

Study of the genus *Lissonota* (Hymenoptera: Ichneumonidae: Banchinae) in southern Iran

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Abstract

A survey was conducted to determine the species of the genus *Lissonota* Gravenhorst, 1829 in two Iranian southern provinces of Fars and Hormozgan from February 2011 through August 2013. Six species were identified of which five species are recorded for the first time from Iran. The newly recorded species are as follows: *Lissonota bivittata* Gravenhorst, 1829, *L. clypeator* Gravenhorst, 1820, *L. impressor* Gravenhorst, 1829, *L. pimplator* (Zetterstedt, 1838) and *L. proxima* Fonscolombe, 1854. An updated checklist of Iranian *Lissonota* species is presented.

Key words: *Lissonota*, taxonomy, Fars, Hormozgan, Iran

چکیده

مطالعه زنبورهای جنس (*Lissonota* (Hymenoptera: Ichneumonidae: Banchinae) در جنوب ایران

عباس امیری، علی اصغر طالبی، کارمن ری دل کاستیلو، احسان رخشانی و حمید رضا حاجی قنبر

پژوهش حاضر به منظور شناسایی گونه‌های جنس *Lissonota* Gravenhorst, 1829 (Hymenoptera: Ichneumonidae: Banchinae) در دو استان جنوبی ایران (فارس و هرمزگان) طی سال‌های ۱۳۸۹-۱۳۹۲ انجام گردید. در مجموع شش گونه از این جنس جمع‌آوری و شناسایی شد که پنج گونه برای اولین بار از ایران گزارش می‌شوند. این گونه‌ها عبارتند از: *L. bivittata* Gravenhorst, 1829، *L. clypeator* Gravenhorst, 1820، *L. impressor* Gravenhorst, 1829، *L. pimplator* (Zetterstedt, 1838) و *L. proxima* Fonscolombe, 1854. فهرست به روز شده گونه‌های جنس *Lissonota* در ایران ارائه شده است.

واژگان کلیدی: *Lissonota*، تاکسونومی، فارس، هرمزگان، ایران

Introduction

The family Ichneumonidae with 39 subfamilies and more than 24000 species is one of the largest families in the class Insecta (Quicke, 2015). It has been estimated that this family contains about 60,000 to 100,000 species worldwide (Townes *et al.*, 1965). Ichneumonid wasps parasitize mainly the immature stages of holometabolous insects (Wahl & Sharkey, 1993) and a few species are predators of spider eggs, as well as ectoparasitoids of post-embryonic spiders (Arachnida: Araneae) (Miller *et al.*, 2013). The subfamily Banchinae comprises three tribes including Banchini Wesmael, 1845, Glyptini Cushman & Rohwer, 1920 and Atrophini Seyrig, 1932 containing 65 genera and at least 1758 species (Yu *et al.*, 2012). All species are koinobiont endoparasitoids of larvae of Lepidoptera (Çoruh & Özbek, 2013).

Lissonota Gravenhorst, 1829 with 388 species is the largest genus in the tribe Atrophini (Yu *et al.*, 2012) and are endoparasitoids of various lepidopterous larvae in stems, buds and leaf rolls (Townes, 1969). The greatest diversity of *Lissonota* species occurs in the Old world (Yu *et al.*, 2012) where the taxonomy of this genus has been comparatively better studied (Meier, 1935; Bain, 1970; Kasparyan, 1981; Rey del Castillo, 1989). Kasparyan (1981) published a key to about 150

species of the genus in the European part of USSR. Iranian ichneumonids have been studied by Masnadi *et al.* (2010), Barahoeiet *et al.* (2012) and Mohammadi-Khoramabadi *et al.* (2013a,b). Barahoei *et al.* (2012) provided a checklist containing 10 species from two tribes Banchini and Atrophini and the four genera *Banchus* Fabricius, 1798, *Exetastes* Gravenhorst, 1829, *Lissonota* Gravenhorst, 1829 and *Arenetra* Holmgren, 1859. Faunistic studies on Banchinae including the genus *Lissonota* have been carried out in the north and northwest of Iran (Ghahari *et al.*, 2010; Masnadi *et al.*, 2010; Mohammadi-Khoramabadi *et al.*, 2016).

