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Casinaria Holmgren and *Dusona* Cameron (Hymenoptera: Ichneumonidae) in Iran: distribution extension

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ABSTRACT. This study is carried out to present new species records and new distributional data of the genera *Casinaria* Holmgren and *Dusona* Cameron (Hymenoptera: Ichneumonidae, Campopleginae) from Iran and also to provide the illustrated taxonomic notes on their diagnostic morphological characters. Specimens were collected using Malaise traps during 2013, 2015 and 2016 from Fars, Kerman and Mazandaran provinces. Four species present here as *Casinaria kriechbaumeri* (Costa, 1884); *Casinaria trochanterator* Aubert, 1960; *Dusona cultrator* (Gravenhorst, 1829) and *Dusona erythrogaster* (Förster, 1868). Two species i.e. *D. cultrator* and *D. erythrogaster* are newly reported from Iran. Data about distribution of *D. rugifer* and *D. stygia* in Iran as part of eastern Palaearctic fauna is updated to the western Palaearctic realm, based on collecting sites in Iran (*D. rugifer* from Golestan province and *D. stygia* from West Azerbaijan province). Available data on adult flight period of Iranian species of *Casinaria* and *Dusona* may indicate that five species are univoltine and the others are bivoltine.

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Introduction

Campopleginae is the third largest subfamily of Ichneumonidae (Hymenoptera: Ichneumonoidea) with more than 2127 described species in the world (Yu et al., 2016). Members of this subfamily are koinobiont endoparasitoids of mostly Lepidoptera larvae, although species of a few genera attack Coleoptera, Symphyta (Hymenoptera) and Rhaphiodioptera (Neuroptera) larvae. Because of this, Campoplegines are widely investigated and considered for both classical and conservation biological control of pests (Quicke, 2015). In Iran, the first data on the 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, 64 campoplegine species have been reported and 14 host-parasitoid relations have been

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documented (Amiri et al., 2017; Barahoei et al., 2012; Fathi et al., 2012; Mohammadi-Khoramabadi et al., 2017, 2018; Mohammadi-Khoramabadi & Ziaaddini, 2017; Mohebban et al., 2016; Riedel et al., 2019a, 2019b; Shaw et al., 2016; Talebi et al., 2006).

Casinaria Holmgren, 1859 is a moderately large genus with 100 described species globally (Yu et al., 2016). The first recorded Iranian species of this genus was *C. tenuiventris* (Gravenhorst, 1829) which was reported as a larval parasitoid of *Lymantria dispar* Linnaeus, 1758 (Lep.: Lymantriidae) (Herard et al., 1979). Two other species have been recently added to the Iranian *Casinaria* records, i.e. *C. kriechbaumeri* (Costa, 1884) and *C. trochanterator* Aubert, 1960 (Riedel, 2018; Riedel et al., 2019a). *Dusona* Cameron, 1901 is a very large genus with more than 442 described species in the world (Yu et al., 2016) but only three species and very few collected specimens have been found in Iran so far, i.e. *D. rugifer* (Förster, 1868) (Hinz & Horstmann, 2004), *D. stygia* (Förster, 1868) (Horstmann, 2009) and *D. rufigaster* Riedel, 2019 (Riedel et al., 2019a). The aim of this study is to present new distributional records of these genera from Iran and also to provide some taxonomic notes with some photographs of their morphological characters.

Material and methods

Specimens were collected by Malaise trap during 2013, 2015 and 2016 in different regions of Iran and identified by M. Riedel. Digital photographs were taken using a Canon EOS 600D on a SZ-ST Olympus stereomicroscope. Stacking of photographs was done by Adobe Photoshop. Terminology followed Hinz & Horstmann (2004). The identified species are deposited in the private collection of Dr. M. Riedel (Bad Fallinghostel/ Germany) and insect collection of Darab college of Agriculture and Natural Resources, Shiraz University.

