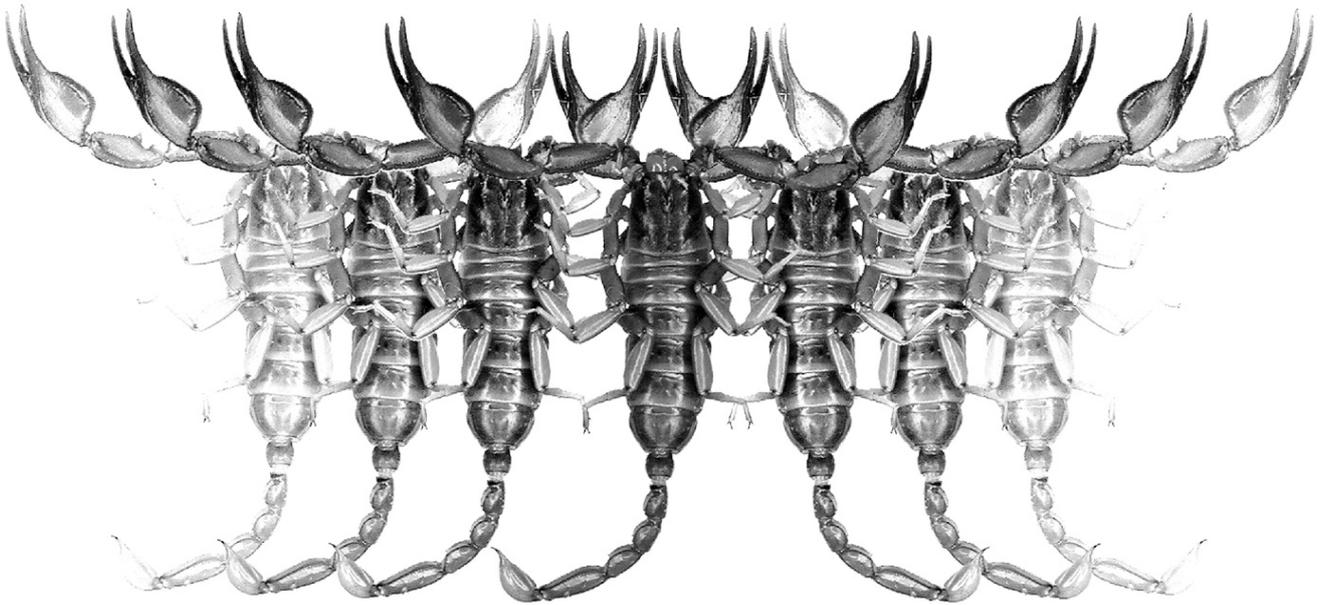


# *Euscorpium*

Occasional Publications in Scorpiology



**Revision of the genus *Scorpio* in Jordan, with  
a description of a new genus and three new  
species (Scorpiones: Scorpionidae)**

Bassam Abu Afifeh, Ersen Aydın Yağmur, Mohammad Al-Sarairoh & Zuhair Amr

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# *Euscorpius*

## *Occasional Publications in Scorpiology*

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<http://zoobank.org/urn:lsid:zoobank.org:pub:DF75A6FC-8635-407E-AC13-2C3F9A9442FC>

# Revision of the genus *Scorpio* in Jordan, with a description of a new genus and three new species (Scorpiones: Scorpionidae)

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<http://zoobank.org/urn:lsid:zoobank.org:pub:DF75A6FC-8635-407E-AC13-2C3F9A9442FC>

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## Summary

Several new *Scorpio* populations are studied from various habitats in Jordan, including specimens previously identified as *Scorpio kruglovi* Birula, 1910 and *S. fuscus* (Ehrenberg, 1829). A new scorpionid genus, *Jordanius* **gen. n.** is described, mainly differentiated from the genus *Scorpio* Linnaeus, 1758 by the elongation and heavy patterns of granulation of chela manus, and granulated chela fingers. *Scorpio granulomanus* Al-Saraireh et al., 2023 is transferred to the new genus, and *Jordanius maysaraensis* **gen. et sp. n.** is described. Also, *Scorpio jordanensis* **sp. n.** and *S. wahbehi* **sp. n.** are described. Detailed redescriptions and illustrations of *S. palmatus* (Ehrenberg, 1828) and *S. fuscus* (Ehrenberg, 1829) are given. A neotype of *S. palmatus* from Alexandria, Egypt and a neotype of *S. fuscus* from Lebanon are designated. A key to the family Scorpionidae in Jordan and comments on dubious or incorrect records from Jordan are provided. Lastly, *S. propinquus* is suggested as nomen dubium.

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## Introduction

Fauna of the Middle East, a land bridge between Europe, Africa and Asia, where three different biogeographic realms meet (Ethiopian, Oriental, and Palaearctic), always received a great attention. Recently, Jordan and the entire area of Middle East has witnessed growing interest in studying scorpion fauna of this region, with description of a number of endemic species (Al-Saraireh et al., 2021; Lourenço et al., 2021a, 2021b; Cain et al., 2021; Abu Afifeh et al., 2022).

Since its initial description and for many decades, the genus *Scorpio* Linné, 1758 (Scorpionidae) remained poorly studied. Earlier attempts to analyse its presumably highly polymorphic species, *Scorpio maurus* Linné, 1758, established a number of subspecies (Kraepelin, 1899; Pocock, 1900; Birula, 1910; Pallary, 1928; Werner, 1929, 1936; Vachon, 1950, 1952; Bouisset & Larrouy, 1962; Levy & Amitai, 1980). Subsequently, many subspecies of *Scorpio maurus* distributed from West Africa, throughout the Middle East and Arabia to Iran were raised to species level (Froufe et al., 2008; Lourenço, 2009; Talal et al., 2015).

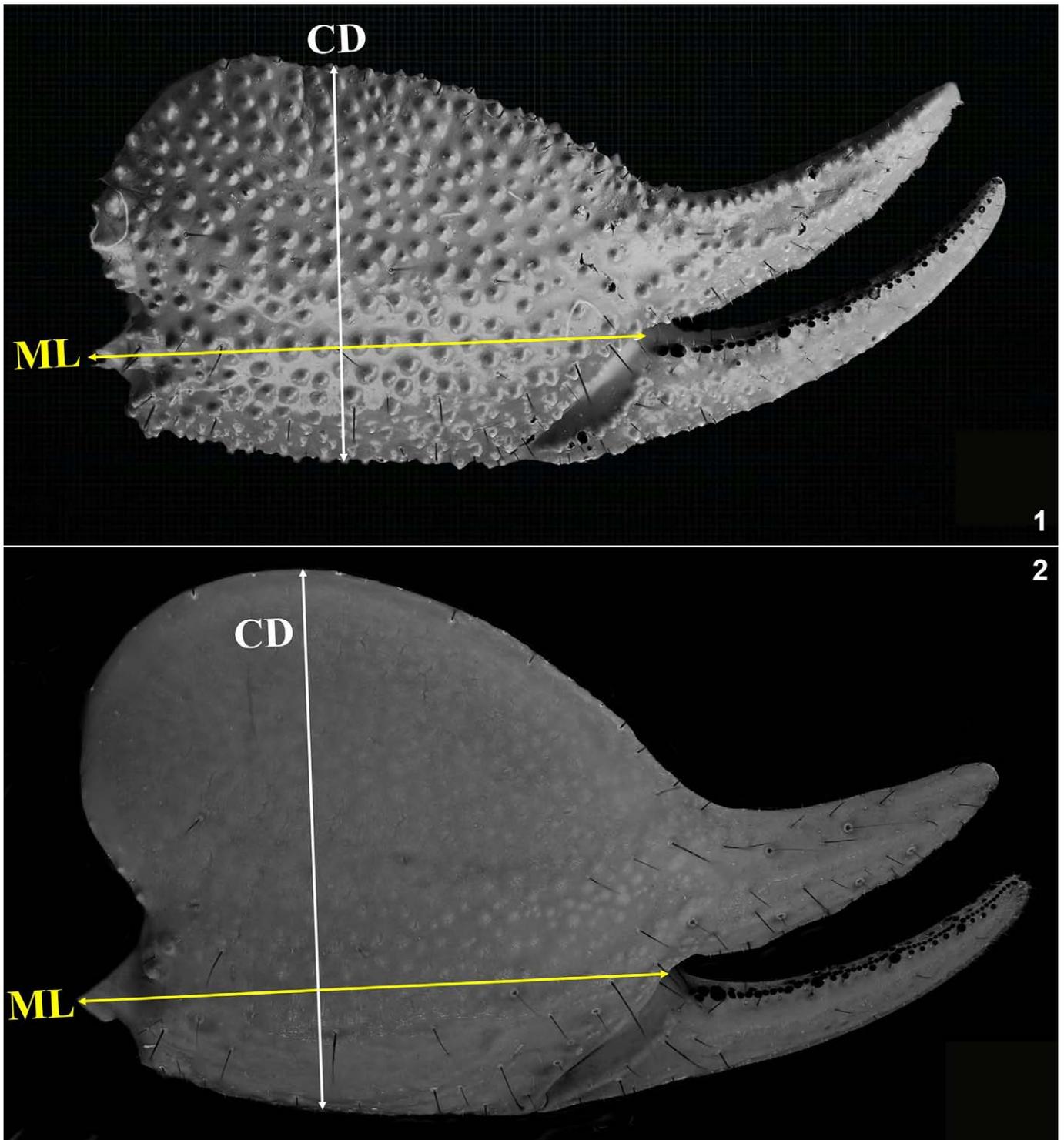
Four of these species were traditionally recorded from the Middle East: *S. palmatus* (Ehrenberg, 1828); *S. fuscus* (Ehrenberg, 1829); *S. propinquus* (Simon, 1872); and *S. kruglovi* Birula, 1910 (Levy & Amitai, 1980; Vachon & Kinzelbach, 1987; El-Hennawy, 1992; Amr & Al-Oran, 1994; Kabakibi et al., 1999; Amr & Abu Baker, 2004; Kovařík, 2009; Shehab et al., 2011; Monod et al., 2019; Kachel et al., 2021). Meanwhile, two taxa in this region were still treated

as subspecies: *S. maurus arabicus* Pocock, 1900 and *S. m. townsendi* Pocock, 1900. More recently, Al-Saraireh et al. (2023) described *S. granulomanus* Al-Saraireh, Yagmur, Afifeh & Amr, 2023 from Dibeen Forest in northern Jordan.

Prendini et al. (2003) revised the systematics of four genera of family Scorpionidae (*Heterometrus*, *Pandinus*, *Opisththalmus*, and *Scorpio*) based on morphological and molecular features. They also included taxonomic keys and diagnosis for these genera. Prendini et al. (2003) indicated the taxonomic discrepancy between the subspecies of *Scorpio maurus*. They employed several characters to distinguish this genus including color, granulation patterns, number of pectinal teeth, etc., and stated, in particular, that pedipalp chela surface in the genus *Scorpio* is “coarsely granular, while chela fingers smooth.”

Lately, Khammassi et al. (2024) performed a phylogenetic analysis using mitochondrial COI gene based on some new populations and published sequence data. Their phylogenetic analyses revealed twenty distinct lineages within two main clades in North Africa and in the Middle East.

In this study, we provided a comprehensive analysis of morphological variation among large number of specimens representing different populations from various habitats in Jordan, with comparative material of *S. palmatus* from Egypt. This analysis led to the description of a new genus *Jordanius* **gen. n.** with two species *Jordanius maysaraensis* **sp. n.**, and *J. granulomanus* **comb. n.** The latter species is transferred from the genus *Scorpio*. We also described two new species of *Scorpio*: *S. jordanensis* **sp. n.** and *S. wahbehi* **sp. n.**



**Figures 1–2:** External view of chela under UV light showing variation in shape, slenderness, and pattern of granulation between *Jordanius*, gen. n. and *Scorpio*. **Figure 1.** *Jordanius granulomanus* comb. n., female paratype. **Figure 2.** *Scorpio jordanensis* sp. n., female paratype. Abbreviations: Manus Length (ML), Chela Depth (CD).

## Material and Methods

Specimens were collected by digging burrows during the day or at night. The specimens were preserved in 80% alcohol. Photographs were taken by Canon EOS 7D. Stacking of pictures was made using Helicon Focus software. The focus

stacking method is modified from Canon-Cognisys system described in Brecko et al. (2014). Illustration under UV illumination was after Volschenk (2005). The trichobothrial nomenclature was followed according to Vachon (1974) and morphological nomenclature was after Francke (1977), Stahnke (1971), Sissom (1990), and Hjelle (1990).

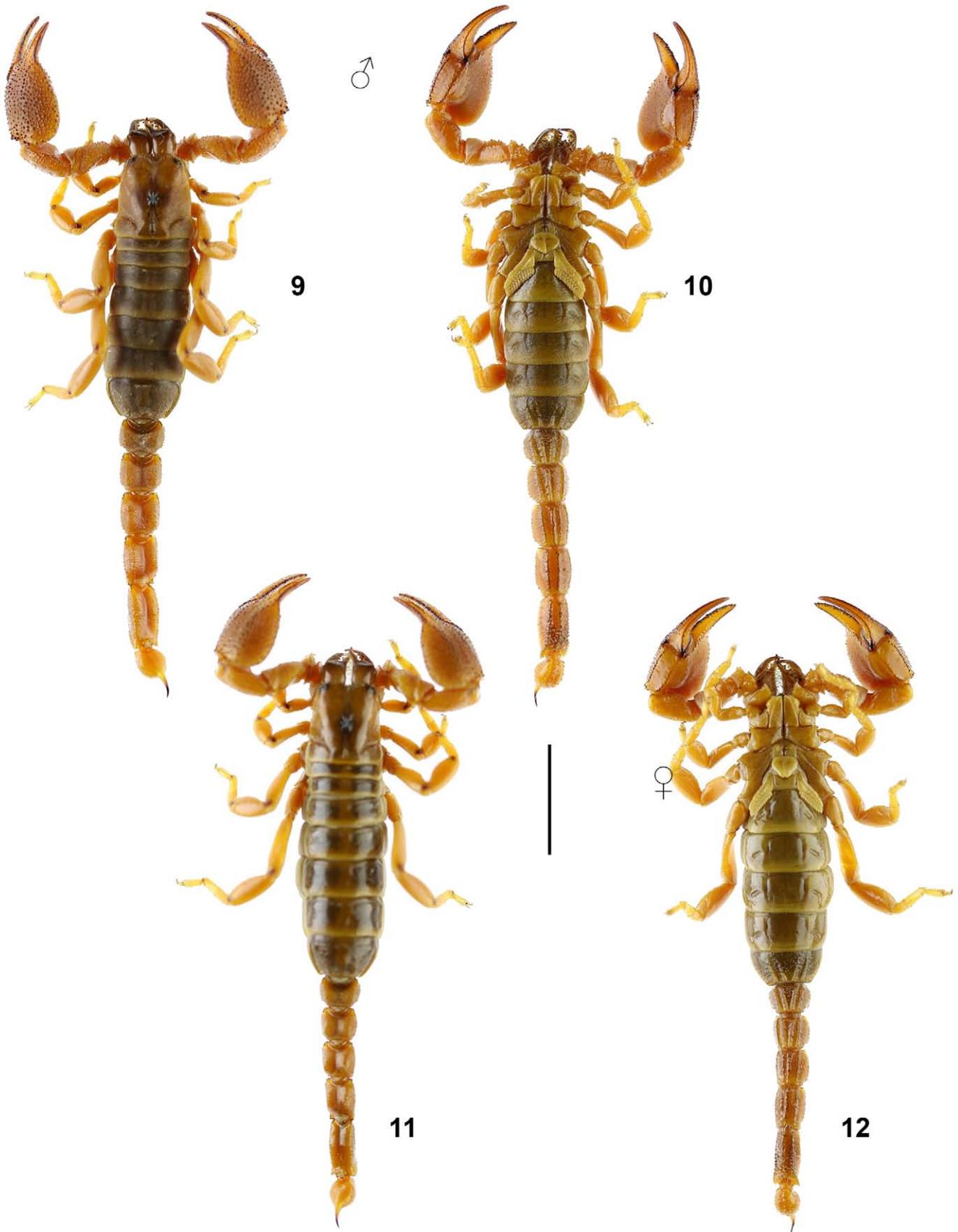


**Figures 3–8:** In vivo habitus. **Figure 3.** *Scorpio fuscus*, male from Bader Al Jadeedah, Balqa Governorate. **Figure 4.** *Scorpio fuscus*, female from Birqish Forest, northwestern Jordan, Irbid Governorate. **Figure 5.** *Jordanius maysaraensis* gen. et sp. n., female paratype. **Figure 6.** *Jordanius granulomanus* comb. n., female paratype. **Figure 7.** *Scorpio wahbehi* sp. n., female paratype. **Figure 8.** *Scorpio jordanensis* sp. n., male paratype.

Male holotypes and one female paratype for each new species are deposited at the Zoology Museum of Alaşehir Vocational School, Manisa Celal Bayar University, Manisa, Turkey (AZMM); other paratypes are deposited in the private collection of Bassam Abu Afifeh (BAPC) and the collection of Royal Society for the Conservation of Nature (RSCN).

*Scorpio palmatus* specimens from Egypt are deposited in Institut Royal des Sciences Naturelles de Belgique, Bruxelles, Belgium (IRSNB) (W. Dekoninck).

Total length was defined as the distance from the tip of chelicerae of mouth to the end of telson. Chela length was measured as the distance from the tip of fixed finger to the



**Figures 9–12:** *Jordanius maysaraensis* gen. et sp. n., habitus under white light. **Figures 9–10.** Male holotype, in dorsal (9) and ventral (10) views. **Figures 11– 12.** Female paratype, in dorsal (11) and ventral (12) views. Scale bar: 10 mm.

joint with patella. Chela depth (CD) was measured as the maximum height in the plane of movement of the movable finger. The length of the fixed finger of pedipalp was measured from the tip of fixed finger along dentate margin to the joint of the movable finger. Movable finger length was measured as the distance from the tip of movable finger to the joint of the movable finger with manus on the ventral side. Underhand length was defined as the length of chela manus along ventro external carina. Manus length (ML) was defined as the distance from the joint between fixed and the movable finger to the joint of manus with patella.

## Systematics

### Family Scorpionidae Latreille, 1802

#### *Jordanius* gen. n.

(Figures 1, 5–6, 9–78, 363–364, 369–370)

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TYPE SPECIES. *Scorpio granulomanus* Al-Sarairoh, Yağmur, Abu Afifeh & Amr, 2023 (see description below).

ETYMOLOGY. The generic name is derived from Jordan, the country to which this genus is endemic.

DIAGNOSIS. Medium-sized species. Adult males are about 47.29–52.46 mm, and females are about 48.13–52.58 mm in length. Anterior margin of carapace bilobed, with 13–17 medium to large setae and a distinct depression. There is a protrusion in the middle of the depression. Carapace acarinate, only the posteriomedian carinae are visible. Carapace shagreened, but the triangular region between median eyes and the anterior margin is smooth in males; smooth and lustrous with small granules laterally in females. The external surface of chela manus densely covered with large, raised, rounded and somewhat pointed granules, the posterior margin of the external surface of chela manus bears very large spinoid protrudings. Internal surface of chela manus with small to moderate pointed granules. Chela manus flattened and elongated; manus length to chela depth ratio almost the same in both sexes (1.24–1.29). Chela fingers are relatively long with small pointed gradually decreased granules anteriorly. Fixed and movable fingers with 4 or 5 strong accessory denticles. Tergites I–VI matt, shagreened in males with scattered small granules; smooth and lustrous with flattened medium granules in females. Metasoma I with 10 carinae, II–IV with 8, and V with 7 carinae. Lateral inframedian carinae on segment I indistinct. Ventral submedian and ventrolateral carinae moderate to strong, with moderate rounded granules, size and numbers of granules decrease from segment I toward segment IV, nearly obsolete on segment IV. Ventromedian and ventrolateral carinae strong with spaced large and pointed granules on segment V, pointed granules gradually increase posteriorly on ventrolateral carina of segment V. Pectinal teeth number 11–13 in males, 9–13 in females. Trichobothriotaxy of type C, orthobothriotaxic (Vachon, 1974), pedipalp chela trichobothrium *it* placed basally

along fixed finger near *ib*. Tibial spurs absent. Tarsi armed only with pro lateral pedal spurs, tarsi of legs I to IV with 5/8–6/8–7/9–7/10 internal and external spines arranged in series.

AFFINITIES. The new genus *Jordanius* gen. n. is a fossorial borrowing scorpion belonging to the family Scorpionidae Latreille, 1802; this genus is closely related to the genus *Scorpio*, differing primarily in the shape, elongation, and pattern of granulation of pedipalp chela. The new genus can be separated from the genus *Scorpio* by having remarkably elongated chela manus, and very large, dense and pointed granules on the dorsoexternal surface of the chela manus, in addition genus *Scorpio* has generally smooth chela fingers, whereas *Jordanius* gen. n. has small pointed gradually decreased granules anteriorly on chela fingers.

Figures 1 and 2 show the general difference in elongation and pattern of granulation in chela manus between *Jordanius* gen. n. and *Scorpio*.

#### *Jordanius granulomanus* (Al-Sarairoh et al., 2023), comb. n.

(Figures 1, 75–76, 364, 370)

*Scorpio granulomanus*: Al-Sarairoh et al., 2023: 1–16, figs. 1–59.

TYPE LOCALITY AND TYPE DEPOSITORY. **Jordan**, Jerash Governorate, Dibbeen Forest Reserve, 32°14'38.40"N 35°49'20.90"E, 783 m a. s. l., AZMM.

TYPE MATERIAL EXAMINED. **Jordan**: Jerash Governorate, Dibbeen Forest Reserve, 32°14'46.9"N 35°49'20.00"E, 745 m a. s. l., 2♂ (paratypes), 6 September 2013, leg. Z. Amr (RSCN); Jerash Governorate, Dibbeen Forest Reserve, 32°14'52.70"N 35°49'23.80"E, 741 m a. s. l., 1♂9♀ (paratypes), 22 April 2022, leg. B. Abu Afifeh & M. Al-Sarairoh (BAPC); Jerash Governorate, Dibbeen Forest Reserve, 32°14'38.40"N 35°49'20.90"E, 783 m a. s. l., 1♂ (holotype) (AZMM/Sco-2022:01), 1♀ (paratype) (AZMM/Sco-2022:02), 1♂10♀ (paratypes), 20 May 2022, leg. B. Abu Afifeh & M. Al-Sarairoh (BAPC); Jerash Governorate, Dibbeen Forest Reserve, 32°14'52.70"N 35°49'23.80"E, 741 m a. s. l., 2♀ (paratypes), 26 June 2022, leg. B. Abu Afifeh & M. Al-Sarairoh (BAPC).

DIAGNOSIS. Medium-sized species compared with its congeners. Adults are about 51 mm in length. Carapace is light reddish brown in males and dark reddish brown in females with reticulations in both sexes. Mesosoma basically, reddish brown in males and reddish black in females. Venter dark yellow in males and light brown in females. Pedipalp femur and patella dark yellow, chela reddish yellow in both sexes. Metasoma and legs dark yellow in males and light brownish yellow in females. Anterior margin of carapace bilobed, carapace finely granulated, the triangular region between the median eyes and the anterior margin is smooth with scattered moderate granules in males, with fine and dense

Dimensions (mm)		<i>Jordanius maysaraensis</i>	<i>Jordanius maysaraensis</i>
		gen. et sp.n. ♂ holotype	gen. et sp.n. ♀ paratype
Carapace	L / W	7.80 / 7.20	7.56 / 6.96
Mesosoma	L	15.73	18.85
Metasoma + telson	L	25.80	22.68
Segment I	L / W / D	3.00 / 4.08 / 3.55	2.76 / 3.72 / 3.24
Segment II	L / W / D	3.48 / 3.72 / 3.24	3.00 / 3.30 / 2.87
Segment III	L / W / D	3.84 / 3.54 / 3.08	3.36 / 3.12 / 2.71
Segment IV	L / W / D	4.44 / 3.36 / 2.92	3.84 / 2.88 / 2.51
Segment V	L / W / D	5.76 / 2.76 / 2.40	5.16 / 2.40 / 2.10
Telson	L / W / D	5.28 / 2.64 / 2.28	4.56 / 2.40 / 2.04
Pedipalp	L	21.47	21.24
Femur	L / W	4.55 / 2.40	4.56 / 2.40
Patella	L / W	5.28 / 2.64	5.04 / 2.52
Chela	L	11.64	11.64
Manus	L / W / D	7.44 / 4.20 / 6.00	7.20 / 3.36 / 5.76
Movable finger	L	6.96	6.96
Fixed finger	L	4.32	4.92
<b>Total</b>	<b>L</b>	<b>49.33</b>	<b>49.09</b>

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

granules laterally and scattered moderate granules anteriorly and posteriorly in females. Dorsoexternal carinae of pedipalp femur distinct with separate granules distally, sometimes with several rows of spaced granules, intercarinal surface smooth with numerous setae, dorsoexternal surface with numerous rounded and pointed granules of different size, internal surface with some large, pointed granules. Patella with two carinae. Dorsomedian carina distinct with swollen and some fused granules and the ventrointernal carinae are obsolete with few swollen granules, intercarinal surface is smooth with numerous setae. Chela manus densely covered with large rounded and somewhat pointed granules, the posterior margin of the external surface of chela manus bears very large spinoid protrusions. Internal surface of chela manus with small to moderate pointed granules along the dorsal margin. Chela manus flattened and elongated; manus length to chela depth ratio almost the same in both sexes with an average of 1.27. Chela fingers are relatively long with small pointed gradually decreased granules anteriorly. Fixed and movable fingers with 4 or 5 strong accessory denticles. Tergites I–VI matte, completely covered with fine granules in males; glossy and smooth, at most slightly shagreened laterally in females. Tergite VII finely granular with moderate, pointed granules posteriorly and laterally in males, but smooth anteriorly, granulate posteriorly and laterally in females. Sternites III–VI wrinkled medially, almost smooth laterally in males, smooth and shiny in females with numerous moderate setae on the posterior margins. Sternite VII granular and feebly wrinkled medially; shagreened laterally with four tuberculated carinae with lobated granules; the posterior margin bears

numerous moderate setae. Metasoma: Segment I with 10 carinae, segment II–IV with 8, and segment V with 5 carinae. Lateral inframedian carinae on segment I indistinct. Ventral submedian and ventrolateral carinae moderate to strong, with moderate rounded granules, size and numbers of granules decrease from segment I toward segment IV, nearly obsolete on segment IV. Ventromedian and ventrolateral carinae strong with spaced large and pointed granules on segment V, pointed granules gradually increase posteriorly on ventrolateral carina of segment V. Pectinal teeth number 9–12 in males, 8–11 in females. Genital operculum is heart-shaped in females, ovoid in males. Trichobothriotaxy of type C, orthobothriotaxic (Vachon, 1974), pedipalp chela trichobothrium *it* placed basally along fixed finger near *ib*. Tibial spurs absent. Tarsi armed only with prolateral pedal spurs, tarsi of legs I to IV with 4/7–6/8–7/8–7/8 internal and external spines arranged in series.

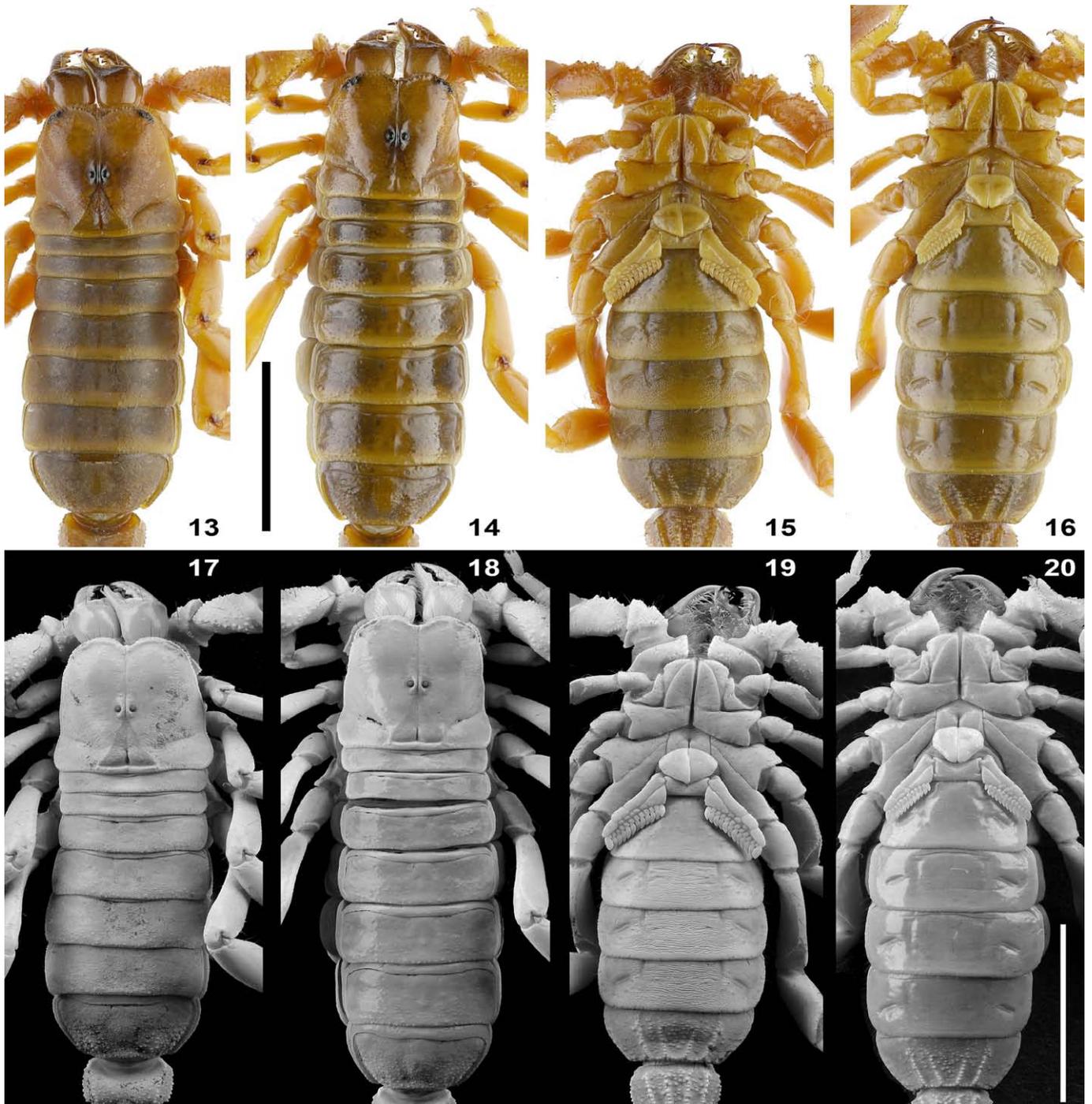
***Jordanius maysaraensis* gen. et sp. n.**

(Figures 5, 9–74, 77–78, 363, 369, 374; Table 1)

<http://zoobank.org/urn:lsid:zoobank.org:act:C6B0D55E-6C8D-47D4-82C5-D2F2697A842D>

TYPE LOCALITY AND TYPE DEPOSITORY. **Jordan**, Al Ardha road, 2.7 km NW of Maysara, 32°08'02.4"N 35°39'44.2"E, Balqa Governorate, 447 m a. s. l., AZMM.

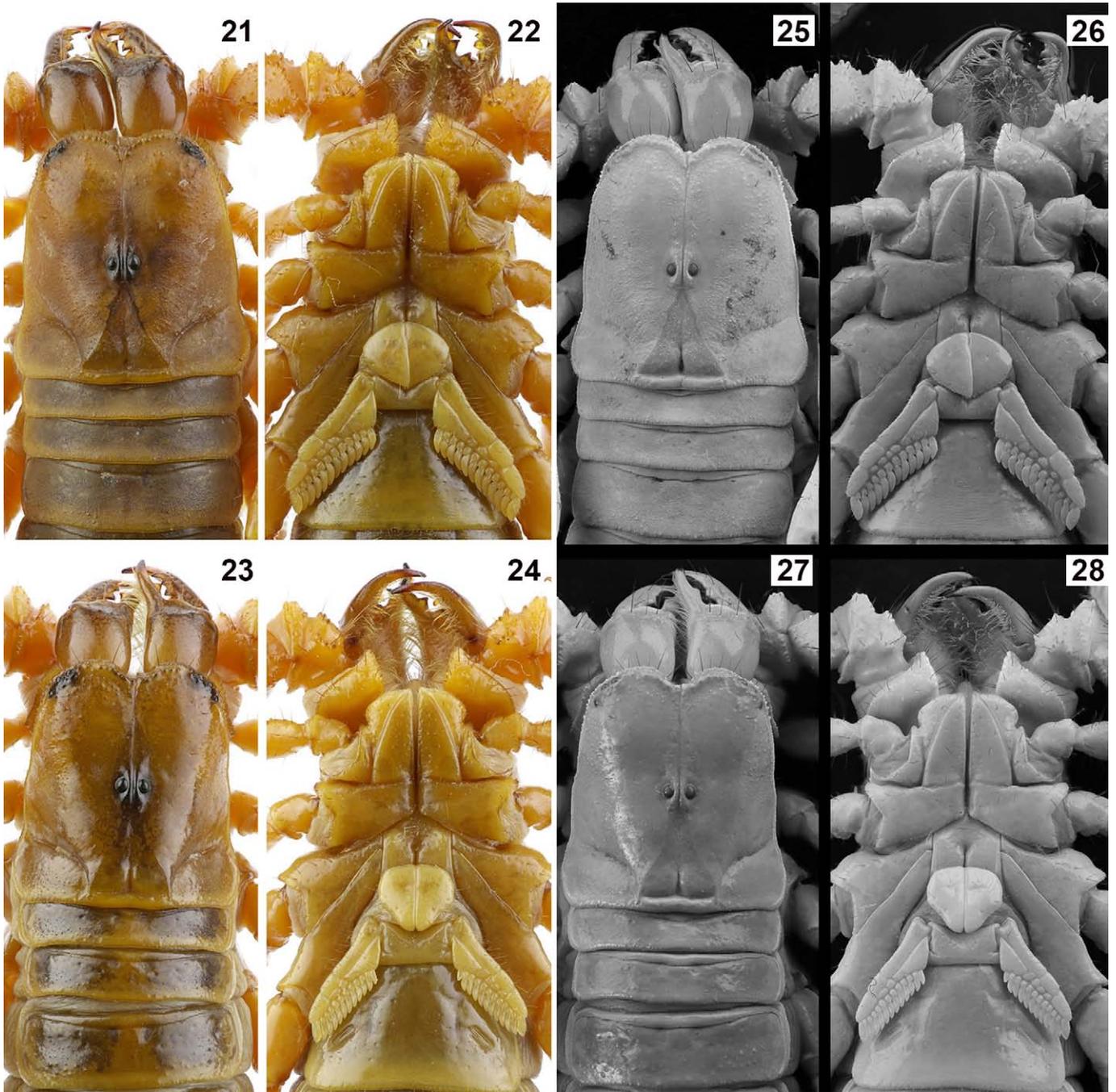
TYPE MATERIAL EXAMINED. **Jordan**: Balqa Governorate, Al Ardha road, 2.7 km NW of Maysara, 32°08'02.4"N 35°39'44.2"E, 447 m a. s. l., 1♂ (holotype) (AZMM/Sco-



**Figures 13–20:** *Jordanius maysaraensis* gen. et sp. n., male holotype (13,15,17,19) and female paratype (14,16,18,20). **Figures 13–14, 17–18.** Carapace and mesosoma. **Figures 15–16, 19–20.** Coxal and sternopectinal regions and sternites. **Figures 13–16** under white light. **Figures 17–20** under UV light. Scale bar: 10 mm.

2022:10), 1♀ (paratype) (AZMM/Sco-2022:11), 5♀, 11 May 2022, leg. B. Abu Afifeh (BAPC); Balqa Governorate, Al Ardha road, 2.7 km NW of Maysara, 32°08'02.1"N 35°39'43.2"E, 434 m a. s. l., 3♂, 2 subadult ♂, 2 subadult ♀, 2 juvs. ♂, 13 May 2022, leg. B. Abu Afifeh (BAPC); Balqa Governorate, Al Ardha road, 2.7 km NW of Maysara, 32°08'00.2"N 35°39'44.5"E, 438 m a. s. l., 5♂4♀, 16 May

2022, leg. B. Abu Afifeh (BAPC); Balqa Governorate, Zai water pipeline road, 470 m E of Zai water pump station (PS2), 32°10'52.8"N 35°39'14.6"E, 124 m a. s. l., 4♀, 26 Jan 2023, leg. B. Abu Afifeh (BAPC); Ajloun Governorate, 1.7 km W of Kufrankeh Dam, 32°16'10.3"N 35°37'24.6"E, 122 m a. s. l., 6♀, 7 subadult ♀, 2 subadult ♂, 28 Jan 2023, leg. B. Abu Afifeh (BAPC).

