


Medically significant spiders (Araneae), camel spiders (Solifugae), and centipedes (Chilopoda) of Iran: new distributional records and public health implications

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Abstract

Several species of spiders, camel spiders and centipedes have medical significance due to their envenomation and causing painful wounds. These arthropods are responsible for various public health problems in different regions of Iran. Encountering these arthropods often causes fear, anxiety, and obsession among many people. The bites from certain species can be dangerous and include various clinical symptoms such as pain, burning, inflammation, nausea, injury, infection, muscle spasm, and rarely death. This paper seeks to investigate the medically important species of spiders, camel spiders and centipedes of Iran, their distribution, and the clinical symptoms associated with their bites. In this study, a literature review using reliable scientific databases was conducted and informative data were summarized and presented. Several spider species of the genera *Latrodectus* and *Loxosceles* (Araneae), most large galeodid and rhagodid species (Solifugae), and four *Scolopendra* species (Chilopoda) are listed as the most important species in terms of medical significance in Iran. New distributional records of camel spider species *Galeodopsis bilkjeviczi* (Birula), *Paragaleodes nesterovi* Birula, *Rhagodorta zorab* (Birula), and centipede species *Scolopendra canidens* Newport and *Scolopendra mirabilis* (Porat) are provided.

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Introduction

The great variety of terrestrial arthropods is found in Iran due to the diverse climate, topography, and ecosystems. Thousands of arthropod species, including insects, arachnids, myriapods, and terrestrial isopods inhabit the country. Insects are the most prominent among them and Coleoptera (beetles), Lepidoptera (butterflies and moths), Hymenoptera (ants, bees, and wasps), and Diptera (flies) are the most species-rich orders within the insects. Spiders, scorpions and camel spiders (class Arachnida) are also quite diverse with several endemic species adapted to Iran's desert and

mountainous areas. There are 950 species of spiders, 68 species of scorpions and 68 species of camel spiders in Iran (Barahoei et al., 2020; World Solifugae Catalog, 2022; Maddahi et al., 2022; World Spider Catalog, 2025). With nearly 50 species, Iran represents the highest centipede species diversity among its neighboring countries after Turkey (Zarei et al., 2020; Dyachkov et al., 2023). The terrestrial arthropods in Iran are very important in terms of performing ecological functions as pollinators, decomposers, and predators, which contribute to the balance of the ecosystem. Additionally, several economically significant

arthropod species affect agriculture. Furthermore, some species have medical importance as they are venomous or vectors of some human pathogens.

Some insects known from Iran cause medically significant bites or stings. There are several reports of stings of ants, bees, and wasps across the country. The sting of the ant species *Pachycondyla sennaarensis* (Mayr) is prevalent on three islands in the Persian Gulf, Abu-Musa, Greater Tunb, and Lesser Tunb. The stings are mostly associated with the motor organs and have symptoms such as pain, itching, redness, inflammation, and blisters (Khoobdel et al., 2012). According to a study carried out in four Persian Gulf islands, 11 species from two families Vespidae and Apidae were reported. Among them, the two species *Polistes olivceus* (DeGeer) and *Vespa orientalis* Linnaeus were the most common and their stings are considered to have significant medical importance (Khoobdel et al., 2014). Additionally, several species of medically significant flies have been reported from Iran, known to transmit various parasitic, bacterial, and viral pathogens to humans (Khoobdel et al., 2008).

Among the venomous arthropods of Iran, scorpion sting is undoubtedly the most important and includes various clinical symptoms. More than 40,000 scorpion stings occur in Iran each year, mainly in the southern provinces of the country (Dehghani et al., 2018a). The literature reports that the venom of some species of scorpions in Iran is hazardous and even fatal, especially the species *Androctonus crassicauda* (Olivier) and *Hemiscorpius lepturus* Peters (Motevalli and Dehghani, 2017; Dehghani et al., 2018b).

The venom of various species of spiders (order Araneae) and centipedes (class Chilopoda), as well as the bites of some camel spider species (order Solifugae) can cause pain, inflammation, swelling, nausea, dizziness, tissue necrosis, muscle spasm, and rarely death (Lewis, 1981; Punzo, 1998; Isbister and Fan, 2011; Haddad Junior et al., 2015; Bird et al., 2021). Most cases of their bites are not diagnosed due to insufficient awareness of the existence of these animals and inadequate knowledge of the clinical symptoms. However, it is important to note that the venom of few spiders and centipedes, as well as the bite of a small number of camel spider species can cause serious danger to humans (Lewis, 1981; Punzo, 1998; Swanson and Vetter, 2006; Isbister and Fan, 2011; Haddad Junior et al., 2015; Bird et al., 2021).

As spiders, camel spiders and centipedes adapt to warm and dry climates, many species are found in different regions of Iran (Attems, 1951; Zamani et al., 2014; Hoseinpour et al., 2020; Zarei et al., 2020; Zamani et al., 2021; Maddahi et al., 2022). They often inhabit near residential areas, leading to more encounters and an increased risk of bites. The chance of being bitten is higher among farmers, ranchers, residents of rural areas, nomads, and military personnel. According to previous research and

medical documents, some cases of bites by these arthropods have been reported from various regions of Iran (Vazirianzadeh et al., 2007; Afshari et al., 2009; Mirshamsi et al., 2013).

The aims of the present study were to a) investigate diversity and distribution of medically significant taxa of spiders, camel spiders and centipedes of Iran, b) increase public awareness about morphology, habitat, ecology, and medical importance of these arthropods, c) provide examples of bite history, several cases of envenomation, and clinical symptoms of their bites, d) present new distributional records of camel spiders and centipedes for Iran, and e) provide a distribution map.

Material and Methods

This study investigates medically significant species of spiders, camel spiders and centipedes of Iran. References published until 2025 were searched in scientific databases using keywords such as "Araneae + fauna + Iran", "Solifugae + fauna + Iran", "centipedes + faunistic + Iran", "spiders + new data + Iran", "camel spider + distribution + Iran", "venomous arthropods + Iran", "widow spider + venom", "recluse spider + medical importance", "spiders + envenomation", "spider + Persian Gulf + island", "*Loxosceles* + toxin", "*Scolopendra* + venom", "*Latrodectus* + clinical symptoms", and "Latrodectism + Iran". To search more precisely among English sources, the terms spiders, camel spiders, and centipedes were used instead of Araneae, Solifugae, and Chilopoda, respectively. As a result of searching in reliable scientific databases, a total of 148 books and articles were obtained. Literature with repetitive and irrelevant information or outdated topics was removed. Ultimately, 59 references mostly published after 2015 were included in the study. The extracted information regarding species diversity, geographical distribution, and clinical symptoms of bites from medically significant species was categorized and presented.

New materials were mainly hand-collected from six provinces of Iran during 2014–2017 and deposited at Zoological Museum, Arak University, Arak, Iran (ZMAU). The words "SOL" and "CHI" before the museum number of each material correspond to the Solifugae and Chilopoda collections, respectively. Collected materials were identified using the identification keys in the literature (Roewer, 1933, 1934; Lewis, 2010) and compared with the original descriptions of the species. The distribution map was created using DIVA-GIS Version 7.5 (Hijmans et al., 2012) (Fig. 1).

