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A New Species of the Medically Important Scorpion Genus *Hemiscorpius* Peters, 1861 (Hemiscorpiidae Pocock, 1893) from Kurdistan, Iraq

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Abstract

The scorpion genus *Hemiscorpius* Peters, 1861 is renowned for its medically important species, particularly *Hemiscorpius lepturus* Peters, 1861, the type species of the genus and only species previously recorded in Iraq. However, the scorpion diversity of the rugged, arid landscapes of the Kurdistan Region, especially Erbil Governorate, in northern Iraq, remains largely unknown. Extensive fieldwork in Erbil Province in 2024 resulted in the discovery of a previously unknown species, described herein as *Hemiscorpius kurdistanus* sp. n. The Halgurd-Sakran Mountains in the Bradost Region, to which it appears to be endemic, probably played a role in its speciation, providing a barrier that contributed to geographical isolation. The new discovery supports the hypothesis that Kurdistan represents an area of endemism for arthropods due to its isolation and unique environmental conditions. The addition of a new, potentially medically important scorpion species to the Iraqi fauna emphasizes the need for continued studies on the systematics of *Hemiscorpius* and other scorpion taxa as well as updated public health awareness and envenomation management strategies across the Middle East.

Keywords: morphometrics; scorpion; systematics; allopatric speciation

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1. Introduction

The Kurdistan region of northern Iraq has a high diversity and endemism of terrestrial arthropods, owing to a major latitudinal gradient intersected by multiple transverse rivers and mountain ranges [1]. The current understanding of the region's biodiversity remains inadequate, however, as most of the territory is poorly sampled and there is a paucity of taxon specialists [2].

Scorpions are dominant terrestrial arthropods in arid ecosystems [3], and Iraq is no exception [4]. Nineteen species in thirteen genera and five families have been recorded in the country, although ca. 80% of the species belong to the family Buthidae C.L. Koch, 1837 [2]. An epidemiological survey of scorpion envenomation in Iraq revealed that at least four or five species are medically important [5]. These include species of the family Hemiscorpiidae Pocock, 1893. Hemiscorpiidae currently comprises a single genus, *Hemiscorpius* Peters, 1861, with 20 species, distributed from northeast Africa, across the Arabian Peninsula, through Iraq and Iran, to western Pakistan [6,7]. Whereas eight species

of *Hemiscorpius* have been recorded in Iran [8], only one species, *Hemiscorpius lepturus* Peters, 1861, the type species of the genus, was previously recorded in Iraq (Figures 1 and 2) [9].

Extensive fieldwork in the Kurdistan Region, especially Erbil Governorate, of northern Iraq in 2024 (Figure 1) resulted in the discovery of a previously unknown species, described herein as *Hemiscorpius kurdistanus* sp. n. (Figure 3). The Halgurd-Sakran Mountains in the Bradost Region, to which it appears to be endemic, may have played a role in its speciation, providing a barrier that contributed to geographical isolation. This discovery supports the hypothesis that Kurdistan represents an area of endemism for arthropods due to its isolation and unique environmental conditions. The identification of a new, potentially medically important scorpion species calls for updated public health awareness and envenomation management strategies across the region.