Results

Casinaria kriechbaumeri (Costa, 1884) (Figs 1–3)

Material examined: Iran, Mazandaran province, Amol county (36°27′14″ N, 53°06′01″ E, Elevation: 180 m a.s.l.), 1♂1♀, 14.VI–9.VII.2016.

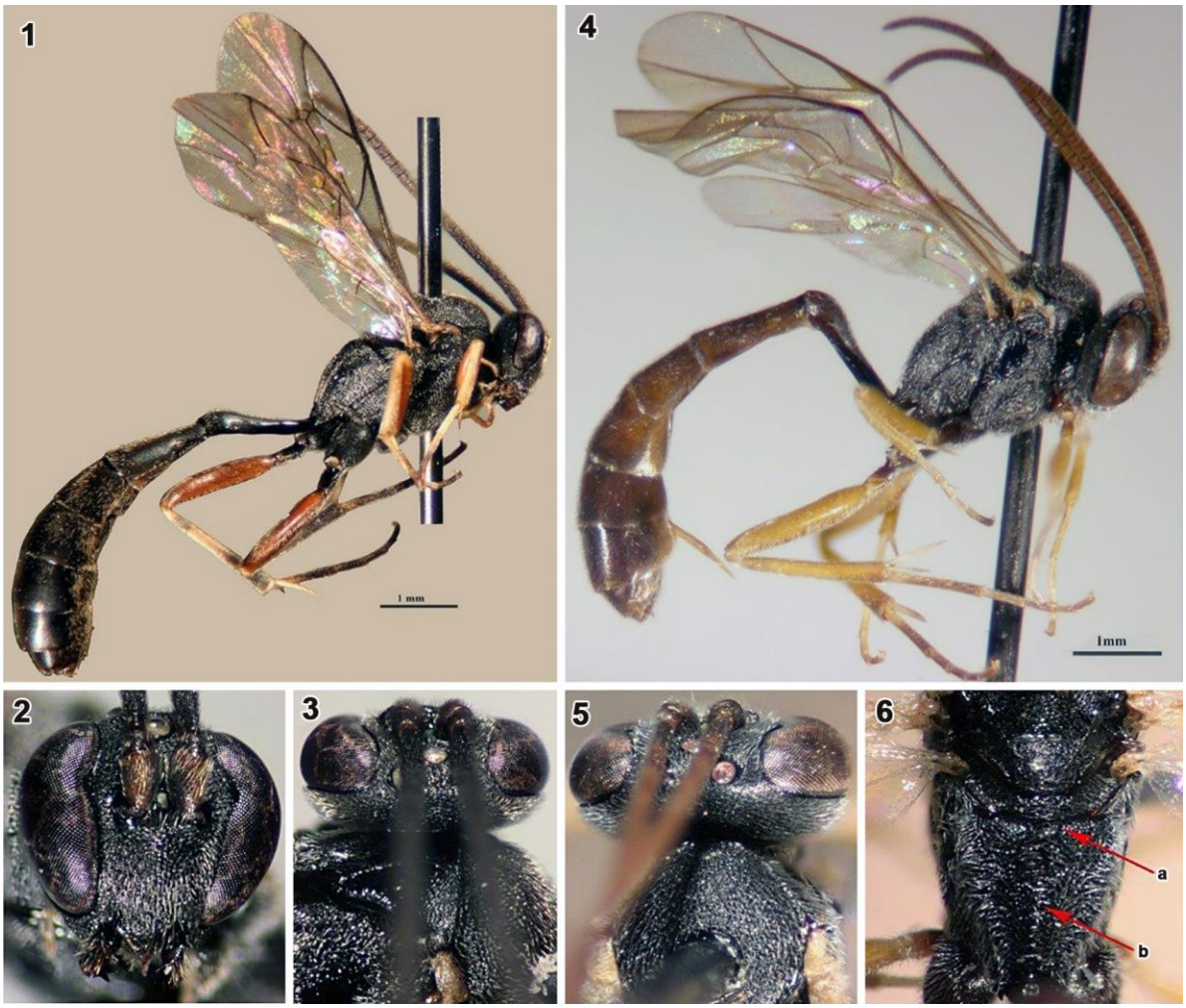
Distribution in Iran: Khuzestan, Markazi (Riedel et al., 2019a) and Mazandaran provinces.

