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New data on the genus *Latibulus* Gistel, 1848 (Hym., Ichneumonidae, Cryptinae, Cryptini) in Iran

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ABSTRACT. The genus *Latibulus* Gistel, 1848 (Hymenoptera: Ichneumonidae) is taxonomically reviewed in Iran. Specimens were collected using Malaise traps in the Isfahan province, during 2013–2015. Two species, *Latibulus argiolus* (Rossi, 1790) (spring form) and *Latibulus orientalis* (Horstmann, 1987) (summer form) are identified, of which *L. orientalis* is a new record for the fauna of Iran. In addition, *L. argiolus* is recorded from central part of Iran (Isfahan) for the first time. The geographical distribution of the recorded species in relation to the overall knowledge in the target area and adjacent regions is also discussed.

Key words: Diagnosis, new record, paper wasps, parasitoids, seasonal forms

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Introduction

Cryptini Kirby, 1837 includes 252 genera and 2743 species comprises more than 53% of described species in the subfamily Cryptinae (Yu et al., 2016). The genus *Latibulus* Gistel, 1848 is the largest in the subtribe Sphecophagina Gaulle, 1908. The first description dates of *Latibulus* back to 1790 by Rossi, over a span of 230 years the number of the species rose to 11 (Yu et al., 2016). Of which only, *Latibulus nigrinotum* (Uchida, 1936), is found both in the Palaearctic and the Oriental regions, all another species are distributed in the Palaearctic region (Yu et al., 2016). Several authors revised and keyed *Latibulus* species in the western (Horstmann, 1987), and Eastern (Lee & Oh, 2006) Palaearctic and on the world background, as well (Oh et al., 2012).

Paper wasps in the genera *Polistes* Latreille, 1802 and *Ropalidia* Guérin-Méneville, 1831 (Hymenoptera: Vespidae) are known as the hosts of seven *Latibulus* species (Rudow, 1917; Makino, 1983; Horstmann, 1987; Kanai et al., 2001; Lee & Oh 2006; Oh et al., 2012). The *Latibulus* species imitating the color pattern of the polistine wasp (having a black body marked with bright color), approach the vicinity of a wasp nest a little more easily

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without being rapidly noticed by adult wasps (Oh et al., 2012). Most *Latibulus* species have seasonal dimorphism, so that it is somewhat difficult to associate spring and summer forms as they are belonging to the same species or the seasonal variation (Horstmann, 1987).

Territory of Iran is known as a land of diverse habitats formed its unique biodiversity (Zohary, 1963). In recent years, the fauna of the Ichneumonidae has been considerably studied in various parts of Iran (Amiri et al., 2015; Ghafouri Moghaddam et al., 2016; Mahyabadi et al., 2016; Pourmahyabadi et al., 2016; Mohebban et al., 2015, 2016; Shirzadegan et al., 2018; Zardouei Heydari et al., 2019), but the major parts of the country remain unexplored for the ichneumonids, especially the Cryptinae. A single species of the genus *Latibulus* has recently been recorded from the north of Iran (Ghahari & Jussila, 2016). The vast area in Central part of the country has received the least contributions comprises small but relevant faunistic works on Cryprinae (Barahoei et al., 2012), bearing no record of *Latibulus*. In the present study, additional surveys were done in Isfahan province (Central area) revealing existence of two *Latibulus* species. Illustrated diagnoses, and notes on the worldwide distribution of the species are also provided.

Material and methods

In total, 10 adult parasitoid individuals were collected from Isfahan province of Iran, using Malaise traps during 2013–2015. The material was extracted from the traps once every two weeks and transferred to the laboratory. The collected specimens were preserved in 75% ethanol, they were prepared for study using the following AXA procedure (Achterberg, 2009). Dried specimens were mounted on the triangular card, labeled and sorted. External morphology of the specimens was studied under a Nikon® SZM645 stereomicroscope. Specimens were identified using the keys and descriptions in Horstmann (1987) and Oh et al. (2012). The specimens were also compared with the identified materials, deposited in the ZSM (Zoologisches Staatsammlung, Münchhausenstrasse 21, D-81247 München, Germany) and OOL (Biologiezentrum-Oberösterreichisches Landesmuseum, Linz, Austria). The terminology follows Townes (1969) for the external morphology. Wing veins and wing cell nomenclature are based on Goulet & Huber (1993) and Gauld (1991), respectively. Measurements were done using an ocular micrometer. The following dimensions were measured: Body length: head to end metasoma in dorsal view; Clypeus width: a straight line across the lower margin of clypeus in frontal view; Clypeus height: at the center of clypeus, from groove between face and clypeus to lower edge in frontal view.