Here, we present new data on the occurrence of *Lissonota* species in Hormozgan and Fars provinces and provide an updated checklist of the Iranian *Lissonota* species.

Materials and methods

Malaise traps and sweep nets were used in Fars and Hormozgan provinces from February 2011 through August 2013. The provinces include forests, rangelands, desert plants, mangrove (*Avicennia marina*) (Mozaffarian, 1991; Soltanipoor, 2005; Zaeifi, 2001), fruit orchards (tropical and non-tropical trees), and agro-ecosystems (fig. 1). A total of 24 Malaise traps were used. The specimens were treated

with a mixture of Alcohol (60%) /Xylene (40%) for two days and with Amyl acetate for the next two days (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 were used for the identification of the specimens (Meier, 1935; Bain, 1970; Kasparyan, 1981; Rey del Castillo, 1989). Illustrations were made using an Olympus TM AX70 microscope and Olympus TM SZX9 stereomicroscope equipped with a Sony TM digital camera. A series of 4-5 captured images were merged into a single in-focus image using the image-stacking software Combine ZP1.0. The specimens are deposited at the Collection of Department of Entomology, Tarbiat Modares University (TMUC), Tehran, Iran.

Results

A total of 27 specimens of the genus *Lissonota* were collected representing six species (*L. bivittata* Gravenhorst, 1829, *L. clypeator* Gravenhorst, 1820, *L. impressor* Gravenhorst, 1829, *L. pimptator* (Zetterstedt, 1838), *L. proxima* Fonscolombe, 1854 and *L. (Loxonota) flavovariegata* Lucas, 1849). Among them, *L. (Loxonota) flavovariegata* has been previously recorded from Iran, while the other five species are new for the Iranian fauna. The species are listed alphabetically and diagnostic characters presented for the newly recorded species.

Lissonota bivittata Gravenhorst, 1829

Material examined: Iran, Hormozgan province, Bandar Abbas, Zakin (27°28'53" N, 56°18'27" E, 680 m a.s.l.), 27.VI.2011, 1♂, Malaise trap, Leg.: A. Ameri



Fig. 1. Habitats of Fars and Hormozgan provinces of Iran where the *Lissonota* specimens were collected.

Diagnosis: Male (fig. 2, A): Body length 7.0–7.5 mm; clypeus convex medially, about 1.74x as wide as long (fig. 2, B); malar space 0.70–0.75x width of mandibular base; face 1.7x as wide as height (fig. 2, B), sparsely punctate; antenna 39 segmented, first flagellomere 1.3x as long as second flagellomere; face and frons finely punctate; temple finely punctate, its length in dorsal view 0.57x as long as eye width (fig. 2, C); occipital carina dorsally complete (fig. 2, C); notauli short and shallow; mesoscutum finely and evenly punctate; mesopleuron finely punctate (fig. 2, D); fore wing 4.9–5.0 mm (fig. 2, E); propodeum with basal transverse carina (fig. 2, F); first

metasomal tergite about 2.1x and second about 1.3x as long as posterior width (fig. 2, G); hind femur 4.7x as long as its broad; Coloration: face and clypeus reddish brown, mandible red (tooth black); antenna brown, vertex black, frontal orbit white and continues to vertex, mesonotum and scutellum yellow, tegula whitish yellow, pleura whitish yellow, propodeum black, metasomal tergites darkish brown with white strips on posterior margin, fore and mid coxae and trochanters white, hind trochanter yellow.

General distribution: East and West Palaearctic (Yu *et al.*, 2012), New to Iran.

