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## The spider genus *Latrodectus* Walckenaer, 1805 (Araneae, Theridiidae) in Iran with the first record of *Latrodectus revivensis* Shulov, 1948

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**ABSTRACT.** In this study, *Latrodectus revivensis* Shulov, 1948 is recorded for the first time from Iran based on female specimens. This species was previously recorded from the eastern Mediterranean region. As a result, the number of *Latrodectus* species recorded from Iran is raised to six. A comparative diagnosis is provided for this species and other widow spiders previously recorded from the country. *Latrodectus revivensis* can be easily distinguished from its congeners by colouration, genitalic characters and the shape of the nest. This record represents the easternmost distribution limit of *L. revivensis*. An updated distribution map of *Latrodectus* species is also provided.

**Key words:** Distribution, Iranian Plateau, taxonomy, Theridiidae, Widow spider

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## INTRODUCTION

Spiders play a key role in terrestrial ecosystems as active predators, and there is increasing evidence that spider communities play an important role in the biological control of other arthropods (Lee & Kim, 2001; Ghavami et al., 2007; Foelix, 2011). Spiders are probably one of the most widespread and diverse groups of arthropods in the order Araneae, with 4,352 genera and 51,624 species identified worldwide to date (World Spider Catalog, 2023). The family Theridiidae Sundevall, 1833 has a worldwide distribution and is one of the most diverse groups of spiders, with 124 genera and 2538 species, it is the fourth largest family among all spiders (Agnarsson, 2004; WSC, 2023). The members of this family are known as comb-footed spiders due to having rows of bristles on the tarsus of the fourth leg. The genus *Latrodectus* Walckenaer, 1805 has an exclusive global reputation due to its unique

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sexual cannibalism and medical importance (Forster, 1992; Andrade & Banta, 2001, 2002; Jocque & Dippenaar-Schoeman, 2007). This genus comprises 34 taxonomically valid morphospecies, of which five species have been previously recorded from Iran: *L. cinctus* Blackwall, 1865, *L. dahli* Levi, 1959, *L. geometricus* C.L. Koch, 1841, *L. pallidus* O. P. Cambridge, 1872, and *L. tredecimguttatus* (Rossi, 1790) (Zamani et al., 2014, 2022; WSC, 2023).

In this study, new geographic records of *Latrodectus revivensis* Shulov, 1948, from the Markazi and Qom Provinces have been presented. This species was first described based on both sexes from Be'er-Sheva, Southern Palestine. Therefore, this study aims to make a new contribution to the species of the genus *Latrodectus* in Iran, focusing on the morphological diagnosis of newly recorded *L. revivensis*.

## MATERIAL AND METHODS

Specimens were collected using the hand-collecting method during the daytime from different localities in Iran from September 2021 to October 2022. In addition to the newly collected material, the specimens deposited at the spider collection in Zoological Museum, Ferdowsi University of Mashhad (ZMFUM) have been examined. Samples were preserved in 70–80 % ethanol. Identifying species was done using identification keys presented by Levi (1959) and Lotz (1994). The terminology follows Shulov (1948), Levi (1959) and Lotz (1994). Illustrations were produced using an Olympus® DP-71 camera attached to an Olympus SZH-10 stereomicroscope at the Ferdowsi University of Mashhad. In order to provide a complete depth of field, several digital images were combined using Helicon focus V8.2.2 stacking software (Kozub et al., 2023) and edited using Adobe® Photoshop CS2 Extended. Illustrations of internal genitalia were made after clearing and cleaning the epigyne in a 10% potassium hydroxide (KOH) aqueous solution, followed by a few minutes of treatment in Lactophenol cotton blue (LCB) (Zamani et al., 2014). Distribution map was created using DIVA-GIS 7.5 (Hijmans et al., 2012) by overlaying records of sampling locations on spatial layers depicting political boundaries and topography at 2.5 arc-minutes altitude and then enhanced in Adobe Photoshop CS2 Extended. All measurements are given in mm. All of the studied specimens were deposited at the Zoological Museum, Ferdowsi University of Mashhad, Iran (ZMFUM).

The following abbreviations are used in the text and figures: ZMFUM: Zoological Museum, Ferdowsi University of Mashhad; HUJ: National Natural History Collections, Hebrew University, Jerusalem; TL: Total length; CL: Carapace length; AME: anterior median eyes; PME: posterior median eyes; CW: Carapace width; EpW: Epigyne width; AbL: Abdomen length; EpL: Epigyne length; PedL: Pedipalp length.

