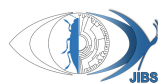


Original Article 

Review of the genus *Casinaria* Holmgren (Hymenoptera, Ichneumonidae, Campopleginae) in Iran

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ABSTRACT. *Casinaria* is a genus within Campopleginae (Hym., Ichneumonidae) with 125 species worldwide. In this study, as part of the surveys on the ichneumonid diversity, specimens were collected during three surveys in north-central, southern, and north-eastern Iran. Examination of the collected specimens revealed new findings for the genus *Casinaria* Holmgren, 1859. Four species are newly recorded from Iran: *Casinaria horstmanni* Riedel, 2018, *C. moesta* (Gravenhorst, 1829), *C. nigripes* (Gravenhorst, 1829), and *C. pyreneator* Aubert, 1960. This study provides identifications based on reliable diagnostic characters, illustrations, zoogeographical distribution data, and an updated list of Iranian species.

KEYWORDS: Parasitoid wasps, illustrated key, distribution, morphology, taxonomy

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INTRODUCTION

The subfamily Campopleginae Förster, 1869 (Hymenoptera, Ichneumonidae) includes more than 2500 valid described species worldwide (Yu et al. 2016; Haraldseide 2021; Riedel 2018; Riedel et al. 2019; Shaw et al. 2016; Vas 2019a, 2019b, 2020, 2023; Vas et al. 2022). *Casinaria* Holmgren, 1859, is a species-rich genus within Campopleginae, comprising 125 described species worldwide. Of these, 36 species occur in the Oriental; 29 in the Western Palaearctic; 27 in the Eastern Palaearctic; 12 in the Australasian; two in the Oceanic; seven in the Afrotropical; 20 in the Nearctic, and nine in the Neotropical regions (Yu et al. 2016; Riedel 2018, 2022; Han et al. 2021; Vas 2019a, 2019b, 2021). The Western Palaearctic species of *Casinaria* were recently revised by Riedel (2018), who described eight new species.

The study of the genus *Casinaria* in Iran began with the record of *Casinaria tenuiventris* (Gravenhorst, 1829), the first species reported as a larval parasitoid of *Lymantria dispar* (Linnaeus, 1758) (Lepidoptera, Erebididae) from Iran (Herard et al. 1979; Rajabi 1986; Masnadi-Yazdinejad et al. 2010). Since then, five additional species have been recorded from the country (Barahoei et al. 2021; Riedel 2018; Riedel et al. 2019; Mohammadi-Khoramabadi & Riedel, 2020; Falahatpisheh et al. 2021; Bahremand et al. 2022; Mohammadi-Khoramabadi 2023; Vas et al. 2024). Species of *Casinaria* can be easily recognized by the following characters: inner margin of compound eyes notched opposite

antennal sockets, nervellus of hind wing not intercepted, sternal suture above the middle at proximal one-third of first metasomal segment, and short ovipositor (Townes 1969). Members of this genus are koinobiont endoparasitoids of various lepidopterous hosts (Jerman & Gauld 1988). This life history makes them promising agents for biological control programs, as they regulate host populations in natural and agricultural ecosystems. Several attempts have been made to utilize *Casinaria* species for this purpose; for example, *Casinaria infesta* (Cresson, 1872) was introduced to Fiji for controlling the coconut moth, *Levuana iridescens* Bethune-Baker, 1906 (Lepidoptera: Zygaenidae) (Bennet 2009). In a more extensive effort, Coulson et al. (1986) imported and evaluated four species of *Casinaria* into North America for the classical biological control of the invasive gypsy moth, *Lymantria dispar* (L.) (Lepidoptera: Erebididae). These examples underscore the significant potential of *Casinaria* species in integrated pest management (IPM) strategies. This study aims to document new records of the genus *Casinaria* in Iran through sampling surveys across various regions, to provide illustrations, update distribution data, and present an identification key for Iranian species. The research enhances taxonomic knowledge and understanding of parasitoid diversity within this genus in Iran.

MATERIAL AND METHODS

Specimens were collected from nine Iranian provinces (Alborz and Guilan, Golestan, Khorasan-e Razavi, Hormozgan, Mazandaran, Qazvin, and West Azarbaijan) between 2010 and 2023, using Malaise traps and sweep nets. The insects were preserved in 75% ethanol. All insects trapped in the Malaise traps were removed from the collecting jars and transferred to the laboratory. Subsequently, the specimens were placed on filter paper for drying. The dried specimens were then card-mounted, labeled, and stored in containers designed for long-term preservation under controlled conditions. Mounted specimens were examined using an Olympus™ SZX9 stereomicroscope and identified according to the identification key for Western Palaearctic *Casinaria* species provided by Riedel (2018).

Photographs were taken with a Canon 50D Camera. Image stacking was performed using Helicon Focus (v7.7.6), and final editing was completed in Adobe Photoshop CS5. Morphological terminology follows Townes (1969). Zoogeographical distribution maps were prepared using the online SimpleMappr software (Shorthouse 2010). All specimens were deposited in the Tarbiat Modares University Collection (TMUC). Other abbreviations used: OD – maximum diameter of posterior ocellus; OOL – minimum distance between posterior ocellus and eye margin; POL – minimum distance between posterior ocelli.

RESULTS

We examined 202 specimens representing nine *Casinaria* species, four of which are newly recorded from Iran.

Taxonomic hierarchy

Class Insecta Linnaeus, 1758

Order Hymenoptera Linnaeus, 1758

Family Ichneumonidae Latreille, 1802

Subfamily Campopleginae Förster, 1869

Genus *Casinaria* Holmgren, 1859

Type species. *Campoplex tenuiventris* Gravenhorst, 1829; designation by Viereck (1914).

***Casinaria horstmanni* Riedel, 2018 (Fig. 1A–F)**

Material examined. 1♀, IRAN, GUILAN, Rudsar county, Rahim Abad district, Ziaz (36°52'30"N, 50°13'24"E, 490 m a.s.l.), 03–10.v.2010; 1♀, 17–24.v.2010; 2♂♂, 21–28.vi.2010; Orkom (36°45'44.34"N, 50°18'11.88"E, 1201 m a.s.l.), 1♂, 21–28.vi.2010; Qazi Chak (36°45'52.62"N, 50°20'01.08"E, 1787 m), 1♀, 07–14.vi.2010; Astaneh Ashrafiyeh, Eshman Kamachal (37°22'03.66"N, 49°57'57.84"E, -1 m b.s.l.), 1♀, 19–29.viii.2010; Leg.: A. Nadimi; MAZANDARAN, Noor, Chamestan, Joorband (36°26'15.54"N,

52°07'13.50"E, 275 m a.s.l.), 1♀, 22.vi–05.vii.2011; Leg.: M. Khayrandish; ALBORZ, Chalous road, Sarzarat (35°55'10.38"N, 51°06'51.24"E, 1980 m a.s.l.), 1♀, 16–24.viii.2010; Arangeh (35°55'07.20"N, 51°05'09.24"E, 1891 m a.s.l.), 1♀, 14–22.vi.2010; 1♀, 18–24.viii.2010; Karaj county (35°46'08.88"N, 50°56'55.20"E, 1277 m a.s.l.), 1♀, 12–19.x.2010; Leg.: A. Mohammadi-Khoramabadi; QAZVIN, Loshan (36°40'09.12"N, 49°25'37.74"E, 291 m a.s.l.), 1♀, 3♂♂, 04–18.v.2011; 15♂♂, 26.v–09.vi.2011; 3♂♂, 10–25.v.2011; (36°40'14.58"N, 49°25'38.52"E, 295 m a.s.l.), 1♀, 04–13.iv.2011; 1♂, 10–25.v.2011; 1♂, 04–18.v.2011; 3♂♂, 26.v–09.vi.2011; 1♂, 04–10.v.2011; Leg.: A. Mohammadi-Khoramabadi; GOLESTAN, Ali Abad, Zarin Gol (36°48'58"N, 55°02'13"E, 694 m, a.s.l.), 1♀, 26.vii–21.viii.2016; Leg.: S. Farahani; HORMOZGAN, Sirik (26°19'24.3"N 57°05'43.3"E, 0±5 m a.s.l.), 1♂, 22.vi.2013; FARS, Noor Abad (30°07'03"N, 51°33'48"E, 1695 m a.s.l.), 1♂, 08.vi.2014; Leg.: A. Amiri.

