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## **A NEW *SCORPIO* (SCORPIONES, SCORPIONIDAE) SPECIES FROM NORTHERN IRAQ**

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**A new *Scorpio* (Scorpiones, Scorpionidae) species from Northern Iraq. Yağmur, E. A., Kachel, H. S., Hussen, F. S., Al-Khazali, A. M., Ali, F. R., Al-Jubouri, M. A. K., Hamad, I. I., Sdiq, A. B.** — *Scorpio assyriacus* sp. n., from northern Iraq is described illustrated and compared with all known species of the genus *Scorpio* Linnaeus, 1758, occurring in Turkey, the Middle East, and Iran. Aspects of the ecology and distribution of the new species are discussed and compared with those of other closely related *Scorpio* species from nearby localities in Turkey. The new species can be distinguished by its reduced number of pectinal teeth, the cardinal-triangular configuration of the genital operculum (which is not posteriorly elongated in females), a more hirsute body, globular vesicle, flattened and discrete granules on the external surface of the chela manus, and significantly longer chela fingers compared to other species. With this discovery, the total number of documented scorpion species in Iraq has reached 23.

Key words: Mesopotamia, endemic, fauna, description, taxonomy.

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## Introduction

The genus *Scorpio* is distributed across Africa, the Middle East, Turkey, and Iran (Prendini et al., 2003; Fet, 2000; Kovařík, 2009; Lourenço & Cloudsley-Thompson, 2012; Lourenço & Rossi, 2016; Yağmur et al., 2024). It currently includes 28 species and 5 subspecies, ranging from Morocco to Iran (Abu Afifeh et al., 2024; Fet, 2000; Rein, 2025; Yağmur et al., 2024). Historically, *Scorpio* was considered a monotypic genus, with *Scorpio maurus* Linnaeus, 1758 as its only species believed to be highly polymorphic. For nearly two centuries, many populations were described as subspecies of *S. maurus* (Birula, 1910; Vachon, 1952; Kovařík, 2009). In recent years, most of these subspecies have been elevated to full species status (Lourenço, 2009; Talal et al., 2015). However, some taxa, such as *S. maurus arabicus* (Pocock, 1900) and *S. maurus townsendi* (Pocock, 1900), still require further taxonomic revision.

The *Scorpio* fauna of Africa has been extensively studied by many researchers (e. g., Birula 1910; Vachon, 1952; Lourenço & Cloudsley-Thompson, 2009, 2012; Lourenço et al., 2012; Lourenço & Rossi, 2016; Kovařík, 2009; Khammassi et al., 2023; Ythier & François, 2023; Ythier et al., 2024). In contrast, information on the distribution and taxonomy of *Scorpio* in the Middle East, Iran, and Turkey remains limited and relatively unclear, with many populations still attributed to *Scorpio maurus*. Only a few studies have investigated *Scorpio* species in these regions. The following species have been reported: *S. fuscus* (Ehrenberg, 1829), *S. kruglovi* Birula, 1910, *S. palmatus* (Ehrenberg, 1828), *S. propinquus* (Simon, 1872), *S. yemenensis* Werner, 1936, *S. maurus arabicus* (Pocock, 1900), and *S. maurus townsendi* (Pocock, 1900) (Birula, 1910; El-Hennawy, 1992; Fet, 2000; Levy & Amitai, 1980; Kovařík, 2009; Koç et al., 2017; Talal et al., 2015). Although *S. propinquus* was considered valid by Talal et al. (2015), it was recently suggested to be a *nomen dubium* by Abu Afifeh et al. (2024).

Recently, four significant studies have contributed to the clarification of *Scorpio* systematics. As a result, a new genus (*Jordanius*) and several new species, including *J. granulomanus*, *J. maysaraensis*, *S. jordanensis*, *S. karakurti*, *S. sirnakensis*, and *S. wahbehi*, have been described from Jordan and Turkey (Abu Afifeh et al., 2024; Al-Saraireh et al., 2023; Yağmur et al., 2024).

The first record of *Scorpio* in Iraq was provided by Simon (1880) from Nineveh Province (Mosul), where the specimen was identified as *Heterometrus maurus*. Birula (1910), in his revision of *S. maurus* and its subspecies, did not examine Simon's material but suggested it likely belonged to *S. kruglovi*. Penther (1912) recorded *S. maurus* var. *testaceus* from Iraq, although this subspecies had already been synonymized by Birula (1910).

