriculture, forestry, and natural areas (Bouček & Rasplus 1991). The subfamily Pteromalinae Dalman, 1820 is the most species-rich group within Pteromalidae with more than 2330 described species in over 317 genera, distributed worldwide (Noyes 2019). Still, very little is known about the Pteromalinae fauna in Iran. Lotfalizadeh & Gharali (2008) provided the first checklist of Iranian Pteromalidae, which includes 78 species from various regions.

The recently published checklist of Pteromalidae (Hymenoptera: Chalcidoidea) of Iran (Abolhassanzadeh *et al*. 2017) includes 62 genera and 129 species, of which 44 genera and 91 species belong to the subfamily Pteromalinae. Further Pteromalinae species have recently been found by the subsequent research (Moravvej *et al*. 2018, Lotfalizadeh *et al*. 2020, Rahmani *et al*. 2019, 2020, Shojaey *et al*. 2019, 2021, Gibson *et al*. 2021) bringing the number of known Iranian species of Pteromalinae to 113, and this also indicated the least contribution on this diverse group of parasitoids. Among the explored areas in South-Eastern parts of Iran, a moderately good knowledge of Pteromalinae is already devoted to Kerman province (Mitroiu *et al*. 2011, Lotfalizadeh *et al*. 2012, Mahdavi & Madjdzadeh 2013, Ziaaddini *et al*. 2014, Mahdavi *et al*. 2015, Rahmani *et al*. 2019, Shojaey *et al*. 2019, 2021), the areas contributed as the largest province of Iran with a

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rather wide variety of climatic and habitat diversity. Our recent infrequent surveys in these areas led to the discovery of additional Pteromalinae species, presented in this paper.

MATERIAL AND METHODS

The material for the present study was sporadically collected in various regions of the South-Eastern part of Iran (Kerman province) by Malaise traps and using a sweep net, during 2013–2019. The specimens were treated and prepared according to the AXA protocol (van Achterberg 2009), then card mounted and labelled. The external morphology of the specimens was studied under a Nikon® SMZ645 stereomicroscope and photographed using a Canon® EOS 700D (Canon® Inc., Japan) camera, mounted with an adapter on Hund® Stereomicroscope (Wetzlar Inc., Germany). Identification of the specimens was done based on the relevant keys and descriptions (Graham 1969, Sureshan & Narendran 2001, Dzhanokmen 2009, Mitroiu 2012). The terminology of the morphological characters generally follows that of Graham (1969) and Gibson *et al*. (1997). Data about the distribution of species are mainly extracted from Noyes (2019). The studied specimens are deposited in the collection of the Department of Plant Protection, University of Zabol, Iran (DPPZ). Previously recorded species of Pteromalinae from Kerman province were also listed.

The following abbreviations have been used for some morphological terms: POL for posterior ocellar distance; OOL for ocello-ocular distance.

The institutes, where the type specimens were deposited are as follows: BMNH − The Natural History Museum, London, England; CUTT − Plant Protection Department, Cumhuriyet Universitesi, Tokat Ziraat Fakültesi, Tokat, Turkey; LUZN − Zoological Museum, Lund University, Sweden; MLSF - Museum "La Specola", Florence, Italy; NHRM − Naturhistoriska Riksmuseet, Stockholm, Sweden; QMB - Queensland Museum, Brisbane, Australia, and ZMUC – Zoologiske Museum, Copenhagen, Denmark.

RESULTS

In total, 16 species belonging to 10 genera of the subfamily Pteromalinae are listed, among them, four genera and eight species are first records for the fauna of Kerman province. *Dinarmus altifrons* (Walker, 1862) and *Syntomopus incurvus* Walker, 1833 are also recorded for the first time from Iran. Newly recorded species are marked with an asterisk (*).

Family Pteromalidae Dalman, 1820

Subfamily Pteromalinae Dalman, 1820

Genus *Caenocrepis* Thomson, 1878

Caenocrepis Thomson, 1878: 51.

Type species: *Dimachus arenicola* Thomson, 1878, by monotypy.

Caenocrepis arenicola (Thomson, 1878)

Dimachus arenicola Thomson, 1878: 51, Lectotype ♀. – LUZN, Sweden.

Material examined. 1♀, Iran, Kerman province, Jiroft (28°40'31.17"N, 57°44'16.69"E, 686 m), swept on *Mentha pulegium*, 04.09.2014, N. Amirinasab, leg.

Distribution in Iran. Kerman province (Shojaey *et al*. 2019, 2021, current study).

General distribution. Eastern Palaearctic (Iran – Shojaey *et al*. 2019, Kazakhstan), Western Palaearctic (Europe, Morocco, Turkey).

Genus *Cheiropachus* Westwood, 1829

Cheiropachus Westwood, 1829: 23.

Type species: *Ichneumon quadrum* Fabricius, 1787, by original designation.

Cheiropachus quadrum (Fabricius, 1787)

Ichneumon quadrum Fabricius, 1787: 270, ♂. – ZMUC, Germany.

Material examined. 8♀♀, Iran, Kerman province: Baft (29°22'35.96"N, 56°40'18.22"E, 2736 m), Malaise trap, 11.05.2018, 3♀♀; Golbaf (29°52'54.53"N, 57°43'40.71"E, 1743 m), Malaise trap, 10.04.2018, 5♀♀, Sh. Mohebban, leg.

Distribution in Iran. Ardabil (Basiri *et al*. 2012), East Azarbaijan (Lotfalizadeh & Gharali 2008), and Kerman (Mitroiu *et al*. 2011, current study) provinces.

General distribution. Eastern Palaearctic (China, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Turkmenistan), Nearctic (Canada, U.S.A), Neotropical (Argentina, Chile), Oriental (India), Western Palaearctic (Armenia, Europe, Caucasus, Egypt, Israel, Lebanon, Morocco, North Africa, Russia, Tunisia, Turkey).

Genus: *Dinarmus* Thomson, 1878

Dinarmus Thomson, 1878: 56 (as subgenus of *Dimachus* Thomson).

Type species: *Dimachus acutus* Thomson, 1878. Designated by Ashmead 1904.

Dinarmus altifrons (Walker, 1862)*

(Figures 1–2)

Pteromalus altifrons Walker, 1862: 388, Lectotype ♀. – BMNH, South Africa.