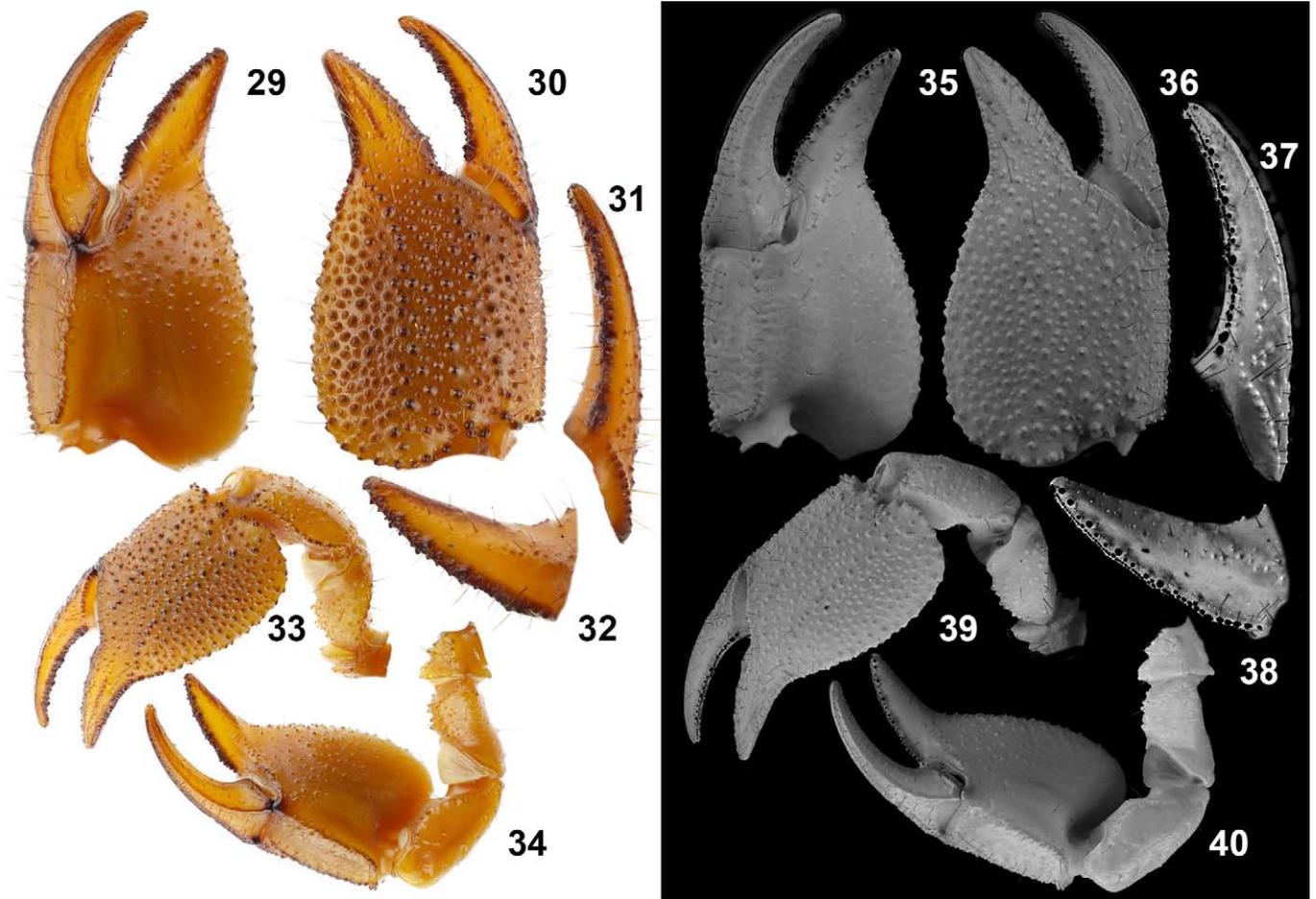


**Figures 21–28:** *Jordanius maysaraensis* gen. et sp. n., male holotype (21, 22, 25, 26) and female paratype (23, 24, 27, 28). **Figures 21, 23, 25, 27.** Carapace and tergites I–III. **Figures 22, 24, 26, 28.** Coxal and sternoplectinal region. **Figures 21–24** under white light. **Figures 25–28** under UV light.

**ETYMOLOGY.** The specific epithet refers to Maysara town in Balqa Governorate, Jordan.

**DIAGNOSIS.** Medium-sized species. Total length in adults is about 52.50 mm in both sexes. General coloration dark yellow to light yellowish brown. Carapace anterior margin distinctly bilobed. Carapace acarinate, only posteriomedian carinae visible, carapace shagreened but triangular region between median eyes and anterior margin smooth with scattered moderate and flattened granules in males; smooth

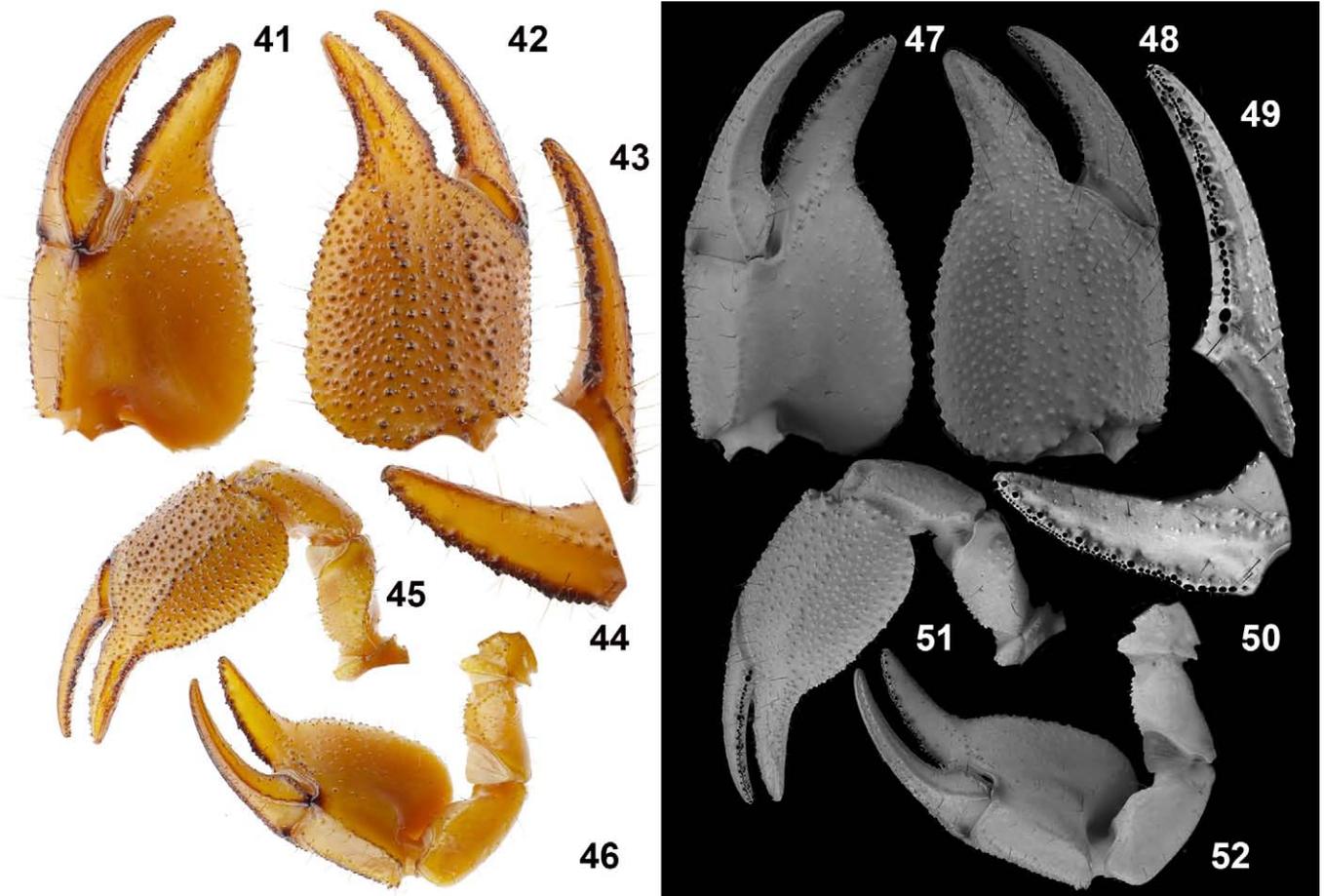
and lustrous with small granules laterally in females. The external surface of chela manus densely covered with large, raised, rounded and somewhat pointed granules, the posterior margin of the external surface of chela manus bears very large spinoid protrudings. Internal surface of chela manus with small to moderate pointed granules along the dorsal margin. Chela manus flattened and elongated; manus length to chela depth ratio almost the same in both sexes. Chela fingers are relatively long with small pointed gradually decreased granules anteriorly. Fixed and movable fingers with 4 or 5



**Figures 29–40.** *Jordanius maysaraensis* gen. et sp. n., male holotype, pedipalp segments under white light (29–34) and under UV light (35–40). Chela ventral (29, 35) and dorsal (30, 36). Movable (31, 37) and fixed (32, 38) fingers dentition. Pedipalp dorsal (33, 39) and ventral (34, 40).

strong accessory denticles. Tergites I–VI matt, shagreened in males with scattered small granules in males; smooth and lustrous with flattened medium granules in females. Metasoma I with 10 carinae, II–IV with 8, and V with 7 carinae. Lateral inframedian carinae on segment I indistinct. Ventral submedian and ventrolateral carinae moderate to strong, with moderate rounded granules, size and numbers of granules decrease from segment I toward segment IV, nearly obsolete on segment IV. Ventromedian and ventrolateral carinae strong with spaced large and pointed granules on segment V, pointed granules gradually increase posteriorly on ventrolateral carina of segment V. Telson globular in females and relatively slender in males. Pectinal teeth number 11–13 in males, 10–12 in females. Genital operculum ovoid in males, cordate or heart-shaped in females, anterior margin slightly convex, posterior area slightly but widely elongated and a small posterior indentation exist in females. Trichobothriotaxy of type C, orthobothriotaxic (Vachon, 1974), pedipalp chela trichobothrium *it* placed basally along fixed finger near *ib*. Tibial spurs absent. Tarsi armed only with prolateral pedal spurs, tarsi of legs I to IV with 5/8–6/8–7/9–7/10 internal and external spines arranged in series.

**DESCRIPTION:** (♂ holotype, unless otherwise specified). **Coloration** (Figs. 5, 9–12). General coloration dark yellow to light yellowish brown. Prosoma: Carapace is light olive yellow with light brown triangular reticulations limited by the lateral eyes at the base and posterior median furrow in both sexes. Between median eyes is brownish black and around median eyes is light brown. Mesosoma: Basically, light olive yellow with brown pigmentation and reticulations on tergites; overlap area of segments yellow therefore yellow bands visible on posterior margins of segments I–VI. Venter dark olive yellow, poststernites yellowish. Pedipalp: femur, patella, and chela olive yellow. Coxae and sternum dark yellow, genital operculum and pectines lustrous yellow. Pedipalp: Femur and patella dark yellow, dorsal carina of patella and granules reddish brown. Chela manus dark yellow; fixed finger, and movable finger dark yellow to reddish yellow; ventrointernal surface of chela manus dark yellow; granules reddish brown or reddish black on apex; finger dental margins and movable finger condyles reddish black. Metasoma: Dark yellow to olive yellow, darker in ventral surface; granules on dorsolateral, ventrolateral, ventral and ventral submedian carinae light reddish brown. Vesicle of telson dark yellow,



**Figures 41–52:** *Jordanius maysaraensis* gen. et sp. n., female paratype, pedipalp segments under white light (41–46) and under UV light (47–52). Chela ventral (41, 47) and dorsal (42, 48). Movable (43, 49) and fixed (44, 50) fingers dentition. Pedipalp dorsal (45, 51) and ventral (46, 52).

aculeus reddish yellow at the base and dark reddish brown at the tip. Legs: olive yellow, spinules and condyles red or reddish black. Chelicerae: Chelicera manus dark yellow with brown reticulations, fingers brown, teeth reddish black.

**Carapace** (Figs. 21–28). Carapace anterior margin distinctly bilobed. Carapace acarinate, only posteriomedian carinae visible, carapace shagreened but triangular region between median eyes and anterior margin smooth with scattered moderate and flattened granules in males; smooth and lustrous with small granules laterally in females. Anterior margin with 13–17 medium to large setae and distinct depression. There is a protrusion in the middle of the depression. Along anterior margin a rounded and flattened row of granules present. Median ocular tubercle distinct and located in the center of the carapace. A pair of median eyes, and three pairs of lateral eyes exist; the first two lateral eyes in equal size, and the third slightly reduced and located separately. Anteriomedian furrow moderate but posterior median and posterior lateral furrows distinct. 12 moderate setae exist on the carapace.

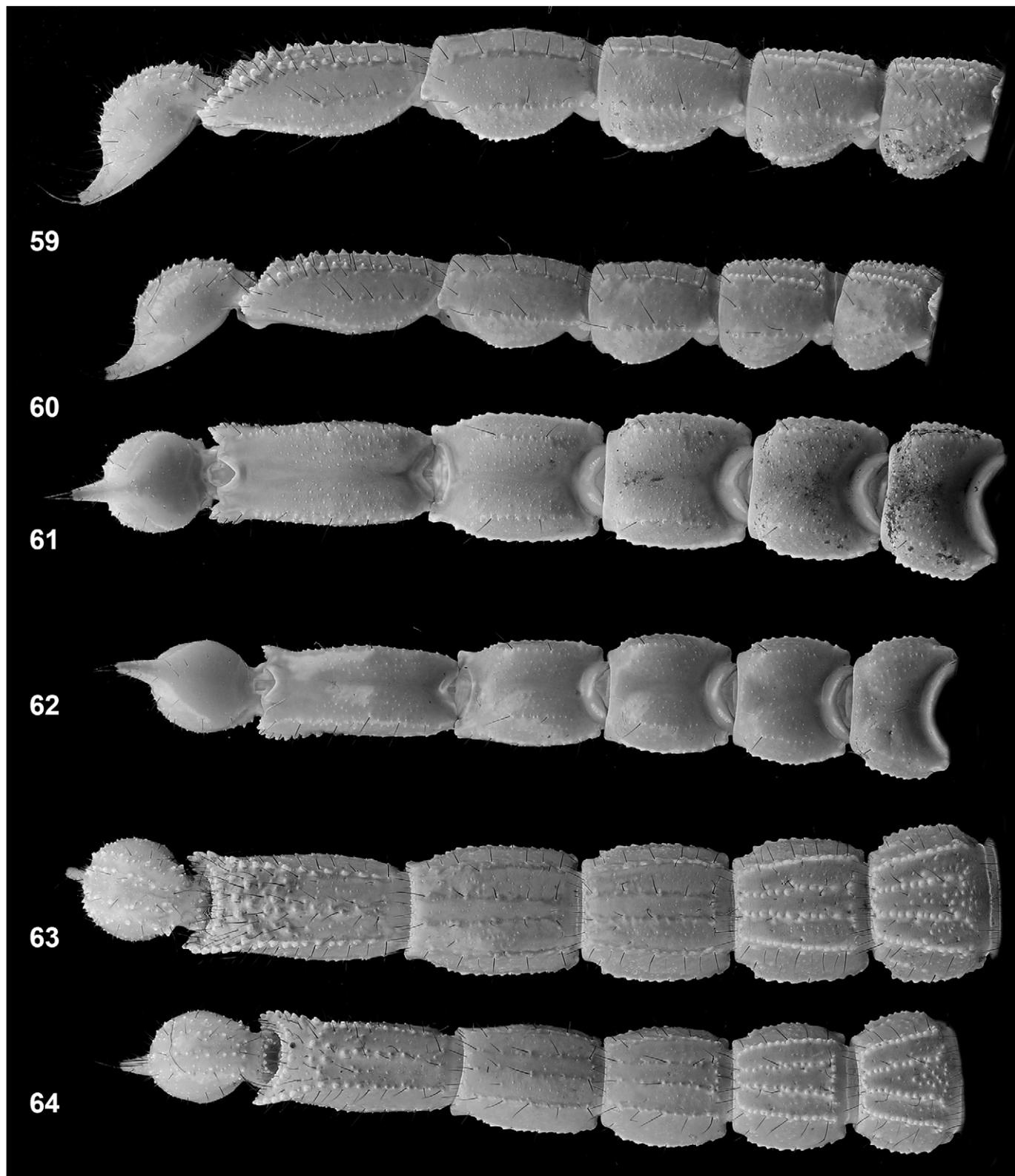
**Chelicerae** (Figs. 21–28). Cheliceral dentition characteristic for the family Scorpionidae (Vachon, 1963). Dorsal surface of manus smooth, convex; smooth longitudinal ridges present anteriorly; prolateral and ventral surfaces densely setose; prodorsal margin bears 3 reddish macrosetae. Fixed finger

dorsal and ventral surfaces densely setose, dorsal margin bears 4 teeth: distal, subdistal, median, and basal; ventral margin without teeth; movable finger dorsal surface smooth; ventral surface densely setose; dorsal margin bears 4 teeth: external distal, subdistal, median, and basal; ventral margin with internal distal teeth. The movable finger always ends in two distal teeth—one external and one internal—between which is inserted the distal tooth of the fixed finger.

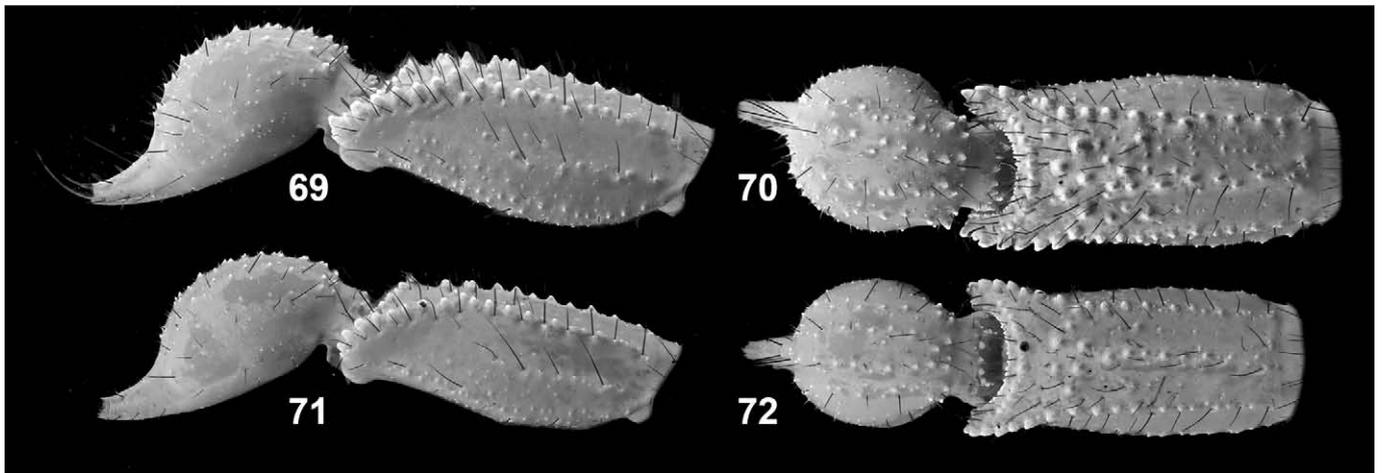
**Mesosoma** (Figs. 13–28). Tergites I–VI acarinate. Tergites I–VI matt, shagreened with scattered small granules in males; smooth and lustrous with flattened medium granules in females. Tergite VII shagreened in males, smooth in females with moderate, pointed granules posteriorly and laterally; carinae granulate and present only in posterior half of segment. Posterior margin of tergites with microsetae and a long seta on seventh tergite at end of each carina. Sternites III–VI wrinkled medially, almost smooth laterally in males, completely smooth in females. Sternite VII granular with coarse granules between lateral carinae and feebly wrinkled medially; shagreened laterally with four tuberculate carinae with lobated granules; posterior margin bears numerous moderate setae. Genital operculum ovoid in males, cordate or heart-shaped in females, anterior margin slightly convex, posterior area slightly but widely elongated and a small posterior indentation exist in



Figures 53–58. *Jordanius maysaraensis* gen. et sp. n., male holotype (53, 55, 57), and female paratype (54, 56, 58). Metasoma and telson under white light, in lateral (53–54), dorsal (55–56), and ventral (57–58) views. Scale bar: 10 mm.



Figures 59–64: *Jordanius maysaraensis* gen. et sp. n., male holotype (59, 61, 63), and female paratype (60, 62, 64). Metasoma and telson under UV light, in lateral (59–60), dorsal (61–62), and ventral (63–64) views. Scale bar: 10 mm.



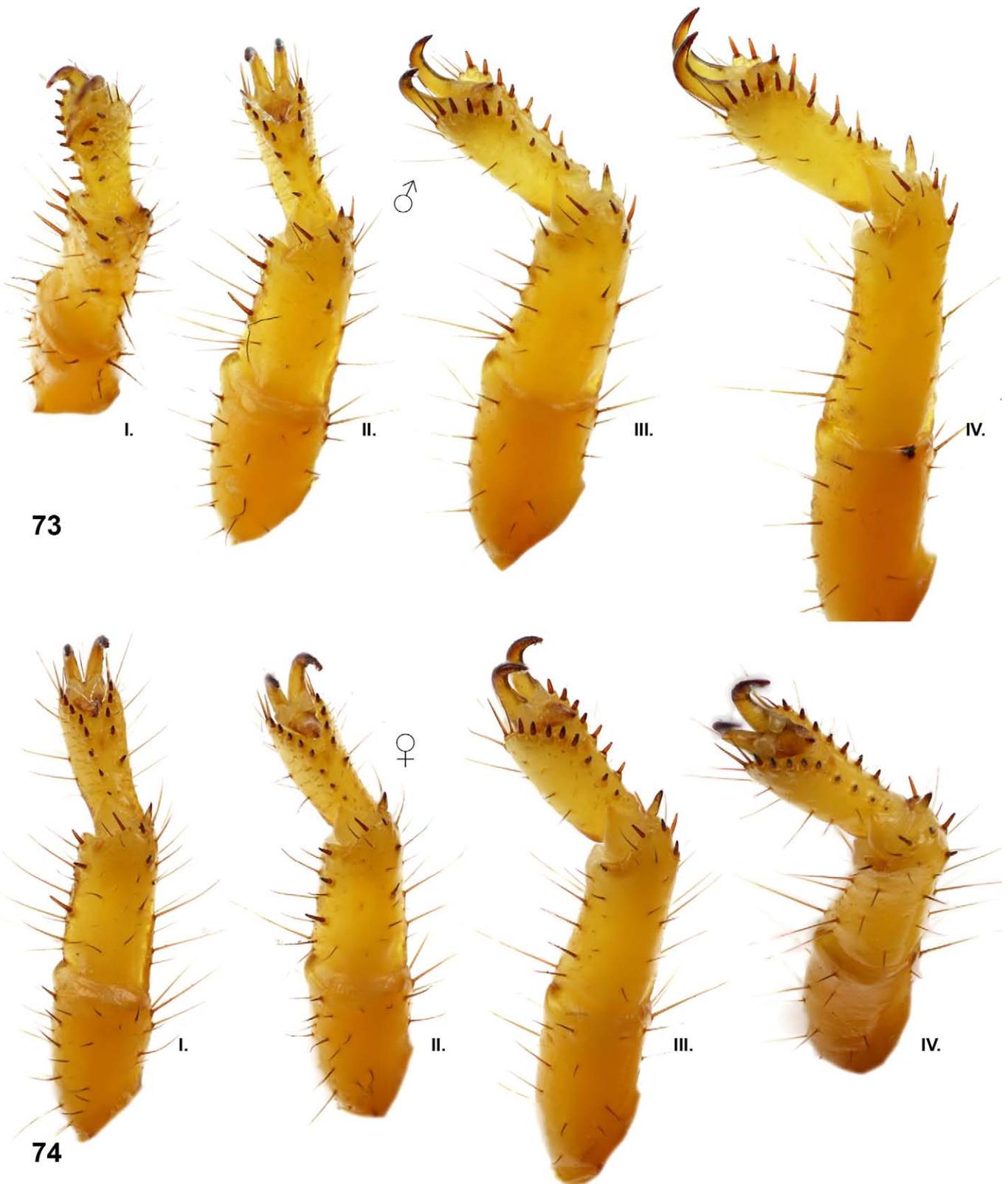
**Figures 65–72.** *Jordanius maysaraensis* gen. et sp. n., male holotype (65, 66, 69, 70), and female paratype (67, 68, 71, 72). Metasoma V and telson under white light (65–68) and under UV light (69–72), in lateral (65, 67, 69, 71), and ventral (66, 68, 70, 72) views.

females. Pectines short, dentate margin length to pectin length ratio 0.73 in male holotype. Teeth numbers 11–13 in males and 10–12 in females; three marginal and three to five median lamellae. Stigmas linear, angled 45° and conspicuous.

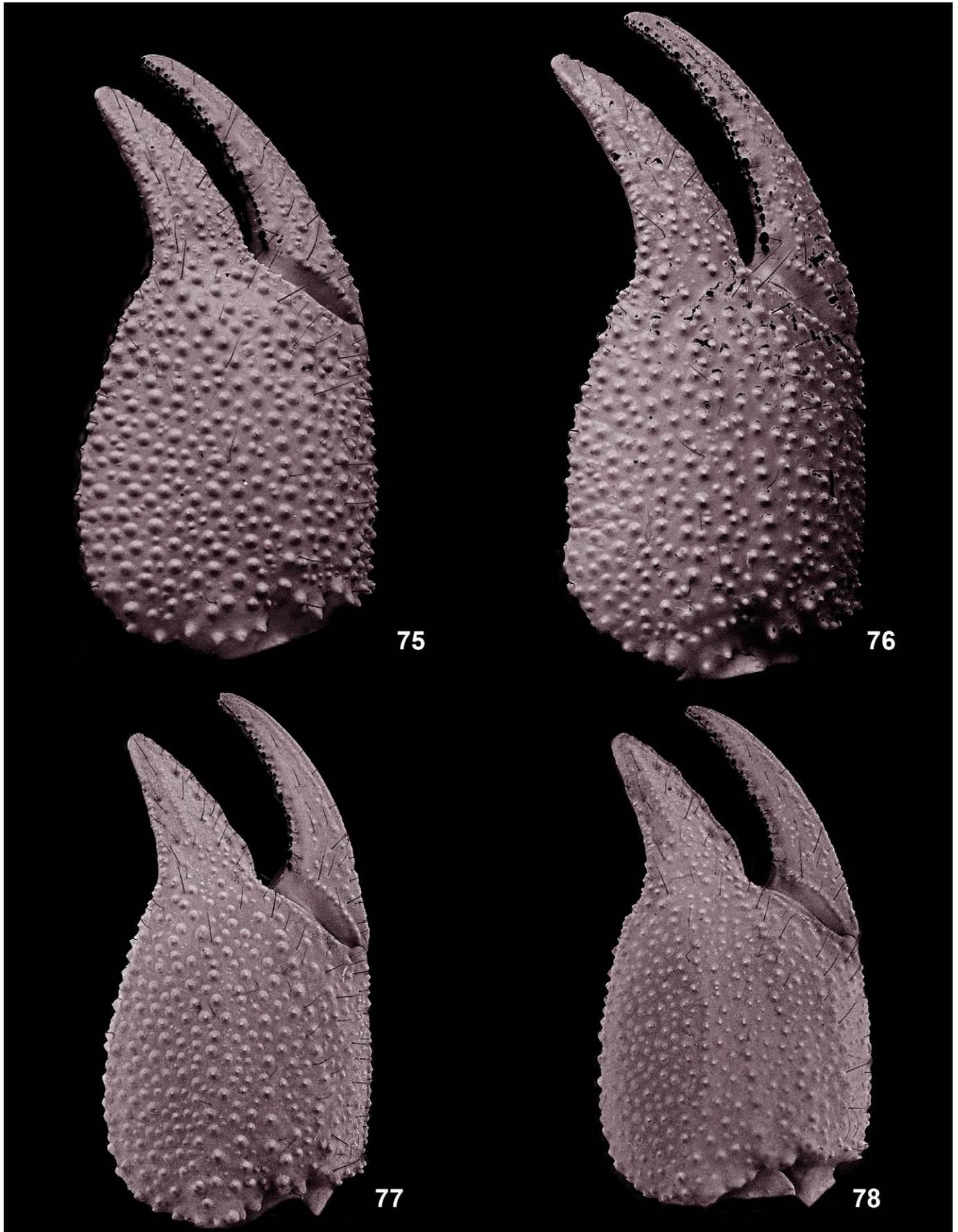
**Metasoma and telson** (Figs. 53–72). Metasoma I with 10, II–IV with 8, and V with 7 carinae. Lateral inframedian carinae on segment I indistinct. Ventral submedian and ventrolateral carinae strong on segments I–II, with moderate rounded granules, weak to moderate on III–IV, size and numbers of granules decrease from segment I toward segment IV, nearly obsolete on segment IV. Ventromedian and ventrolateral carinae strong with spaced large and pointed granules, continues in lateral of anal arch on segment V, pointed granules gradually increase posteriorly on ventrolateral carina of segment V. Dorsolateral carinae strong on segments I–IV with pointed and spaced, small granules; moderate on segment V with rounded granules. Lateral supramedian carinae moderate to strong with spaced granules on segments I–IV. Segment V with a row of granules laterally on the anterior half of segment. Intercarinal surfaces on segments I–V with fine to moderate granules in males, smooth and with scattered fine granules in females on dorsal and lateral surfaces. Segments I–V covered

moderately with red setae of variable size, more dense on ventral surface. Vesicle globular, smooth dorsally, granulated ventrally and laterally; ventral aspect with numerous small, spinoid granules, vesicle with many red macrosetae even on the base of aculeus. Aculeus strongly curved and shorter than vesicle.

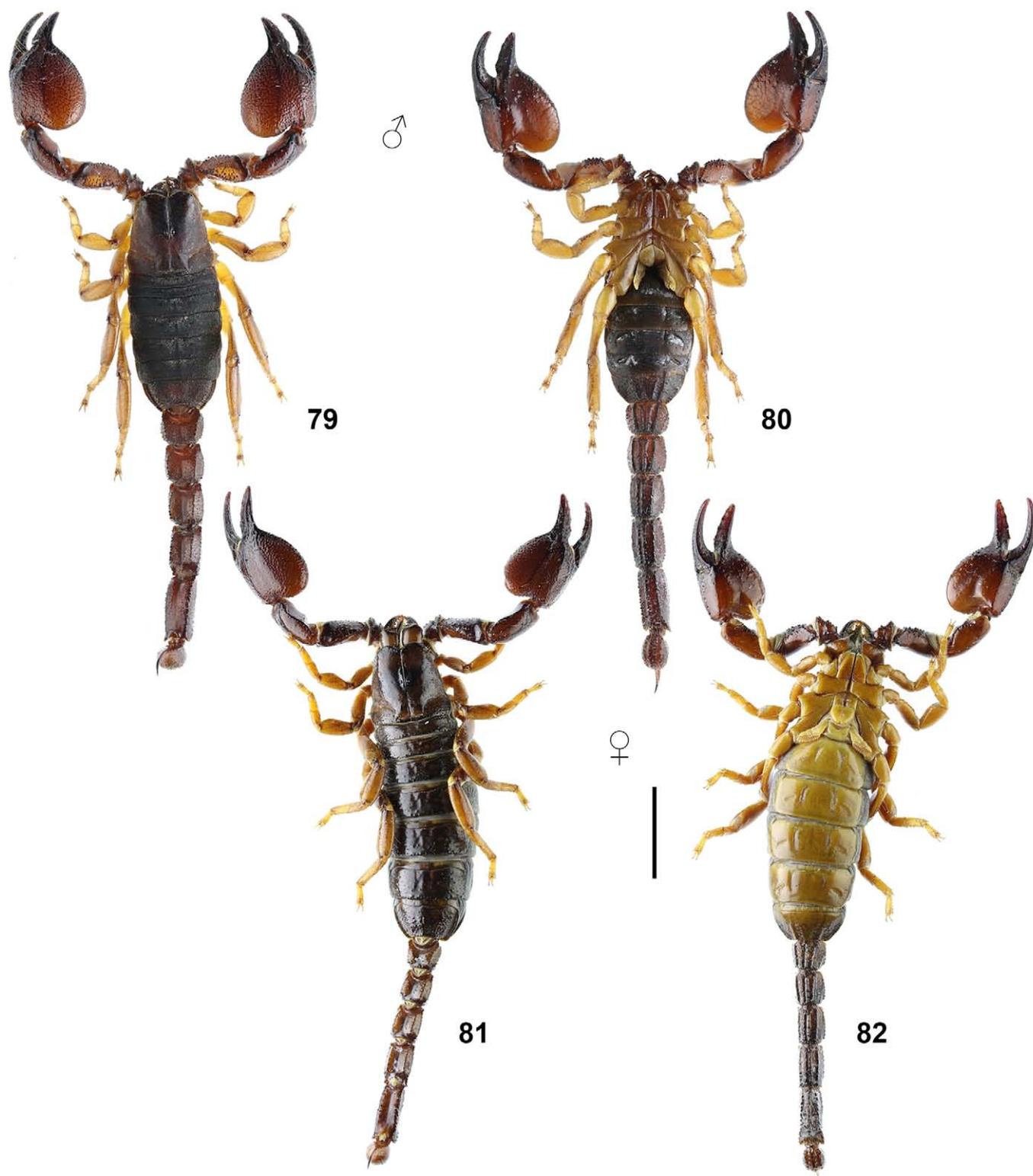
**Pedipalp** (Figs. 29–52). Pedipalp femur with three carinae; dorsointernal and ventrointernal carinae moderate with spaced rounded granules; dorsoexternal carinae of pedipalp femur distinct with separate granules distally, sometimes with several rows of spaced granules, intercarinal surface smooth with numerous setae, dorsoexternal surface with numerous rounded and pointed granules of different sizes, internal surface with some large, pointed granules. Patella with two carinae. Dorsomedian carina distinct with swollen and some fused granules and ventrointernal carinae obsolete with a few swollen granules, intercarinal surface smooth with numerous setae. The external surface of chela manus densely covered with large, raised, rounded and somewhat pointed granules, the posterior margin of the external surface of chela manus bears very large spinoid protrudings. Internal surface of chela manus with small to moderate pointed granules along dorsal margin.



Figures 73–74. *Jordanius maysaraensis* gen. et sp. n., right legs I–IV, male holotype (73) and female paratype (74).



Figures 75–78: Right pedipalp chelae under UV light in dorsal views. Figures 75–76. *Jordanius granulomanus* comb. n., male holotype (75), and female paratype (76). Figures 77–78. *Jordanius maysaraensis* gen. et sp. n., male holotype (77), and female paratype (78).



**Figures 79–82:** *Scorpio fuscus*, habitus under white light. **Figures 79–80.** Male from Birqish Forest, northwestern Jordan, in dorsal (79) and ventral (80) views. **Figures 81–82.** Female from Birqish Forest, northwestern of Jordan, in dorsal (81) and ventral (82) views. Scale bar: 10 mm.

Dimensions (mm)		<i>Scorpio fuscus</i> Linné, 1758	<i>Scorpio fuscus</i> Linné, 1758
		♂ Jordan	♀ Jordan
Carapace	L / W	8.88 / 8.76	9.12 / 8.64
Mesosoma	L	20.65	21.01
Metasoma + telson	L	30.84	28.68
Segment I	L / W / D	3.72 / 4.32 / 3.80	3.36 / 4.08 / 3.59
Segment II	L / W / D	4.08 / 3.90 / 3.43	3.84 / 3.72 / 3.28
Segment III	L / W / D	4.44 / 3.84 / 3.38	4.08 / 3.60 / 3.17
Segment IV	L / W / D	5.40 / 3.48 / 3.06	4.80 / 3.36 / 2.96
Segment V	L / W / D	6.96 / 2.88 / 2.76	6.60 / 2.88 / 2.76
Telson	L / W / D	6.24 / 2.64 / 2.40	6.00 / 2.64 / 2.40
Pedipalp	L	26.29	26.77
Femur	L / W	5.88 / 2.88	6.12 / 3.00
Patella	L / W	6.72 / 3.00	6.96 / 3.24
Chela	L	13.69	13.69
Manus	L / W / D	8.88 / 4.08 / 8.04	8.40 / 4.08 / 7.56
Movable finger	L	8.16	8.04
Fixed finger	L	5.40	5.40
<b>Total</b>	<b>L</b>	<b>60.37</b>	<b>58.81</b>

**Table 2:** Comparative measurements of *Scorpio fuscus* male and female from Jordan. Abbreviations: length (L), width (W), depth (D).

