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A new genus and two new species with some new records of the subfamily Campopleginae (Hymenoptera: Ichneumonidae) from Iran

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Abstract

Background The Campopleginae is the third largest subfamily of Ichneumonidae in the world and Iran.

Results During a study of the family Ichneumonidae in northwestern Iran, we collected 30 species of the subfamily Campopleginae. One genus, *Parameloboris* Riedel, and two species, *Diadegma persicum* Riedel **sp. nov.** and *Parameloboris nigrocephalus* Riedel **sp. nov.**, are new to science described and illustrated here. Nine species are recorded for the first time for the fauna of Iran. A checklist of the Iranian members of Campopleginae was provided showing the geographical distribution in Iran. A new name, *Dusona rufigaster* Riedel, Mohammadi-Khoramabadib and Khayrandish, 2019 proposed for preoccupied by Walley, 1940 a new name, *Dusona rufitergus* Riedel & Karimi is proposed here.

Conclusions The number of identified species of the subfamily Campopelgine in Iran increased to 94 species.

Keywords Parasitoid, Fauna, Iran, Palaearctic, *Diadegma*, *Parameloboris*

Background

Ichneumonidae (Hymenoptera: Ichneumonoidea) is one of the largest families of insects with more than 25,285 species described worldwide (Yu et al. 2016). In order to increase our knowledge of these abundant and important parasitoids of pests, research on their taxonomy, distribution and biology is ongoing throughout the world, even in well-studied areas such as Europe (Klopfstein et al. 2019; Vas and Giovanni 2020).

The Iranian Ichneumonidae fauna is not well investigated, although it is one of the most interesting in the Western Palaearctic due to its affinities to the Eastern Palaearctic region. The first records of Ichneumonidae species from Iran had been done by Kokujev (1906). Later, many species of the subfamily Ichneumoninae were reported by Heinrich (1929). In recent years, several studies in the form of dissertations or research projects in this field were carried out in Iran (Talebi et al. 2005; Barahoei et al. 2012; Fathi et al. 2012; Shaw et al. 2016; Moheban et al. 2016; Amiri et al. 2017; Mohammadi-Khoramabadi and Ziaaddini 2017; Mohammadi-Khoramabadi et al. 2017, 2018; Riedel et al. 2019a, 2019b; Mohammadi-Khoramabadi 2023).

The subfamily Campopleginae is the third largest subfamily of Ichneumonidae, with more than 2127 identified

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species in the world (Yu et al. 2016). The members of this subfamily are mainly koinibiont endoparasitoids of Lepidoptera larvae, although some species attack Coleoptera, Symphyta (Hymenoptera), Rhaphidioptera and Neuroptera larvae (Broad et al. 2018). Therefore, campoplegines are effective parasitoids for both classical and conservation biological control of pests (Quick 2015).

Gonzalez et al. (1980) and Herard et al. (1979) have reported some species of the subfamily Campopleginae from Iran. Subsequently, studies elaborated the knowledge about this subfamily. Eighty Iranian species of the subfamily Campopleginae are known to 2023 (Talebi et al. 2005; Barahoei et al. 2012; Fathi et al. 2012; Shaw et al. 2016; Moheban et al. 2016; Amiri et al. 2017; Mohammadi-Khoramabadi and Ziaaddini 2017; Mohammadi-Khoramabadi et al. 2017, 2018; Riedel et al. 2019a, 2019b; Mohammadi-Khoramabadi 2023). Our recently collected specimens from northwest Iran revealed many new findings, including new species and new records.

Methods

This study is based on specimens collected in north-west Iran during the spring and summer of 2019–2020. Collections were done via a Malaise trap and sweep net. Totally 58 specimens were collected. Collected specimens were preserved in 75% ethanol and prepared according to the AXA method (van Achterberg 2009). Prepared specimens were mounted on rectangular cards and labeled. Prepared specimens were sorted, and specimens were then examined under an Olympus™ SZH. The last author identified specimens according to reliable keys (Townes 1969, 1970; Kasparyan and Dbar 1985; Horstmann 1994; Varga 2014; Di Giovanni and Riedel 2017; Riedel 2018). Morphological terminology follows Broad et al. (2018). The distributional data of some species were extracted from Yu et al. (2016).

An Olympus SZX 7 stereo microscope with a dividing eyepiece was used for the measurement. The figures were taken with a Canon® A720 digital camera using Adobe Photoshop CS software and processed with Helicon Focus and Microsoft Picture manager software.

Voucher specimens were deposited in the HMIM (Hayk Mirzayans Insect Museum, Iranian Research Institute of Plant Protection, Tehran, Iran).

Acronyms for depositories are listed below:

HMIM: Hayk Mirzayans Insect Museum, Tehran, Iran.

ZSM: Zoologische Staatssammlung München, München, Germany.

Results

In this research, we identified 30 species of the subfamily Campopleginae in 12 genera. One new genus and two new species were described, and 13 species were reported for the first time in Iran.

List of findings

***Campoletis raptor* (Zetterstedt, 1838)**

Material examined: 1♀, West-Azarbaijan, Bukan, 36°31′49.5″N, 46°11′50.7″E, 1337 m, 2.ix.2019, leg. S. Karimi.

Distribution: Western Palaearctic, Iran (Samin et al. 2021).

***Campopletis scyticus* Riedel, 2017**

Material examined: 1♀, West-Azarbaijan, Mahabad, 36°39′58″N, 45°36′70″E, 1470 m, 18.viii.2020, leg.S. Karimi.

Distribution: Transpalaearctic (Mohammadi-Khoramabadi et al. 2018; Bahremand et al. 2022).

***Campoletis varians* (Thomson, 1887)**

Material examined: 1♀, West-Azarbaijan, Mahabad, 36°23′42″N, 45°40′08″E, 1586 m, 8.ix.2019, leg. S. Karimi. 1♂, West-Azarbaijan, Bukan, 36°38′34.6″N, 46°16′35.4″E, 1455 m, 18.viii.2020, leg. S. Karimi.

Distribution: Western Palaearctic (Iran, **new record**).

***Campoplex punctulatus* (Szépligeti, 1916)**

Material examined: 1♂, West-Azarbaijan, Bukan, 36°35′34″N, 45°57′42″E, 1635 m, 8.vi.2019, leg. S. Karimi.

Distribution: Western Palaearctic (Iran, **new record**).

***Chromoplex picticollis* (Thomson, 1887)**

Material examined: 1♀, West-Azarbaijan, Sardasht, 36°16′49.4″N, 45°29′11.1″E, 1063 m, 30.viii.2020, leg. S. Karimi.

Distribution: Transpalaearctic.

***Cymodusa australis* (Smits van Burgst, 1913)**

Material examined: 2 ♀♀, West-Azarbaijan, Sardasht, 36°16′49.4″N, 45°29′11.1″E, 1063 m, 30.viii.2020, leg. S. Karimi.

