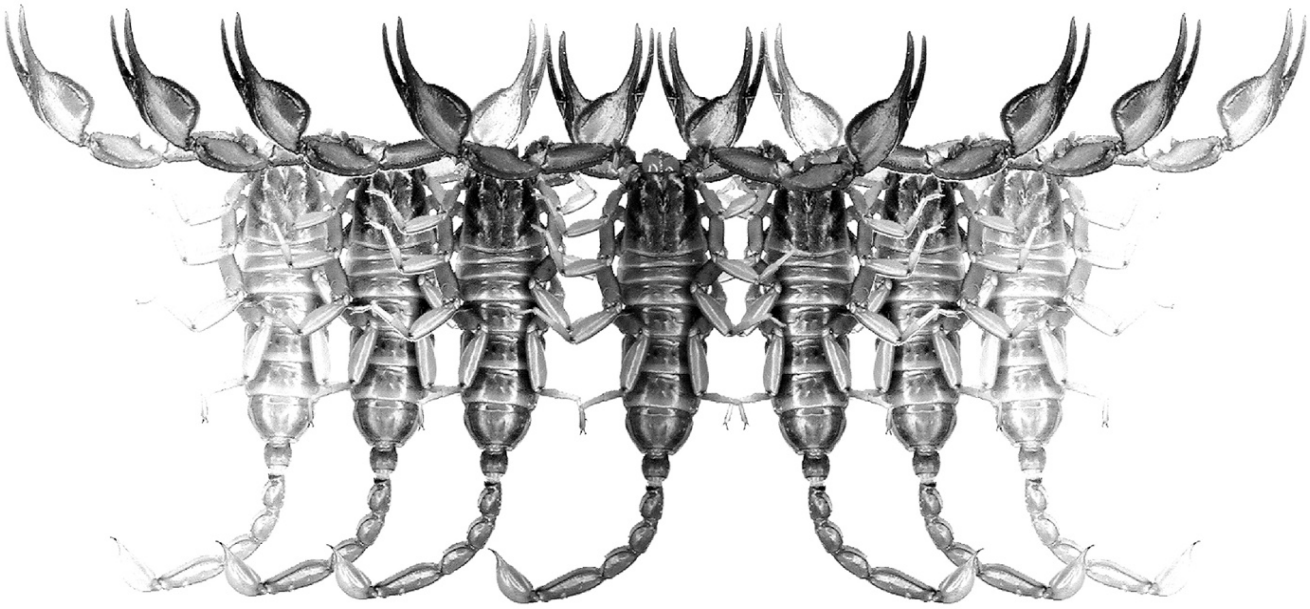
Euscorpius

Occasional Publications in Scorpiology



A new species of *Scorpio* from Jordan (Scorpiones: Scorpionidae)

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

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Euscorpius — Occasional Publications in Scorpiology. 2023, No. 369

A new species of *Scorpio* from Jordan (Scorpiones: Scorpionidae)

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Summary

A new species *Scorpio granulomanus* **sp**. **n**. is described and illustrated from Dibbeen Forest, Jerash Governorate, Jordan. The new species is compared with the previously recorded species of the genus *Scorpio* in the Middle East; it can be distinguished from all other congeners by its very large, pointed granules on the dorsoexternal surface of the chela manus, and an untypically elongated chela manus.

Introduction

Over the past few years, four new species of scorpions have been described from Jordan (Al-Saraireh et al., 2021; Lourenço et al., 2021a, 2021b; Abu Afifeh et al., 2022). In addition to 18 species recorded earlier (Amr, 2015), and including the new species described here, scorpiofauna of Jordan now includes 23 species belonging to three families.

Scorpio Linnaeus, 1758 (Scorpionidae) is an Old World genus that consists of 27 species (including the new one described here) and subspecies distributed from north Africa, western Sahara, Mauritania, and Senegal to the Middle East as far as Iran (Prendini et al., 2003). For many years, the genus was considered monotypic, with *Scorpio maurus* Linnaeus, 1758 treated as a highly polymorphic species (Lourenço, 2009). Several authors, however, recognized other species belonging to this genus as well as several subspecies for the nominate species (Simon, 1872; Kraepelin. 1899; Pocock, 1900; Birula, 1910). Prendini et al. (2003) and Lourenço (2009) gave a comprehensive account of the taxonomy of this genus.