## RESULTS

### *Taxonomic hierarchy*

**Class Arachnida Lamarck, 1801**

**Order Araneae Clerck, 1757**

**Family Theridiidae Sundevall, 1833**

**Genus *Latrodectus* Walckenaer, 1805**

***Latrodectus cinctus* Blackwall, 1865 (Figs 1 A–B, 2 M–O, 5)**

**Material examined.** IRAN: 3 ♀♀ (ZMFUM), Hormozgan Province, Bastak (27°11'24"N, 54°21'36"E), 403 m a.s.l, 16.ix.2021, semi-desert, steppe area, leg.: A.M. Souri; 1♀ (ZMFUM), Hormozgan Province, Bandar Abbas (27°12'0"N, 56°17'24" E), 23 m a.s.l, 18.viii.2022, semi-desert, steppe area, leg.: A.M. Souri.

**Geographic distribution.** Cape Verde, Africa, Oman, Kuwait, Iraq, and Iran (WSC, 2023).

***Latrodectus dahli* Levi, 1959 (Figs 1 C–D, 2 D–F, 4C, 5)**

**Material examined.** IRAN: 1 ♀ (ZMFUM), Khorasan Razavi Province, Mashhad (36°17'24"N, 59°28'48"E),

1200 m a.s.l, 31.x.2020, semi-desert area, leg.: A.M. Souri; 2 ♀♀ (ZMFUM), Hormozgan Province, Haji abad (28°18'36"N, 55°54'0"E), 931 m a.s.l, 15.ix.2021, semi-desert area, leg.: A.M. Souri; 1 ♀ (ZMFUM), Hormozgan Province, Bastak (27°11'24"N, 54°21'36"E), 403 m a.s.l, 16.ix.2021, semi-desert area, leg.: A.M. Souri; 1 ♀ (ZMFUM), Ilam Province, Dehloran (32°38'24"N, 47°48'0"E), 434 m a.s.l, 06.viii.2022, semi-desert area, leg.: A.M. Souri.

**Geographic distribution.** North Africa, Cyprus, Turkey, Azerbaijan, Kazakhstan, Middle East, Iran, and Central Asia (WSC, 2023).

***Latrodectus geometricus* C.L. Koch, 1841 (Fig. 5)**

**Material examined.** IRAN: 1 ♀ (ZMFUM), Khorasan-e-Razavi Province, Mashhad (36°18'0"N, 59°36'0"E), 10.xi.1995, leg.: O. Mirshamsi (damaged specimen).

**Geographic distribution.** Africa. Introduced to both Americas, Middle East, Pakistan, India, China, Japan, Thailand, Malaysia, Papua New Guinea, Australia, and Hawaii (WSC, 2023).

***Latrodectus pallidus* O. P. Cambridge, 1872 (Figs 1 E–F, 2 G–I, 4D, 5)**

**Material examined.** IRAN: 1 ♀ 2 ♂♂ (ZMFUM), Markazi Province, Ghargh Abad (35°7'48"N, 49°50'24"E), 1599 m a.s.l, 6.ix.2021, semi-desert, steppe area, leg.: A.M. Souri; 22 ♀♀ 3 ♂♂ (ZMFUM), Alborz Province, Nazar Abad (35°56'24"N, 50°35'24"E), 1190 m a.s.l, 6.ix.2021, semi-desert, steppe area, leg.: A.M. Souri; 1 ♀ (ZMFUM), Khorasan Razavi Province, Neyshabur (36°06'0"N, 58°28'12"E), 1100 m a.s.l, 07.xi.2022, semi-desert, steppe area, leg.: A.M. Souri.

**Geographic distribution.** Cape Verde Is. to Libya, South Africa, Turkey, Kazakhstan, Iran, and Central Asia (WSC, 2023).

***Latrodectus revivensis* Shulov, 1948 (Figs 2 A–C, 3 A–D, 4A, 5; Table 1)**

**Type locality and repository.** Palestine: 37 km. southwest of Beer Sheba near the new settlement of Revivim (types lost); **Syntype:** ♂♂ ♀♀ (lost) (Levy & Amitai, 1983) (HUJ).