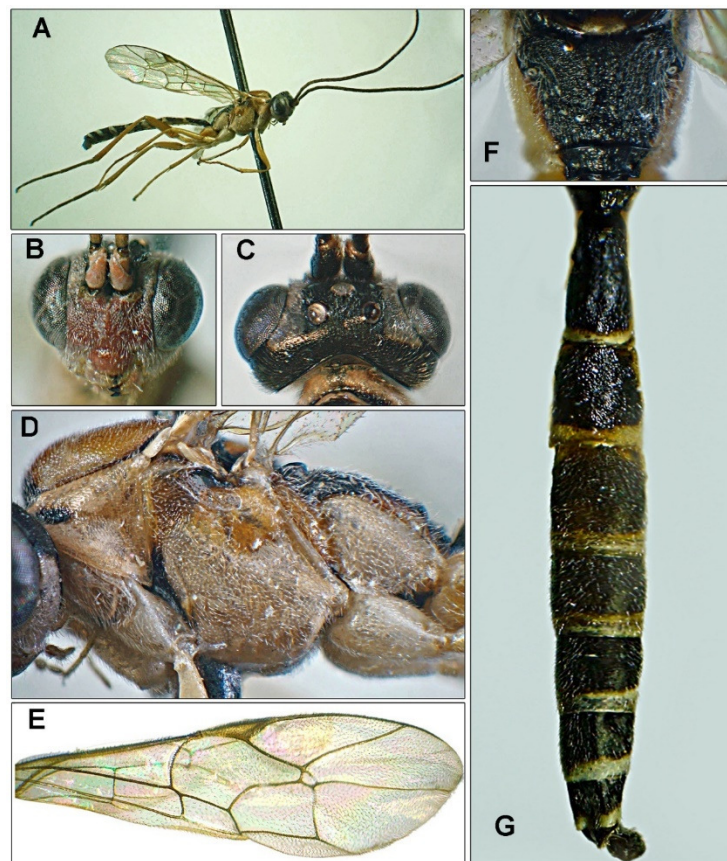


Fig. 2. *Lissonota bivittata*, male; A. Adult, lateral view; B. Head, frontal view; C. Head, dorsal view; D. Mesosoma, lateral view; E. Fore wing; F. Propodeum, dorsal view; G. Metasoma, dorsal view.

***Lissonota clypeator* (Gravenhorst, 1820)**

Material examined: Iran, Fars province, Eghlid, Sedeh, Zava (30°44'17" N, 52°08'31" E 2130 m a.s.l.), 17. VI.2013, 2♀, 2♂, sweep net, Leg.: A. Amiri

Diagnosis: Female (fig. 3, A): Body length 12–13.5mm; clypeus convex medially, about 2.66x as wide as height (fig. 3, B); malar space 1.0–1.1x width

of mandibular base; face 2.16x as wide as height (fig. 3, B), finely 91unctate; antenna 42–43 segmented, first flagellomere 1.73x as long as second flagellomere; face and frons finely 91unctate; temple finely 91unctate, its length in dorsal view 0.62x as long as eye width (fig. 3, C), occipital carina dorsally complete; notauli absent, mesonotum finely and evenly

92unctuate; mesopleuron punctuate (fig. 3D); fore wing venation as in fig. 3, E, its length 7.5mm; propodeum with posterior transverse carina (fig. 3, F); first metasomal tergite about 1.6x as long as posterior width, sparsely 92unctuate, with a groove in the middle (fig. 3, G), second tergite about 0.85x as long as posterior width; ovipositor longer than body, its length 1.87x as long as metasoma; hind femur 4.5x as long as broad. Coloration: Face black, clypeus black in base, its apex yellow, mandible red (tooth black), antenna dark brown, vertex black, thorax black, first metasomal tergite black, tergites 2–3 black with red spots, tergites 4–7 blackish brown; all coxae and trochanters black, tibia and femurs red, apex of hind tibia dark, hind tarsi black.

Male: Antenna with 41–43 segments, other features as female.

General distribution: East and West Palaearctic, Nearctic (Yu *et al.*, 2012), New to Iran.

Remark: *Lissonota clypeator* has been recently reported from north of Iran (Amol, Mazandaran province) (Hooshyar *et al.*, 2014), but based on its figures it is mistakenly identified and it is obviously *L. flavovariegata*.

Lissonota (Loxonota) flavovariegata (Lucas, 1849)

Material examined: Iran, Fars province, Eghlid, Shahrman (30°54'39" N, 52°28'16" E, 2120m a.s.l.), 05.VII.2012, 3♂, 3♀, Malaise trap, Leg.: A. Amiri.