In the Middle East, and Jordan in particular, two subspecies of *Scorpio maurus* were recognized for many decades; *Scorpio maurus fuscus* (Ehrenberg, 1829), and *S. m. palmatus* (Ehrenberg, 1828) (El-Hennawy, 1992; Amr & Al-Oran, 1994; Kabakibi et al., 1999; Amr & Abu Baker, 2004; Kovařík, 2009; Shehab et al., 2011). Later, Amr et al. (2016) considered all previous records of *Scorpio maurus palmatus* collected from Ajloun, Amman, Theban, Wadi Musa, and Wadi Rum as *Scorpio kruglovi* Birula, 1910, without a proper justification. They also referred to specimens collected from Ash Shawbak and from several other localities as to *S. kruglovi*.

Talal et al. (2015), based on morphological and molecular data as well as burrowing behavior, showed that *Scorpio fuscus* and *S. palmatus* are distinct species. They recognized four species in the Middle East: *Scorpio fuscus*, *S. kruglovi*, *S. palmatus*, and *S. propinquus* (Simon, 1872).

The status of species of the genus *Scorpio* inhabiting Jordan is not fully understood. This small country has a wide range of habitats including forested mountainous areas, arid deserts with volcanic outcrops, and sand and gravel deserts (Amr, 2011). This study adds a description of a new species of the genus *Scorpio* from Jordan.

Material and Methods

Specimens of *Scorpio granulomanus* **sp**. **n**. were collected by digging burrows at night from Dibbeen Forest in Jerash Governorate, The specimens were preserved in 96% alcohol. Photographs were taken by Canon EOS 7D. Stacking of pictures was made using Helicon Focus software. Illustration under UV illumination was after Volschenk (2005). Trichobothrial nomenclature followed Vachon (1974) and morphological nomenclature was after Francke (1977), Stahnke (1971), Sissom (1990), and Hjelle (1990).

Male holotype and one female paratype deposited at the Zoology Museum of Alaşehir Vocational School, Manisa Celal Bayar University, Manisa, Turkey (AZMM); other paratypes deposited in the Department of Biology, the University of Jordan, Amman, Jordan (JUST), and Royal Society for the Conservation of Nature collection (RSCN).

Figures 1–**4**: *Scorpio granulomanus* **sp**. **n**. **Figures 1**–**2**. Male holotype, dorsal (1) and ventral (2) views. **Figures 3**–**4**. Female paratype, dorsal (3) and ventral (4) views. Scale bar: 10 mm.

		Scorpio granulomanus sp. n.	*Scorpio granulomanus* sp. n.
Dimensions (MM)		**♂ holotype**	**♀ paratype**
Carapace	L / Wa / Wp	6.48 / 4.08 / 6.48	7.44 / 4.92 / 7.20
Mesosoma	L	16.57	16.69
Metasoma + telson	L	24.24	24
Segment I	L / W / D	2.76 / 3.84 / 2.29	2.76 / 3.84 / 2.42
Segment II	L / W / D	3.24 / 3.36 / 2.45	3.12 / 3.30 / 2.36
Segment III	L / W / D	3.60 / 3.30 / 2.60	3.36 / 3.12 / 2.32
Segment IV	L / W / D	4.08 / 3.12 / 2.33	4.08 / 2.94 / 2.18
Segment V	L / W / D	5.40 / 2.52 / 2.28	5.40 / 2.40 / 2.22
Telson	L / W / D	5.16 / 2.46 / 2.16	5.28 / 2.52 / 2.04
Pedipalp	L	19.44	22.32
Femur	L / W	4.20 / 2.10	4.80 / 2.28
Patella	L / W	4.68 / 2.40	5.28 / 2.76
Chela	L	10.56	12.24
Manus	W / D	3.60 / 5.52	3.60 / 5.76
Movable finger	L	6.24	7.20
Total	**L**	**47.29**	**48.13**

