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NOTES ON GEOGRAPHIC DISTRIBUTION

First record of *Gnaphosa jodhpurensis* Tikader & Gajbe, 1977 (Araneae, Gnaphosidae) from Iraq and the Middle East

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Abstract. We report *Gnaphosa jodhpurensis* Tikader & Gajbe, 1977 (Araneae, Gnaphosidae) from Iraq and the Middle East for the first time, based on material collected from Karbala, Babylon, and Dhi Qar provinces. Identification was based on morphological comparison with the original description and further supported by DNA barcoding of the mitochondrial cytochrome c oxidase subunit I gene. Known distribution records of the species across its range are mapped.

Key words. Biodiversity, distribution, DNA barcoding, faunistics, ground spiders, taxonomy

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INTRODUCTION

The family Gnaphosidae Banks, 1892, commonly known as ground spiders, is among the most species-rich and widely distributed within araneomorph spiders, globally comprising 2,500 described species in 153 genera (WSC 2025). These spiders are generally free-living, with most species being ground-dwellers, and they inhabit a variety of microhabitats, including leaf litter, soil surfaces, and rock crevices (Jocqué and Dippenaar-Schoeman 2006). Despite this ecological breadth, the gnaphosid fauna of Iraq remains far less documented than that of neighboring countries, such as Turkey (163 species in 34 genera; Danışman et al. 2025) and Iran (143 species in 40 genera; Zamani 2025).

According to the most recent national checklist, 16 species in 11 genera of gnaphosids are known from Iraq (Al-Khazali et al. 2023). Early records included *Nomisia conigera* (Spassky, 1941) and *Pterotricha arzhantsevi* Fomichev, Marusik & Koponen, 2018 (Fomichev et al. 2018), followed by *Berlandina mesopotamica* Al-Khazali, 2020 from Dhi Qar (Al-Khazali 2020), with the female described later (Al-Khazali and Fomichev 2021). During the two years following the checklist, seven additional species were documented from Iraq, raising the total to 23 species in 15 genera by 2025. These include *Cryptodrassus helvolus* (O. Pickard-Cambridge, 1872), *Zelotes laetus* (O. Pickard-Cambridge, 1872) (Abdalrazzaq and Najim 2024), *Drassodes lapidosus* (Walckenaer, 1802) (Zamani et al. 2024), *Minosia simeonica* Levy, 1995, *Synaphosus shirin* Ovtsharenko, Levy & Platnick, 1994 (Al-Khazali 2024) newly recorded from Iraq, and *Talanites gilgamesh* Al-Khazali, 2024 (Al-Khazali 2024) and *Zelotes hazarmerdensis* Zamani & Marusik, 2024 (Zamani and Marusik 2024) described as new to science.

Within Gnaphosidae, the genus *Gnaphosa* Latreille, 1804 is both species-rich and taxonomically complex, with 151 valid species currently recognized worldwide (WSC 2025). In Iraq, only one species has so far been recorded: *G. dolosa* Herman, 1879 (Al-Khazali et al. 2023). The present study documents the occurrence of *G. jodhpurensis* Tikader & Gajbe, 1977 as the second representative of the genus in Iraq, extending its known distribution into the Middle East.

Originally described from India and later reported from China (WSC 2025) and Pakistan (Tahir et al. 2019), *G. jodhpurensis* has not been the subject of an integrative taxonomic study. We document here the first occurrence of *G. jodhpurensis* in Iraq, based on a combined approach using morphological and molecular evidence.

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STUDY AREA

Specimens were collected from three Iraqi provinces: Karbala (Alwand) and Babylon (Al-Musayyib) in central Iraq, and Dhi Qar (Al-Fuhud) in southern Iraq (Figure 1). These areas lie within the Mesopotamian Plain