Diagnosis: Female: Body length 9.5–11 mm; fore wing 7.1 mm; Head: face about 2.2x as wide as high, convex medially; distance from lateral ocellus to eye 1.2–1.3x diameter of ocellus; temple finely 92unctuate, its length in dorsal view 0.57x eye width; antenna with 45 segments; malar space 0.95x as wide as basal width of mandible; mesopleuron and metapleuron densely 92unctuate, the space between points equal to or less than their diameters; length of second tergite 0.94–0.97x as long as its apical width, 92unctuate densely; ovipositor with straight apex, its length less than 1.1x as long as body.

Coloration: Head and thorax black, clypeus black in base and reddish brown in apex, coxae and trochanters black, femur and tibia red, first and second tarsomeres red, tarsomeres 3–5 brown, tergites 1–5 reddish brown, tergites 6 and 7 black.

Distribution in Iran: Mazandaran (Ghahari *et al.*, 2010), Fars province (current study).

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

Lissonota impressor Gravenhorst, 1829

Material examined: Iran, Fars province, Eghlid, Shahrman (30°54'39" N, 52°28'16" E, 2120 m a.s.l.), 10.VII.2013, 2♂, 1♀, Malaise trap, Leg.: A. Amiri

Diagnosis: Female (fig. 4, A): Body length 10–11mm; clypeus convex medially, about 2.29x as wide as high (fig. 4, B), punctate basally; malar space 0.75x basal width of mandible; face 2.12x as wide as high (fig. 4, B), densely punctate; antenna 35–36 segmented, first flagellomere 1.48x as long as second flagellomere; temple finely punctate, its length in dorsal view 0.7x eye width (fig. 4, C); occipital carina dorsally complete; notauli absent, mesonotum densely punctate; mesopleuron punctuate (fig. 4, D); fore wing 7.5 mm (fig. 4, E); propodeum with posterior transverse carina (fig. 4, F); first metasomal tergite about 1.3x as long as apical width, and uniformly convex (fig. 4, G), wrinkly-punctured, second tergite square, its length 0.86x apical width, very finely striated; ovipositor longer than body; hind femur 4.9x as long as wide. Coloration: Face black, clypeus brown, mandible at the middle brown (base and tooth black), antenna black, vertex black, thorax black, metasomal tergites black, all coxae and trochanters black, legs reddish brown, apex of hind tibia dark, hind tarsomeres 1–4 black.

Male: Body length 10–11mm, antenna with 41 flagellomeres, mid and hind coxae black.

General distribution: West Palaearctic (Yu *et al.*, 2012), New to Iran.

Lissonota pimplator (Zetterstedt, 1838)

Material examined: Iran, Fars province, Eghlid, Shahrman (30°54'39" N, 52°28'16" E, 2120 m a.s.l.), 05.VII.2012, 1♂, 7♀, Malaise trap, Leg.: A. Amiri.

Diagnosis: Female (fig. 5, A): Body length 8.70–10mm, clypeus convex medially, about 2.1x as wide as high (fig. 5, B), punctate basally; malar space 0.88x as wide as basal width of mandible; face 2.08x as wide as height (fig. 5, B), punctate; antenna 30–32 segmented, first flagellomere 1.25x as long as second flagellomere; occipital carina dorsally complete; temple with fine scattered punctures, its length in dorsal view 0.48x eye width (fig. 5, C); notauli absent, mesonotum densely punctate, punctures larger and less (in number) than those of second tergite, posterior lateral edges of pronotum, scutellum and mesopleuron finely punctate

(fig. 5, D); fore wing 5.5mm (fig. 5, E); propodeum with strong posterior transverse carina (fig. 5, F); first metasomal tergite (fig. 5, G) about 1.4x as long as apical width, second tergite square, its length 0.8x as long as apical width, first and second tergites punctate; ovipositor as long as or 0.85x length of body;

hind femur 5.35x as long as wide. Coloration: Body black, antenna, head, thorax and metasomal tergites black, legs red, apex of hind tibia and hind tarsus reddish brown.

General distribution: West Palaearctic (Yu *et al.*, 2012), New to Iran.