Ventroexternal carina strong with dark rather fused granules, ventrointernal carina smooth. Digital and external secondary carinae not visible with more distinct and darker granules only, parallel each other. Chela manus flattened and elongated. Intercarinal surface smooth with numerous distinct setae. Chela fingers are relatively long with small pointed gradually decreased granules anteriorly. Fixed and movable fingers with 4 or 5 strong accessory denticles. Trichobothriotaxy of type C; orthobothriotaxic (Vachon, 1974); femur of pedipalp with 3 (1 internal, 1 dorsal, 1 external, and 0 ventral) trichobothria; patella of pedipalp with 19 (1 internal, 2 dorsal, 13 external, and 3 ventral) trichobothria; chela of pedipalp with 26 trichobothria; of them 16 on the hand (0 internal, 2 dorsal, 10 external, and 4 ventral) trichobothria; and 10 on the fixed finger (2 internal, 4 dorsal, 4 external, and 0 ventral) trichobothria.

**Legs** (Figs. 73–74). Tibial spurs absent; tarsi armed with prolateral pedal spurs only, tarsi of right legs I to IV with 5/8–6/8–7/9–7/10 internal and external spines arranged in series.

**Measurements.** See Table 1.

**AFFINITIES.** *Jordanius maysaraensis* **gen. et sp. n.** shows some morphological similarities with *J. granulomanus* **comb. n.** in the presence of large, rounded, somewhat pointed granules on the dorsal surface of chela manus; also in having a remarkably elongated chela manus. The new species can be distinguished from *J. granulomanus* **comb. n.** by:

**a)** having less dense and relatively smaller granulation on the external surface of chela manus (Figs. 75–78).

**b)** higher pectinal teeth number; 11–13 (average 12.0) in males (26 combs, n=13), 10–12 (average 10.9) in females (24 combs, n=12) in *J. maysaraensis* **gen. et sp. n.**; whereas it is

9–12 with average 10.7 in males (18 combs, n=9), 8–11 with average 9.9 in females (44 combs, n=22) in *J. granulomanus* **comb. n.**

**c)** general coloration of *J. maysaraensis* **sp. n.** is olive yellow (Fig. 5), whereas *J. granulomanus* **comb. n.** has generally reddish-brown coloration (Fig. 6).

*Scorpio* Linnaeus, 1758  
*Scorpio fuscus* (Ehrenberg in Hemprich & Ehrenberg, 1829)  
(Figures 3–4, 79–144, 360, 366; Table 2)

<http://zoobank.org/urn:lsid:zoobank.org:act:A16B77BE-78AC-41FB-A105-74EA67D4ED2C>

*Buthus (Heterometrus) palmatus fuscus*: Hemprich & Ehrenberg, 1829: 352.

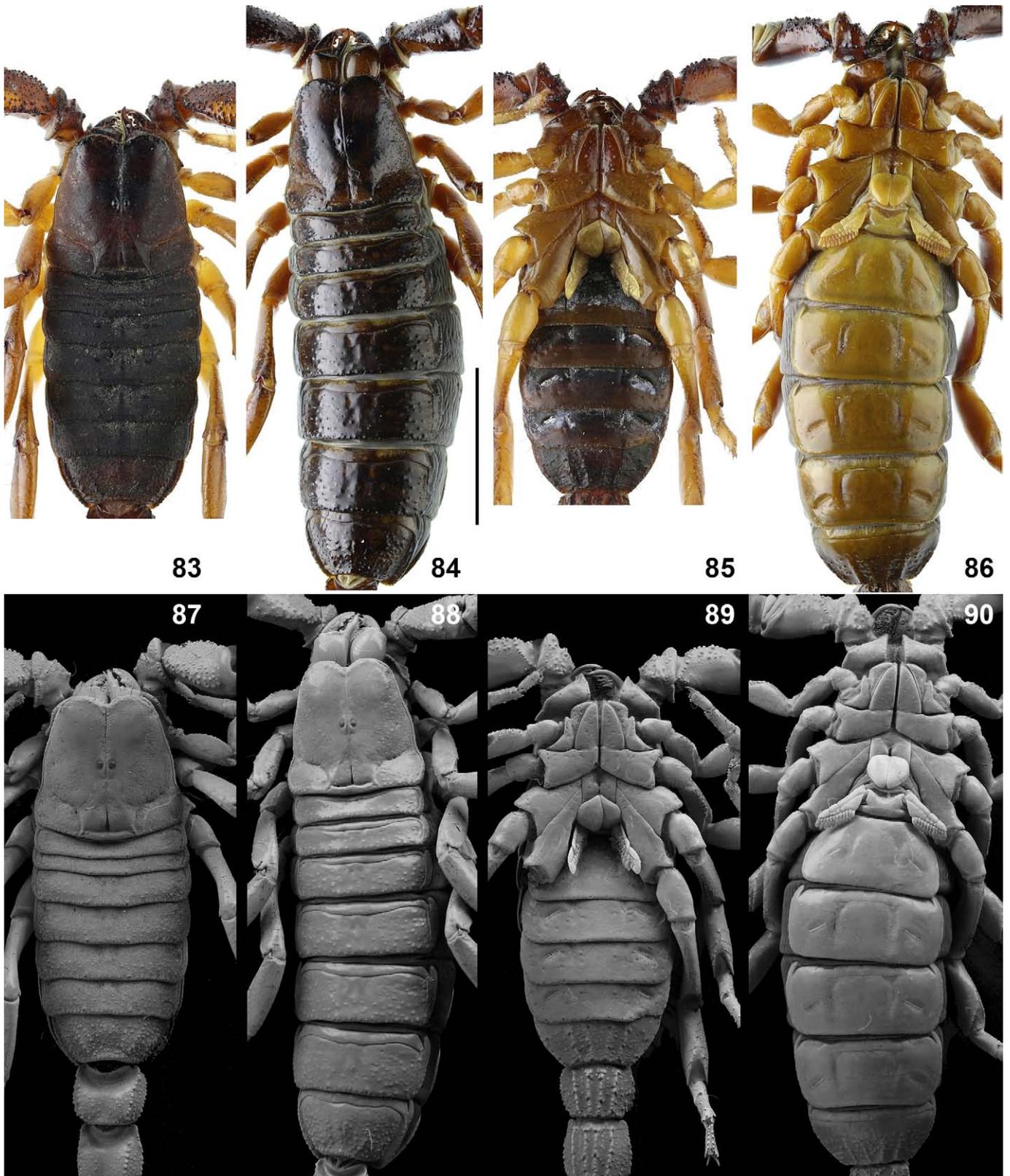
*Heterometrus palmatus fuscus*: Simon, 1872: 258.

*Heterometrus fuscus*: Pocock, 1900: 363.

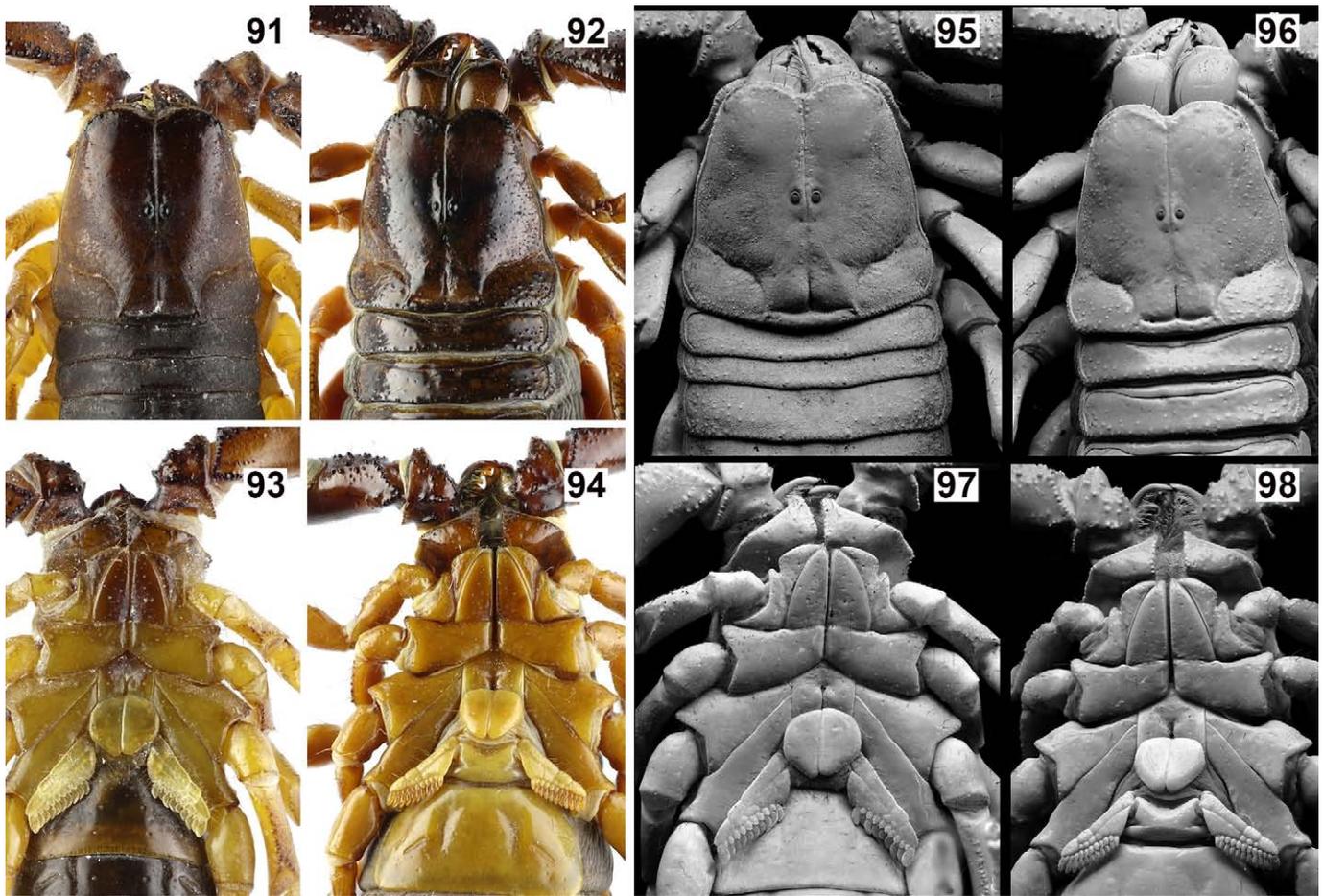
*Scorpio maurus fuscus*: Birula, 1910: 169–170, 173–178, pl. XIX, figs. 9–10; pl. XIII, figs. 13, 15; Fet, 2000: 476–477 (complete references list until 1999).

**NEOTYPE LOCALITY AND TYPE DEPOSITORY.** **Lebanon**, Keserwan-Jbeil Governorate, Keserwan, Wadi El Amine, 33°54'28"N 35°47'59"E, 1719 m a. s. l., ♂ neotype, 7 June 2024, leg. Rami Khashab, AZMM.

**MATERIAL EXAMINED.** **Jordan**, Irbid Governorate, Birqish Forest, northwestern Jordan, 32°26'22.6"N 35°44'03.5"E, 788 m a. s. l., 1♂ (AZMM/Sco-2019: 4), 1♀ (AZMM/Sco-2019:



**Figures 83–90:** *Scorpio fuscus* from Birqish Forest, northwestern Jordan, male (83, 85, 87, 89) and female (84, 86, 88, 90) under white light (83–86), and under UV light (87–90). **Figures 83, 84, 87, 88.** Carapace and mesosoma. **Figures 85, 86, 89, 90.** Coxal and sternopectinal regions and sternites. Scale bar: 10 mm.



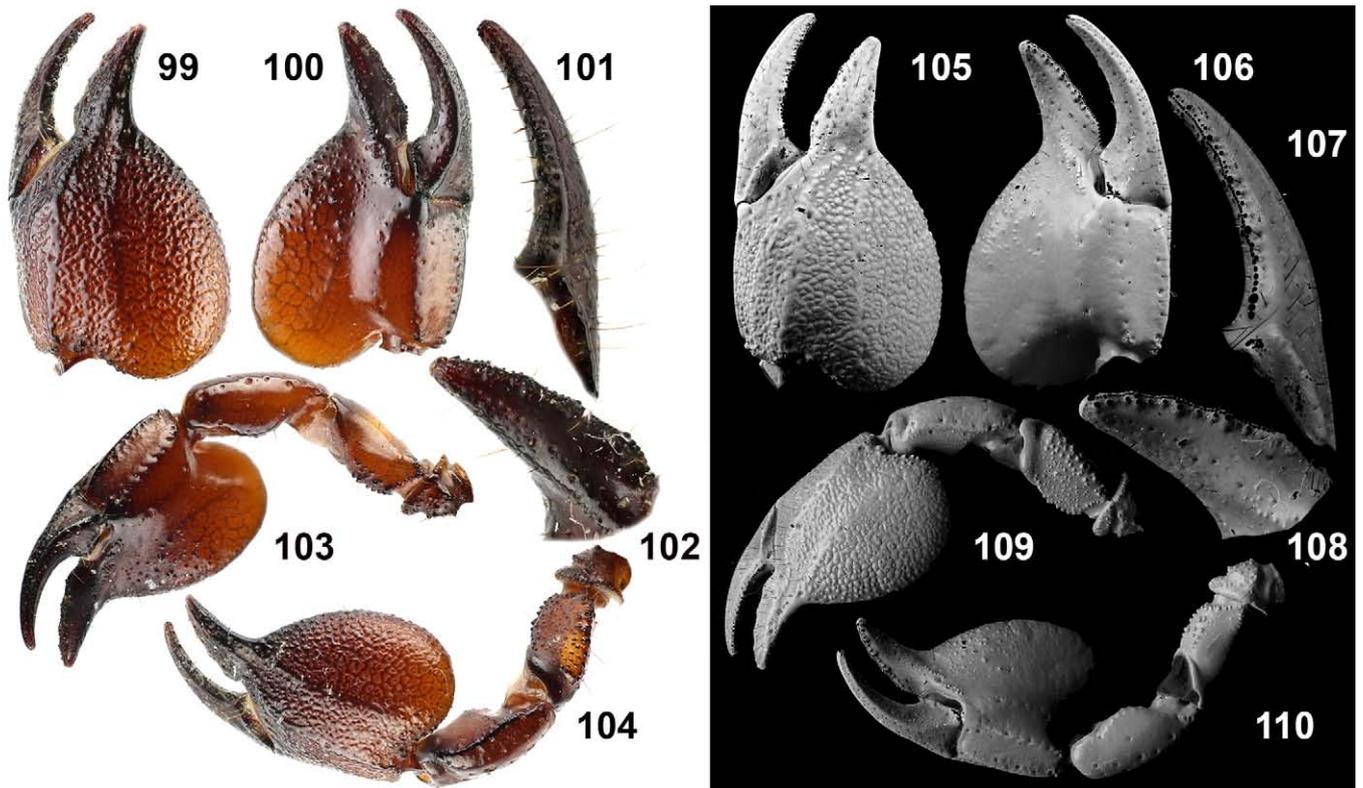
**Figures 91–98:** *Scorpio fuscus* from Birqish Forest, northwestern Jordan, male (91, 95, 93, 97) and female (92, 96, 94, 98), under white light (91–94), and under UV light (95–98). **Figures 91, 92, 95, 96.** Carapace and tergites I–II. **Figures 93, 94, 97, 98.** Coxal and sternopectinal region.

5), 14 August 2019, leg. M. Al-Sarairoh & I. Bani Yaseen (BAPC); Irbid Governorate, Birqish Forest, northwestern Jordan, 32°26'22.6"N 35°44'03.5"E, 788 m a. s. l., 2♂2♀, 19 May 2022, leg. M. Al-Sarairoh & B. Abu Afifeh (BAPC); Balqa Governorate, Bader Al Jadeedah, 31°57'09.2"N 35°44'11.2"E, 555 m a. s. l., 2♂, 20 July 2023, leg. B. Abu Afifeh & M. Al-Sarairoh (BAPC). **Lebanon**, Keserwan-Jbeil Governorate, Keserwan, Wadi El Amine, 33°54'28"N 35°47'59"E, 1719 m a. s. l., 1♂ (neotype), 7 June 2024, leg. Rami Khashab (AZMM/Sco-2024:50).

**DIAGNOSIS.** Medium-big sized species compared with its congeners. Adults are about 58–63.5 mm in males and 62.4–70 mm in females in length. General coloration dark reddish brown to brownish black. Carapace is slightly longer than its wide. Carapace anterior margin distinctly bilobed and a deep median indentation. Carapace lacks carinae, only posteriomedian carinae slightly visible. Around median eyes and anterior region of carapace smooth, rest of carapace shagreened with small, scattered granules or shagreened. Tergites I–VI acarinate. Tergites I–VI matt and shagreened, moderately covered with medium sized rounded granules in males; smooth, lustrous, moderately covered with medium

sized flattened granules in females. Genital operculum is heart-shaped in females, ovoid in males. Pectinal teeth numbers 9–10 in males and 8–11 in females (Talal et al., 2015). Metasoma I wider than long, II–V longer than wide. Metasoma I with 10, II–IV with 8, and V with 5 carinae. Vesicle globular and smooth, granulated ventrally with spinoid granules in both sexes. Pedipalp femur with three carinae, patella with two carinae. The external surface of chela manus with very large and very flattened and fused granules in reticulate shape. Internal surface of chela manus smooth with moderate pointed granules in anterior area. Chela manus flattened, slightly longer than wide. Chela fingers are relatively long without granules. Trichobothriotaxy of type C, orthobothriotaxic (Vachon, 1974), pedipalp chela trichobothrium *it* placed basally along fixed finger near *ib*. Tibial spurs absent. Tarsi armed only with prolateral pedal spurs, tarsi of legs I to IV with 4/7–6/8–7/8–7/8 internal and external spines arranged in series.

**DESCRIPTION** (♂, unless otherwise specified). **Coloration** (Figs. 3, 4, 79–82). General coloration dark reddish brown to brownish black. Carapace: dark reddish brown, anterior area is darker. Mesosoma: Tergites I–VI brownish black. Tergite VII dark yellow. Coxae and sternum dark



**Figures 99–110.** *Scorpio fuscus* male from Birqish Forest, northwestern Jordan, pedipalp segments under white light (99–104), and under UV light (105–110). Chela dorsal (99, 105) and ventral (100, 106). Movable (101, 107) and fixed (102, 108) fingers dentition. Pedipalp ventral (103, 110) and dorsal (104, 109).

yellow. Genital operculum and pectines lustrous yellow. Sternites III–IV shiny light yellowish brown with darker patches; sternites V–VI shiny yellowish brown with lighter reticulations; sternites VII yellowish brown to brown with dark reticulations. Pedipalp: Femur and patella dark reddish brown with blackish reticulations. Chela manus dark reddish to reddish black; reticular granulation, granules and carinae reddish black. Fingers black but anterior tips reddish brown. Metasoma: metasoma dark reddish brown in dorsal and lateral surface; reddish black in ventral surface with reddish black reticulations in lateral surface. Carinae and granules reddish black. Vesicle of telson dark reddish brown, aculeus reddish at the base and black at the tip. Legs: Tarsi, basitarsus and pretarsus dark yellow, femur and tibia yellowish brown with reticulation. Spinules and condyles reddish brown. Chelicerae: Chelicera manus blackish anteriorly, rest of manus dark brown with blackish reticulations. Fingers dark brown, tips of fingers and teeth reddish brown.

**Carapace** (Figs. 91–98). Carapace is slightly longer than its wide; almost upright trapezoid in shape. Carapace anterior margin distinctly bilobed with 14 medium to large setae with a deep median indentation. Carapace lacks carinae, only posteriomedian carinae slightly visible. Close area of median eyes and anterior region of carapace smooth, rest of carapace shagreened with small, scattered granules. Far area of median eyes and anterior region of carapace smooth, lateral flanks with small, rounded granules and posterior region with

flattened medium granules in females. Along anterior margin a rounded and flattened row of granules present. Median ocular tubercle not distinct and located in the center of the carapace. A pair of median eyes and three pairs of lateral eyes exist; the third located separately. The anteromedian furrow is narrow but deep and distinct. The posteromedian furrow is wide and bifurcated as an inverted T-shaped at posterior edge and located in arrow-shaped depressions between posteriomedian carinae and posterior margin. Posterior lateral furrows wide and distinct. A few setae exist on the anterior area of carapace.

**Chelicerae** (Figs. 91–98). Cheliceral dentition characteristic for the family of Scorpionidae (Vachon, 1963); subdistal tooth and basal teeth conspicuous rather than on the movable finger. Smooth longitudinal ridges present anteriorly.

**Mesosoma** (Figs. 83–90). Tergites I–VI acarinate. Tergites I–VI matt and shagreened, moderately covered with medium sized rounded granules in males; smooth, lustrous, moderately covered with medium sized flattened granules. Tergite VII matt and shagreened, densely covered with medium sized rounded granules in males, and smooth, lustrous, densely covered with medium sized flattened granules in females. Sternites III–VI almost smooth with scattered setae in males; smooth and lustrous without setae in females. Sternite VII granular with four spaced granular carinae.

**Metasoma and telson** (Figs. 123–142). Metasoma I wider than long, II–V longer than wide. Metasoma I with 10, II–IV with 8, and V with 5 carinae. Lateral inframedian carinae on



**Figures 111–122.** *Scorpio fuscus* female from Birqish Forest, northwestern Jordan, pedipalp segments under white light (111–116), and under UV light (117–122). Chela dorsal (111, 117) and ventral (112, 118). Movable (113, 119) and fixed (114, 120) fingers dentition. Pedipalp ventral (115, 122) and dorsal (116, 121).

segment I indistinct with spaced rounded granules. Ventral submedian carinae moderate and ventrolateral carinae with moderate and rounded granules on segments I–IV, the granules somewhat flattened and fused; more obsolete in segments III–IV. Dorsolateral carinae and lateral supramedian carinae strong and crenulated on segments I–IV with pointed and spaced spinoid granules. Segment V: Ventromedian carina moderate with large, spinoid and pointed granules; ventrolateral carinae strong and serrated with spaced large and pointed granules, gradually increase posteriorly, continues in lateral of anal arch; dorsolateral carinae moderate and rounded with moderate spinoid granules; segment V with a row of granules laterally at posterior half. Intercarinal area smooth covered with scattered moderate granules in males, moderately covered with various sized granules in females on ventral and lateral surfaces; dorsal surface smooth in males, granular in females on segments I–V. Ventral and lateral surfaces covered with moderately variable sized setae. Vesicle globular and smooth, granulated ventrally with spinoid granules in both sex, females with small granules laterally. Vesicle with numerous macrosetae reaching the base of aculeus. Aculeus strongly curved and shorter than vesicle.

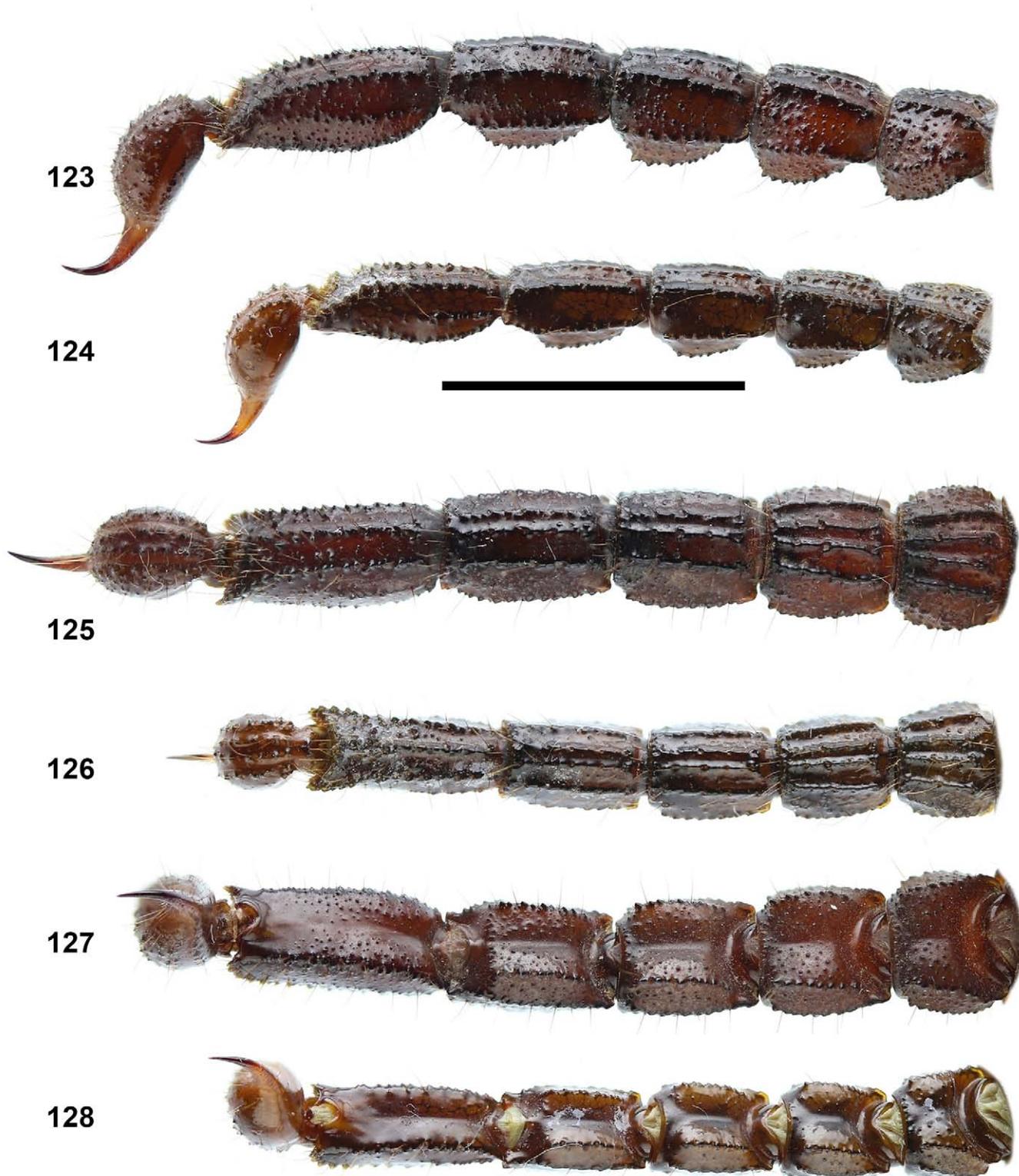
**Pedipalp** (Figs. 99–122). Pedipalp femur with three carinae; dorsointernal and ventrointernal carinae moderate with spaced rounded granules; dorsoexternal carinae strong with separated, large and rounded granules. Intercarinal area shagreened with various sized granules dorsally, smooth ventrally.

Intercarinal surface with a few distinct setae. Patella with two carinae; dorsomedian carina strong with flattened and fused granules; ventrointernal carinae obsolete without granules. Intercarinal area smooth and lustrous in dorsal, ventral and external surfaces, but internal surface shagreened. Intercarinal surface with a few distinct setae. The external surface of chela manus with very large and very flattened and fused granules in reticulate shape, forming as granulation in anterior area. Posterior margin of external surface with a few large, rounded granules. Internal surface of chela manus smooth with moderate, pointed granules on anterior area. Ventroexternal carina strong, obsolete without granules; ventrointernal carina smooth, rounded without granules. Digital and external secondary carinae distinct, granules fused completely and obsolete; become denser anteriorly. Chela manus flattened, slightly longer than wide. Chela fingers are relatively long without granules. Fixed and movable fingers with 4 or 5 strong accessory denticles. Intercarinal surface with few distinct setae on manus but fingers hirsute. Trichobothriotaxy of type C; orthobothriotaxic (Vachon, 1974).

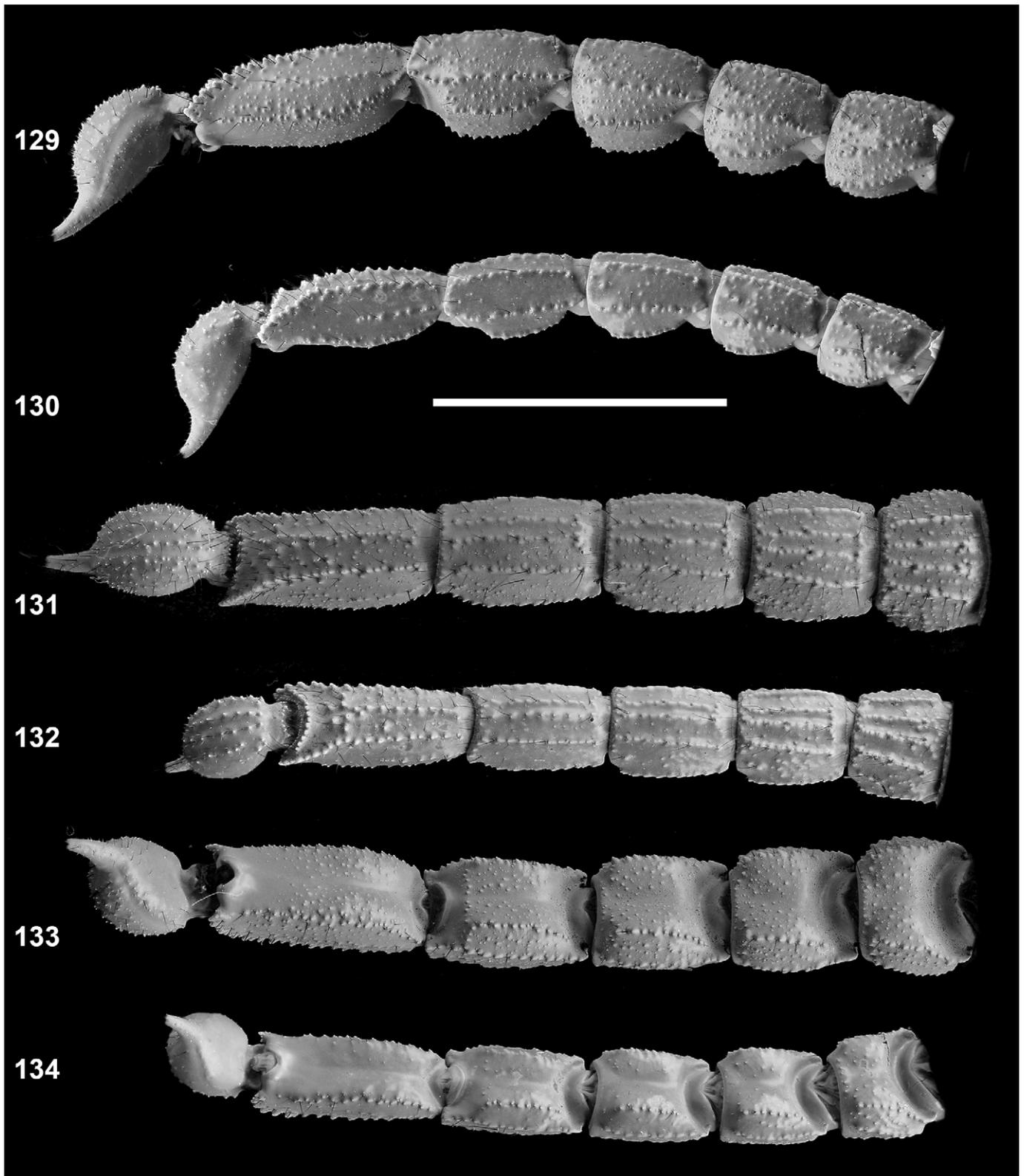
**Legs** (Fig. 143–144). Tarsi of right legs I to IV with 5/7–6/7–6/8–7/8 internal and external spines arranged in series.

**Measurements.** See Table 2.

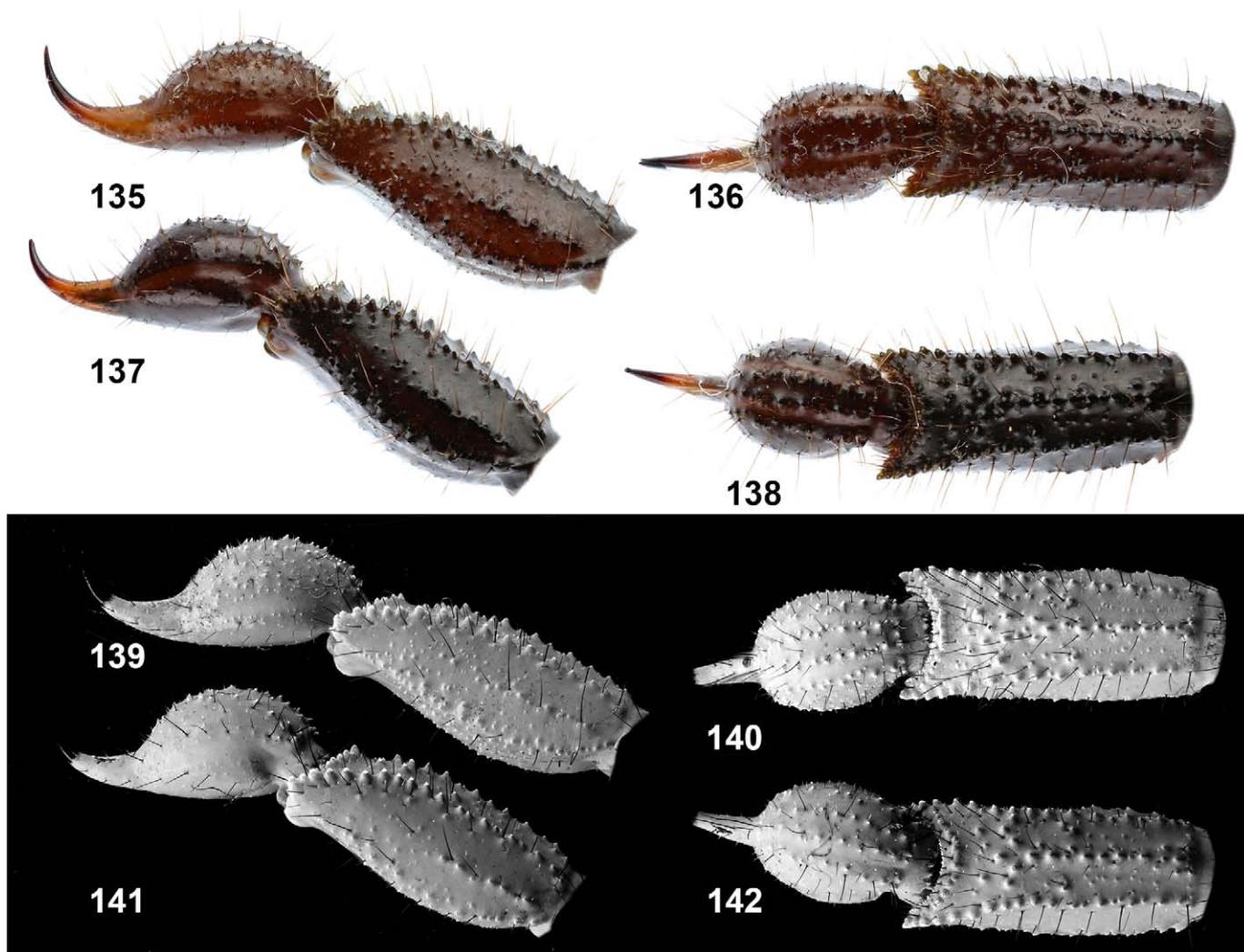
**COMMENTS.** Braunwalder & Fet (1998: 33) noted that type specimens of *Buthus (Heterometrus) palmatus fuscus* are



Figures 123–128. *Scorpio fuscus* from Birqish Forest, northwestern Jordan, male (123, 125, 127), and female (124, 126, 128). Metasoma and telson under white light, in lateral (123–124), ventral (125–126) and dorsal (127–128) views. Scale bar: 10 mm.



Figures 129–134. *Scorpio fuscus* from Birqish Forest, northwestern Jordan, male (129, 131, 133), and female (130, 132, 134). Metasoma and telson under UV light, in lateral (129–130), ventral (131–132) and dorsal (133–134) views. Scale bar: 10 mm.



**Figures 135–142:** *Scorpio fuscus* from Birqish Forest, northwestern Jordan, male (135, 136, 139, 140), and female (137, 138, 141, 142). Metasoma V and telson under white light (135–138) and under UV light (139–142), in lateral (135, 137, 139, 141), and ventral (136, 138, 140, 142) views.

unknown. Hemprich & Ehrenberg (1829) described this taxon from “Lebanon (mountains near Beirut).” For the purposes of taxonomic stability, we designate here a neotype from Lebanon.

***Scorpio jordanensis* sp. n.**

(Figures 2, 8, 145–214, 216, 218, 220, 222, 362, 368, 371; Table 3)

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*Scorpio maurus palmatus*: Amr & Al-Oran, 1994: 189; Amr et al., 2004: 241, fig. 3.

*Scorpio kruglovi*: Amr et al., 2015: 36, fig. 2E.