Morphological characteristics. *Female.* Body length 7–7.4 mm (Fig. 1A); antenna with 28–30 flagellar segments; face rugose, slightly convex in profile, width 1.1× its height (Fig. 1B); clypeus rugose, apically granulate, width 2.1× its height; malar space 0.5× basal width of mandible, mandibles black with yellow tip, teeth reddish; OOL equal to OD; POL 1.7× OD (Fig. 1C); gena coriaceous, 0.4× width of compound eye; genal carina not elevated, reaching mandibular base; mesopleuron punctate with granular base, speculum almost granular, shiny, striate anteriorly (Fig. 1D); epicnemial carina not raised, moderately bent behind fore coxa; propodeum rugose; basal area trapezoidal; area petiolaris with a longitudinal trough, transversely wrinkled (Fig. 1E); areolet stalked (Fig. 1F); hind femur red, hind tibia red, black at base and apex; petiole without glymmae, black; metasomal tergites black. *Male.* Similar to female with the following differences: body length 7.8–8 mm; antenna with 33–34 flagellomeres; fore and middle tarsi slightly brownish apically.

Distribution in Iran. Alborz, Fars, Guilan, Hormozgan, Golestan, Mazandaran, and Qazvin provinces (current study).

General distribution. Western Palaearctic (Riedel 2018), Iran (new record).

Casinaria ischnogaster Thomson, 1887

Material examined. 1♀, IRAN, GUILAN, Astaneh Ashrafiyeh, Eshman Kamachal (37°22'03.66"N, 49°57'57.84"E, -1 m b.s.l.), 16–29.viii.2010; 1♀, 20–27.ix.2010; 2♂♂, 27.ix–04.x.2010; 1♀, 04–11.x.2010; Leg.: A. Nadimi.

Distribution in Iran. Fars (Mohammadi-Khoramabadi 2023) and Guilan provinces (current study).

General distribution. Palaearctic (Yu et al. 2016; Riedel 2018).

Casinaria krieckbaumeri (Costa, 1884)

Material examined. 1♀, IRAN, GUILAN, Rudsar county, Rahim Abad district, Orkom (36°45'44.34"N, 50°18'11.88"E, 1201 m a.s.l.), 31.v–07.vi.2010; 1♂, 14–22.vi.2010; 1♂, 21–28.vi.2010; 1♀, 28.vi–06.vii.2010; 1♀, 13–20.vii.2010; 1♀, 19–25.vii.2010; 1♀, 09–16.viii.2010; 1♀, 20–26.ix.2010; 1♂, 11–18.x.2010; Qazi Chak (36°45'52.62"N, 50°20'01.08"E, 1787 m a.s.l.), 1♀, 1♂, 05–11.vii.2010; 1♀, 1♂, 19–25.vii.2010; 1♂, 02–09.viii.2010; Ziaz (36°52'27.18"N, 50°13'24.78"E, 490 m a.s.l.), 1♂, 25.vi–11.vii.2010; Leg.: A. Nadimi; MAZANDARAN, Noor, Chamestan, Joorbard (36°26'15.54"N, 52°07'13.50"E, 275 m a.s.l.), 1♂, 05–19.vii.2011; Leg.: M. Khayrandish; ALBORZ, Karaj county, Chaloos road, Arangeh (35°55'07.20"N, 51°05'09.24"E, 1891 m a.s.l.), 1♂, 14–22.vi.2010; Shahriar (35°40'08.10"N, 50°56'56.64"E, 1168 m a.s.l.), 1♀, 28.ix–05.x.2010; Leg.: A. Mohammadi-Khoramabadi; QAZVIN, Loshan, (36°40'09.12"N, 49°25'37.74"E, 291 m a.s.l.), 1♂, 26.v–09.vi.2011; (36°40'14.58"N, 49°25'38.52"E, 295 m a.s.l.), 1♀, 26.v–09.vi.2011; Zereshek road (36°21'39.72"N, 50°03'55.56"E, 1541 m a.s.l.), 5♂♂, 26.v–09.vi.2011; Leg.: A. Mohammadi-Khoramabadi; HORMOZGAN, Hajiabbad, Tezerj (27°17'51.81"N, 55°45'14.76"E, 867 m a.s.l.), 1♀, 20–27.iv.2012; Zakin, (27°28'53.23"N, 56°18'27.03"E, 680 m a.s.l.), 2♂♂, 09–16.v.2011; (27°53'07.32"N, 56°19'58.34"E, 1020 m a.s.l.), 2♂♂, 25.iv–01.v.2011; 1♀, 06–13.vi.2011; Geno (27°24'16.16"N, 56°08'51.80"E, 1274 a.s.l.), 1♂, 20–27.iv.2011; Leg.: A. Amiri; KHORASAN-e RAZAVI, Mashhad county, Ahmad Abad, Koruj (36°01'39.46"N, 59°34'36.97"E, 1306 m a.s.l.), 1♀, 1♂, 06.v.2023; 2♀♀, 27.v.2023; 1♂, 02.vi.2023 (Sweeping net); Molk Abad (35°59'53.97"N, 59°35'10.14"E, 1300 m a.s.l.), 1♀, 1♂, 22.v–05.vi.2023; Sar Ghayeh, Tangal (35°9'48.59"N, 59°31'49.22"E, 1545 m a.s.l.), 1♀, 24.vi.2023; Leg.: A. Feizi.

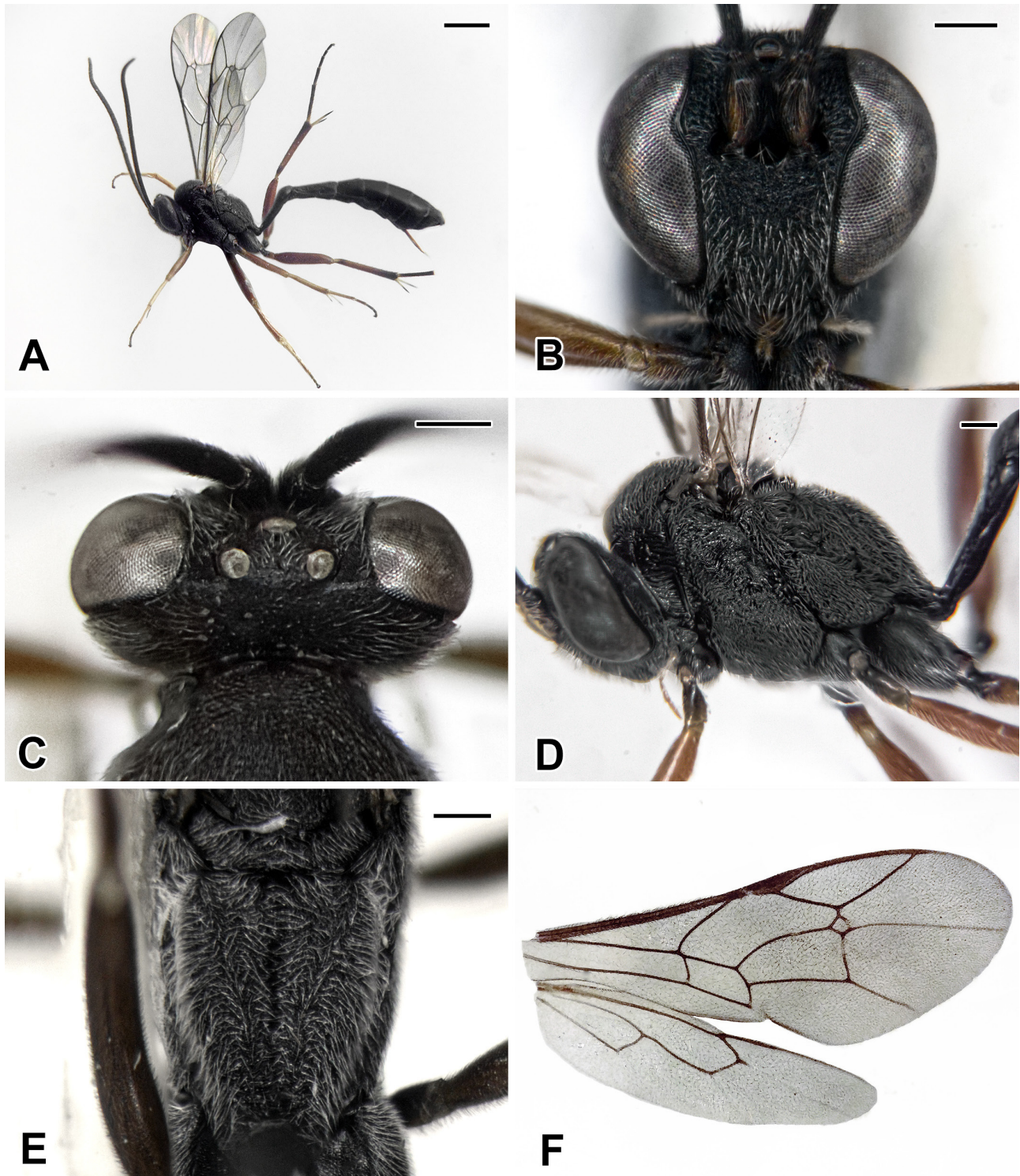


Figure 1. *Casinaria horstmanni* Riedel, 2018, female. **A.** General habitus, lateral view; **B.** Head, frontal view; **C.** Head, dorsal view; **D.** Mesosoma, lateral view; **E.** Propodeum, dorsal view; **F.** Wing venations. (Scale bars, B–E: 0.2 mm; A, F: 1 mm).