Material examined. 6♀♀, 2♂♂, Iran, Kerman province, Bardsir (29°56'20.01"N, 56°34'41.84"E, 2040 m): swept on *Sophora* sp., 12.08.2013, 3♀♀; swept on *Glycyrrhiza glabra*, 06.08.2013, 3♀♀, 1♂; swept on weed, 17.06.2013, 1♂, M. Azad-Biglari, leg.

Diagnosis. Female (Figs 1–2A). Body length: 2.8–3.0 mm. Head in frontal view 1.24–1.25 times wider than high; (Fig. 1A). Clypeal margin bidentate (Fig. 1A). Toruli inserted above lower margins of eyes (Fig. 1A). Antenna with scape reaching lower edge of median ocellus (Fig. 1A). Width of head 2.7–2.9 times its median length (dorsal view) (Fig. 1B). POL 2–2.14 times longer than OOL (Fig. 1B). Eye height 1.54–1.64 times longer than its length (lateral view) (Fig. 1C). Mesoscutum 1.6–1.8 times wider than its length (Fig. 1D). Fore wing with basal cell and basal fold glabrous, marginal, postmarginal and stigmal veins almost equal in length, stigma large (Fig. 1E). Propodeum coarsely reticulate, median carina and costula absent; plicae weakly indicated (Fig. 1F). Gaster sessile, ovate, elongate. Body metallic green with bronze-copper reflection, wings hyaline, veins yellow, setae pale yellow and stigma dark brown (Fig. 2A).

Male (Fig. 2B). Body length: 2–2.3 mm. Similar to female, but antenna with two anelli and six funicular segments, costal cell forewing widened with dense bristles, marginal vein shorter and wider, body metallic green with weak bronze-copper reflection, wings hyaline, veins and setae brown.

Distribution in Iran. Kerman province (current study).

*General distribution***.** Afrotropical (South Africa), Oriental (India), Eastern (Pakistan, Iran [**New record**]) and Western (Algeria, Israel) Palaearctic.

Genus: *Euneura* Walker, 1844

Euneura Walker, 1844: 331.

Type species: *Euneura augarus* Walker, 1844, by monotypy.

Euneura lachni (Ashmead, 1887)

Pachycrepis lachni Ashmead, 1887: 193.

Material examined. 5♀♀, Iran, Kerman province: Rayen (29°35'51.22"N, 57°28'03.04"E, 2093 m), Malaise trap, 25.05.2018, 3♀♀; Rabor (29°18'11.39"N, 56°52'53.28"E, 2440 m), Malaise trap, 20.06.2018, 2♀♀, Sh. Mohebban, leg.

Distribution in Iran. Ardabil, Hamadan, Tehran (Rakhshani *et al*. 2005), and Kerman (current study) provinces; No exact locality cited (OILB 1971).

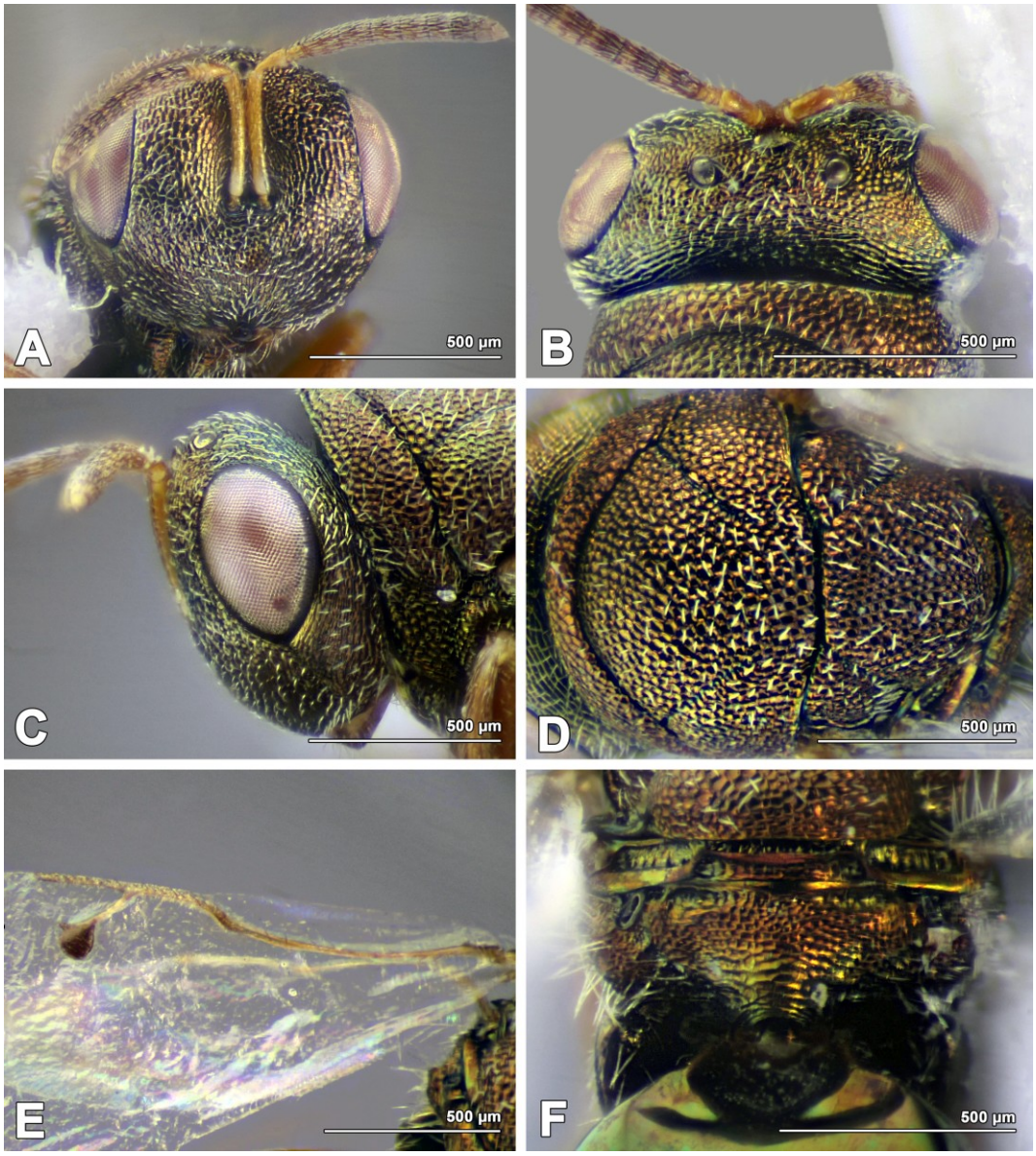


Figure 1. *Dinarmus altifrons* (Walker, 1862). Female. A = Head in frontal view, B = Head in dorsal view, C = Head in lateral view, D = Mesosoma in dorsal view, E = Fore wing venation, F = Propodeum in dorsal view.

