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First report of the genus *Cymodusa* (Ichneumonidae: Campopleginae) from Iran

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ABSTRACT. A survey was conducted to identify the parasitic wasps of the subfamily Campopleginae (Hym.: Ichneumonidae) in Fars province (southern Iran) during February 2011 – August 2013. Specimens were collected using Malaise traps and sweeping nets. Two new record species of the genus *Cymodusa* (Ichneumonidae, Campopleginae) were identified: *C. longiterebra* Dbar, 1985 and *C. australis* (Smits van Burgst, 1913). An identification key, morphological diagnosis and geographical distribution of Iranian *Cymodusa* are provided.

Key words: Ichneumonidae, Campopleginae, Fars province, new record, Taxonomy

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Introduction

The family Ichneumonidae with 39 subfamilies and more than 23000 described species is one of the largest families in the class Insecta (Quick, 2015). In recent years, some studies about Ichneumonidae subfamilies from Iran have been done (Mohammadi-Khoramadadi, Talebi, & Zwakhals, 2013; Mohammadi-Khoramadadi & Talebi 2013; Amiri *et al.*, 2015a, b; Amiri *et al.*, 2016; Barahoei *et al.* 2013, 2014; Ghahari *et al.* 2014; Ghahari & Jussila, 2014; Sarafi *et al.*, 2015), however the subfamily Campopleginae has poorly studied in our countries (Barahoei, Rakhshani & Riedel, 2012). Campopleginae is one of the largest and important

subfamilies of ichneumonid wasps that widely investigated from biocontrol aspects (Gauld, 1995; Quicke, 2015). The genus *Cymodusa* Holmgren, 1859 is a moderately large genus in this subfamily (Kolarov & Yurtcan, 2008; Choi, Kolarov & Lee, 2013). This genus contains about 42 described species from the Palaearctic, Nearctic, Neotropical and Oriental regions (Yu, van Achterberg & Horstmann, 2012; Choi, Kolarov & Lee, 2013) but the majority of species are distributed in Palaearctic region (Yu, van Achterberg & Horstmann, 2012). Palaearctic species of *Cymodusa* was reviewed and keyed by Dbar (1984, 1985), after that five species

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have been added to his work (Kolarov & Yurtcan, 2008; Kolarov & Coruh, 2008; Choi, Kolarov & Lee, 2013). Dbar (1985) divided the members of *Cymodusa* into four species groups (*jaceki* group, *leucocera* group, *australis* group and *convergator* group). The *australis* group includes eight species (e. g., *C. australis* Smits van Burgst (1913), *C. orientalis* Uchida (1956), *C. longiterebra* Dbar (1985), *C. tibialis* Dbar (1985), *C. rufiventris* Dbar (1985), *C. aenigma* Dbar (1985), *C. parva* Dbar (1985) and *C. oculator* Dbar (1985)) in the Palaearctic region and three species (e. g., *C. dravida* Gupta & Gupta (1974), *C. josephi* Gupta & Gupta (1974) and *C. shiva* Gupta & Gupta (1974)) in Oriental region. Members of this genus usually occurs among grasses and they are parasitoids of Lepidoptera (Kolarov & Yurtcan, 2008). The “*australis*” group can easily be distinguished from the other species groups by the following characteristics: temple very narrowed, areolet receiving second *recurrent vein* before the middle, sixth and seventh tergites deeply emarginated in dorsal view (Dbar, 1985). Current study is the first report of the genus *Cymodusa* with two record species belong to “*australis*” group were collected from Fars province in southern Iran.

Material and methods

Materials used in this study were collected using sweeping net and Malaise traps that were installed at two locations in Jahrom (Citrus garden) and Eghlid County, Dejekord in south and north of Fars province, respectively. Specimens were collected during February 2011 to August 2013. Samples were extracted from the collecting jars in an interval of two weeks and transferred to the laboratory in Tarbiat Modares University. The collected wasps were sorted from the samples and then chemically dried and mounted for taxonomic study. Specimens

treated with mixture of ethanol (60%) /Xylene (40%) for 18 hours, followed by Amyl acetate for 12 hours (AXA) and finally placed on the filter paper for drying (van Achterberg 2009). The dried specimens were then card mounted and labeled. Morphological terminology predominantly follows Townes (1969) and (Yoder *et al.*, 2010).