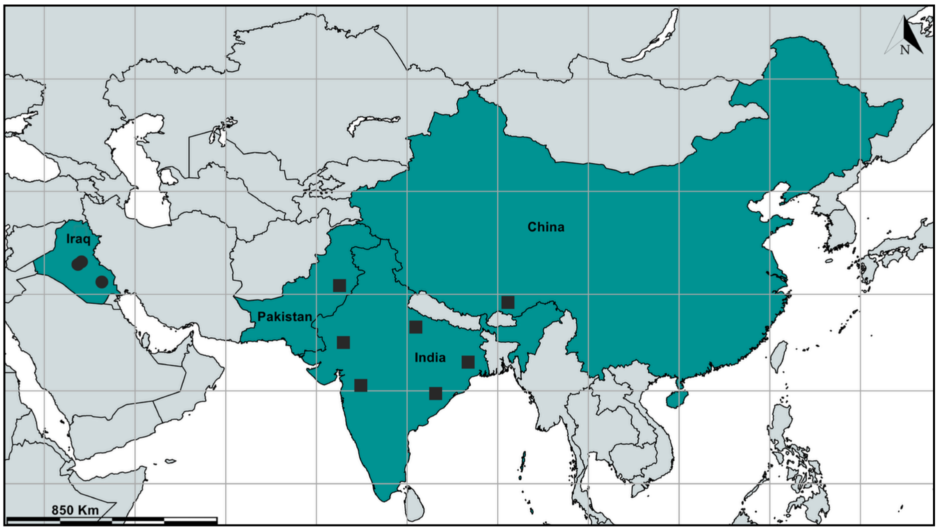

Figure 1. Known distribution records of *Gnaphosa jodhpurensis* Tikader & Gajbe, 1977. Squares = previous records; circles = new records from Iraq.

and are characterized by arid to semi-arid climate conditions. The terrain is flat to gently undulating, with predominantly alluvial soils. Average annual rainfall is less than 200 mm, with peak temperatures exceeding 45 °C during the summer months. Vegetation is sparse and dominated by xerophytic and halophytic plants. None of the surveyed locations is designated as a protected area.

METHODS

Specimen collection and morphological examination. Adult specimens were manually collected from soil surfaces and preserved in 75% ethanol. Morphological examination was conducted using a stereomicroscope (ED4) equipped with a Nikon digital camera. Epigynes were dissected and cleared in 10% potassium hydroxide (KOH) for examination, and placed in shallow ethanol-filled dishes lined with white cotton to enhance imaging contrast. Measurements (in mm) were taken dorsally, and leg segment lengths are presented as total length (femur, patella, tibia, metatarsus, tarsus). Spination is based on the right-side legs. A distribution map was created using SimpleMappr (Shorthouse 2010). Voucher specimens are deposited at the Arachnid Collection, Department of Science, College of Basic Education, University of Sumer, Iraq.

Molecular procedures. DNA was extracted from leg tissue using the Wizard Genomic DNA Purification Kit (Promega, USA), with modifications. Tissue was ground under liquid nitrogen and lysed in Nuclei Lysis Solution at 65 °C for 30 min. Proteinase K (17.5 μl, 20 mg/ml) was then added and incubated at 55 °C for 3–12 h. DNA was precipitated in isopropanol, washed with 70% ethanol, and rehydrated in DNA Rehydration Solution.

The COI gene was amplified using LCO1490 and HCO2198 primers (Folmer et al. 1994) in 25 μl reactions containing 12.5 μl Master Mix, 1 μl of each primer, 5 μl template DNA, and 5.5 μl nuclease-free water. PCR cycling conditions were as follows: initial denaturation at 94 °C for 15 min; 35 cycles of 94 °C for 60 s, 50 °C for 60 s, 72 °C for 90 s; final extension at 72 °C for 7 min. PCR products were visualized on 1.5% agarose gels stained with RedSafe and documented under UV. A 100-bp kb DNA ladder (SMOBIO) was used as a size standard.

Phylogenetic analysis. A dataset of 13 published *Gnaphosa* COI sequences, along with the Iraqi specimen (GenBank accession PV926656.1), was aligned using MUSCLE implemented in MEGA X. *Runcinia acuminata* (Thorell, 1881) (EU168166), Family Thomasidae, was included as the outgroup. Phylogenetic reconstruction was performed using the maximum-likelihood method under the Tamura–Nei model, selected as the best-fit substitution model test in MEGA X. Node support was evaluated with 1,000 bootstrap replicates.