Distribution: Austria, Bulgaria, Croatia, France, Greece, Jordan, Kazakhstan, Kirgizstan, Malta, Slovakia, Spain, Tunisia, Turkey, Turkmenistan, Uzbekistan (Riedel, 2018) and Iran (Riedel et al., 2019a).

Diagnosis: In the recent key of West Palaearctic *Casinaria* (Riedel, 2018), it runs to couplets 9 and 15. The main diagnostic morphological characters of the Iranian specimens (Fig. 1) are: Mandibles black (Fig. 2); temple strongly narrowed behind eyes (Fig. 3); prepectal carina not elevated; propodeum with short basal carinae, coarsely rugose, area petiolaris with rather deep and narrow depression, the depression with transverse rugae; hind femur red, metasoma stout, apical tergites not strongly compressed, 2nd tergite 1.8–2.1 × as long as wide, 3rd tergite 0.85–1.1 × as long as wide (Fig. 1).

Casinaria trochanterator Aubert, 1960 (Figs 4–6)

Material examined: Iran, Fars province, Darab (28°45′04″ N, 54°26′51″ E, Elevation: 1107 m a.s.l.), 1♀, 7–20.X.2013; Kerman province, Maskoon (28°51′41″ N, 57°52′10″ E, Elevation: 1665 m a.s.l.), 1♂, 9–23.VI.2015.



Figures 1–6. *Casinaria* spp. **1–3.** *Casinaria kriechbaumeri*: **1.** habitus of male, **2.** face, **3.** head in dorsal view; **4–6.** *Casinaria trochanterator*: **4.** female habitus, **5.** head in dorsal view, **6.** propodeum, basal carina (arrow a) and area petiolaris (arrow b).

Distribution in Iran: Khuzestan, Markazi (Riedel et al., 2019a) and Fars provinces.

Distribution: Austria, Bulgaria, Czech (Moravia), Egypt, France, Germany, Hungary, Iran, Italy, Norway, Serbia, Slovakia, Spain, United Kingdom (Riedel, 2018).

Diagnosis: *C. trochanterator* runs to couplet 8 in the key (Riedel, 2018). This species (Fig. 4) is mainly characterized by: mandibles black; temple slowly narrowed behind eyes (Fig. 5); hind femur red; propodeum with basal carinae (area basalis and 1/3-1/2 of area superomedia) (Fig. 6, arrow a), area superomedia wider than long, area petiolaris slightly and deeply depressed and with rugae (Fig. 6, arrow b); prepectal carina lamelliform and strongly elevated at ventral; metasoma stout, apical tergites not strongly compressed, 2nd tergite 1.8–2.1 × as long as wide; thyridia longer than wide or roundish, distance from basal margins 1.5 × their length; 3rd tergite 0.9–1.0 × as long as wide (Fig. 4).