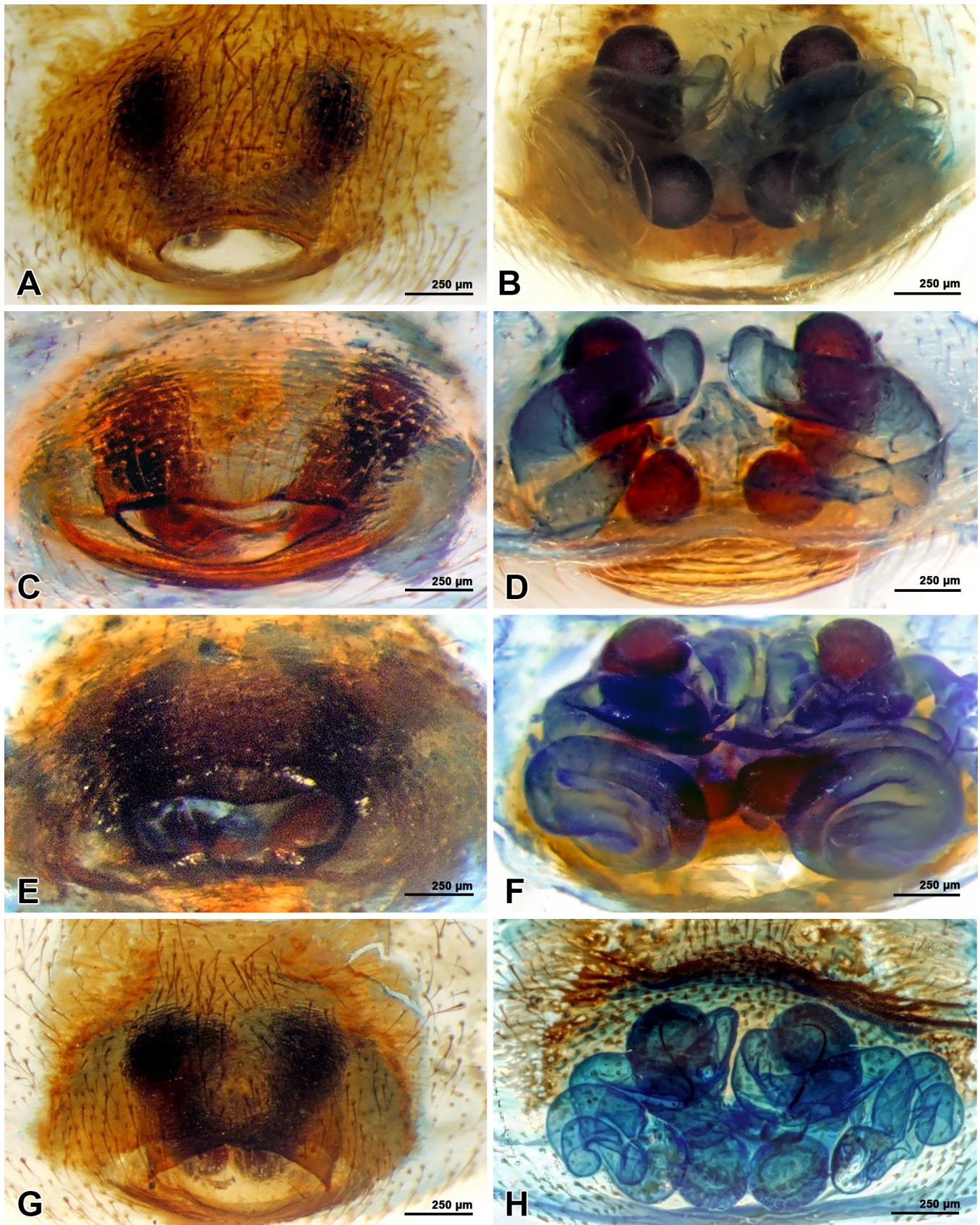
**Material examined.** IRAN: 5 ♀♀ (ZMFUM), Markazi Province, Ghargh Abad (35°07'48"N, 49°51'0"E), 1599 m a.s.l, 6.ix.2021, semi-desert, steppe area, leg.: A.M. Souri; 7 ♀♀ (ZMFUM), Qom Province, 40 km south of Salafchegan (34°13'48"N, 50°33'0"E), 1369 m a.s.l, 22.x.2022, semi-desert, steppe area, leg.: A.M. Souri; 5 ♀♀ (ZMFUM), Qom Province, 12 km north of Salafchegan (34.56°N, 50.44°E), 1423 m a.s.l, 22.x.2022, semi-desert, steppe area, leg.: A.M. Souri.

**Diagnosis.** *Latrodectus revivensis* can be easily distinguished from other congeners with a combination of somatic (Fig. 2 A–C) and genitalic characters (Fig. 3 A–D). *Latrodectus revivensis* differs from *L. pallidus*, *L. tredecimguttatus*, *L. cinctus* and *L. dahli* by having general black colouration, distinct abdominal pattern and finely curved abdominal setae. *Latrodectus revivensis* differs from *L. pallidus*, *L. dahli*, and *L. cinctus* by having four spermathecal loops (Figs 1 A–H, 3 A–D). *Latrodectus revivensis* differs from all other congeners by having a curved carina parallel to the anterior lip of the opening of the epigynum (Fig. 3A; see Levi, 1966:430, figs 26–27).

**Short description. — Female.** Medium-sized spiders (TL: 9.14±1.43, AbL: 5.57±0.90) (Table 1). AME and PME equal in size. Chelicerae subequal in length to the clypeus. Maxillae and labium brown. The sternum slightly longer than wide. Legs (I, II, III, IV) brownish black. Tarsi and metatarsi lighter than the proximal end. **Coloration:** Females typically dark brown with indistinct dark markings, covered with very short, slightly curved black hairs. The dorsal surface of abdomen with minute black setae with no pubescence (Fig. 1 A–C). **Epigynum:** *L. revivensis* epigynum is transverse and suboval. The anterior margin is slightly curved forward, its median part extending backwards and forming two distinct oval subdivisions. With a distinct curved carina parallel to the anterior lip of the opening of the epigynum. The posterior margin is slightly curved. With four spermathecal ducts (Figs 3B, 3D).