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

Systematics

Family **Scorpionidae Latreille**, **1802**
Scorpio Linnaeus, 1758

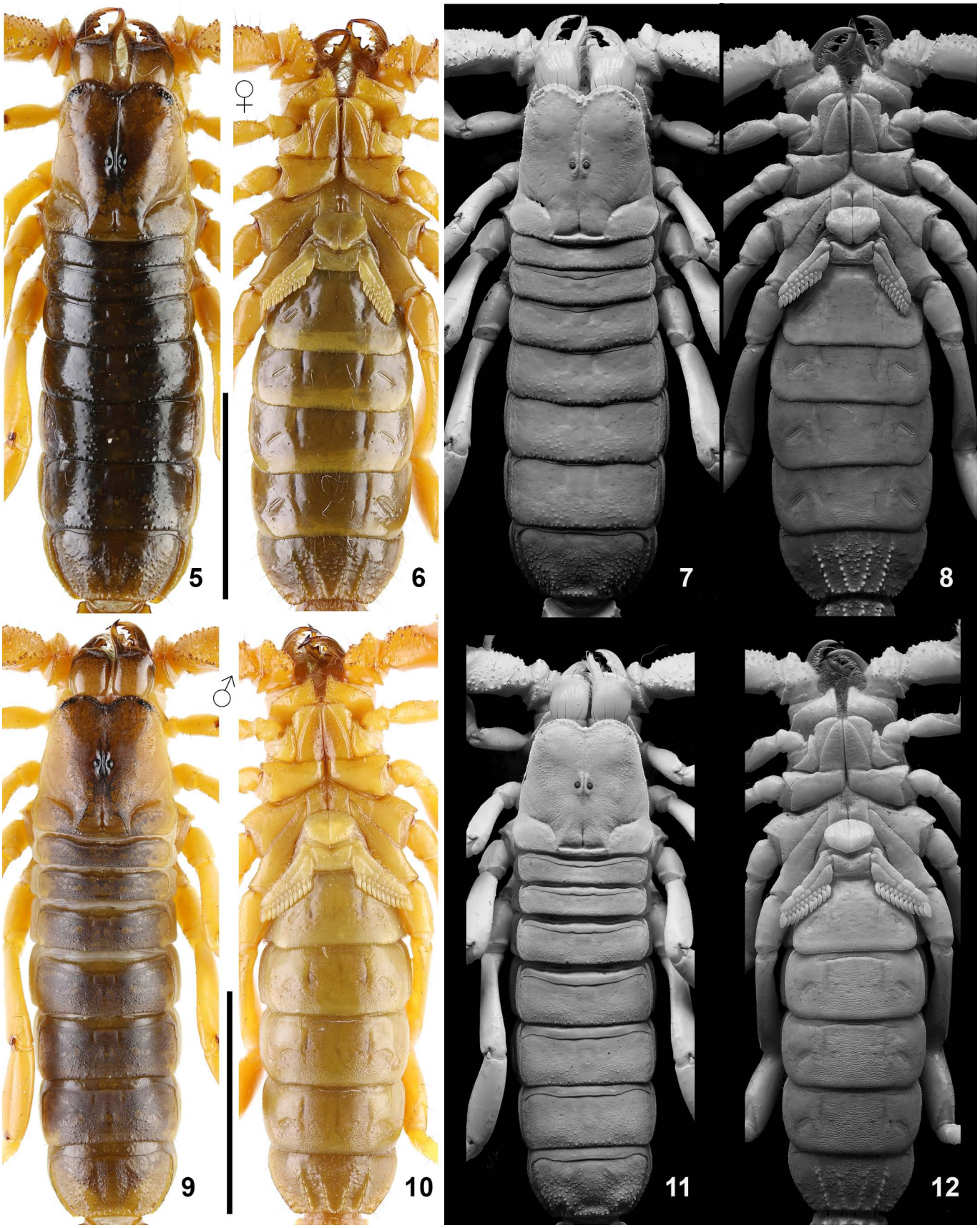
***Scorpio granulomanus* sp. n.**
(Figures 1–59, Table 1)
http://zoobank.org/urn:lsid:zoobank.org:act:9C65CC28-A91F-4DBA-9749-AF558680CB87

Type locality and type depository. **Jordan**, Dibbeen Forest Reserve, 32°14'38.40"N 35°49'20.90"E, Jerash Governorate, 783 m a. s. l., AZMM.