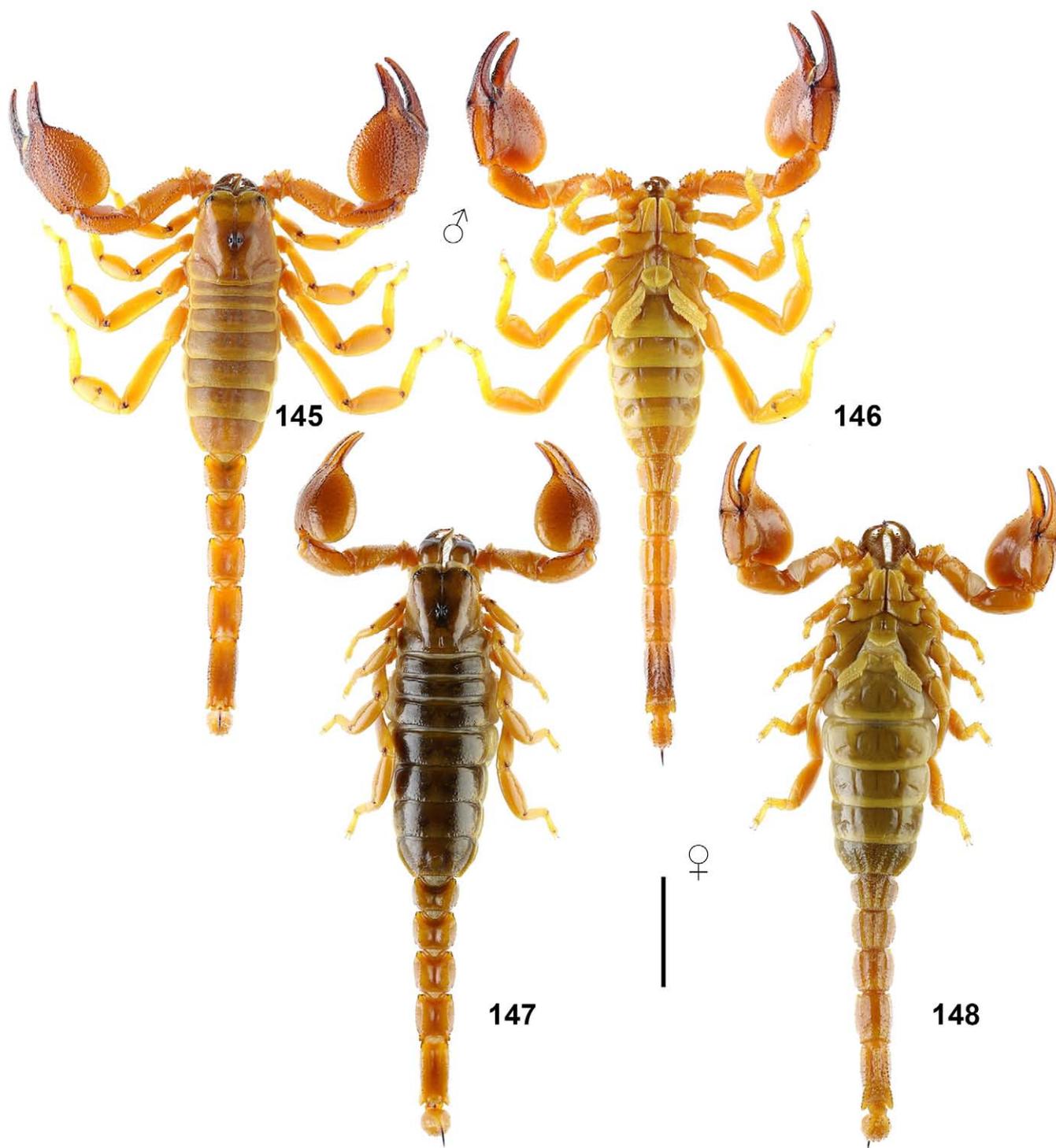
**TYPE LOCALITY AND TYPE DEPOSITORY.** Jordan, Balqa Governorate, Um Al-Dananeer, 32°05'34.6"N 35°49'02.8"E, 773 m a. s. l., AZMM.

**TYPE MATERIAL EXAMINED.** Jordan: Ma'an Governorate, near Al-Shawback Castle, 30°31'35.6"N 35°33'57.2"E, 1335 m a. s.

l., 2♂, 8 September 2013, leg. L. Prendini, Z. Amr, O. Abed, T. Al Share & L. Al-Azam (RSCN); Aqaba Governorate, Al-Barrah, Wadi Rum, 29°32'47.7"N 35°19'36.3"E, 1100 m a. s. l., 1♂, 10 September 2013, leg. Z. Amr, N. Hamidan & L. Al-Azam (RSCN); Aqaba Governorate, Al-Khoshakhashe, Wadi Rum, 29°29'52.1"N 35°25'54.4"E, 1109 m a. s. l., 1♂, 11 September 2013, leg. Z. Amr, N. Hamidan & T. Al Share (RSCN); Zarqa Governorate, Abu-Al Zighan, 32°08'49.3"N 36°02'56.6"E, 457 m a. s. l., 1♂, 6 July 2018, leg. M. Al-Sarairoh and A. Gayada (BAPC); Zarqa Governorate, Alook, 32°09'29.3"N 35°55'32.4"E, 608, m a. s. l., 1♂1♀, 23 March 2019, leg. M. Al-Sarairoh (BAPC); Amman Governorate, Sahab, 31°49'14.0"N 36°01'34.7"E, 773 m a. s. l., 2♂, 13 August 2019, leg. M. Al-Sarairoh (BAPC); Balqa Governorate, Ghor Ira, 5 km W of Ira town, 31°59'13.3"N 35°36'43.7"E, 25 m a. s. l., 2♂, 3 November 2019, leg. B. Abu Afifeh & M. Al-Sarairoh (BAPC); Amman Governorate, Ghor Sweimeh near Dead Sea, 31°46'13.3"N 35°35'21.2"E, 365 m a. s. l., 2♂, 5 July 2020, leg. M. Al-Sarairoh (BAPC); Irbid Governorate, Kufraheel, 32°24'53.9"N



Figures 143–144: *Scorpio fuscus*, from Birqish Forest, northwestern Jordan, right legs I–IV, male (143) and female (144).



**Figures 145–148:** *Scorpio jordanensis* sp. n., habitus under white light. **Figures 145–146.** Male holotype, in dorsal (145) and ventral (146) views. **Figures 147–148.** Female paratype, in dorsal (147) and ventral (148) views. Scale bar: 10 mm.

Dimensions (mm)		<i>Scorpio jordanensis</i> sp. n.	
		♂ holotype	♀ paratype
Carapace	L / W	7.56 / 7.56	7.80 / 8.16
Mesosoma	L	14.77	19.45
Metasoma + telson	L	27.36	26.28
Segment I	L / W / D	3.24 / 3.96 / 3.48	3.00 / 4.20 / 3.70
Segment II	L / W / D	3.60 / 3.72 / 3.27	3.36 / 3.84 / 3.38
Segment III	L / W / D	3.96 / 3.45 / 3.04	3.84 / 3.72 / 3.27
Segment IV	L / W / D	4.68 / 3.12 / 2.75	4.44 / 3.42 / 3.01
Segment V	L / W / D	6.12 / 2.64 / 2.40	6.00 / 2.76 / 2.52
Telson	L / W / D	5.76 / 2.40 / 2.16	5.64 / 2.76 / 2.40
Pedipalp	L	21.00	21.96
Femur	L / W	4.80 / 2.28	4.80 / 2.52
Patella	L / W	5.40 / 2.64	5.76 / 2.64
Chela	L	10.80	11.40
Manus	L / W / D	3.60 / 6.84	7.20 / 3.96 / 6.60
Movable finger	L	6.36	6.60
Fixed finger	L	3.84	4.56
<b>Total</b>	<b>L</b>	<b>49.69</b>	<b>53.53</b>

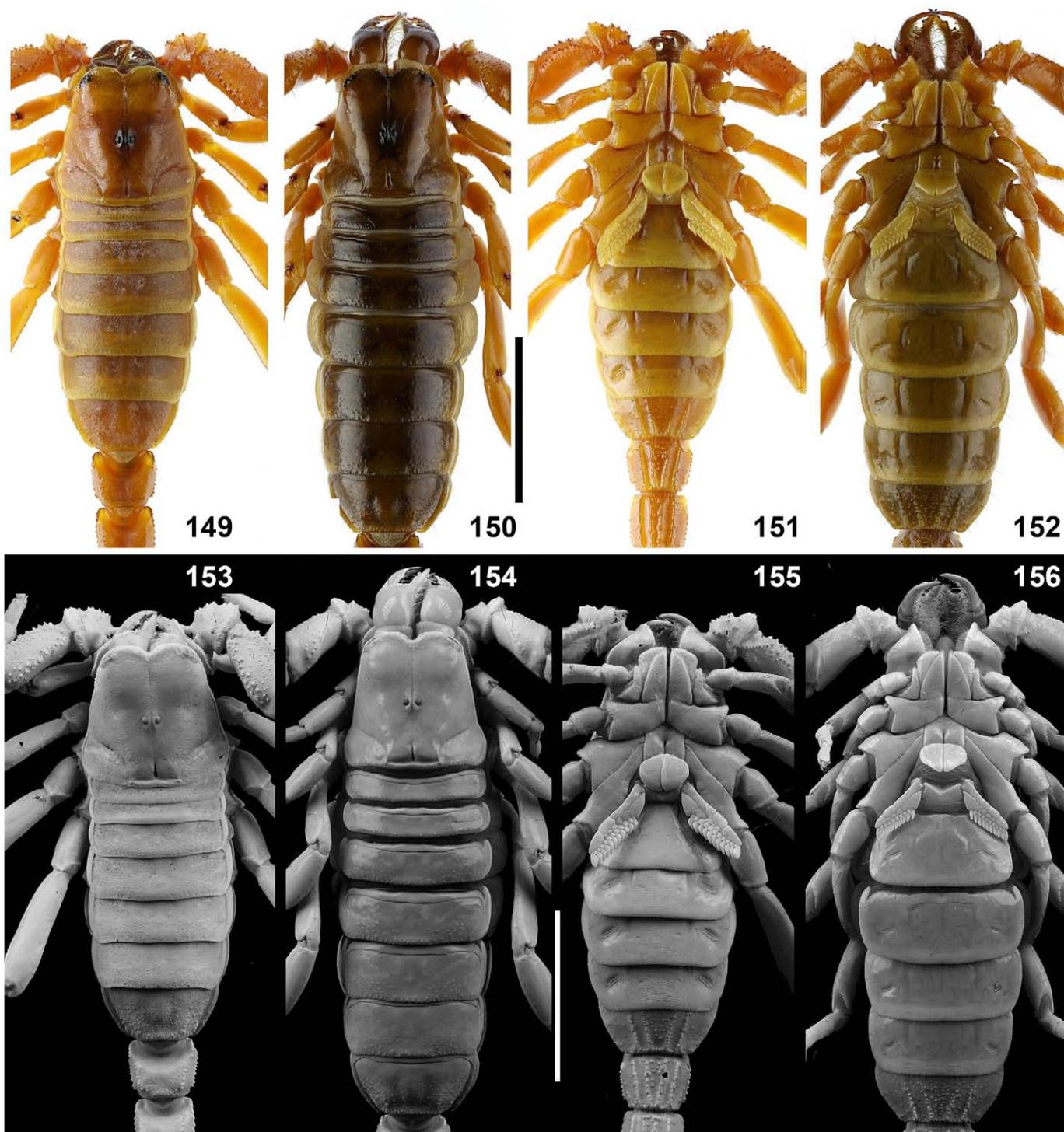
**Table 3:** Comparative measurements of *Scorpio jordanensis* sp. n. male holotype and female paratype. Abbreviations: length (L), width (W), depth (D).

35°39'19.6"E, 370 m a. s. l., 1♀, 26 September 2020, leg. Omar Aldhoon (BAPC); Ma'an Governorate, Ayn Al-Baydah, 5 km N of Petra, 30°23'10.3"N 35°26'02.3"E, 1075 m a. s. l., 1 subadult ♀, 18 June 2021, leg. B. Abu Afifeh & M. Al-Sarairoh (BAPC); Balqa Governorate, Um Al-Dananeer, 32°05'34.6"N 35°49'02.8"E, 773 m a. s. l., 1♂ (holotype) (AZMM/Sco-2021:39), 4 ♂, 2 juvs. ♂, 12 August 2021, leg. B. Abu Afifeh (BAPC); Balqa Governorate, Ghor Ira, 5 km W of Ira town, 31°58'57.9"N 35°36'44.0"E, 16 m a. s. l., 1♀, 13 April 2022, leg. B. Abu Afifeh & R. Abu Afifeh (BAPC); Balqa Governorate, Um Al-Dananeer, 32°06'07.7"N 35°50'09.1"E, 827 m a. s. l., 1♀ (AZMM/Sco-2021:40), 21 April 2022, leg. B. Abu Afifeh; Tafilah Governorate, Dana Biosphere Reserve, 30°41'32.2"N 35°36'09.8"E, 1500 m a. s. l., 11♂8♀, 25-26 May 2022, leg. B. Abu Afifeh (BAPC); Amman Governorate, Al-Baydah, 31°56'32.6"N 36°02'29.9"E, 768 m a. s. l., 7 subadults ♂, 6 June 2022, leg. M. Al-Sarairoh (BAPC); Balqa Governorate, Um Al-Dananeer, 32°06'27.1"N 35°49'26.2"E, 855 m a. s. l., 5♂1♀, 28 July 2022, leg. B. Abu Afifeh (BAPC); Tafilah Governorate, Khirbat Al-Ghuwaiba, 14 km NW of Dana village, 30°41'34.2"N 35°28'31.3"E, 162 m a. s. l., 4♀, 20 January 2023, leg. B. Abu Afifeh (BAPC); Balqa Governorate, 6.3 km E of Karameh Dam, 32°01'16.8"N 35°37'42.1"E, 2 m a. s. l., 3♀, 17 February 2023, leg. B. Abu Afifeh (BAPC); Balqa Governorate, Um Kharrouba, 32°03'23.0"N 35°39'43.8"E, 402 m a. s. l., 1♂2♀, 18 March 2023, leg. B. Abu Afifeh (BAPC); Balqa Governorate, Homrat Al Sahn, 32°06'47.7"N 35°40'41.3"E, 452 m a. s. l., 2♀, 18 March 2023, leg. B. Abu Afifeh (BAPC); Balqa Governorate, 2.5 km SW of Maysara town, 32°07'31.4"N 35°40'27.0"E, 509 m a. s. l., 1♂1♀, 18 March 2023, leg. B. Abu Afifeh (BAPC);

Tafilah Governorate, Dana Biosphere Reserve, 30°41'32.2"N 35°36'09.8"E, 1500 m a. s. l., 8♀, 8 July 2023, leg. B. Abu Afifeh (BAPC); Tafilah Governorate, Ein Lahda groundwater, 3.1 km NW of Dana village, 30°42'02.6"N 35°35'51.6"E, 1430 m a. s. l., 4♂1♀, 8 July 2023, leg. B. Abu Afifeh (BAPC); Ma'an Governorate, Basta, 30°14'49.5"N 35°31'42.2"E, 1538 m a. s. l., 1♂, 7 September 2023, leg. B. Abu Afifeh & M. Al-Sarairoh (BAPC); Aqaba Governorate, 9.5 km SW of Titin village, 29°24'43.0"N 35°06'39.1"E, 1115 m a. s. l., 14♂1♀, 9 May 2024, leg. B. Abu Afifeh, R. Abu Afifeh & H. Bdareen (BAPC); Zarqa Governorate, As-Sukhnah, 32°08'02.8"N 36°03'33.0"E, 480 m a. s. l., 1♂, 17 May 2024, leg. B. Abu Afifeh & M. Al-Sarairoh (BAPC).

**ETYMOLOGY.** The specific name refers to Jordan, the country in which the new species is endemic and widely distributed.

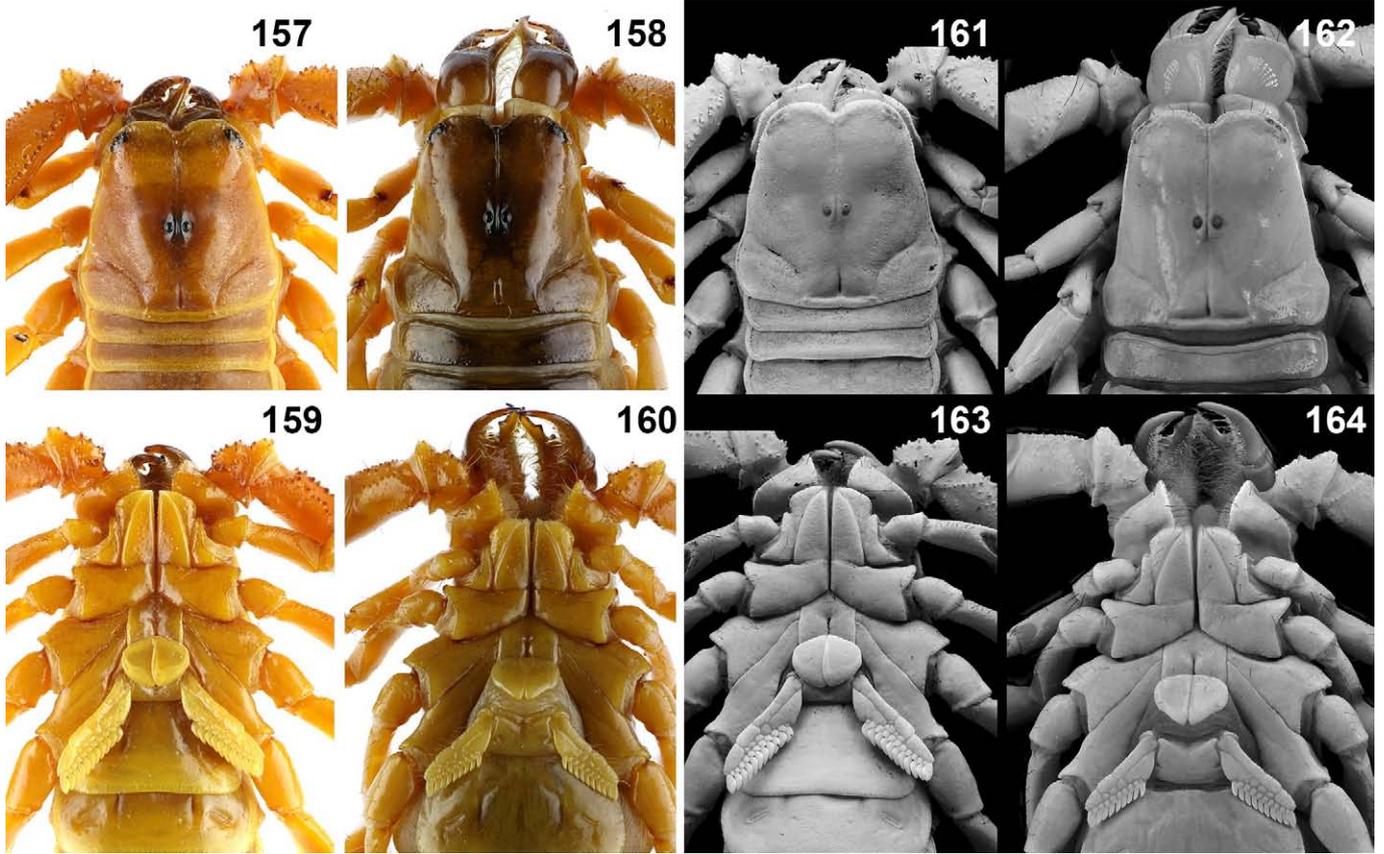
**DIAGNOSIS.** Medium sized species compared with its congeners. Adults are about 42.50- 53.54 mm in males and 45.70- 56.90 mm in females in length. General coloration light reddish yellow. Carapace is slightly longer than its wide; almost trapezoid in shape. Carapace anterior margin distinctly bilobed with a deep median indentation. Carapace lacks carinae, only posteriomedian carinae slightly visible. Carapace shagreened but a triangular region between median eyes and anterior margin smooth. Median ocular tubercle not distinct and located in the center of the carapace. Tergites I–VII acarinate. Tergites I–VII matt and shagreened; posttergites of segments I–IV with scattered flattened granules; tergite VII moderately covered with dense coarse and pointed granules



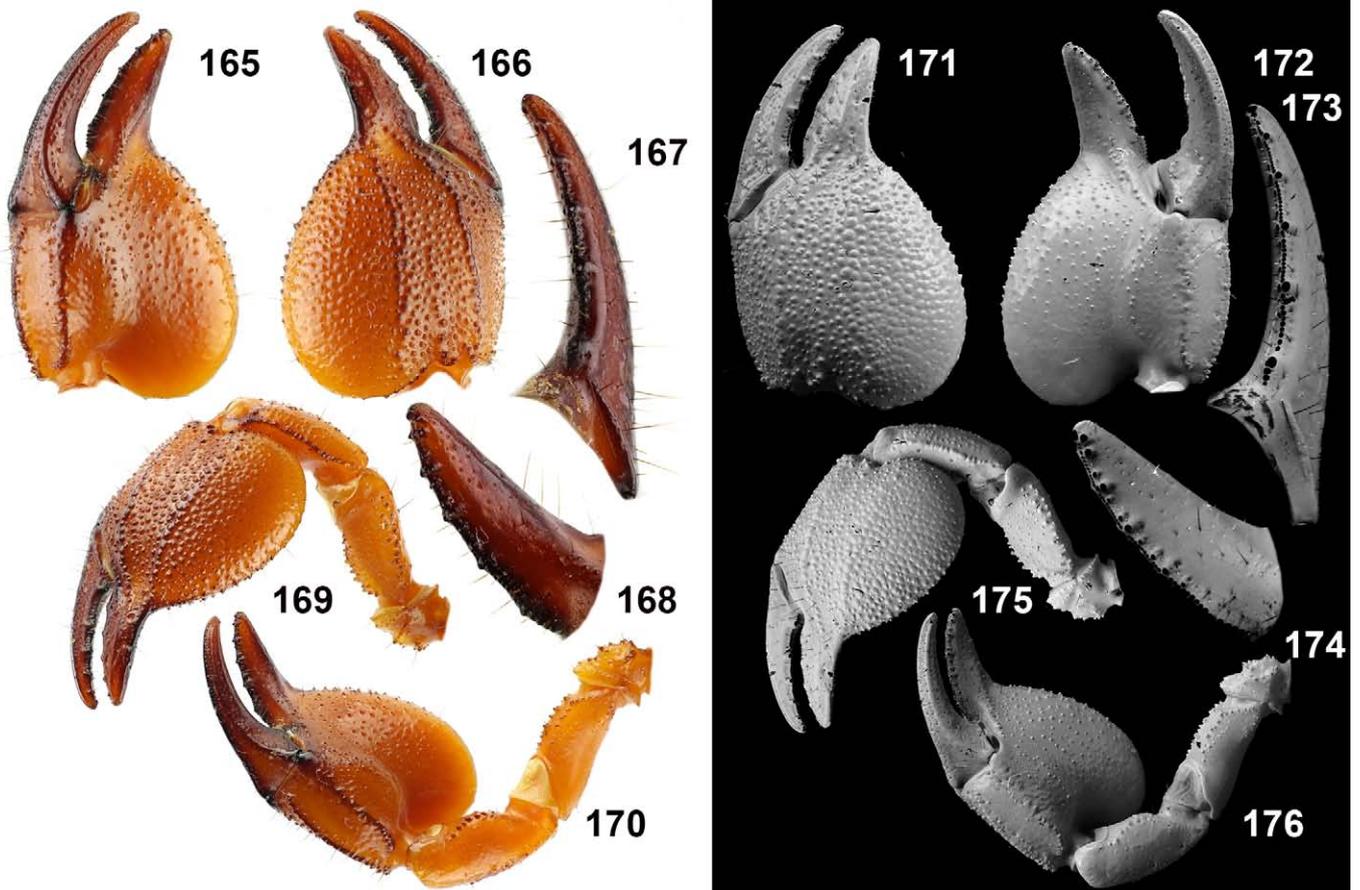
**Figures 149–156:** *Scorpio jordanensis* sp. n., male holotype (149, 151, 153, 155) and female paratype (150, 152, 154, 156). **Figures 149–150, 153–154.** Carapace and mesosoma. **Figures 151–152, 155–156.** Coxal and sternopectinal regions and sternites. **Figures 149–152** under white light. **Figures 153–156** under UV light. Scale bar: 10 mm.

in male, while in females tergites I–VII smooth, lustrous; posttergites of segments I–IV with flattened moderate granules, tergite VII moderately covered with dense coarse and pointed granules. Pectines short; teeth numbers 10–13 in males and 9–13 in females. Metasoma I with 10, II–IV with 8, and V with 5 carinae. Metasoma I–II wider than long, segments III–V

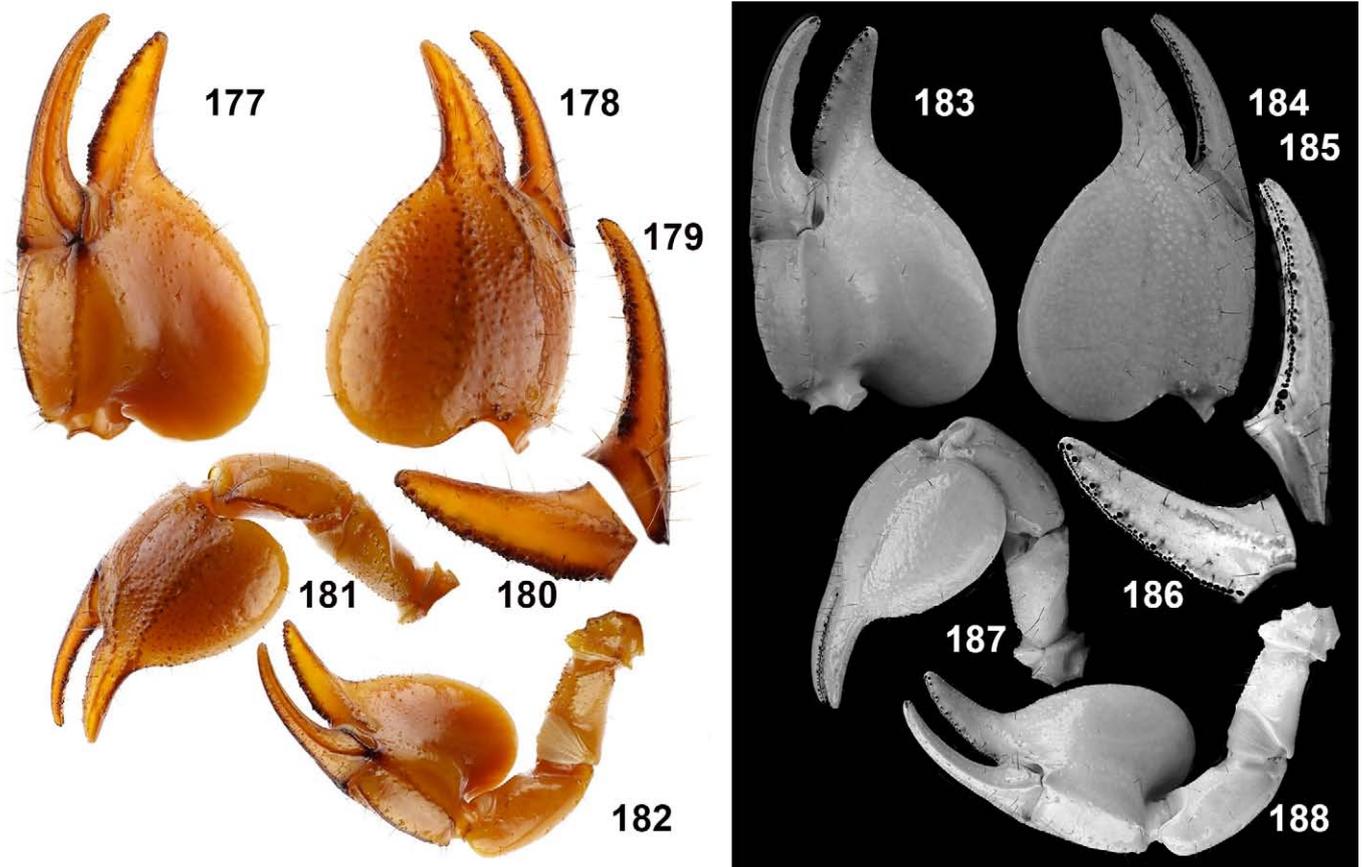
longer than wide. Ventral submedian carinae and ventrolateral carinae strong with moderate, rounded and fused granules on segments I–II, strong and obsolete granules on segments III–IV in male; strong with large lobate and spaced granules on segments I–II in females. Between ventral submedian carinae of segment I 10–20 small to medium granules exist.



Figures 157–164: *Scorpio jordanensis* sp. n., male holotype (157, 159, 161, 163) and female paratype (158, 160, 162, 164), under white light (157–160), and under UV light (161–164). Figures 157, 158, 161, 162. Carapace. Figures 159, 160, 163, 164. Coxal and sternopectinal region.



Figures 165–176: *Scorpio jordanensis* sp. n., male holotype, pedipalp segments under white light (165–170), and under UV light (171–176). Chela ventral (165, 172) and dorsal (166, 171). Movable (167, 173) and fixed (168, 174) fingers dentition. Pedipalp dorsal (169, 175) and ventral (170, 176).



**Figures 177–188.** *Scorpio jordanensis* sp. n., female paratype, pedipalp segments under white light (177–182), and under UV light (183–188). Chela ventral (177, 183) and dorsal (178, 184). Movable (179, 185) and fixed (180, 186) fingers dentition. Pedipalp dorsal (181, 187) and ventral (182, 188).

Dorsolateral carinae moderate and rounded with moderate spinoid granules, less distinct granules in females on segment V. Vesicle globular and smooth. Pedipalp femur with three carinae, patella with two carinae. The external surface of chela manus with very large and very flattened granules, more distinct and rounded in anterior area, posterior part with smaller granules; interior part nearly smooth in females. Posterior margin of external surface, and internal margin with large and conical granules. Digital carina not distinct but with larger and more distinct granules than other granules and not fused; external secondary carina distinct with large and fused granules; that get denser anteriorly. Chela manus flattened, slightly longer than wide. Fixed and movable fingers with 4 or 5 strong accessory denticles. Intercarinal surface with few distinct setae on manus. Trichobothriotaxy of type C; orthobothriotaxic (Vachon, 1974).

**DESCRIPTION** (♂ holotype, unless otherwise specified).

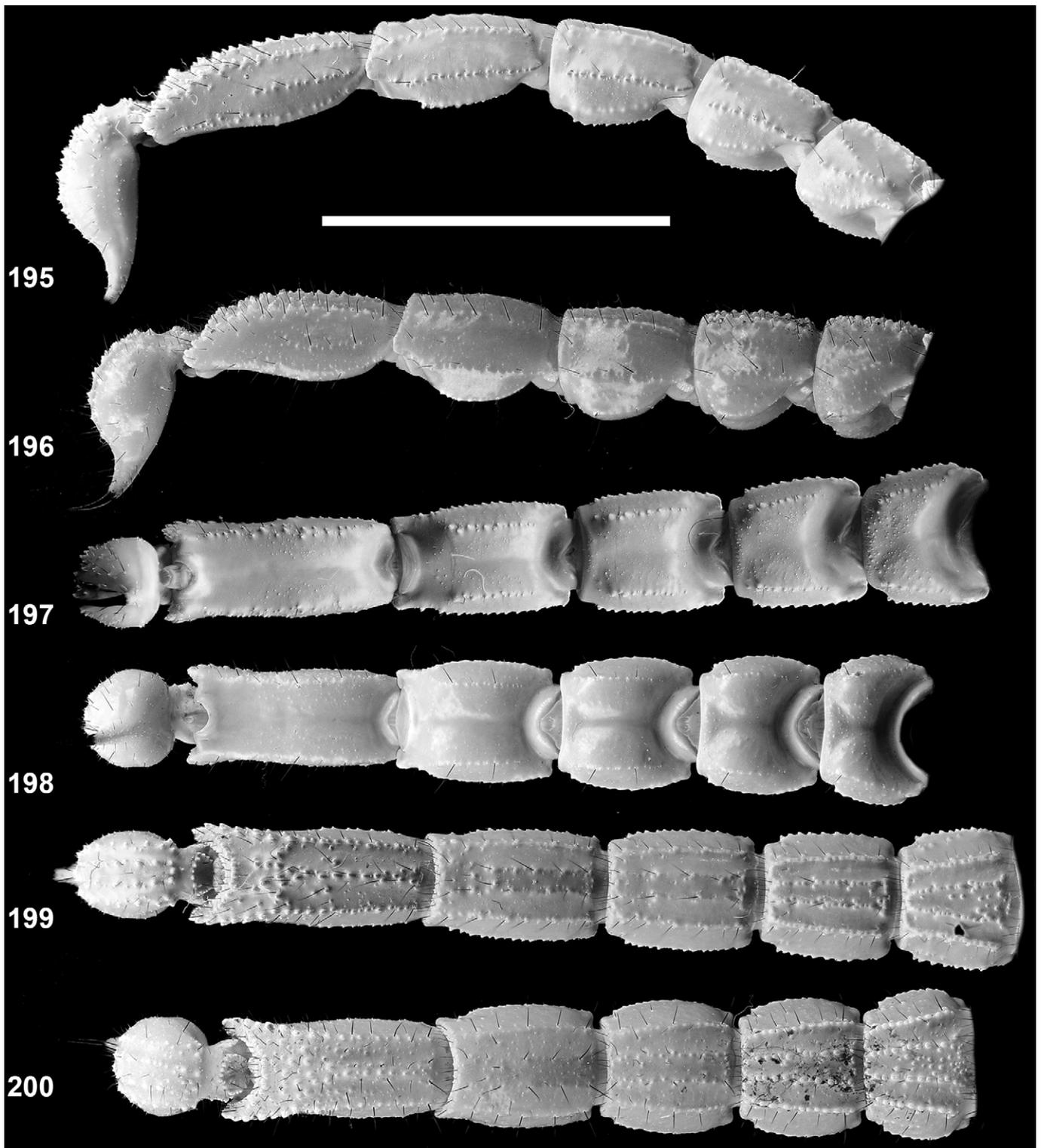
**Coloration** (Figs. 8, 145–148, 211–214). General coloration light reddish yellow. Carapace: light reddish yellow, black between median eyes, and light reddish brown around median eyes, posterior area of median eyes with reddish brown reticulation; posterior margin with a yellow band in overlap area of first mesosoma segment in male; yellowish olive brown in females. Mesosoma: Tergites I–VII light reddish yellow;

posterior margins of segments I–VI with yellow bands in overlap area in males; lustrous, olive brown with reticulation and yellowish olive patches in females. Coxae and sternum lustrous and reddish yellow. Genital operculum and pectines shiny yellow. Sternites III–VII reddish yellow in male; olive brown in females. Pedipalp: Femur and patella reddish yellow; carinae and granules red. Chela manus reddish yellow, granules darker, ventroexternal, ventrointernal, digital carina, external secondary carina and fingers dark yellowish red in males, manus darker, fingers lighter in females. Dental margin and condyles reddish black. Metasoma: metasomal segments I–IV uniformly light reddish yellow, segment V dark reddish yellow with reticulation in males; metasomal segments I–V uniformly reddish yellow in females. Telson dark yellow; aculeus reddish at the base and black at the tip. Legs: Tarsi and basitarsus light yellow; pretarsus, femur and tibia dark yellow. Spinules and condyles reddish brown. Chelicerae: Chelicera manus dark yellowish brown with reticulations posteriorly. Fingers brown, tips of fingers and teeth reddish.