General distribution. Eastern Palaearctic (Iran, Japan, Kyrgyzstan, Korea, Pakistan, China), Nearctic (Canada, USA), Oriental (India), Western Palaearctic (Europe, Russia).

Genus *Habritys* Thomson, 1878

Habritys Thomson, 1878: 54 (as subgenus of *Dimachus* Thomson).

Type species: *Pteromalus brevicornis* Ratzeburg 1844, by monotypy.

Habritys brevicornis (Ratzeburg, 1844)

Pteromalus brevicornis Ratzeburg, 1844: 201.

Material examined. 1♀, Iran, Kerman province, Bardsir (29º52'04.69"N, 56º38'53.36"E,

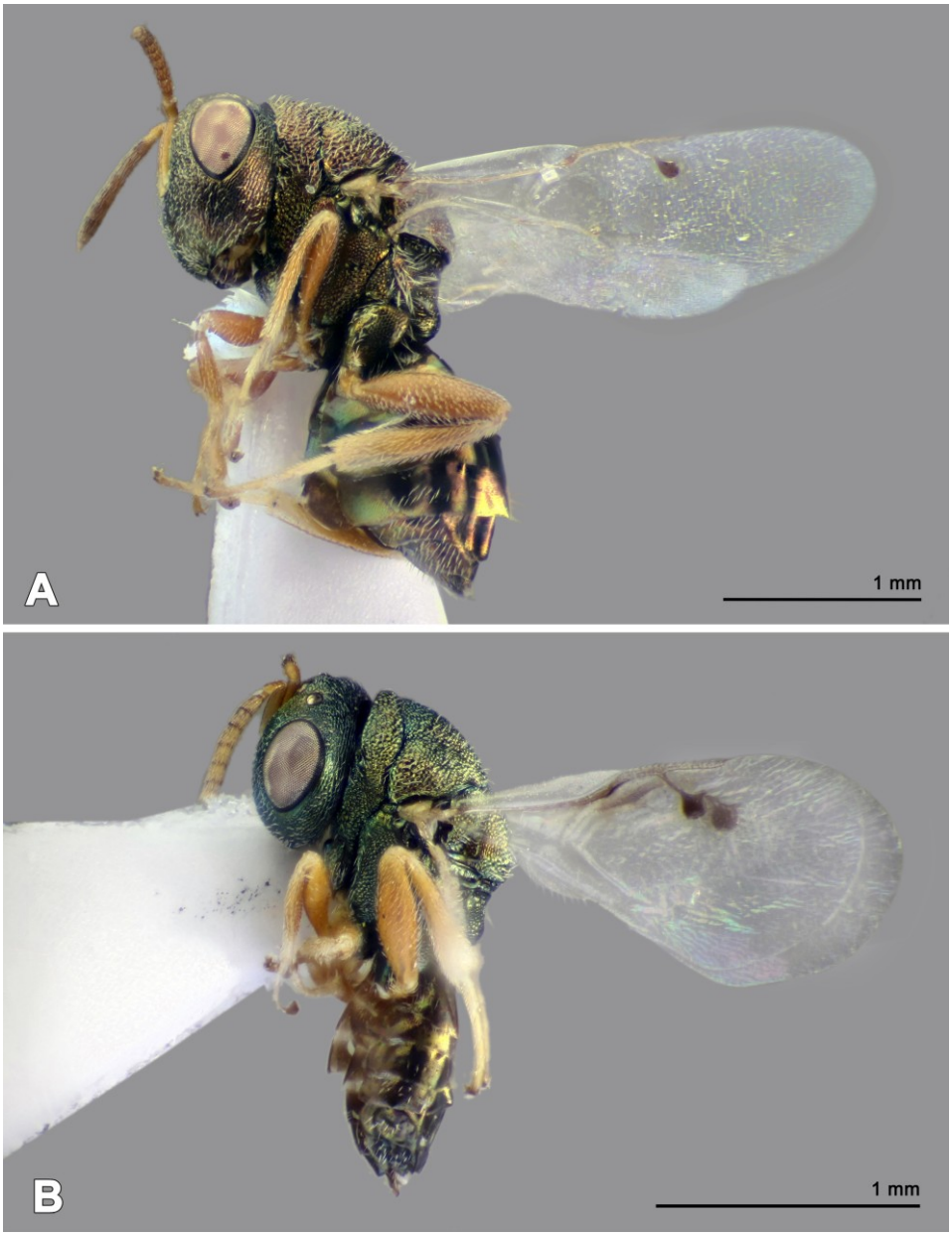


Figure 2. *Dinarmus altifrons* (Walker, 1862). Lateral view of habitus, A = Female, B = Male

2088 m), Malaise trap, 03.05.2018, Sh. Mohebban, leg.

Distribution in Iran. East Azarbaijan, West Azarbaijan (Hassan-Pashaimehr & Lotfalizadeh 2015), and Kerman (current study) provinces.

General distribution. Eastern Palaearctic (Iran – Hassan-Pashaimehr & Lotfalizadeh 2015, Kazakhstan), Nearctic (Canada, U.S.A), Western Palaearctic (Europe).

Genus: *Homoporus* Thomson, 1878

Homoporus Thomson, 1878: 60, 64.

Type species: *Pteromalus fulviventris* Walker, 1835. Designation by Ashmead, 1904.

Homoporus apharetus (Walker, 1839)

Pteromalus apharetus Walker, 1839: 228, Lectotype ♂. – BMNH, United Kingdom.