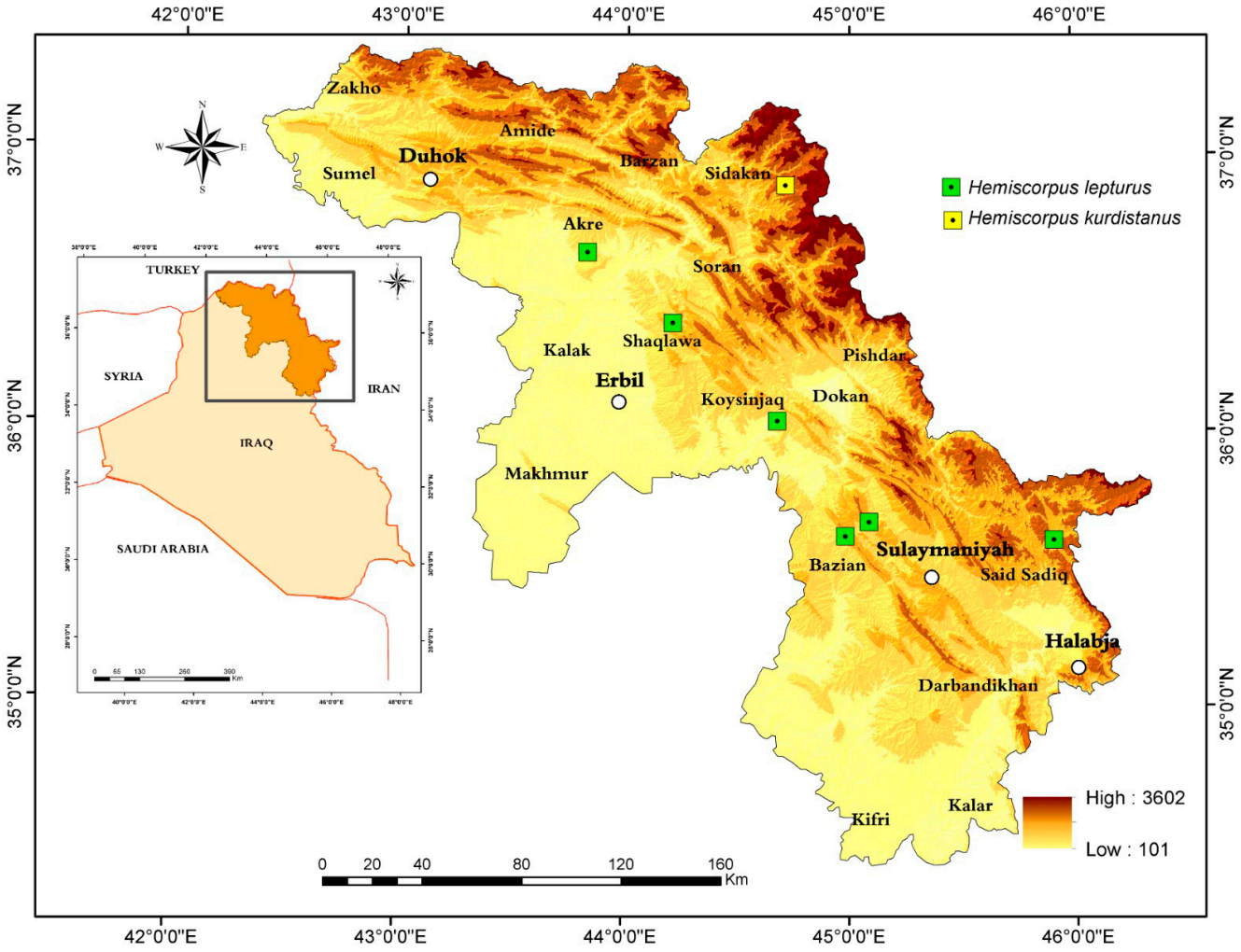

Figure 1. Map plotting the known distribution of *Hemiscorpius* Peters, 1861 in the Kurdistan Region (inset) of northern Iraq: *Hemiscorpius kurdistanus* sp. n. (yellow square); *Hemiscorpius lepturus* Peters, 1861 (green squares).

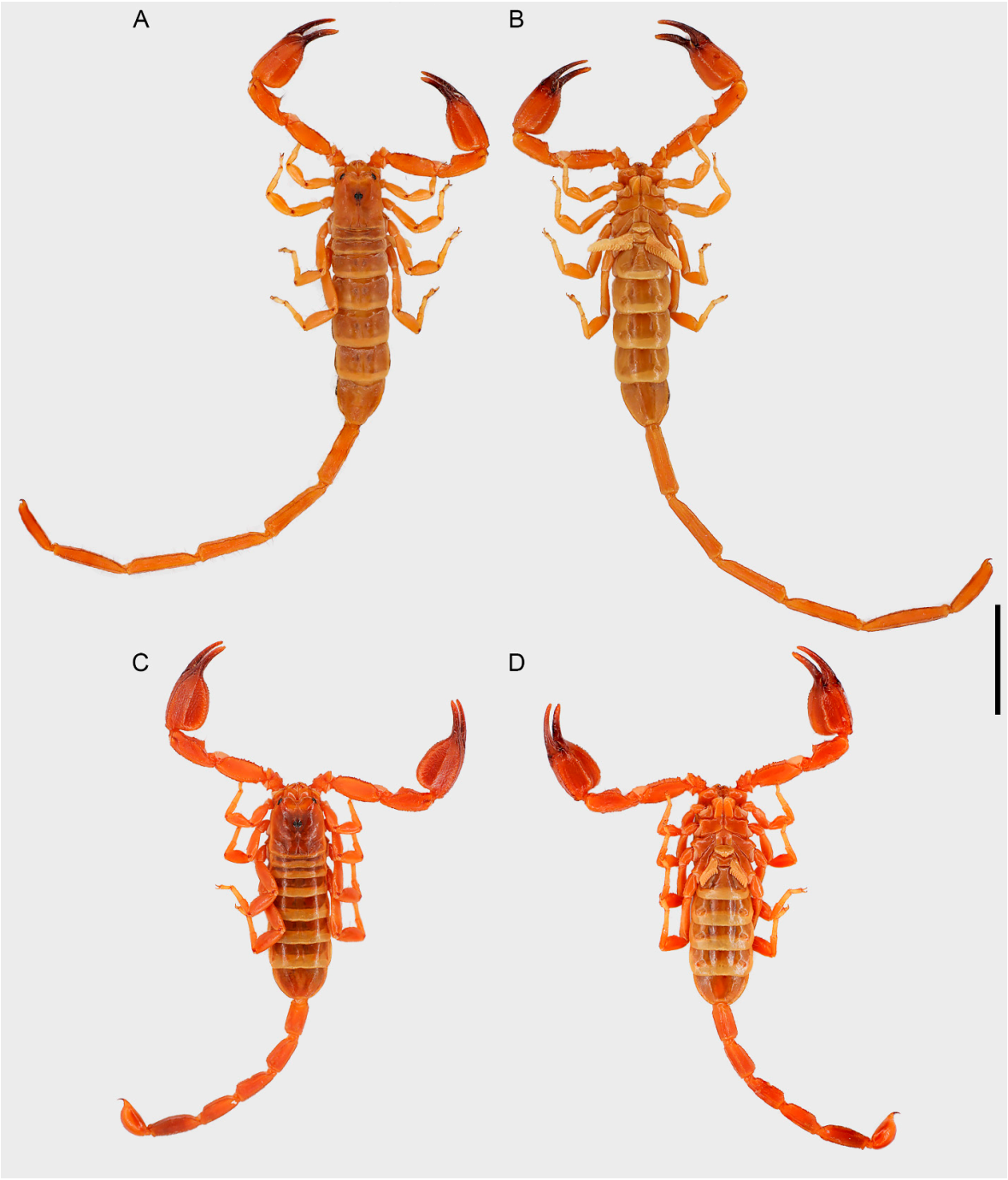

Figure 2. *Hemiscorpius lepturus* Peters, 1861, habitus, dorsal (**A**,**C**) and ventral (**B**,**D**) aspects. (**A**,**B**) ♂(SU). (**C**,**D**) ♀(SU), Koysenjaq, Bardbr. Scale bar = 10 mm.

2. Materials and Methods

Scorpions were collected at night with ultraviolet light flashlights and preserved in 80% ethanol. Material is deposited in Salahaddin University (SU), Erbil, Iraq, and the American Museum of Natural History (AMNH), New York, NY, USA. Specimens were examined using an OPTIKA SN260723 (Ponteranica, Italy) stereomicroscope, photographed with a Canon EOS 6D Mark II (Tokyo, Japan) camera, and photographs edited using Adobe Photoshop (San Jose, CA, USA). Measurements (mm), following [10], were recorded on preserved specimens using digital calipers. Morphological terminology mostly follows [11], except for trichobothrial nomenclature, which follows [12].