RESULTS

Family Gnaphosidae Banks, 1892
Genus *Gnaphosa* Latreille, 1804

Gnaphosa jodhpurensis **Tikader & Gajbe, 1977**
Figures 2–6

For a list of taxonomic references, see the WSC (2025).

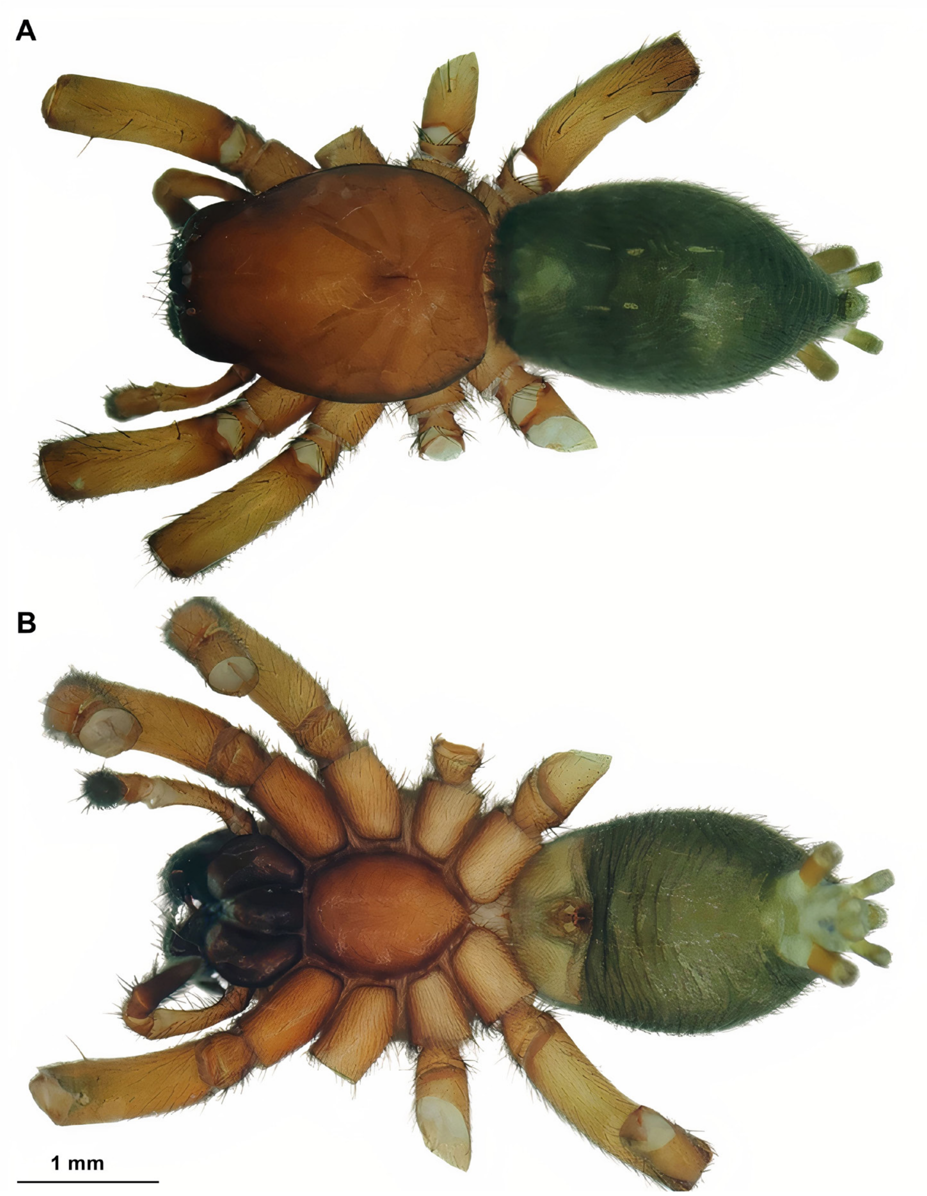

Figure 2. Female *Gnaphosa jodhpurensis*, habitus. **A.** Dorsal view. **B.** Ventral view.