Material examined. 1♀, Iran, Kerman province, Koohpayeh (30°28'50.65"N, 57°19'17.98" E, 1803 m), Malaise trap, 28.06.2018, Sh. Mohebban, leg.

Distribution in Iran. Kerman province (Shojaey *et al*. 2021, current study).

General distribution. Eastern (China, Iran, Kazakhstan, Kyrgyzstan, Russia) and Western (Europe) Palaearctic.

Genus *Pachycrepoideus* Ashmead, 1904

Pachycrepoideus Ashmead, 1904: 329.

Type species: *Pachycrepoideus dubius* Ashmead, 1904, by monotypy.

Pachycrepoideus vindemmiae (Rondani, 1875)

Pteromalus vindemmiae Rondani, 1875: 145–148, Lectotype ♀. – MLSF, Italy.

Material examined. 1♀, Iran, Kerman province, Jiroft (28º33'16.99"N, 57º43'38.84"E, 602 m), Malaise trap, 10.05.2019, Sh. Mohebban, leg.

Distribution in Iran. Kerman (Shojaey *et al*. 2021, current study), and Qom (Farahani *et al*. 2010) provinces.

General distribution. Cosmopolitan.

Genus: *Pachyneuron* Walker, 1833

Pachyneuron Walker, 1833: 371, 380.

Type species: *Pachyneuron formosum* Walker, 1833, by monotypy.

Pachyneuron aphidis (Bouché, 1834)

Diplolepis aphidis Bouché, 1834: 170, ♀♂. – Germany.

Material examined. 2♀♀, Iran, Kerman province, Bardsir (29°56'20.01"N, 56°34'41.84"E, 2040 m), swept on Weed, 30.05.2013, M. Azad-Biglari, leg.

Distribution in Iran. Ardabil (Lotfalizadeh & Gharali 2008), Kerman (Mitroiu *et al*. 2011, Shojaey *et al*. 2021, current study), Khorasan-e Razavi (Hasani & Madjdzadeh 2012), Khuzestan (Moravvej *et al*. 2018), and Tehran (Rakhshani *et al*. 2004) provinces.

General distribution. Cosmopolitan.

Pachyneuron erzurumicum Doğanlar, 1986

Pachyneuron erzurumicum Doğanlar, 1986: 25, 26–30, Holotype ♀. – CUTT, Turkey.

Material examined. 5♀♀; Iran, Kerman province, Rayen (29°35'51.22"N, 57°28'03.04"E, 2093 m), Malaise trap, 25.05.2018, Sh. Mohebban, leg.

Distribution in Iran. Ilam (Lotfalizadeh & Gharali 2008), Kerman (Mitroiu *et al*. 2011, current study), and Khorasan-e Razavi (Hasani & Madjdzadeh 2012) provinces.

General distribution. Eastern Palaearctic (Iran, Kazakhstan), Western Palaearctic (Turkey).

Pachyneuron formosum Walker, 1833

Pachyneuron formosum Walker, 1833: 380, Lectotype ♀♂. – BMNH, United Kingdom.

Material examined. 1♀, Iran, Kerman province, Rabor (29°18'11.9"N, 56°52'53.28"E, 2440 m), Malaise trap, 24.06.2018, Sh. Mohebban, leg.

Distribution in Iran. Ilam (Lotfalizadeh & Gharali 2008), Kerman (current study), and Kordestan (Dehdar & Madjdzadeh 2016) provinces.

General distribution. Eastern Palaearctic (China, Iran, Japan, Kazakhstan, Kyrgyzstan, Tadzhik-

istan), Western Palaearctic (Europe, Morocco, Turkey).

Pachyneuron grande Thomson, 1878

Pachyneuron grande Thomson, 1878: 29, Lectotype ♀. – LUZN, Sweden.

Material examined. 1♀, Iran, Kerman province, Jiroft (28°40'31.17"N, 57°44'16.69"E, 686 m), swept on weed, 10.04.2013, N. Amirinasab, leg.

Distribution in Iran. Kerman province (current study), and Northern coastal (Sadeghi & Ebrahimi 2001).

General distribution. Eastern Palaearctic (China, Iran, Kazakhstan, Kyrgyzstan), Western Palaearctic (Europe).

Pachyneuron groenlandicum (Holmgren, 1872)

Pteromalus groenlandicus Holmgren, 1872: 100, Lectotype ♀. – NHRM, Greenland.

Material examined. 1♀, Iran, Kerman province, Baft (29°22'35.96"N, 56°40'18.22"E, 2736 m), Malaise trap, 11.05.2018, Sh. Mohebban, leg.

Distribution in Iran. Alborz (Haeselbarth 1983), Ilam (Lotfalizadeh & Gharali 2008), Khorasan-e Razavi (Hasani & Madjdzadeh 2012), and Kerman (Mitroiu *et al*. 2011, current study) provinces.

General distribution. Afrotropical (Yemen), Oriental (India), Nearctic (Greenland), Eastern Palaearctic (China, Iran, Japan, Kazakhstan, Korea), Western Palaearctic (Europe, Turkey).

Pachyneuron muscarum (Linnaeus, 1758)

Ichneumon muscarum Linnaeus, 1758: 567, Sweden.

Material examined. 2♀♀, Iran, Kerman province, Koohpayeh (30°28'50.65"N, 57°19' 17.98" E, 1803 m), Malaise trap, 28.06.2018, Sh. Mohebban, leg.

Distribution in Iran. Alborz (Ebrahimi 2014), East Azarbaijan (Lotfalizadeh *et al*. 2014), Fars (Lotfalizadeh & Ahmadi 2000 – as *Pachyneuron concolor* Förster, 1841, Ebrahimi 2014), Kerman (current study), Kermanshah (Jalilvand *et al*. 2014), and Tehran (Haeselbarth 1989 – as *Pachyneuron concolor*) provinces.

General distribution. Afrotropical (Saudi Arabia), Oriental (India), Neotropical (St Vincent & Grenadines), Eastern Palaearctic (China, Iran, Kazakhstan, Taiwan), Western Palaearctic (Armenia, Europe, Caucasus, Georgia, Israel, Russia, Turkey).

Pachyneuron nelsoni Girault, 1928

Pachyneuron nelsoni Girault, 1928: 2, Holotype ♀. – QMB, Australia-Queensland.