Photographs of important morphological characters were produced using a Nikon® digital camera situated on a Leica® Z16 APO microscope. A series of 30–50 (dependent on the size of shooting part) multi-focused captured photos were combined into a single in-focus image using Helicon Focus software. Subsequent processing, plating and slight editing were done by Adobe Photoshop® CS5. Geographical distribution of the recorded species complied based on the information provided in Taxapad (Yu et al., 2016). Examined material are deposited in the collection of the Department of Plant Protection, University of Zabol, Iran (DPPZ).

Results

The females of two species of the genus *Latibulus*, were examined, of which *Latibulus orientalis* is new to the fauna of Iran.

Taxonomic account**Family Ichneumonidae Latreille, 1802****Subfamily Cryptinae Kirby, 1837****Tribe Cryptini Kirby, 1837****Genus *Latibulus* Gistel, 1848**

Diagnosis: Adults of *Latibulus* species easily can be recognized by the following combination of morphological characters: Head wider than thorax in dorsal view; frons with a pair of frontal horns; clypeus apically bilobate, with median apical notch; labrum exposed; forewing without areolet, with *Rs* vein postfurcal to *2m-cu*; basal transverse carina of propodeum present; very short ovipositor.

***Latibulus argiolus* (Rossi, 1790)**

Ichneumon arigolus Rossi, 1790: 52. Lectotype ♀. – Museum für Naturkunde Berlin, Germany.

Specimens examined: 2♀ (DPPZ), IRAN, Isfahan province, Najaf-Abad (32°39'00"N, 51°23'18"E, 1635 m), Malaise trap situated in orchard, 23–30.V.2013; 1♀ (DPPZ), same collecting data, 4–10.V.2015; 6♀ (DPPZ), same collecting data, 11–16.VI.2015, leg.: E. Nader.

Distribution in Iran: Isfahan (current study) and Mazandaran provinces (Ghahari & Jussila, 2016).

Distribution outside Iran: Eastern Palaearctic (Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Uzbekistan) and Western Palaearctic (Albania, Austria, Bulgaria, Croatia, Cyprus, Czech Republic, France, Germany, Greece, Hungary, Iran, Italy, Moldova, Poland, Romania, Serbia, Slovakia, Slovenia, Spain, Switzerland, Tunisia, Turkey, Ukraine, former Yugoslavia) (Yu et al., 2016).

Morphological characters. (*Female* – Spring form). Body length 11.8–12.4 mm; fore wing 7.8–8.1 mm, ovipositor 0.2–0.3 mm (Fig. 1); temple in lower half distinctly narrower than upper half in lateral view (Fig. 1A); temple in dorsal view slightly round, not narrowed behind eye; ocellus diameter shorter than the distance between lateral ocellus and eye (Fig. 1B); face narrowed downward; frons with a pair of frontal horns, frontal horn shorter than the basal width of each horn with median furrow; clypeus width 2.6 times its height; the inner eye orbits convergent ventrally; malar space (cheek) about 0.9 × as long as basal width of mandible; inner margins of eyes strongly convergent (Fig. 1C); pronotum dorsally not elevated; submetapleural carina forming large, anterior lobe (Fig. 1D); mesoscutum punctate (punctures separated from each other by equal a puncture diameter); notauli distinct (Fig. 1E); propodeum strongly rugose with dense pubescence in lateral parts (Fig. 1F); fore wing first subdiscoidal cell with *1/Cu* vein parallel to *2/A* (Fig. 1G); hind wing with vein *1/Cu+cu-a* broken at 0.5 of its length (Fig. 1H); second to fourth metasomal tergites with swollen area medially (Fig. 1I); ovipositor 0.2 × hind tibia (Fig. 1J).

Color. Body largely black with yellow markings as follows; facial, frontal and temporal orbits, labrum, collar, tegula, metapleuron posteriorly, postscutellum, first to fourth metasomal tergites apically. Pedicel apically, flagellomeres, all trochanters, femurs, tibiae, and ovipositor dark reddish-brown.