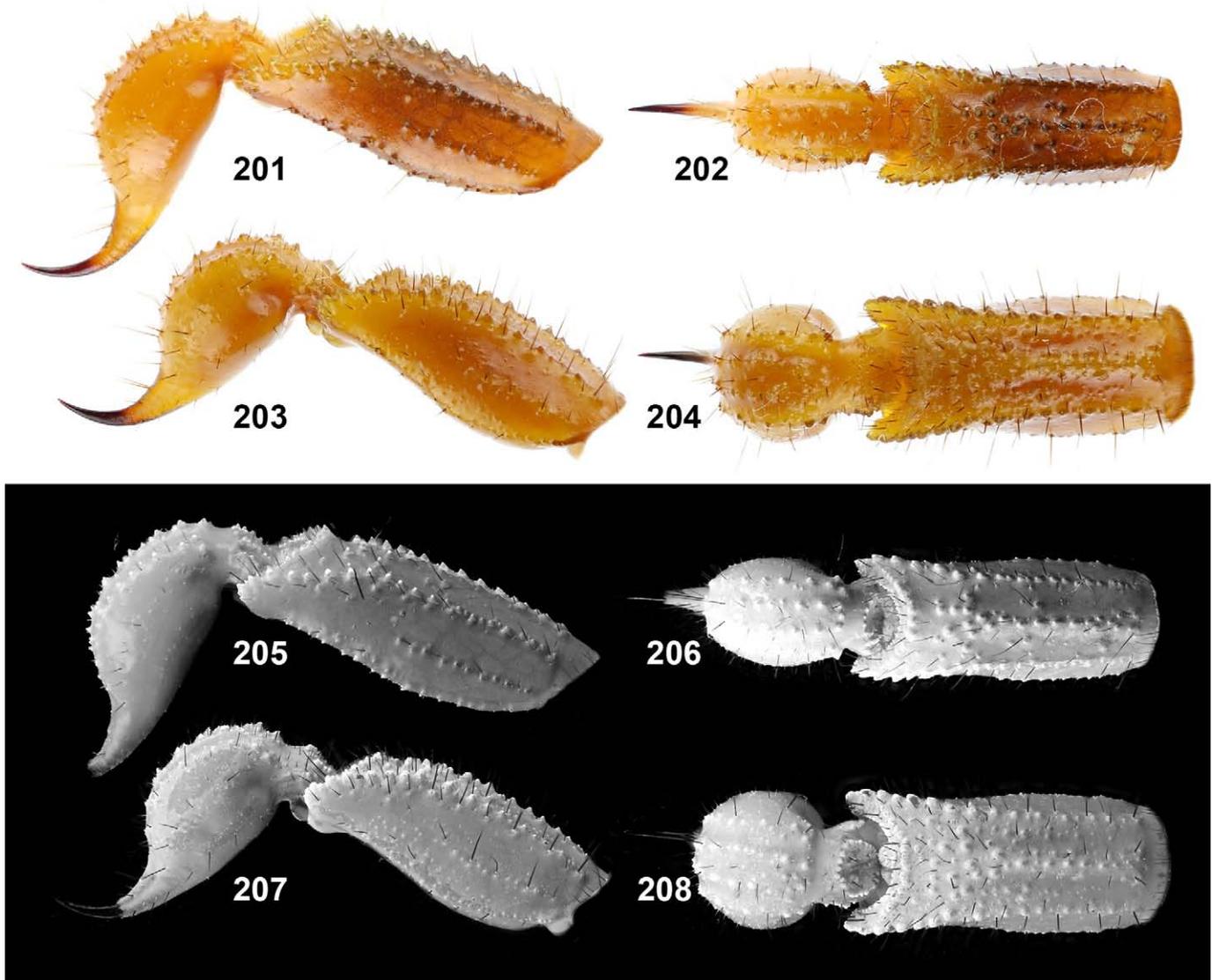
**Carapace** (Figs. 157–164). Carapace is slightly longer than its wide; almost trapezoid in shape. Carapace anterior margin distinctly bilobed, with 8 medium to large setae and a deep median indentation. Carapace lacks carinae, only posteriomedian carinae slightly visible. Carapace shagreened but a triangular region between median eyes and anterior



Figures 189–194. *Scorpio jordanensis* sp. n., male holotype (189, 191, 193), and female paratype (190, 192, 194). Metasoma and telson under white light, in lateral (189–190), ventral (191–192) and dorsal (193–194) views. Scale bar: 10 mm.



Figures 195–200. *Scorpio jordanensis* sp. n., male holotype (195, 197, 199), and female paratype (196, 198, 200). Metasoma and telson under UV light, in lateral (195–196), dorsal (197–198) and ventral (199–200) views. Scale bar: 10 mm.



**Figures 201–208:** *Scorpio jordanensis* sp. n., male holotype (201, 202, 205, 206), and female paratype (203, 204, 207, 208). Metasoma V and telson under white light (201–204) and under UV light (205–208), in lateral (201, 203, 205, 207), and ventral (202, 204, 206, 208) views.

margin smooth, anterior of carapace and along anteriomedian furrow with moderately dense small granules in males; carapace smooth and lustrous with small granules laterally in females. Median ocular tubercle not distinct and located in the center of the carapace. A pair of median eyes and three pairs of lateral eyes exist; the third located separately and slightly smaller. Median eyes separated by one ocular diameter. The anteromedian furrow is narrow, shallow and more distinct in males. The posteromedian furrow is wide and deep and bifurcated as an inverted T-shaped at posterior edge and located in arrow-shaped depressions between posteriomedian carinae and posterior margin. Posterior lateral furrows wide and distinct. A few setae exist on the anterior area of carapace.

**Chelicerae** (Figs. 149–156). Cheliceral dentition characteristic for the family Scorpionidae (Vachon, 1963); subdistal tooth and basal teeth conspicuous rather than on the movable finger. Manus lustrous, no longitudinal ridges present anteriorly.

**Mesosoma** (Figs. 149–156). Tergites I–VII acarinate. Tergites I–VII matt and shagreened; posttergites of segment I–IV with scattered flattened granules; tergite VII moderately covered with dense coarse and pointed granules in male; tergites I–VII smooth, lustrous; posttergites of segment I–IV with flattened moderate granules, tergite VII moderately covered with dense coarse and pointed granules in females. Sternites III–VI with scattered setae; wrinkled midally in male; smooth and lustrous in females. Sternite VII granular between submedian carinae with four granular carinae, granules fused, granular between lateral and submedian carinae in females. Genital operculum ovoid; a small posterior indentation exists in males, while cordate in shape; anterior margin slightly convex; posterior area slightly elongated, and a small posterior indentation exist in females. Pectines short: teeth numbers 10–13 in males, and 9–13 in females. Three marginal and three to five median lamellae. Stigmas linear, angled 45° and conspicuous.



Figures 209–210: *Scorpio jordanensis* sp. n., right legs I–IV, male holotype (209) and female paratype (210).



**Figures 211–214:** *Scorpio jordanensis* sp. n. from Dana Biosphere Reserve, southwestern of Jordan, habitus under white light. **Figures 211–212.** Male paratype, in dorsal (211) and ventral (212) views. **Figures 213–214.** Female paratype, in dorsal (213) and ventral (214) views. Scale bar: 10 mm.

**Metasoma and telson** (Figs. 189–208). Metasoma I with 10, II–IV with 8, and V with 5 carinae. Metasoma I–II wider than long, III–V longer than wide. Lateral inframedian carinae and on segment I indistinct, composed by a few spaced rounded granules on anterior. Ventral submedian carinae and ventrolateral carinae strong with moderate, rounded and fused granules on metasoma I–II, strong and obsolete granules on metasoma III–IV in male; strong with large lobate and spaced granules on segments I–II in females. Dorsolateral carinae strong and crenulate with small, spaced granules on metasoma I–IV. Lateral supramedian carinae strong and obsolete on segments I–IV. Intercarinal area on segments I–IV smooth covered with scattered small sized granules at ventral and lateral surfaces, between ventral submedian carinae of segment I 10–20 small to medium granules exist; segment I–II with moderately fine granules, III–IV with scattered fine granules and without granules medially in males; segments I–IV smooth with scattered fine granules and without granules medially in females. Segment V: Ventromedian carina moderate with large, spinoid and pointed granules, bifurcated anteriorly; ventrolateral carinae strong and serrated with spaced large and conical granules, gradually increase posteriorly, continues in lateral of anal arch; dorsolateral carinae moderate and rounded with moderate spinoid granules, granules less distinct in females; segment V with a row of granules laterally at posterior half, granules less distinct in females. Lateral surfaces smooth with scattered fine granules. Ventral surface densely covered with large granules. Dorsal surface smooth covered with fine granules, without granules medially. Ventral of anal arch serrated with pointed denticles. Ventral and lateral surfaces covered with moderately variable sized setae on segments I–V. Vesicle globular and smooth; with spinoid granules ventrally, more distinct in males. Vesicle with numerous macrosetae reaching the base of aculeus. Aculeus strongly curved and shorter than vesicle.

**Pedipalp** (Figs. 165–188). Pedipalp femur with three carinae; dorsointernal and ventrointernal carinae moderate with spaced rounded granules; dorsoexternal carinae strong with separate large and rounded granules. Intercarinal area smooth with small sized granules dorsally and medium sized granules ventrally. Intercarinal surface with a few distinct setae. Patella with two carinae; dorsomedian carina strong with so flattened and fused granules; ventrointernal carinae moderate with rounded coarse granules. Intercarinal area of dorsal, ventral and external surfaces smooth and lustrous, external surface with moderate rounded granules; internal surface shagreened. Intercarinal surface with a few distinct setae. The external surface of chela manus with very large and very flattened granules, more distinct and rounded in anterior area, posterior part with smaller granules; interior part nearly smooth in females. Posterior margin of external surface and internal margin with large and conical granules. Internal surface of chela manus smooth with moderate pointed granules in anterior area. Ventroexternal carina strong, obsolete without granules; ventrointernal carina smooth, rounded without granules. Digital carina not distinct with granules larger and more distinct than other granules and not fused; external

secondary carina distinct with large and fused granules that become denser anteriorly. Chela manus flattened, slightly longer than wide. Chela fingers are relatively short and without granules, slightly longer in females. Fixed and movable fingers with 4–5 strong accessory denticles. Intercarinal surface with few distinct setae on manus. Trichobothriotaxy of type C; orthobothriotaxic (Vachon, 1974).

**Legs** (Figs. 209–210). Coxa and trochanters smooth. Tarsi of right legs I to IV with 4–6/8–5–6/8–9–6–7/8–9–6–7/9 internal and external spines arranged in series. Basitarsus of legs I with 2–3 retrolateral spines (generally with 3 spines) and on legs II with 3–4 retrolateral spines (generally with 3 spines).

**Measurements.** See Table 4.

**AFFINITIES.** *S. jordanensis* sp. n. shows similarities with *S. palmatus* regarding to several morphological characters; both are medium sized yellow species, external surface of chela manus with reduced granulation, and chela fingers are short. That led several previous authors to assign specimens of the widespread *Scorpio* from Jordan to *S. palmatus* (Wahbeh, 1976; El-Hennawy, 1988; Amr & Al-Oran 1994; Amr & Abu Baker, 2004). The two species can be distinguished by the following characters: (a) pedipalp chela fingers of *S. jordanensis* sp. n. is shorter than in *S. palmatus* (see table 6); (b) seventh sternite and ventral surface of segment I moderately granular in *S. jordanensis* sp. n. (Figs. 220, 222) whereas in *S. palmatus* it has a few scattered granules (Figs. 219, 221); (c) ventrolateral and ventral submedian carinae of segments I and II with spaced distinct rounded granules in *S. jordanensis* sp. n. (Figs. 216, 218), whereas indistinct and fused granules are present in *S. palmatus* (Figs. 215, 217); (d) lateral inframedian carina of segment I visible and present on posterior part in *S. jordanensis* sp. n. (Figs. 216, 218) whereas it is not visible and composed of 2–3 granules on posterior of segment I in *S. palmatus* (Figs. 215, 217).

*S. jordanensis* sp. n. can be distinguished from *S. fuscus* by several characters shown in table 6;

a) general coloration light reddish yellow in *S. jordanensis* sp. n. (Figs. 8, 145–148), whereas it is dark reddish brown to brownish black in *S. fuscus* (Figs. 3–4, 79–82);

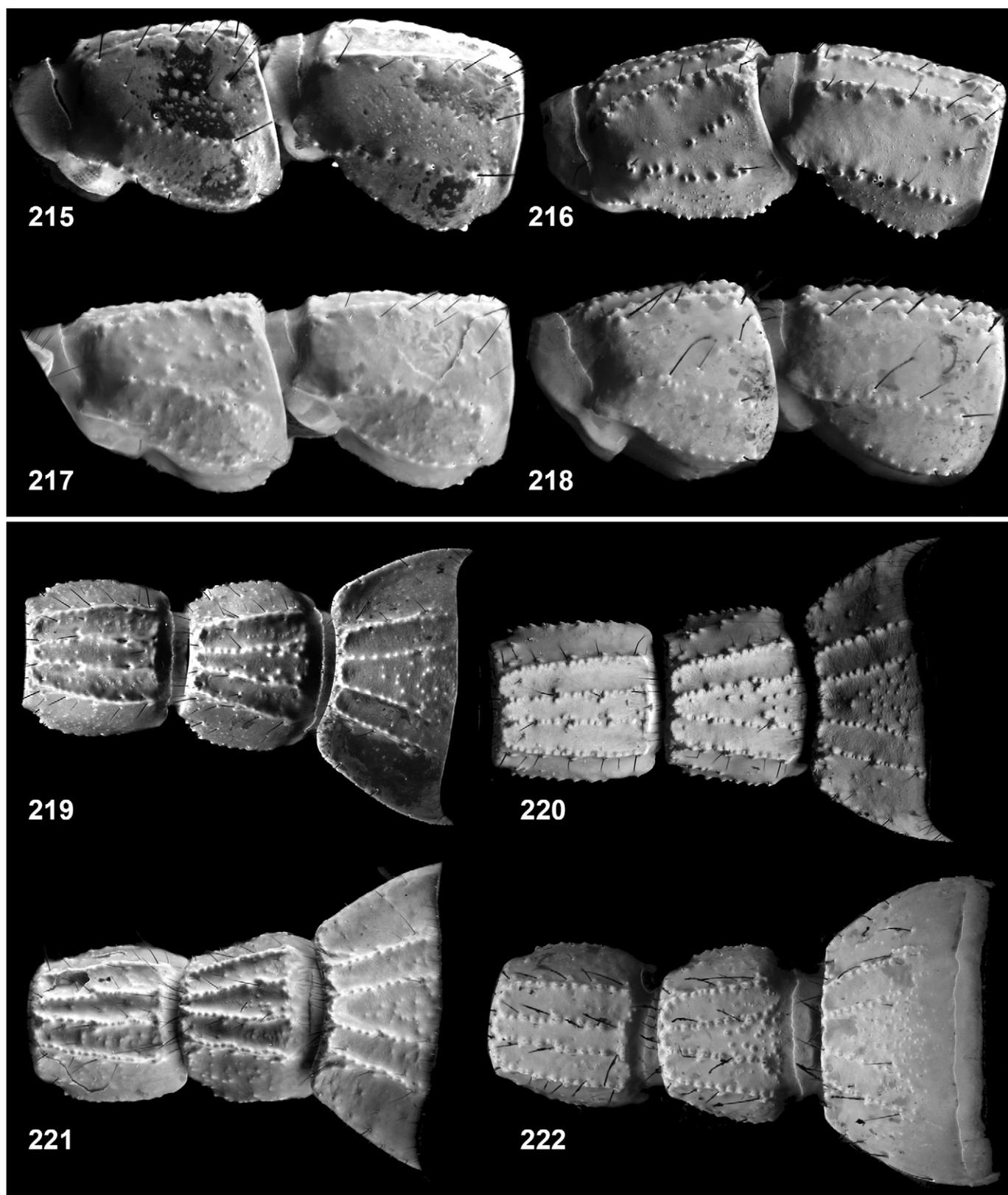
b) *S. jordanensis* sp. n. is smaller in size (adults 53–56 mm in total length), than *S. fuscus* (adults 61–67 mm in total length);

c) pectines is longer in males of *S. jordanensis* sp. n. than in males of *S. fuscus*; pectines extending well beyond coxa-trochanter articulation of leg IV in male of *S. jordanensis* sp. n. (Fig. 163), whereas extending approximately to the coxa-trochanter articulation of leg IV in male of *S. fuscus* (Fig. 97);

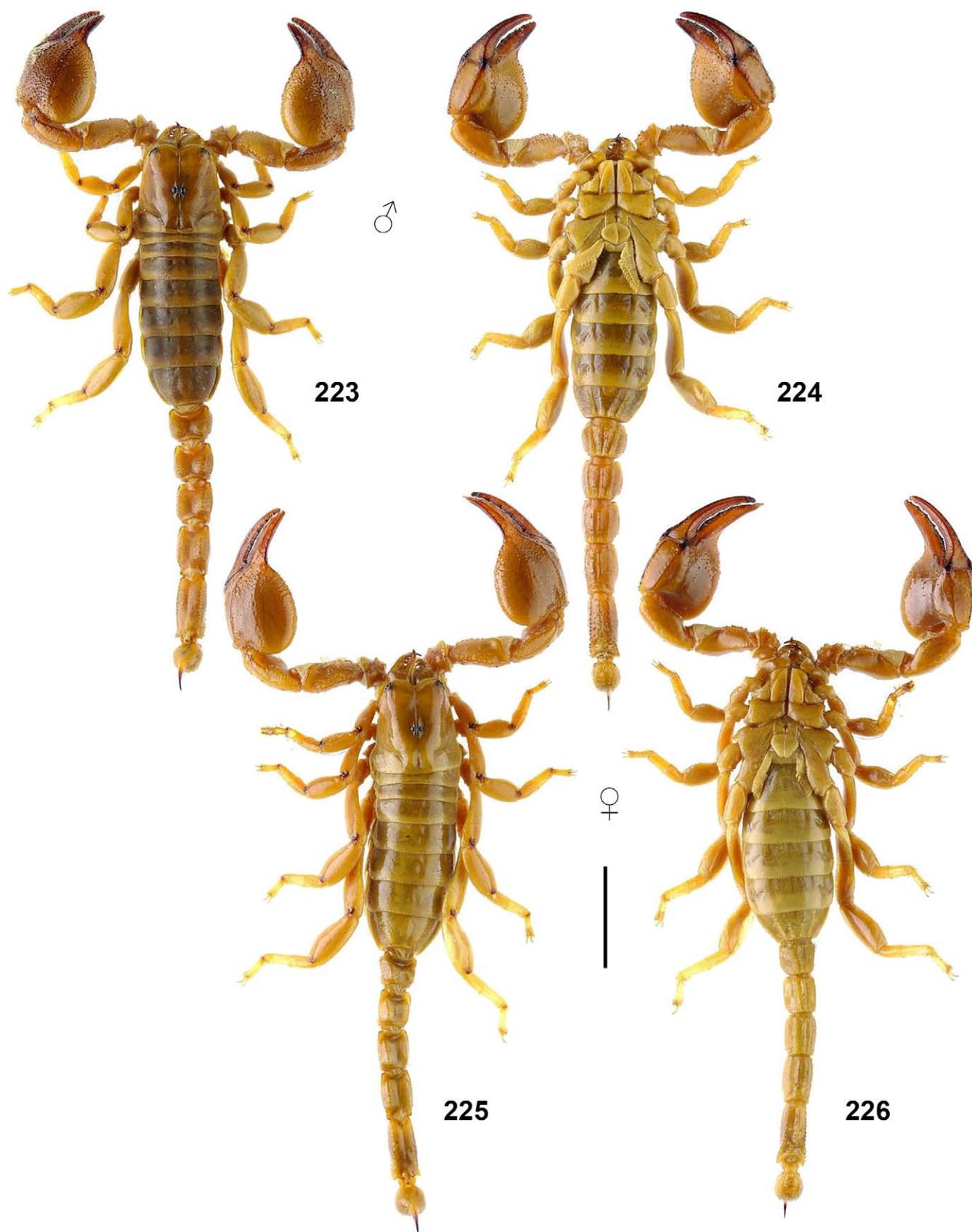
d) external surface of pedipalp chela with isolated rounded and separated granules in male of *S. jordanensis* sp. n. (Figs. 171, 175), whereas male of *S. fuscus* has reticular fused and flattened granulation (Figs. 105, 109);

e) pectinal teeth numbers in *S. jordanensis* sp. n. (10–13 in males and 9–13 in females) is higher than in *S. fuscus* (9–10 in males and 8–11 in females);

f) metasomal segment II is always wider than long in *S. jordanensis* sp. n., whereas it is longer than wide or as long as wide in *S. fuscus*.



**Figures 215–222:** Metasoma I-II in lateral views, under UV light (215–218). **Figures 215, 217.** *Scorpio palmatus* from Egypt, male (215), and female (217). **Figures 216, 218.** *Scorpio jordanensis* sp. n., male holotype (216), and female paratype (218). Sternite VII and metasoma I-II in ventral views, under UV light (219–222). **Figures 219, 221.** *Scorpio palmatus* from Egypt, female (219), and male (221). **Figures 220, 222.** *Scorpio jordanensis* sp. n., female paratype (220), and male holotype (222).



**Figures 223–226:** *Scorpio palmatus* from Egypt, habitus under white light. **Figures 223–224.** Male, in dorsal (223) and ventral (224) views. **Figures 225–226.** Female, in dorsal (225) and ventral (226) views. Scale bar: 10 mm.

Dimensions (mm)		<i>Scorpio palmatus</i>	<i>Scorpio palmatus</i>	<i>Scorpio palmatus</i>	<i>Scorpio palmatus</i>
		♂ Egypt	♀ Egypt	♂ Egypt	♀ Egypt
Carapace	L / W	8.23 / 8.02	8.71 / 8.07	8.06 / 7.75	8.47 / 8.43
Mesosoma	L	16.06	14.60	14.28	13.04
Metasoma + telson	L	26.00	26.32	25.62	25.01
Segment I	L / W / D	3.10 / 4.04 / 3.13	2.89 / 3.61 / 2.76	3.18 / 3.97 / 2.84	2.91 / 3.59 / 2.93
Segment II	L / W / D	3.43 / 3.75 / 2.87	3.34 / 3.12 / 2.62	3.55 / 3.54 / 3.15	3.29 / 3.42 / 2.89
Segment III	L / W / D	3.81 / 3.53 / 2.93	3.70 / 3.05 / 2.70	3.67 / 3.34 / 2.83	3.58 / 3.29 / 2.82
Segment IV	L / W / D	4.49 / 3.14 / 2.69	4.34 / 2.98 / 2.65	4.56 / 3.02 / 2.80	4.22 / 3.01 / 2.56
Segment V	L / W / D	5.63 / 2.80 / 2.29	6.01 / 2.82 / 2.04	5.21 / 2.68 / 2.17	5.30 / 2.56 / 2.25
Telson	L / W / D	5.54 / 2.73 / 2.16	6.04 / 2.56 / 2.34	5.45 / 2.49 / 2.11	5.71 / 2.57 / 2.21
Pedipalp	L	22.88	24.56	21.63	22.35
Femur	L / W	5.57 / 2.40	5.57 / 2.40	4.96 / 2.39	5.15 / 2.47
Patella	L / W	6.07 / 2.66	6.07 / 2.66	5.36 / 2.81	5.29 / 2.74
Chela	L	11.24	12.92	11.31	11.91
Manus	L / W / D	7.78 / 3.92 / 7.33	8.05 / 3.82 / 7.07	7.60 / 4.05 / 7.24	7.62 / 3.95 / 6.87
Movable finger	L	7.02	8.01	6.36	7.03
Fixed finger	L	4.41	5.62	4.02	4.70
<b>Total</b>	<b>L</b>	<b>50.29</b>	<b>49.63</b>	<b>47.96</b>	<b>46.52</b>

**Table 4:** Comparative measurements of *Scorpio palmatus* (Ehrenberg, 1828), males and females from Egypt. Abbreviations: length (L), width (W), depth (D).

***Scorpio palmatus*** (Ehrenberg, 1828)

(Figures 215, 217, 219, 221, 223–288, 361, 367, 372; Table 4)

<http://zoobank.org/urn:lsid:zoobank.org:act:974207E9-2461-49B3-BCE1-C7A4DB2A0B93>

*Buthus (Heterometrus) maurus palmatus*: Hemprich & Ehrenberg, 1828: pl. I, fig. 1.

*Heterometrus palmatus*: Birula, 1898: 134–135.

*Scorpio palmatus*: Birula, 1900: 13–14; Birula, 1908: 147–148.

*Scorpio maurus palmatus*: Birula, 1909: 517–518; Birula, 1910: 166–169, pl. XI, fig. 8; pl. XII, fig. 7; Fet, 2000: 478 (complete references list until 1999).

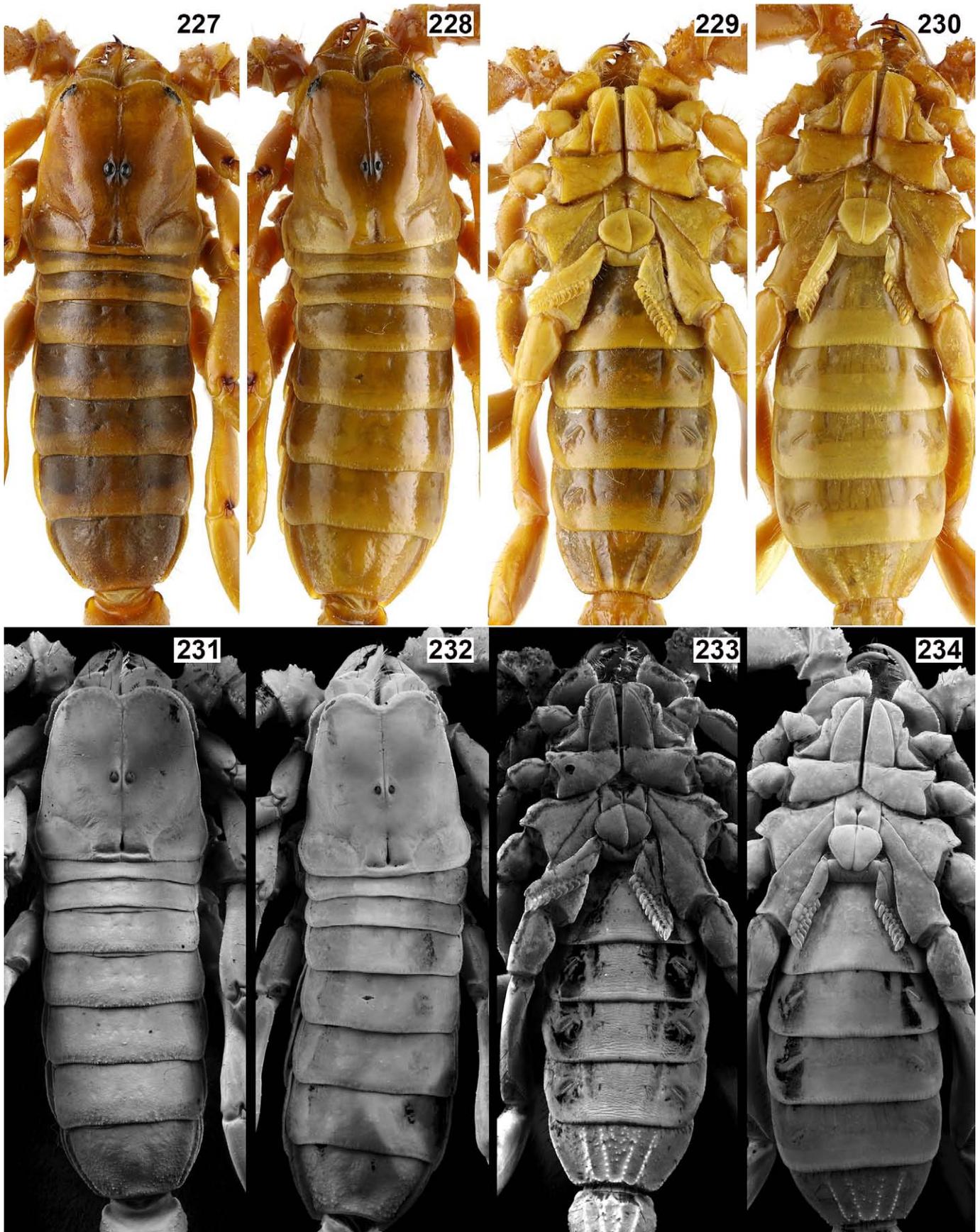
NEOTYPE LOCALITY AND TYPE DEPOSITORY. **Egypt**, Alexandria, Borg El Arab, Bahig, W of Bahig village, AZMM.

MATERIAL EXAMINED. **Egypt**, no exact locality, “Provenance d’Egypte, 2013, Don. de Mr. J. Vanni”, 10♂16♀ (IRSNB). **Egypt**, Alexandria, Borg El Arab, Bahig, W of Bahig village, 1♂ (neotype), 1 September 2001 (AZMM/SCO-2001:1).

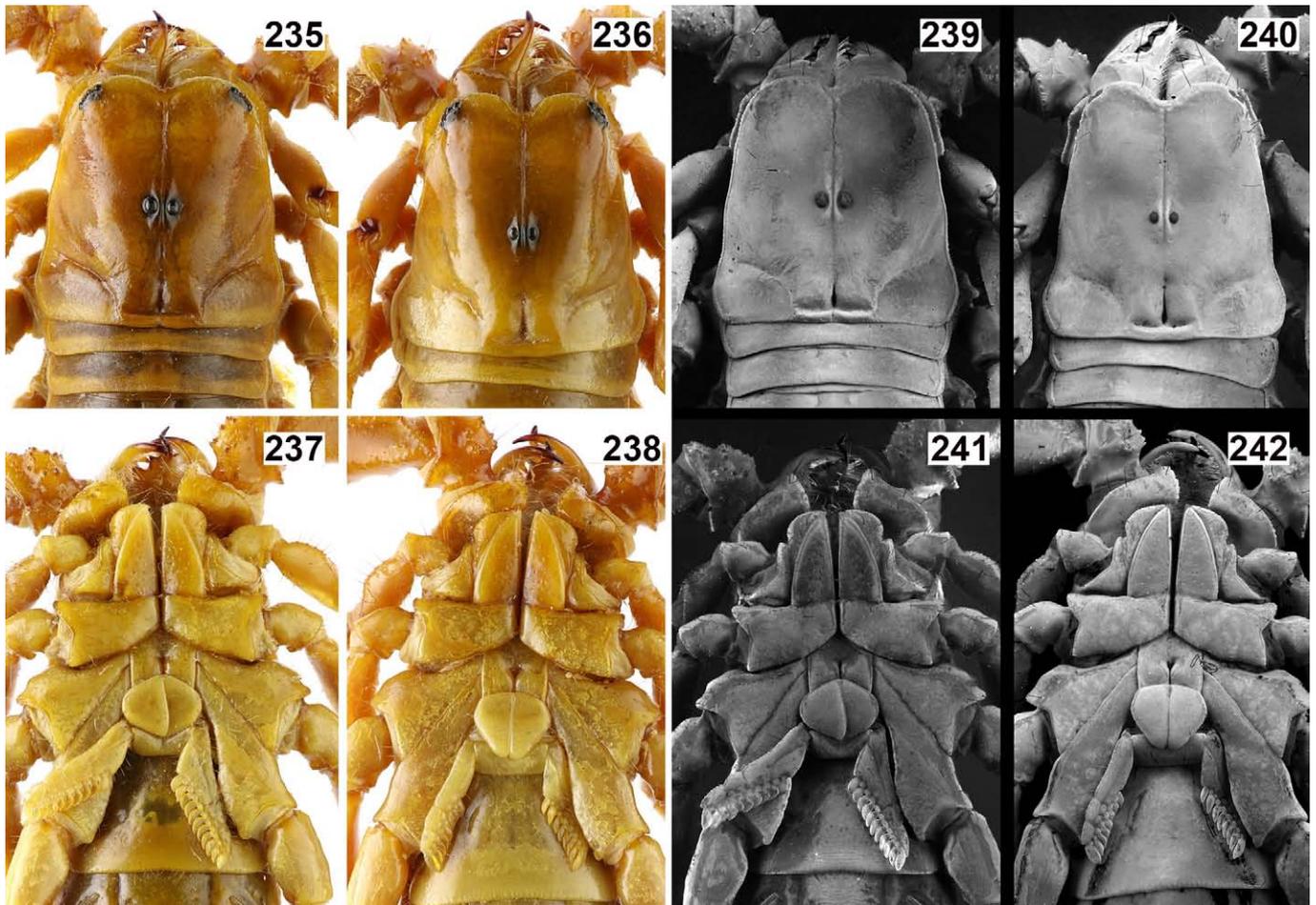
DIAGNOSIS. Medium sized species compared with its congeners. Adults are about 47.96–50.29 mm in males, and 46.52–49.63 mm in females. General coloration yellowish in males, slightly darker in females. Carapace is slightly longer than wide; almost upright trapezoid in shape. Carapace anterior margin distinctly bilobed with a deep median indentation. Carapace lacks carinae, only posteriomedian carinae slightly visible. Smooth around median eyes and anterior region of carapace,

rest of carapace shagreened, laterals with small scattered granules in females. Median ocular tubercle not distinct and located in the center of the carapace. Tergites I–VII acarinate. Tergites I–VII matt and shagreened in males; smooth and, lustrous in females. Sternite VII granular between lateral carinae with four granular carinae, granules fused. Pectines short; teeth numbers 10–13 in males; and 8–12 in females (Talal et al., 2015); with three marginal and three or four median lamellae. Metasoma I with 10, II–IV with 8, and V with 5 carinae. Ventromedian carina of metasoma V moderate with large, spinoid and pointed granules; ventrolateral carinae strong and serrated with spaced large and pointed granules, gradually increase posteriorly, continues in lateral of anal arch. Vesicle globular and smooth; granulated ventrally with spinoid granules in both sexes. The external surface of chela manus with very large and flattened granules, more distinct and rounded on anterior area, posterior part nearly smooth. Internal surface of chela manus smooth with moderate pointed granules on anterior area. Chela manus flattened, slightly longer than wide. Chela fingers are relatively short without granules, slightly longer in females. Fixed and movable fingers with 4–5 strong accessory denticles. Intercarinal surface with few setae on manus, but fingers with more dense setae. Trichobothriotaxy of type C; orthobothriotaxic (Vachon, 1974).

DESCRIPTION (♂, unless otherwise specified). **Coloration** (Figs. 223–226). General coloration yellowish. Carapace yellow and reticulated with light reddish yellow patches in males; light reddish yellow, medially reticular. Tergites I–VII



**Figures 227–234:** *Scorpio palmatus* from Egypt, male (227, 229, 231, 233) and female (228, 230, 232, 234) under white light (227–230), and under UV light (231–234). **Figures 227, 228, 231, 232.** Carapace and mesosoma. **Figures 229, 230, 233, 234.** Coxal and sternoplectinal regions and sternites. Scale bar: 10 mm.



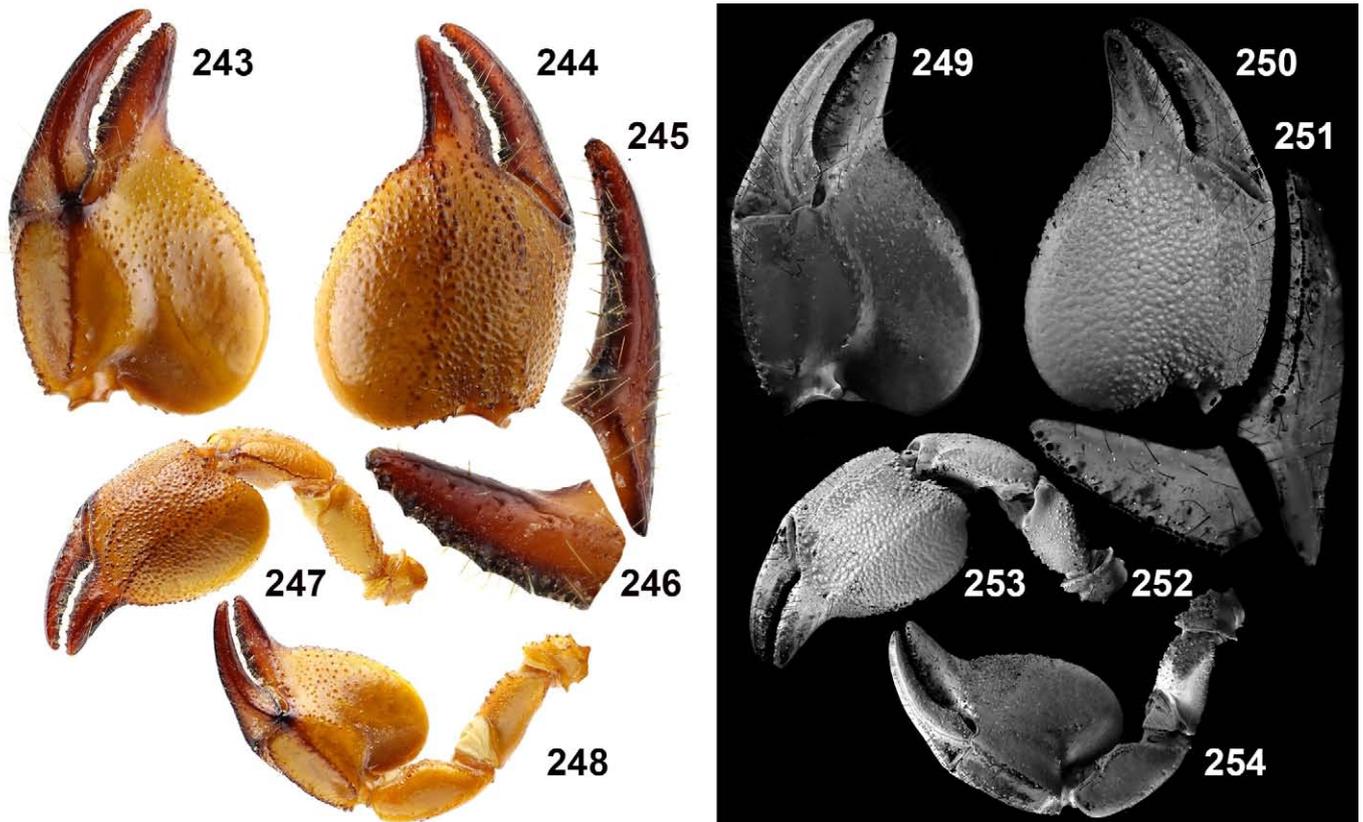
**Figures 235–242:** *Scorpio palmatus* from Egypt, male holotype (235, 237, 239, 241) and female paratype (236, 238, 240, 242), under white light (235–238), and under UV light (239–242). **Figures 235, 236, 239, 240.** Carapace. **Figures 237, 238, 241, 242.** Coxal and sternopectinal region.

light brownish yellow and reticulated with yellow patches medially, lustrous in females. Coxae and sternum yellow. Genital operculum and pectines lustrous and light yellow. Sternites III–VII shiny light yellowish. Pedipalp femur and patella dark reddish brown with blackish reticulations. Chela manus yellow with lateral surface with very light reddish yellow reticulation and granules light reddish yellow in males, slightly darker in females. Fingers yellow in males and yellowish red in females; dental margin and condyles dark reddish in both sexes. Metasoma I–IV uniformly yellow, V light brownish yellow in males; metasoma I–III uniformly dark yellow, IV yellowish brown, segment V brownish in females. Telson yellow in males, slightly darker in females, aculeus reddish at the base and black at the tip. Legs: Tarsi, basitarsus and pretarsus yellow, femur and tibia lustrous and dark yellow. Spinules and condyles reddish brown. Chelicera manus dark yellow with reticulations anteriorly. Chelicera fingers yellow, tips of fingers and teeth reddish.