Results

Herein, medically significant spiders, camel spiders and centipedes of Iran are presented, and their habitat, distribution, bite, and toxicity for humans are discussed. Additionally, new distributional records of camel spiders and centipedes are included at the end of their respective section.

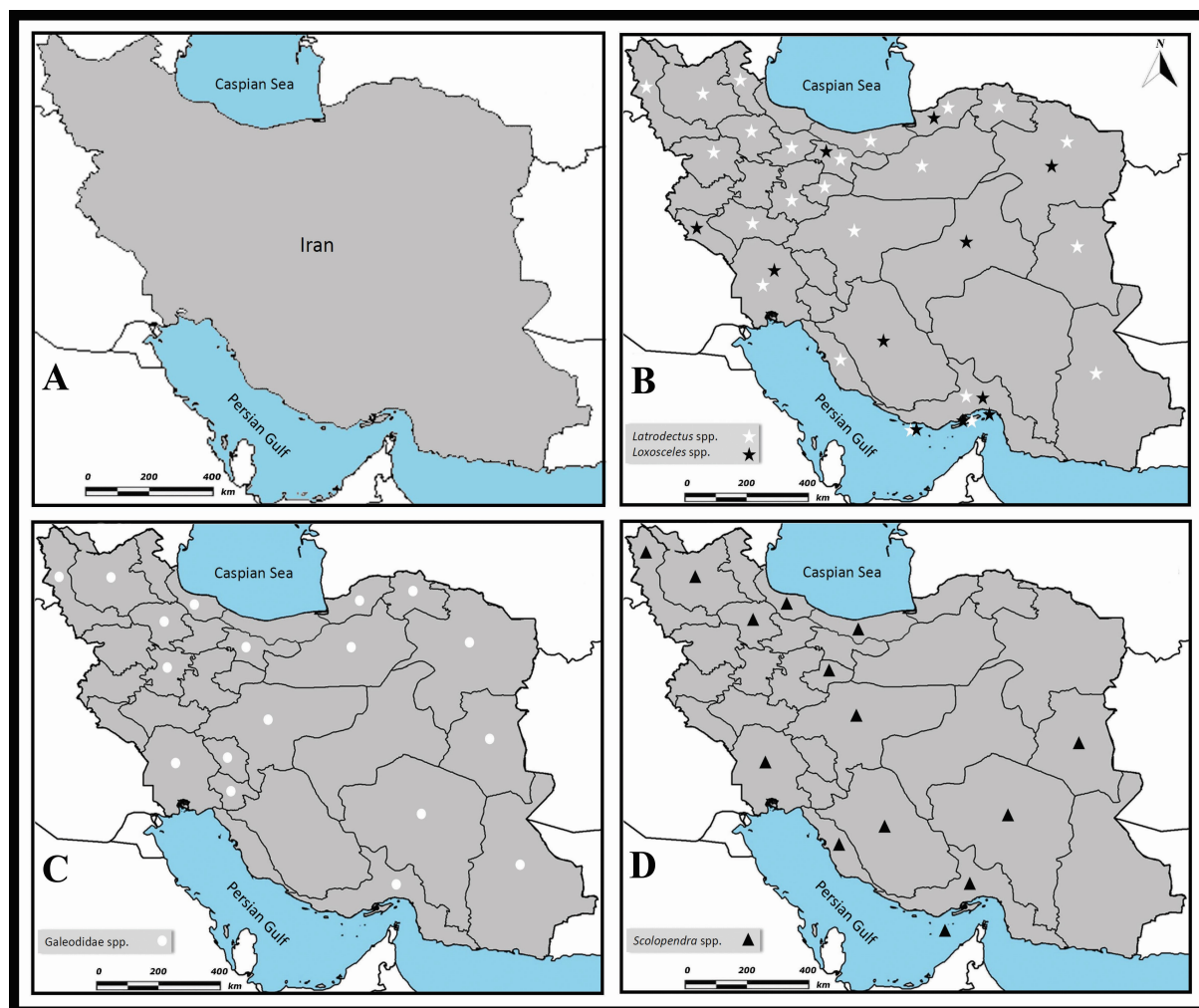


Figure 1: Distribution map of medically significant spiders, camel spiders and centipedes in Iran, created using DIVA-GIS software. The studied area (A), widow spider species of the genus *Latrodectus* and recluse spider species of the genus *Loxosceles* (B), camel spiders' family Galeodidae (C), and centipede species of the genus *Scolopendra* (D). Locality records are based on newly collected materials and the literature (Attems, 1951; Vazirianzadeh et al., 2007; Mirshamsi et al., 2013, 2015; Maddahi et al., 2015, 2017, 2022; Zamani et al., 2014, 2021; Hoseinpour et al., 2020; Zarei et al., 2020; Mohammadi Bavani et al., 2021; World Solifugae Catalog, 2022; Dehghani et al., 2023; Souri et al., 2024).

Spiders

Spider venom contains proteins, amino acids, and polypeptides. Some of these molecules can disrupt the communication between the nervous and muscular systems, causing paralysis or partial stroke. The venom composition is species-specific and depends on several factors, including gender, nutrition, habitat, and climate (Lüddecke et al., 2022). Spiders have chelicerae equipped with fangs, which are specialized for injecting venom (Table 1; Fig. 2A, B). They use their venom carefully and learn how much to inject through their fangs to subdue or sometimes kill their prey (Casas, 2011).

Most spider species are not considered medically important because their venom is not dangerous to humans, or the amount of injected venom is very low. Additionally, the fangs of many species are not strong enough to pierce human skin and inject venom.

The venom of approximately 200 spider species around the world can be harmful to humans (Diaz, 2004). However, most of these species tend to avoid humans and only bite when they feel threatened. Some individuals may respond more severely to spider venom (Casas, 2011; Lüddecke et al., 2022). The observed symptoms after a bite may vary among individuals based on factors such as the amount of venom injected, the health status of the bitten person, their age, and any background allergy (Dehghani et al., 2025).

Among nearly 950 spider species distributed in Iran, several members of families Theridiidae and Sicariidae are considered the most medically significant taxa (World Spider Catalog, 2025). Specifically, bites from *Latrodectus* spp. (widow spiders) and *Loxosceles* spp. (recluse spiders) can lead to a variety of clinical symptoms.

Table 1: Comparison of venom composition and bite clinical symptoms among four medically important arthropod taxa (Lewis, 1981; Ozsarac et al., 2004; Vazirianzadeh et al., 2007; Afshari et al., 2009; Vazirianzadeh et al., 2012; Haddad Junior et al., 2015; Swanson and Vetter, 2016; Pardal et al., 2017; Ombati et al., 2018; Trave et al., 2020; Tanaka et al., 2022; Gremski et al., 2022; Morsy et al., 2023).