3. Systematics

Family Hemiscorpiidae Pocock, 1893.
Genus *Hemiscorpius* Peters, 1861.
Hemiscorpius kurdistanus sp. n.
Figures 1, 3, 4A,B, 5A,B, 6, 7, 8, 9 and 10A,B; Tables 1 and 2.
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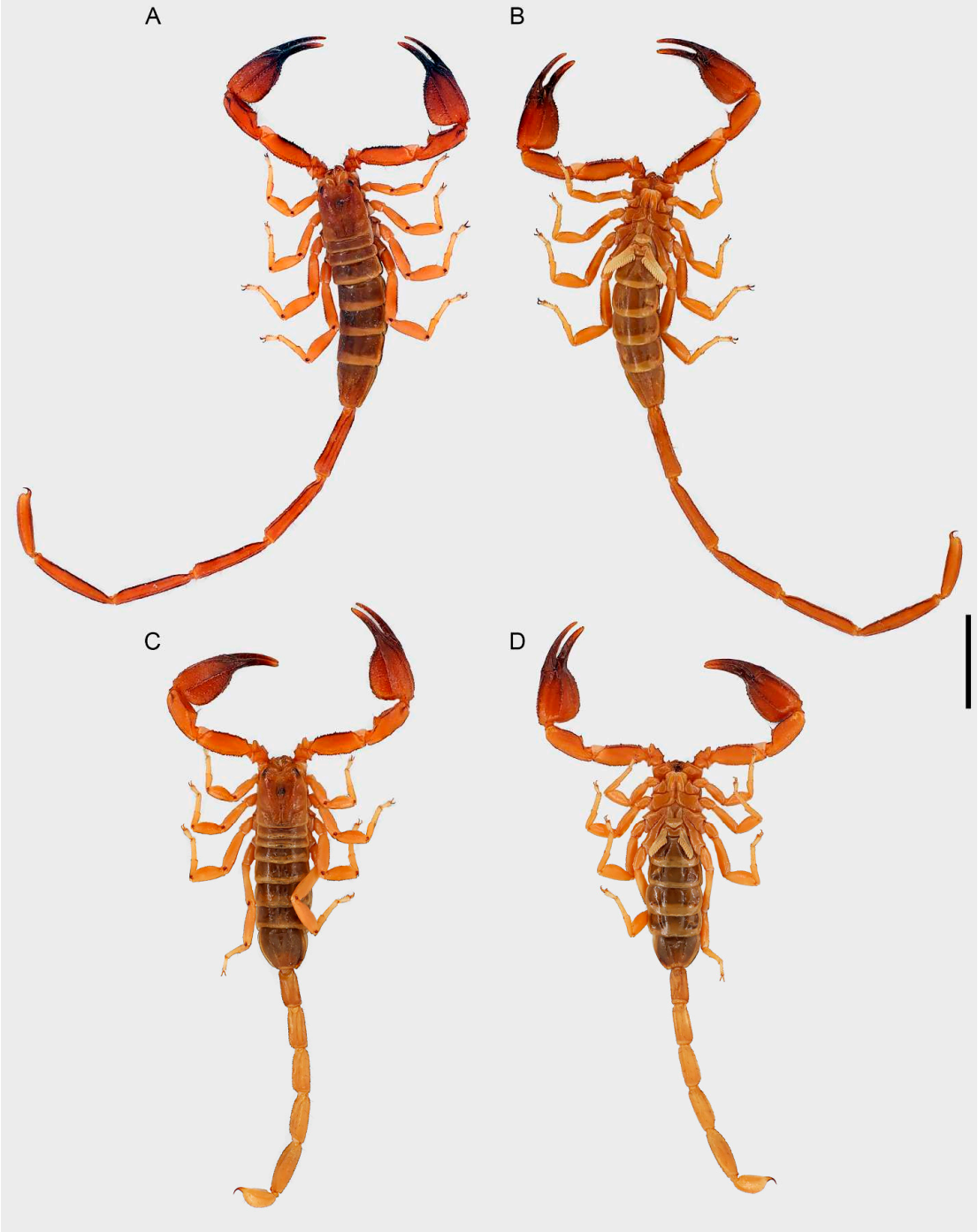

Figure 3. *Hemiscorpius kurdistanus* sp. n., habitus, dorsal (**A**,**C**) and ventral (**B**,**D**) aspects. (**A**,**B**) Holotype ♂(SU). (**C**,**D**) Paratype ♀(SU), Sidakan, Panjar village. Scale bars = 10 mm.