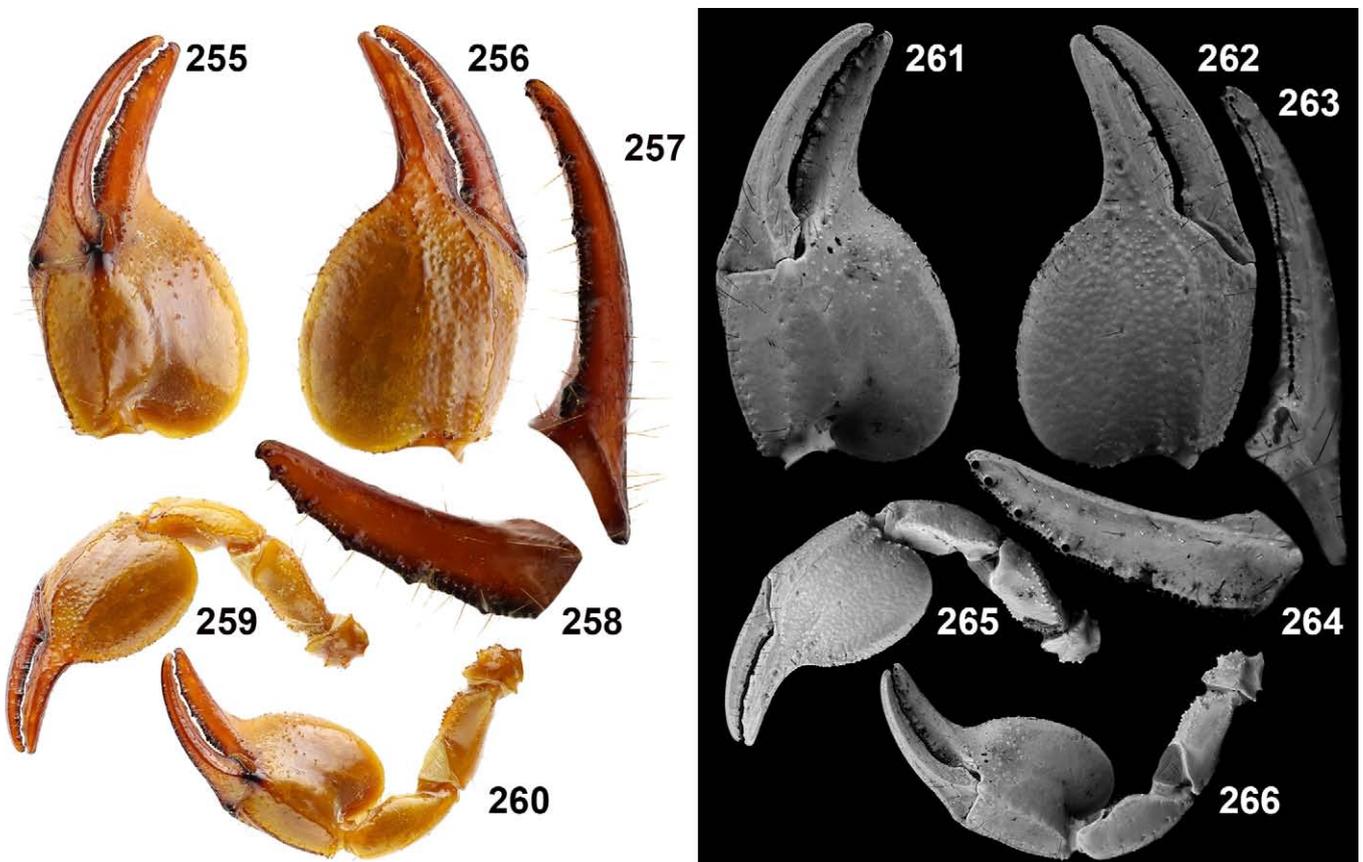
**Carapace** (Figs. 235–242). Carapace is slightly longer than its wide; almost upright trapezoid in shape. Carapace anterior margin distinctly bilobed with 10 medium or large setae and a deep median indentation. Carapace lacks carinae, only posteromedian carinae slightly visible. Carapace shagreened

but a triangular region between median eyes and anterior margin smooth, anterior of carapace and along anteriomedian furrow with moderately dense small granules in males, carapace smooth and lustrous with small granules laterally in females. Median ocular tubercle not distinct and located in the center of the carapace. A pair of median eyes and three pairs of lateral eyes exist; the third located separately and slightly smaller. The anteromedian furrow is narrow and shallow, and more distinct in males. The posteromedian furrow is wide and bifurcated as an inverted T-shaped at posterior edge, and located in arrow-shaped depressions between posteromedian carinae and posterior margin. Posterior lateral furrows wide and distinct. A few setae exist on the anterior area of carapace. **Chelicerae** (Figs. 227–234). Cheliceral dentition characteristic for the family of Scorpionidae (Vachon, 1963); subdistal tooth and basal teeth conspicuous rather than on the movable finger. No longitudinal ridges present anteriorly.

**Mesosoma** (Figs. 227–234). Tergites I–VII acarinate. Tergites I–VII matt and shagreened, tergite VII with scattered medium sized granules in males, while tergites I–VII smooth, lustrous, tergite VII covered with moderately medium sized flattened granules in females. Sternites III–VI smooth and wrinkled with scattered setae in males; smooth and lustrous with scattered



**Figures 243–254.** *Scorpio palmatus* male from Egypt, pedipalp segments under white light (243–248), and under UV light (249–254). Chela ventral (243, 249) and dorsal (244, 250). Movable (245, 251) and fixed (246, 252) fingers dentition. Pedipalp dorsal (247, 253) and ventral (248, 254).



**Figures 255–266.** *Scorpio palmatus* female from Egypt, pedipalp segments under white light (255–260), and under UV light (261–266). Chela ventral (255, 261) and dorsal (256, 262). Movable (257, 263) and fixed (258, 264) fingers dentition. Pedipalp dorsal (259, 265) and ventral (260, 266).

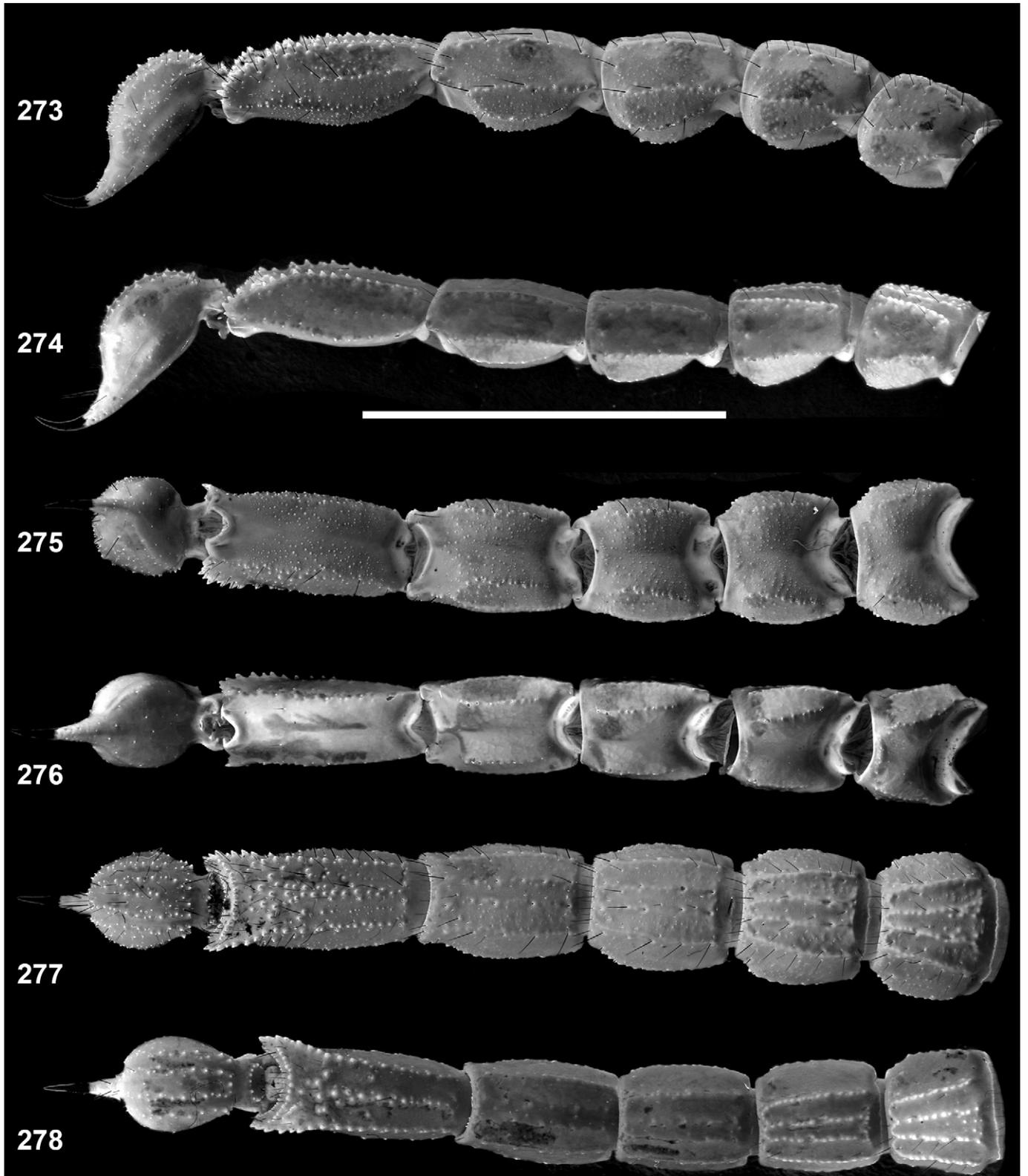


**Figures 267–272.** *Scorpio palmatus* from Egypt, male (267, 269, 271), and female (268, 270, 272). Metasoma and telson under white light, in lateral (267–268), dorsal (269–270) and ventral (271–272) views. Scale bar: 10 mm.

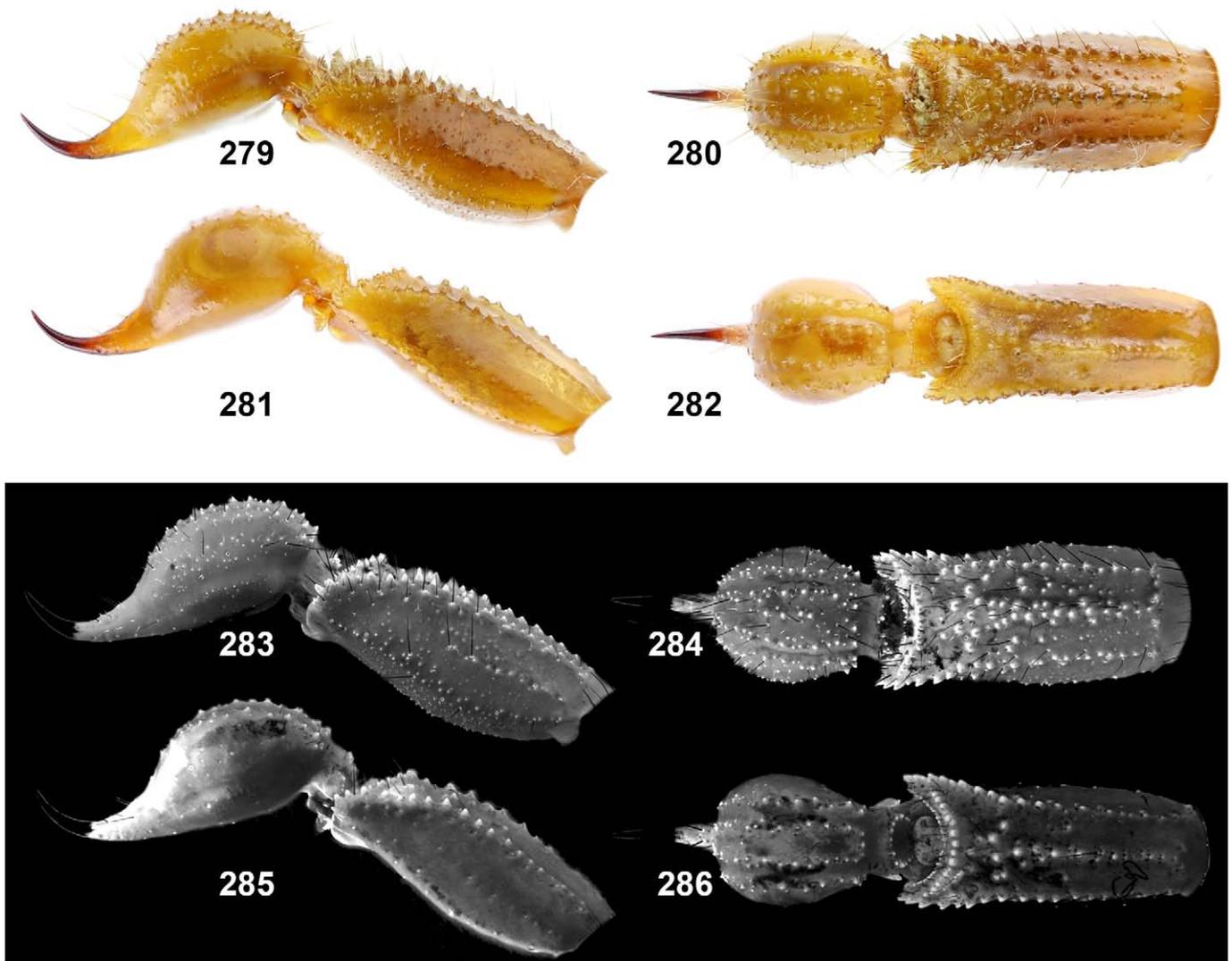
setae in females. Sternite VII granular between lateral carinae with four granular carinae, granules fused. Genital operculum ovoid, a small posterior indentation exists in males, while cordate; anterior margin slightly convex; posterior area slightly elongated, and a small posterior indentation exist in females. Pectines short: teeth numbers 10–12 in males and 8–11 in females; three marginal and three to four median

lamellae. Stigmas linear, angled 45° and conspicuous.

**Metasoma and telson** (Figs. 267–286). Metasoma I slightly wider than long, II–V longer than wide. Metasoma I with 10, II–IV with 8, and V with 5 carinae. Lateral inframedian carinae on segment I indistinct, composed by a few spaced rounded granules anteriorly. Ventral submedian carinae and ventrolateral carinae strong with moderate, rounded and fused



Figures 273–278. *Scorpio palmatus* from Egypt, male (273, 275, 277), and female (274, 276, 278). Metasoma and telson under UV light, in lateral (273–274), dorsal (275–276) and ventral (277–278) views. Scale bar: 10 mm.



**Figures 279–286.** *Scorpio palmatus* from Egypt, male (279, 280, 283, 284), and female (281, 282, 285, 286). Metasoma V and telson under white light (279–282) and under UV light (283–286), in lateral (279, 281, 283, 285), and ventral (280, 282, 284, 286) views.

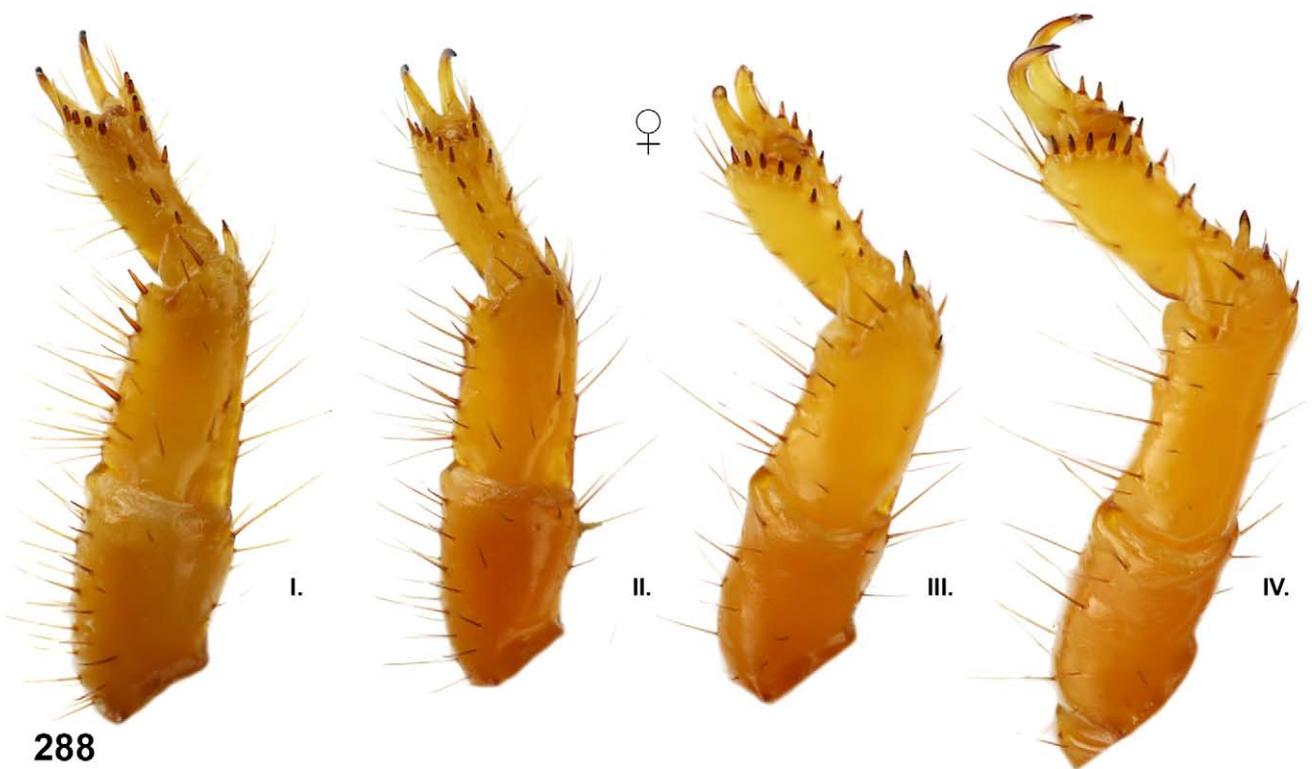
granules on segments I–II, strong and obsolete granules on segments III–IV. Dorsolateral carinae strong and crenulated with small, spaced granules on segments I–IV. Lateral supramedian carinae strong, and obsolete on segments I–IV. Intercarinal area smooth, covered with moderately medium and small sized granules in males, while smooth at ventral and lateral surfaces on segments I–IV in females, 3–4 small granules exist between ventral submedian carinae on segment I; dorsal surfaces on segments I–V shagreened in males, nearly smooth in females. Segment V: Ventromedian carina moderate with large, spinoid and pointed granules; ventrolateral carinae strong and serrated with spaced large and conical granules, gradually increase posteriorly, continues in lateral of anal arch; dorsolateral carinae moderate and rounded with moderate granules; segment V with a row of granules laterally at posterior half. Lateral surfaces shagreened in males, smooth with a few flattened granules in females. Ventral surface densely covered with large granules. Dorsal

surface shagreened in males, nearly smooth in females. Ventral of anal arch serrated with pointed denticles. Ventral and lateral surfaces covered with moderately variable sized setae in segments I–V. Vesicle globular and smooth; granulated ventrally with spinoid granules in both sexes. Vesicle with numerous macrosetae reaching the base of aculeus. Aculeus strongly curved and shorter than vesicle.

**Pedipalp** (Figs. 243–266). Pedipalp femur with three carinae; dorsointernal and ventrointernal carinae moderate with spaced rounded granules; dorsoexternal carinae strong with separated, large and rounded granules. Intercarinal area shagreened with moderate sized granules dorsally and shagreened ventrally. Intercarinal surface with a few distinct setae. Patella with two carinae; dorsomedian carina strong with so flattened and fused granules; ventrointernal carinae obsolete without granules. Intercarinal area of dorsal, ventral and external surfaces smooth and lustrous, external surface with moderate flattened granules; internal surface shagreened. Intercarinal surface with a few



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Figures 287–288. *Scorpio palmatus* from Egypt, right legs I–IV, male (287) and female (288).

Dimensions (mm)		<i>Scorpio wahbehi</i> sp. n.	
		♂ holotype	♀ paratype
Carapace	L / W	9.36 / 8.76	10.80 / 9.95
Mesosoma	L	20.53	21.73
Metasoma + telson	L	32.47	32.58
Segment I	L / W / D	3.72 / 4.32 / 3.80	3.72 / 4.56 / 4.01
Segment II	L / W / D	4.08 / 3.96 / 3.48	4.20 / 4.00 / 3.52
Segment III	L / W / D	4.44 / 3.72 / 3.27	4.68 / 3.84 / 3.38
Segment IV	L / W / D	5.52 / 3.48 / 3.06	5.58 / 3.60 / 3.17
Segment V	L / W / D	7.27 / 3.00 / 2.76	7.20 / 3.18 / 2.76
Telson	L / W / D	7.44 / 2.88 / 2.40	7.20 / 2.88 / 2.64
Pedipalp	L	27.73	30.73
Femur	L / W	6.48 / 2.76	7.20 / 3.12
Patella	L / W	6.60 / 3.00	7.44 / 3.36
Chela	L	14.65	16.09
Manus	L / W / D	9.24 / 4.56 / 8.16	9.96 / 4.80 / 8.40
Movable finger	L	8.52	9.84
Fixed finger	L	5.76	6.72
<b>Total</b>	<b>L</b>	<b>62.36</b>	<b>65.11</b>

**Table 5:** Comparative measurements of *Scorpio wahbehi* sp. n. male holotype and female paratype. Abbreviations: length (L), width (W), depth (D).

distinct setae. The external surface of chela manus with very large and very flattened granules, more distinct and rounded on anterior area, posterior part nearly smooth. Posterior margin of external surface with a few large, rounded granules. Internal surface of chela manus smooth with moderate pointed granules on anterior area. Ventroexternal carina strong, obsolete without granules; ventrointernal carina smooth, rounded without granules. Digital and external secondary carinae not distinct; granules larger anteriorly; the granules separated in males, fused in females; and become denser anteriorly. Chela manus flattened, slightly longer than wide. Chela fingers are relatively short without granules, slightly longer in females. Fixed and movable fingers with 4–5 strong accessory denticles. Intercarinal surface with few distinct setae in manus, but fingers with more dense setae. Trichobothriotaxy of type C; orthobothriotaxic (Vachon, 1974).

**Legs** (Fig. 287–288). Coxa and trochanters smooth. Tarsi of right legs I to IV with 4-5/7-8-4-6/7-9-5-6/8-10-5-7/8-10 internal and external spines arranged in series. Basitarsus of legs I with 2–3 retrolateral spines (generally with 2 spines) and on legs II with 3-4 retrolateral spines (generally with 3 spines). **Measurements.** See Table 4.

**COMMENTS.** Braunwalder & Fet (1998: 32) noted that type specimens of *Buthus (Heterometrus) palmatus* are unknown. Hemprich & Ehrenberg (1828) originally assigned to this taxon specimens from a very wide range they outlined as “Libyan desert (?Egypt), Egypt (Alexandria, Sinai), Lebanon (mountains), Arabia, Syria.” For the purposes of taxonomic stability, we designate here a neotype from Alexandria, Egypt.

### *Scorpio wahbehi* sp. n.

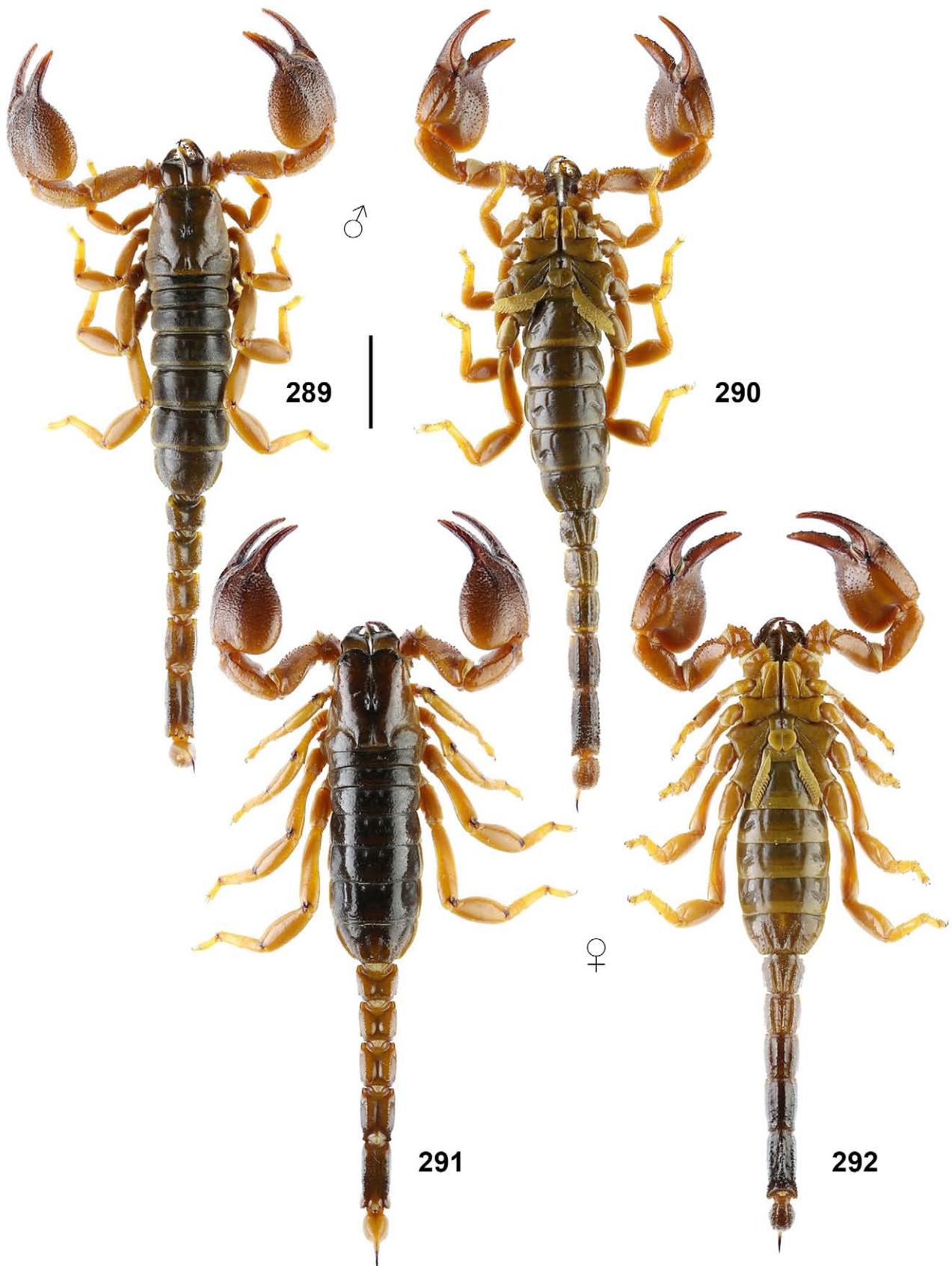
(Figures 7, 289–358, 359, 365, 373; Table 5)

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**TYPE LOCALITY AND TYPE DEPOSITORY.** Jordan, Zarqa Governorate, Wadi Rajel (Wadi Qarma), northeastern desert of Jordan, 14 km SE of Al Azraq, 31°47'43.5"N 36°57'15.1"E, 522 m a. s. l., AZMM.

**TYPE MATERIAL EXAMINED.** Jordan, Zarqa Governorate, Wadi Rajel (Wadi Qarma), northeastern desert of Jordan, 14 km SE of Al Azraq, 31°47'43.5"N 36°57'15.1"E, 522 m a. s. l., 1♂ (holotype) (AZMM/Sco-2022:12), 1♀ (AZMM/Sco-2022:13), 2♀, 2 May 2022, leg. B. Abu Afifeh & R. Abu Afifeh; Zarqa Governorate, Wadi Rajel (Wadi Qarma), northeastern desert of Jordan, 14 km SE of Al Azraq, 31°47'43.5"N 36°57'15.1"E, 522 m a. s. l., 2♂3♀, 30 June 2023, leg. B. Abu Afifeh & R. Abu Afifeh (BAPC); Zarqa Governorate, Wadi Rajel (Wadi Qarma), northeastern desert of Jordan, 14 km SE of Al Azraq, 31°47'43.5"N 36°57'15.1"E, 522 m a.s.l., 3♂5♀, 7 July 2023, leg. B. Abu Afifeh & R. Abu Afifeh (BAPC).

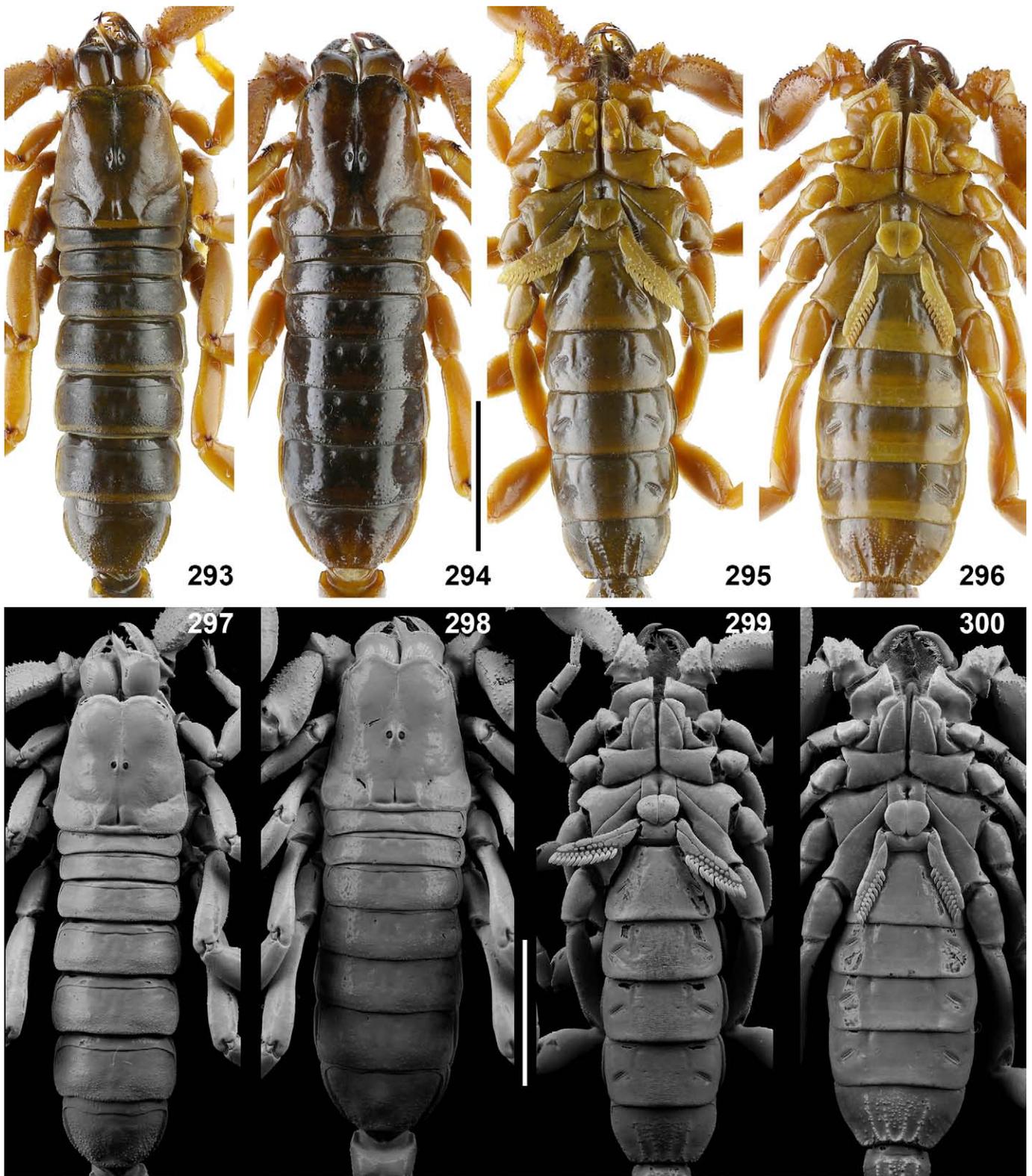
**ETYMOLOGY.** Species name is a patronym honoring Dr. Yahya Wahbeh. A Jordanian paediatrician who used to treat children from scorpion stings, he made a study of Jordanian scorpions with a primary checklist in 1976 to help healthcare system in identifying medically important species in Jordan.



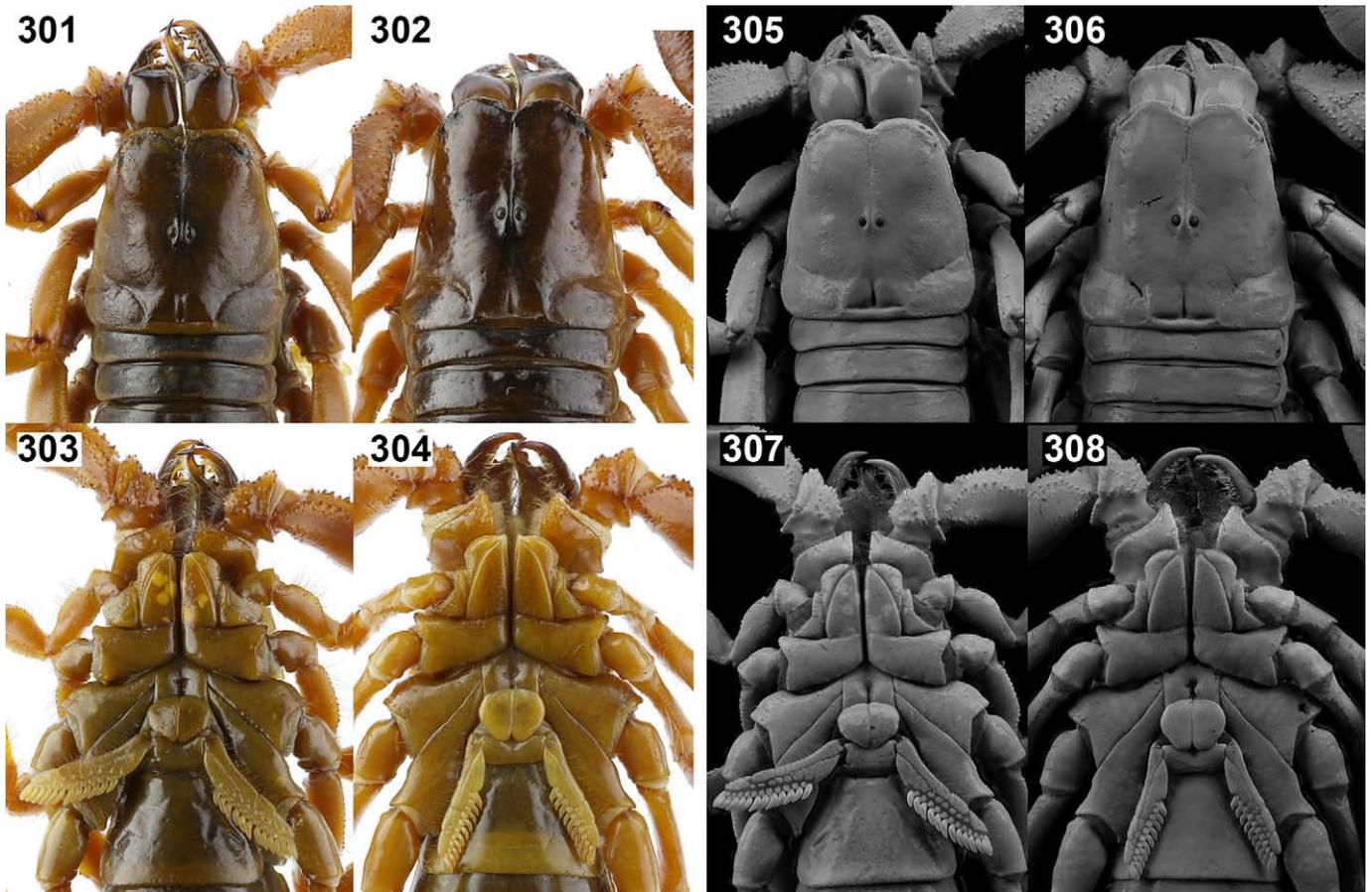
**Figures 289–292:** *Scorpio wahbehi* sp. n., habitus under white light. **Figures 289–290.** Male holotype, in dorsal (289) and ventral (290) views. **Figures 291–292.** Female paratype, in dorsal (291) and ventral (292) views. Scale bar: 10 mm.