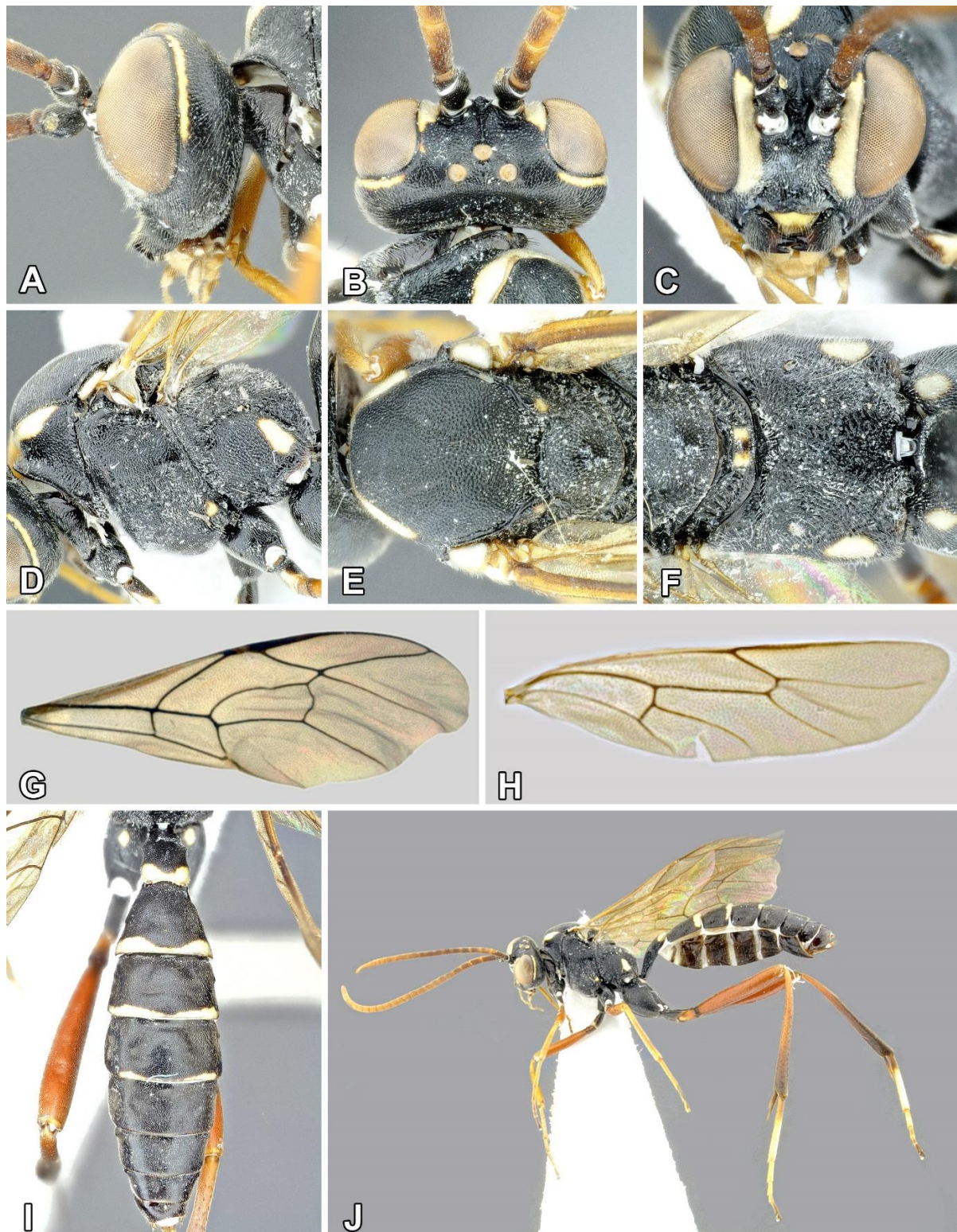


Figure 1. External morphological characters of *Latibulus arigolus* (Rossi, 1790) - Female (spring form): **A.** Head, lateral view; **B.** Head, dorsal view; **C.** Head, frontal view; **D.** Mesosoma; **E.** Mesoscutum; **F.** Propodeum; **G.** Fore wing; **H.** Hind wing; **I.** Metasoma; **J.** Habitus.

Latibulus orientalis* Horstmann, 1987

Latibulus orientalis Horstmann, 1987: 117. Holotype ♀. – The Natural History Museum, London.