Biting organ	Scorpion	Spider	Camel spider	Centipede
	Stinger tail	Fang	Chelicera	Forcipule
Venom composition	Hyaluronidases Phospholipase A ₂ Metalloproteinases L-Amino acid oxidase Ion channel (Na ⁺ , Ca ²⁺ , K ⁺ , and Cl ⁻) toxins Non-disulfide-bridged peptides (NDBPs)	Hyaluronidases Phospholipase A ₂ L-Amino acid oxidase Antithrombins Antimicrobial peptides (cytolytic or cationic peptides) Cysteine-rich peptides Cystine knot inhibitor Psalmopeotoxin I, II Huwentoxin I	Venom gland not reported	5-hydroxytryptamine, phospholipase A cytolysin cardiotoxic protein
Clinical symptoms	Erythema, rash and itching, pain, edema, Respiratory distress, abdominal pain, vomiting Convulsion, vertigo, fever, death degeneration of liver, kidney, lung, spleen and stomach	<i>Latrodectus</i> spp.: local pain and burning, muscle pain and spasm, sweating, chills, nausea, vomiting, flushing, high salivation and high blood pressure, electrocardiographic changes shortness of breath <i>Loxosceles</i> spp.: burning and blistering, itching, edema and redness, necrotic wound, necrotic plaque, intravascular hemolysis, thrombocytopenia, and acute renal failure	Local inflammation wounds, secondary bacterial infection	Secondary bacterial infection, pain, inflammation, itching, burning, blistering, tissue necrosis, swelling of the bite area, nausea lymphangitis, anaphylaxis, hemoglobinuria, hematuria
The most medically important genera in Iran	<i>Hemiscorpius</i> <i>Androctonus</i>	<i>Latrodectus</i> <i>Loxosceles</i>	<i>Galeodes</i> <i>Paragaleodes</i> <i>Rhagodes</i>	<i>Scolopendra</i>



Figure 2: Biting organs of medically important arthropods. Frontal view of the cephalothorax (A) and chelicerae and fangs (B) of spider genus *Karakumosa*, the dorsal (C) and retrolateral (D) views of chelicerae of camel spider *Rhagodes aureus*, dorsal surface of head region of the centipede *Scolopendra mirabilis* (E) and its forcipules from ventral surface (F). Figures A, B, E, and F courtesy of Mahdi Hatami and figures C and D courtesy of Hassan Maddahi.

Family Theridiidae

Theridiidae is a large family of spiders distributed worldwide, comprising 131 genera and 2584 species (World Spider Catalog, 2025). Although all theridiid species are venomous, the bites of widow spiders (genus *Latrodectus*) are particularly notable and cause public health problems. A total of 35 *Latrodectus* species have been reported globally (World Spider Catalog, 2025), whose bites can lead to paralysis, partial stroke, and even death. Latrodectism is a clinical syndrome caused by the bite of widow spiders, characterized by initial symptoms as local pain and burning, muscle pain and spasm, nausea, vomiting, high salivation, and high blood pressure (Isbister and Fan, 2011; Haddad

Junior et al., 2015). These spiders have painful bites and a strong neurotoxic venom that not only affects the human nervous system but also causes disorders in the respiratory system (Afshari et al., 2009). Apart from medical significance, studying widow spiders is crucial for conservation biology because of their impact on other animal populations. For instance, the invasion of the species *Latrodectus hasseltii* Thorell was shown from central Japan and poses a threat to coastal insects (Takagi et al., 2016).

Widow spiders are medium-sized with a body length of about 8 to 15 millimeters. The abdomen is round and button-like, brown to black in color, usually with red and yellow to orange patterns on the dorsal surface (Fig. 3A).



Figure 3: Some arthropod species with medical importance in Iran (figures A-C from Razavi Khorasan Province and figure D from Golestan Province). The Mediterranean widow spider *Latrodectus tredecimguttatus* (A), the Mediterranean recluse spider *Loxosceles rufescens* (B), the centipede *Scolopendra mirabilis* (C), the camel spider *Galeodes caspius*, feeding on a grasshopper (D). Figure C was taken from a preserved specimen, the dorsal banded pattern faded out due to loss of color in preservation. Figures A and B courtesy of Mahdi Hatami and figures C and D courtesy of Hassan Maddahi.

These spiders can be encountered in various places such as residential areas near gardens and agricultural fields, garden houses, stables, and other resting places for farmers. They may also be found in soil piles or construction waste disposal sites, as well as under harvested crops.

Six species of widow spider *Latrodectus dahli* Levi, *L. geometricus* C. L. Koch, *L. pallidus* O. Pickard-Cambridge, *L. tredecimguttatus* (Rossi), *L. cinctus* Blackwall, and *L. revivensis* Shulov have been recorded from Iran (Zamani et al., 2014; World Spider Catalog, 2025). These spiders were mostly reported from the northeast, south, and southwest regions of the country, as well as on the islands of the Persian Gulf (Fig. 1B). Most of the Iranian provinces host at least one species of *Latrodectus*, indicating the ecological and medical significance of these spiders. So far, the presence of widow spider species has been confirmed from 20 provinces across Iran, and the majority of records reported from Razavi Khorasan, South Khorasan, Semnan, Tehran, East Azerbaijan, Hormozgan, and Bushehr Provinces (Zamani et al., 2014; Mirshamsi et al., 2015; Najim and Hadlag, 2020; Souri et al., 2024).

There are several reports of latrodectism in Iran, particularly from Razavi Khorasan Province, where the bites of *L. tredecimguttatus* are relatively common. The victims of these spider bites were often farmers and housekeepers who lived mainly in the countryside (Rafinejad et al., 2007; Afshari et al., 2009). In a study, most of the bites were recorded in the first half of the year and affected the motor organs, face, and left side of the body (Afshari et al., 2009). The most frequently observed symptom was pain, which was mainly felt in the back, abdomen, lower limbs, upper limbs, and chest. Other symptoms included sweating, chills, shortness of breath, flushing, spasms, nausea, and dizziness. According to their result, latrodectism is common in the studied area (Mashhad city) and leads to various symptoms in affected individuals. In the process of treatment of the victims, calcium gluconate, methocarbamol, benzodiazepine, dexamethasone, hydrocortisone, and ranitidine were prescribed. Apart from *Latrodectus* spp., ten theridiid species of the genus *Steatoda* (false black widow spiders) are present in Iran (World Spider Catalog, 2025), whose venom can also cause mild pain and inflammation at the bite site.

Family Sicariidae

The family Sicariidae comprises six-eyed venomous spiders and includes three genera and 176 species. Sicariids possess cytotoxic venom and necrotic bites. Bites of *Loxosceles* spiders or loxoscelism can lead to cutaneous or systemic symptoms. The former are more common and typically include dermonecrosis, burning, and blistering at the bite site. The venom is cytotoxic and the skin necrosis is largely due to the presence of phospholipases D (PLDs). The venom composition can

rarely cause systemic loxoscelism, including clinical signs as intravascular haemolysis, thrombocytopenia, and acute renal failure (Swanson and Vetter, 2006; Trave et al., 2020; Gremski et al., 2022).

The Mediterranean recluse spiders originated in the Mediterranean countries and have spread to many parts of the world by human activities. These spiders are medium-sized and have long legs. Their most diagnostic characteristic is a violin-shaped pattern on the dorsal surface of the prosoma (Nentwig et al., 2017) (Fig. 3B). They prefer living in warm, dark, and isolated places within residential areas. They usually weave an irregular web on the floor or at a height of 10–15 centimeters between the wall and the floor. The bites of these spiders rarely occur.