		Total size (mm) Range, (Average)	General coloration	Basal lamellae of pectines	External surface of chela granulations	Pectinal tooth no. Range, (Average)	Pectines length	Metasoma II L/W Range, (Average)	Manus L/ chela depth ratio Range, (Average)
<i>Jordanius maysaraensis</i> gen.n. et sp.n.	♂	38.40 - 52.46 (45.47) (n = 10)	Generally dark yellow to light yellowish brown	Broadly triangular	Moderately dense small to large rounded & pointed granules	11-13 (12.0) (26 combs)	Extending beyond coxa- trochanter articulation	0.86 - 0.94 (0.90) (n = 10)	1.22 - 1.29 (1.25) (n = 9)
	♀	42.10 - 52.58 (48.89) (n = 10)				10-12 (10.9) (24 combs)	Reaching coxa- trochanter articulation	0.86 - 0.93 (0.89) (n = 10)	1.22 - 1.27 (1.25) (n = 9)
<i>Jordanius granulomanus</i> comb. n.	♂	38.40 - 50.66 (45.38) (n = 7)	Generally reddish brown	Broadly triangular	Densely Large rounded & pointed granules	9-12 (10.7) (18 combs)	Extending beyond coxa- trochanter articulation	0.91 - 0.96 (0.94) (n = 7)	1.22 - 1.27 (1.25) (n = 7)
	♀	43.50 - 51.85 (48.56) (n = 7)				8-11 (9.9) (44 combs)	Reaching coxa- trochanter articulation	0.88 - 0.95 (0.92) (n = 7)	1.22-1.29 (1.25) (n = 7)
<i>Scorpio jordanensis</i> sp. n.	♂	42.50 - 53.54 (49.37) (n = 20)	Generally light reddish yellow	Broadly triangular	Isolated rounded or flattened granules	10-13 (11.4) (46 combs)	Extending beyond coxa- trochanter articulation	0.89 - 0.97 (0.94) (n = 20)	1.00 - 1.09 (1.06) (n = 9)
	♀	45.70 - 56.90 (52.38) (n = 20)				9-13 (10.6) (36 combs)	Reaching coxa- trochanter articulation	0.85 - 0.96 (0.91) (n = 20)	1.05 - 1.09 (1.07) (n = 9)
<i>Scorpio fuscus</i>	♂	62.30 - 67.55 (64.45) (n = 3)	Generally dark reddish brown to brownish black	Broadly triangular	Reticulated fused or flattened granules	9-10 (9.9) (8 combs) (Talal et al., 2015)	Reaching coxa- trochanter articulation	1.01-1.05 (1.02) (n = 4)	1.07-1.13 (1.10) (n = 4)
	♀	61.70 - 62.42 (62.06) (n = 2)				8-11 (9.8) (16 combs) (Talal et al., 2015)	Reaching coxa- trochanter articulation	1.03 - 1.05 (1.04) (n = 2)	1.11 - 1.13 (1.12) (n = 2)
<i>Scorpio palmatus</i>	♂	47.96 - 50.29 (49.13) (n = 2)	Generally light olive brown to yellow	Broadly triangular	Isolated rounded or flattened granules	10-13 (11.5) (14 combs) (Talal et al., 2015)	Extending beyond coxa- trochanter articulation	0.91 - 1.00 (0.96) (n = 2)	1.04 - 1.06 (1.05) (n = 2)
	♀	46.52 - 49.63 (48.08) (n = 2)				8-12 (10.4) (38 combs) (Talal et al., 2015)	Reaching coxa- trochanter articulation	0.96 - 1.07 (1.02) (n = 2)	1.10 - 1.13 (1.12) (n = 2)
<i>Scorpio wahbehi</i> sp. n.	♂	61.75 - 64.95 (63.10) (n = 4)	Reddish yellow to olive brown	Broadly triangular	Large flattened, less distinct granules, posterior part nearly smooth	12-15 (12.6) (12 combs)	Extending beyond coxa- trochanter articulation	1.00 - 1.06 (1.03) (n = 6)	1.12 - 1.18 (1.15) (n = 6)
	♀	60.90 - 68.79 (65.47) (n = 8)	Reddish brown to reddish black	Narrowly triangular		10-13 (11.0) (22 combs)	Extending beyond coxa- trochanter articulation	1.00 - 1.05 (1.02) (n = 8)	1.14 - 1.19 (1.16) (n = 9)
<i>Scorpio kruglovi</i>	♂	64.00 - 67.00 (65.50) (n=2) (Birula, 1910)	Brownish yellow. (Birula, 1910)	Broadly triangular (Birula, 1910)	Large and flattened granules. (Birula, 1910)	12-13 (12.5) (8 combs) (Birula, 1910)	Extending beyond coxa- trochanter articulation	NA	1.05 - 1.13 (1.09) (n = 4) (Birula, 1910)
	♀	66.00 - 80.00 (74.10) (n=10) (Birula, 1910)	Yellowish red. (*)	Narrowly triangular (*)	Large and very flattened granules. Nearly smooth. (*)	9-12 (10.7) (26 combs) (Birula, 1910)	Reaching coxa- trochanter articulation (*)	NA	1.00 - 1.02 (1.01) (n = 8) (Birula, 1910)

Table 6: Summary of key characters separating the two species of the new genus *Jordanius* gen. n., and five *Scorpio* species. (\*) Asterisk refers to a female syntype of *Scorpio maurus kruglovi* Birula, 1910, Syrie, Deir-Zor, Birula A. det. MNHN Paris- RS1239.



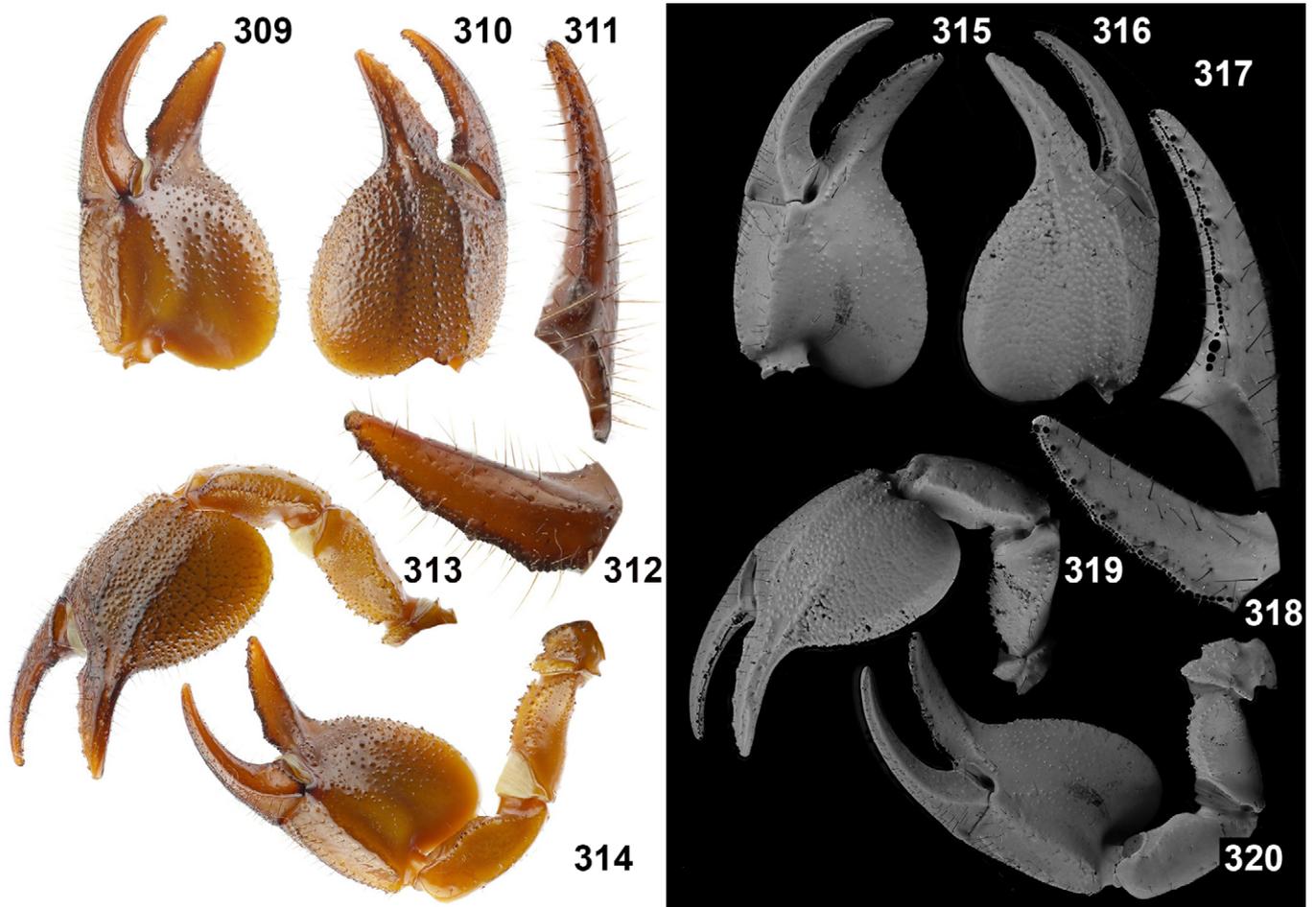
**Figures 293–300:** *Scorpio wahbehi* sp. n., male holotype (293, 295, 297, 299) and female paratype (294, 296, 298, 300). **Figures 293–294, 297–298.** Carapace and mesosoma. **Figures 295–296, 299–300.** Coxal and sternopectinal regions and sternites. **Figures 293–296** under white light. **Figures 297–300** under UV light. Scale bar: 10 mm.



**Figures 301–308:** *Scorpio wahbehi* sp. n., male holotype (301, 303, 305, 307) and female paratype (302, 304, 306, 308), under white light (301–304), and under UV light (305–308). **Figures 301, 302, 305, 306.** Carapace and tergites I–II. **Figures 303, 304, 307, 308.** Coxal and sternopectinal region.

**DIAGNOSIS.** Medium-big sized species compared with its congeners. Adults are about 61.75–64.95 mm in males, and 60.90–68.79 mm in females. General coloration reddish yellow to olive brown in male, reddish brown to reddish black in females. Carapace is slightly longer than its wide; almost trapezoid in shape. Carapace anterior margin distinctly bilobed with a deep median indentation. Carapace lacks carinae, only posteriomedian carinae slightly visible. Carapace shagreened but a triangular region between median eyes and anterior margin smooth. Median ocular tubercle not distinct and located in the center of the carapace. Tergites I–VII acarinate. Tergites I–VII matt; smooth anteriorly, shagreened posteriorly with scattered medium sized granules on tergites I–IV; tergite VII smooth anteriorly; shagreened posteriorly and covered with moderately dense coarse and pointed granules laterally in males, while tergites I–VII smooth, lustrous in females; posterior of segments III–VI with flattened moderate granules; posterior of tergite VII covered with moderately dense coarse granules laterally. Genital operculum ovoid to subhexagonal in males; anterior margin convex with a small posterior indentation exist, while circular to heart-shaped in females; anterior margin convex; posterior area slightly widely elongated; and a small posterior indentation exist. Pectines short and thin: teeth numbers 12–15 in males and 10–13 in females. Metasoma I–II with 10, III–

IV with 8, and V with 5 carinae. Metasoma I slightly wider than long, II usually longer than wide, or sometimes as long as wide, III–V longer than wide. Ventral submedian carinae and ventrolateral carinae strong with moderate, rounded and fused granules on metasom I–II, strong and obsolete granules on III–IV in male; the granules more distinct on segments I–II in females. Ventromedian carina moderate with large, spinoid and pointed granules, bifurcated anteriorly on segment V. Vesicle elongated and smooth; four rows of spinoid granules exist ventrally, more distinct in males. Aculeus long and do not abruptly curved. Two parallel furrows exist on ventral of vesicle. Vesicle with numerous macrosetae reaching the base of aculeus. Pedipalp femur with three carinae, patella with two carinae. The external surface of chela manus with very large and very flattened granules, more distinct and rounded in the anterior area. Ventroexternal and ventrointernal carinae obsolete without granules. Digital carina and external secondary carinae distinct and smooth, the granules fused; and become more dense anteriorly. Chela manus flattened and slightly elongated, longer than depth. Chela fingers are relatively long without granules, longer in females. Fixed and movable fingers with 4–5 strong accessory denticles. Intercarinal surface covered densely with distinct setae on manus and fingers. Trichobothriotaxy of type C; orthobothriotaxic (Vachon, 1974).



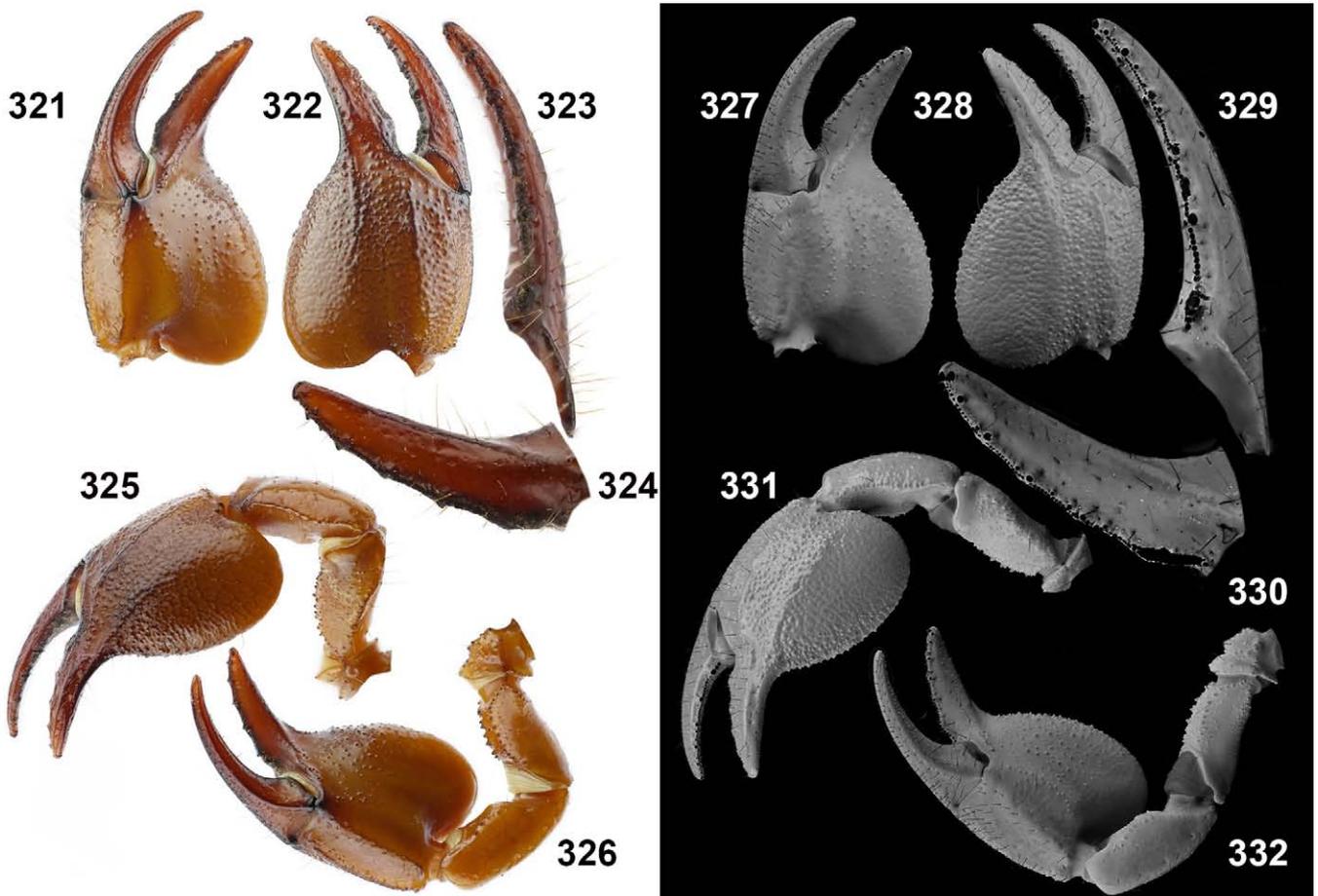
**Figures 309–320.** *Scorpio wahbehi* sp. n., male holotype, pedipalp segments under white light (309–314), and under UV light (315–320). Chela ventral (309, 315) and dorsal (310, 316). Movable (311, 317) and fixed (312, 318) fingers dentition. Pedipalp dorsal (313, 319) and ventral (314, 320).

**DESCRIPTION** (♂ holotype, unless otherwise specified).

**Coloration** (Figs 7, 289–292). General coloration reddish yellow to olive brown in male, reddish brown to reddish black in females. Carapace: olive brown; posterior area of median eyes and anterior area of carapace with brownish, hardly visible reticulation; posterior margin with an olive yellow band in overlap area of first mesosoma segment in male; reddish brown; posterior area of median eyes and anterior area of carapace with hardly visible yellowish brown patches shaped reticulation in females. Tergites I–VII light olive brown; posterior margins of tergites I–VI with olive yellow bands in overlap area in male; I–VI lustrous and reddish black with reticulations medially; tergites I–VII olive brown in females. Coxae, sternum and genital operculum lustrous and dark olive yellow. Pectines light olive yellow. Sternites III–VII olive brown, poststernites of III–VI olive yellow in male; sternites III–VII yellowish olive, poststernites of III–VI light olive yellow in females. Pedipalp femur and patella dark reddish yellow with carinae and granules light red. Chela manus dark reddish yellow to reddish brown with reddish brown reticulations, granules reddish brown; ventroexternal and ventrointernal reddish brown; digital carina and external

secondary carina and fingers dark reddish brown, tip of fingers reddish yellow. Dental margin and condyles reddish black. Metasoma I–II olive brown, III–V yellowish red dorsally and laterally with reddish black reticulations, reddish black dorsally in male; metasoma I–III yellowish red dorsally and laterally, IV–V reddish black dorsally and laterally, metasoma I–II reddish brown, III–V reddish black dorsally in females. Vesicle yellowish red, aculeus dark yellow in posterior part and reddish black at the tip, granules reddish brown in male; ventroposterior area of vesicle reddish brown, granules reddish black in females. Legs with tarsi and basitarsus dark yellow; pretarsus, femur and tibia reddish yellow. Spinules and condyles reddish brown. Chelicera manus dark olive brown with reticulations posteriorly, brownish black anteriorly. Chelicera fingers brownish black, tip of fingers and teeth dark yellow, tip of teeth reddish black.

**Carapace** (Figs. 301–308). Carapace is slightly longer than its wide; almost trapezoid in shape. Carapace anterior margin distinctly bilobed with 8 medium to large setae and a deep median indentation. Carapace lacks carinae, only posteriomedian carinae slightly visible. Carapace shagreened but a triangular region between median eyes and anterior



**Figures 321–332.** *Scorpio wahbehi* sp. n., female paratype, pedipalp segments under white light (321–326), and under UV light (327–332). Chela ventral (321, 327) and dorsal (322, 328). Movable (323, 329) and fixed (324, 330) fingers dentition. Pedipalp dorsal (325, 331) and ventral (326, 332).

margin smooth, along to anteriomedian furrow with several small granules, lateral and posterior surface with scattered small granules in male; carapace smooth and lustrous with several small granules posteriorly in females. Median ocular tubercle not distinct and located in the center of the carapace. A pair of median eyes and three pairs of lateral eyes exist; the third located separately and slightly smaller. Median eyes separated by one ocular diameter. The anteromedian furrow is narrow and distinct. The posteromedian furrow is wide and deep and bifurcated as an inverted T-shaped at posterior edge and located in arrow-shaped depressions between posteriomedian carinae and posterior margin. Posterior lateral furrows wide and distinct. A few setae exist on the anterior area of carapace.

**Chelicerae** (Figs. 301–308). Cheliceral dentition characteristic for the family of Scorpionidae (Vachon, 1963); subdistal tooth and basal teeth conspicuous rather than on the movable finger. Manus lustrous, no longitudinal ridges present anteriorly.

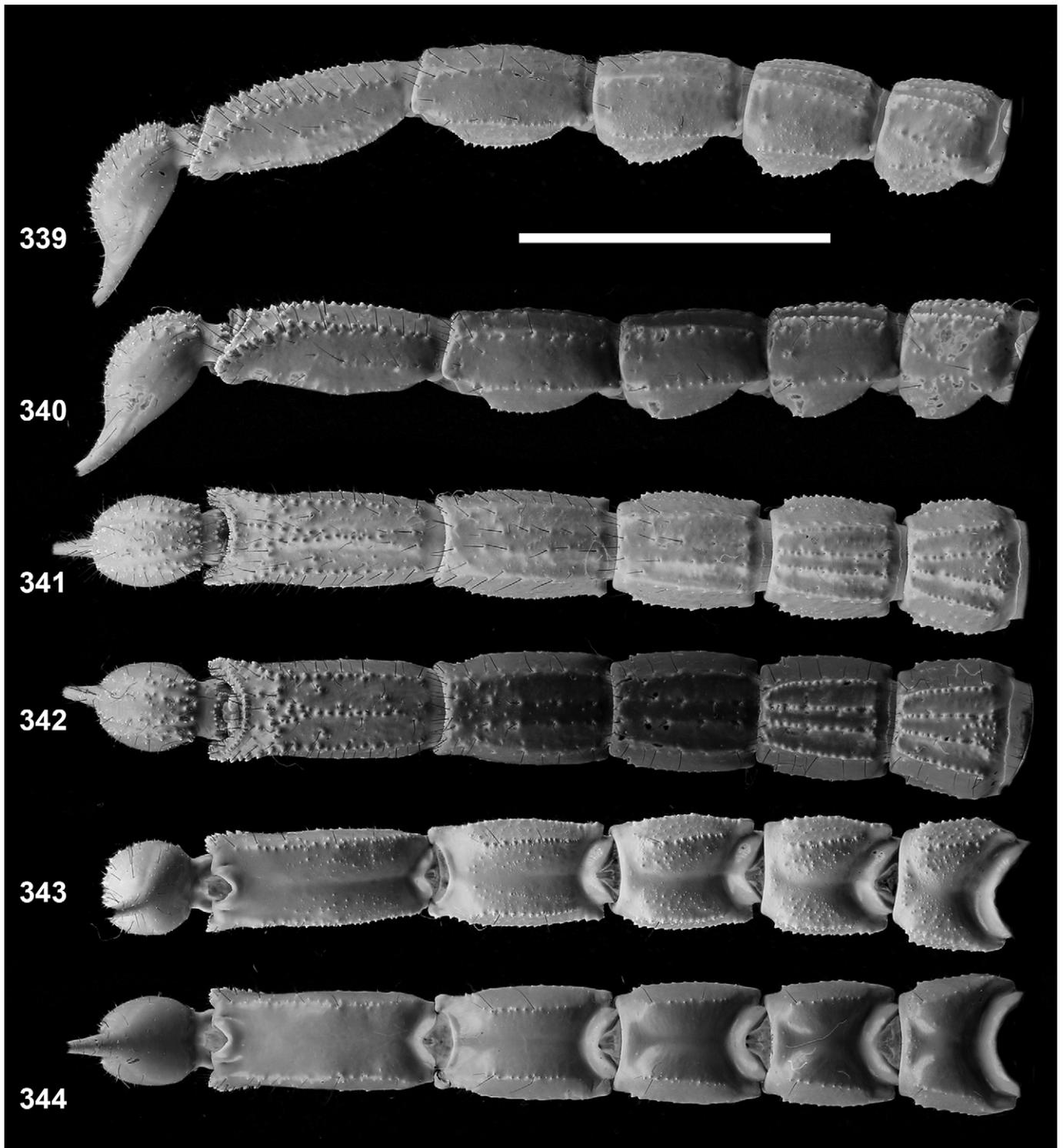
**Mesosoma** (Figs. 293–300). Tergites I–VII acarinate, matt; smooth anteriorly; shagreened posteriorly with scattered medium sized granules on segment I–IV; tergite VII smooth anteriorly; shagreened posteriorly and covered with moderately dense coarse and pointed granules laterally in males, while

tergites I–VII smooth, lustrous in females; posterior of segments III–VI with flattened moderate granules; posterior of tergite VII covered with moderately dense coarse granules laterally. Sternites III–VI with scattered setae, smooth and wrinkled in males; smooth and lustrous in females. Sternite VII with four granular carinae; intercarinal surfaces with scattered, small to medium granules anteriorly. Genital operculum ovoid to subhexagonal in males, anterior margin convex with a small posterior indentation exist, while circular to heart-shaped in females; anterior margin convex; posterior area widely elongated; and a small posterior indentation exist. Pectines short and thin: teeth numbers 12–15 in males and 10–13 in females; three marginal and seven or eight median lamellae. Stigmas linear, angled 45° and conspicuous.

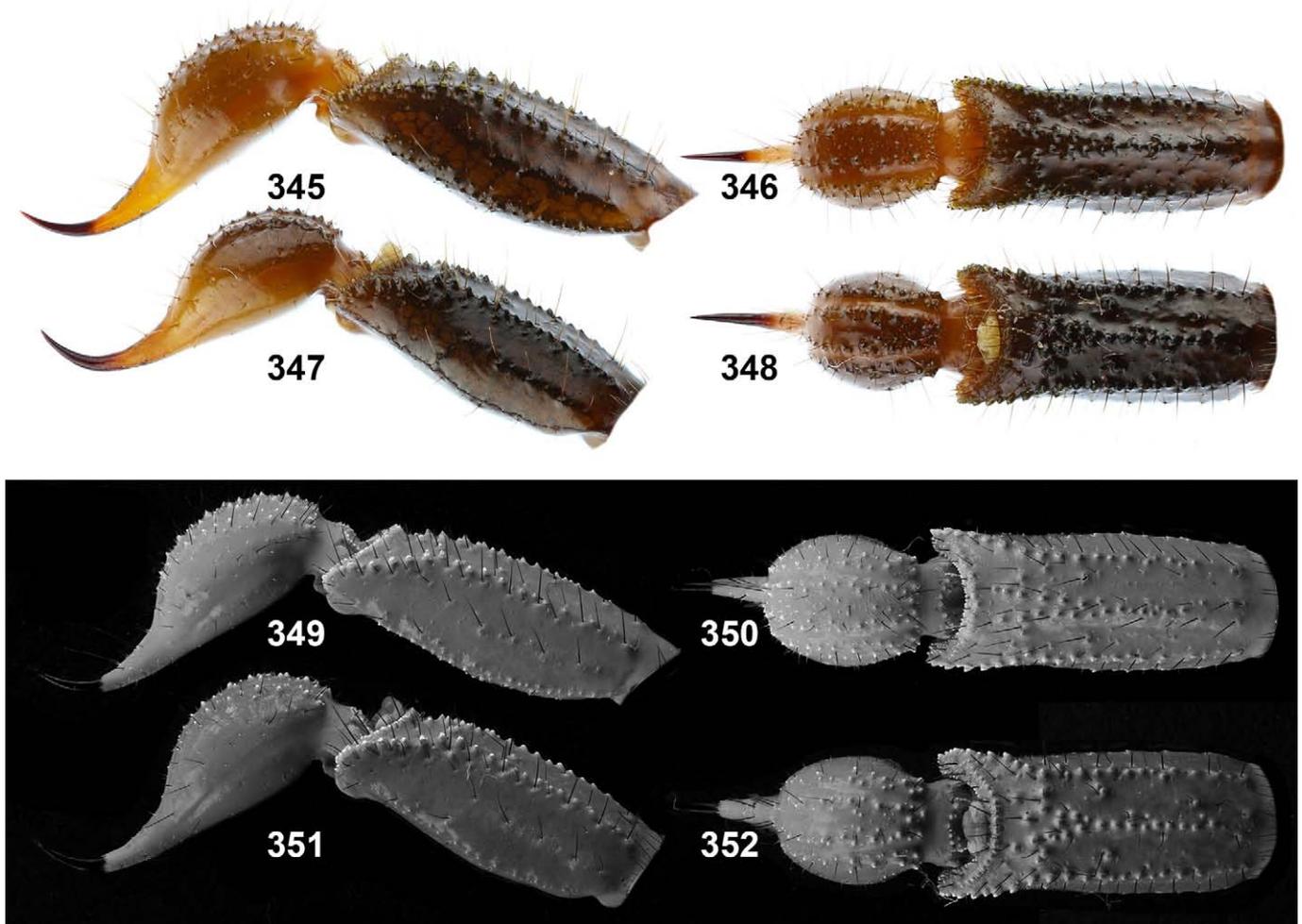
**Metasoma and telson** (Figs. 333–352). Metasoma I–II with 10, III–IV with 8, and V with 5 carinae. Segment I slightly wider than long, II usually longer than wide, or sometimes as long as wide, segments III–V longer than wide. Lateral inframedian carinae on segment I indistinct, complete, composed of a few spaced rounded granules; on segment II composed 1–2 granules on posterior quarter. Ventral submedian carinae and ventrolateral carinae strong with moderate, rounded and fused granules on segments I–II, strong and obsolete granules on



Figures 333–338. *Scorpio wahbehi* sp. n., male holotype (333, 335, 337), and female paratype (334, 336, 338). Metasoma and telson under white light, in lateral (333–334), ventral (335–336) and dorsal (337–338) views. Scale bar: 10 mm.



Figures 339–344. *Scorpio wahbehi* sp. n., male holotype (339, 341, 343), and female paratype (340, 342, 344). Metasoma and telson under UV light, in lateral (339–340), ventral (341–342) and dorsal (343–344) views. Scale bar: 10 mm.

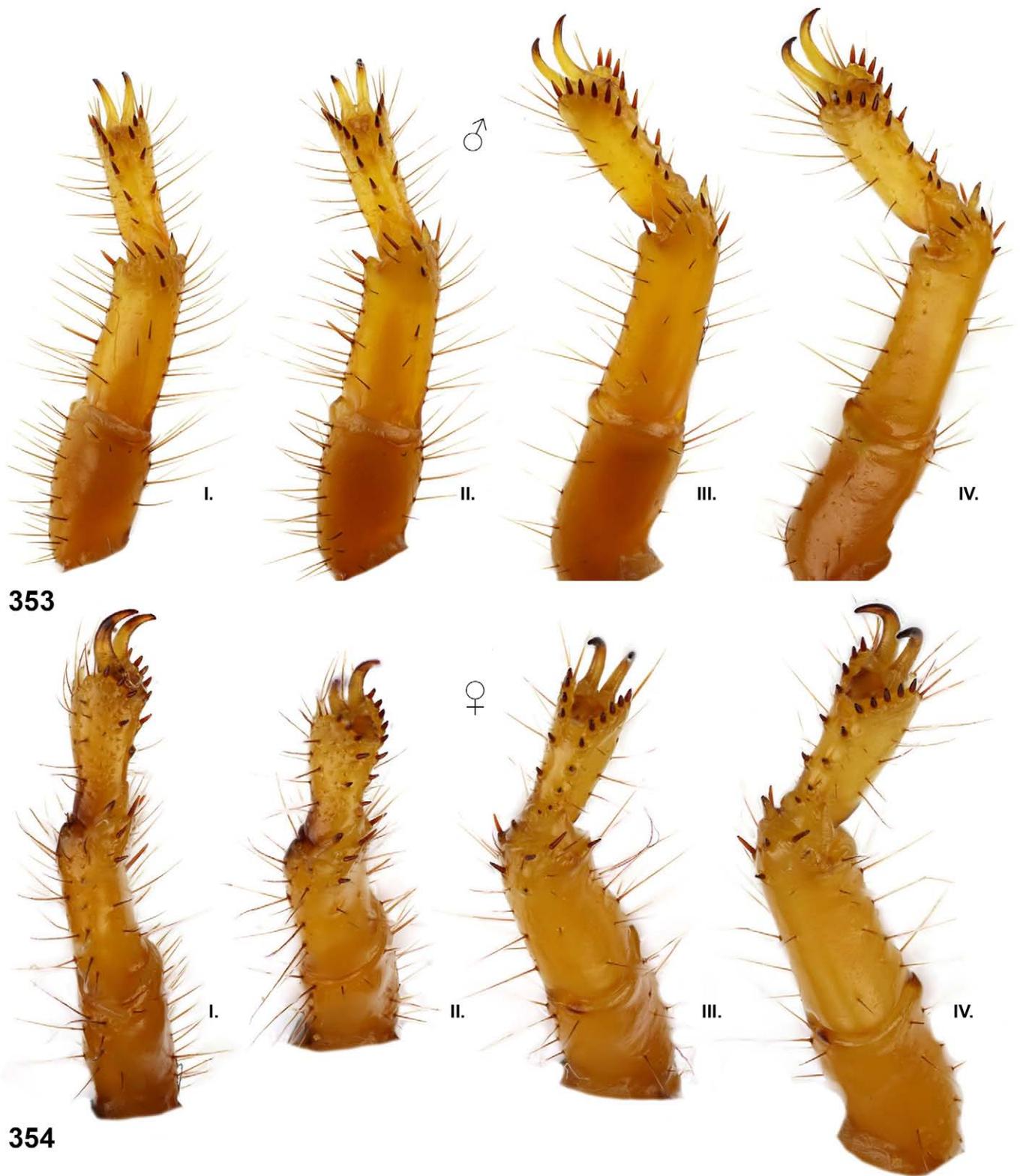


**Figures 345–352.** *Scorpio wahbehi* sp. n., male holotype (345, 346, 349, 350), and female paratype (347, 348, 351, 352). Metasoma V and telson under white light (345–348) and under UV light (349–352), in lateral (345, 347, 349, 351), and ventral (346, 348, 350, 352) views.