Specimens examined: 1♀ (DPPZ), IRAN, Isfahan province, Najhvan Nozhvan (32°38'19"N, 51°38'08"E, 1579 m), Malaise trap, 25.VI.2013, leg.: E. Nader.

Distribution in Iran: Isfahan province (current study).

Distribution outside Iran: Palaearctic (Cyprus, Iran [**new record**], Israel).

Morphological characters. (*Female* – Summer form). Body length 15.1 mm; fore wing 10 mm; ovipositor 0.3 mm (Fig. 2); temple in lower half as wide as upper half in lateral view (Fig. 2A); temple in dorsal view almost straight and distinctly narrowed behind eye; ocellus diameter shorter than the distance between lateral ocellus and eye (Fig. 2B); face narrowed downward; frons with a pair of frontal horns, frontal horn longer than the basal width of each horn with median furrow; clypeus width 2.5 times its height; the inner eye orbits convergent ventrally; malar space (cheek) about 1.2 × as long as basal width of mandible; inner margins of eyes strongly convergent (Fig. 2C); pronotum dorsally elevated; submetapleural carina forming small, anterior lobe (Fig. 2D); mesoscutum punctate (punctures separated from each other by less than a puncture diameter); notauli indistinct (Fig. 2E); propodeum strongly rugose with dense pubescence in lateral parts (Fig. 2F); fore wing first subdiscoidal cell with 1/Cu vein divergent to 2/A (Fig. 2G); hind wing with vein 1/Cu+cu-a broken at 0.3 of its length (Fig. 2H); second to fourth metasomal tergites without swollen area medially (Fig. 2I); ovipositor 0.1 × hind tibia (Fig. 2J).

Color. Body largely yellow with black markings as follows; Clypeal fovea, frons medially, temple posteriorly, pronotum except upper edge, median and lateral lobes of mesoscutum, axillary trough of mesonotum, axillary trough of mesoscutum, propodeum except petiolar area, spots on mesopleurum, metapleuron anteriorly, fore and mid coxae, hind coxa apically, metasomal tergites basally.

Discussion

The genus *Latibulus* Gistel, 1848 consists of about 11 described species worldwide (Yu et al., 2016). First occurrence of the genus *Latibulus* was indicated by *L. argiolus* recorded from North of Iran (Ghahari & Jussila, 2016). Here, this species were found from central parts of the country, too, where the second species, *L. orientalis* was also found for the first time for the fauna of Iran. Occurrence of *L. orientalis* in Iran represents the third discovery of this species in the world, which was already recorded in Cyprus, and Israel (Horstmann, 1987). No data are documented from this species in the adjacent territories. *Latibulus argiolus* has been previously reported only from Mazandaran province in the north (Ghahari & Jussila, 2016), is here recorded from central part of Iran, and it is expected to have a more expanded range of its distribution in other areas of the country.

In general, the genus *Latibulus* is poorly studied in Iran. More species are expected to be distributed in the area where the host wasps are recorded. Additional faunistic and taxonomic surveys in other provinces of the country, especially the areas not sampled so far, should be conducted to reveal the occurrence and distribution of more species of *Latibulus*. Existence of two spring and summer forms in some *Latibulus* species make it difficult to separate the species (Horstmann, 1987). Further studies are necessary to reveal the occurrence of other forms of both *L. argiolus* and *L. orientalis* in Iran.