Material examined. 3♀♀, Iran, Kerman province, Rayen (29°35'51.22"N, 57°28'03.04"E, 2093 m), Malaise trap, 25.05.2018, Sh. Mohebban, leg.

Distribution in Iran. East Azarbaijan (Lotfalizadeh & Gharali 2008), Kerman (Shojaey *et al*. 2021, current study), Khorasan-e Razavi (Hasani & Madjdzadeh 2012), and Kordestan (Dehdar & Madjdzadeh 2016) provinces.

General distribution. Cosmopolitan

Genus: *Rhaphitelus* Walker, 1834

Rhaphitelus Walker, 1834: 168, 178.

Type species: *Rhaphitelus maculatus* Walker, 1834, by monotypy.

Rhaphitelus maculatus Walker, 1834

Rhaphitelus maculatus Walker, 1834: 179, Holotype ♀. – BMNH, United Kingdom.

Material examined. 2♀♀, Iran, Kerman province: Rayen (29°35'51.22"N, 57°28'03.04"E, 2093 m), Malaise trap, 27.07.2018, 1♀; Golbaf (29°52'54.53"N, 57°43'40.71"E, 1743 m), Malaise trap, 19.04.2018, 1♀, Sh. Mohebban, leg.

Distribution in Iran. Alborz, Ardabil, East Azarbaijan, Hamedan, Isfahan, Markazi, Zanjan (Abolhassanzadeh *et al*. 2017), and Kerman (current study) provinces.

General distribution. Australian (Australia), Eastern Palaearctic (Iran, Japan, Kazakhstan, Kyrgyzstan, China, Turkmenistan, Uzbekistan), Nearctic (Canada, USA), Neotropical (Argentina, Chile), Oceanic (New Zealand), Oriental (India), Western Palaearctic (Egypt, Europe, Israel, Russia, Tunisia, Turkey).

Genus: *Syntomopus* Walker, 1833

Syntomopus Walker, 1833: 371, 372:

Type species: *Syntomopus thoracicus* Walker, 1833. Designation by Westwood 1839.

Syntomopus incurvus Walker, 1833*

(Figures 3–4)

Syntomopus incurvus Walker, 1833: 372, Lectotype ♀. – BMNH, United Kingdom.

Material examined. 3♀♀, 1♂, Iran, Kerman province: Koohpayeh (30°28'50.65"N, 57°19' 17.98"E, 1803 m), Malaise trap, 07.02.2018, 1♀; Fahraj (28º53'10.57"N, 58º47'22.88"E, 726m), Malaise trap, 12.06.2019, 1♀, 1♂, Sh. Mohebban, leg.; Jiroft (28°40'31.17"N, 57°44'16.69"E, 686 m), swept on *Mentha pulegium*, 21.05.2014, 1♀, N. Amirinasab, leg.

Diagnosis. Female (Figs 3–4A). Body length: 1.9–2.25 mm. Head in frontal view 1.23–1.29 times wider than high (Fig. 3A). Toruli inserted above lower margins of eyes (Fig. 3A). Antenna with scape not reaching lower edge of median ocellus; funicular segments transverse except first segment quadrate (Fig. 3A). Width of head 2.33–2.46 times its length (dorsal view) (Fig. 3B). POL 1.55–1.75 times longer than OOL (Fig. 3B). Eye height 1.66–1.76 times longer than its length (lateral view) (Fig. 3C). Pronotum with lateral angles almost prominent. Mesoscutum 1.8–1.84 times wider than its length (Fig. 3D). Fore wing with basal cell and basal fold almost glabrous except few setae on basal fold, marginal vein 1.2–1.23 times longer than postmarginal vein and 2.36–2.4 times longer than stigmal vein (Fig. 3E). Propodeum with median area coarsely reticulate, lateral parts smooth, median carina complete, plicae distinct (Fig. 3F). Gaster 1.61–1.65 times longer than wide; petiole 1.8–1.9 times longer than wide and with parallel sides; posterior margin of first tergite emarginated. Head and mesosoma dark green with metallic yellow reflection; Antenna dark brown with scape yellow; Legs with coxa concolorous with mesosoma, remainder segments yellow. Wings hyaline, venation light brown; metasoma dark brown with petiole black (Fig. 4A).

Male (Fig. 4B). Body length: 1.55–1.75 mm. Similar to female, but antenna with funicular segments slightly longer than width, decreasing in length towards apex; marginal vein 2.1–2.12 times longer than stigmal vein.

Distribution in Iran. Kerman province (current study).

General distribution. Eastern (Iran [**New record**], Kazakhstan, China) and Western (Europe, Turkey) Palaearctic.

DISCUSSION

On the basis of the new findings, four genera (*Euneura* Walker*, Habritys* Thomson, *Rhaphitelus* Walker and *Syntomopus* Walker) and eight species of Pteromalinae (*Dinarmus altifrons*, *Euneura lachni*, *Habritys brevicornis*, *Pachyneuron formosum*, *Pachyneuron grande*, *Pachyneuron muscarum*, *Rhaphitelus maculatus*, and *Syntomopus incurvus*) are first recorded for Kerman province. Considering the habitat diversity in Kerman province as the largest province of Iran, many more species than the listed taxa (Table 1)