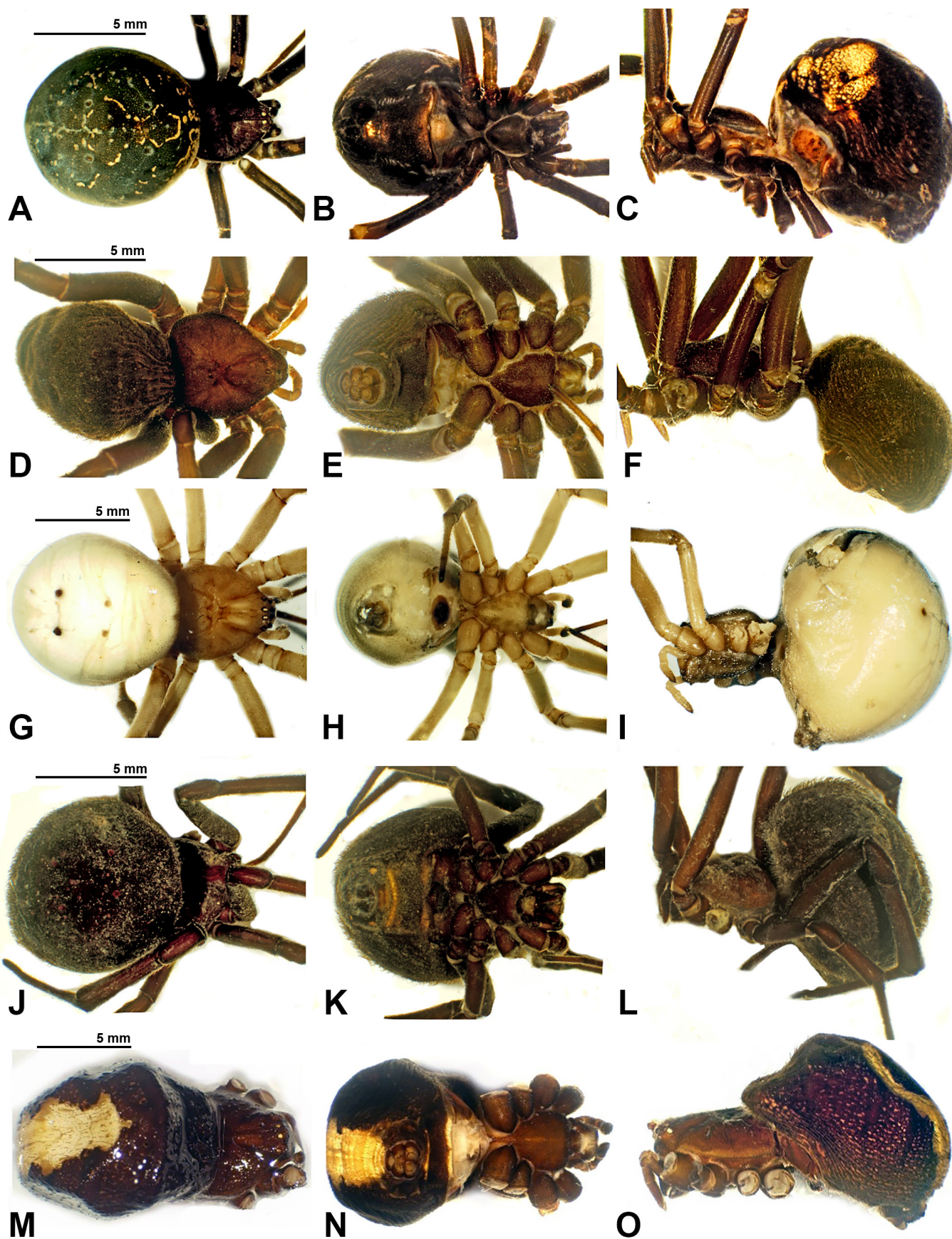
**Male.** No male has been examined.