Material examined. IRAQ — Karbala • Alwand; 32.65°N, 044.00°E; elev. 30 m; 26.XII.2024; under building rubble near agricultural land; 1 ♀, UOS-GJ-2024-01, GenBank MK154517.1 — Babylon • Al-Musayyib; 32.78°N, 044.30°E; elev. 28 m; 26.XII.2024; disturbed soil near farmland; 2 ♀, UOS-GJ-2024-02 — Dhi Qar • Al-Fuhud; 30.95°N, 046.50°E; elev. 17 m; 04.XII.2024; field margins and debris piles; 1 ♀, 1 juvenile ♀, UOS-GJ-2024-03.

The Iraqi female specimen was identified as *G. jodhpurensis* based on morphological similarities in the epigyne with the original type description from India (Figure 2A–C; cf. Tikader and Gajbe 1977). Molecular analysis of the COI gene revealed 99.7% similarity with a reference sequence from Pakistan (MK154238.1), confirming the morphological identification.

Redescription. Female. Body length 8.40 mm. Carapace 3.60 mm long, 2.95 mm wide. Abdomen 4.80 mm long, 3.15 mm wide. Carapace narrowing anteriorly; dorsally slightly convex; anteriorly bearing a V-shaped brown mark (Figure 3A). Sternum and coxae uniformly yellowish brown, finely set with short, brown hairs (Figure 3B). Endites and maxillae dark brown (Figure 3C). Posterior median eyes large and rounded; anterior median eyes smaller and closely set (Figure 3D). Chelicerae dark brown, with serrated keels; margins of keel strongly elevated (Figure 4A, B). Palps and legs reddish brown, without distinct markings. Leg measurements (in mm): I 13.80 (3.85, 1.35, 3.00, 3.60, 2.00), II 12.40 (3.90, 1.20, 2.80, 3.10, 1.40), III 12.50 (3.10, 1.00, 3.30, 3.20, 1.90), IV 15.90 (4.40, 1.30, 3.40, 4.50, 2.30).

Abdomen elongate-oval, moderately convex, clothed with fine, greenish setae giving velvety appearance; dorsum with three longitudinal pairs of chalky-white sigilla, posterior pair largest, extending toward spinnerets (Figure 4C). Venter pale, sparsely setose, without distinct patterning (Figure 2B). Spinnerets as in Figure 4D.