Four recluse spider species *Loxosceles rufescens* (Dufour), *L. turanensis* Zamani, Mirshamsi and Marusik, *L. coheni* Zamani, Mirshamsi and Marusik, and *L. persica* Ribera and Zamani are present in Iran (Mirshamsi et al., 2013, 2015; Zamani et al., 2021). So far, the presence of these spiders has been reported from eight provinces of the country, and the largest number of distribution reports were from Razavi Khorasan, Khuzestan, and Hormozgan Provinces, and the Persian Gulf Islands (Fig. 1B).

In 2012, a case of a recluse spider bite was reported in a 40-year-old woman in Mashhad city, Iran (Mirshamsi et al., 2013). The clinical symptoms include pain and redness in the back of her right leg, fever, nausea, sweating, increased edema, and redness at the bite site. After five days, a 5×5 centimeters necrotic wound developed at the bite site. After 11 days, a necrotic plaque formed. According to her medical documents, no microbial contamination was observed at the wound site (Mirshamsi et al., 2013). Another case was reported from Bandar Abbas city, Iran, with relatively similar symptoms (Shahi et al., 2021).

Other spiders

Most of spider bites occur by species other than the widow and recluse spiders. In Iran, there are several spider species whose bites do not have a serious medical significance. These spiders have weaker venom, which usually does not lead to acute symptoms in humans. The symptoms may include pain, redness, itching, and slight local inflammation. However, the bites of the species of the genus *Drassodes* (family Gnaphosidae) and the genus *Cheiracanthium* (family Cheiracanthiidae) can lead to mild pain, inflammation, and tissue necrosis. Moreover, bites from large species of *Argiope* (family Araneidae), *Lycosa* (family Lycosidae), and members of the families Sparassidae and Theraphosidae may result in larger, deeper, and more painful wounds, since they have larger fangs. The injuries can be seen as two adjacent wounds, formed by the pairs of cheliceral fangs.

Camel spiders

Camel spiders are voracious hunters and mostly nocturnal arthropods. They prefer living in natural

habitats with low vegetation. They can be distinguished from spiders due to possessing large, massive, and powerful chelicerae, large pedipalps, a segmented expandable abdomen, and the presence of racquet organs at the ventral side of the body (Fig. 3D). Unlike spiders, camel spiders have no venom glands and silk glands. Their powerful chelicerae can cause painful bites resulting in injuries (Table 1). Each chelicera consists of a fixed and a movable finger equipped with rows of teeth (Fig. 2C, D). Ten racquet organs located on the ventral surface of their fourth legs play the role of sensor organs (Punzo, 1998; Sombke et al., 2019).

The presence of venom glands in camel spiders has not been documented except for an unconfirmed report concerning the species *Rhagodes nigricinctus* (family Rhagodidae) in India (Punzo, 1998). The possible local inflammation observed after camel spider bites is more likely due to secondary infection from their infected chelicera. There is a possibility of transmitting pathogenic microbes via their bites.

According to the literature, 68 camel spider species occur in Iran (Hoseinpour et al., 2020; Maddahi et al., 2022; World Solifugae Catalog, 2022). The larger species from the families Galeodidae and Rhagodidae can be considered medically significant due to their larger chelicerae and painful bites. Species of other families are almost smaller and have tiny chelicerae. Despite the public fear of camel spiders in the country, no bites have been reported.

Family Galeodidae

Members of the family Galeodidae have elongated bodies and long legs, with dark yellow to brown color (Fig. 3D). Adult specimens are typically large and agile. They are mainly nocturnal and often attracted to artificial light. They also occur on the outskirts of cities and villages, in stables, cattle shelters, nomadic tents, and military camps. When they encounter humans or feel threatened, they show aggressive behavior and may deliver a painful bite. Their bite force is considerable and correlates with the size of their chelicerae. Humans more frequently encounter galeodid species in the Middle East than other camel spiders, due to the high species diversity and high mobility.

A total of 37 galeodid species (17% of the global species of the family) occur in Iran, and at least one species is present in almost every province. Most of these species belong to the genus *Galeodes* Olivier, followed by the genera *Paragaleodes* Kraepelin, *Galeodopsis* Birula, and *Roeweriscus* Birula. The highest numbers of species have been recorded from the northeast, east, and southeast of the country, as well as Khuzestan Province (Hoseinpour et al., 2020; Maddahi et al., 2015, 2022; World Solifugae Catalog, 2022;). Notably, the possibility of encountering the species *Galeodes caspius* Birula, *G. arabs* C. L. Koch, and *G. araneoides* (Pallas) is higher than other species in the northeast, southwest, and northwest of Iran, respectively (Fig. 1C).

Family Rhagodidae

Rhagodids are medium-sized, heavy-bodied, and have robust legs and massive and powerful chelicerae. They are less active and less aggressive compared to galeodids. Seven genera and thirteen rhagodid species are present in Iran. Due to wider distribution ranges, encountering the species *Rhagodes eylandti* (Walter) and *R. melanopygus* (Walter) in the northeast and east of the country is more probable. Additionally, the species *R. caucasicus* Birula is more common in the northwest and west of the country, while *Rhagodorta zorab* (Birula) occurs in central parts of the Iranian Plateau (Maddahi et al., 2015, 2019, 2022; Hoseinpour et al., 2020; World Solifugae Catalog, 2022).

New records

Order Solifugae Sundevall

Family Galeodidae Sundevall

Genus *Galeodopsis* Birula

Galeodopsis bilkjeviczi (Birula)

Material Examined. Iran: Sistan and Baluchestan Province: 2 juv♀ (ZMAU-SOL-1001 and ZMAU-SOL-1002), 15 km SW Zahedan, Manzel Ab (29°20'11" N, 60°46'38" E), 1567 m a.s.l., 24.vii.2017, leg. H. Barahoei.

Remarks. This species was hitherto known from Iran and Turkmenistan (Roewer, 1934; Maddahi et al., 2022). Freshly sampled materials are new provincial records for Sistan and Baluchestan Province and lie in the southernmost limits of the species' known range.

Genus *Paragaleodes* Kraepelin

Paragaleodes nesterovi Birula

Material Examined. Iran: West Azerbaijan Province: 1♀ (ZMAU-SOL-1003), 45 km N Sardasht, Mirabad (36°24' N, 45°22' E), 1391 m a.s.l., 13.vi.2015, leg. H. Maddahi. Zanzan Province: 1♀ (ZMAU-SOL-1004), 4 km E Sojas, Majidabad (36°13' N, 48°36' E), 1799 m a.s.l., 07.viii.2011, leg. G. Kashani.

Remarks. The species has been previously recorded from Azerbaijan, Iran, Iraq, and Turkey (Roewer, 1934; Hosseinpour et al., 2020). The newly collected materials represent new provincial records for West Azerbaijan and Zanzan Provinces.