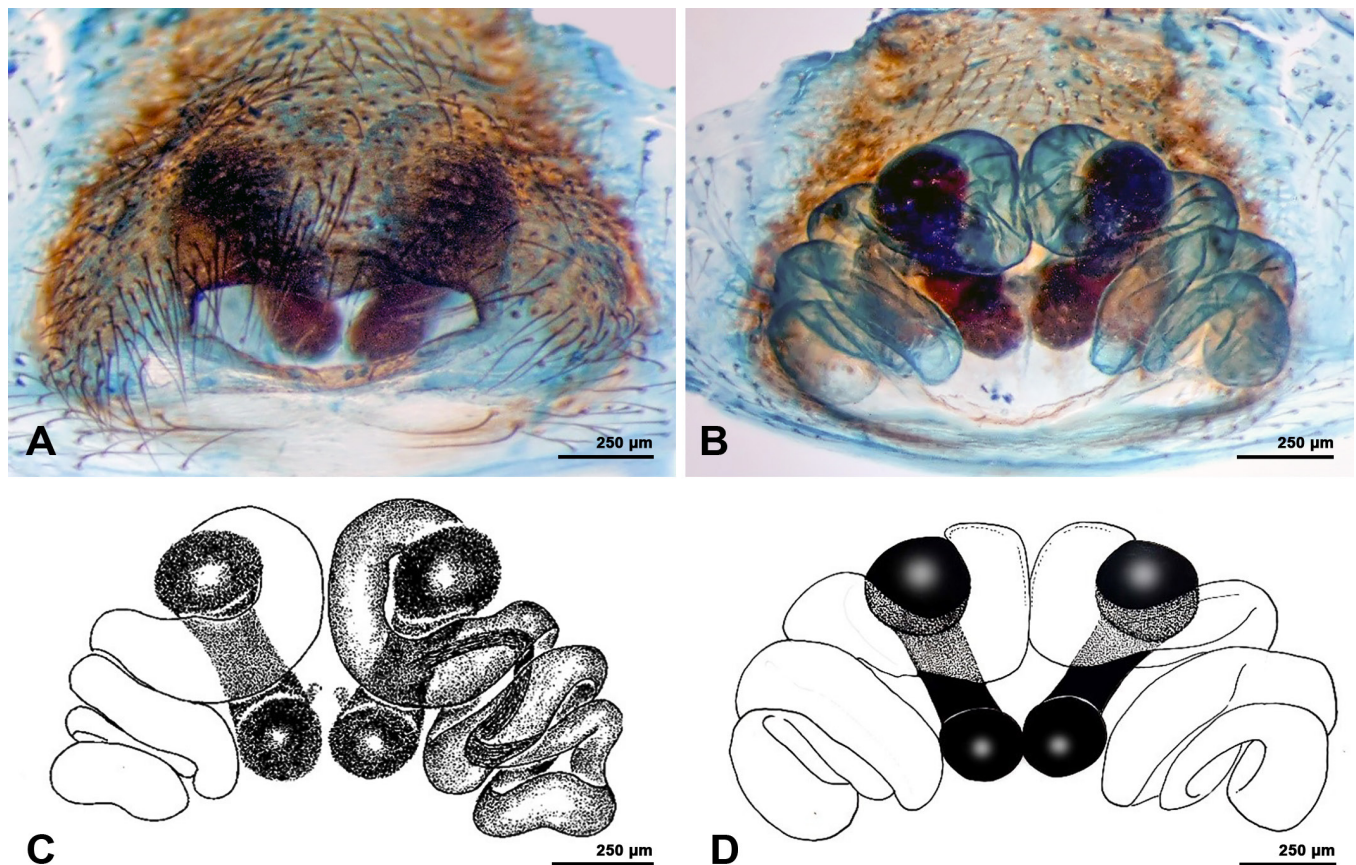
**Figure 1.** Epigynum of female specimens of *Latrodectus* spp. **A.** *L. cinctus* Blackwall, 1865, ventral view; **B.** *L. cinctus* Blackwall, 1865, dorsal view; **C.** *L. dahli* Levi, 1959, ventral view; **D.** *L. dahli* Levi, 1959, dorsal view; **E.** *L. pallidus* O. P. Cambridge, 1872, ventral view; **F.** *L. pallidus* O. P. Cambridge, 1872, dorsal view; **G.** *L. tredecimguttatus* (Rossi, 1790), ventral view; **H.** *L. tredecimguttatus* (Rossi, 1790), dorsal view.





**Figure 2.** Habitus of females *Latrodectus* spp. **A-C.** *L. revivensis* Shulov, 1948; **D-F.** *L. dahli* Levi, 1959; **G-I.** *L. pallidus* O. P. Cambridge, 1872; **J-L.** *L. tredecimguttatus* (Rossi, 1790), **M-O.** *L. cinctus* Blackwall, 1865.





**Figure 3.** Epigynum of *Latrodectus revivensis* Shulov, 1948. **A.** Ventral view; **B-D.** Dorsal view [figure C., After Levy & Amitai (1983)].