Distribution in Iran. Khuzestan, Markazi (Riedel et al. 2019), Mazandaran (Mohammadi-Khoramabadi & Riedel 2020), Alborz, Guilan, Qazvin, Hormozgan, and Khorasan-e Razavi provinces (current study).

General distribution. Western Palaearctic (Yu et al. 2016; Riedel 2018).

***Casinaria mesozosta* (Gravenhorst, 1829)**

Material examined. 1♀, IRAN, GUILAN, Roodsar, Rahim Abad, Ziaz (36°52'27.18"N, 50°13'24.78"E, 490 m a.s.l.), 28.vi–06.vii.2010; 2♀♀, 14–22.vi.2010; 1♀, 05–11.vii.2010; Leg.: A. Nadimi.

Distribution in Iran. FARS (Falahatpisheh et al. 2021) and Guilan provinces (current study).

General distribution. Palaearctic (Yu et al. 2016; Riedel 2018).

***Casinaria moesta* (Gravenhorst, 1829) (Figs 2A–F)**

Material examined. 1♀, IRAN, MAZANDARAN, Noor, Chamestan, Tangehvaz (36°21'55.68"N, 52°06'10.32"E, 702 m a.s.l.), 28.vi–13.vii.2011; Gaznasara (36°16'56.82"N, 52°10'58.50"E, 2032 m a.s.l.), 1♀, 27.v–07.vi.2011; Leg.: M. Khayrandish.

Morphological characteristics. Female: Body length 8 mm (Fig. 2A); antenna with 30 flagellar segments; face rugose, almost flat in profile, width 1.1× its height (Fig. 2B); clypeus rugose with lamellate apical margin and a raised point in the middle, width 2.1× its height; malar space 0.7× basal width of mandible, mandibles black basally, brown apically, teeth reddish; OOL 0.5× OD; POL 1.7× OD (Fig. 2C); gena coriaceous, concave ventrally, 0.4× width of compound eye; genal carina bent outwards, reaching mandibular base; mesopleuron rugose-reticulate with granular base, speculum smooth and shiny with traces of striation, striate anteriorly (Fig. 2D); epicnemial carina not raised; propodeum strongly rugose-reticulate; basal area trapezoidal, area petiolaris with a longitudinal trough, transversely wrinkled (Fig. 2E); areolet long stalked (Fig. 2F); hind femur black with reddish basal ring, hind tibia black with yellow basal ring; petiole without glymmae, black; metasoma black basally and apically, red medially.

Distribution in Iran. Mazandaran province (current study).

General distribution. Palaearctic (Yu et al. 2016; Riedel 2018), Iran (new record).

***Casinaria nigripes* (Gravenhorst, 1829) (Figs 3A–F)**

Material examined. 1♀, IRAN, GUILAN, Astaneh Ashrafiyeh, Eshman Kamachal (37°22'03.66"N, 49°57'57.84"E, -1 m b.s.l.), 03–10.v.2010; 1♀, 09–16.viii.2010; 1♀, 20–27.ix.2010; 1♀, 27.ix–04.x.2010; Leg.: A. Nadimi.

Morphological characteristics. Female, body length 8.3 mm (Fig. 3A); antenna with 37 flagellar segments; face finely rugose-punctate, slightly convex in profile, width 1.3× its height (Fig. 3B); clypeus rugose, width 2.6× its height; malar space 0.5× basal width of mandible, mandibles black, apically brownish, teeth brown; OOL 0.7× OD; POL 1.5× OD (Fig. 3C); gena coriaceous, 0.5× width of compound eye; genal carina not elevated, reaching mandibular base; mesopleuron granulate-reticulate, speculum granulate, matte, strongly striate anteriorly (Fig. 3D); epicnemial carina not raised, not bent behind fore coxa; propodeum rugose; basal area almost absent; area petiolaris with a shallow longitudinal trough, transversely wrinkled (Fig. 3E); areolet stalked (Fig. 3F); hind femur black, hind tibia black, medially brownish, with a basal yellow spot; petiole without glymmae, black; metasomal tergites black, except 3rd and 4th tergites red, apical 0.2 of 2nd tergite red with an apical black band.

Distribution in Iran. Guilan province (current study).

General distribution. Palaearctic and Oriental (Yu et al. 2016; Riedel 2018), Iran (new record).

Note. The prior record of *Casinaria nigripes* by Samin et al. (2021) is considered unreliable, as no verifiable voucher specimen was cited or could be located in insect collections or museums. The current study provides the first confirmed record for Iran, supported by a detailed morphological description, diagnostic illustrations, and the deposition of voucher specimens in a recognized repository (TMUC).

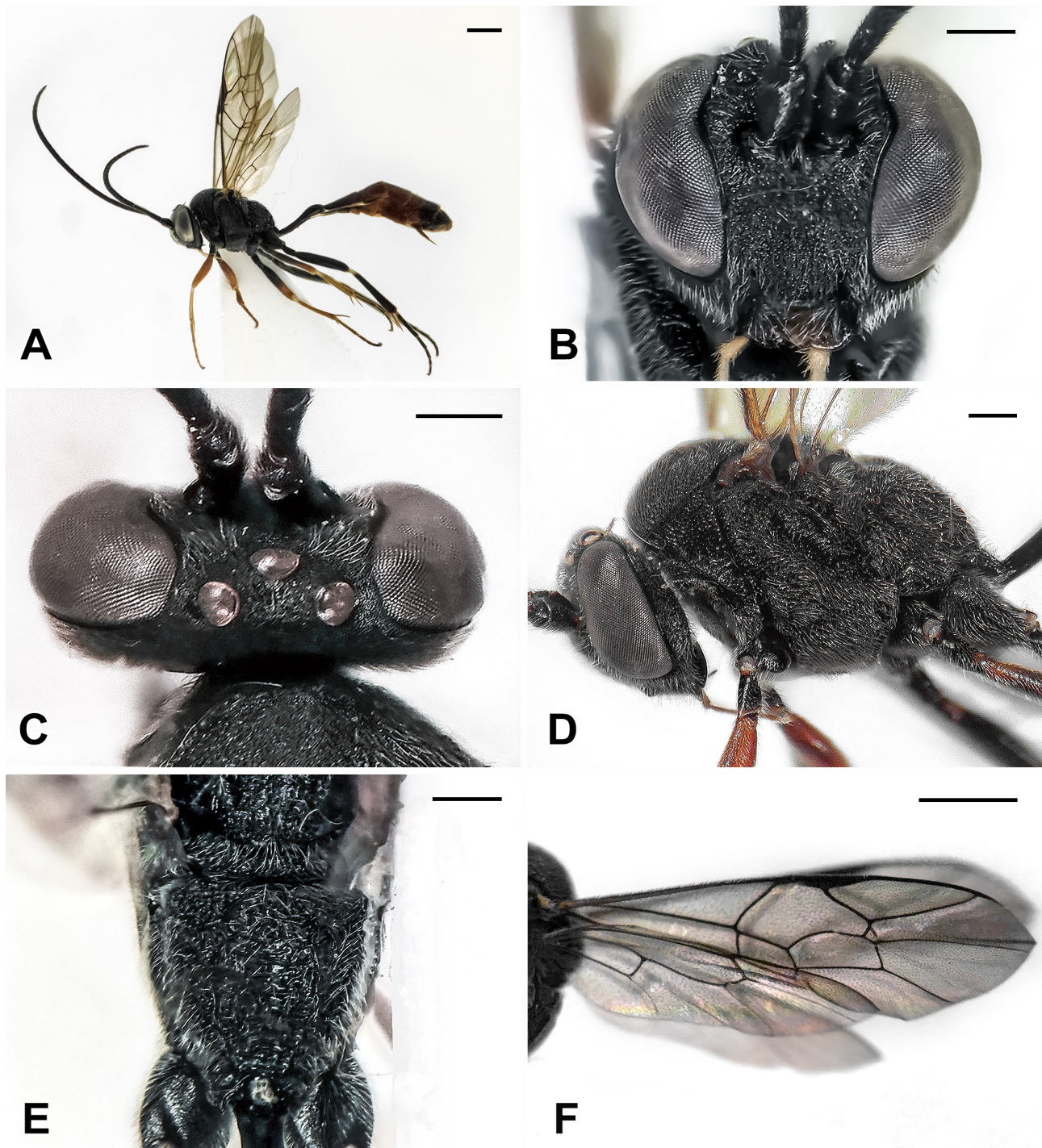


Figure 2. *Casinaria moesta* (Gravenhorst, 1829), female. **A.** General habitus, lateral view; **B.** Head, frontal view; **C.** Head, dorsal view; **D.** Mesosoma, lateral view; **E.** Propodeum, dorsal view; **F.** Wing venations. (Scale bars, B–E: 0.3 mm; A, F: 1 mm).