Later records include *S. maurus kruglovi* from Dohuk Province (Aqra) by Whittick (1955) and Pringle (1960), and from Erbil Province (Rawandiz), Nineveh Province (Tal Afar), and Al-Anbar Province (Al-Rutba) by Pringle (1960). *S. maurus fuscus* was also recorded by Pringle (1960) from Dohuk (Sarsing) and Baghdad Provinces. Additional reports of *S. maurus* include those by L.Khalaf (1962) and K.Khalaf (1963) from Al-Anbar (Al-Rutba) and Diyala (Abu Sayda), Ahmed (2015) from Erbil, Al-Azawi (2016) from Najaf (Al-Mishkhab), Mohammad et al. (2017) from Erbil, Kachel (2020) from Dohuk (Zakho), Hussen & Ahmed (2020) from Sulaymaniyah, Erbil, and Nineveh, and Al-Yacoub et al. (2021) from Dhi Qar Province.



**Fig. 1.** *Scorpio assyriacus* sp. n., habitus. *a–c* — dorsal views; *b–d* — ventral views; *a, b* — holotype ♂; *c, d* — paratype ♀. Scale bar: 10 mm

In this study, *Scorpio* populations from northern Iraq (Dohuk, Erbil, and Nineveh Provinces) were reviewed, and a new species, *Scorpio assyriacus* sp. n., is described.

## Material and Methods

The specimens were collected during the daytime using hand collection under stones and the burrow-digging technique in the provinces of Duhok, Erbil, and Nineveh. They were preserved in 96% ethanol. Photographs were taken using a Canon EOS 7D camera, and image stacking was performed with Helicon Focus software. The focus stacking method was adapted from the Canon-Cognisys system, as recommended by Brecko et al. (2014). Trichobothrial nomenclature follows Vachon (1974), while morphological terminology and measurements follow Francke (1977), Soleglad & Sissom (2001), Stahnke (1971), Sissom (1990), and Hjelle (1990).

### Depositories:

AZMM — Holotypes and paratypes were deposited in the Zoology Museum of Alaşehir Vocational School, Manisa Celal Bayar University, Manisa, Turkey.

## Results

Family **Scorpionidae** Latreille, 1802

Genus ***Scorpio*** Linnaeus, 1758

Type species: ***Scorpio maurus*** Linnaeus, 1758

***Scorpio assyriacus*** Yağmur, Kachel, Hussen, Al-Jubouri, Al-Khazali, sp. n. (Figs 1–9, Table 1)

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Type material. Holotype ♂: Duhok, Zakho, Telkaber, 37°09'55" N 42°42'39" E, 473 m, 10.08.2018, leg. H. S. Kachel (AZMM/Sco-2018:228). Paratypes (11 ♂, 45 ♀ and 16 juveniles). Iraq, Duhok, Bardaresh, Dolejan, 36°34'58" N, 43°33'58" E, 342 m, 14.08.2023, 2 ♀, leg. H. S. Kachel & F. R. Ali (AZMM/Sco-2023:19-20). Ibid. 05.08.2023, 3 ♀ (AZMM/Sco-2023:21-23). Duhok, Zakho, Avagane, 37°10'53" N, 42°55'00" E, 766 m, 30.08.2020, 1 juv., leg. H. S. Kachel & F. R. Ali (AZMM/Sco-2020:200). Duhok, Zakho, Betas, 37°03'34" N, 42°44'02" E, 698 m, 21.08.2020, 5 ♂, 6 ♀, 3 juv., leg. H. S. Kachel & F. R. Ali. (AZMM/Sco-2020:201-214). Duhok, Zakho, Demka, 37°13'02" N, 43°04'41" E, 872 m, 19.08.2020, 3 ♀, leg. H. S. Kachel & F. R. Ali (AZMM/Sco-2020:215-217). Duhok, Zakho, Dashte Bosel, 37°12'37" N, 42°54'00" E, 1088 m, 18.08.2023, 5 ♀, 1 juv., leg. H. S. Kachel & F. R. Ali (AZMM/Sco-2023:24-29). Duhok, Zakho, Dashte Nordinjalal, 37°13'47" N, 42°48'14" E, 786 m, 01.08.2023, 5 ♀, 2 juv., leg. H. S. Kachel & F. R. Ali (AZMM/Sco-2023:30-36). Duhok, Zakho, Greksindi, 37°10'48" N, 42°46'56" E, 542 m, 24.08.2020, 1 ♀, leg. H. S. Kachel & F. R. Ali (AZMM/Sco-2020:218). Duhok, Zakho, Ibrhim Khalel, 37°08'14" N, 42°34'01" E, 410 m, 20.08.2020, 1 ♂, leg. H. S. Kachel & F. R. Ali (AZMM/Sco-2020:219). Duhok, Zakho, Sharansh, 37°13'43" N, 42°50'48" E, 1048 m, 29.08.2020, 2 ♀, leg. H. S. Kachel & F. R. Ali (AZMM/Sco-2020:220-221). Duhok, Zakho, Telkaber, 37°09'55" N 42°42'39" E, 473 m, 10.08.2018. 3 ♂, 7 ♀, 1 juv., leg. H. S. Kachel (AZMM/Sco-2018:229-240). Ibid. 20.08.2023, 1 ♀ (AZMM/Sco-2023:37). Ibid. 29.08.2023, 2 ♂, 1 ♀, 4 juv. (AZMM/Sco-2023:38-44). Ibid. 22.08.2020, 3 ♀ (AZMM/Sco-2020:222-224). Erbil Province,