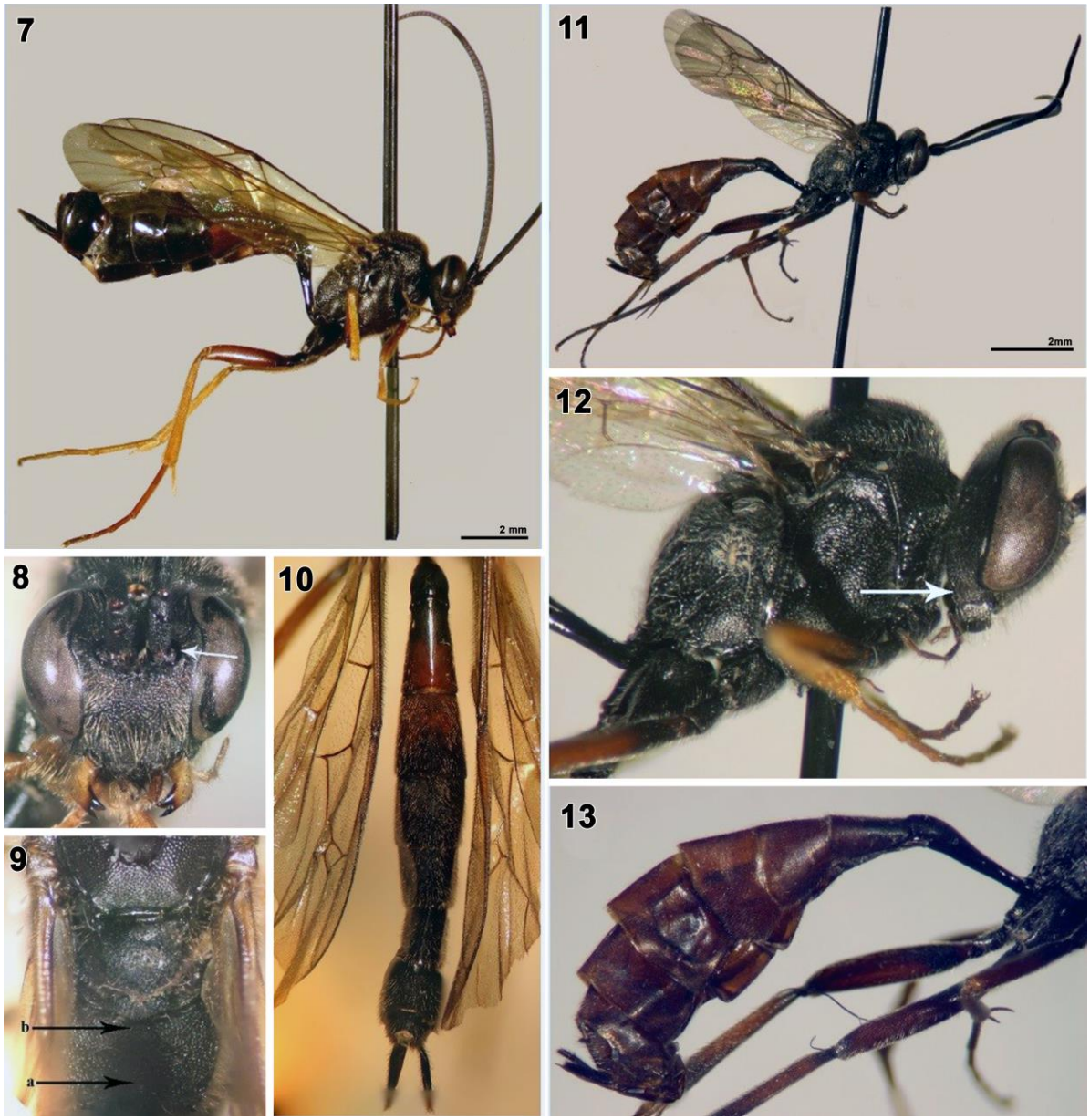
Dusona cultrator (Gravenhorst, 1829) (Figs 7–10)

Material examined: Iran, Mazandaran province, Amol county (36°27′14″ N, 53°06′01″ E, Elevation: 180 m a.s.l.), 1♀, 8–25.IV.2016, Haftkhal (36°17′18″ N, 53°23′43″ E, Elevation: 861 m a.s.l.). 3♀♀, 26.IV–16.V.2016.

Distribution in Iran: Mazandaran province.

Distribution: Eastern and western Palaearctic (Yu et al., 2016) and Iran.

Diagnosis: This species can be separated from other species of the genus by a combination of the following characters: body length 12–16 mm (Fig. 7); antenna with 52–59 flagellomeres, antennal carina narrow (Fig. 8); hind femur red; hind tibia yellow (Fig. 7); propodeum deeply depressed, the sulcus with distinct transverse striae (Fig. 9, arrow a), area basalis sessile (Fig. 9, arrow b), area superomedia not bordered by carina; glymma present; metasoma black except for posterior half of the 2nd tergite and anterior half of the 3rd tergite red (Fig. 10).