**Structure of the nest.** Members of *L. revivensis* build large webs in bushes and other brush in large open land areas. They prefer taller individual plants and also build a conspicuous, cone-shaped nest in bushes up to 1m high. *Latrodectus tredecimguttatus* constructs its nest at the ground level, concealing its major part within crevices in the soil or beneath large stones, at the base of shrubs. The web of *L. tredecimguttatus* contains no regularly outlined retreat, its function being formed by an invagination of the funnel. *Latrodectus pallidus* builds its nest at some 40–60 cm height, invariably affixed to the leaves and branches of low shrubs or other vegetation. Regarding the retreat, the structure is a clearly outlined thimble shape that spins it from a white, thin, opaque material. In contrast, the retreat of *L. revivensis* is conical to cylindrical, is shallower than that of *L. pallidus*, and is located upon the upper side of the funnel. *Latrodectus dahli* builds their nests under stones or on the ground (Fig. 4).

**Records from Iran.** New record to Iran (Markazi and Qom Provinces).

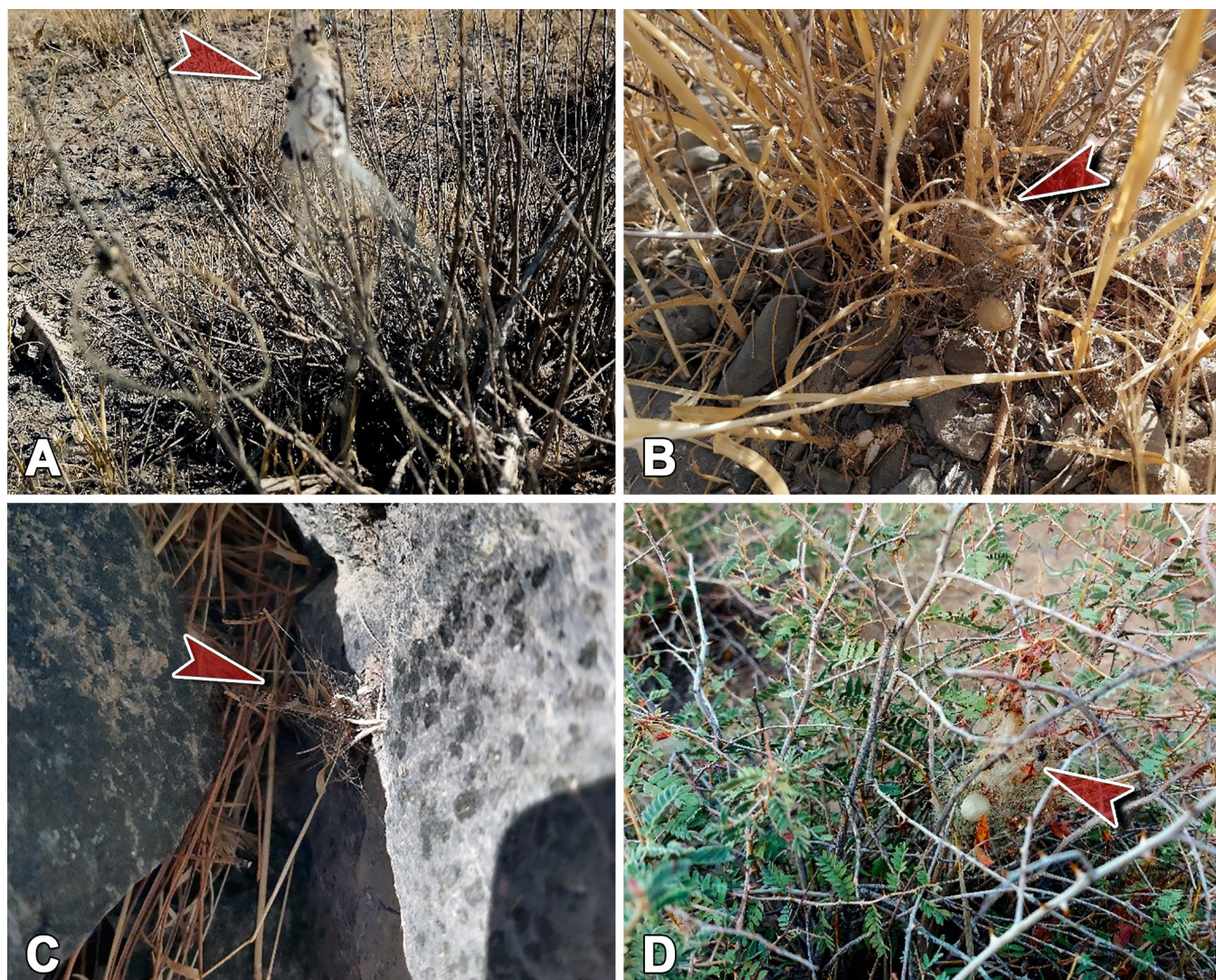
**Distribution.** Palestine (Shulov, 1948) and Iran.