Table 1. Comparative measurements of *Scorpio assyriacus* sp. n. male holotype and female paratype. Abbreviations: length (L), width (W), depth (D)

Dimensions (mm)	Parameters	<i>Scorpio assyriacus</i> sp. n.	
		♂, holotype	♀, paratype
Carapace	L / W	8.95 / 9.15	9.76 / 9.87
Mesosoma	L	22.16	30.06
Tergite VII	L / W	4.02 / 7.03	5.88 / 9.44
Metasoma + telson	L	31.75	31.54
Segment I	L / W / D	3.40 / 4.41 / 3.64	3.39 / 4.97 / 3.91
Segment II	L / W / D	4.19 / 4.02 / 3.67	4.04 / 4.03 / 3.58
Segment III	L / W / D	4.61 / 3.90 / 3.39	4.60 / 3.94 / 3.41
Segment IV	L / W / D	5.59 / 3.72 / 2.34	5.47 / 3.55 / 3.22
Segment V	L / W / D	7.10 / 3.25 / 2.60	7.23 / 3.24 / 2.96
Telson	L / W / D	6.86 / 3.27 / 2.69	6.98 / 3.56 / 2.86
Vesicle	L	5.17	5.20
Aculeus	L	2.02	2.12
Pedipalp	L	24.15	25.13
Femur	L / W	5.90 / 2.68	4.60 / 2.99
Patella	L / W	6.23 / 2.98	6.91 / 3.15
Chela	L	12.22	13.84
Manus	L / W / D	6.41 / 4.29 / 8.48	6.95 / 4.83 / 8.22
Movable finger	L	7.44	8.92
Total	L	62.86	71.36

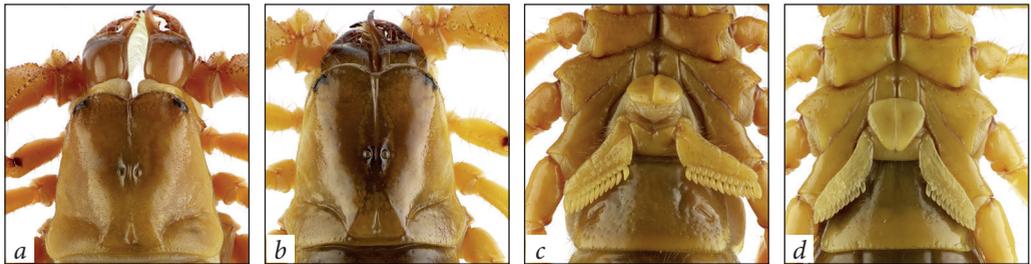


**Fig. 2.** *Scorpio assyriacus* sp. n. *a-c* — male holotype; *b-d* — female paratype; *a, b* — carapace and mesosoma in dorsal view; *c, d* — mesosoma ventral and sternopectinal area

Makhmour, Mount Makhmour, 35°46'24" N, 43°37'55" E, 467 m, 01.10.2023, 4 ♀, 1 juv., leg. F. S. Hussien, I. I. Hamad & A. Burhan (AZMM/Sco-2023:45-49). Ibid. 01.11.2023, 1 ♀, 2 juv. (AZMM/Sco-2023:50-52). Nineveh Province, Mosul, Qayyarah, 36°16'28" N, 43°03'51" E, 306 m, 11.07.2023, 2 ♀, 1 juv., A. M. Al-Khazali, M. A. K. Al-Jubouri (AZMM/Sco-2023:53-55).

**Etymology.** This species is named after “Assyria,” a kingdom that existed from the 21st century BC to the 7th century BC and was established in northern Mesopotamia, the region that includes the type locality of the new species.

**Diagnosis** (♂, ♀). A large-sized species compared with its congeners (62.86 mm in males, 71.36 mm in females; see Table 1). Trichobothriotaxy is of type C; orthobothriotaxic (Vachon, 1974). General coloration dark yellow in males and olive yellow in females. The carapace shagreened in males, but smooth and lustrous in females. Pectines short, with 9–13 teeth in males (usually 11–12;  $n = 20$ ; mean = 10.23) and 8–13 in females (usually 10–12;  $n = 93$ ; mean = 10.49). The genital operculum ovoid in males, and cardioid-triangular or cardioid-pentagonal in females, with distinctly rounded posterior sclerite tips. The pedipalp femur bears three carinae, and the patella has two. The external surface of the chela manus bears large and flattened granules in males, while in females