Casinaria paramorionella Riedel, 2018

Material examined. 1♀, IRAN, GUILAN, Roodsar, Rahim Abad, Ziaz (36°52'27.18"N, 50°13'24.78"E, 490 m a.s.l.), 1♂, 07–14.vi.2010; 2♂♂, 14–21.vi.2010; 1♀, 2♂♂, 21–28.vi.2010; 1♀, 28.vi–06.vii.2010; Leg.: A. Nadimi; ALBORZ, Chalous road, Arangeh (35°55'07.20"N, 51°05'09.24"E, 1891 m a.s.l.), 14–20.vii.2010; 1♂, 29.vi–06.vii.2010; 3♀♀, 06–13.vii.2010; 1♀, 03–10.viii.2010; Shahrestanak (35°57'34.98"N, 51°22'20.34"E, 2305 m a.s.l.), 1♂, 22–29.vi.2010; 3♂♂, 29.vi–06.vii.2010; 2♀♀, 1♂, 06–13.vii.2010; 1♂, 13–26.vii.2010; Sarziarat (35°55'10.38"N, 51°06'51.24"E, 1980 m a.s.l.), 1♂, 06–14.vii.2010; Leg.: A.

Mohammadi-Khoramabadi; FARS, Eghlid county, Dej Kord (30°43'58.91"N, 51°56'55.10"E, 2171 m a.s.l.), 1♀, 21–28.viii.2012; Leg.: A. Amiri.

Distribution in Iran. Guilan (Vas et al. 2024), Alborz, Guilan, and Fars provinces (current study).

General distribution. Western Palaearctic (Riedel 2018).

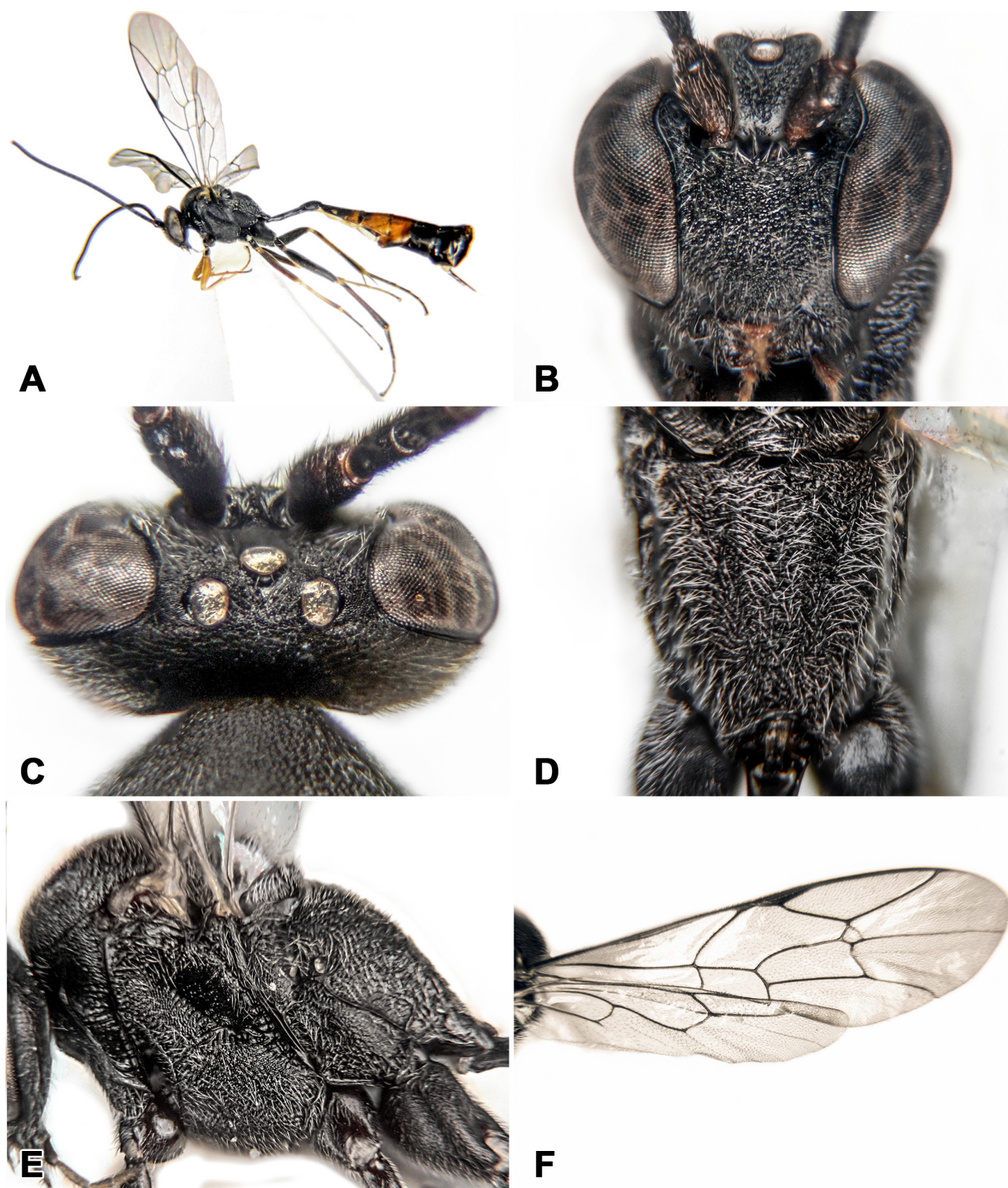


Figure 3. *Casinaria nigripes* (Gravenhorst, 1829), female. A. General habitus, lateral view; B. Head, frontal view; C. Head, dorsal view; D. Mesosoma, lateral view; E. Propodeum, dorsal view; F. Wing venations. (Scale bars, B–E: 0.2 mm; A, F: 1 mm).

Casinaria pyreneator Aubert, 1960 (Figs 4A–F)

Material examined. 1♀, IRAN, GUILAN, Astaneh Ashrafiyeh, Eshman Kamachal (37°22'03.66"N, 49°57'57.84"E, -1 m b.s.l.), 10–17.v.2010; 1♀, 29.viii–05.ix.2010; 1♀, 06–13.ix.2010; 1♂, 13–20.ix.2010; 1♀, 2♂♂, 20–28.ix.2010; 1♂, 04–11.x.2010; 2♀♀, 2♂♂, 11–18.x.2010; 1♂, 18–25.x.2010; 1♀, 25.x–01.xi.2010; 2♂♂, 01–08.xi.2010; 2♂♂, 08–15.xi.2010; Qazi Chak (36°45'52.62"N, 50°20'01.08"E, 1787 m a.s.l.), 1♂, 07–14.vi.2010; 1♂, 06–13.ix.2010; Rudсар county, Rahim Abad district, Orkom (36°45'44.34"N, 50°18'11.88"E, 1201 m a.s.l.), 1♂, 07–14.vi.2010; 1♂, 16–23.viii.2010; 1♂, 06–13.ix.2010; Ziaz (36°52'27.18"N, 50°13'24.78"E, 490 m a.s.l.), 1♂, 13.iii–05.iv.2010; 2♂♂, 28.vi–06.vii.2010; 1♂, 02–09.viii.2010; 1♂, 13–20.ix.2010; 1♂, 20–27.ix.2010; Leg.: A. Nadimi; MAZANDARAN, Noor, Chamestan, Joorband (36°26'17.28"N, 52°07'16.62"E, 272 m a.s.l.), 1♂, 13–26.vii.2011; 2♂♂, 03–16.viii.2011; 1♀, 3♂♂, 16.viii–05.ix.2011; 1♀, 9♂♂, 19.ix–03.x.2011; 1♀, 23.x–05.xi.2011; (36°26'15.54"N, 52°07'13.50"E, 275 m a.s.l.), 2♂♂, 19.ix–03.x.2011; 1♂, 23.x–05.xi.2011; Tangehvaz; (36°21'55.02"N, 52°06'10.74"E, 692 m a.s.l.), 1♀, 13–26.vii.2011; 1♀, 16.viii–05.ix.2011; (36°21'55.68"N, 52°06'10.32"E, 702 m a.s.l.), 2♀♀, 26.vii–16.viii.2011; (36°18'51.42"N, 52°07'48.00"E, 1353 m a.s.l.), 1♀, 13–26.vii.2011; Faculty of Natural Resources and Marine Sciences (36°34'52.98"N, 52°02'45.78"E, -14 m b.s.l.), 3♀♀, 1♂, 16.viii–05.ix.2011; 3♀♀, 1♂, 05–26.ix.2011; 1♀, 26.ix–10.x.2011; Leg.: M. Khayrandish; GOLESTAN, Gorgan county, Shamooshak (36°43'55"N, 54°16'53"E, 492 m, a.s.l.), 1♂, 26.ix–x.2016; 1♀, 05–26.vii.2016; Shast Kola (36°45'29"N, 54°23'12"E, 424 m, a.s.l.), 1♀, 12.vi–03.vii.2016; Tuskestan (36°46'33"N, 54°34'58"E, 500 m, a.s.l.), 1♂, 05–25.vii.2016; Leg.: S. Farahani; HORMOZGAN, Zakin (27°53'7.32"N, 56°19'58.34"E, 1020 m a.s.l.), 1♂, 26.v.2011; 1♂, 16.v.2011; 1♂, 25.iv.2013; Minab, Tahghighat (27°08'39.1"N, 57°04'31.22"E, 28 m a.s.l.), 2♂♂, 03.vi.2012; 1♂, 01.v.2012; Leg.: A. Amiri. WEST AZARBAIJAN, Urmia county, Shirü Kandî village (Qasemlû valley) (37°18'02"N, 45°07'10"E, 1433 m a.s.l.), 1♀, 2♂, 07.vii.2016; Leg.: Y. Karimpour.