Distribution: Western Palaearctic, Iran (Amiri et al. 2017; Mohammadi-Khoramabadi et al. 2020).

***Cymodusa* sp.**

Material examined: 1♂, West-Azarbaijan, Miandoab, 37°00′33.6″N, 46°05′16.7″E, 1305 m, 6.x.2019, leg. S. Karimi.

1♂, West-Azarbaijan, Mahabad, 36°34′50″N, 45°40′59″E, 1504 m, 24.v.2019, leg. S. Karimi.

1♂, West-Azarbaijan, Mahabad, 36°39′56″N, 45°36′07″E, 1407 m, 28.v.2019, leg. S. Karimi.

***Diadegma auricellae* Horstmann, 2008**

Material examined: 1♀, West-Azarbaijan, Mahabad, 36°40′53″N, 45°44′58″E, 1362 m, 20.v.2020, leg. S. Karimi.

Distribution: Western Palaearctic (Iran, **new record**).

***Diadegma crassicorne* (Gravenhorst, 1829)**

Material examined: 1♀, West-Azarbaijan, Mahabad, 36°52′23″N, 45°48′35″E, 1340 m, 20.vii.2019, leg. S. Karimi.

1♀, West-Azarbaijan, Sardasht, 36°16′49.4″N, 45°29′11.1″E, 1063 m, 30.viii.2020, leg. S. Karimi.

Distribution: Transpalaearctic.

***Diadegma exareolator* Aubert, 1964**

Material examined: 1♀, West-Azarbaijan, Sardasht, 36°16′49.4″N, 45°29′11.1″E, 1063 m, 20.v.2020, leg. S. Karimi. 1♂, West-Azarbaijan, Miandoab, 37°00′33.6″N, 46°05′16.7″E, 1305 m, 06.x.2019, leg. S. Karimi. 4♀♀, West-Azarbaijan, Bukan, 36°31′49.5″N, 46°11′50.7″E, 1337 m, 2.ix.2019, leg. S. Karimi.

Distribution: Western Palaearctic (Iran, **new record**).

***Diadegma fenestrale* (Holmgren, 1860)**

Material examined: 1♀, West-Azarbaijan, Bukan, 36°31′49.5″N, 46°11′50.7″E, 1337 m, 2.ix.2019, leg. S. Karimi.

Distribution: Oriental, Transpalaearctic (Iran) (Kolarov 2019).

***Diadegma litorale* (Holmgren, 1856)**

Material examined: 1♀, West-Azarbaijan, Piranshahr, 36°34′32.0″N, 45°12′43.8″E, 1399 m, 15.vii.2020, leg. S. Karimi.

Distribution: Western Palaearctic (Iran, **new record**).

***Diadegma monospilum* (Thomson, 1887)**

Material examined: 1♀, West-Azarbaijan, Bukan, 36°35′36″N, 45°57′40″E, 1605 m, 21.vi.2019, leg. S. Karimi. 1♀, West-Azarbaijan, Mahabad, 36°48′16″N, 45°43′21″E, 1302 m, 10.viii.2019, leg. S. Karimi.

Distribution: Transpalaearctic (Iran, **new record**).

***Diadegma persicum* Riedel sp. nov.**

https://zoobank.org/NomenclaturalActs/98ac839d-2f19-4b4d-8b17-633944f9c5d3

Etymology: The species name refers to its occurrence in Persia, an old name for Iran.

***Holotype*:** (♀) Iran, West-Azarbaijan, Sardasht, 36°03′35.7″N, 45°30′48.9″E, 1143 m, 8.ix.2019, leg. S. Karimi **(ZSM).**

***Paratype*:** (♀) Iran,West-Azarbaijan, Bukan, 36°34′30.1″N, 46°04′12.0″E, 1407 m, 18.viii.2020, leg. S. Karimi (**HMIM**).

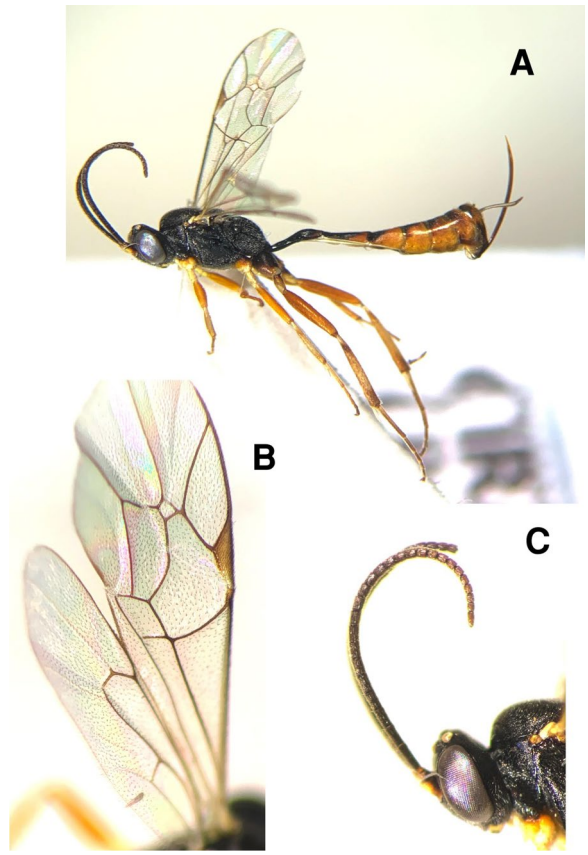

Fig. 1 *Diadegma persicum* **sp. nov.**, female: **A** female in lateral view; **B** fore and hind wings venation; **C** head and antenna in lateral view

Description:

Female. Body length 6.1–6.8 mm, length of fore wing 4.0–4.1 mm (Fig. 1A). Head covered with dense whitish setae. Temple narrow, strongly and roundly narrowed behind eye. Ocelli large; distance between lateral ocellus and eye 0.8–0.9 × and between lateral ocelli 1.3–1.5 × ocellar diameter. Face granulated, without distinct punctures. Compound eye bare; inner margins slightly excavated and slightly convergent ventrally (Fig. 2E). Flagellum with 26–27 flagellomeres, filiform; 1st flagellomere 3.6–3.9 × longer than wide; preapical flagellomere 1.2 × longer than wide (Fig. 1C). Clypeus moderately convex, with fine punctures, ∀ shaped shining. Mandible with narrow ventral lamella in basal half; dorsal tooth slightly longer than ventral one. Malar space 0.4 × as long as width of mandibular base. Genal carina complete, reaching hypostomal carina far from mandibular base; both carinae low.