**Fig. 3.** *Scorpio assyriacus* sp. n., carapace and sternopectinal area. *a-c* — male holotype; *b-d* — female paratype; *a, b* — carapace; *c, d* — sternopectinal area



Fig. 4. *Scorpio assyriacus* sp. n., variations in shape of genital operculum in female paratypes

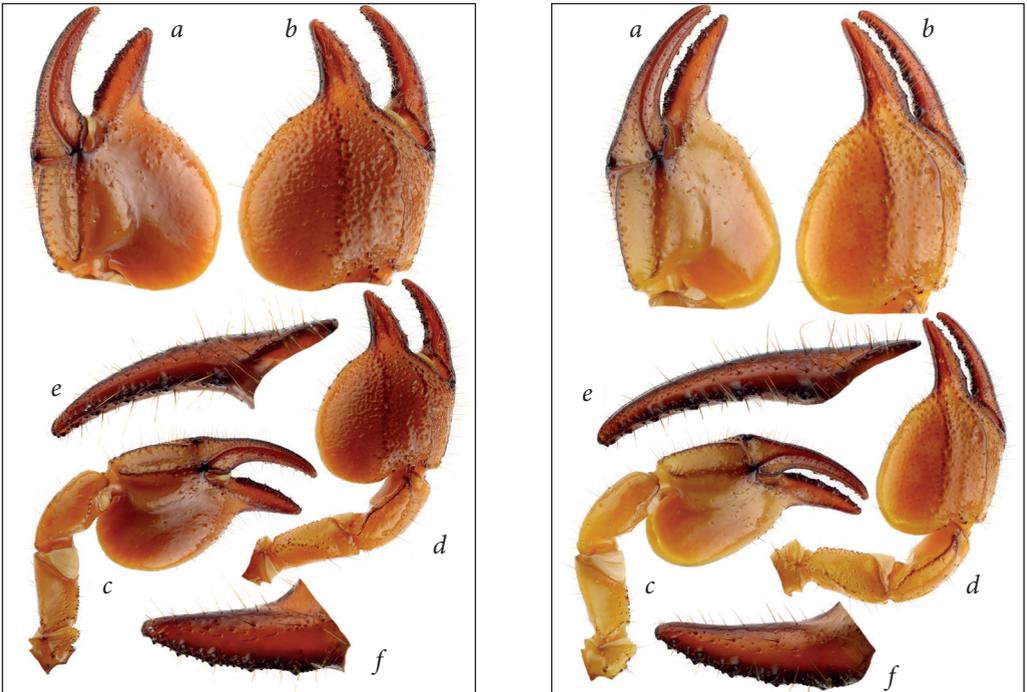


Fig. 5. *Scorpio assyriacus* sp. n., pedipalp segments of male holotype. *a* — chela ventral view; *b* — chela dorsal view; *c* — pedipalp ventral view; *d* — pedipalp dorsal view; *e* — movable fingers dentition; *f* — fixed fingers dentition

Fig. 6. *Scorpio assyriacus* sp. n., pedipalp segments of female holotype. *a* — chela ventral view; *b* — chela dorsal view; *c* — pedipalp ventral view; *d* — pedipalp dorsal view; *e* — movable fingers dentition; *f* — fixed fingers dentition