Morphological characteristics. *Female.* Body length 4.7–5.5 mm (Fig. 4A); antenna with 26–31 flagellomeres; face punctate, convex in profile, width 1.2× its height (Fig. 4B); clypeus granulate, bulging, width 2.3× its height; malar space 0.6–0.7× basal width of mandible, mandibles yellow, with brownish-red teeth; OOL 0.8× OD; POL 1.5× OD (Fig. 4C); gena coriaceous, 0.4× width of compound eye; genal carina weak ventrally; upper half of mesopleuron coriaceous, speculum smooth and shiny, striate anteriorly (Fig. 4D), lower half of mesopleuron coriaceous with punctures; epicnemial carina not raised; propodeum granulate with wrinkles, basal area triangular; area petiolaris not depressed, without longitudinal trough, transversely wrinkled (Fig. 4E); areolet stalked (Fig. 4F); hind femur red, hind tibia reddish yellow, infusate basally and apically; petiole without glymmae, black, apically brownish; 2nd to 7th tergites black basally and orange-red apically. *Male.* Similar to female with the following differences: body length 4.5–5.4 mm; antenna with 30–32 flagellomeres; 2nd to 4th tergites orange-red apically and laterally.

Distribution in Iran. Golestan, Guilan, West Azarbaijan, Hormozgan, and Mazandaran (current study).

General distribution. Western Palaearctic (Yu et al. 2016; Riedel 2018), Iran (new record).

Casinaria tenuiventris (Gravenhorst, 1829)

Material examined. 1♀, IRAN, GUILAN, Rudсар county, Rahim Abad district, Orkom (36°45'44.34"N, 50°18'11.88"E, 1201 m a.s.l.), 13–19.iv.2010; 1♀, 03–10.v.2010; 1♀, 21–28.vi.2010; Astaneh Ashrafiyeh, Eshman Kamachal (37°22'03.66"N, 49°57'57.84"E, -1 m b.s.l.); 2♀♀, 16–29.viii.2010; Qazi Chak (36°45'52.62"N, 50°20'01.08"E, 1787 m a.s.l.); 1♀, 09–16.viii.2010; Leg.: A. Nadimi; MAZANDARAN, Noor, Chamestan, Tangehvaz (36°21'55.02"N, 52°06'10.74"E, 692 m a.s.l.); 1♀, 13–26.vii.2011; Gaznasara (36°16'56.82"N, 52°10'58.50"E, 2032 m a.s.l.); 1♀, 13–26.vii.2011; Noor, Faculty of Natural Resources and Marine Sciences (36°34'52.98"N, 52°02'45.78"E, -14 m b.s.l.); 1♀, 13–26.vii.2011; Leg.: M. Khayrandish; ALBORZ, Chalous road, Arangeh (35°55'07.20"N, 51°05'09.24"E, 1891 m a.s.l.); 1♀, 27.ix–04.x.2010; Shahrestanak (35°57'34.98"N, 51°22'20.34"E, 2305 m a.s.l.); 1♀, 22–29.vi.2010; Leg.: A. Mohammadi-Khoramabadi; QAZVIN, Loshan (36°40'14.58"N, 49°25'38.52"E, 295 m a.s.l.); 2♀♀, 10–25.v.2011; Zeresk road (36°21'39.72"N, 50°03'55.56"E, 1541 m a.s.l.); 1♀, 09–28.vi.2011; (36°25'39.36"N, 50°06'36.90"E, 1997 m a.s.l.); 1♀, 26.v–09.vi.2011; 1♀, 06–26.vii.2011; Leg.: A. Mohammadi-Khoramabadi.

Distribution in Iran. Guilan (Herard et al. 1979; current study), Kerman (Bahremand et al. 2022), Tehran (Rajabi 1986; Masnadi-Yazdinejad et al. 2010), Alborz, Mazandaran, and Qazvin provinces (current study).

General distribution. Palearctic (Yu et al. 2016; Riedel 2018).

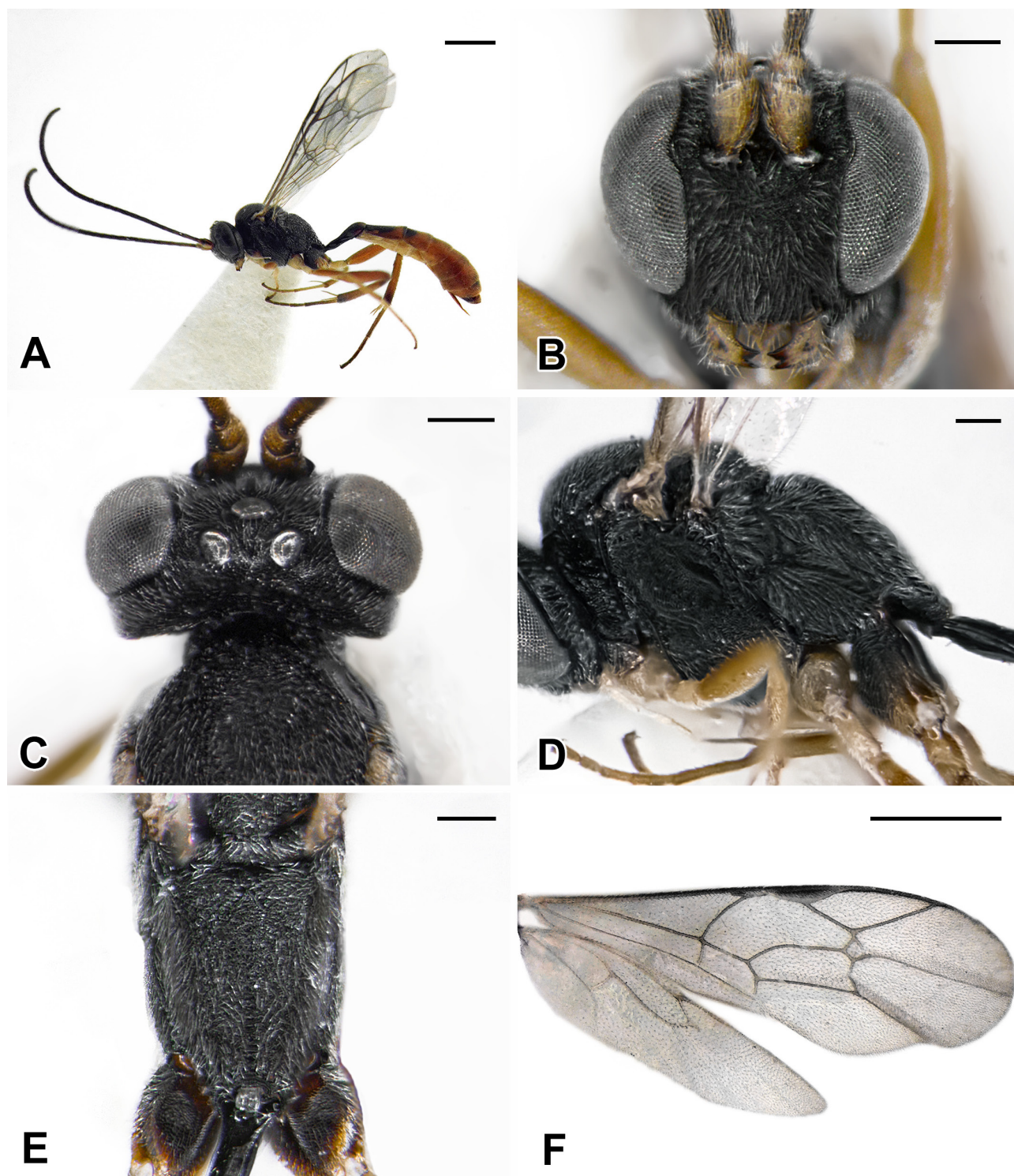
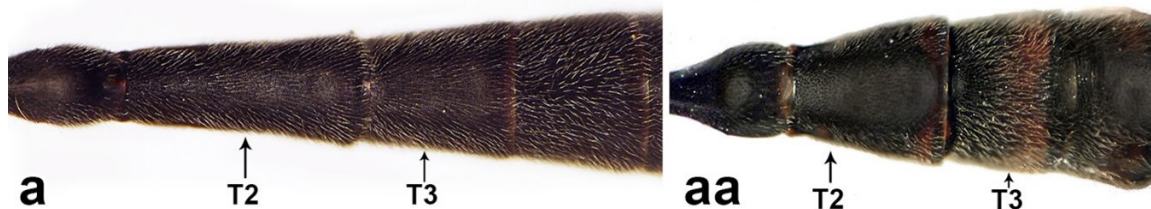