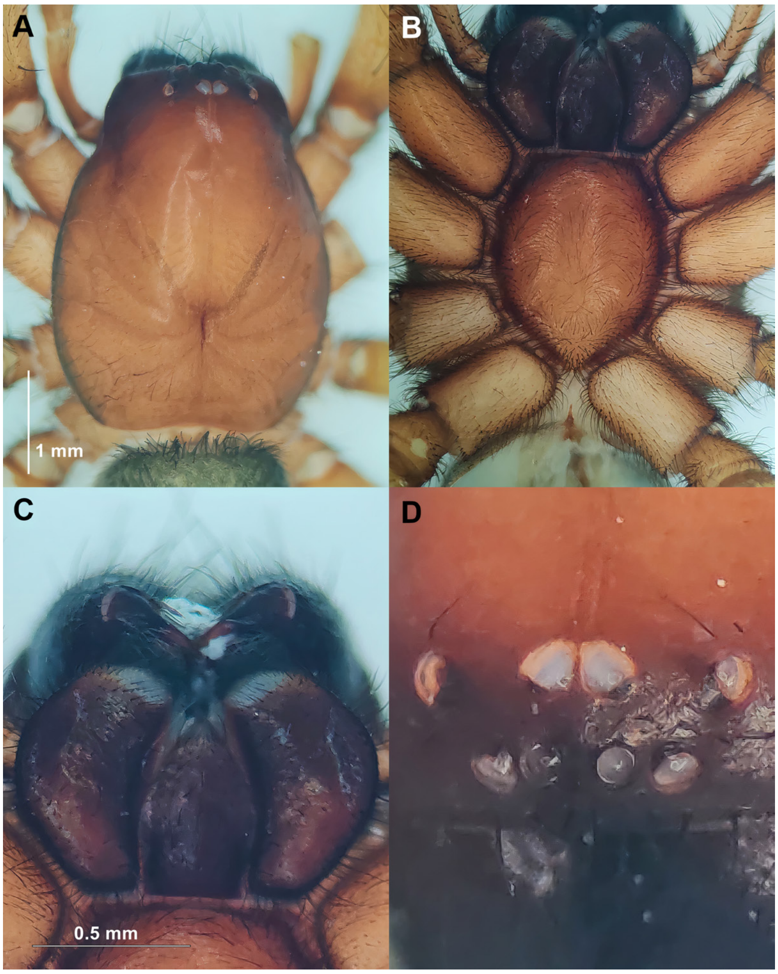

Figure 3. *Gnaphosa jodhpurensis*, female. **A.** Prosoma, dorsal view. **B.** Same, ventral view. **C.** Chelicerae and mouth parts, ventral view. **D.** Ocular region, anterodorsal view.

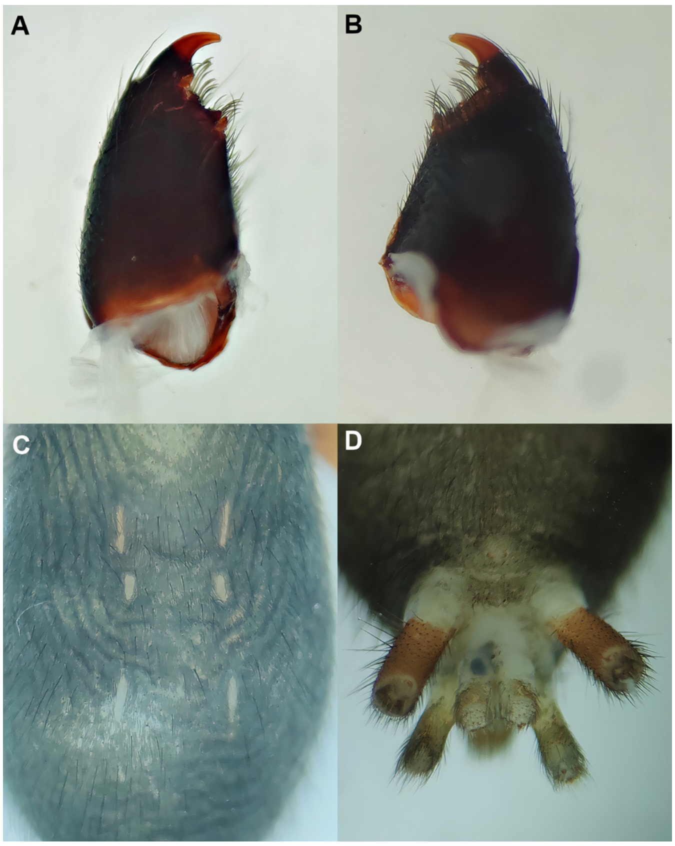

Figure 4. Chelicerae and somatic structures of *Gnaphosa jodhpurensis* female. **A.** Left chelicera, prolateral view. **B.** Right chelicera, retrolateral view. **C.** Abdominal sigilla. **D.** Spinnerets.