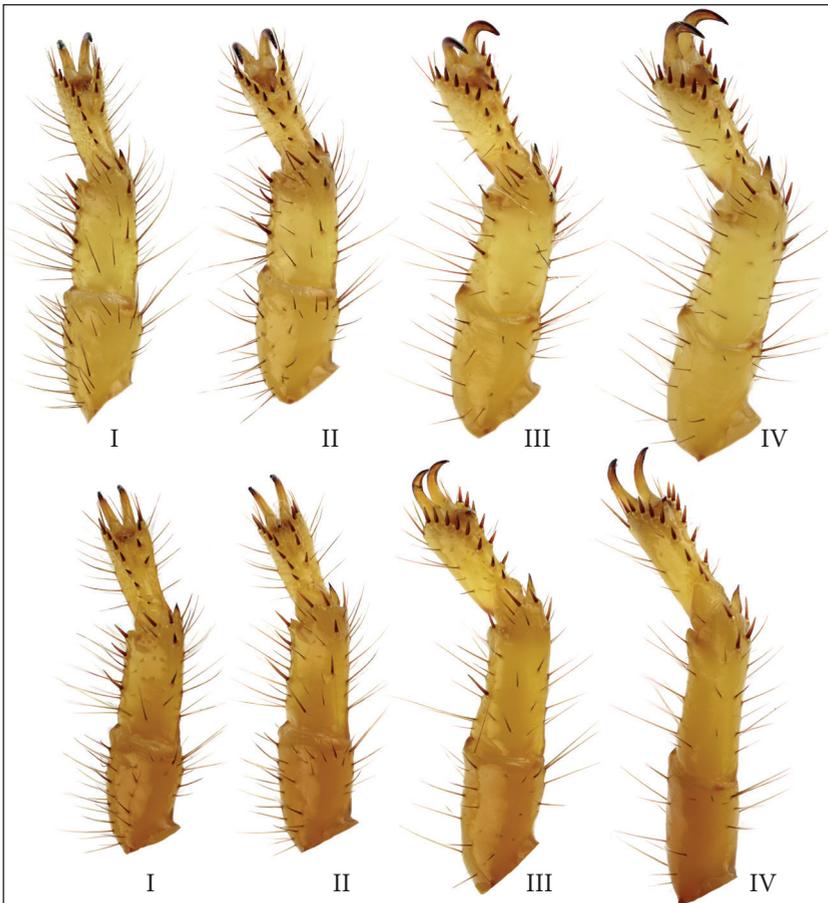


**Fig. 7.** *Scorpio assyriacus* sp. n., metasoma and telson. *a, c, e* — male holotype; *b, d, f* — female paratype; *a, b* — ventral views; *c, d* — dorsal views; *e, f* — lateral views

the granules very flattened; the posterior internal area nearly smooth in both sexes. The internal surface of the chela manus smooth. External secondary carinae distinct in males, bearing coarse and very flattened granules that are fused posteriorly; in females, they are obsolete and indistinct posteriorly but visible and smooth anteriorly. The chela manus flattened, not elongated, and shorter than its depth (manus length/depth ratio: 0.75 in males, 0.84 in females). Chela fingers relatively short and lack granules in males, while in females they are elongated; the manus shorter than the movable finger (manus/movable finger ratio: 0.86 in males, 0.77 in females). Fixed and movable fingers possess five and four strong accessory denticles, respectively. The intercarinal surfaces of the manus and fingers bear moderately dense, moderately to strongly developed setae (Figs 5, *b*; 6, *b*). The tarsi of legs I–IV bear 4–5/6–8, 5–6/7–9, 6–7/7–9, and 6–7/7–11 internal/external spines arranged in series (Fig. 9). Tergites I–VII acarinate. Tergites I–IV matt and shagreened in males, and smooth and lustrous in females. Metasomal segment I slightly wider than long; metasomal segment II slightly longer than wide; metasomal segments III–V longer than wide. From segment I to V, segment length increases, while width and depth decrease. Segment I bears 10 carinae; segments II–IV each bear 8; and segment V bears 7. Ventral submedian and ventrolateral carinae strong and serratogranular in

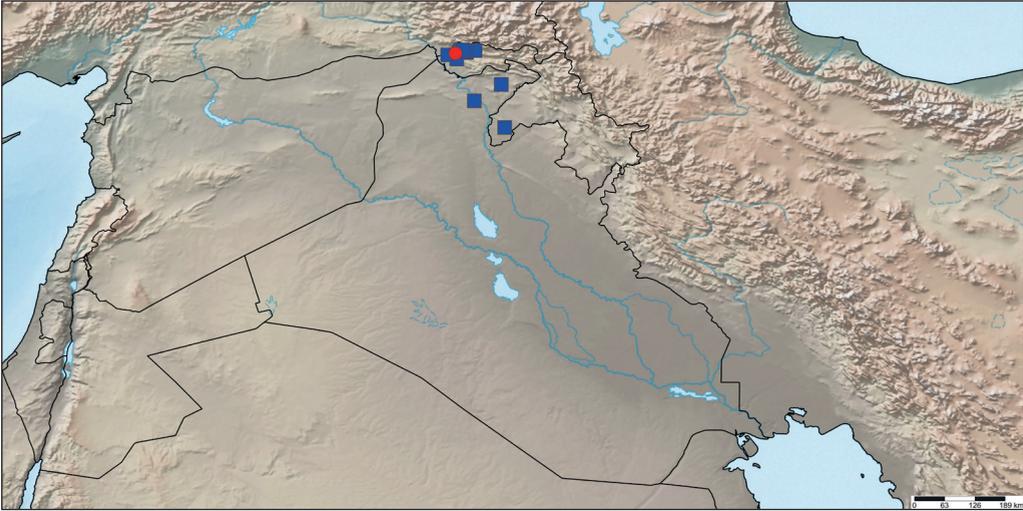


**Fig. 8.** *Scorpio assyriacus* sp. n., metasomal segment V and telson. *a, c* — male holotype; *b, d* — female paratype; *a, b* — lateral views; *c, d* — ventral views



**Fig. 9.** *Scorpio assyriacus* sp. n., right legs I–IV of male holotype (top) and female paratype (bottom)

males, and strong with moderate, rounded granules in females on segments I–II. On segment V, ventrolateral carinae strong and distinctly dentate, with spaced, large, conical granules increasing in size posteriorly and extending laterally into the anal arch. The vesicle bulbous in males and globular in females; the aculeus short, abruptly curved, and possesses four ventral carinae formed by spinoid granules, which more distinct in males.