Side of pronotum with superficial punctures dorsally, finely rugose and with some striae ventrally. Mesoscutum granulate, dull; area of notauli frontally with some fine punctures, notaulus not impressed. Mesopleural

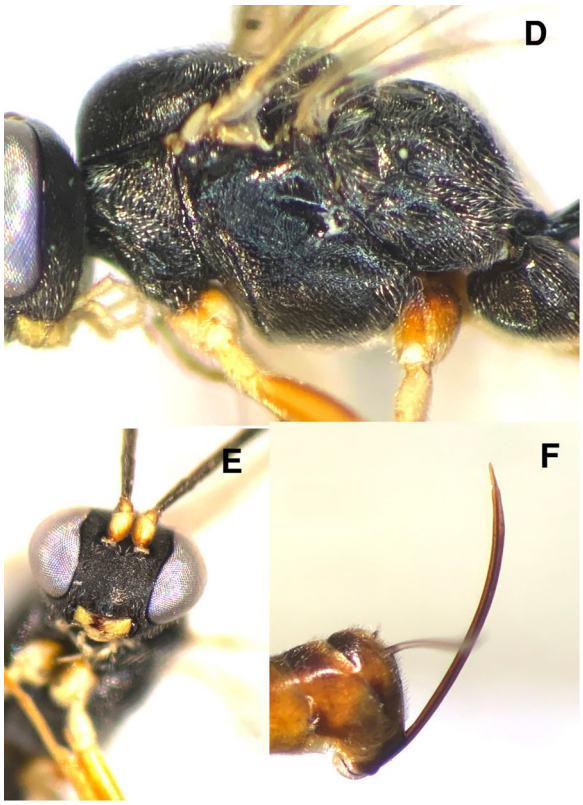

Fig. 2 *Diadegma persicum* **sp. nov.** female: **D** mesosoma in lateral view; **E** head in frontal view; **F** ovipositor

disc granulate and partly finely punctate, ∀ shaped shining (Fig. 2D). Speculum smooth and shining; impression dorso-frontally to speculum with some irregular striae. Epicnemial carina low, complete. Area basalis trapezoid, about as long as wide. Area superomedia hexagonal, slightly wider than long, open apically, with some coarse rugae; anterior transverse carina (costula) present, reaching area superomedia in its middle. Area petiolaris slightly impressed, transversally rugose-punctate. Hind femur 5.0–5.3 × longer than wide. Inner spur of hind tibia 0.60 × as long as hind metatarsus. Claws short, hind claw with three teeth.

Areolet stalked frontally, slightly oblique; vein 2 m-cu reaching its middle. Vein 1cu-a postfurcal by 2–3 × its width. Postnervulus intercepted in or slightly behind its middle. Nervellus of hind wing not intercepted, vertical; discoidella absent (Fig. 1B).

First metasomal tergite 3.0 × longer than wide; petiolus smooth laterally; glymma large; postpetiolus 1.10–1.15 × longer than wide, with rounded sides and distinct lateral carina. Second metasomal tergite 1.42–1.45 × longer than wide; 3rd metasomal tergite 1.0–1.2 × as long as wide. Apical margin of 5th metasomal tergite weakly and triangularly excised medially in holotype, not excised in paratype; 6th metasomal tergite strongly and triangularly excised medio-apically. Seventh metasomal tergite with deep triangular excision medio-apically. Ovipositor sheath 1.05–1.10 × longer than hind tibia. Ovipositor continuously and moderately bent upwards; upper valve subapically without a distinct notch in holotype, with a notch in paratype (Fig. 2F).

Color: Black. Palps, mandible except teeth, scape and pedicel ventrally, spot on hind edge of pronotum, tegula, fore coxa, fore and mid-trochanters and all trochantelli cream-yellow. Mid-coxa reddish or yellowish, brown basally; hind coxa black, diffusely reddish in apical 0.3; hind trochanter black, with yellow apical margin. Legs otherwise reddish-yellow. Mid- and hind tibiae ivory basally and medio-externally, with subbasal and apical brownish bands; hind tarsus brownish, metatarsus yellowish in basal 2/3. Postpetiolus and 2nd metasomal tergite black, with apical red bands; following tergites largely and triangularly or roundish black baso-medially, red laterally and apically. Wings hyaline; pterostigma pale brownish, with darker margins.

Male unknown.

Diagnosis: This new species is similar to *Diadegma maculatum* (Gravenhorst, 1829) but differs by ivory color pattern of hind tibia (reddish-yellow in *D. maculatum*), blackish baso-medial spots on 3rd to 7th tergites, strongly excised hind margin of 6th tergite, and longer 2nd metasomal tergite (non-excised 6th metasomal tergite and shorter 2nd in *D. maculatum*).

It also resembles *Diadegma aegyptiacum* Horstmann 1993 but differs by larger ocelli, at least as long as OOL (smaller in *D. aegyptiacum*), mainly black hind coxa and trochanter (reddish in *D. aegyptiacum*) and trapezoid area basalis of propodeum (apically stalked in *D. aegyptiacum*).

Diadegma semiclausum (Hellén, 1949)

Material examined: 1♀, West-Azarbaijan, Mahabad, 36°40′53″N, 45°44′58″E, 1362 m, 20.v.2020, leg. S. Karimi. 1♀, West-Azarbaijan, Mahabad, 36°33′50.1″N, 45°42′37.3″E, 1617 m, 17.v.2019, leg. S. Karimi. 1♀, West-Azarbaijan, Mahabad, 36°34′50″N, 45°40′59″E, 1504 m, 29.v.2019, leg. S. Karimi,. 1♀, West-Azarbaijan, Bukan, 36°31′49.5″N, 46°11′50.7″E, 1337 m, 2.ix.2019, leg. S. Karimi.

Distribution: Afrotropical, Australasian, Oceanic, Oriental, Palaearctic (Yu et al. 2016).

***Diadegma tenuipes* (Thomson, 1887)**

Material examined: 1♀, West-Azarbaijan, Mahabad, 36°44′48″N, 45°54′29″E, 1877 m, 5.viii.2019, leg. S. Karimi.

Distribution: Transpalaearctic, known from Iran (Navaeian et al. 2021).

Diadegma variegatum **(Szépligeti, 1916)**

Material examined: 2♀♀, West-Azarbaijan, Miandoab, 37°00′33.6″N, 46°05′16.7″E, 1305 m, 5.viii.2019, leg. S. Karimi. 1♂, West-Azarbaijan, Naghadeh, 37°00′03.0″N, 45°32′06.7″E, 1301 m, 23.ix.2019, leg. S. Karimi. 1♂, West-Azarbaijan, Sardasht, 36°03′35.7″N, 45°30′48.9″E, 1143 m, 8.ix.2019, leg. S. Karimi.

Distribution: Western Palaearctic (Iran, **new record**).