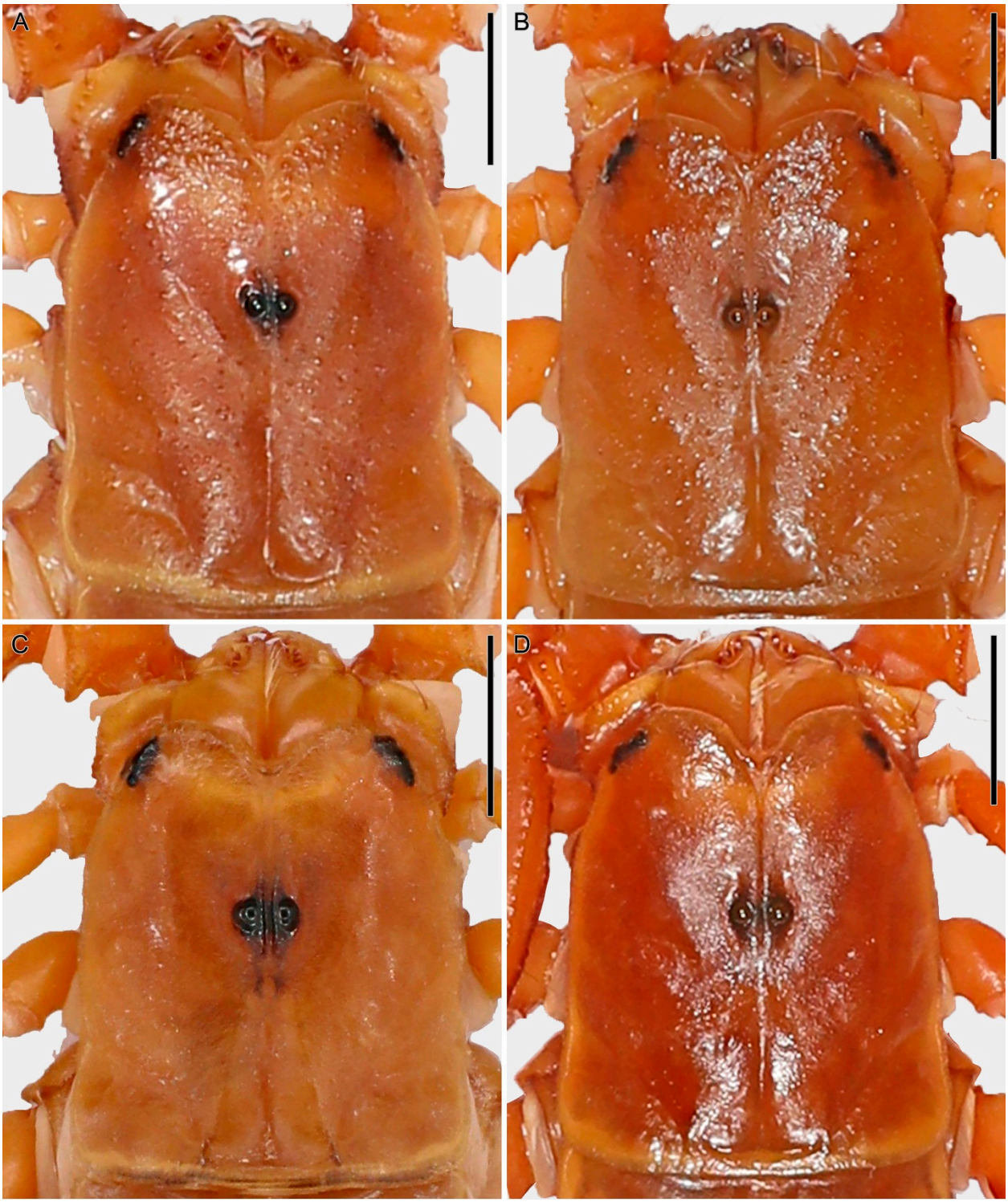

Figure 4. *Hemiscorpius kurdistanus* sp. n. (**A**,**B**) and *Hemiscorpius lepturus* Peters, 1861 (**C**,**D**), carapaces. (**A**) Holotype ♂(SU). (**B**) Paratype ♀(SU). (**C**) ♂(SU), Sidakan, Panjar village. (**D**) ♀(SU), Koysenjaq, Bardbr. Scale bars = 10 mm.

Figure 5. *Hemiscorpius kurdistanus* sp. n. (**A**,**B**) and *Hemiscorpius lepturus* Peters, 1861 (**C**,**D**), coxosternal region and pectines. (**A**) Holotype ♂(SU). (**B**) Paratype ♀(SU). (**C**) ♂(SU), Sidakan, Panjar village. (**D**) ♀(SU), Koysenjaq, Bardbr. Scale bars = 2 mm.

Type Material. Holotype ♂, **IRAQ: Kurdistan Region:** *Erbil Province*: Sidakan, Panjar village, 36°45′46.1″ N 44°37′35.6″ E, 23.ix.2024, F.S. Hussen, H.S. Sabir & A.I. Ahmed. Paratypes: 1 ♂, 2 ♀, 1 juv. ♀(SU), same data as holotype; 1 ♂, 1 ♀(AMNH), same data, except "10.viii.2024".

Diagnosis. *Hemiscorpius kurdistanus* sp. n. may be distinguished from the other congeners occurring in Iraq and Iran by a combination of size, coloration, granulation of the carapace and metasoma, pedipalp carination and dentition, and telson shape (Figures 3, 4A,B and 10A,B). It differs from *H. lepturus* (Figures 2, 4C,D and 10C,D), the only other species of the genus occurring in the near vicinity (Figure 1), as follows: The new species is larger, >70 mm (♂) or >50 mm (♀) in total length, than *H. lepturus*, which

is <65 mm (♂) or <50 mm (♀) (Tables 1 and 2). The new species is yellow to olive in base coloration, whereas *H. lepturus* is orange to brown. The carapace surfaces of the male are sparsely and coarsely granular, more densely so on the frontal lobes, in the new species, but entirely smooth or nearly so in *H. lepturus* (Figure 4). The dorsomedian carina of the pedipalp chela manus is granular in the new species, but smooth in *H. lepturus*. The granules comprising the dorsosubmedian carinae of the metasomal segments, especially the anterior segments, are more prominent and spiniform in the new species than in *H. lepturus*. The telson of the adult male is longer and more curved in the new species than in *H. lepturus* (Figure 10).