Family Rhagodidae Pocock

Genus *Rhagodorta* Roewer

Rhagodorta zorab (Birula)

Material Examined. Iran: Qom Province: 1♀ (ZMAU-SOL-1005), the vicinity of Qom (34°34' N, 50°54' E), 913 m a.s.l., 28.vii.2016, leg. G. Kashani.

Remarks. So far, this species has been recorded from Iran, Iraq, and Saudi Arabia (Roewer, 1933; World Solifugae Catalog, 2022). New provincial record for Qom Province.

Centipedes

Centipedes are carnivorous, active, and agile predators that place the upper levels of the food chains within the soil food web. Many species are larger than other soil macrofauna (Mona and Atlam, 2022). Their bodies are flattened and consist of two distinct parts, the head and the segmented trunk. Centipedes have long legs that extend out to the sides of their bodies (Fig. 3C). They possess between 15 and 191 pairs of legs. Centipedes are distinguished from millipedes by several characteristics, including thicker body, strong chitinous exoskeleton, carnivorous diet, possession of venomous claws, presence of one pair of legs per segment, and inability to crawl (Lewis, 1981; Hickman et al., 2006; Ombati et al., 2018).

Centipedes are the only animals whose legs are differentiated into organs for venom delivery. The first pair of appendages in the abdominal part has evolved into large claws known as fangs or forcipules and are used to inject venom (Fig. 2E, F). The venom is produced in large glands located at the base of the forcipules.

The bite of most centipedes is not dangerous to humans, but it can produce a response similar to that caused by a sting from a bee or scorpion (Lewis, 1981; Ombati et al., 2018). A variety of compounds found in centipede venom, such as 5-hydroxytryptamine, phospholipase A, and cytolysin, which can lead to different symptoms like inflammation and cell lysis (Lewis, 1981; Vazirianzadeh et al., 2007; Undheim and King, 2011) (Table 1). The effect of the venom may vary depending on several factors such as the species of centipedes and the age of the bitten person. Clinical symptoms of bites of the same species can be more severe in children compared to adults (Lewis, 1981). Moreover, the bite of centipedes may lead to secondary bacterial infection, especially in vulnerable groups, including people who receive immunosuppressive medications, AIDS sufferers, cancer patients, diabetics, and patients with kidney and vascular disorders (Vazirianzadeh et al., 2007).

Genus *Scolopendra*

The venom of some *Scolopendra* species can subdue or kill many invertebrates and even small vertebrates (Lewis, 1981; Molinari et al., 2005; Dehghani et al., 2025). Although all centipede species are venomous, the venoms of less than 0.5% of the world's species are clinically significant. Most species with medical importance belong to the genus *Scolopendra* (Ombati et al., 2018) (Table 1). Bites of *Scolopendra* species cause pain, inflammation, itching, burning, and tissue necrosis. In more severe cases, symptoms such as anaphylaxis, lymphangitis, myoglobinuria, coronary ischemia, hemoglobinuria, hematuria, and even fatal cases have been reported (Lewis, 1981; Pardal et al., 2017; Ombati et al., 2018; Tanaka et al., 2022).

Lewis (1981) listed a dozen bites from various *Scolopendra* species, such as *S. heros* Girard, *S. polymorpha* Wood, *S. subspinipes* Leach, *S. viridicornis* Newport, *S. morsitans* Linnaeus, and *S. cingulata* (Latreille). The most commonly reported symptoms of their bites were pain and inflammation. The other symptoms included blisters, swelling, subcutaneous bleeding, edema, local necrosis, and darkening of the center of the bite site. Based on another study, centipede bites from the genus *Scolopendra* led to changes in the ST sector of the electrocardiogram in a 60-year-old man (Ozsarac et al., 2004). His other symptoms included sweating, dizziness, and changes in blood pressure and heart rate (Ozsarac et al., 2004). A recent case report on *Scolopendra* envenomation showed relatively severe symptoms such as pain, necrosis, erythema, and infection (Tanaka et al., 2022).

Scolopendra species of Iran

Few studies have been conducted on the centipede fauna of Iran. To date, four species of the genus *Scolopendra*, *S. mirabilis* (Porat), *S. canidens* Newport, *S. cingulata*, and *S. valida* Lucas have been recorded across 11 provinces of the country (Fig. 1D) (Attems, 1951; Zarei et al., 2020). Previous records have been scattered, and the distribution of these species within Iran remains unknown.

Two bite cases of the species *S. valida* were reported in Khuzestan Province (Vazirianzadeh et al., 2007). Both cases presented erythema, pain, itching, and burning at the bite site. Also, hemoglobinuria and hematuria were observed in both cases. The prescribed treatments included local lidocaine, oral antibiotic ceftazidime, antihistamine, and hydrocortisone. The patients' vital signs were all normal and both individuals were discharged after one and four days, respectively (Vazirianzadeh et al., 2007).

Other centipedes

Apart from *Scolopendra* species, other centipede taxa possess weaker venom and are almost harmless to humans. In many cases, they are unable to pierce the human skin, due to their small size and smaller forcipules. So far, there have been no recorded bites by members of the order Geophilomorpha or the order Lithobiomorpha. For example, the species *Lithobius mordax* Koch, which measures 20–25 millimeters in length, cannot pierce the human skin. The house centipede *Scutigera coleoptrata* (Linnaeus), a representative of the order Scutigeroomorpha is also harmless (Lewis, 1981).

New records

Order Scolopendromorpha Pocock

Family Scolopendridae Leach

Genus *Scolopendra* Linnaeus

Scolopendra canidens Newport

Material Examined. Iran: Zanjan Province: 2♀ (ZMAU-CHI-1011 and ZMAU-CHI-1012), 5 km N Zanjan, Qavazang (36°43' N, 48°31' E), 1920 m

a.s.l., 16.v.2014, leg. G. Kashani; 1♀ (ZMAU-CHI-1013), the vicinity of Qeydar (36°06' N, 48°34' E), 2068 m a.s.l., 08.ix.2016, leg. H. Maddahi; 1♀ (ZMAU-CHI-1014), 95 km W Zanzan, the vicinity of Dandi (36°33' N, 47°37' E), 1599 m a.s.l., 07.ix.2016, leg. H. Maddahi.

Remarks. The species has been previously recorded from the Mediterranean Region to Central Asia (Zarei et al., 2020). Freshly collected materials are new provincial records for Zanzan Province.

Scolopendra mirabilis (Porat)

Material Examined. Iran: Kerman Province: 1♀ (ZMAU-CHI-1020), the vicinity of Kerman (30°18' N, 57°06' E), 1762 m a.s.l., iv.2017, no col. South Khorasan Province: 2♂ 2♀ (ZMAU-CHI-1007–1010), the vicinity of Qaen (33°43' N, 59°11' E), 1462 m a.s.l., 07.iv.2017, leg. A. Koohejad; 1♀ (ZMAU-CHI-1023), the vicinity of Darmian (32°50'N, 59°54'E), 1932 m a.s.l., iv.2018, leg. S. Mohammadi.

Remarks. This centipede species is distributed from Africa to central Asia (Zarei et al., 2020). Newly sampled materials represent new provincial records for South Khorasan Province.