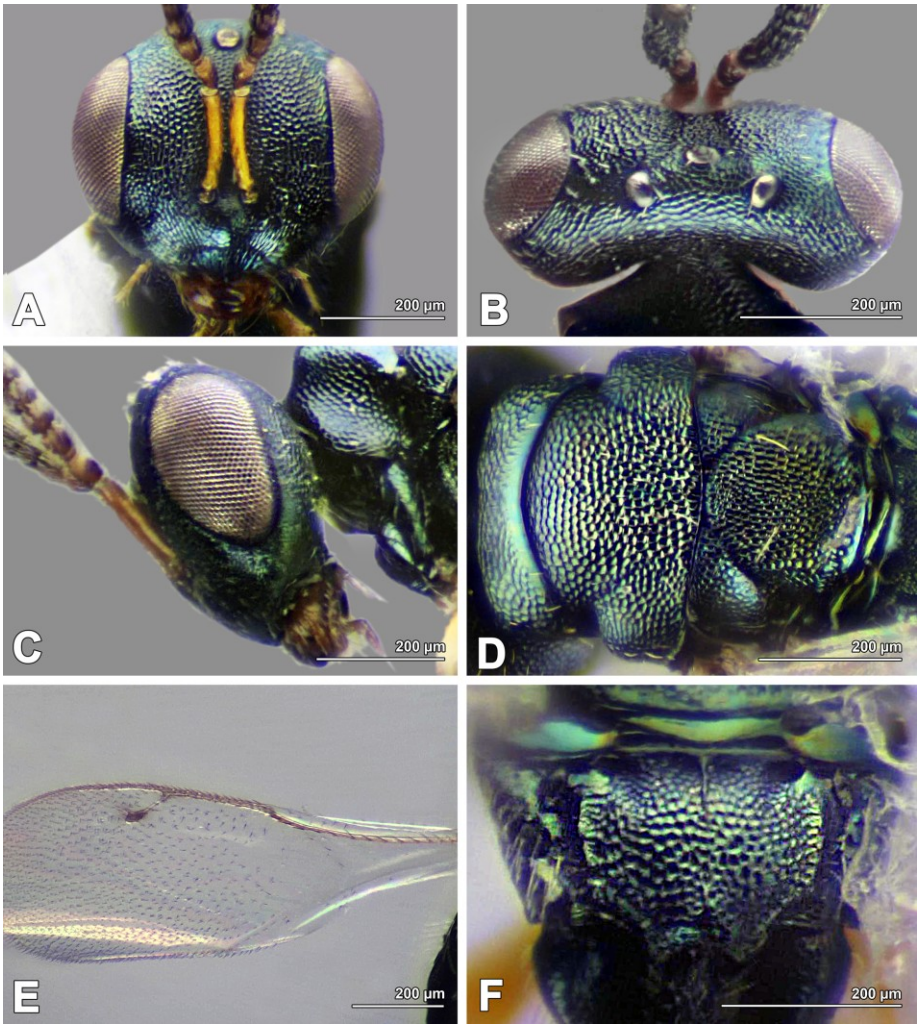


Figure 3. *Syntomopus incurvus* Walker, 1833. Female. A = Head in frontal view, B = Head in dorsal view, C = Head in lateral view, D = Mesonotum in dorsal view, E = Fore wing venation, F = Propodeum in dorsal view.

are expected. On the other hand, very little is known about the occurrence of the known species in other provinces of Iran (Figure 5). The 45 species of Pteromalinae recorded in Kerman comprise only 39.8% of the known Pteromalinae from Iran (Abolhassanzadeh *et al*. 2017, Moravvej *et al*. 2018, Lotfalizadeh *et al*. 2020, Rahmani *et al*. 2019, 2020, Shojaey *et al*. 2019, 2021, Gibson *et al*. 2021). Two species, *Dinarmus altifrons* and *Syntomopus incurvus* are also representing new records for the fauna of Iran. Three *Dinarmus* species (Eslami 1998, Hasani *et al*. 2011, Mitroiu *et al*. 2011) and only a single *Syntomopus* species (Lotfalizadeh & Gharali 2008) were already recorded from Iran. The genera *Dinarmus* and *Syntomopus* have seven and nine species in the Palaearctic region, respectively (Noyes 2019).

The Iranian specimens of *Dinarmus altifrons* were rather similar to the description of the lectotype from South Africa (Rasplus 1989). The marginal clypeal dentacles make a V-shape incision, a character that is slightly different from the U-shape incision illustrated in the African specimens and more similar to the Indian specimens of *D. altifrons* (Sureshan & Narendran 2001). The scape reaches the lower margin of the median ocellus and the propodeal nucha sculpture