Dusona annexa **(Förster 1868)**

Material examined: 1♀, West-Azarbaijan, Piranshahr, 36°34′32.0″N, 45°12′43.8″E, 1399 m, 15.vii.2020, leg. S. Karimi.

Distribution: Holarctic (Iran, **new record**).

Hyposoter didymator **(Thunberg, 1822)**

Material examined: 1♀, West-Azarbaijan, Miandoab, 36°54′29″N, 46°03′39″E, 1306 m, 25.vii.2019, leg. S. Karimi. 1♀, West-Azarbaijan, Mahabad, 36°39′58″N, 45°36′70″E, 1470 m, 31.v.2019, leg. S. Karimi. 1♀, West-Azarbaijan, Mahabad, 36°52′21.2″N, 45°43′46.0″E, 1316 m, 5.viii.2019, leg. S. Karimi. 1♀, West-Azarbaijan, Mahabad, 36°52′23″N, 45°48′35″E, 1340 m, 19.v.2019, leg. S. Karimi. 1♀, West-Azarbaijan, Mahabad, 36°40′53″N, 45°44′58″E, 1362 m, 20.v.2020, leg. S. Karimi.

Distribution: Transpalaearctic (Yu et al. 2016).

Hyposoter notatus **(Gravenhorst, 1829)**

Material examined: 2♂♂, West-Azarbaijan, Mahabad, 36°39′58″N, 45°36′70″E, 1470 m, 31.v.2019, leg. S. Karimi. 1♀, West-Azarbaijan, Miandoab, 37°00′33.6″N, 46°05′16.7″E, 1305 m, 6.x.2019, leg. S. Karimi.

Distribution: Holarctic, known from Iran (Yu et al. 2016).

Nemeritis macrocentra **(Gravenhorst, 1829)**

Material examined: 1♀, West-Azarbaijan, Bukan, 36°35′36″N, 45°57′40″E, 1605 m, 21.vi.2019, leg. S. Karimi.

Distribution: Western Palaearctic, known from Iran (Samin et al. 2021).

Olesicampe patellana **(Thomson, 1887)**

Material examined: 1♂, West-Azarbaijan, Bukan, 36°35′36″N, 45°57′40″E, 1605 m, 21.vi.2019, leg. S. Karimi.

Distribution: Western Palaearctic, known from Iran (Samin et al. 2018).

Parameloboris **Riedel, gen. nov.**

https://zoobank.org/NomenclaturalActs/8a53e6a4-9356-4929-bf8b-bcb4c496116c

Type species: *Parameloboris nigrocephalus* Riedel, **sp. nov.**

Diagnosis: Length of fore wing 3.4–3.9 mm. Head with dense fine granulation, not punctate (Fig. 3B, C). Temple wide, slightly and roundly narrowed behind eye, dorsally 0.8 × as long as eye. Ocelli smaller than the distance between lateral ocellus and compound eye. Face wider than long. Inner eye margins slightly indented opposite antennal sockets. Clypeus slightly convex, apical margin almost smooth and ± shining; apical margin sharp and almost straight, slightly protruding medially, but without median tooth or tubercle. Mandible with low ventral lamella; ventral tooth slightly larger than dorsal one. Malar space 0.6 × as long as width of mandibular base. Genal carina reaching hypostomal carina away from mandibular base; both carinae low.

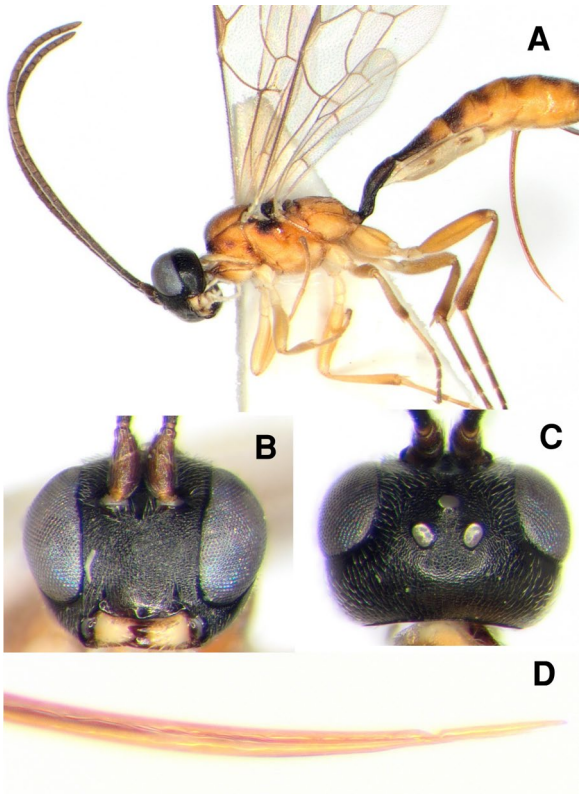

Fig. 3 *Parameloboris nigrocephalus* **sp. nov.** female: **A** female in lateral view; **B** head in frontal view; **C** head in dorsal view; **D** ovipositor

Mesosoma mainly granulate, not punctate. Mesopleural disc granulate, dull. Speculum with microsculpture but shining; impression dorso-frontally to speculum with fine irregular striae. Epicnemial carina low, dorsally reaching frontal margin of mesopleuron. Posterior transverse carina of mesosternum complete, low and unmodified. Propodeum mainly granulate, moderately elongate, with distinct carination. Propodeal spiracle small and round. Area basalis trapezoid, about 2 × longer than wide. Area superomedia pentagonal, elongate, closed apically, lateral carinae parallel in caudal 2/3. Anterior transversal carina (costula) present. Area petiolaris without or with weak lateral carina. Hind trochantellus unmodified. Hind

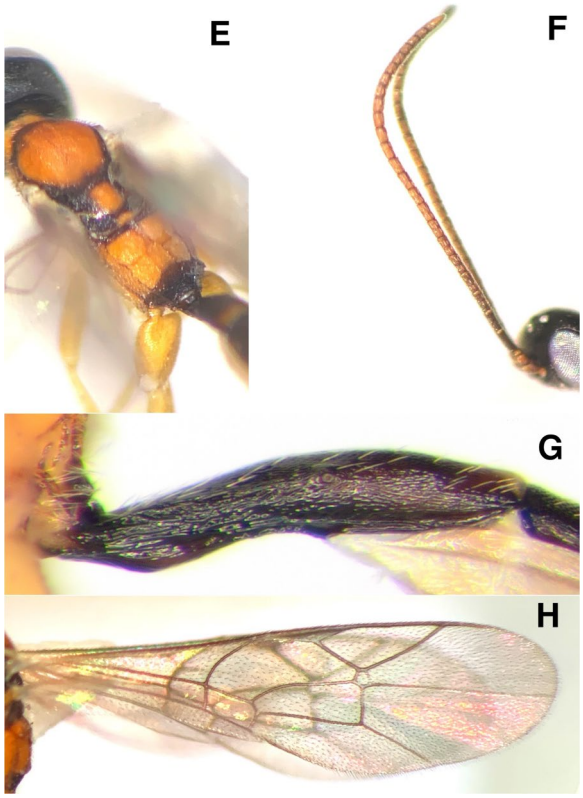

Fig. 4 *Parameloboris nigrocephalus* **sp. nov.** female: **E** propodeum in dorsal view; **F** antenna in lateral view; **G** first metasomal segment in lateral view; **H** fore wing venation

femur rather slender. Hind metatarsus without midventral row of closely spaced setae. Hind claw with one short basal visible tooth.