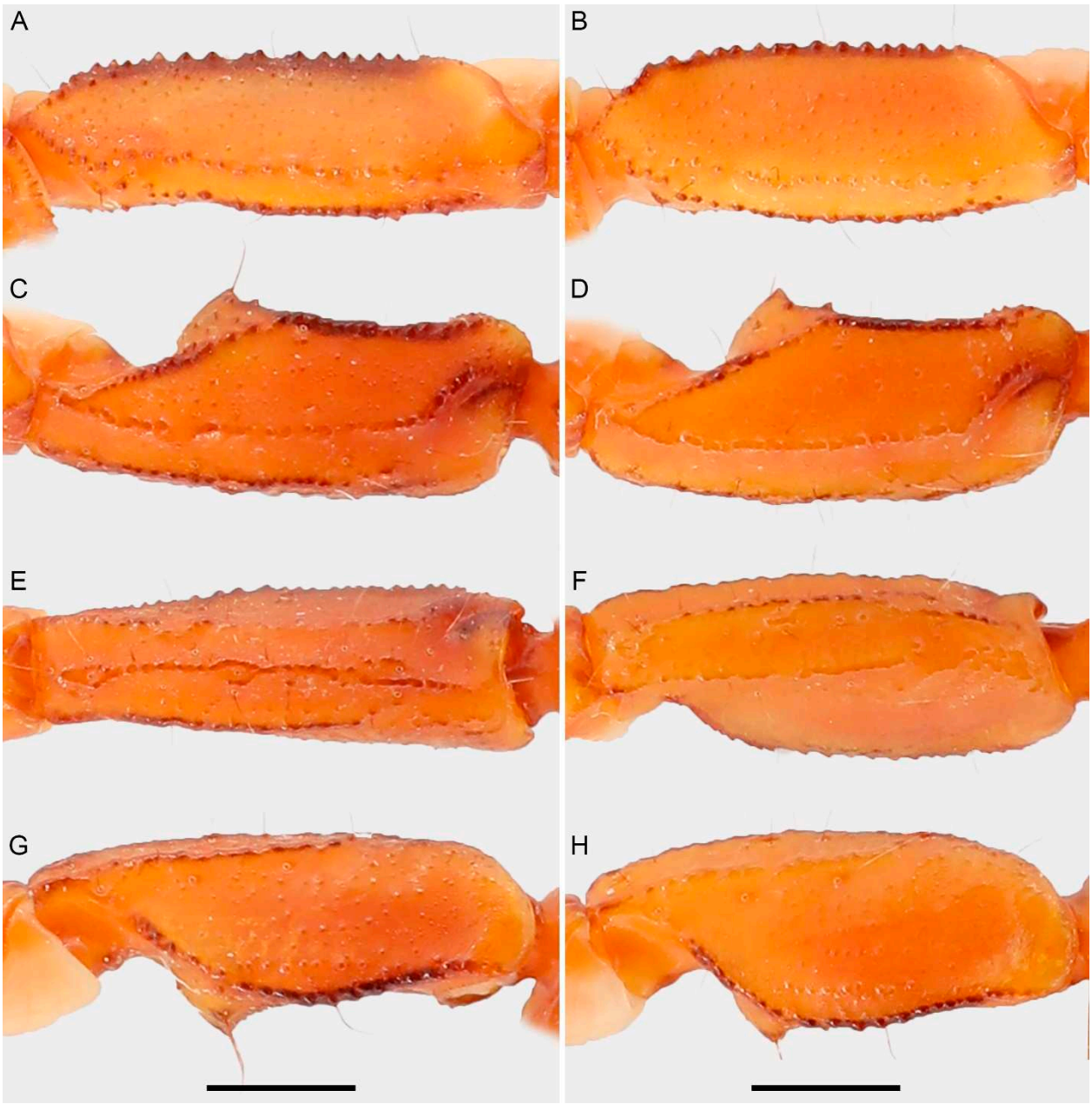

Figure 6. *Hemiscorpius kurdistanus* sp. n., holotype ♂(SU) (**A**,**C**,**E**,**G**) and paratype ♀(SU) (**B**,**D**,**F**,**H**), pedipalp segments. (**A**,**B**) Femur, dorsal aspect. (**C**–**H**) Patella, dorsal (**C**,**D**), retrolateral (**E**), retroventral (**F**), and ventral (**G**,**H**) aspects. Scale bars = 2 mm.

Figure 7. *Hemiscorpius kurdistanus* sp. n., holotype ♂(SU), pedipalp chela. (**A**) Dorsal aspect. (**B**) Retrodorsal aspect. (**C**) Proventral aspect. Scale bar = 2 mm.

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Figure 8. *Hemiscorpius kurdistanus* sp. n., paratype ♀(SU), pedipalp chela. (**A**) Dorsal aspect. (**B**) Retrolateral aspect. (**C**) Proventral aspect. Scale bar = 2 mm.

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Figure 9. *Hemiscorpius kurdistanus* sp. n., paratype ♀(SU) (**A**,**C**,**E**) and holotype ♂(SU) (**B**,**C**,**D**,**F**), metasoma and telson. (**A**) Dorsal aspect. (**B**) Dorsal to retrodorsal aspect. (**C**,**D**) Lateral aspect. (**E**,**F**) Ventral aspect. Scale bar = 5 mm.