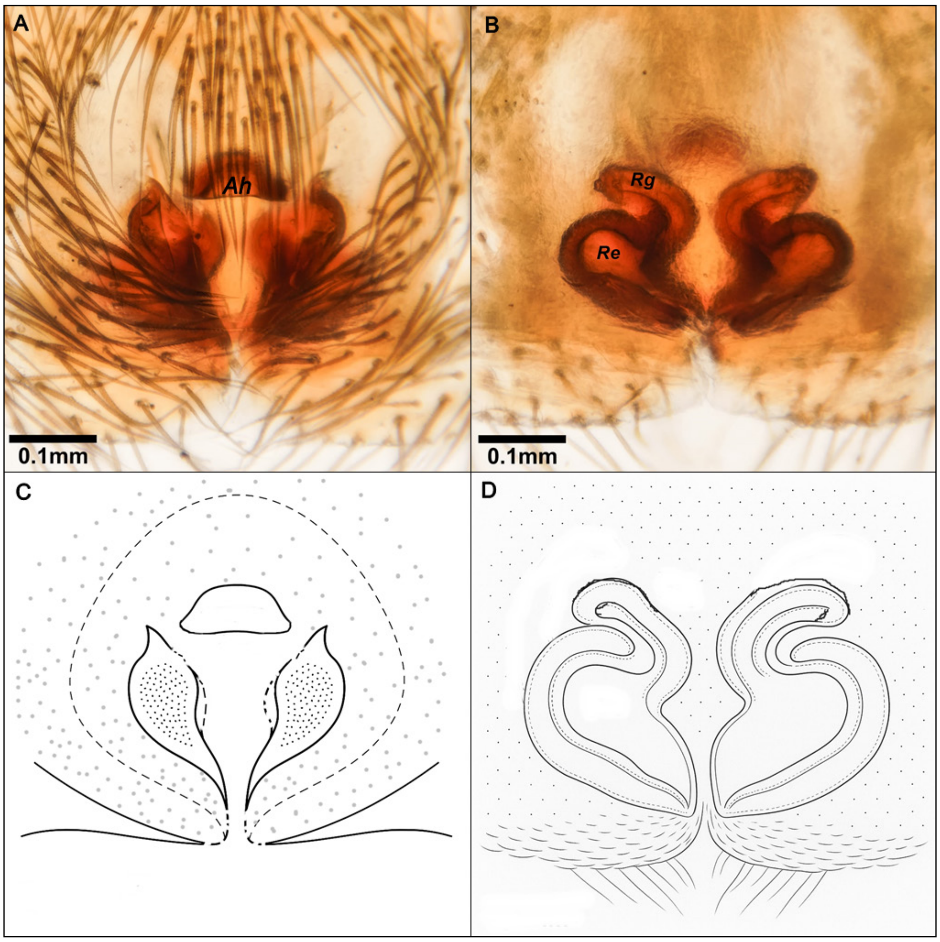

Figure 5. Epigyne and vulva of *Gnaphosa jodhpurensis* female. **A.** Epigyne, ventral view (Ah = anterior hood). **B.** Vulva, dorsal view (Re = receptacle; Rg = receptacle gland). **C.** Schematic illustration of epigyne, ventral view. **D.** Schematic illustration of vulva, dorsal view.

Epigyne as in Figure 5; scape large, about twice as wide as long, with concave posterior margin; anterior hood (*Ah*) distinctly narrowed behind; receptacles (*Re*) oval, obliquely elongated at about 40–50° to body axis, directed latero-posteriorly; glands (*Rg*) relatively long and slender, running parallel to the receptacles and laterally outward.

Male. See Gajbe (2005, 2007).

Distribution. The species was originally described from India (Tikader and Gajbe 1977) and subsequently reported from China (Song et al. 1999). Later, Ashfaq et al. (2019) provided molecular evidence supporting its occurrence in Pakistan. The present record from Iraq represents the first confirmed occurrence of *G. jodhpurensis* in the Middle East, significantly extending the species' known range westward into the Western Palearctic.

Behavioral observation. An unusual behavioral pattern was observed in a female individual of *G. jodhpurensis* reared in captivity. The spider gathered fine wood shavings and small twigs from the substrate of the rearing container, and subsequently wrapped them in silk. Following the completion of this construction, the female positioned herself inside the resulting cocoon-like tubular structure and remained hidden within it throughout the day. This behavior is interpreted as an adaptive retreat strategy, likely serving functions of camouflage or predator avoidance (Figure 6B).

Barcoding results. The mitochondrial cytochrome c oxidase subunit I (COI) gene was successfully amplified and sequenced from the examined specimen. The resulting 658 bp sequence was analyzed using the BLAST algorithm against the GenBank database. The top match was with *G. jodhpurensis* (voucher UOS-MTSPD-0118), with a similarity of 99.69% and 100% coverage, corresponding to GenBank accession number MK154517.1. This sequence originates from a published DNA barcode reference library for spiders from Pakistan (Tahir et al. 2019). The high sequence similarity confirms the molecular identity of the Iraqi specimen as *G. jodhpurensis* and supports the morphological identification. To determine the genetic affiliation of the Iraqi specimen, a phylogenetic tree was constructed using the maximum-likelihood method based on COI sequences from 13 *Gnaphosa* species and the outgroup (*Runcinia acuminata*) (EU168166)). The phylogenetic tree (Figure 7) clearly shows that the Iraqi specimens (in blue) cluster within a strongly supported clade (bootstrap = 99%) alongside two reference sequences of *G. jodhpurensis* from Pakistan.