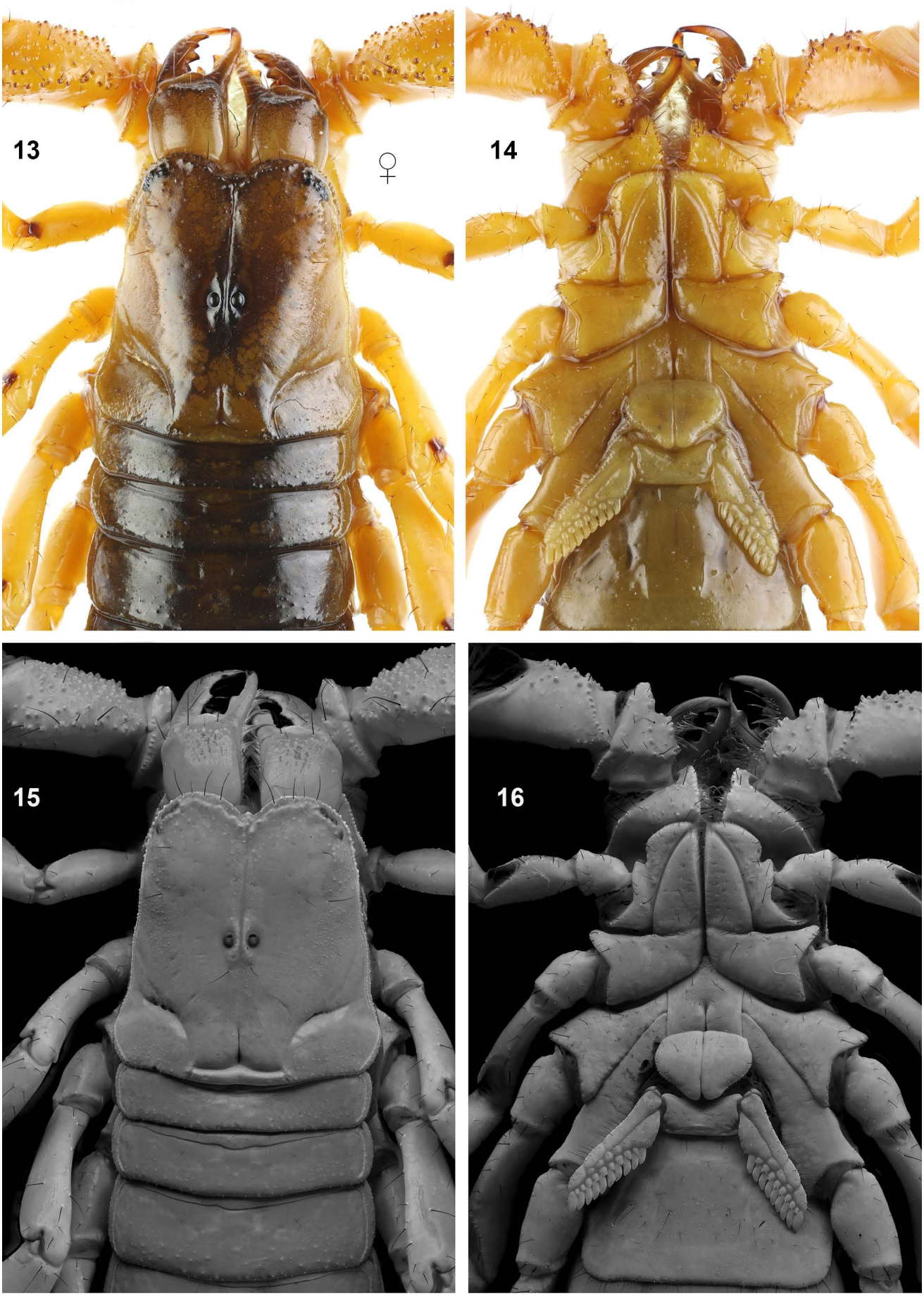
Type material examined. **Jordan**, Dibbeen Forest Reserve, 32°14'46.9"N 35°49'20.00"E, Jerash Governorate, 745 m a. s. l., 2♂ (paratypes), 6 September 2013, leg. Z. Amr (RSCN); Dibbeen Forest Reserve, 32°14'52.70"N 35°49'23.80"E, Jerash Governorate, 741 m a. s. l., 1♂9♀ (paratypes), 22 April 2022, leg. B. Abu Afifeh & M. Al-Saraireh (JUST); Dibbeen Forest Reserve, 32°14'38.40"N 35°49'20.90"E, Jerash Governorate, 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-Saraireh (JUST); Dibbeen Forest Reserve, 32°14'52.70"N 35°49'23.80"E, Jerash Governorate, 741 m a. s. l., 2♀ (paratypes), 26 June 2022, leg. B. Abu Afifeh & M. Al-Saraireh (JUST).