**Fig. 10.** A map of distribution *Scorpio assyriacus* sp. n. Red circle, type locality; blue squares, localities.

The telson and vesicle slightly more elongated in males than in females (telson length/depth ratio: 2.55 in males, 2.44 in females). The aculeus shorter than the vesicle (vesicle/aculeus ratio: 2.55 in males, 2.45 in females) (Fig. 8, a, b).

**Affinities**

(a) *Scorpio assyriacus* sp. n. can be differentiated from other *Scorpio* species based on its coloration (see Table 2).

(b) Differences in the number of pectinal teeth between *S. assyriacus* sp. n. and other known *Scorpio* species from the Middle East, Iran, and Turkey are presented in Table 3.

(c) *S. assyriacus* sp. n. has a short and abruptly curved aculeus, whereas *S. kruglovi* and *S. wahbehi* possess an elongated and gradually curved aculeus.

**Table 2. Comparative colorations of *Scorpio assyriacus* sp. n. and known species of *Scorpio* species in the Middle East and Turkey**

Species	Male Coloration	Female Coloration	References
<i>S. assyriacus</i> sp. n.	Dark yellow	Olive yellow	This study
<i>S. fuscus</i>	Dark brown/Greenish black	Dark brown/Greenish black	Abu Afifeh et al., 2024
<i>S. karakurti</i>	Reddish yellow	Reddish brown	Yağmur et al., 2024
<i>S. jordanensis</i>	Light reddish yellow	Light reddish yellow	Abu Afifeh et al., 2024
<i>S. sirnakensis</i>	Dark yellow	Reddish brown	Yağmur et al., 2024
<i>S. kruglovi</i>	Brownish yellow	Yellowish red	Birula, 1910; Abu Afifeh et al., 2024
<i>S. palmatus</i>	Light olive brown to yellow	Light olive brown to yellow	Abu Afifeh et al., 2024; Yağmur & Badry, 2024
<i>S. wahbehi</i>	Reddish yellow to olive brown	Reddish brown to reddish black	Abu Afifeh et al., 2024

(d) *S. assyriacus* sp. n. exhibits a globular vesicle, while *S. kruglovi* and *S. wahbehi* have elongated vesicles. In contrast, *S. karakurti* and *S. sirnakensis* possess somewhat elongated vesicles.

(e) The posterior tips of the sclerites of the genital operculum are distinctly rounded in females of *S. assyriacus* sp. n., whereas they are elongated in females of *S. karakurti* and *S. sirnakensis*.

(f) *S. assyriacus* sp. n. has longer chela fingers and a more elongate manus (manus length/depth ratio = 0.75 in males, 0.84 in females; manus/movable finger ratio = 0.86 in males, 0.77 in females) compared to *S. sirnakensis* (manus length/depth ratio = 1.08 in males, 1.21 in females; manus/movable finger ratio = 1.15 in males, 1.04 in females) and *S. karakurti* (manus length/depth ratio = 1.04 in males, 1.16 in females; manus/movable finger ratio = 1.07 in males, 1.10 in females).

(g) *S. assyriacus* sp. n. is moderately hirsute, bearing stout and long setae, while *S. sirnakensis* and *S. karakurti* are more sparsely hirsute and have shorter setae.

(h) *S. assyriacus* sp. n. is a large-sized species compared to its congeners (62.86 mm in males, 71.36 mm in females), whereas *S. jordanensis* (53.54 mm in males, 56.90 mm in females; Abu Afifeh et al. 2024), *S. karakurti* (50.47 mm in males, 49.67 mm in females; Yağmur et al. 2024), *S. palmatus* (50.29 mm in males, 49.63 mm in females; Abu Afifeh et al. 2024), and *S. sirnakensis* (49.56 mm in males, 48.26 mm in females; Yağmur et al. 2024) are medium-sized species within the genus.

**Description.** The description is based on the ♂ holotype and ♀ paratypes. The total length of the holotype is 79.72 mm. Measurements are provided in Table I.