Discussion

Iran hosts a wide variety of spiders, camel spiders and centipedes due to its geographical location and various climates and habitats. The bites of some of these arthropods are medically significant and lead to a variety of clinical symptoms. Spiders, as one of the most diverse animal groups in Iran, have several species with medical importance. Among them, envenomation by six widow spider species and four recluse spider species, which are highlighted in this study, is of particular concern. The findings of this study indicated that species from the genera *Latrodectus* and *Loxosceles* have been recorded from 25 Iranian provinces, with at least one species of these genera present in every province of the country (Fig. 1B).

Moreover, large solifugae species from the families Galeodidae and Rhagodidae are found in Iran. These arachnids possess huge chelicerae, which can inflict serious wounds. Galeodids are aggressive wandering arachnids and quickly bite their victim when they are frightened. Rhagodids are less active and less likely to encounter humans compared to galeodids. They also have massive chelicerae and their bites can inflict painful wounds. Additionally, among the centipede species distributed in Iran, only the bites of members of the genus *Scolopendra* can cause considerable clinical symptoms. The results of this study showed that four *Scolopendra* species occur in nearly half of the Iranian provinces (Fig. 1D).

Discovering species diversity is prior to introducing medically significant arthropods. Comprehensive faunistic studies are necessary to clarify the species

diversity and distribution range of medically important arthropods in Iran. Although some recent studies have been conducted on the fauna of spiders, camel spiders and centipedes of Iran (e.g., Zamani et al., 2014; Mirshamsi et al., 2015; Hoseinpour et al., 2020; Maddahi et al., 2022; Dyachkov et al., 2023), large parts of the country have not been investigated yet. This offers an urgent need for further research to understand their biodiversity, distribution, and ecological roles in Iran.

As a result of this study, several new provincial records of camel spiders and centipedes were reported for the first time. Notably, new records include the camel spiders *Galeodopsis bilkjeviczi* from Sistan and Baluchestan Province, *Paragaleodes nesterovi* from West Azerbaijan and Zanzan Provinces, and *Rhagodorta zorab* from Qom Province. Also, new records of centipedes were the species *Scolopendra canidens* from Zanzan Province and *S. mirabilis* from South Khorasan Province.

In summary, the results of this study suggest the necessity of future research on venomous arthropods and their correlation with medical implications and public health issues. From a medical perspective, understanding the species diversity of venomous arthropods, their distribution range, and the symptoms of their bites in different regions of Iran can lead to quick diagnoses and appropriate treatment decisions. Moreover, increasing public awareness about the biological aspects of venomous arthropods would be effective in reducing public fear, especially concerning arachnophobia. Lastly, this study listed several venomous arthropod species whose venom can serve in the development of the pharmaceutical industry, particularly anticancer drugs.

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Author contributions

Hassan Maddahi supervised the study, conducted the literature review, collected some new materials, photographed some species, provided a distribution map, and prepared the draft of the manuscript. Mehdi Khoobdel revised the manuscript and handled project administration. Mahdi Hatami photographed some species.

Conflict of interest

The authors declare that there are no conflicting issues related to this review article.

References

- Afshari, R., Khadem-Rezaiyan, M. and Balali-Mood, M. (2009). Spider bite (latrodectism) in Mashhad, Iran. *Human and Experimental Toxicology*, 28 (11): 697–702.
<https://doi.org/10.1177/0960327109350668>
- Attems, C. (1951). Ergebnisse der Österreichischen Iran-Expedition 1949/50. Myriapoden vom Iran gesammelt von der Expedition Heinz Loeffler und Genossen 1949/50. *Sitzungsberichte der Österreichischen Akademie der Wissenschaften*, 160: 387–426.
- Barahoei, H., Navidpour, S., Aliabadian, M., Siahsarvie, R. and Mirshamsi, O. (2020). Scorpions of Iran (Arachnida: Scorpiones): Annotated checklist, DELTA database and identification key. *Journal of Insect Biodiversity and Systematics*, 6 (4): 375–474.
<https://doi.org/10.52547/jibs.6.4.375>
- Bird, T. L., Van Rensburg, R. and Dippenaar-Schoeman, A. S. (2021). Medically important spider bites in southern Africa. *South African General Practitioner*, 2 (4): 131–136.
<https://doi.org/10.36303/SAGP.2021.2.4.0088>
- Casas, J. (2011). *Spider physiology and behaviour: behaviour*. Academic Press, London, UK. 288 pp.
- Dehghani, R., Khoobdel, M. and Sobati, H. (2018a). Scorpion control in military units: A review study. *Journal of Military Medicine*, 20 (1): 3–13. [In Persian]
- Dehghani, R., Charkhloo, E., Seyyedi-Bidgoli, N., Chimehi, E. and Ghavami-Ghameshlo, M. (2018b). A review on scorpionism in Iran. *Journal of Arthropod-borne Diseases*, 12 (4): 325–333.
<https://doi.org/10.18502/jad.v12i4.350>
- Dehghani, R., Kassiri, H., Kasiri, A., Mirbagheri, K. and Shateri, S. (2023). First record of *Latrodectus dahli* Levi, 1959 the medically important spider species (Araneae: Theridiidae) and some data about it from Kashan County, Central Iran. *Journal of Entomological Research*, 47 (suppl): 1021–1024.
<https://doi.org/10.5958/0974-4576.2023.00190.1>
- Dehghani, R., Fathi, B., Dehghani, M. and Mohamadzadeh, N. (2025). Venomous and poisonous arthropods in Iran, West Asia, and the Middle East: an overview of their identification, bites, stings, behavior, biology and geographical distribution. *Iranian Journal of Veterinary Science and Technology*, 17 (1): 1–36.
<https://doi.org/10.22067/ijvst.2025.92244.1483>
- Diaz, J. H. (2004). The global epidemiology, syndromic classification, management, and prevention of spider bites. *The American Journal of Tropical Medicine and Hygiene*, 71 (2): 239–250.
<https://doi.org/10.4269/ajtmh.2004.71.2.0700239>
- Dyachkov, Y. V., Davoodi, P. and Zarei, R. (2023). The Chilopoda fauna of the Hyrcanian ecoregion. *Ecologica Montenegrina*, 70: 46–59.
<https://dx.doi.org/10.37828/em.2023.70.6>
- Gremski, L. H., da Justa, H. C., Polli, N. L., Schluga, P. H., Theodoro, J. L., Wille, A. C., Senff-Ribeiro, A. and Veiga, S. S. (2022). Systemic loxoscelism, less frequent but more deadly: the involvement of phospholipases D in the pathophysiology of envenomation. *Toxins*, 15 (1): 1–16.
<https://doi.org/10.3390/toxins15010017>
- Haddad Junior, V., Amorim, P. C., Haddad Junior, W. T. and Cardoso, J. L. (2015). Venomous and poisonous arthropods: identification, clinical manifestations of envenomation, and treatments used in human injuries. *Revista da Sociedade Brasileira de Medicina Tropical*, 48: 650–657.
<https://doi.org/10.1590/0037-8682-0242-2015>
- Hickman, C. P., Roberts, L. S., Larson, A., l'Anson, H. and Eisenhour, D. J. (2006). *Integrated Principles of Zoology*. McGraw Hill, New York, 872 pp.
- Hijmans, R. J., Guarino, L. and Mathur, P. (2012). DIVA-GIS. Version. 7.5. A geographic information system for the analysis of species distribution data. Available from <http://www.diva-gis.org> (Accessed 23 April 2024).
- Hoseinpour, A., Maddahi, H., Soltani, A. and Azizi, K. (2020). New data on the camel spider fauna of Iran (Arachnida: Solifugae), Part I. Kohgiluyeh & Boyer Ahmad Province. *Iranian Journal of Animal Biosystematics*, 16 (1): 69–76.
<https://doi.org/10.22067/IJAB.V16I1.84275>
- Isbister, G. K. and Fan, H. W. (2011). Spider bite. *Lancet*, 378 (9808): 2039–2047.
[https://doi.org/10.1016/S0140-6736\(10\)62230-1](https://doi.org/10.1016/S0140-6736(10)62230-1)
- Khoobdel, M., Jonaidi, N. and Rashti, M. S. (2008). Blowfly and flesh fly (Diptera: Cyclorrhpha) fauna in Tehran, Iran. *Journal of Entomology*, 5 (3): 185–192.
<https://doi.org/10.3923/je.2008.185.192>
- Khoobdel, M., Akbarzadeh, K., Jafari, H., Mehrabi Tavana, A., Mousavi Jazayari, A., Rafinejad, J., Izadi, M., Esfahani, A., Jahani, Y., Nobakht, M. and Bahmani, M. M. (2012). Ant stings in military forces on three Persian islands of Abu-Musa, Greater Tunb and Lesser Tunb. *Journal of Military Medicine*, 14 (2): 155–162. [In Persian]
- Khoobdel, M., Tavassoli, M., Salari, M. and Firozi, F. (2014). The stinging Apidae and Vespidae (Hymenoptera: Apocrita) in Iranian islands, Qeshm, Abu-Musa, Great Tunb and Lesser Tunb on the Persian Gulf. *Asian Pacific Journal of Tropical Biomedicine*, 1 (4): 258–262.
<https://doi.org/10.12980/APJTB.4.2014C1153>