Areolet pentagonal; vein 2 m-cu reaching areolet in or slightly distad its middle. Vein 1cu-a interstitial or slightly postfurcal (Fig. 4H). Nervellus of hind wing not intercepted, distinctly reclivous; discoidella absent.

Metasoma slender (Fig. 4G). Petiolus somewhat prismatic in profile, suture between sternite and metasomal tergite slightly below the mid-height of the petiole; glymma absent. Postpetiolus longer than wide. Second metasomal tergite much longer than wide; thyridium roundish, distance to basal margin of 2nd metasomal tergite almost 2×its diameter. Third metasomal tergite as long as wide. Apical margins of 2nd to 6th metasomal tergites straight. Seventh metasomal tergite with weak triangular excision medio-apically. Ovipositor sheath 0.9×as long as hind tibia. Ovipositor continuously and moderately bent upwards; tip behind subapical notch slender (Fig. 3D).

Taxonomical remark: This new genus runs to *Nemeritis* Holmgren in the key of World Campopleginae (Townes 1969), but differs by a pentagonal areolet of fore wing, absence of discoidella and interception of nervellus in hind wing, a densely granulate but not punctate body, and an extensive red coloration of the mesosoma and tergites. It might represent an aberrant species of *Nemeritis*.

***Parameloboris nigrocephalus* Riedel, sp. nov.**

https://zoobank.org/NomenclaturalActs/e96ae743-abc7-43a1-b1cb-72734fa36d83

Etymology: The species name refers to the black coloration of head (e.g., Latin names for black and head).

Holotype: (♀) Iran, West.Azarbaijan, Sardasht, 36°16′49.4″N, 45°29′11.1″E, 1063 m, 30. viii.2020,leg. S. Karimi **(ZSM).**

Paratype: (♀) Iran, West.Azarbaijan, Sardasht, 36°16′49.4″N, 45°29′11.1″E, 1063 m, 30.viii.2020, leg.S. Karimi **(HMIM).**

Description:

Female: Body length 4.8 mm (Fig. 3A), length of fore wing 3.9 mm. Flagellum with 23 flagellomeres, filiform; 1st flagellomere 3.9×longer than wide; all flagellomeres longer than wide (Fig. 4F). Head granulate, covered with whitish setae. Temple wide, slightly and roundly narrowed behind eye, dorsally 0.8×as long as eye. Ocelli small; distance between lateral ocellus and eye 1.5×and between lateral ocelli 1.1×ocellar diameter. Face granulate, without punctures, facial width 1.2×length of clypeus + face and 0.8×eye length. Compound eye bare; inner margins slightly excavated at antennal level, parallel ventrally (Fig. 3B, C). Clypeus slightly convex, granulate, apical margin almost smooth and ∀ shaped shining; apical margin sharp and almost straight, but slightly protruding medially, but without median tooth or tubercle. Mandible rather narrow, with narrow ventral lamella in basal half; ventral tooth slightly larger than dorsal one.

Side of pronotum granulate dorsally, with some coarse longitudinal striae ventrally. Mesoscutum granulate, dull; notaulus not impressed. Mesopleural disc granulate, dull. Speculum with microsculpture but shining; impression dorso-frontally to speculum with fine irregular striae. Epicnemial carina low, dorsally reaching frontal margin of mesopleuron. Posterior transverse carina of mesosternum complete, unmodified. Metapleuron granulate, juxtacoxal carina absent, subpleural carina low. Scutellum moderately elevated, slightly longer than wide, without lateral carina. Propodeum mainly granulate (Fig. 4E); area posteroexterna with some oblique rugae. Spiracle small and round. Area basalis trapezoid, about 2×longer than wide. Area superomedia pentagonal, 1.8×longer than wide, closed apically, lateral carinae parallel in caudal 2/3. Anterior transversal carina (costula) reaching area superomedia of 0.3 of its length. Area petiolaris without lateral carina confluent with area posteroexterna. Hind

trochantellus unmodified. Hind femur 4.8 × longer than wide. Spurs of hind tibia rather short, longer inner spur 0.46 × as long as hind metatarsus. Hind claw with one short basal visible tooth.

Areolet pentagonal; frontal distance between veins 2rs-m and 3rs-m about 2 × their width; vein 2 m-cu reaching areolet slightly distad its middle. Vein 1cu-a interstitial. Postnervulus intercepted before its middle. Outer edge of 2nd discal cell with an angle of 90°. Nervellus of hind wing not intercepted, distinctly reclivous; discoidella absent (Fig. 4H).

1st metasomal tergite 3.2 × longer than wide; petiolus granulate, with some rugae laterally; glymma absent. Postpetiolus 1.4 × longer than wide, with parallel sides, lateral carina absent. Second metasomal tergite 1.7 × longer than wide; 3rd metasomal tergite as long as wide. Apical margins of 2nd to 6th metasomal tergites straight. Seventh metasomal tergite with weak triangular excision medio-apically. Ovipositor sheath 0.9 × as long as hind tibia. Ovipositor continuously and moderately bent upwards (Fig. 3D); tip behind subapical notch slender, c. 7 × longer than maximally wide.

Color: Head black; palps cream-yellow; mandible except teeth yellowish. Scape ventrally and distal third of flagellum brownish. Mesosoma mainly reddish. Frontal margin of pronotum and dorsal spot of mesopleuron yellowish. Tegula cream-yellow. Scuto-scutellar groove, sides of scutellum, metanotum laterally and apical spot of area petiolaris blackish. First metasomal tergite black, narrowly reddish at apex. Second and 3rd metasomal tergites black, red in apical 0.3; 4th and 5th tergites brown basally, red in apical half; 6th metasomal tergite brown, with red apical and lateral margins; 7th metasomal tergite brown. Fore and mid-coxae, all trochanters and trochantelli, fore and mid-tibia basally and mid-metatarsus basally cream-yellow. Fore and mid-legs otherwise yellowish-red; mid-tibia in apical 0.3 and mid-tarsus in apical 2/3 brownish. Hind femur red, slightly infuscate apically; hind tibia reddish, brown in basal 0.2 and apical 0.3. Hind tarsus brown. Wings hyaline; pterostigma brown.