**Coloration.** Prosoma. The carapace brownish black in males, and pale brownish black to dark reddish-brown in females; carinae and granules black. The area between and surrounding the median eyes shows distinct black pigmentation. Furrows dark brown. Chelicerae. The manus shiny brown with dark brown reticulated spots; fingers dark brown to dark reddish, and the teeth red with reddish-black apices (Fig. 3, a, b). Pedipalps. The femur and patella brownish black dorsally and reddish black ventrally. Carinae and granules blackish brown. The chela manus lustrous dark reddish-brown with blackish reticulations in males, and reddish-brown with dark brown reticulations in females. The fingers blackish brown posteriorly and dark yellow anteriorly in males, and reddish black posteriorly and reddish yellow anteriorly

**Table 3. Comparative pectinal teeth numbers of *Scorpio assyriacus* sp. n. and known species of *Scorpio* species in the Middle East, Iran and Turkey**

Species	Male (Range)	Female (Range)	Reference
<i>S. assyriacus</i> sp. n.	9–13	8–13	This study
<i>S. karakurti</i>	11–15	10–11	Yağmur et al., 2024
<i>S. sirnakensis</i>	8–13	9–11	Yağmur et al., 2024
<i>S. fuscus</i>	9–11	6–10	Levy & Amitai, 1980
<i>S. maurus townsendi</i>	16–16	12–12	Birula, 1910
<i>S. propinquus</i>	–	14–14	Simon, 1872
<i>S. palmatus</i>	9–13	7–13	Levy & Amitai, 1980; Talal et al., 2015
<i>S. kruglovi</i>	12–13	9–12	Birula, 1910
<i>S. jordanensis</i>	10–13	9–13	Abu Afifeh et al., 2024
<i>S. wahbehi</i>	12–15	10–13	Abu Afifeh et al., 2024

in females. Denticles reddish black (Figs 5, *e, f*; 6, *e, f*). Legs. Tarsi olive yellow; basitarsus and pretarsus light yellowish-brown with brown reticulated spots; the remaining leg segments reddish-brown (Figs 1, 9). Mesosoma. Dark reddish-brown to brownish black in males, pale brownish black in females. Sternites III–V lustrous, dark yellowish-brown, and exhibit dark yellow coloration medially and posteriorly in males; in females, these sternites dark reddish-brown with reddish-yellow medial and posterior areas. Sternite VI dark brown to blackish brown with a dark yellow band along the posterior margin in males, and pale brown in females. Sternite VII dark brown to blackish brown in males and pale brown in females. Coxae dark reddish brown with black carinae. Pectines pale yellow with light brown spots (Fig. 3, *c, d*). Metasoma. Segments I to V dark reddish brown, with carinae and granules bearing dark brown or black pigmentation. The vesicle reddish black with reddish-brown dorsal and lateral furrows; the aculeus reddish brown at the base and black at the tip (Fig. 8, *a, b*).

**Morphology.** Prosoma (Fig. 3, *c, d*). The carapace slightly wider than long and nearly trapezoidal in shape. Its anterior margin distinctly bilobed with a deep median indentation, a few medium and large setae, and slightly pitted. No distinct carinae present, though the posteromedian carinae faintly visible, more so in females. The surface shagreened overall; however, the anteromedian areas slightly granulated. Interocular triangle nearly smooth, except for granules along the anteromedian furrow in males. In females, the carapace smooth and lustrous with small, flattened granules laterally and posterolaterally. The median ocular tubercle indistinct and located slightly anterior to the center. There one pair of median eyes and three pairs of lateral eyes, with the third pair being slightly smaller and positioned separately. Median eyes separated by approximately one ocular diameter. The anteromedian furrow narrow, deep, and suturiform. The posteromedian furrow broad and deep, bifurcated in an inverted T-shape at the posterior edge, forming an arrow-shaped depression between the posteromedian carinae and posterior margin. Posterior lateral furrows wide and distinct. Coxae and trochanters smooth and shiny. Genital operculum ovoid in males, with slightly pointed posterior sclerite tips. In females, the genital operculum cardioid-triangular or cardioid-pentagonal in shape; the anterior margin slightly convex, and the posterior margin has a median indentation. Sclerites fused and posteriorly rounded (Fig. 3, *c, d*). Pectines short. Tooth count. 12 in the male holotype, 8–12 in females. There are three marginal and 5–6 median lamellae (Fig. 3, *c, d*). Stigmas linear, conspicuous, and angled at approximately 45°. Chelicerae (Fig. 3, *a, b*). Dentition typical for Scorpionidae (Vachon, 1963). The manus lustrous and lacks longitudinal ridges anteriorly. Pedipalp (Figs 5–6). The femur bears three carinae; dorsointernal and ventrointernal carinae moderate with spaced rounded granules, while dorso-external carina strong with coarse, separated granules. The ventral intercarinal surface scattered with minute granules; dorsally, several medium-sized, flattened granules present. Distinct setae are scattered across the intercarinal areas. The patella has two carinae; the dorsomedian carina strong and nearly smooth, and the ventrointernal carina moderate with a few flattened granules. The dorsal, ventral, and external intercarinal areas smooth and lustrous; the internal surface finely granular, with scattered distinct setae. The external surface of the chela manus