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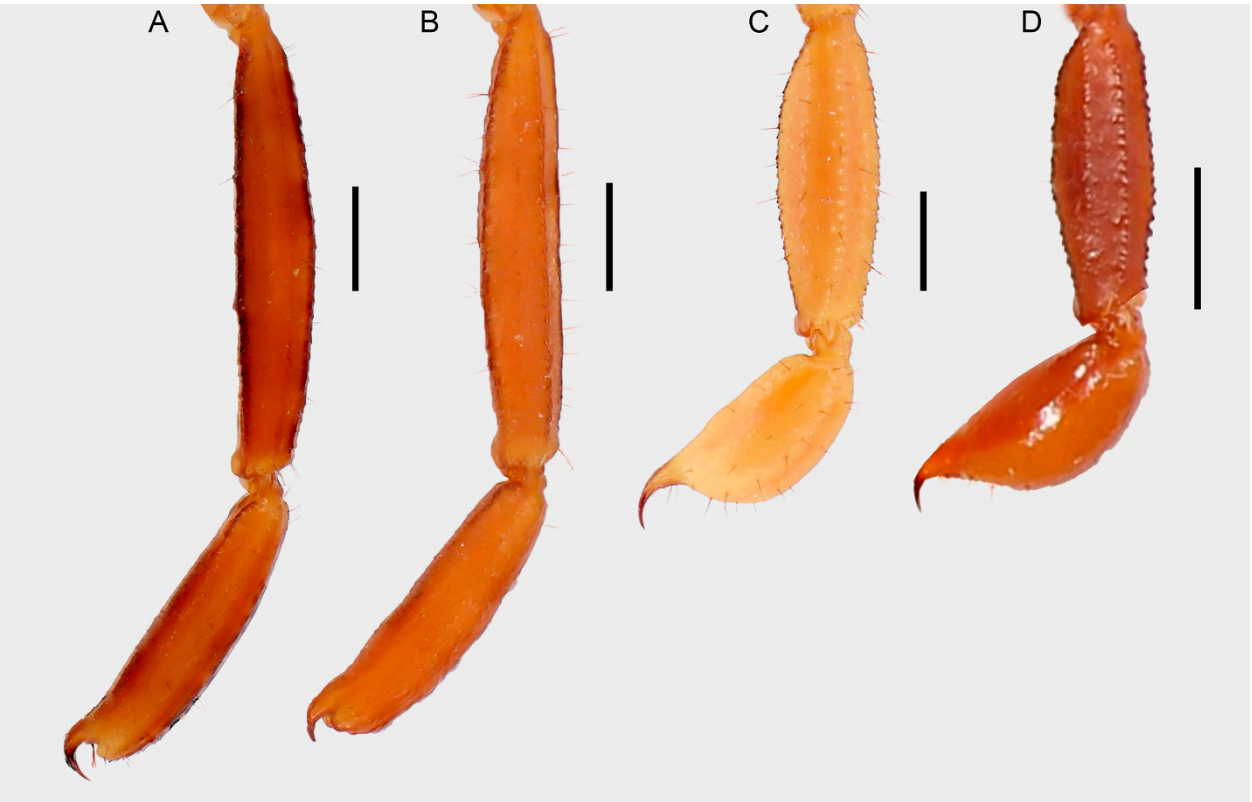

Figure 10. *Hemiscorpius kurdistanus* sp. n. (**A**,**C**) and *Hemiscorpius lepturus* Peters, 1861 (**B**,**D**), metasomal segment V and telson, lateral aspect. (**A**) Holotype ♂(SU). (**B**) Paratype ♀(SU). (**C**) ♂(SU), Sidakan, Panjar village. (**D**) ♀(SU), Koysenjaq, Bardbr. Scale bars = 2 mm.

Table 1. Diagnostic morphological characters separating *Hemiscorpius kurdistanus* sp. n. from *Hemiscorpius lepturus* Peters, 1861.

	H. kurdistanus	***H. lepturus***
Total length (♂)	>70 mm	<65 mm
Total length (♀)	>50 mm	<50 mm
Base coloration	yellow to olive	orange to brown
Carapace surfaces (♂)	sparsely and coarsely granular	smooth or nearly so
Pedipalp chela manus, dorsomedian carina	granular	smooth
Metasomal segments, dorsosubmedian carinae	prominent spiniform granules	small spiniform granules
Telson length	very elongate	elongate

The new species differs from other species of *Hemiscorpius* occurring in neighboring Iran as follows: It may be distinguished from *Hemiscorpius enischnochela* Monod & Lourenço, 2005; *Hemiscorpius gaillardi* (Vachon, 1974); and *Hemiscorpius shahii* Kovařík et al., 2017 by possessing only three trichobothria on the ventral surface of the pedipalp patella (Figure 6G,H), whereas the other three species each possess more than nine ventral trichobothria [8,12–14]. Unlike *Hemiscorpius kashkayi* Karataş & Moradi-Gharkheloo, 2013 and *Hemiscorpius persicus* (Birula, 1903), it is markedly sexually dimorphic [13,15,16]. The adult male of the new species possesses a slender, elongate metasoma and telson, and a pair of blunt projections posteriorly at the base of the aculeus, whereas the female and immature stages possess a shorter metasoma and a globose telson without projections posteriorly (Figures 9B,D,F and 10A). The adult male of *H. kashkayi* resembles the female and immature stages [16].

Table 2. Morphometric and meristic data for type specimens of *Hemiscorpius kurdistanus* sp. n. and *Hemiscorpius lepturus* Peters, 1861, deposited at Salahaddin University, Erbil, Iraq. Measurements in mm. Abbreviations: HT, holotype; PT, paratype.

	H. kurdistanus				***H. lepturus***	
	HT ♂	**PT ♂**	**PT ♀**	**PT ♀**	**♂**	**♀**
Total body length	81.9	78.75	54.45	56.17	66.6	36.18
Carapace length	6.79	6.72	6.71	6.95	5.14	5.59
Carapace anterior width	2.47	2.36	2.98	2.66	4.34	4.59
Carapace posterior width	5.14	5.13	5.22	5.32	4.79	5.06
Pedipalp femur length	6.51	6.36	6.49	6.39	5.08	4.9
Pedipalp femur width	1.04	1.08	1.20	1.71	1.89	1.85
Pedipalp patella length	6.90	6.86	6.60	6.72	4.76	4.75
Pedipalp patella width	1.80	1.71	1.91	1.89	1.69	1.55
Pedipalp chela manus length	8.26	7.40	8.42	8.89	5.37	5.52
Pedipalp chela manus width	4.92	4.45	5.02	4.90	2.81	3.31
Pedipalp chela manus depth	2.35	2.33	2.57	2.54	3.22	3.62
Pedipalp chela movable finger length	6.67	6.75	6.64	6.37	4.92	5.18
Pedipalp chela fixed/mov. finger denticles	6/6	6/6	6/6	6/6	6/6	6/6
Mesosoma length	19.98	17.44	17.97	18.46	17.15	11.36
Metasomal segment I length	8.27	8.12	4.02	3.76	6.26	3.38
Metasomal segment I width	1.48	1.49	2.21	1.94	1.51	1.79
Metasomal segment I depth	1.54	1.46	1.83	1.76	1.36	1.34
Metasomalsegment II length	9.37	9.04	4.55	4.95	7.31	3.8
Metasomalsegment II width	1.15	1.12	1.80	1.61	1.28	1.42
Metasomal segment II depth	1.43	1.42	1.77	1.72	1.35	1.53
Metasomal segment III length	9.30	9.36	4.87	5.14	7.89	3.83
Metasomal segment III width	1.10	1.07	1.55	1.50	1.10	1.38
Metasomal segment III depth	1.45	1.42	1.84	1.73	1.52	1.76
Metasomal segment IV length	9.52	9.98	5.03	5.20	8.19	3.97
Metasomal segment IV width	1.16	1.15	1.62	1.49	1.12	1.44
Metasomal segment IV depth	1.54	1.39	1.82	1.87	1.16	1.62
Metasomal segment V length	10.59	10.57	6.34	6.54	8.51	4.39
Metasomal segment V width	1.13	1.09	1.60	1.42	0.81	1.48
Metasomal segment V depth	1.69	1.59	1.92	1.83	1.49	1.58
Telson length	8.08	7.52	4.96	5.17	6.19	4.25
Telson vesicle width	1.31	1.39	1.81	1.83	1.17	1.48
Telson vesicle depth	1.50	1.67	1.79	1.90	1.26	1.88
Pectinal teeth (sinistral/dextral)	12/13	12/13	9/10	9/10	15/15	9/9