Microsculpture terminology follows Eady (1968). Relevant literatures (Townes, 1970; Dbar, 1984, 1985; Kolarov & Coruh, 2008; Kolarov & Yurtcan, 2008; Choi, Kolarov & Lee, 2013) were used for identification of the specimens. Illustrations were taken using an Olympus™ SZX9 stereo-microscope equipped with a Sony™ digital camera. A series of 7-10 captured images were merged into a single in-focus image using the image-stacking software Helicon Focus 6. The specimens (*C. australis* 35 f*, 22m*; *C. longiterebra* 7f*, 11m*) are deposited in the Collection of Department of Entomology, Tarbiat Modares University (TMUC), Tehran, Iran. One sample from each species (*C. australis* and *C. longiterebra*) is deposited in General Station of Forest Pest Management, Shenyang, Liaoning collection, China (GSFPMC). The following abbreviations and acronyms were used: OOL: Ocular ocellar line; POL: Posterior ocellar line; TMUC: Collection of Department of Entomology, Tarbiat Modares University; GSFPMC: General Station of Forest Pest Management, Shenyang, Liaoning collection, China.

Results

Two species (*C. australis* and *C. longiterebra*) of the genus *Cymodusa* (*australis* group) were collected and identified from non-tropical and tropical orchard ecosystems. Genus *Cymodusa* is recorded for the first time for Iranian fauna.

Cymodusa Holmgren, 1859

Sagaritis Holmgren, 1859; *Sagaritopsis* Hincks, 1944; *Thersitia* Schmiedeknecht, 1907

Diagnosis: Eyes sparsely to densely hairy, inner margins of eyes strongly convergent ventrally; clypeus small, weakly convex, not separated from face, apical margin rounded; mandible short, upper tooth as long as or a little longer than lower tooth; fore wing with areolet, nervulus opposite or distad of basal vein; thyridia longitudinally elliptic, ovipositor straight, with dorsal subapical notch (Dbar, 1984).

Key to the Iranian *Cymodusa* Holmgren, 1859

Ovipositor sheet 1.2X as long as hind tibia, area petiolaris almost depressed and strongly rugous (Fig. 12), metasomal tergites entirely black.

.....*C. longiterebra* Dbar, 1985

- Ovipositor sheet not longer than hind tibia, area petiolaris not depressed and not strongly rugous (Fig. 3), metasomal tergites black except of second tergite with posterior reddish margin.

.....*C. australis* (Smits van Burgst, 1913)

***Cymodusa australis* (Smits van Burgst, 1913) (Figs. 1-6)**

Material examined: Fars province: Eghlid County, Sedeh city, Chaman Bid (30°42'N, 52°09'E, 2146m a.s.l.), 22.vii.2013, 1♀, Sweeping net; Shahrman Village (30°54'N, 52°28'E, 2120m a.s.l.), 07.ix.2012, 2♂♂, 08.vi.2012, 2♂♂, 12.vii.2013, 1f*, Malaise trap; Jahrom County, Goldamcheh (28°40'N, 53°33'E, 1031m a.s.l.), 20.v.2012 - 23.viii.2012, 7♂♂ 9♀♀, 15.v.2013, 2♀♀; (28°39'N, 53° 32'E 1018m a.s.l.), 14.vi.2012 - 15.viii.2012, 3♂♂ 6♀♀, 30.iii.2013- 15.vi.2013, 8m* 17f*, Malaise trap; leg.: A. Amiri.