bears large, flattened granules in males, which are even more flattened in females. Anterior granules more distinct and rounded, while the posterior interior surface in males nearly smooth; in females, it almost entirely smooth. The posterior margin bears large, rounded granules. The internal surface smooth; in males, the posterior two-thirds lack granules, while the anterior one-third has several pointed granules. In females, granules minute and sparse. Ventroexternal and ventrointernal carinae strong, rounded, and smooth. The digital carina weak but bears large, flattened granules in males, and smooth posteriorly in females. The subdigital carina indistinct, represented by very flattened, fused granules on the posterior half of the manus in males, and nearly smooth and barely visible in females. The external secondary carina distinct and bears coarse, flattened granules that are fused posteriorly in males. In females, it is obsolete posteriorly and smooth anteriorly. The digital and external secondary carinae nearly parallel. The chela manus flattened and not elongated, shorter than its depth (manus length/depth ratio: 0.75 in males, 0.84 in females). The chela fingers relatively short and lack granules in males, but elongated in females; the manus shorter than the movable finger (manus/movable finger ratio: 0.86 in males, 0.77 in females). Both fixed and movable fingers have five principal rows of denticles, and the fixed finger has four strong accessory denticles. The manus and fingers bear moderately dense, distinct setae. Trichobothriotaxy conforms to type C, orthobothriotaxic (Vachon, 1974). Legs (Fig. 9). The internal and external spine series of the tarsi arranged as follows in the holotype male: right legs I to IV with 4/8, 5/8, 6/8, and 7/9 spines, and left legs I to IV with 4/7, 5/8, 6/8, and 6/9 spines.

Mesosoma (Fig. 2). Tergites I–VII acarinate. Tergites I–IV matte and shagreened in males with sparse, minute granules on the posttergites; in females, these are smooth and lustrous, with flattened granules on the posttergites. Posterior margins of tergites I–IV in females bear a row of spaced, flattened granules. Tergite VII rough and finely granular in males with moderately dense, coarse subspinoid granules; in females, it is smooth and lustrous with moderately dense, coarse, rounded granules laterally. Sternites III–VI smooth with margins bearing distinct setae. In males, sternites III punctate with scattered setae; sternites III–VI wrinkled with a few distinct furrows. In females, they are smooth, lustrous, with furrows and scattered setae. Sternite VII has four granular carinae, with a granular area between the submedian carinae; the surface smooth in both sexes.

Metasoma and Telson (Figs 7–8). Segments I slightly wider than long; II slightly longer than wide; III–V progressively longer and narrower. Segment I has 10 carinae, II–IV have 8, and V has 7. Lateral inframedian carinae complete but indistinct on segment I. Ventral submedian and ventrolateral carinae strong and serrato-granular in males; strong with moderate, rounded granules in females on segments I–II; obsolete and slightly bumpy on segments III–IV. Dorsolateral carinae strong with small, spaced, spinoid granules on segments I–IV. Lateral supramedian carinae moderate on segments II–IV, obsolete on I, and bear small, serrated granules. Lateral and ventral surfaces smooth and lustrous with scattered minute granules; only the ventral submedian area on segment I bears moderate granules. Dorsal surfaces smooth medially and finely granular laterally in males; smooth in females (segments I–IV). Segment V: The ventromedian carina moderate with coarse, con-

ical granules and bifurcated anteriorly. Ventrolateral carinae strong and distinctly dentate with large, conical granules that increase posteriorly and continue onto the lateral aspect of the anal arch. Lateral inframedian carinae indistinct and smooth on the posterior half. Dorsolateral carinae moderate, rounded, and bear minute pointed granules. Lateral and ventral surfaces smooth and lustrous with scattered granules; ventral surfaces smooth medially and finely granular laterally in males, with more flattened granules in females. The ventral side of the anal arch serrate with pointed denticles. Segments I–V bear moderate coverage of long, distinct setae ventrally and laterally. Telson: The vesicle bulbous in males and globular in females. The aculeus short and abruptly curved, with four ventral carinae formed by spinoid granules, more prominent in males. Telson and vesicle slightly more elongate in males (telson length/depth ratio: 2.55 in males, 2.44 in females). The ventral surface of the vesicle has two furrows. The dorsal surface smooth; lateral surfaces rough with numerous macrosetae. The aculeus shorter than the vesicle (vesicle/aculeus ratio: 2.55 in males, 2.45 in females).

**Habitat.** These fossorial scorpions exhibit a preference for specific soil conditions, favoring areas with minimal root density and low rock content that facilitate efficient burrow construction. Consequently, they are predominantly found in open plains with sparse vegetation. This habitat preference is critical to their survival, as it allows the formation of complex burrows that offer shelter and protection, while also providing a stable microenvironment that buffers against extreme fluctuations in temperature and humidity.

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