The new species differs from *Hemiscorpius acanthocercus* Monod & Lourenço, 2005 and *Hemiscorpius jiroftensis* Amiri Ghanat Saman et al., 2025 in the following respects: It is yellow to olive in base coloration, whereas *H. acanthocercus* is orange to brown, and *H. jiroftensis* is brown.

The telson of the adult male is longer and more curved in the new species than in *H. acanthocercus* and *H. jiroftensis*. The new species is larger, >70 mm (♂) or >50 mm (♀) in total length, than *H. acanthocercus*, which is <65 mm (♂) or <55 mm (♀) [8,14]. The fixed and movable fingers of the pedipalp chela each possess six denticles, the sixth denticle being rudimentary, and the movable finger is shorter than the chela manus in the new species, whereas the chela fingers each possess seven denticles, and the movable finger is longer than the manus in *H. jiroftensis* [8].

Etymology. The new species is named after the Kurdistan region of northern Iraq, where the type locality is situated.

Description. The following description is based on the holotype ♂and paratype ♀(SU) (Figures 3, 4A,B, 5A,B, 6, 7, 8, 9 and 10A,B, Table 2). Coloration refers to material preserved in ethanol.

Coloration: Carapace yellow to light brown; mesosomal tergites yellow to olive, pectines and sternites pale yellow; metasomal segments I–III mustard yellow, IV and V light brown, carinae dark brown; telson vesicle yellow, aculeus brown to black; pedipalps dark yellow and chelae orange to brown; legs yellow.

Chelicerae: Fixed finger, median and basal teeth bifurcate; movable finger with one subdistal tooth and one basal tooth in retrolateral series; retrodistal tooth smaller than prodistal tooth; and cheliceral teeth without secondary serrations.

Carapace: Carapace subrectangular, longer than wide (Figure 4A,B); surfaces sparsely and coarsely granular, more densely so on frontal lobes; small median ocular tubercle located in anterior half, with moderately granular superciliary carinae; pair of median ocelli, three pairs of lateral ocelli, posterior ocellus smaller than others; frontal notch deep; lateral margins with moderate granules ventral to lateral ocular tubercles; anterior median longitudinal sulcus narrow, suturiform, bifurcate anteriorly, continuous from anterior margin to ocular tubercle; posteromedian sulcus forming shallow depression; posterolateral sulci deep.

Pedipalps: Femur elongate, 6.25 times longer than wide (Table 2); pentacarinate, with four distinct carinae; prodorsal, retrodorsal, proventral, and retroventral carinae each comprising prominent spiniform granules; ventromedian carina reduced to few granules; dorsal surface finely and densely granular; prolateral surface with few prominent spiniform granules; retrolateral surface shagreened; ventral surface smooth.

Patella elongate, 3.8 times longer than wide (Table 2); with five distinct carinae; prodorsal carina comprising prominent granules; proventral carina granular; retrodorsal carina obsolete; retromedian and retroventral carina each comprising spiniform granules; prolateral process pronounced, separated into prodorsal and proventral tubercles, prodorsal tubercle with single spiniform granule.

Chela with five distinct carinae; dorsomedian carina coarsely granular; prodorsal and retrodorsal carinae finely granular; proventral carina comprising few spiniform granules; manus surfaces finely granular; fingers, dorsal and ventral surfaces predominantly smooth and finely punctate; movable finger longer than manus (Table 2); fixed finger with proximal notch (Figure 8B); movable finger with two rows of denticles, interrupted at regular intervals by six larger denticles, sixth rudimentary, each with accessory denticles; two or three terminal denticles.

Type C trichobothrial pattern. Femur with three trichobothria (Figure 6A,B): *i* retroproximal on prolateral surface; *d* dorsoproximal on dorsal surface; *e* dorsoproximal on retrolateral surface. Patella with 19 trichobothria (Figure 6C–H): *i* dorsal in distal half of prolateral surface; d_1 retroproximal to prodorsal carina; d_2 situated midway; five *eb* trichobothria; two *esb* and *em* trichobothria; *est* trichobothrium near *et* series; three *et* and *v* trichobothria. Chela manus with 15 trichobothria (Figures 7 and 8): *Db* proximal on

dorsal surface; three *Eb* trichobothria proximal on retrolateral surface; *Esb* near *Eb* series; *Est* near *Et* series; five *Et* trichobothria, Et_1 on ventral surface; four *V* trichobothria, V_3 and V_4 in proximal half of manus, V_1 and V_2 distal. Fixed finger with 11 trichobothria (Figures 7 and 8): *Dt* proximal on dorsal surface; *db* dorsal on prolateral surface, in proximal half of fixed finger; *dsb*, *dst*, and *dt* on dorsal surface, in distal half of fixed finger; *eb* on retrolateral surface, in basal third of fixed finger, opposite *db*; *esb*, *est*, and *et* in distal half of fixed finger, opposite *dsb*, *dst*, and *dt*, respectively; *it* and *ib* in median third of fixed finger.