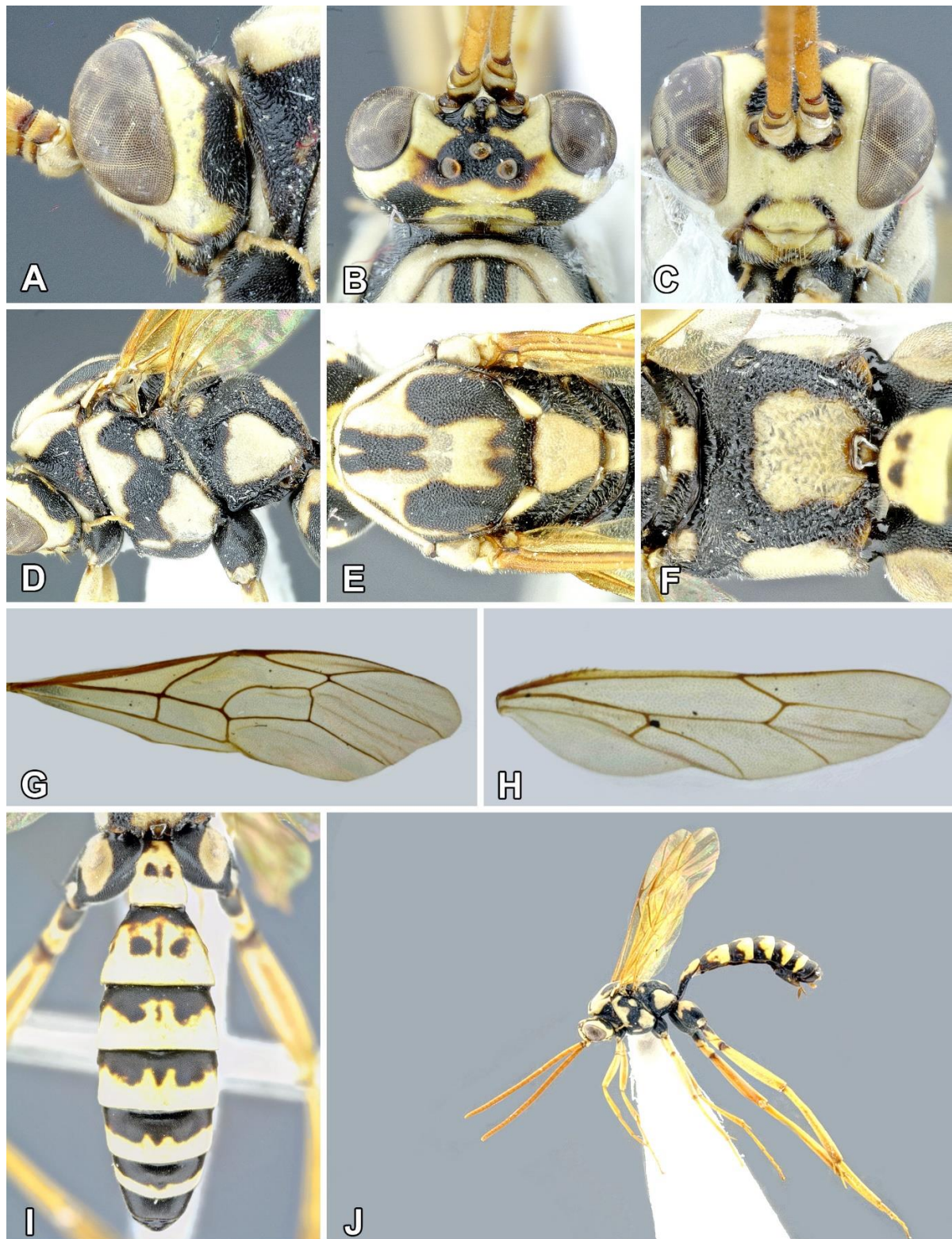


Figure 2. External morphological characters of *Latibulus orientalis* Horstmann, 1987 - Female (summer form): **A.** Head, lateral view; **B.** Head, dorsal view; **C.** Head, frontal view; **D.** Mesosoma; **E.** Mesoscutum; **F.** Propodeum; **G.** Fore wing; **H.** Hind wing; **I.** Metasoma; **J.** Habitus.

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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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گزارش‌های جدید از جنس *Latibulus* Gistel (Hym., Ichneumonidae, Cryptinae) در ایران (Cryptini)

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چکیده: جنس *Latibulus* Gistel, 1848 (Hymenoptera: Ichneumonidae) در استان اصفهان، ایران مورد بازبینی تاکسونومیک قرار گرفت. نمونه‌ها با استفاده از تله‌های مالیز طی سال‌های ۲۰۱۳-۲۰۱۵ جمع‌آوری شدند. دو گونه شامل *Latibulus argiolus* (Rossi, 1790) (فرم بهاره) و *Latibulus orientalis* (Horstmann, 1987) (فرم تابستانه) شناسایی شدند، که از بین آنها گونه *L. orientalis* برای فون ایران جدید است. به علاوه، گونه *L. argiolus* نیز برای اولین بار از مرکز ایران (استان اصفهان) گزارش می‌شود. انتشار جغرافیایی گونه‌های گزارش شده در منطقه مورد مطالعه و سایر مناطق بحث شد.

واژگان کلیدی: توصیف افتراقی، گزارش جدید، زنبورهای کاغذسازی، پارازیتوئید، چندشکلی فصلی