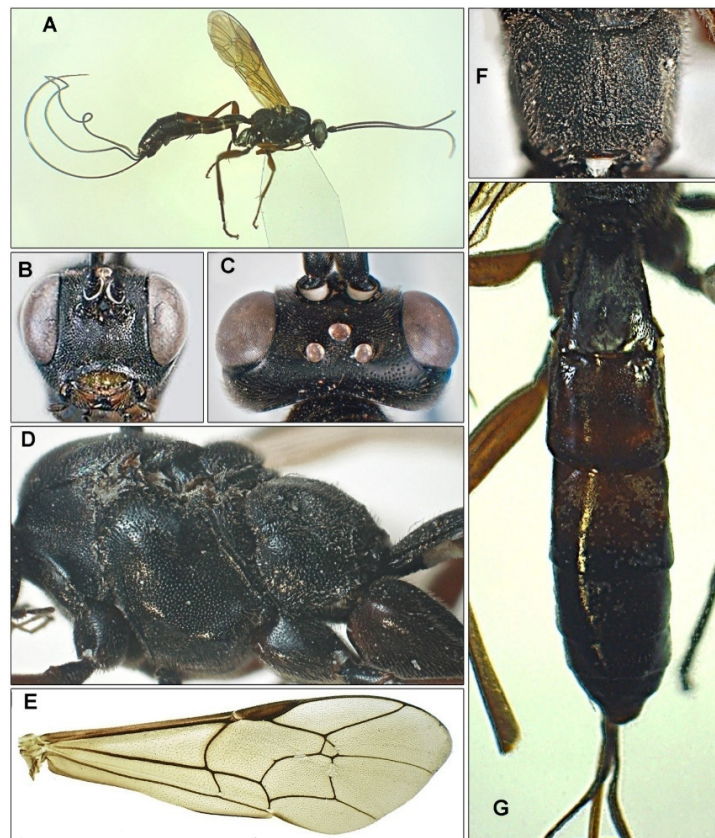


Fig. 3. *Lissonota clypeator*, female; A. Adult, lateral view; B. Head, frontal view; C. Head, dorsal view; D. Mesosoma, lateral view; E. Fore wing; F. Propodeum, dorsal view; G. Metasoma, dorsal view.

Lissonota proxima Fonscolombe, 1854

Material examined: Iran, Fars province, Eghlid, Dejekord (30°44'01" N, 51°57'07" E, 2075 m a.s.l), 10.VII.2013, 2♂, 3♀, Malaise trap, Leg.: A. Amiri

Diagnosis: Female (fig.6, A): Body length 10–10.5mm; clypeus almost 1.9x as wide as high (fig. 6, B), finely punctate in base; malar space as long as basal width of mandible; face 2.35x as wide as high (fig. 6, B), densely punctate; antenna 39–41 segmented, first flagellomere 1.6x as long as second one; occipital carina dorsally complete; temple finely punctate, its length in dorsal view 0.46x eye width (fig. 6, C); mesopleuron densely and finely punctate (fig. 6, D), notauli absent; fore wing 6mm (fig. 6, E);

propodeum with posterior transverse carina (fig. 6, F); first metasomal tergite almost 1.3x as long as apical width, second tergite almost transverse (fig.6, G), 0.72x as long as its apical width; ovipositor shorter than body; hind femur 5.2x as long as its wide. Coloration: Body black, antenna, head, thorax and tegula black, vertex black with two yellow triangle spots, clypeus black, in base and apex reddish brown, base of first tergite black, postpetiol red, tergites 2–4 completely red, tergites 6–7 black; all coxae red, trochanters dark, hind tibia dark in base and apex, tarsi brown.

General distribution: West Palaearctic (Yu *et al.*, 2012), New to Iran.