Legs: Ventral surfaces smooth; trochanter and femur, dorsal surfaces finely and sparsely granular; telotarsus with ventromedian row of spinules and paired ventrosubmedian rows of rigid spiniform macrosetae; tarsal ungues of equal length.

Sternum: Sternum pentagonal, longer than wide, median sulcus deep, more pronounced in posterior half (Figure 5A,B).

Genital operculum: Operculum comprising two subtriangular sclerites (♂) or single, triangular sclerite (♀) (Figure 5A,B); genital papillae short, not protruding from beneath operculum (♂) or absent (♀).

Pectines: Pectinal tooth count 12 or 13 (♂) or 9 or 10 (♀) (Figure 5A,B).

Mesosoma: Tergites smooth, posterior margins of III–VII finely granular; III–VI each with pair of submedian shallow depressions anteriorly and finely granular carinae posterolaterally; VII longer than wide, with coarsely granular lateral and submedian carinae, restricted to posterior three-quarters. Sternites III–VI smooth; III with pair of large, finely and densely granular depressions, covered by pectines; IV–VI each with pair of deep median sulci; VII longer wide (♂) or wider than long (♀), with fine granules medially, becoming coarser laterally, pair of costate-granular lateral carinae in posterior three-quarters, median carina restricted to anterior half; spiracles crescent-shaped.

Metasoma: Segments elongate and slender (♂) or short and stout (♀) (Figure 9), segment I shorter and broader than II–V; surfaces finely granular anteriorly and posteriorly, smooth medially on I–IV, finely and sparsely granular across entire surface on V; I–IV each with seven distinct carinae, paired dorsosubmedian carinae each comprising spiniform granules; paired median lateral carinae costate-granular on I and II, granular on III and IV; paired ventrolateral carinae costate, almost smooth on I and II, each comprising spiniform granules on III and IV, ventromedian carina granular on I–IV. Segment V with five distinct carinae; paired dorsosubmedian carinae each comprising spiniform granules; paired median lateral carinae obsolete, each comprising sparse row of fine granules in anterior half of segment; ventromedian carina moderately granular; paired ventrolateral carinae each comprising spiniform granules.

Telson: Vesicle very elongate and slender, length/width = 6.2 (♂, Figure 10A, Table 2) or globose, length/width = 2.8 (♀, Figure 10C, Table 2), with (♂) or without (♀) pair of blunt tubercles posteriorly at base of aculeus, posterior tubercles (♂) without spiniform granules; dorsal surface densely granular with small depression; lateral and ventral surfaces granular with few macrosetae anteriorly, more numerous near base of aculeus; ventrolateral sulci and ventromedian carina absent; aculeus short and stout, strongly curved.

Intraspecific variation: The metasomal segments are much longer, with the length/width of metasomal segment V greater in the male than the female (Figures 3 and 9, Table 2). The telson vesicle is elongate, with a pair of blunt tubercles posteriorly at the base of the aculeus, in the male, but globose, without tubercles in the female (Figure 10A,C). The pectines of males and females possess 12 or 13 and 9 or 10 teeth, respectively (Figure 5A,B, Table 2).

Distribution. *Hemiscorpius kurdistanus* sp. n. is known only from the type locality, Panjar village, in the Halgurd-Sakran Mountains of Erbil Governorate, in the Kurdistan Region, northern Iraq.

Hemiscorpius lepturus Peters, 1861

Figures 1, 2, 4C,D, 5C,D and 10C,D; Tables 1 and 2

Material Examined. IRAQ: Kurdistan Region: *Duhok Province*: Akre, 36°44′39.8″ N 43°53′35.9″ E, 3.iix.2024, F.S. Hussen & H. Sabir, 6 ♀(SU). *Erbil Province*: Koysenjaq Bardbr, 36°00′18.2″ N 44°20′52″ E, 15.vi.2024, F.S. Hussen, H. Sabir & A. Ahmed, 1 ♂, 1 ♀(AMNH), 1 ♂, 2 ♀(SU); Shaqlawa Heran, 36°16′44.6″ N 44°29′35.5″ E, 10.vii.2024, F.S. Hussen & H. Sabir, 3 ♂, 1 ♀(SU). *Sulaymaniyah Province*: Chaqzhi chwaroo, 35°37′34.7″ N 45°11′57.4″ E, 28.vi.2024, F.S. Hussen & A. Ahmed, 10 ♂, 7 ♀(SU); Peramagron, 35°43′15.9″ N 45°08′54.5″ E, 20.iix.2024, F.S. Hussen & A. Ahmed, 5 ♂, 3 ♀(SU); Tazade, 35°31′35.6″ N 45°58′20″ E, 4.iix.2024, F.S. Hussen & A. Ahmed, 6 ♂, 3 ♀(SU).

4. Discussion

The new species described herein doubles the number of *Hemiscorpius* species recorded in Iraq, highlighting the underexplored scorpion diversity of the region. *H. kurdistanus* sp. n. was collected from the Halgurd-Sakran Mountains in the Bradost Region of Kurdistan (Figure 1), to which it appears to be endemic. These mountains probably played a role in its speciation, providing a barrier that contributed to geographical isolation from other congeners such as *H. lepturus* [17]. The new discovery supports the hypothesis that Kurdistan represents an area of endemism for arthropods due to its isolation and unique environmental conditions.

Considering the medical importance of *Hemiscorpius*, envenomation by which is potentially fatal [4], the discovery of a new species of the genus in Iraq is significant from a public health perspective. An accurate understanding of the diagnostic characters and geographical distributions of medically important scorpion species is critically important for improving clinical responses and anti-venom development.

5. Conclusions

This finding emphasizes the need for continued studies on the systematics of *Hemiscorpius* and other scorpion taxa in the Middle East, not only for biodiversity assessment but for public health initiatives across a region in which scorpionism is a significant medical concern.

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