- Lewis, J. G. (1981). *The biology of centipedes*. Cambridge University Press, Cambridge, 476 pp.
- Lewis, J. G. (2010). A key and annotated list of the *Scolopendra* species of the Old World with a reappraisal of *Arthrorhabdus* (Chilopoda: Scolopendromorpha: Scolopendridae). *International Journal of Myriapodology*, 3 (1): 83–122.
<https://doi.org/10.1163/187525410X12578602960380>
- Lüddecke, T., Herzig, V., Von Reumont, B. M. and Vilcinskis, A. (2022). The biology and evolution of spider venoms. *Biological Reviews*, 97 (1): 163–178.
<https://doi.org/10.1111/brv.12793>
- Maddahi, H., Kami, H. G., Aliabadian, M. and Mirshamsi, O. (2015). Redescription of *Rhagodes eylandti* (Walter, 1889) (Arachnida: Solifugae) with notes on its morphological variation and geographic distribution. *Zoology in the Middle East*, 61 (3): 278–284.
<https://doi.org/10.1080/09397140.2015.1058450>
- Maddahi, H., Khazanehdari, M., Aliabadian, M., Kami, H. G., Mirshamsi, A. and Mirshamsi, O. (2017). Mitochondrial DNA phylogeny of camel spiders (Arachnida: Solifugae) from Iran. *Mitochondrial DNA Part A*, 28(6): 909–919.
<https://doi.org/10.1080/24701394.2016.1209194>
- Maddahi, H., Aliabadian, M., Moradmand, M. and Mirshamsi, O. (2019). New insights to the taxonomy of *Rhagodes eylandti* (Walter, 1889): A remarkable sexually dimorphic species (Solifugae: Rhagodidae). *Zootaxa*, 4648 (3): 494–510.
<https://doi.org/10.11646/zootaxa.4648.3.5>
- Maddahi, H., Babaei Savasari, R. and Khoobdel, M. (2022). New data on the camel spider fauna of Iran (Arachnida: Solifugae), Part II. Northeast and east Iran. *Arthropoda Selecta*, 31 (4): 211–218.
<https://doi.org/10.15298/arthsel.31.4.06>
- Mirshamsi, O., Hatami, M. and Zamani, A. (2013). New record of the Mediterranean recluse spider *Loxosceles rufescens* (Dufour, 1820) and its bite from Khorasan Province, northeast of Iran (Aranei: Sicariidae). *Iranian Journal of Animal Biosystematics*, 9 (1): 83–86.
<https://doi.org/10.22067/ijab.v9i1.33311>
- Mirshamsi, O., Marusik, Y. M., Zamani, A., Moradmand, M. and Kashefi, R. (2015). Annotated checklist of the spiders of Iran (Arachnida: Araneae). *Iranian Journal of Animal Biosystematics*, (1): 1–108.
<https://doi.org/10.22067/IJAB.VFAUNA.IRANI.CAII.50696>
- Mohammadi Bavani, M., Shafaie, S., Chavshin, A. R., Dabiri, F., Badakhshan, M., Naghian, A., Entezar Mahdi, R., Seyyed-Zadeh, S. J., Rafinejad, J., Saedi, Sh. and Rasegh, P. (2021). New data on *Latrodectus tredecimguttatus* Rossi, 1790, the medically important spider species (Araneae: Theridiidae) from Iran. *Archives of Razi Institute*, 76 (2): 385–390.
<https://doi.org/10.22092/ARI.2020.341960.1446>
- Molinari, J., Gutiérrez, E. E., Ascensão, A. A., Nassar, J. M., Arends, A. and Márquez, R. J. (2005). Predation by giant centipedes, *Scolopendra gigantea*, on three species of bats in a Venezuelan cave. *Caribbean Journal of Science*, 41 (2): 340–346.
- Mona, M. M. and Atlam, A. I. (2022). Phenotypic description of Egyptian endemic centipedes, genus *Scolopendra* Linnaeus, 1758 with a histological study of its venom glands. *Zoomorphology*, 141 (3–4): 273–281.
<https://doi.org/10.1007/s00435-022-00573-5>
- Morsy, M. A., Gupta, S., Dora, C. P., Jhawar, V., Dhanawat, M., Mehta, D., Gupta, K., Nair, A. B. and El-Daly, M. (2023). Venoms classification and therapeutic uses: a narrative review. *European Review for Medical and Pharmacological Sciences*, 27 (4): 1633–1653.
https://doi.org/10.26355/eurrev_202302_31408
- Motevalli Haghi, F. and Dehghani, R. (2017). A review of scorpions reported in Iran. *Journal of Mazandaran University of Medical Sciences*, 27 (151): 213–226. [In Persian]
- Najim, S. A. and Hadlag, K. S. A. (2020). First record of *Latrodectus dahli* Levi, 1959 (Araneae: Theridiidae) from Iraq. *Journal of Animal Diversity*, 2 (1): 141–146.
<https://doi.org/10.29252/JAD.2020.2.1.6>
- Nentwig, W., Pantini, P. and Vetter, R. S. (2017). Distribution and medical aspects of *Loxosceles rufescens*, one of the most invasive spiders of the world (Araneae: Sicariidae). *Toxicon*, 132: 19–28.
<https://doi.org/10.1016/j.toxicon.2017.04.007>
- Ombati, R., Luo, L., Yang, S. and Lai, R. (2018). Centipede envenomation: clinical importance and the underlying molecular mechanisms. *Toxicon*, 154: 60–68.
<https://doi.org/10.1016/j.toxicon.2018.09.008>
- Ozsarac, M., Karcioğlu, O., Ayrik, C., Somuncu, F. and Gumrukcu, S. (2004). Acute coronary ischemia following centipede envenomation: case report and review of the literature. *Wilderness and Environmental Medicine*, 15 (2): 109–112.
[https://doi.org/10.1580/1080-6032\(2004\)015\[0109:ACIFCE\]2.0.CO;2](https://doi.org/10.1580/1080-6032(2004)015[0109:ACIFCE]2.0.CO;2)
- Pardal, P. P., Arraes, J. A. A., Weekes, K. W. and da Costa Gadelha, M. A. (2017). Dermatitis caused by centipede envenomation: a case report. *Revista de Patologia Tropical/Journal of Tropical Pathology*, 46 (4): 343–348.
<https://doi.org/10.5216/rpt.v46i4.51014>
- Punzo, F. (1998). *The biology of camel-spiders (Arachnida, Solifugae)*. Kluwer Academic Publishers, New York, USA. 301 pp.
- Rafinejad, J., Tirgari, S., Biglarian, F. and Shemshad, K. (2007). Systematics, bioecology, and medical importance of widow spiders (*Latrodectus* spp.) in Khorasan Province, Iran. *Journal of Arthropod-Borne Diseases*, 1 (1): 52–57.