Figures 7–13. *Dusona* spp. **7–10.** *Dusona culterator*; **7.** habitus of female, **8.** face, antennal carina arrowed, **9.** propodeum, arrows show area petiolaris (a) and area basalis (b), **10.** metasomal tergites; **11–13.** *Dusona erythrogaster*; **11.** female habitus, **12.** head and mesosoma in lateral view, genal carina arrowed, **13.** metasoma.

Dusona erythrogaster (Förster, 1868) (Figs 11–13)

Material examined: Iran, Mazandaran province, Amol county (36°13′14″ N, 53°39′24″ E, Elevation: 1624 m a.s.l.), 15–25.V.2016.

Distribution in Iran: Mazandaran province.

Distribution: Western Palaearctic (Yu et al., 2016) and Iran.

Diagnosis: body length 7–8 mm (Fig. 11); genal carina joining the oral carina at the base of mandible (Fig. 12), oral carina not distinctly raised; antenna with 35–39 flagellomeres, antennal carina not raised; ventral part of the prepectal carina merge with the transverse carina, pleural part of prepectal carina obliterated; hind tibia black at base and apex, brown medially; glymma present; metasoma with the 0.2–0.3 of the 2nd tergite onwards red (Fig. 13).

Discussion

Distribution of the Iranian recorded species of the genera *Casinaria* and *Dusona* are shown in Fig. 14. Hinz & Horstmann (2004) reported *D. rugifer* and *D. stygia* from Iran as part of eastern Palaearctic fauna, but based on collecting sites in Iran (*D. rugifer* from Golestan province and *D. stygia* from west Azerbaijan province) as well as other countries (Yu et al., 2016), they are actually belonging to the western Palaearctic realm (Fig. 14 g and h).