Figure 4. *Casinaria pyreneator* Aubert, 1960, female. **A.** General habitus, lateral view; **B.** Head, frontal view; **C.** Head, dorsal view; **D.** Mesosoma, lateral view; **E.** Propodeum, dorsal view; **F.** Wing venations. (Scale bars, B–E: 0.2 mm; A, F: 1 mm).

Illustrated key to species of *Casinaria* occurring in Iran (modified from Riedel 2018).

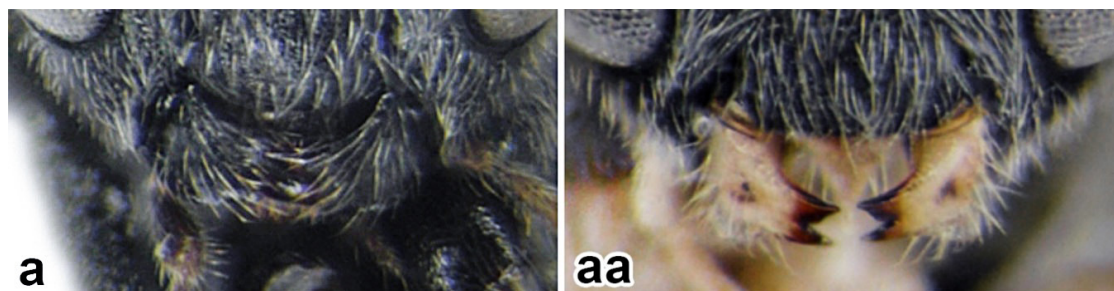
- 1 2nd tergite more than 1.5× longer than wide, 3rd tergite longer than wide (a).2
 — 2nd tergite at most 1.5× longer than wide; 3rd tergite wider than long (aa).9



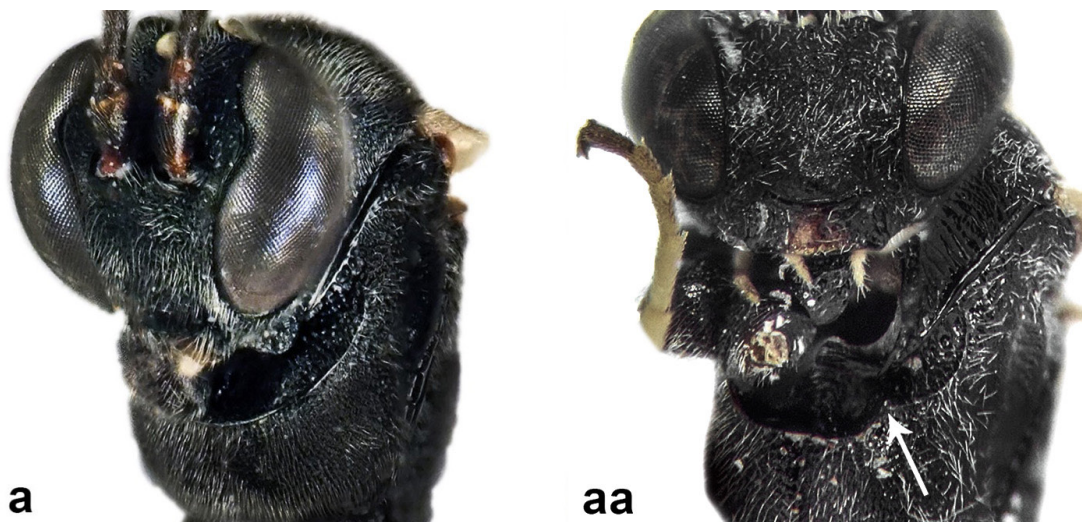
- 2 Hind femora red (a).3
 — Hind femora black (aa).8



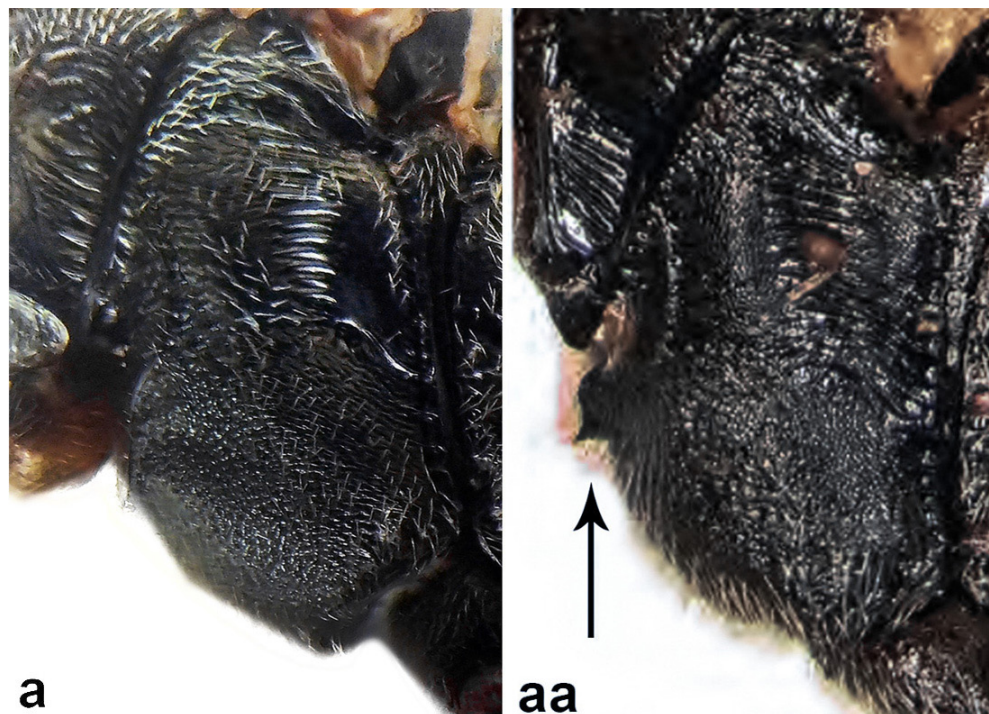
- 3 Mandibles blackish (a).4
 — Mandibles ivory except teeth (aa).7