Male: unknown.

***Sinophorus fuscicarpus* (Thomson, 1887)**

Material examined: 1♀, West-Azarbaijan, Mahabad, 36°52′23″N, 45°48′35″E, 1340 m, 20.vii.2019, leg. S. Karimi.

Distribution: Oriental, Transpalaearctic (Iran, **new record**).

***Sinophorus xanthostomus* (Gravenhorst, 1829)**

Material examined: 4♀♀, West-Azarbaijan, Oshnaviyeh, 36°59′48,6″N, 45°06′09.9″E, 1448 m, 11.ix.2019, leg. S. Karimi. 1♀, West-Azarbaijan, Miandoab, 36°54′29″N, 46°03′39″E, 1306 m, 25.vii.2019, leg. S. Karimi. 1♀, West-Azarbaijan, Bukan, 36°34′30.1″N, 46°04′12.0″E, 1407 m, 18.viii.2020, leg. S. Karimi.

Distribution: Afrotropical, Oriental and Transpalaearctic.

***Venturia canescens* (Gravenhorst, 1829)**

Material examined: 1♀, West-Azarbaijan, Miandoab, 37°00′33.6″N, 46°05′16.7″E, 1305 m, 6.x.2019, leg. S. Karimi.

Distribution: Almost worldwide.

Discussion

The Campopleginae is one of the most diverse subfamilies of Ichneumonidae family, consisting of more than 2500 known species into 66 genera (Vas et al. 2022). In Iran, the first data on this subfamily comes from surveys on the parasitoids of some important pests (Gonzalez et al. 1980; Herard et al. 1979) but over past two decades, the faunal, taxonomical and bioecological researches have been considerably accelerated our information on this subfamily as up to now, 14 host-parasitoid relations have been documented, so that Families Noctuidae, Yponomeutidae, Lymantridae, Pyralidae, Geometridae, Tortricidae, Pieridae, Tischeriidae, Plutellidae, Lycaenidae, Choreutidae and Nymphlidae from Lepidoptera and Curculionidae family from Coleoptera have been reported as hosts for Compopleginae species from Iran (Amiri et al. 2017; Barahoei et al. 2012; Fathi et al. 2012; Mohammadi Khoramabadi et al., 2017, 2018; Mohammadi-Khoramabadi and Ziaaddini 2017; Mohebban et al. 2016; Riedel et al. 2019a, 2019b; Shaw et al. 2016; Talebi et al. 2005), Therefore, regarding the importance of the Campopleginae in the biological control of important pests, there is a need for more studies in Iran.

In Iran, research has been done by different researchers in Hamadan, Kermanshah, Kuhgiloyeh and Boyerahmad, Lorestan and Semnan (Navaeian et al. 2021); Kordestan (Masnadi et al. 2010; Samin et al. 2018); Hormozgan (Masnadi et al. 2010); Khuzestan (Riedel et al. 2019a); Qom (Kishani et al. 2010); Chaharmahal and Bakhtiari (Roshandel and Ebrahimi 2003; Kolarov and Ghahari 2005; Navaeian et al. 2021); Golestan (Ghadiri et al. 2007; Ghahari and Jussila 2010; Masnadi et al. 2010; Samin et al. 2018); Guilan (Kolarov and Ghahari 2005; Navaeian et al. 2021); Alborz (Golizadeh et al. 2008; Falahatpisheh et al. 2021; Navaeian et al. 2021); Ardabil (Fathi et al. 2012; Samin et al. 2018, 2021; Navaeian et al. 2021); Tehran (Horstmann 1993; Talebi et al. 2005; Sooudi et al. 2007; Masnadi et al. 2010); Sistan and Baluchestan (Kolarov and Ghahari 2005; Barahoei et al. 2013); Qazvin (Sooudi et al. 2007; Ghahari and Schwarz 2012); Isfahan (Ghahari and Jussila 2010; Ghahari et al. 2012); Razavi Khorasan (Barahoei et al. 2014); Markazi (Riedel et al.

Table 1 Iranian species of the subfamily Campopleginae (* need to be confirmed)

Genera	Species	Distribution in Iran	References
Alcima Förster, 1869	*A. orbitale* (Gravenhorst, 1829)	Mazandaran	Haeselbarth (1985), Ghahari and Jussila (2016)
	A. pictor Aubert, 1971*	Guilan	Kolarov and Ghahari (2005)
Bathyplectes Förster, 1869	*B. anurus* (Thomson, 1887)	Chaharmahal and Bakhtiari, Mazandaran, West Azarbaijan	Roshandel and Ebrahimi (2003), Kolarov and Ghahari (2005), Ghahari and Jussila (2016), Gonzalez et al. (1980)
	B. curculionis (Thomson, 1887)	West Azarbaijan, Chaharmahal and Bakhtiari	Gonzalez et al. (1980), Kolarov and Ghahari (2005)
	B. quinqueangularis (Ratzeburg, 1852)*	Alborz	Navaeian et al. (2021)
	B. stenostigma (Thomson, 1887)*	Guilan	Navaeian et al. (2021)
Callidora Forster, 1869	*C. albovincta* (Holmgren, 1860)*	West Azarbaijan	Navaeian et al. (2021)
Campoletis Förster, 1869	*C. annulata* (Gravenhorst, 1829)*	East Azarbaijan	Samin et al. (2021)
	C. chlorideae (Uchida, 1957)*	Kerman	Navaeian et al. (2021)
	C. crassicornis (Tschek, 1871)*	Chaharmahal and Bakhtiari	Navaeian et al. (2021)
	C. ensator (Gravenhorst, 1829)	Fars	Masnadi et al. (2010)
	C. mitis (Holmgren, 1860)	Fars, Mazandaran	Masnadi et al. (2010), Ghahari and Jussila (2016)
	C. rapax (Gravenhorst, 1829)	Golestan	Masnadi et al. (2010)
	C. raptor (Zetterstedt, 1838)	Ardabil, West Azarbaijan	Samin et al. (2021), Present research
	C. rubella Vas, 2022	Fars	Vas et al. (2022)
	C. thomsoni (Roman, 1915)	Fars	Masnadi (2006), Masnadi et al. (2010)
	C. scyticus Riedel, 2017	Kerman, West Azarbaijan	Mohammadi-Khoramabadi et al. (2018), Bahremand et al. (2022), Present research
	C. varians (Thomson, 1887)	West Azarbaijan	Present research
Campoplex Gravenhorst, 1829	*C. deficiens* (Gravenhorst, 1829)	Fars	Masnadi et al. (2010)
	C. multicinctus (Gravenhorst, 1829)	Tehran, Fars	Masnadi et al. (2010), Falahatpisheh et al. 2021
	C. punctulatus (Szépligeti, 1916)	West Azarbaijan	Present research
	C. quadrimaculatus Ratzeburg, 1852	Isfahan	Ghahari et al. (2010)
	C. tumidulus Gravenhorst, 1829	Tehran, Qom, Markazi	Talebi et al. (2005), Kishani et al. (2010)
Casinaria Holmgren, 1859	*C. albipalpus* (Gravenhorst, 1829)*	Alborz	Navaeian et al. (2021)
	C. ischnogaster (Thomson, 1887)*	Ardabil	Samin et al. (2018)
	C. mesozosta (Gravenhorst, 1829)	Fars	Falahatpisheh et al. (2021)
	C. nigripes (Gravenhorst, 1829)*	East Azarbaijan, Kerman	Samin et al. (2021)
	C. tenuiventris (Gravenhorst, 1829)	Tehran, Kerman	Masnadi et al. (2010), Bahremand et al. (2022)
Cymodusa Holmgren, 1859	*C. antennator* (Holmgren, 1860)	Fars, Alborz	Falahatpisheh et al. (2021)
	C. australis (Smits van Burgst, 1913)	Fars	Amiri et al. (2017), Mohammadi-Khoramabadi et al. 2020