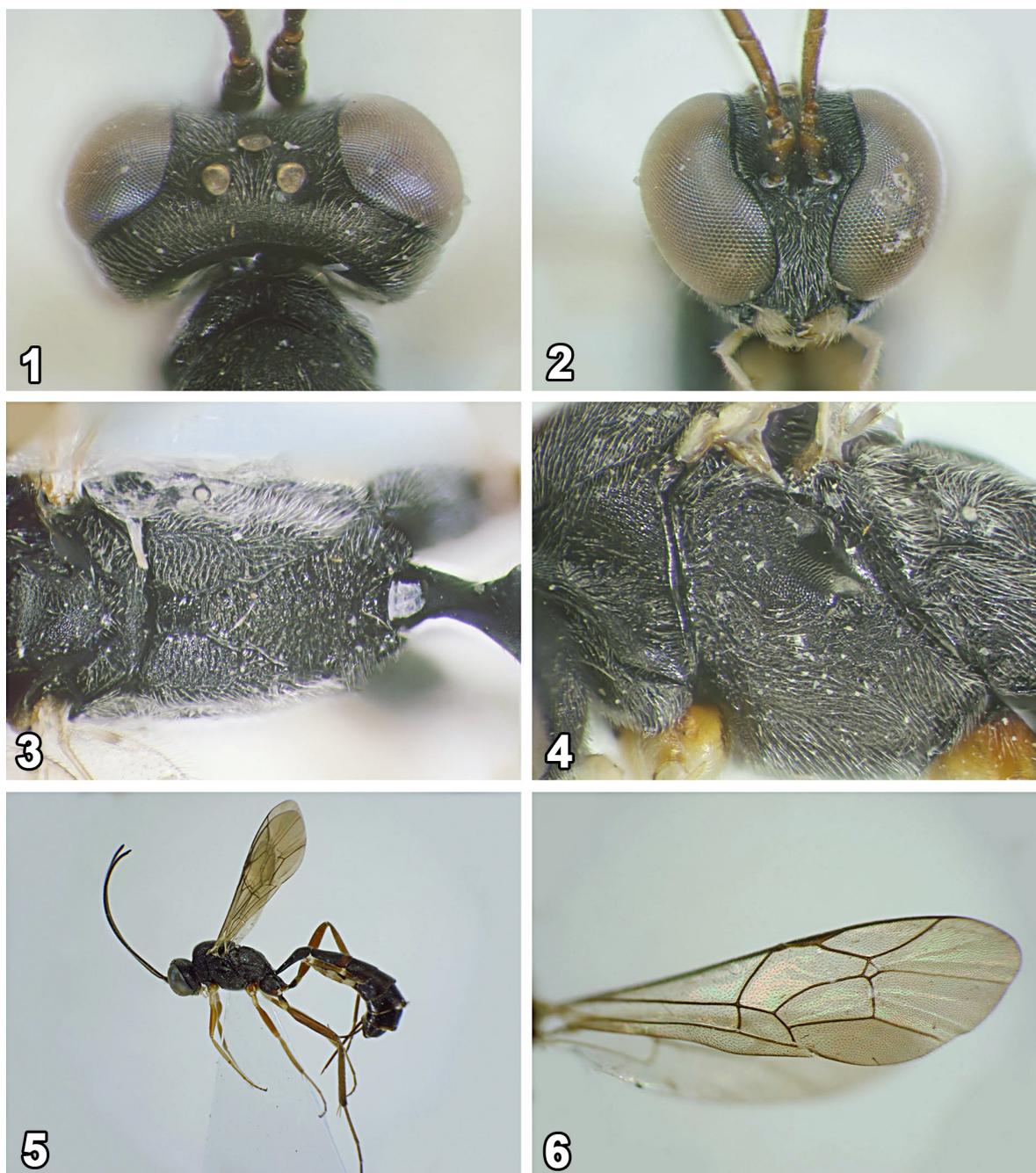
Description: Female - Body length 6.8-7.4mm, fore wing 3.8mm, 0.54X as long as body length, antenna 31-33 segmented, 0.57X as long as body length, clypeus

transverse, 1.5X as wide as its length, punctate, anterior margin convex (Fig. 2); face not transverse, 0.57X as wide as its length, its surface punctate; inter ocular distance 0.4X as wide as maximal distance (Fig. 2); malar space strongly short and 0.1X as long as basal width of mandible (Fig. 2); occipital carina complete; temple 0.43X as wide as transverse diameter of the eye in dorsal view (Fig. 1), OOL as long as and POL 1.6X as long as lateral ocelli diameter (Fig. 1), mesonotum densely punctate, scutellum and propodeum granulate, speculum smooth (Fig. 4), propleuron striated, propodeal spiracle round (Fig. 4), area supermedia hexagonal not strongly rugous and not separated from area petiolaris by carina (Fig. 3), areolet with short stalk anteriorly, receiving second recurrent vein before the middle (Fig. 6), length of hind femur 8.0 X as long as its width, length of hind tibia 9.6 X as long as hind basitarsus, first metasomal tergite 2.9X as long as its width at posterior margin, second metasomal tergite 0.86X as long as first tergite and 1.6X as long as its posterior width, postpetiole and second tergite granulate, ovipositor 0.9X as long as hind tibia, 1.4X as long as first metasomal tergite.

Coloration: Antenna, head, thorax and metasomal tergites black, second tergite with two red spot at posterior margin, in some samples third to sixth tergites black in dorsal and brownish in lateral margin, ovipositor and ovipositor sheet brownish, mandible whitish with black tooth, fore leg yellowish, coxae and trochanters in middle legs yellowish, femora brownish, tibia yellow and tarsi brown, hind coxa blackish in basal half with red apical half, trochanter, femur, tibia and tarsi brown.

Distribution in Iran: Fars province (New for Iranian fauna).

General distribution: Western Palaearctic (Yu, van Achterberg & Horstmann, 2012).