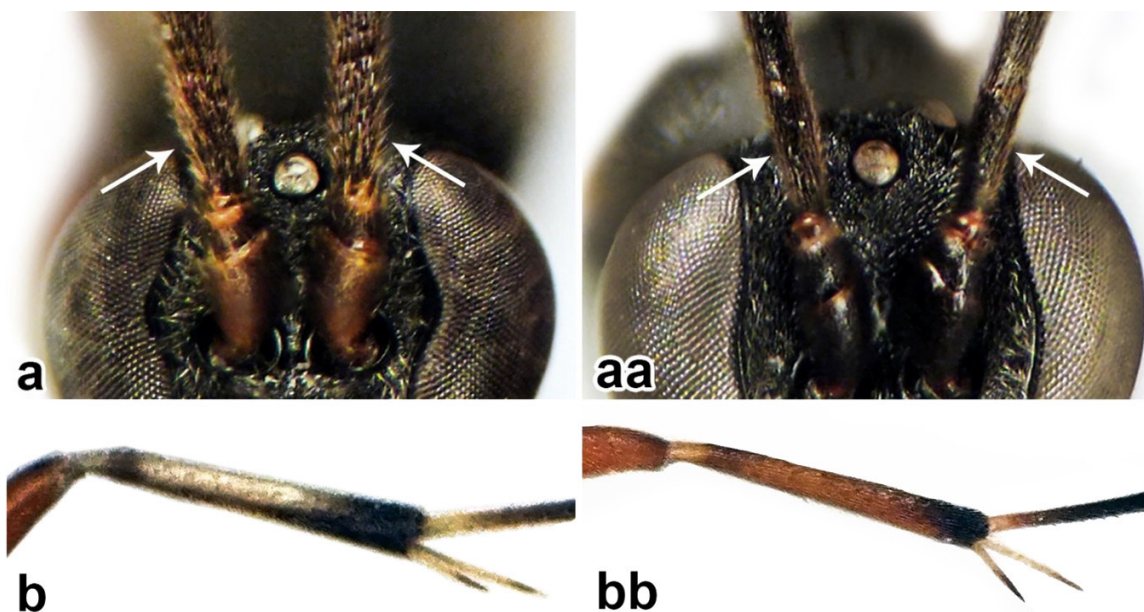
- 4 Epicnemial carina not bent forward behind fore coxae (a).5
 — Epicnemial carina bent forward behind fore coxae (aa), slightly elevated ventrally; mesopleuron coarsely punctate and granulate, but shining; area petiolaris with a narrow and deep longitudinal trough; tegulae yellow. *C. horstmanni* Riedel, 2018



- 5 Epicnemial carina narrow behind fore coxae (a).6
- Epicnemial carina lamelliform, elevated behind fore coxae (aa) [Riedel 2018]; tegulae black; hind tibiae yellow basally, pale reddish or brownish mediodorsally; area petiolaris with a wide longitudinal trough.*C. trochanterator* Aubert, 1960



- 6 1st flagellomeres 2.7× as long as its apical width (a); hind tibiae mainly black, ivory basally and mediodorsally (b); area petiolaris with a rather deep and narrow longitudinal trough (c). *C. krieckbaumeri* (Costa, 1884)
- 1st flagellomeres 3.6–4.0× as long as its apical width (aa); hind tibiae mainly red, ivory basally, reddish mediodorsally (bb); area petiolaris with a slightly or moderately deep and wider longitudinal impression (cc). *C. tenuiventris* (Gravenhorst, 1829)



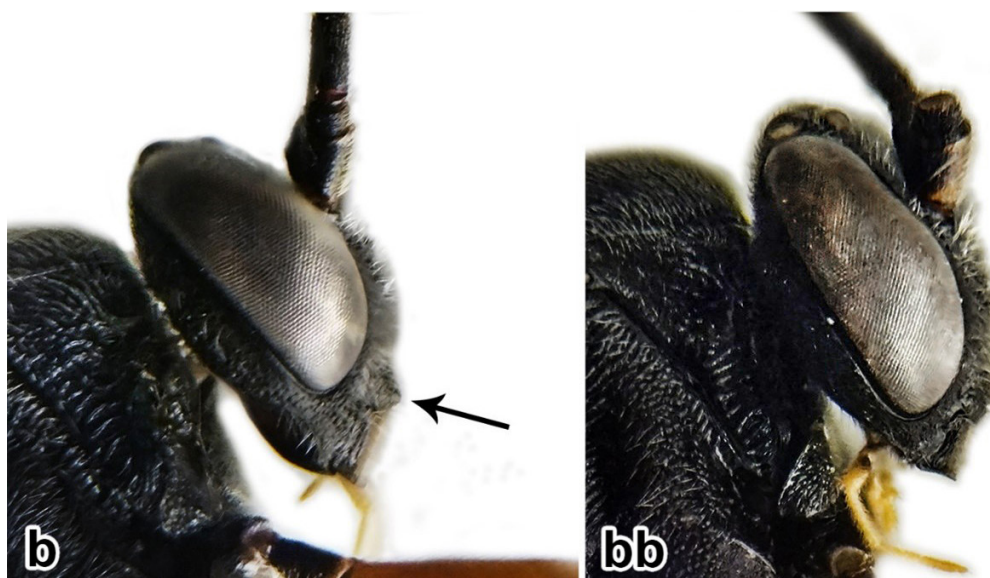


- 7 Hind tibiae red, ivory basally, reddish or yellowish-red mediodorsally, infusate subbasally and apically (a). *C. mesozosta* (Gravenhorst, 1829)
- Hind tibiae red, ivory basally and mediodorsally (aa). *C. ischnogaster* Thomson, 1887

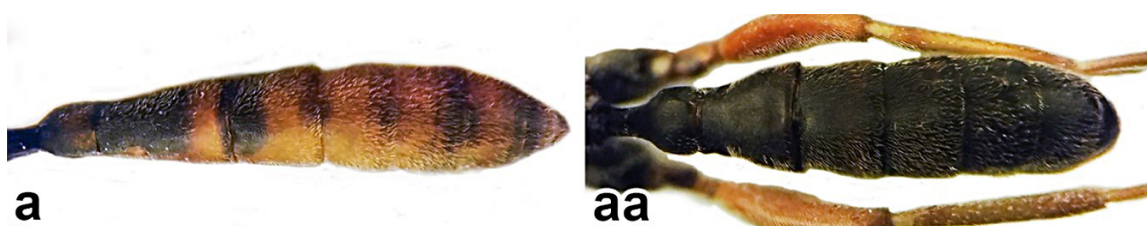


- 8 Epicnemial carina without ridge on transversal parts (a); clypeus apically elevated, nose-like expanded in profile (b). *C. moesta* (Gravenhorst, 1829)
- Epicnemial carina with a small ridge on transversal parts (aa); clypeus not elevated, slightly convex (bb). *C. nigripes* (Gravenhorst, 1829)





- 9 Central tergites reddish (a). *C. pyreneator* Aubert, 1960
 — All tergites black (aa). *C. paramorionella* Riedel, 2018



DISCUSSION

In this study, four *Casinaria* species are recorded for the first time from Iran: *C. horstmanni*, *C. moesta*, *C. nigripes*, and *C. pyreneator*, along with five species with new provincial records. *Casinaria* species have now been recorded from 13 out of the 31 provinces of Iran (Alborz, Fars, West Azarbaijan, Guilan, Golestan, Kerman, Markazi, Mazandaran, Qazvin, Tehran, Hormozgan, Khorasan-e Razavi, and Khuzestan). Guilan province, with eight species, was found to be the richest in diversity, followed by Fars and Mazandaran provinces, each with five species. Previous studies (Herard et al. 1979; Rajabi 1986; Masnadi-Yazdinejad et al. 2010; Riedel 2018; Riedel et al. 2019; Falahatpisheh et al. 2021; Bahremand et al. 2022; Mohammadi-Khoramabadi 2023; Vas et al. 2024) have advanced our knowledge of *Casinaria* in Iran. However, gaps remain in the known distribution of species, as many regions have yet to be surveyed; we expect a higher number of *Casinaria* species in the country with further research. Parasitoid-host relationships have been documented for six Iranian *Casinaria* species, all parasitoids of Lepidoptera, primarily from the families Noctuidae and Geometridae (Yu et al. 2016; Riedel 2018). Additionally, *C. tenuiventris* was recorded as a larval parasitoid of *Lymantria dispar* Linnaeus, 1758 (Lepidoptera, Erebidae) (Herard et al. 1979). With the results of our study, the total number of *Casinaria* species in Iran has increased to 10, compared to neighboring countries: 10 species in Russia, four species in Azarbaijan, two species in Turkiye and Turkmenistan, and none recorded from Iraq (Yu et al. 2016; Riedel 2018). The zoogeographical distribution of *Casinaria* species collected in this survey (Fig. 5) shows that all Iranian *Casinaria* species occur in the Western Palaearctic region, with six species also found in the Eastern Palaearctic region, and one species (i.e., *C. nigripes*) has also been recorded in the Oriental region. An updated list of 10 *Casinaria* species of Iran is presented in Table 1. All other species records of the genus *Casinaria* have been deliberately excluded from the current checklist of Iran's fauna due to significant concerns regarding the reliability and accuracy of those data.