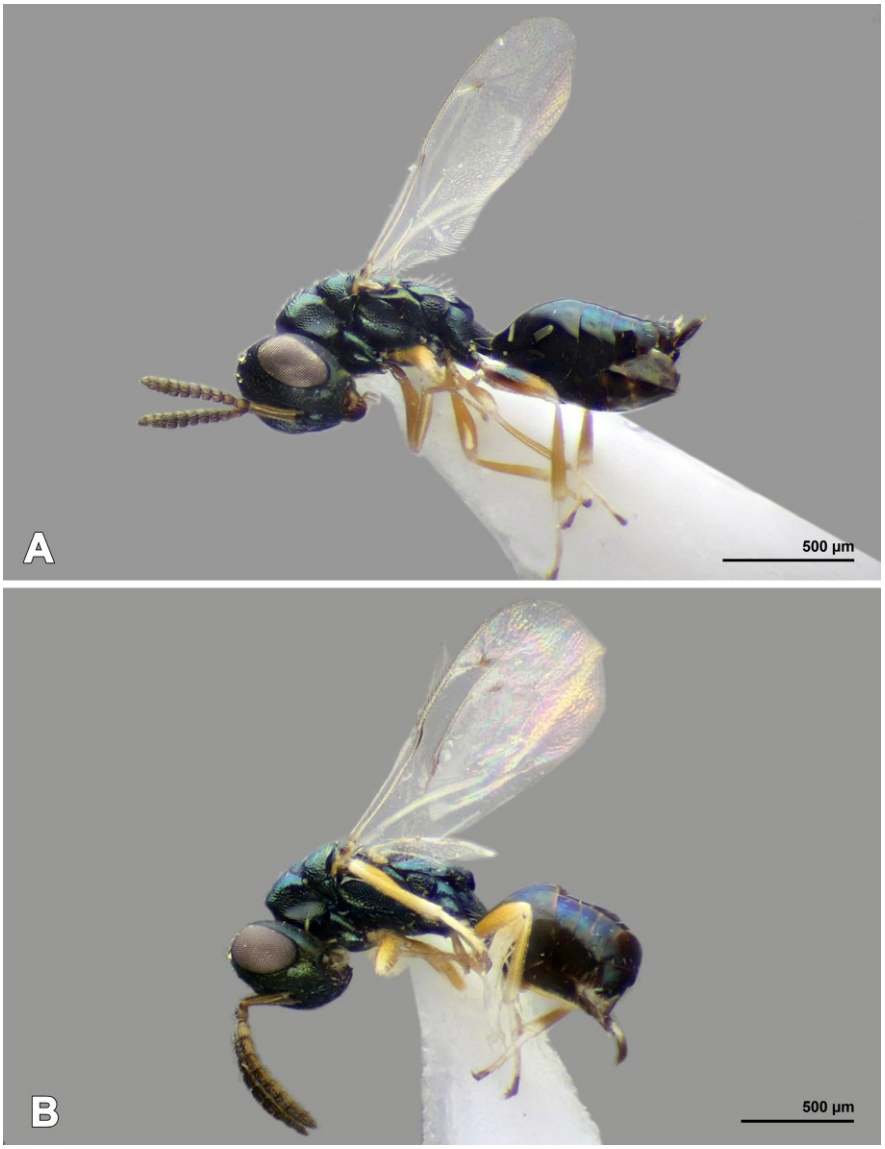
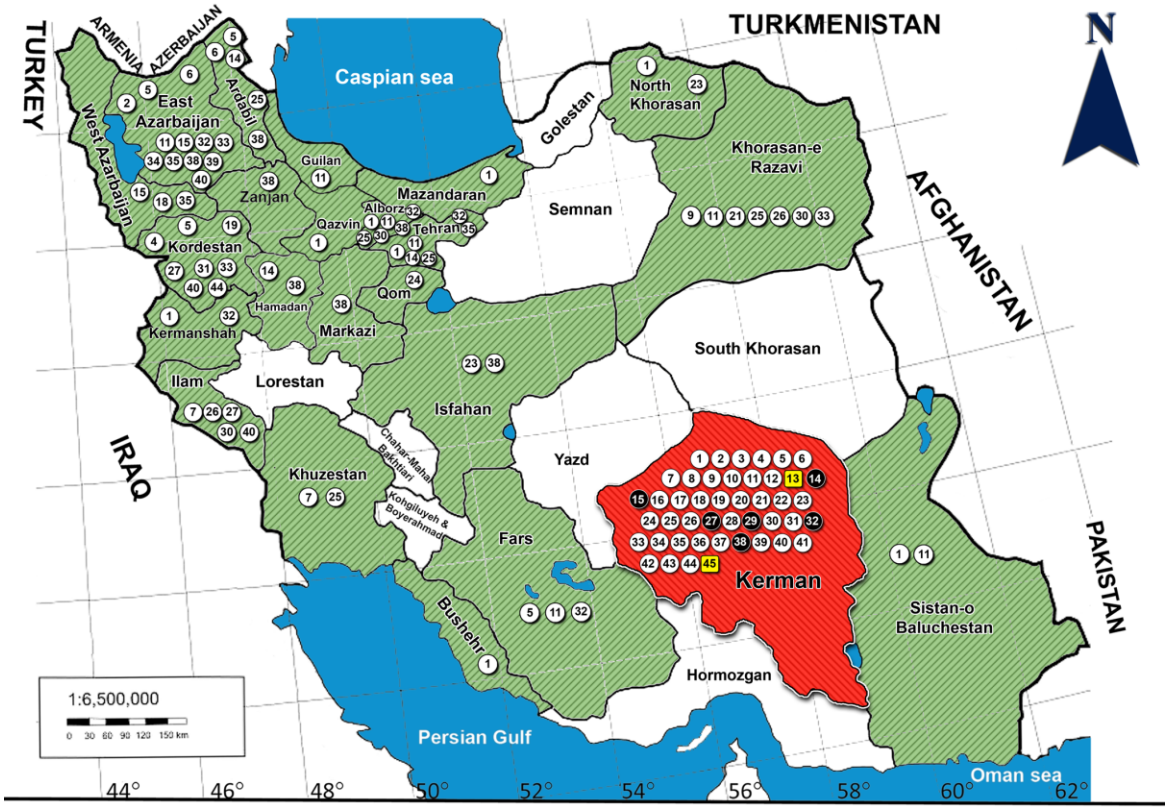


Figure 4. *Syntomopus incurvus* Walker, 1833 – Lateral view of habitus. A. Female; B. Male.

is a bit different. Considering the type locality, and the few minor differences, the specimens outside South Africa may represent a different species. This should be verified by a direct examination of the type specimens (BMNH London), and also by assessing the intraspecific variability through examination of many specimens from various regions. A world revision of the genus or at least of the species group would also be necessary to include molecular data.

The majority of the known Pteromalinae species in Kerman (42.2%) are not recorded outside the Palaearctic region. On the other hand, 20% of species share a distribution both in the Palaearctic and the Nearctic regions (Table 2). Not enough data are yet gathered to make an appropriate judgment about such distribution unless a complete faunal analysis based on extensive exploration is made throughout the whole area of southeastern Iran.



1. *Anisopteromalus calandrae* (Howard, 1881)
2. *Caenacis inflexa* (Ratzeburg, 1848)
3. *Caenocrepis arenicola* (Thomson, 1878)
4. *Callitula bicolor* Spinola, 1811
5. *Catolaccus crassiceps* (Masi, 1911)
6. *Cheiropachus quadrum* (Fabricius, 1787)
7. *Chlorocytus spicatus* (Walker, 1835)
8. *Coelopisthia areolata* Askew, 1980
9. *Cyrtoptyx latipes* (Rondani, 1874)
10. *Dibrachys lignicola* Graham, 1969
11. *Dibrachys microgastri* (Bouché, 1834)
12. *Dinarmus acutus* (Thomson, 1878)
13. *Dinarmus altifrons* (Walker, 1862)
14. *Euneura lachni* (Ashmead, 1887)
15. *Habritys brevicornis* (Ratzeburg, 1844)
16. *Hobbya stenonota* (Ratzeburg, 1848)
17. *Homoporus apharetus* (Walker, 1839)
18. *Homoporus febriculosus* (Girault, 1917)
19. *Homoporus fulviventris* (Walker 1835)
20. *Mesopolobus fasciiventris* Westwood, 1833
21. *Mesopolobus sericeus* (Forster, 1770)
22. *Norbanus brevicornis* Szelenyi, 1974
23. *Novitzkyanus cryptogaster* Bouček, 1961
24. *Pachycrepoideus vindemmiae* (Rondani, 1875)
25. *Pachyneuron aphidis* (Bouché, 1834)
26. *Pachyneuron erzurumicum* Doğanlar, 1986
27. *Pachyneuron formosum* Walker, 1833
28. *Pachyneuron gibbiscuta* Thomson, 1878
29. *Pachyneuron grande* Thomson, 1878
30. *Pachyneuron groenlandicum* (Holmgren, 1872)
31. *Pachyneuron leucopiscida* Mani, 1939
32. *Pachyneuron muscarum* (Linnaeus, 1758)
33. *Pachyneuron nelsoni* Girault, 1928
34. *Peridesmia discus* (Walker, 1835)
35. *Pteromalus bedeguaris* (Thomson, 1878)
36. *Pteromalus cyniphidis* (Linnaeus, 1758)
37. *Pteromalus dolichurus* (Thomson, 1878)
38. *Rhaphitelus maculatus* Walker, 1834
39. *Sphegigaster ineus* Mitroiu, 2008
40. *Sphegigaster nigricornis* (Nees, 1834)
41. *Sphegigaster pedunculiventris* (Spinola, 1808)
42. *Sphegigaster persiana* Mitroiu & Madjdzadeh, 2011
43. *Sphegigaster truncata* Thomson, 1878
44. *Stenoselma nigrum* Delucchi, 1956
45. *Syntomopus incurvus* Walker, 1833