Table 1 (continued)

Genera	Species	Distribution in Iran	References
Cymodusopsis Viereck, 1912	*C. persicus* (Riedel, 2019)	Kerman	Riedel et al. (2019b), Bahremand et al. (2022)
	C.Riedeli Vas, 2022	Fars	Vas et al. (2022)
Diadegma Forster,1869	*D. anurum* (Thomson, 1887)	Alborz, Golestan, Fars, Kerman	Golizadeh et al. (2008), Masnadi et al. (2010), Falahatpisheh et al. (2021), Bahremand et al. (2022)
	D. areolare (Holmgren, 1860)	West Azarbaijan	Masnadi et al. (2010)
	D. armillatum (Gravenhorst, 1829)	East Azarbaijan, Kerman	Masnadi et al. (2010), Mohammadi-Khoramabadi et al. (2016), Bahremand et al. (2022)
	D. auricellae Horstmann, 2008	West Azarbaijan	Present research
	D. claripenne (Thomson, 1887)*	Ardabil	Samin et al. (2021)
	D. consumptor (Gravenhorst, 1829)	Mazandaran	Ghahari and Jussila (2016)
	D. contractum (Brischke, 1880)*	Lorestan	Navaeian et al. (2021)
	D. crassicorne (Gravenhorst, 1829)	West Azarbaijan	Masnadi et al. (2010)
	D. elishae (Bridgman, 1884)*	Hamadan	Navaeian et al. (2021)
	D. exareolator (Aubert, 1964)	West Azarbaijan	Present research
	D. fenestrale (Holmgren, 1860)	Isfahan, Mazandaran, Fars, Kerman, West Azarbaijan	Ghahari et al. (2012), Ghahari and Jussila (2016), Falahatpisheh et al. (2021), Bahremand et al. (2022), Present research
	D. hispanicum (Horstmann, 1973)	Sistan and Baluchestan	Barahoei et al. (2013)
	D. kyffhusanae (Horstmann, 1973)	Kerman	Bahremand et al. (2022)
	D. litorale (Holmgren, 1856)	West Azarbaijan	Present research
	D. maculatum (Gravenhorst, 1829)	East Azarbaijan, West Azarbaijan, Kerman	Mohammadi-Khoramabadi et al. (2020), Pourhaji et al. (2016), Bahremand et al. (2022)
	D. majale (Gravenhorst, 1829)	Fars, Ardabil, Kerman, Markazi, Khuzestan	Masnadi (2006), Masnadi et al. (2010), Fathi et al. (2012), Mohammadi-Khoramabadi et al. (2016), Bahremand et al. (2022), Riedel et al. (2019a)
	D. monospilum (Thomson, 1887)	West Azarbaijan	Present research
	D. persicum Riedel **sp. nov**	West Azarbaijan	Present research
	D. semiclausum (Hellén, 1949)	Isfahan, Qazvin, Kerman, Razavi Khorasan, Sistan and Baluchestan, Fars, West Azarbaijan	Ghahari et al. (2012), Ghahari and Schwarz (2012), Mohammadi-Khoramabadi et al. (2016) & Bahremand et al. (2022), Barahoei et al. (2014), Barahoei et al. (2013), Sarafi et al. (2015), Present research
	D. tenuipes (Thomson, 1887)	Semnan, West Azarbaijan	Navaeian et al. (2021), Present research
	D. trochanteratum (Thomson, 1887)*	Razavi Khorasan	Navaeian et al. (2021)
	D. variegatum (Szépligeti, 1916)	West Azarbaijan	Present research

Table 1 (continued)