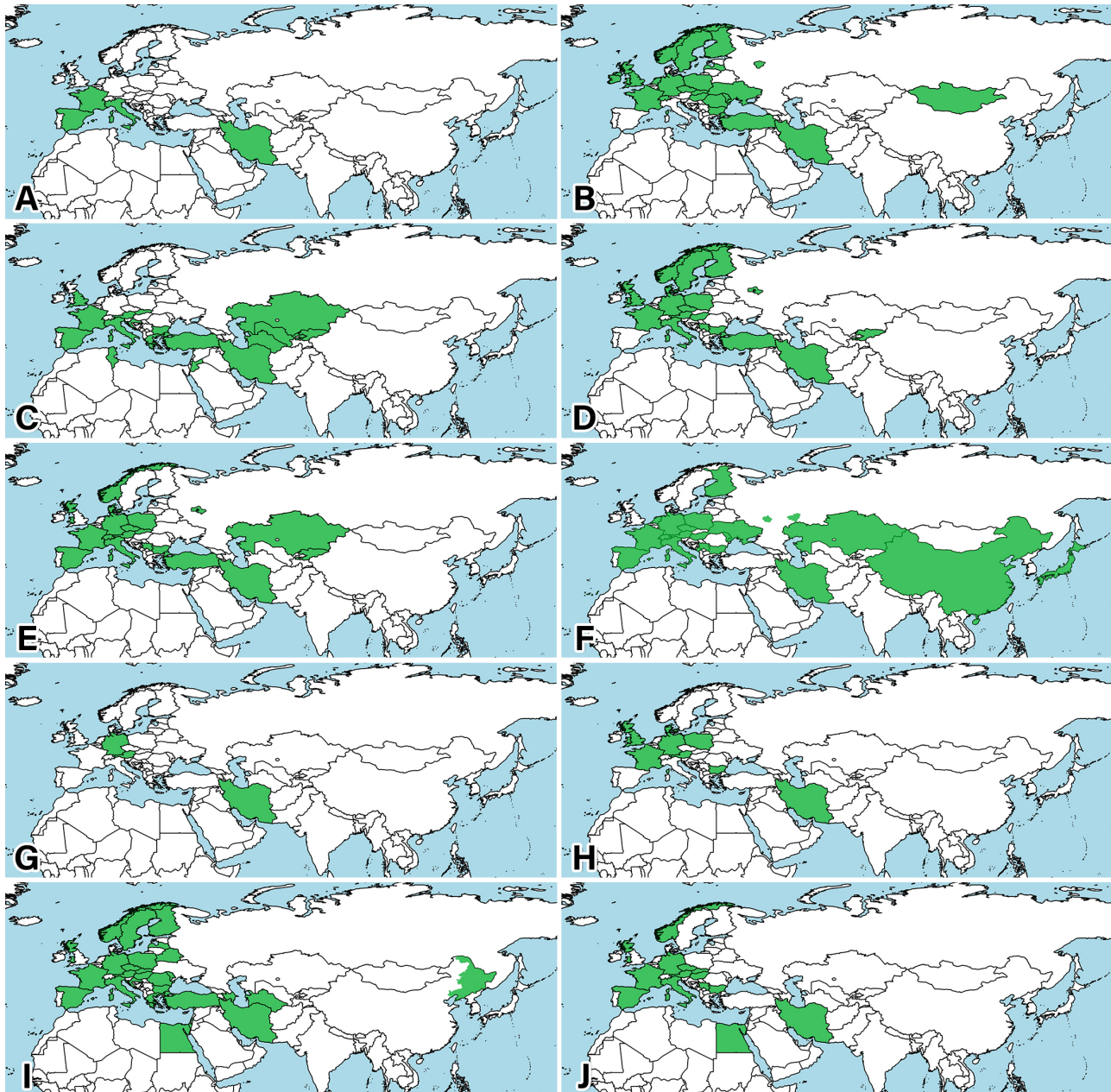


Figure 5. Zoogeographical distribution map of *Casinaria* species recorded from Iran. A. *C. horstmanni*; B. *C. ischnogaster*; C. *C. kriechebaumari*; D. *C. mesozosta*; E. *C. moesta*; F. *C. nigripes*; G. *C. paramorionella*; H. *C. pyreneator*; I. *C. tenuiventris*; J. *C. trochantrator*.

Several records are unreliable due to taxonomic inaccuracies and publication in generalist or even predatory journals that lack rigorous peer review. Therefore, to ensure the accuracy and reliability of the faunal records, we have not incorporated these unverified reports into the present study.

It is worth noting that Herard et al. (1979) reported *C. tenuiventris* from Bandar Anzali in Guilan province (formerly named Bandar Pahlavi), but this record was mistakenly cited as being from Tehran province by Masnadi-Yazdinejad et al. (2010). Furthermore, the first record of *C. ischnogaster* from Fars province by Mohammadi-Khoramabadi (2023), which was not prominently highlighted in the original publication, is confirmed. We also include a previously unreported male specimen of *C. trochantrator* from Kerman province, which was examined by Mohammadi-Khoramabadi and Riedel (2020) but omitted from the distributional data in their work. These corrections have been incorporated into the updated species list provided in Table 1.

Table 1. Validated list of Iranian *Casinaria* species (Hymenoptera: Ichneumonidae, Campopleginae) excluding unreliable records.

Species	Provincial distribution in Iran	References
<i>C. kriechebaumeri</i> (Costa, 1884)	Alborz, Hormozgan, Khorasan-e Razavi, Khuzestan, Markazi, Mazandaran, Guilan, Qazvin	Riedel et al. (2019); Mohammadi-Khoramabadi and Riedel (2020); Current study
<i>C. tenuiventris</i> (Gravenhorst, 1829)	Alborz, Guilan, Kerman, Mazandaran, Qazvin, Tehran	Rajabi (1986), Masnadi-Yazdinejad et al. (2010); Bahremand et al. (2022); Herard et al. (1979); Current study
<i>C. trochanterator</i> Aubert, 1960	Fars, Kerman, Khuzestan, Markazi, Fars	Riedel (2018); Riedel et al. (2019); Mohammadi-Khoramabadi and Riedel (2020); Mohammadi-Khoramabadi (2023)
<i>C. mesozosta</i> (Gravenhorst, 1829)	Fars, Guilan	Falahatpisheh et al. (2021); Current study
<i>C. nigripes</i> (Gravenhorst, 1829)*	Guilan	Current study
<i>C. ischnogaster</i> Thomson, 1887	Fars, Guilan	Mohammadi-Khoramabadi (2023); Current study
<i>C. paramorionella</i> Riedel, 2018	Alborz, Fars, Guilan	Vas et al. (2024); Current study
<i>C. moesta</i> (Gravenhorst, 1829)*	Mazandaran	Current study
<i>C. pyreneator</i> (Aubert, 1960)*	Golestan, Guilan, Hormozgan, Mazandaran, West Azarbaijan	Current study
<i>C. horstmanni</i> Riedel, 2018*	Alborz, Fars, Golestan, Guilan, Hormozgan, Mazandaran, Qazvin	Current study

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: A. Feizi: Sorting and preparation of specimens, identification, data collection, photography, drafting, and revising the manuscript; A.A. Talebi: Conceptualization, fund acquisition, curation of the specimens, revising the manuscript; M. Riedel: Taxonomic examination and comparison of specimens; E. Rakhshani: revising and editing the manuscript. The authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the Tarbiat Modares University Collection and are available from the curator upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

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

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بررسی جنس *Casinaria* Holmgren (Hymenoptera, Ichneumonidae, Campopleginae) در ایران

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چکیده: جنس *Casinaria* متعلق به زیرخانواده Campopleginae و شامل ۱۲۵ گونه در سراسر جهان است. در این پژوهش، به عنوان بخشی از مطالعه زنبورهای خانواده Ichneumonidae، نمونه برداری در بخش‌های شمال مرکزی، جنوب و شمال شرقی ایران انجام شد. بررسی نمونه‌های جمع‌آوری‌شده، یافته‌های جدیدی را برای جنس *Casinaria* Holmgren، ۱۸۵۹، آشکار کرد. چهار گونه شامل *Casinaria horstmanni* Riedel, 2018، *C. moesta* (Gravenhorst, 1829)، *C. pyreneator* Aubert, 1960 و *C. nigripes* (Gravenhorst, 1829) برای اولین بار از ایران گزارش شدند. ویژگی‌های ریخت‌شناسی گونه‌ها، تصاویر، داده‌های پراکنش جغرافیایی جانوری، کلید مصور و فهرست به‌روز شده‌ای از گونه‌های گزارش شده جنس *Casinaria* در ایران ارائه شد.

ویراستار علمی

مجید فلاح‌زاده

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واژگان کلیدی: زنبورهای پارازیتوئید، کلید تصویری، انتشار، ریخت‌شناسی، رده بندی