Figure 5. Distribution map for species of Pteromalinae in Kerman province. Number in black and yellow shapes indicating newly recorded species from Kerman and Iran, respectively.

Table 1. List of the known Pteromalinae species in Kerman province.

	Species name	References
1	*Anisopteromalus calandrae* (Howard, 1881)	Shojaey et al. (2021)
2	*Caenacis inflexa* (Ratzeburg, 1848)	Mahdavi et al. (2015)
3	*Caenocrepis arenicola* (Thomson, 1878)	Shojaey et al. (2019, 2021), current study
4	*Callitula bicolor* Spinola, 1811	Shojaey et al. (2021)
5	*Catolaccus crassiceps* (Masi, 1911)	Shojaey et al. (2021)
6	*Cheiropachus quadrum* (Fabricius, 1787)	Mitroiu et al. (2011); current study
7	*Chlorocytus spicatus* (Walker, 1835)	Shojaey et al. (2021)
8	*Coelopisthia areolata* Askew, 1980	Shojaey et al. (2021)
9	*Cyrtoptyx latipes* (Rondani, 1874)	Mitroiu et al. (2011), Shojaey et al. (2021)
10	*Dibrachys lignicola* Graham, 1969	Ziaaddini et al. (2014)
11	*Dibrachys microgastri* (Bouché, 1834)	Mitroiu et al. (2011)
12	*Dinarmus acutus* (Thomson, 1878)	Mitroiu et al. (2011)
13	*Dinarmus altifrons* (Walker, 1862)	Current study
14	*Euneura lachni* (Ashmead, 1887)	Current study
15	*Habritys brevicornis* (Ratzeburg, 1844)	Current study
16	*Hobbya stenonota* (Ratzeburg, 1848)	Lotfalizadeh et al. (2012)
17	*Homoporus apharetus* (Walker, 1839)	Shojaey et al. (2021), current study
18	*Homoporus febriculosus* (Girault, 1917)	Shojaey et al. (2021)
19	*Homoporus fulviventris* (Walker 1835)	Mitroiu et al. (2011), Shojaey et al. (2021)
20	*Mesopolobus fasciiventris* Westwood, 1833	Mahdavi & Madjdzadeh (2013)
21	*Mesopolobus sericeus* (Förster, 1770)	Mahdavi et al. (2015)
22	*Norbanus brevicornis* Szelenyi, 1974	Shojaey et al. (2021)
23	*Novitzkyanus cryptogaster* Bouček, 1961	Rahmani et al. (2019)
24	*Pachycrepoideus vindemmiae* (Rondani, 1875)	Shojaey et al. (2021), current study
25	*Pachyneuron aphidis* (Bouché, 1834)	Mitroiu et al. (2011), Shojaey et al. (2021), current study
26	*Pachyneuron erzurumicum* Doğanlar, 1986	Mitroiu et al. (2011), current study
27	*Pachyneuron formosum* Walker, 1833	Current study
28	*Pachyneuron gibbiscuta* Thomson, 1878	Shojaey et al. (2021)
29	*Pachyneuron grande* Thomson, 1878	Current study
30	*Pachyneuron groenlandicum* (Holmgren, 1872)	Mitroiu et al. (2011), current study
31	*Pachyneuron leucopiscida* Mani, 1939	Shojaey et al. (2021)
32	*Pachyneuron muscarum* (Linnaeus, 1758)	Current study
33	*Pachyneuron nelsoni* Girault, 1928	Shojaey et al. (2021), current study
34	*Peridesmia discus* (Walker, 1835)	Shojaey et al. (2021)
35	*Pteromalus bedeguaris* (Thomson, 1878)	Lotfalizadeh et al. (2012)
36	*Pteromalus cyniphidis* (Linnaeus, 1758)	Mahdavi et al. (2015)
37	*Pteromalus dolichurus* (Thomson, 1878)	Mahdavi et al. (2015)
38	*Rhaphitelus maculatus* Walker, 1834	Current study
39	*Sphegigaster ineus* Mitroiu, 2008	Shojaey et al. (2021)
40	*Sphegigaster nigricornis* (Nees, 1834)	Shojaey et al. (2021)
41	*Sphegigaster pedunculiventris* (Spinola, 1808)	Shojaey et al. (2021)
42	*Sphegigaster persiana* Mitroiu & Madjdzadeh, 2011	Mitroiu et al. (2011)
43	*Sphegigaster truncata* Thomson, 1878	Mitroiu et al. (2011)
44	*Stenoselma nigrum* Delucchi, 1956	Shojaey et al. (2021)
45	*Syntomopus incurvus* Walker, 1833	Current study

Table 2. Biogeographical distribution of the Pteromalinae species in Kerman province.

Distribution	No of species	Frequency (%)
Palaearctic	19	42.2
Holarctic (Palaearctic and Nearctic)	9	20
Palaearctic and Oriental	3	6.7
Palaearctic, Afrotropical and Oriental	3	6.7
Palaearctic, Nearctic and Oriental	1	2.2

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