Genera	Species	Distribution in Iran	References
Dusona Cameron, 1900	*D. annexa* (Försterm 1868)	West Azarbaijan	Present research
	D. circumcinctus (Forster, 1868)*	East Azarbaijan	Samin et al. (2021)
	D. falcator (Fabricius, 1775)*	Ardabil	Samin et al. (2021)
	D. rufitergus Riedel & Karimi, 2023	Mazandaran	Riedel et al. (2019b) as *D. rufigaster*
	D. rugifer (Förster, 1868)	Fars	Hinz and Horstmann (2004)
	D. stygia (Förster, 1868)	Fars	Hinz and Horstmann (2004)
	D. terebrator (Forster, 1868)*	Golestan	Samin et al. (2018)
Echthronomas Forster, 1869	*E. quadrinotata* (Thomson, 1887)*	West Azarbaijan	Navaeian et al. (2021)
Enytus Cameron, 1905	*E. apostatus* (Gravenhorst, 1829)	West Azarbaijan, East Azarbaijan, Tehran, Qazvin, Kerman, Alborz	Masnadi et al. (2010) & Akbarzadeh-Shoukat, (2012), Lotfalizadeh et al. (2012), Sooudi et al. (2007), Bahremand et al. (2022), Navaeian et al. (2021)
Hellwigia Gravenhorst, 1823	*H. elegans* (Gravenhorst, 1823)	Sistan and Baluchestan	Kolarov and Ghahari (2005)
Hyposoter Forster, 1869	*H. albipes* (Hedwig, 1957)*	Not exactly defined	Kolarov and Ghahari (2005)
	H. barretti (Bridgman, 1881)	Kerman	Bahremand et al. (2022)
	H. brischkei (Bridgman, 1882)*	Ardabil	Samin et al. (2021)
	H. caudator (Horstmann, 2008)	Kerman	Bahremand et al. (2022)
	H. clausus (Brischke, 1880)	West Azarbaijan	Razmi et al. (2011)
	H. didymator (Thunberg, 1822)	West Azarbaijan, Golestan	Karimpour et al. (2005), Ghadiri et al. (2007)
	H. dolosus (Gravenhorst, 1829)*	Kuhgiloyeh and Boyerahmad	Navaeian et al. (2021)
	H. ebeninus (Gravenhorst, 1829)	Mazandaran	Ghahari and Jussila (2016)
	H. leucomerus (Thomson, 1887)	Fars	Falahatpisheh et al. (2021)
	H. notatus (Gravenhorst, 1829)	Fars, West Azarbaijan	Masnadi (2006), Masnadi et al. (2010), Present research
Lathrostizus Forster, 1869	*L. lagens* (Gravenhorst, 1829)*	Guilan	Navaeian et al. (2021)
Lemophagus Townes, 1965	*L. eburnipes* Vas, 2022	Fars	Vas et al. (2022)
	L. pulcher (Szepligeti, 1916)*	Ardabil	Navaeian et al. (2021)
Leptoperilissus Schmiedeknecht, 1912	*L. areolaris* (Hedwig, 1957)	Sistan and Baluchestan	Horstmann (1993), Kolarov and Ghahari (2005), Masnadi et al. (2010)
	L. persicus (Horstmsnn, 1993)	Tehran, Qazvin	Horstmann (1993), Kolarov and Ghahari (2005)
Melalophacharops Uchida, 1928	*M. persicus* Vas, 2022	Fars	Vas et al. (2022)
Meloboris Holmgren, 1859	*M. collector* (Thunberg, 1822)	Kerman	Bahremand et al. (2022)
Nemeritie Holmgren, 1860	*N. macrocentra* (Gravenhorst, 1829)*	Ardabil, West Azarbaijan	Samin et al. (2021), Present research
	N. fallax (Gravenhorst, 1829)*	Guilan	Navaeian et al. (2021)
Olesicampe Forster, 1869	*O. patellana* (Thomson, 1887)*	Kordestan, West Azarbaijan	Samin et al. (2018), Present research
	O. fulcrans (Thomson, 1887)*	Hamadan	Navaeian et al. (2021)
	O. fulviventris (Gmelin, 1790)*	Mazandaran	Navaeian et al. (2021)

Table 1 (continued)

Genera	Species	Distribution in Iran	References
Parameloboris Riedel **gen. nov**	*Parameloboris nigrocephalus* Riedel **sp. nov**	West Azarbaijan	Present research
Phobocampe Forster, 1869	*P. unicincta* (Gravenhorst, 1829)	Not exactly defined	Kolarov and Ghahari (2005)
Rhimphoctona Förster, 1869	*R. (Xylophylax) megacephalus* (Gravenhorst, 1829)	Hormozgan	Masnadi et al. (2010)
Sinophorus Forster, 1869	*S. brunnifemur* (Sanborne, 1984)	Not exactly defined	Kolarov and Ghahari (2005)
	S. fuscicarpus (Thomson, 1887)	West Azarbaijan	Present research
	S. pleuralis (Thomson, 1887)	Kerman	Bahremand et al. (2022)
	S. xanthostomus (Gravenhorst, 1829)	Sistan and Baluchestan, Kermanshah, West Azarbaijan	Barahoei et al. (2013), Navaeian et al. (2021), Present research
Venturia Schrottky, 1902	*V. canescens* (Gravenhorst, 1829)	Guilan, Kerman, Razavi Khorasan, Fars, Mazandaran, West Azarbaijan	Kolarov and Ghahari (2005), Ghahari and Jussila (2016), Falahatpisheh et al. (2021), Present research

2019a); Mazandaran (Haeselbarth 1985; Ghahari and Jussila 2016; Riedel et al. 2019b; Navaeian et al. 2021); Fars (Hinz and Horstmann 2004; Masnadi 2006; Masnadi et al. 2010; Amiri et al. 2017; Mohammadi-Khoramabadi et al. 2020; Falahatpisheh et al. 2021; Vas et al. 2022); Kerman (Mohammadi-Khoramabadi et al. 2016, 2018; Riedel et al. 2019b; Navaeian et al. 2021; Bahremand et al. 2022); East Azarbaijan (Masnadi et al. 2010; Lotfalizadeh et al. 2012; Samin et al. 2021) and West Azarbaijan provinces (Gonzalez et al. 1980; Karimpour et al. 2005; Masnadi et al. 2010; Razmi et al. 2011; Akbarzadeh-Shoukat 2012; Navaeian et al. 2021).

This research was conducted in West Azarbaijan province located in the northwest of Iran. In the present study, a new genus *Parameloboris* **gen. nov.** and two new species *Diadegma persicum* **sp. nov.** and *Parameloboris nigrocephalus* **sp. nov.** and 9 new records for the Iranian fauna of Campopleginae increasing the number of known Iranian Campopleginae from 64 to 94 species in 26 genera. Most of the faunal studies on Campopleginae subfamily in Iran have been done in recent years, so that out of 94 reported species, 54 species were reported after 2018. *Diadegma*, *Campoletis* and *Hyposoter*, each with 22, 11 and 10 species, respectively, are known as the most specious compopleginae genera in Iran. Of 26 reported compopleginae genera from Iran, 11 genera are represented by only one species in Iran (Table 1). 94 species reported from Iran are related to 25 out of 31 provinces of the country, therefore, faunal studies of this subfamily have been carried out in a large part of the country. The most studies have been conducted in West Azarbaijan, Fars and Kerman provinces, respectively, so that 31, 21 and 18 species have been reported from these provinces, respectively. Several provinces including of Hormozgan, Khuzestan, Kermanshah, Kordistan, Kuhgiloyeh and Boyerahmed, Lorestan, Qom and Semnan, represented by only a single species of Campopleginae. No species has been reported from Zanjan, Ilam, Yazd, North Khorasan and South Khorasan provinces, so there is a need for more studies in Iran.

The name of species *Dusona rufigaster* Riedel et al. (2019b) is preoccupied by *Dusona rufigaster* Walley, 1940. Therefore, we propose the new name *Dusona rufitergus* Riedel & Karimi for this species here (see Table 1).

Conclusion

With the addition of a new genus (*Parameloboris* **gen. nov.**) and two new species (*Parameloboris nigrocephalus* **sp. nov.** and *Diadegma persicum* **sp. nov.**) and the report of 9 new records for Iran, the number of species of the subfamily Campopleginae for Iran increased to 94 species of which 24 species need further studies and collection for surely cited for Iranian fauna, therefore marked with an asterisk in Table 1. According to the results of this research as well as the biological and ecological diversity of Iran, the number of species of this subfamily is expected to be much more than this number. Therefore, it is necessary to collect more and more widely in the country.

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Author contributions
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Declarations

Ethics approval and consent to participate
The authors declare that they have no conflict of interest.

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