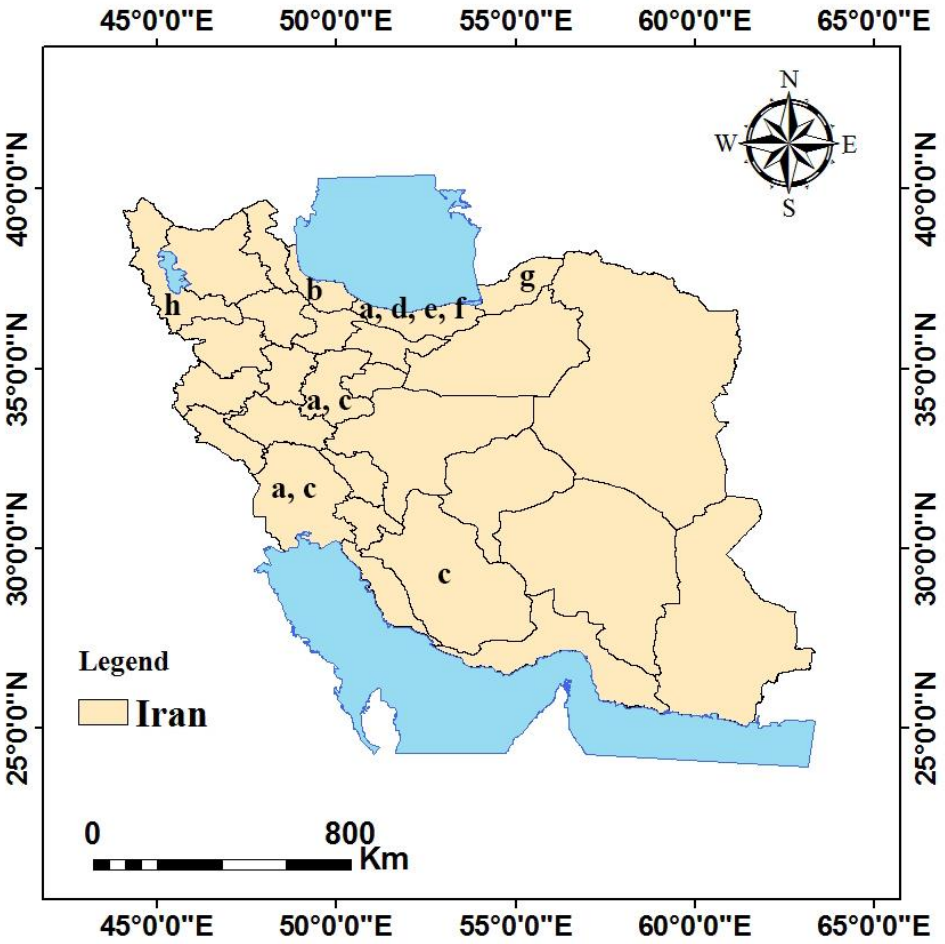


Figure 14. Distribution map in Iran. **a**. *Casinaria kriechbaumeri* **b.** *C. tenuiventris*; **c.** *C. trochanterator*; **d.** *Dusona cultrator*; **e**. *D. erythrogaster*; **f.** *D. rufigaster*; **g.** *D. rugifer*; **h.** *D. stygia*.

The flight period of Iranian species of *Casinaria* and *Dusona* occurred in one (*C. kriechbaumeri*, *C. tenuiventris*, *D. cultrator*, *D. erythogaster*, *D. rufigaster* and *D. rugifer*) and two (*C. trochanterator*) periods, respectively (Table 1). Our data may indicate that *C. kriechbaumeri*, *C. tenuiventris*, *D. cultrator*, *D. erythrogaster* and *D. rugifer* are univoltine and the others bivoltine (Horstmann, 2011).

Table 1. The flight period of Iranian species of *Casinaria* and *Dusona*.

Species	April	May	June	July	August	September	October
C. kriechbaumeri							
C. tenuiventris							
C. trochanterator							
D. cultrator							
D. erythrogaster							
D. rufigaster							
D. rugifer							

Acknowledgments

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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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جنس‌های *Casinaria* Holmgren و *Dusona* Cameron (Hymenoptera: Ichneumonidae) در ایران: گسترش پراکنش

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چکیده: این مطالعه به منظور معرفی گزارش‌های جدید و نیز گزارش پراکنش جدید از گونه‌های جنس‌های *Casinaria* Holmgren و *Dusona* Cameron (Hymenoptera: Ichneumonidae, Campopleginae) از ایران و همچنین ارایه توضیحات تاکسونومیک مصور از ویژگی‌های ریخت‌شناسی افتراقی آنها، انجام شد. نمونه‌ها بوسیله تلهٔ مالیز طی سال‌های ۱۳۹۲ و ۱۳۹۵ از استان‌های فارس، کرمان و مازندران جمع‌آوری شدند. چهار گونه شامل *Casinaria kriechbaumeri* (Costa, 1884)، *Casinaria trochanterator* Aubert, 1960، *Dusona cultrator* (Gravenhorst, 1829) و *Dusona erythrogaster* (Förster, 1868) معرفی شدند. دو گونه شامل *D. cultrator* و *D. erythrogaster* برای اولین بار از ایران گزارش می‌شوند. پراکنش دو گونه *D. rugifer* و *D. stygia* گزارش شده از ایران به عنوان بخشی از فون شرق پالئارکتیک بر اساس محل جمع‌آوری آنها (*D. rugifer* از استان گلستان و *D. stygia* از استان آذربایجان غربی) به فهرست فون غرب پالئارکتیک تغییر کرد. داده‌های موجود از دورهٔ پرواز حشرات بالغ گونه-های ایرانی جنس‌های *Casinaria* و *Dusona* بیان‌گر این است که پنج گونه از جنس‌های مذکور دارای یک نسل و سایرین دو نسل در سال دارند.

واژگان کلیدی: پراکنش، پارازیتوییید، تاکسونومی، گزارش جدید، فون