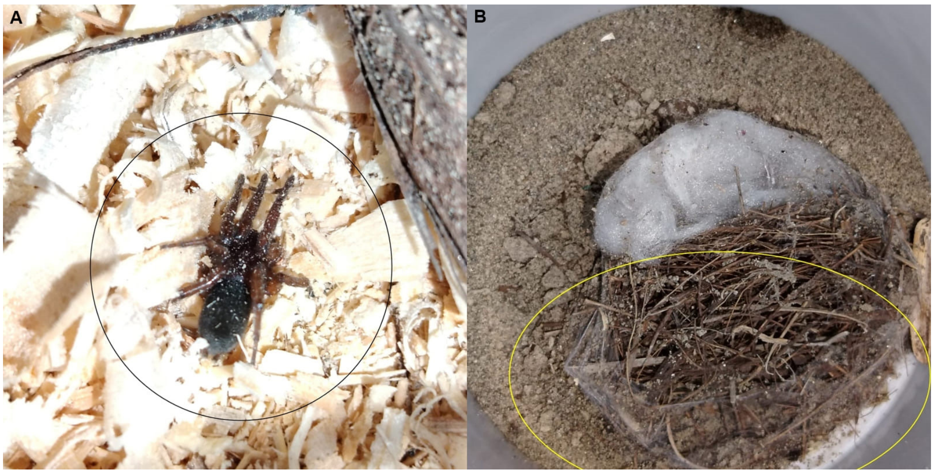

Figure 6. Retreat behavior of *Gnaphosa jodhpurensis* in the laboratory. **A.** Female constructing a tubular retreat using silk and wood shavings. **B.** Completed retreat with plant debris bound by silk threads.

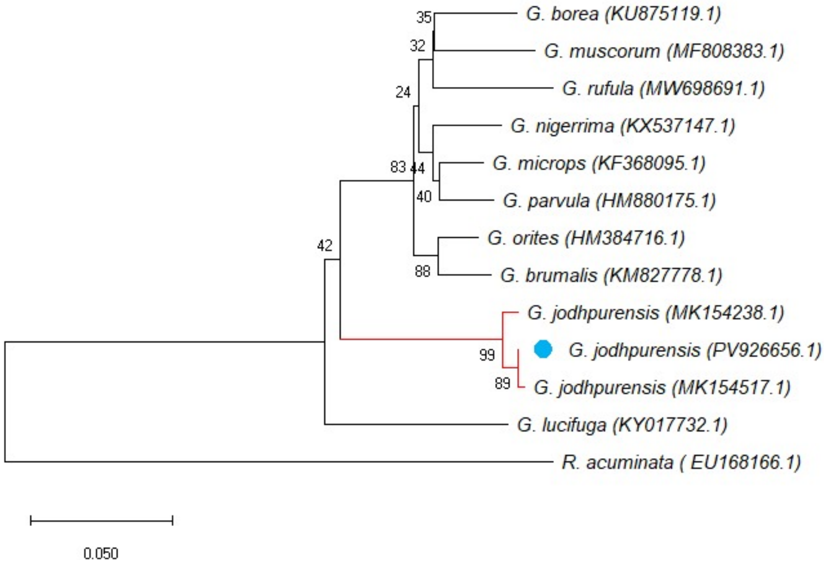

Figure 7. Maximum-likelihood phylogenetic tree based on COI sequences showing placement of the Iraqi specimen (dot blue) among other *Gnaphosa* species. Bootstrap values >30% shown at nodes. GenBank accession numbers are provided.

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ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

All applicable ethical standards for the field collection of non-endangered invertebrate species were followed. No protected or regulated taxa were involved in this study.

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Author contributions

Conceptualization: AMA. Fieldwork and specimen collection: TAAM. Morphological analysis: AMA. Molecular laboratory work: TAAM. Data interpretation: AMA, TAAM. Visualization and mapping: TAAM. Supervision: AMA. Writing – original draft: AMA, TAAM. Writing – review and editing: AMA.

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Data availability

All data supporting the findings of this study are provided within the main text and the Figure. The COI sequence has been submitted to GenBank under accession number [PV926656.1].

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