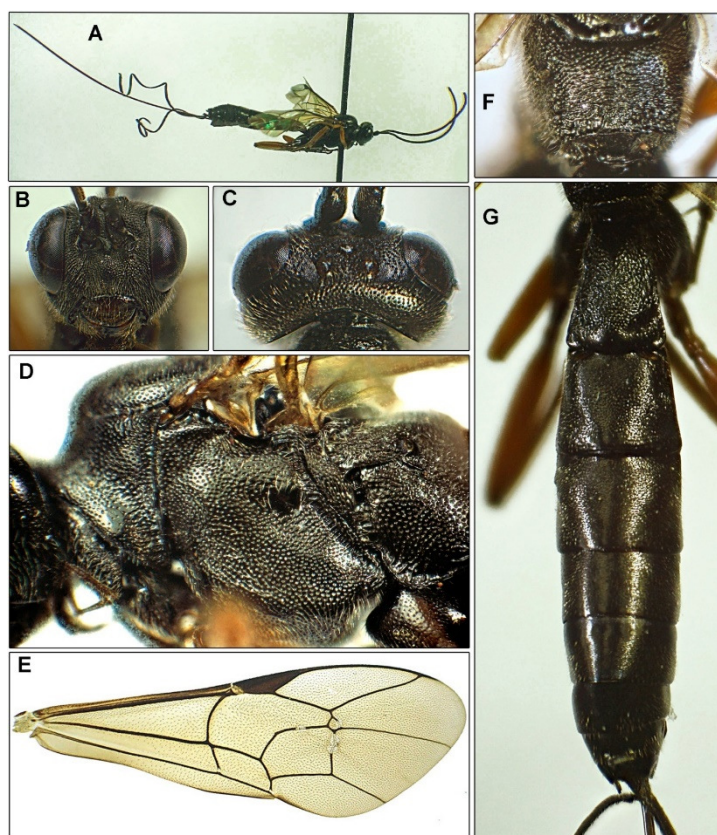


Fig. 4. *Lissonota impressor*, female; A. Adult, lateral view; B. Head, frontal view; C. Head, dorsal view; D. Mesosoma, lateral view; E. Fore wing; F. Propodeum, dorsal view; G. Metasoma, dorsal view.

Discussion

The results of this study showed that *Lissonota* in southern region of Iran is a medium sized genus with low number of each species probably because of spatial distribution of the host plants. *Lissonota* is a species-rich genus (388 species) and the majority of the recorded species are widely distributed in West Palearctic regions (Yu *et al.*, 2012; kasparyan, 1981). All of newly discovered species in this survey attack rangeland, agroecosystem, fruits and ornamental

orchards pests of the order Lepidoptera (Yu *et al.*, 2012). The biology of the species remain unknown awaiting further ecological studies in southern regions. Clearwing moths (Lep.: Sessidae) is one of the

important hosts of *L. pimplator* and *L. clypeator* (Yu *et al.*, 2012) that were collected in the same area where the twig borer pests occurred.

Including our findings, the number of Iranian records of *Lissonota* species increased to thirteen (Table 1).

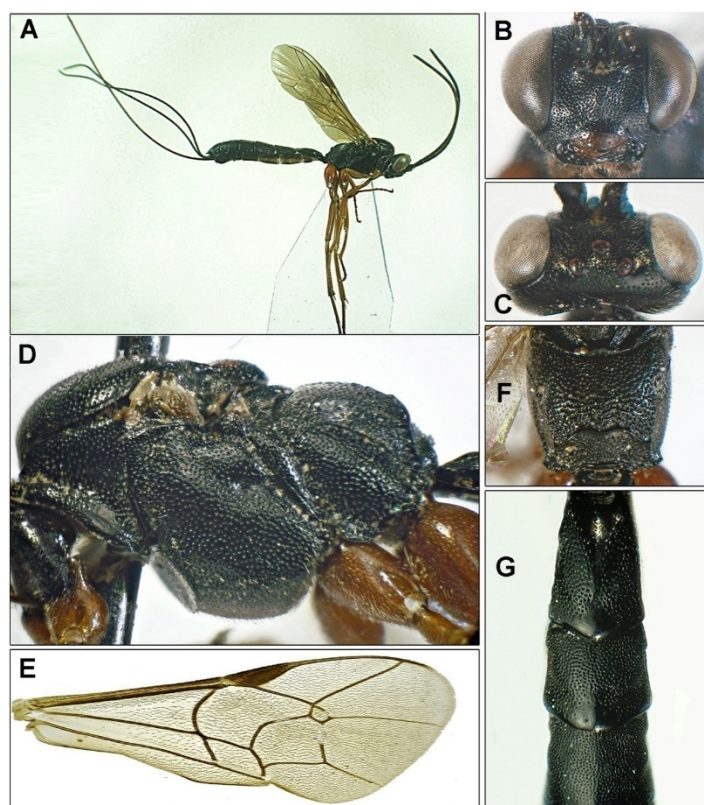


Fig. 5. *Lissonota pimplator*, female; A. Adult, lateral view; B. Head, frontal view; C. Head, dorsal view; D. Mesosoma, lateral view; E. Fore wing; F. Propodeum, dorsal view; G. Metasoma, dorsal view.