- Roewer, C. F. (1933). Solifugae, Palpigradi, *In*: Bronn, E. G. (Ed.), *Klassen und Ordnungen des Tierreichs. 5: Arthropoda. IV: Arachnoidea und kleinere ihnen nahegestellte Arthropodengruppen*. Vol. 5 (IV) (4) (2–3). Leipzig: Akademische Verlagsgesellschaft M.B.H. pp. 161–480.
- Roewer, C. F. (1934). Solifugae, Palpigradi, *In*: Bronn, E. G. (Ed.), *Klassen und Ordnungen des Tierreichs. 5: Arthropoda. IV: Arachnoidea und kleinere ihnen nahegestellte Arthropodengruppen*. Vol. 5 (IV) (4) (4–5). Leipzig: Akademische Verlagsgesellschaft M.B.H. pp. 481–723.
- Shahi, M., Shahi, A., Khademi, Z., Zamani, A. R., Nakhaii, A. R. and Rafinejad, J. (2021). Loxoscelism: a case report from Bandar Abbas in south of Iran. *Hormozgan Medical Journal*, 18 (5): 421–427.
- Sombke, A., Klann, A. E., Lipke, E. and Wolf, H. (2019). Primary processing neuropils associated with the malleoli of camel spiders (Arachnida, Solifugae): a re-evaluation of axonal pathways. *Zoological Letters*, 5: 1–13. <https://doi.org/10.1186/s40851-019-0137-z>
- Souri, A. M., Shafaie, S., Moradmand, M. and Mirshamsi, O. (2024). The spider genus *Latrodectus* Walckenaer, 1805 (Araneae, Theridiidae) in Iran with the first record of *Latrodectus revivensis* Shulov, 1948. *Journal of Insect Biodiversity and Systematics*, 10 (1): 99–109. <https://doi.org/10.61186/jibs.10.1.99>
- Swanson, D. L. and Vetter, R. S. (2006). Loxoscelism. *Clinics in dermatology*, 24 (3): 213–221. <https://doi.org/10.1016/j.clindermatol.2005.11.006>
- Takagi, S., Toki, W. and Yoshioka, A. (2016). Invasion of the redback spider *Latrodectus hasseltii* (Araneae: Theridiidae) into human-modified sand dune ecosystems in Japan. *Applied Entomology and Zoology*, 51 (1): 43–51. <https://doi.org/10.1007/s13355-015-0369-0>
- Tanaka, Y., Mato, T., Fujiya, S., Furuhashi, Y., Takanosu, T., Watanabe, N., Shinjo, T., Matsumura, T., Izawa, Y., Yonekawa, C. and Kato, H. (2022). Necrotizing soft-tissue infection of the trunk resulting from wound caused by a centipede: a case report. *The American Journal of Case Reports*, 23: e937869-1. <https://doi.org/10.12659/AJCR.937869>
- Trave, I., Barabino, G. and Parodi, A. (2020). Cutaneous loxoscelism. *JAMA Dermatology*, 156 (2): 203–203. <https://doi.org/10.1001/jamadermatol.2019.3252>
- Undheim, E. A., and King, G. F. (2011). On the venom system of centipedes (Chilopoda), a neglected group of venomous animals. *Toxicon*, 57 (4): 512–524. <https://doi.org/10.1016/j.toxicon.2011.01.004>
- Vazirianzadeh, B. A., Farhadpour, F., Hosseinzadeh, M., Zarean, M. and Moravvej, S. A. (2012). An epidemiological and clinical study on scorpionism in hospitalized children in Khuzestan, Iran. *Journal of Arthropod-borne Diseases*, 6 (1): 62–69.
- Vazirianzadeh, B., Rahmani, A. H. and Moravvej, S. A. (2007). Two cases of chilopoda (centipede) biting in human from Ahwaz, Iran. *Pakistan Journal of Medical Sciences*, 23 (6): 956–958.
- World Solifugae Catalog (2022). World Solifugae Catalog. Natural History Museum Bern, online at <http://wac.nmbe.ch> (accessed on 2 February 2025).
- World Spider Catalog (2025). World Spider Catalog. Version 26. Natural History Museum Bern, online at <http://wsc.nmbe.ch> (Accessed on 11 February 2025).
- Zamani, A., Mirshamsi, O., Savoji, A. and Shahi, M. (2014). Contribution to the distribution of spiders with significant medical importance (Araneae: *Loxosceles* and *Latrodectus*) in Iran, with a new record for the country. *Iranian Journal of Animal Biosystematics*, 10 (1): 57–66. <https://doi.org/10.22067/IJAB.V10I1.36892>
- Zamani, A., Mirshamsi, O. and Marusik, Y. M. (2021). ‘Burning Violin’: The medically important spider genus *Loxosceles* (Araneae: Sicariidae) in Iran, Turkmenistan, and Afghanistan, with two new species. *Journal of Medical Entomology*, 58 (2): 666–675. <https://doi.org/10.1093/jme/tjaa257>
- Zarei, R., Rahimian, H., Mirmonsef, H. and Bonato, L. (2020). Geophilomorpha from Alborz Mountains and a checklist of Chilopoda from Iran. *Zootaxa*, 4780 (1): 132–146. <https://doi.org/10.11646/zootaxa.4780.1.6>