#### *Latrodectus tredecimguttatus* (Rossi, 1790) (Figs 1 G–H, 2 J–L, 4B, 5)

**Material examined.** IRAN: 12 ♀♀ 1 ♂, Khorasan Razavi Province, Kahoo vill. (36°26'24"N, 59°12'0"E, 1421 m a.s.l, 01.vii.2021, cultivated area, leg.: A.M. Sour; 2 ♀♀, East Azerbaijan Province, Zabil vill. (39°02'24"N, 47°18'36"E), 830 m a.s.l, 02.ix.2021, cultivated area, leg.: A.M. Sour; 1 ♀, Kurdistan Province, Bijar (35°52'12"N, 47°36'0"E), 1929 m a.s.l, 06.viii.2021, cultivated area, leg.: A.M. Sour; 2 ♀♀, Isfahan Province, Mahyar vill. (32°16'12"N, 51°48'0"E), 1876 m a.s.l, 06.viii.2021, cultivated area, leg.: A.M. Sour.

**Geographic distribution.** Mediterranean, Ukraine, Caucasus, Russia (Europe to South Siberia), Kazakhstan, Middle East, Iran, Central Asia, and China (WSC, 2023).



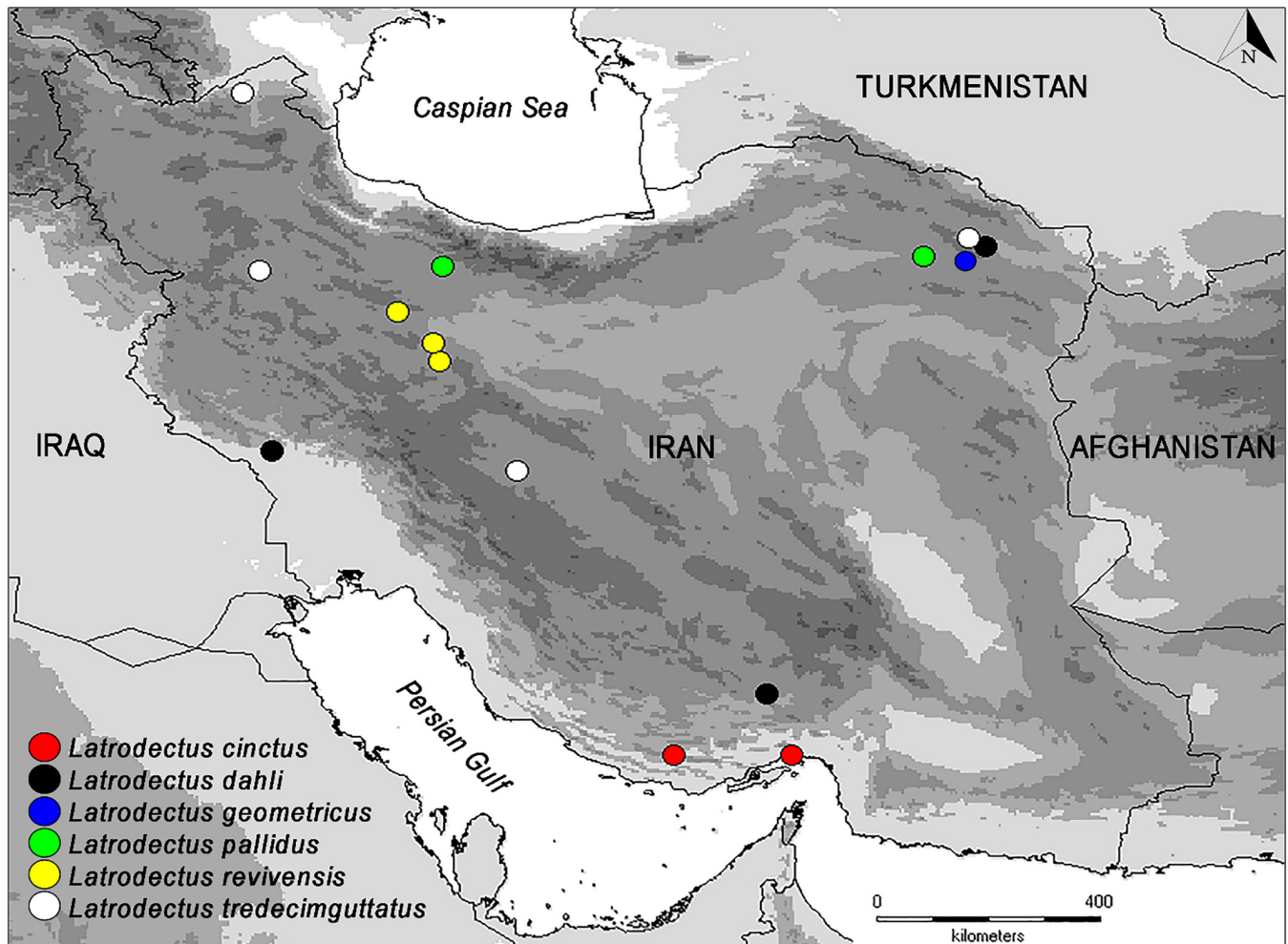


**Figure 4.** Nest of *Latrodectus* species. **A.** *L. revivensis* Shulov, 1948; **B.** *L. tredecimguttatus* (Rossi, 1790); **C.** *L. dahli* Levi, 1959; **D.** *L. pallidus* O. P. Cambridge, 1872.