<i>Lissonota</i> species	Distribution in Iran (provinces)	References
<i>Lissonota bivittata</i> Gravenhorst, 1829	Hormozgan	Current study
<i>L. clypeator</i> Gravenhorst, 1820	Fars	Current study
<i>L. (Loxonota) flavovariegata</i> (Lucas, 1849)	Mazandaran, Fars	Ghahari <i>et al.</i> (2010); Current study
<i>L. fundator</i> (Gravenhorst, 1820)	Mazandaran	Hooshyar <i>et al.</i> (2014)
<i>L. impressor</i> Gravenhorst, 1829	Fars	Current study
<i>L. (Loxonota) lineata</i> Gravenhorst, 1829	Not exactly defined	Kolarov & Ghahari (2005)
<i>L. magdalena</i> Pfankuch, 1921	Ardabil	Masnadi <i>et al.</i> (2010)
<i>L. (Loxonota) mediterranea</i> Seyrig, 1927	Mazandaran, Ardabil	Ghahari <i>et al.</i> (2010) ;Ghahari & Jussila (2011)
<i>L. oculatoria</i> (Fabricius, 1798)	Golestan, Azerbaijan-e-Sharghi	Ghahari <i>et al.</i> (2010); Ghahari & Jussila (2011)
<i>L. palpalis</i> Thomson 1889	Kurdistan	(Mohammadi-Khoramabadi <i>et al.</i> , 2016)
<i>L. pimplator</i> (Zetterstedt, 1838)	Fars	Current study
<i>L. proxima</i> Fonscolombe, 1854	Fars	Current study
<i>L. versicolor</i> (Gravenhorst, 1820)	Mazandaran	Hooshyar <i>et al.</i> (2014)

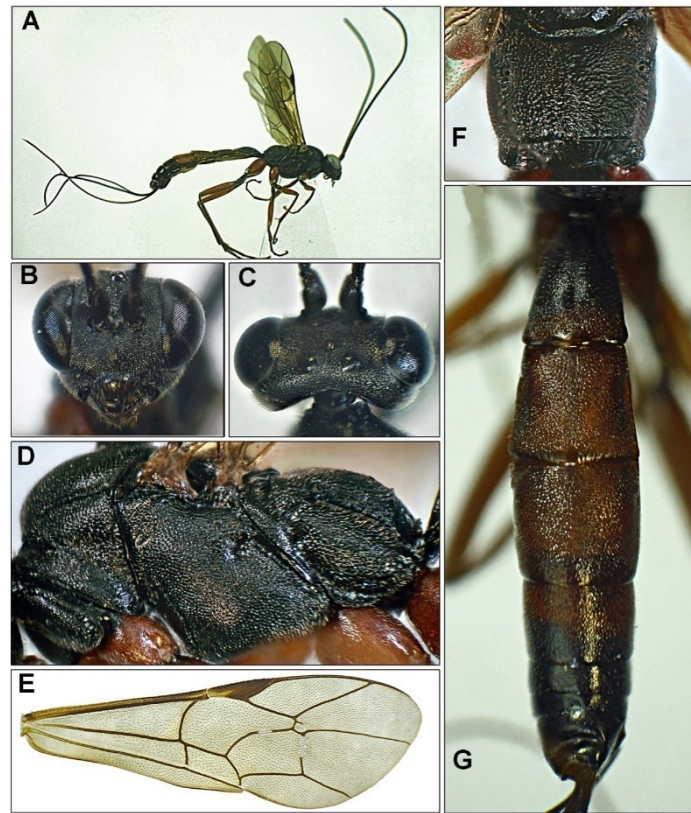


Fig. 6. *Lissonota proxima*, female; A. Adult, lateral view; B. Head, frontal view; C. Head, dorsal view; D. Mesosoma, lateral view; E. Fore wing; F. Propodeum, dorsal view; G. Metasoma, dorsal view.

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