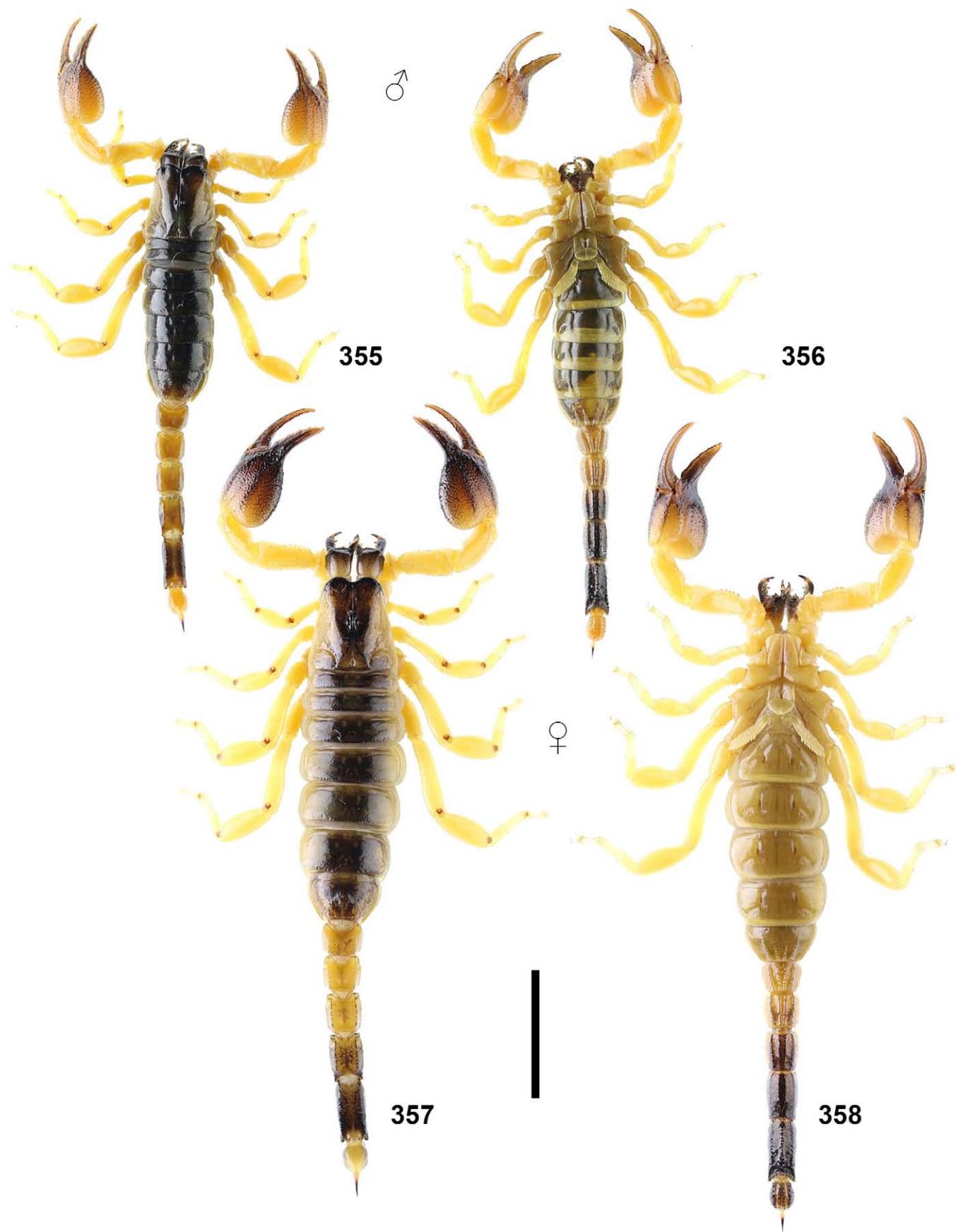
segments III–IV in male; the granules more distinct on segments I–II in females. Dorsolateral carinae strong and crenulated with small, spaced and spinoid granules on segments I–IV. Lateral suprmedian carinae strong and granular on segments I–IV. Intercarinal area smooth, finely granular on lateral surfaces of segments I–IV in male, smooth in females. Dorsal surface moderately granular with fine or moderate granules, medially smooth in male, completely smooth in females on segments I–IV. Segment V: Ventromedian carina moderate with large, spinoid and pointed granules, bifurcated anteriorly; ventrolateral carinae strong and serrated with spaced large and conical granules, gradually increase posteriorly, continues in lateral of anal arch; dorsolateral carinae moderate and rounded with small spinoid granules, smooth in females; segment V with a row of granules laterally at posterior half, granules less distinct in females. Lateral surfaces smooth with scattered few fine granules in male. Ventral surface smooth with few large granules. Dorsal surface moderately granular with fine or moderate granules, medially smooth in male, completely smooth in females. Ventral of anal arch serrated with pointed denticles. Ventral and lateral surfaces covered with moderately variable sized setae in segments I–V, more dense

and larger on segments IV–V. Vesicle elongated and smooth, four rows of spinoid granules exist ventrally, more distinct in males. Aculeus long and do not abruptly curved. Two parallel furrows exist on ventral of vesicle. Vesicles with numerous macrosetae reaching the base of aculeus.

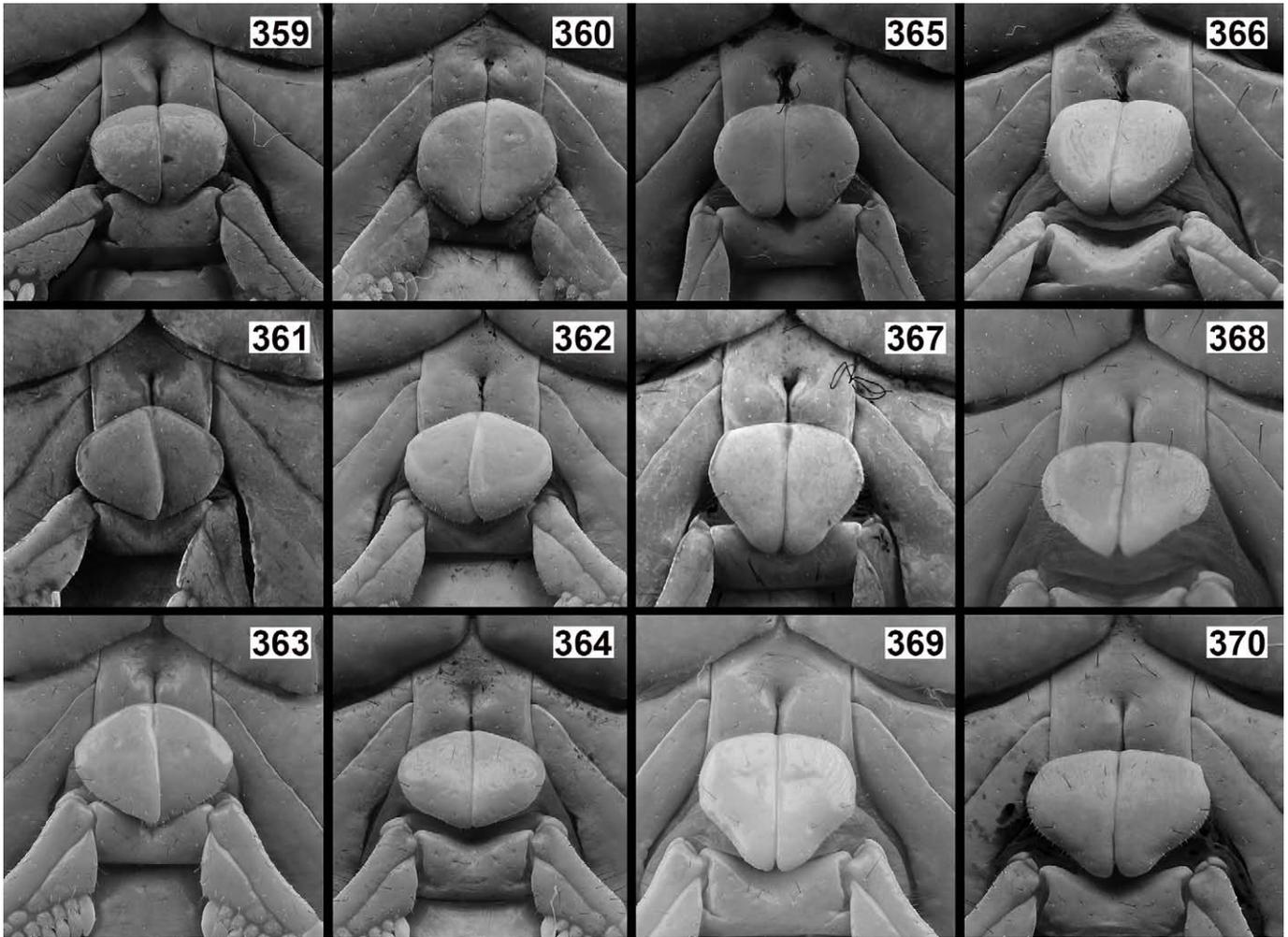
**Pedipalp** (Figs. 309–332). Pedipalp femur with three carinae; dorsointernal and ventrointernal carinae moderate with spaced, rounded and conical granules; dorsoexternal carinae strong with separate large and rounded granules. Intercarinal area smooth with small sized granules dorsally and medium sized granules ventrally. Intercarinal surface with a few distinct setae. Patella with two carinae; dorsomedian carina strong with so flattened and fused granules; ventrointernal carinae moderate and obsolete. Intercarinal area of dorsal, ventral and external surfaces smooth and lustrous; internal surface shagreened. Intercarinal surface with a few distinct setae. The external surface of chela manus with very large and very flattened granules, more distinct and rounded in anterior area, posterior part with smaller granules; posterior internal area with less distinct or more flattened granules in male; the granules more flattened and nearly smooth in posterior internal area in females. Posterior margin of external surface



Figures 353–354. *Scorpio wahbehi* sp. n., right legs I–IV, male holotype (353) and female paratype (354).



**Figures 355–358:** *Scorpio wahbehi* sp. n., habitus under white light. **Figures 355–356.** Subadult male, in dorsal (355) and ventral (356) views. **Figures 357–358.** Subadult female, in dorsal (357) and ventral (358) views. Scale bar: 10 mm.



**Figures 359–370:** Genital operculum and sternum in males (359–364) and in females (365–370) under UV light. **Figure 359, 365.** *Scorpio wahbehi* sp. n. **Figure 360, 366.** *Scorpio fuscus*. **Figure 361, 367.** *Scorpio palmatus*. **Figure 362, 368.** *Scorpio jordanensis* sp. n. **Figure 363, 369.** *Jordanius maysaraensis* gen. et sp. n. **Figure 364, 370.** *Jordanius granulomanus* comb. n.

and internal margin with large and conical granules in male, females lack these granules. Internal surface of chela manus smooth with moderate pointed granules in middle and anterior area in male, fewer granules in females. Ventroexternal and ventrointernal carinae obsolete without granules. Digital carina and external secondary carinae distinct and smooth, the granules fused; become denser anteriorly. Chela manus flattened and slightly elongated, longer than depth. Chela fingers are relatively long without granules, longer in females. Fixed and movable fingers with 4–5 strong accessory denticles. Intercarinal surface covered densely with distinct setae on manus and fingers. Trichobothriotaxy of type C; orthobothriotaxic (Vachon, 1974).

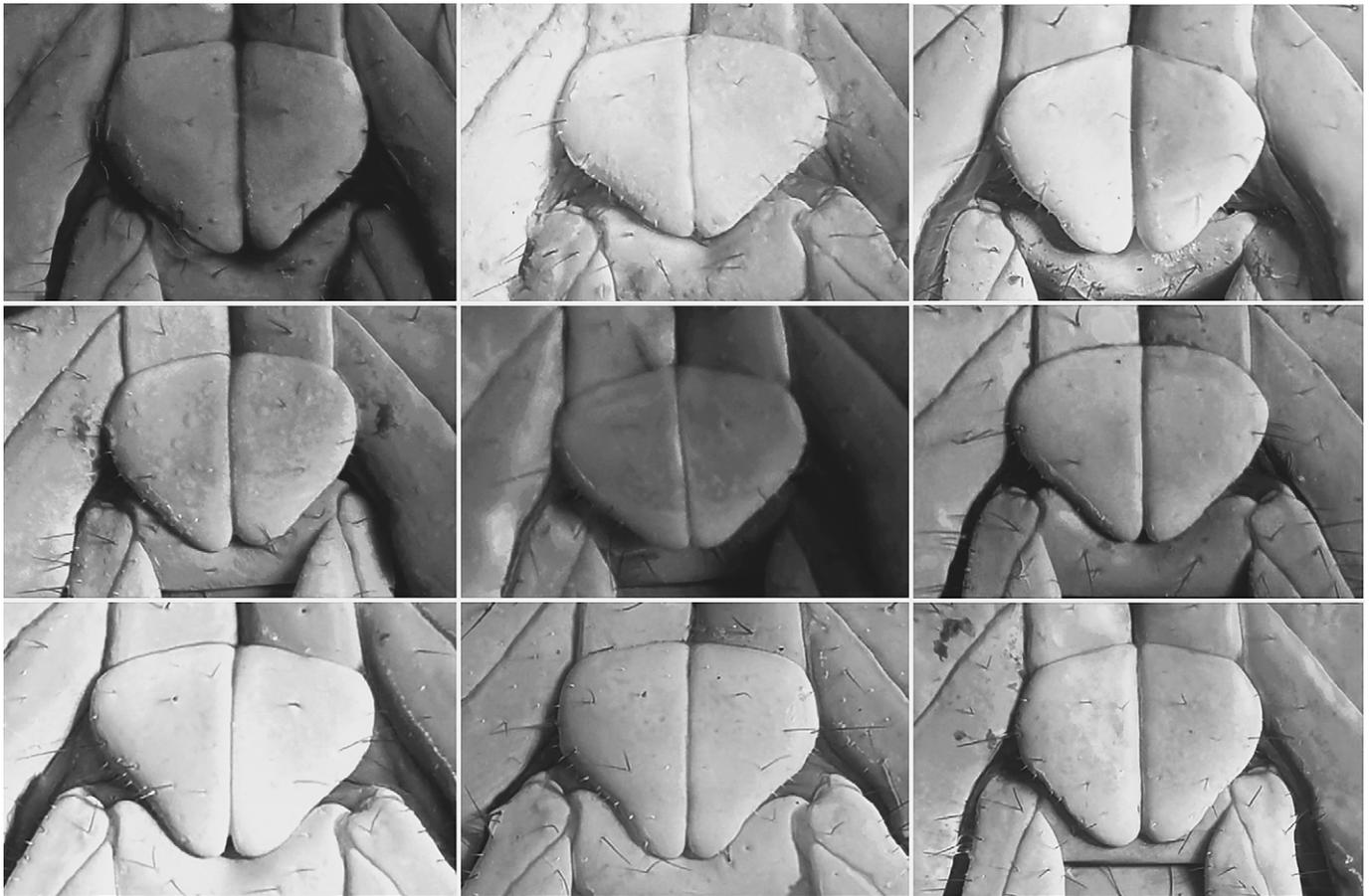
**Legs** (Figs. 353–354). Coxa and trochanters smooth. Tarsi of right legs I to IV with 4-5/7-8-5/8-6/9-10-6-7/9 internal and external spines arranged in series.

**Measurements.** See Table 5.

**AFFINITIES.** *Scorpio wahbehi* sp. n. can be distinguished from *Scorpio kruglovi* Birula, 1910 by a combination of the following characters (more details in Table 6); **a)** pedipalp

chela hand is more elongated in *S. wahbehi* sp. n.; **b)** fixed finger of pedipalp chela is less elongated with respect to chela length in *S. wahbehi* sp. n.; **c)** external surface of pedipalp chela with flattened granules in females of *S. wahbehi* sp. n., whereas it is smooth in females of *S. kruglovi*; **d)** aculeus of *S. kruglovi* is longer and less curved than *S. wahbehi* sp. n.; **e)** genital operculum is circular of *S. wahbehi* sp. n., whereas it is cordate in *S. kruglovi*.

*S. wahbehi* sp. n. can be distinguished from *S. jordanensis* sp. n. by several characters shown in Table 6: **a)** pedipalp chela hand is more elongated in *S. wahbehi* sp. n. than in *S. jordanensis* sp. n.; **b)** fixed finger of pedipalp chela is more elongated in *S. wahbehi* sp. n. than in *S. jordanensis* sp. n.; **c)** the average pectinal tooth numbers in *S. wahbehi* sp. n. is higher than *S. jordanensis* sp. n.; **d)** metasomal segment II is longer than wide or as long as wide in *S. wahbehi* sp. n., whereas it is always wider than long in *S. jordanensis* sp. n.; **e)** *S. wahbehi* sp. n. is larger in size (adults 64–68 mm), than *S. jordanensis* sp. n. (adults 53–56 mm); **f)** the basal lamellae (marginal and median) of pectines is more elongated and narrower in females of *S. wahbehi* sp. n. than females of



**Figures 371.** Variation in the shape of genital opercula in females of *Scorpio jordanensis* sp. n.

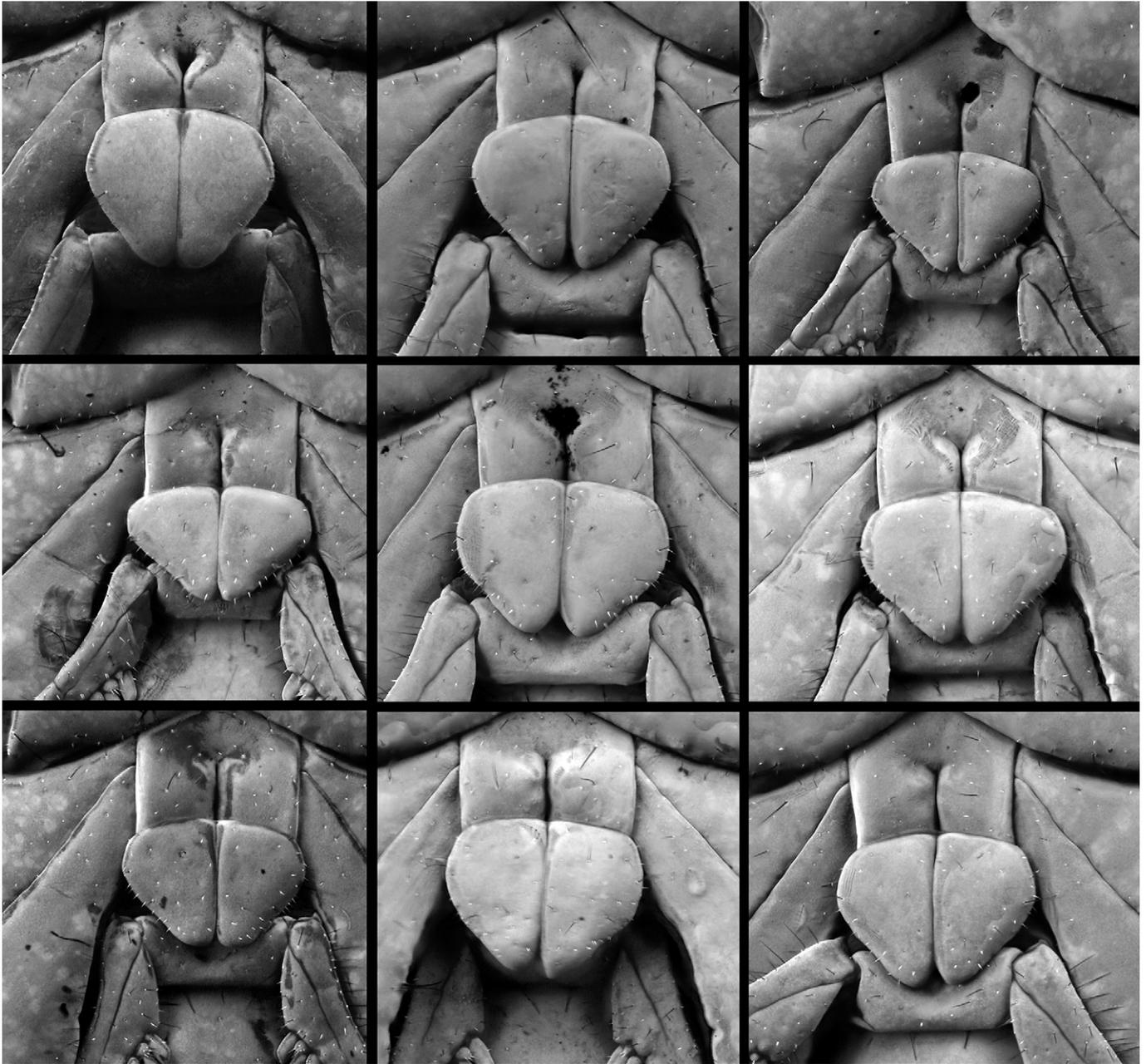
*S. jordanensis* sp. n.; the basal median lamellae is narrowly triangular in shape in *S. wahbehi* sp. n. (Fig. 308), whereas it is broadly triangular in *S. jordanensis* sp. n. (Fig. 164); **g**) the external surface of pedipalp chela mostly with flattened and less distinct granules in *S. wahbehi* sp. n. (Figs. 316, 319), whereas it is rounded and more distinct in *S. jordanensis* sp. n. (Figs. 171, 175); **h**) general coloration is reddish yellow to olive brown in male, reddish brown to reddish black in females of *S. wahbehi* sp. n., whereas it is light reddish yellow in *S. jordanensis* sp. n.

*S. wahbehi* sp. n. can be distinguished from *S. fuscus* by several characters shown in Table 6: **a**) general coloration reddish yellow to olive brown in male, reddish brown to reddish black in females of *S. wahbehi* sp. n. (Figs. 7, 289–292), whereas it is dark reddish brown to brownish black in *S. fuscus* (Figs. 3–4, 79–82); **b**) pedipalp chela hand is more elongated in *S. wahbehi* sp. n. (Figs. 309–310) than in *S. fuscus* (Figs. 99–100); **c**) the basal lamellae ( marginal and median) of pectines is more elongated and narrower in females of *S. wahbehi* sp. n. than in females of *S. fuscus*; the basal median lamellae is narrowly triangular in shape in *S. wahbehi* sp. n. (Fig. 308), whereas it is broadly triangular in *S. fuscus* (Fig. 98); **d**) pectines is longer in *S. wahbehi* sp. n. than in *S. fuscus*; pectines extending well beyond coxa-trochanter articulation of leg IV in *S. wahbehi* sp. n. (Figs. 307–308), whereas extending approximately to the coxa-trochanter articulation of leg IV in

*S. fuscus* (Figs. 97–98); **e**) external surface of pedipalp chela with flattened granules in *S. wahbehi* sp. n., whereas *S. fuscus* has reticular and flattened granulation; **f**) the average pectinal teeth numbers in *S. wahbehi* sp. n. is higher than in *S. fuscus*.

### Sexual dimorphism

In both genera *Scorpio* and *Jordanius* gen. n., males differed from females as follows: **a**) tergites I–VI matt, completely covered with fine granules in males, but glossy and smooth in females, Sternites III–VI wrinkled medially in males, but smooth and shining in females. **b**) fixed finger of pedipalp chela in adult females longer than in males; fixed finger length to chela length ratios is bigger in females than in males; in *Jordanius maysaraensis* gen. et sp. n. 0.36–0.39 with average 0.38 in males (n=9); 0.41–0.43 with average 0.42 in females (n=12); in *S. wahbehi* sp. n. 0.38–0.41 with average 0.40 in males (n=6); 0.42–0.44 with average 0.43 in females (n=10); in *S. jordanensis* sp. n. 0.35–0.36 with average 0.35 in males (n=9); 0.39–0.42 with average 0.40 in females (n=17). **c**) genital operculum generally ovoidal with minor variations in males (Figs. 359–364), whereas it is generally heart-shaped with minor variation in females (Figs. 365–370). **d**) dentate margin length of pecten to pecten length is longer in males than in females; dentate margin length to pecten length ratio in *Jordanius maysaraensis* gen. et sp. n. 0.73–0.79 with average 0.77 in males (n=12); 0.65–0.72

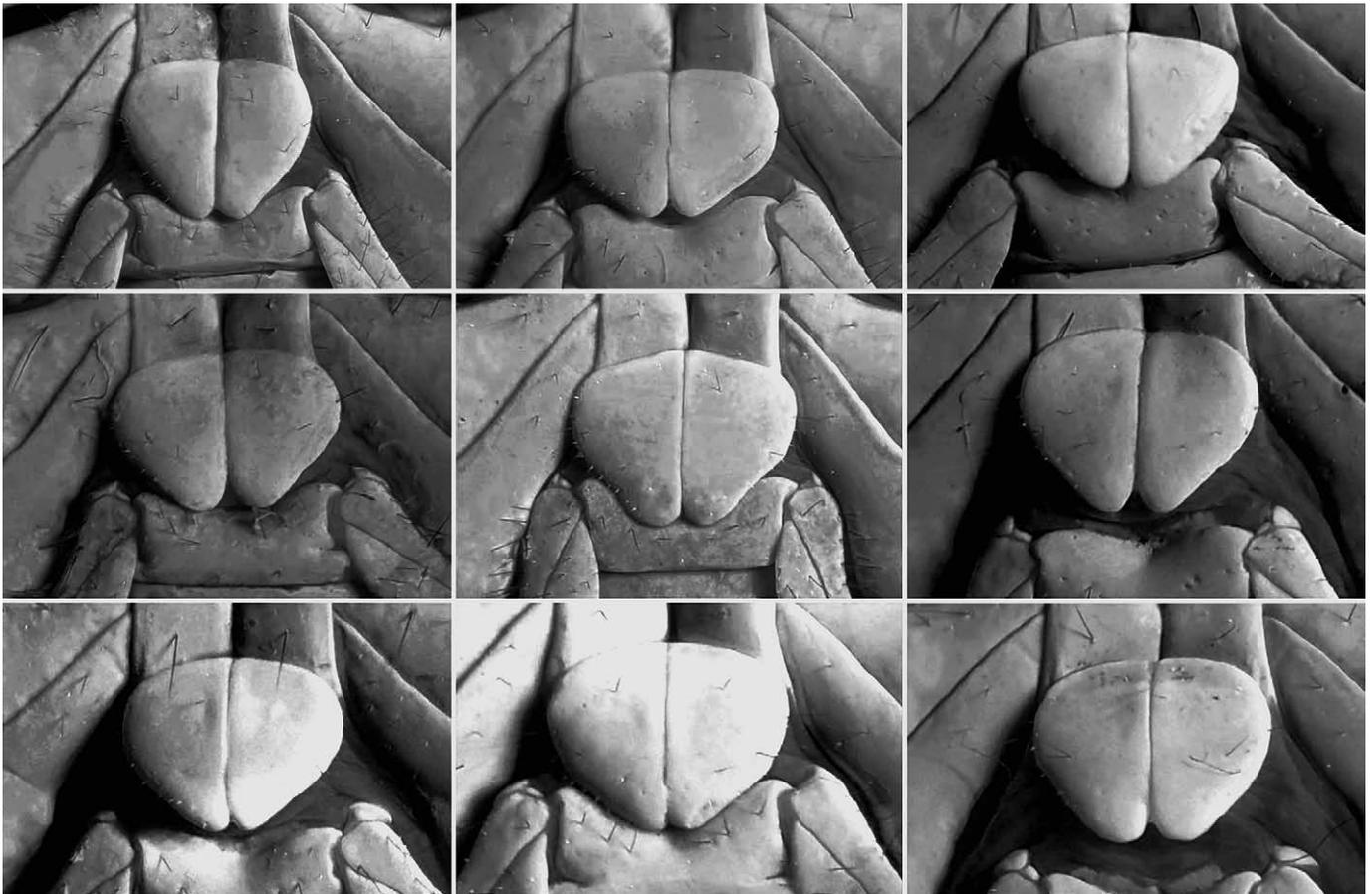


Figures 372. Variation in the shape of genital opercula in females of *Scorpio palmatus*.

with average 0.69 in females (n=12); in *S. wahbehi* **sp. n.** 0.70–0.75 with average 0.72 in males (n=5); 0.60–0.68 with average 0.64 in females (n=10); in *S. jordanensis* **sp. n.** 0.73 in the male; 0.66 in the female. **e)** the average pectinal teeth numbers in males is higher than in females; in *Jordanius maysaraensis* **gen. et sp. n.** 12.1 in males (30 combs, n=15), 11.0 in females (58 combs, n=29); in *S. wahbehi* **sp. n.** 12.6 in males (12 combs, n=6), 11.0 in females (22 combs, n=11); in *S. jordanensis* **sp. n.** 11.4 in males (46 combs, n=23), 10.6 in females (36 combs, n=18). **f)** tergite VII finely granular with moderate, pointed granules posteriorly and laterally in males (Figs. 17, 87, 153, 297), but smooth anteriorly, granulate posteriorly and laterally in females (Figs. 18, 88, 154, 298).

### Dubious and Rejected Records from Jordan

As a result of this study, we remove *Scorpio kruglovi* and *S. palmatus* from the records of Jordanian scorpions and considered these records as erroneous. Amr et al. (2015) considered all previous records of *S. palmatus* collected from Ajloun, Amman, Theban, Wadi Musa, and Wadi Rum as *S. kruglovi*, without providing morphological diagnosis to justify this decision. Most of the materials used in that study were deposited in the collection of Jordanian Royal Society for the Conservation of Nature (RSCN). We had an opportunity to re-examine these specimens and found that all of them belonged to *Scorpio jordanensis* **sp. n.** described in this study.



Figures 373. Variation in the shape of genital opercula in females of *Scorpio wahbehi* sp. n.

### Comments on “*Scorpio propinquus* (Simon, 1872)” and “*Scorpio kruglovi* Birula, 1910”

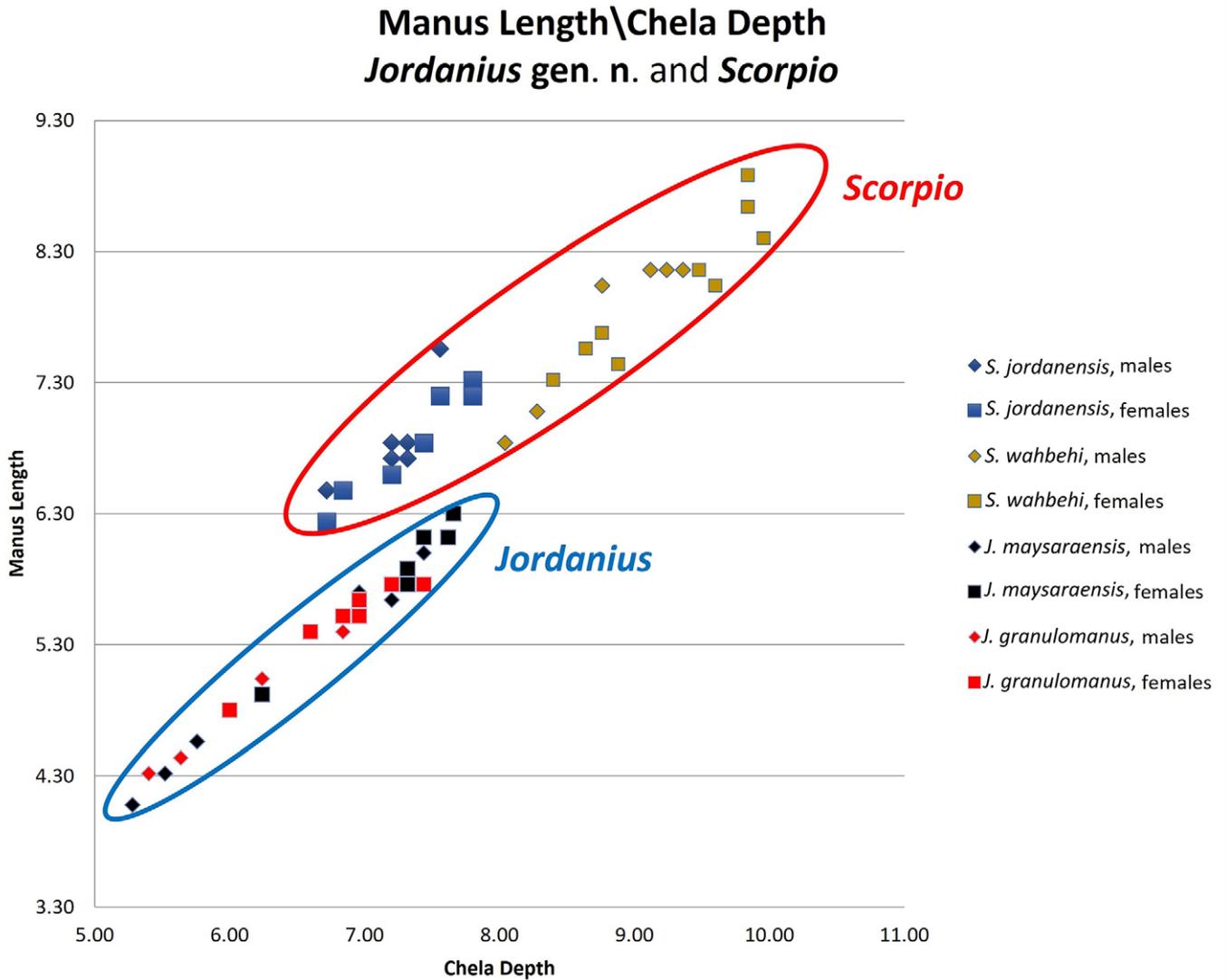
*Scorpio propinquus* was described (as *Heterometrus propinquus*) from “Naplouse in Syria” based on two females; these syntypes cannot be located within Simon’s MNHN collection and are probably lost (Wilson Lourenço, pers. comm.). According to Fet (2000), the type locality is unclear. Birula (1910) suggested that it overlaps with distribution range of *Scorpio fuscus*. Kovařík (2009) doubted validity of this species and accepted it as a synonym of *S. fuscus*. The most prominent character included in the original description of *S. propinquus* is pectinal tooth number, 14-14 in both female syntypes. However, in females of *Scorpio fuscus* it was reported as 9–11 (Birula, 1910), 6–10 (Levy & Amitai, 1980), 8–11 (Talal et al., 2015); it was 9–11 in our examined material. Therefore, *S. propinquus* does not seem to be a synonym of *S. fuscus*. Talal et al. (2015) reported *S. propinquus* from Israel, but they gave little morphological data, with more insights into molecular results. They reported pectinal tooth number as 9 in females (Supplementary Data 1). This number is incompatible with the original description of *S. propinquus*. Therefore, their record seems doubtful. On the other hand, Talal et al. (2015) also reported *Scorpio kruglovi* Birula, 1910 from Israel. The most conspicuous characters of *S. kruglovi* are elongated telson and long chela fingers; these characters

are not clear in the published illustration of Talal et al. (2015). In addition, there is a major difference in coloration compared to illustration of Kovařík (2009) of this species and the picture of female syntype RS1239 in the Muséum national d’Histoire naturelle (MNHN) retrieved from their website, this record also seems doubtful.

On the other hand, the original description of *S. propinquus* based on two lost female syntypes with an unclear type locality lacks any figures or distinguishable morphological characters, and its score of 14–14 pectinal teeth for both females does not fit the genus *Scorpio*, and when comparing it with other non-buthid species in the Middle East, it could fit the description of *Nebo hierichonticus* (Simon, 1872). An unclear taxonomic position and validity of this species caused ambiguity within the genus *Scorpio*. Therefore, we suggest herein that the name *S. propinquus* is *nomen dubium* according to Articles 8 and 75.5 of the ICZN (1999).

### Discussion

Finding reliable and consistent morphological characters for differentiating between various forms and variations in the genus *Scorpio* was traditionally challenging. Many authors (Vachon, 1950; Levy & Amitai, 1980; Sissom, 1994) have agreed that many characters (coloration, number of spines on tarsi, pectine count and shape, genital opercula shape) show



**Figure 374.** Scatter plot of morphometric ratios of Manus Length (ML) to Chela Depth (CD) (slenderness of chela) representing 19 females and 15 males of *Scorpio* spp. and 16 females and 16 males of *Jordanius* gen. n.

great variation when examining large number of specimens even within the same population.

In our attempts to find distinctive characters to distinguish between our specimens from various populations, we found that many previously used characters were variable and unreliable, particularly the shape of genital operculum and sternum; e.g. Figs. 371–373 show a considerable variation in the shape of females genital opercula among three species of *Scorpio*.

Meanwhile such characters as the shape, elongation, and pattern of chela granulation and chela elongation were more informative and showed considerable consistency within populations. The latter character was used to distinguish between the two genera *Scorpio* and *Jordanius* gen. n. The

difference in elongation of chela manus (Manus Length/Chela Depth) (Fig. 374) clearly separates these two genera: *Jordanius* gen. n. with elongated chela manus (Manus Length/Chela Depth 1.24–1.29), and *Scorpio* with inflated chela manus (Manus Length/Chela Depth 1.00–1.18).

Many *Scorpio* populations in the Middle East are still assigned to *S. kruglovi*, therefore a redescription of this species based on available syntypes is necessary to provide systematic stability and determine misidentified populations. Similarly, many populations have been reported as *S. maurus*. This study on *Scorpio* fauna of Jordan resulted in describing three new species. Further studies of this group in the Middle East may reveal additional new species.

## Key to Family Scorpionidae in Jordan

1. External surface of chela manus densely covered with large, raised, rounded and somewhat pointed granules, the posterior margin of the external surface of chela manus bears very large spinoid protrudings, chela fingers granulated with small, pointed, gradually decreased granules anteriorly, Chela manus elongated (Manus Length/Chela Depth (1.24–1.29) (Fig. 1). ..... *Jordanius* **gen. n.** ..... 2
  - External surface of chela manus is almost smooth, or covered with isolated, rounded, or flattened, and sometimes with reticulated fused granules, chela fingers smooth, chela manus inflated (Manus Length/Chela Depth (1.0–1.18) (Fig. 2). .. *Scorpio* Linnaeus, 1758... 3
2. Coloration generally dark yellow to light yellowish brown, external surface of chela manus with moderately dense and generally small granulation. .... *Jordanius maysaraensis* **gen. et sp. n.**
  - Coloration generally reddish brown, external surface of chela manus with dense, large and somewhat pointed granulation ..... *Jordanius granulomanus*, **comb. n.**
3. Metasomal segment II usually longer than wide, or sometimes as long as wide, generally dark coloration, adult total length > 60 mm. .... 4
  - Metasomal segment II always wider than long, generally light coloration, adult total length < 55mm. .... *Scorpio jordanensis* **sp. n.**
4. The basal median lamellae of pectines is narrowly triangular in shape, pectines extending well beyond coxa-trochanter articulation of leg IV, general coloration reddish yellow to olive brown in male, reddish brown to reddish black in females. .... *Scorpio wahbehi* **sp. n.**
  - The basal median lamellae of pectines are broadly triangular in shape, pectines extending approximately to the coxa-trochanter articulation of leg IV, general coloration dark reddish brown to brownish black. .... *Scorpio fuscus* (Ehrenberg, 1829)

## Acknowledgments

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