Figures 1-6. *Cymodusa australis*, female: **1.** Head, dorsal view; **2.** Head, frontal view; **3.** Propodeum, dorsal view; **4.** Mesopleuron, lateral view; **5.** Adult specimen, lateral view; **6.** Fore wing.

***Cymodusa longiterebra* Dbar, 1985 (Figs. 6-12)**

Material examined: Fars province: Eghlid County, Shahrman Village (30°54'N, 52°28'E, 2120m a.s.l.), 11.vii.2012, 2♂♂3♀♀, 20.ix.2013, 5♀♀ 9♂♂, Malaise trap; leg.: A. Amiri.

Description: Female - Body length 7-8 mm; fore wing 4.3 mm, 0.57X as long as body length; antenna 32-35 segmented, 0.58X as long as body length, clypeus transverse, 2.25X as wide as its length, granulate, anterior margin convex (Fig. 8); face not transverse, 0.65X as wide as its

length, its surface granulate; inter ocular distance 0.37X as wide as maximal distance with longitudinal carina (Fig. 8); malar space strongly short, 0.1X as long as basal width of mandible (Fig. 10); occipital carina complete; temple 0.53X as wide as transverse diameter of the eye in dorsal view (Fig. 7), OOL 1.4X and POL 1.15X as long as lateral ocelli diameter (Fig. 7), frons, vertex and temple granulate, mesonotum punctuate, scutellum and propodeum granulate, speculum smooth and shiny (Fig. 9), lower half of mesopleuron punctuate (Fig. 9), propleuron striated in front edge (Fig. 9), propodeal spiracle round (Fig. 9), area supermedia elongated, not separated from area petiolaris, area petiolaris strongly rugous (Fig. 12), areolet stalked, receiving second recurrent vein near the middle, length of hind femur 5.7 X as long as its width, length of hind tibia 2.0X as long as hind basitarsus, first metasomal tergite 2.8X as long as its width at posterior margin, second metasomal tergite as long as first tergite and 1.5X as long as its posterior width, postpetiole granulate, ovipositor 1.4X as long as hind tibia, 2.12X as long as first metasomal tergite.

Coloration: Antenna, head, thorax, first and second metasomal tergites black, third to seventh tergites black in dorsal and reddish brown in lateral margin, ovipositor and ovipositor sheet brownish, mandible reddish with black tooth, fore and middle coxae and trochanters blackish brown, femur, tibia, first and second tarsal segments red; hind coxa and trochanter black, hind femur and tibia red, apical end of tibia darkened, tarsi and dorsal surface of tibia brownish (Fig. 11).

Distribution in Iran: Fars province (New for Iranian fauna).

General distribution: Western Palaearctic (Yu *et al.* 2012).

Discussion

In this survey the genus *Cymodusa* Holmgren (1859) was identified and recorded for the first time for Iranian fauna. This genus comprises 24 species in the Palaearctic region of which 15 species were found in the west Palaearctic (Yu, van Achterberg & Horstmann, 2012). According to the information about geographical distribution of the recorded species (Yu, van Achterberg & Horstmann, 2012), *C. australis* and *C. longiterebra* are only distributed in the west Palaearctic region. Among neighboring countries, both species have previously reported from Turkey and Azerbaijan (Dbar, 1985; Kolarov & Beyarslan, 1995).