**Table 1.** Measurements of females of *L. revivensis* (n=16). All measurements are in mm.

Abbreviations	Minimum	Maximum	Mean±SD
TL	07.00	12.00	09.14±1.43
CL	02.50	05.00	03.57±0.80
CW	03.00	04.50	03.57±0.52
EpW	01.00	03.00	01.89±0.42
AbL	04.00	07.50	05.57±0.90
EpL	01.00	01.50	01.19±0.25
Leg I L	11.00	18.10	14.29±0.25
Leg II L	07.00	13.50	09.67±2.25
Leg III L	05.50	09.50	07.64±1.16
Leg IV L	08.00	21.00	14.00±3.38
PedL	02.70	03.50	02.94±0.27





**Figure 5.** Records of *Latrodectus* species from Iran, examined in this study.

## DISCUSSION

In this study, *L. revivensis* Shulov, 1948 is recorded for the spider fauna of Iran for the first time. As a result, the number of *Latrodectus* species recorded from Iran is raised to six. *Latrodectus cinctus* Blackwall, 1865, *L. dahli* Levi, 1959, *L. geometricus* C.L. Koch, 1841, *L. pallidus* O. P. Cambridge, 1872, *L. revivensis* Shulov, 1948, and *L. tredecimguttatus*. Hitherto, *L. revivensis* only has been reported from Palestine (Shulov, 1948). In addition, a doubtful record from the Canary Islands has been reported (WSC, 2023). Since any published data have not supported this record, the record of *L. revivensis* from the Canary Islands should be considered provisional and might belong to other congeners. The record of the species from the Iranian Plateau is the easternmost record of the species.

Ballooning ability in spiders may contribute to higher levels of gene flow and range expansion in spiders (Gillespie et al., 2012). Spiders frequently disperse using silk lines as juveniles by means of ballooning. This method of long-distance dispersal can significantly increase the distance an individual can move and accelerate its range expansion (Mowery et al., 2022). For instance, aerial dispersal ability in mygalomorphs is significantly correlated with a larger distributional range (Buzatto et al., 2021), which suggests that ballooning is an important process in their dispersal. As shown for some invasive widow spiders such as *L. geometricus*, in addition to human-mediated long-distance dispersal, ballooning and rappelling might be an important process of range expansion in these spiders. This can explain the occurrence of *L. revivensis* in Iran. In such cases, using genetic markers can help to clarify the degree of connectivity between populations, and propose potential scenarios underlying the dispersal history of the species (Mowery et al., 2022).



## AUTHOR'S CONTRIBUTION

The authors confirm their contribution in the paper as follows: Conceptualization: A.S., S.S., M.M. and O.M.; Formal analysis: A.S., O.M.; Software and writing the first draft of manuscript: A.S., O.M.; Sampling: A.S., O.M.; Project administration: O.M; All authors contributed to writing 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 Zoological Museum, Ferdowsi University of Mashhad, Iran (ZMFUM). and are available from the curator, upon request.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

## 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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## عنکبوت‌های جنس *Latrodectus* Walckenaer, 1805 (Araneae, Theridiidae) در ایران و اولین رکورد گونه *Latrodectus revivensis* Shulov, 1948

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**چکیده:** در این مطالعه، گونه *Latrodectus revivensis* Shulov, 1948، برای اولین بار از ایران بر اساس نمونه‌های ماده گزارش شد. پیش از این، این گونه از نواحی شرقی مدیترانه گزارش شده بود. در نتیجه این مطالعه تعداد گونه‌های جنس *Latrodectus* گزارش شده از ایران به شش گونه افزایش یافت. در این مطالعه مقایسه صفات تشخیصی این گونه و سایر عنکبوت‌های بیوه که قبلاً از ایران گزارش شده اند ارائه شد. گونه *Latrodectus revivensis* را می‌توان به راحتی از سایر گونه‌های نزدیک به آن بر اساس الگوی رنگی، ویژگی‌های مربوط به اندام تولید مثلی و شکل لانه تشخیص داد. این رکورد نشان دهنده شرقی‌ترین حد توزیع *L. revivensis* است. در این مقاله نقشه پراکنش گونه‌های مورد مطالعه از جنس *Latrodectus* در ایران نیز ارائه شد.

**واژگان کلیدی:** توزیع جغرافیایی، فلات ایران، آرایه شناسی، Theridiidae، عنکبوت بیوه