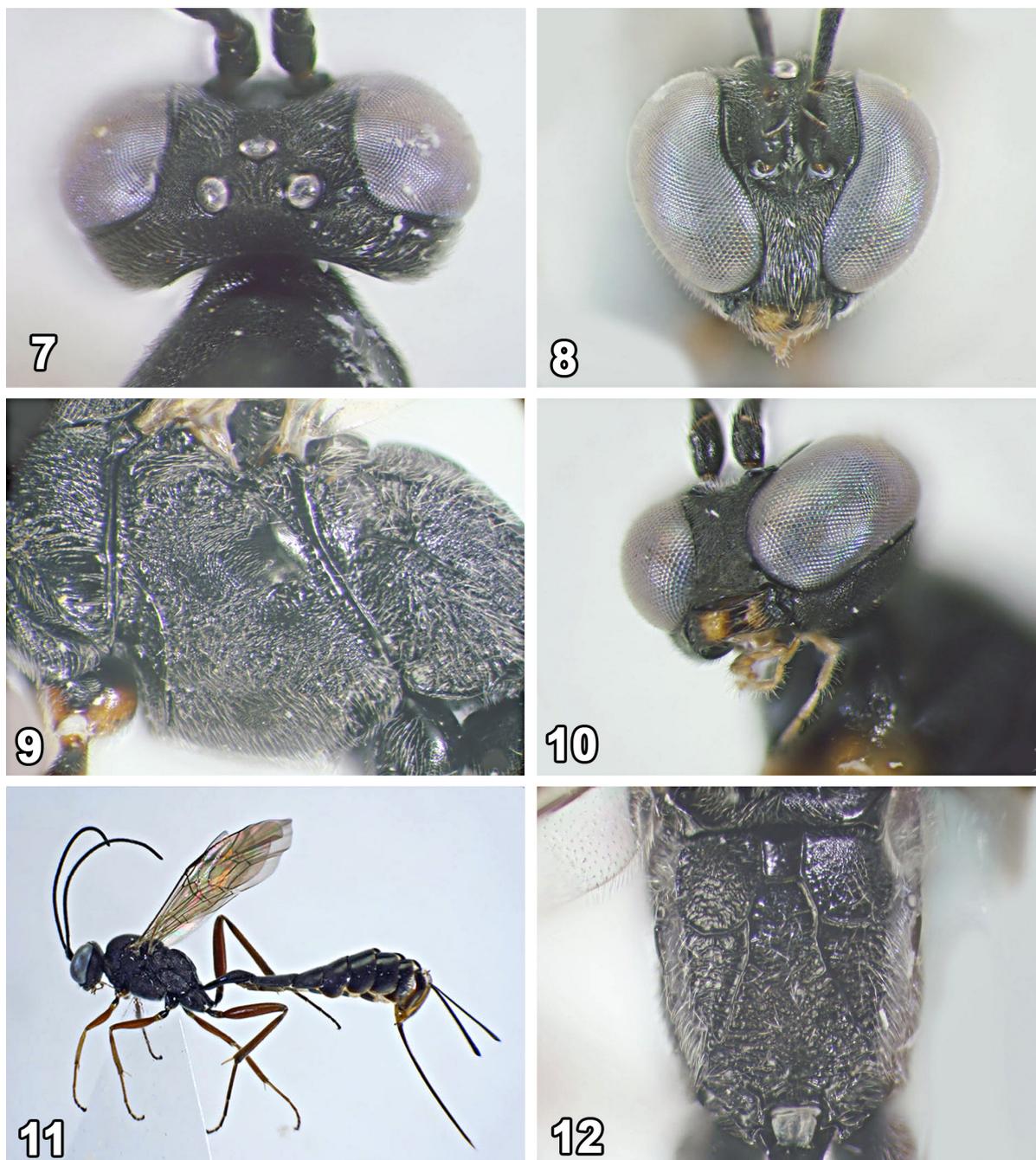
The biology of these species is unknown but some species of the genus *Cymodusa* usually occurs among grasses and they are parasitoids of Lepidoptera (Kolarov & Yurtcan 2008). In the present study *Cymodusa* samples were collected in specific locations (*C. australis* in tropical orchards and *C. longiterebra* in non-tropical orchards only) whereas Malaise traps were installed in different sites (agro and rangeland ecosystems) in Fars province. It seems that these two species prefer the hosts and habitats in sustainable ecosystems. Consider to low information, more investigation about biology, hosts range and their role in biological control should be done.

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Conflict of Interests

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.



Figures 7-12. *Cymodusa longiterebra*, female: **7.** Head, dorsal view; **8.** Head, frontal view; **9.** Mesopleuron, lateral view; **10.** Malar space; **11.** Adult specimen, lateral view; **12.** Propodeum, dorsal view.

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اولین گزارش جنس *Cymodusa* (Ichneumonidae: Campopleginae) از ایران

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چکیده: این تحقیق به منظور شناسایی زنبورهای پارازیتویید زیرخانواده (Hym.: Ichneumonidae) Campopleginae، در فاصله زمانی اسفند ۱۳۹۰ تا مهرماه ۱۳۹۲ در استان فارس (جنوب ایران) انجام شد. نمونه ها با استفاده از تور حشره گیری و تله مالیز جمع آوری شدند. در بین نمونه ها دو گونه زنبور پارازیتویید از جنس *Cymodusa* شامل *C. australis* (Smits van Burgst, 1913) و *C. longiterebra* Dbar, 1985 شناسایی شد که برای فون ایران جدید هستند. کلید شناسایی، ویژگی های مرفولوژیک افتراقی و پراکنش جغرافیایی این دو گونه ارایه شده است.

واژگان کلیدی: Campopleginae Ichneumonidae، استان فارس، گزارش جدید، تاکسونومی