Etymology. The specific epithet refers to a heavily granulated chela manus of this species, the most distinct character for this new species.

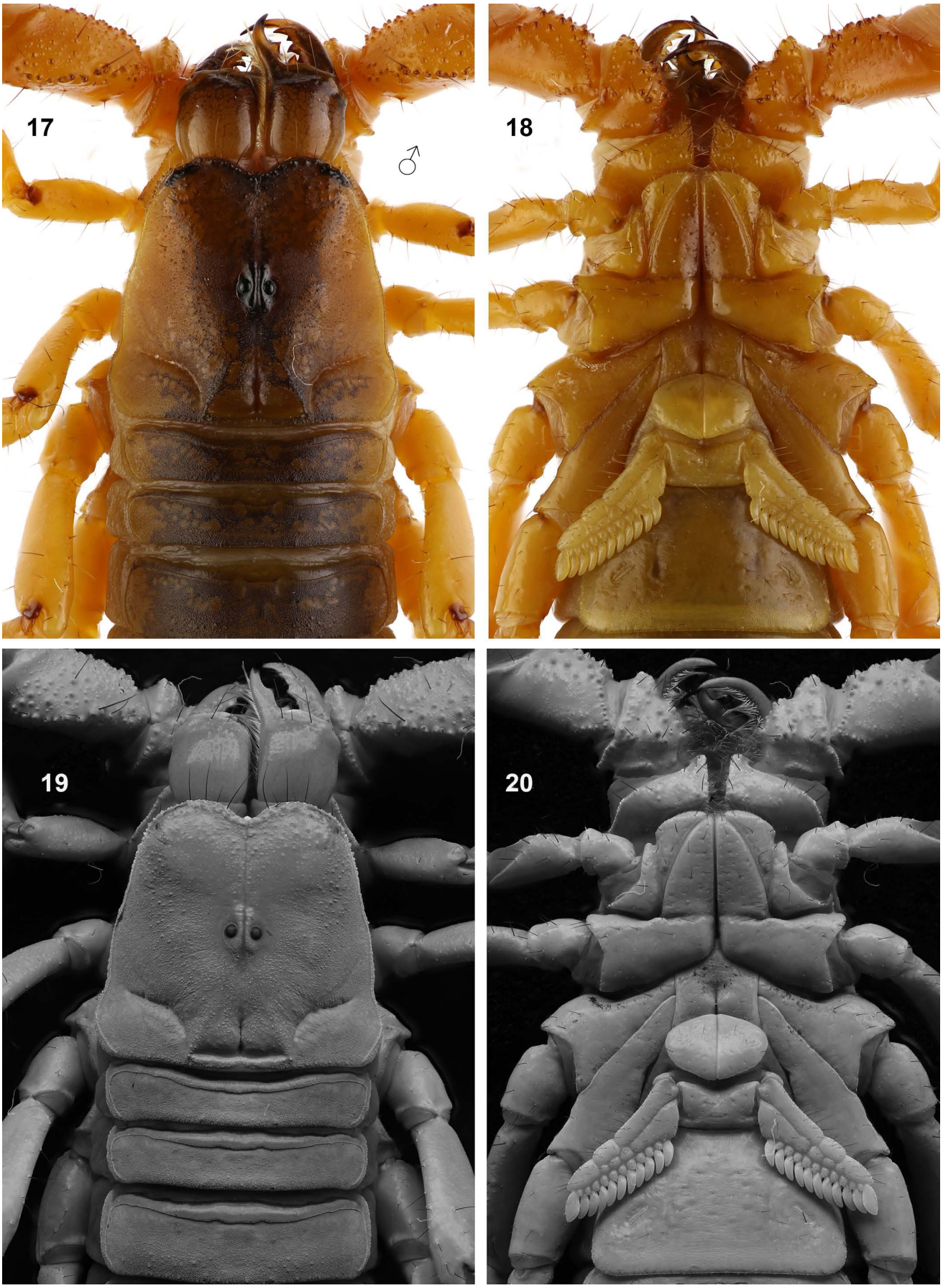
Diagnosis. Medium-sized species compared with its congeners. Adults are about 48 mm in length. Coloration: carapace is light reddish brown in males and dark reddish brown in females with reticulations in both sexes. Mesosoma: basically, reddish brown in males and reddish black in females. Venter dark 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. Prosoma: 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 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. Chela fingers are relatively long with small pointed gradually



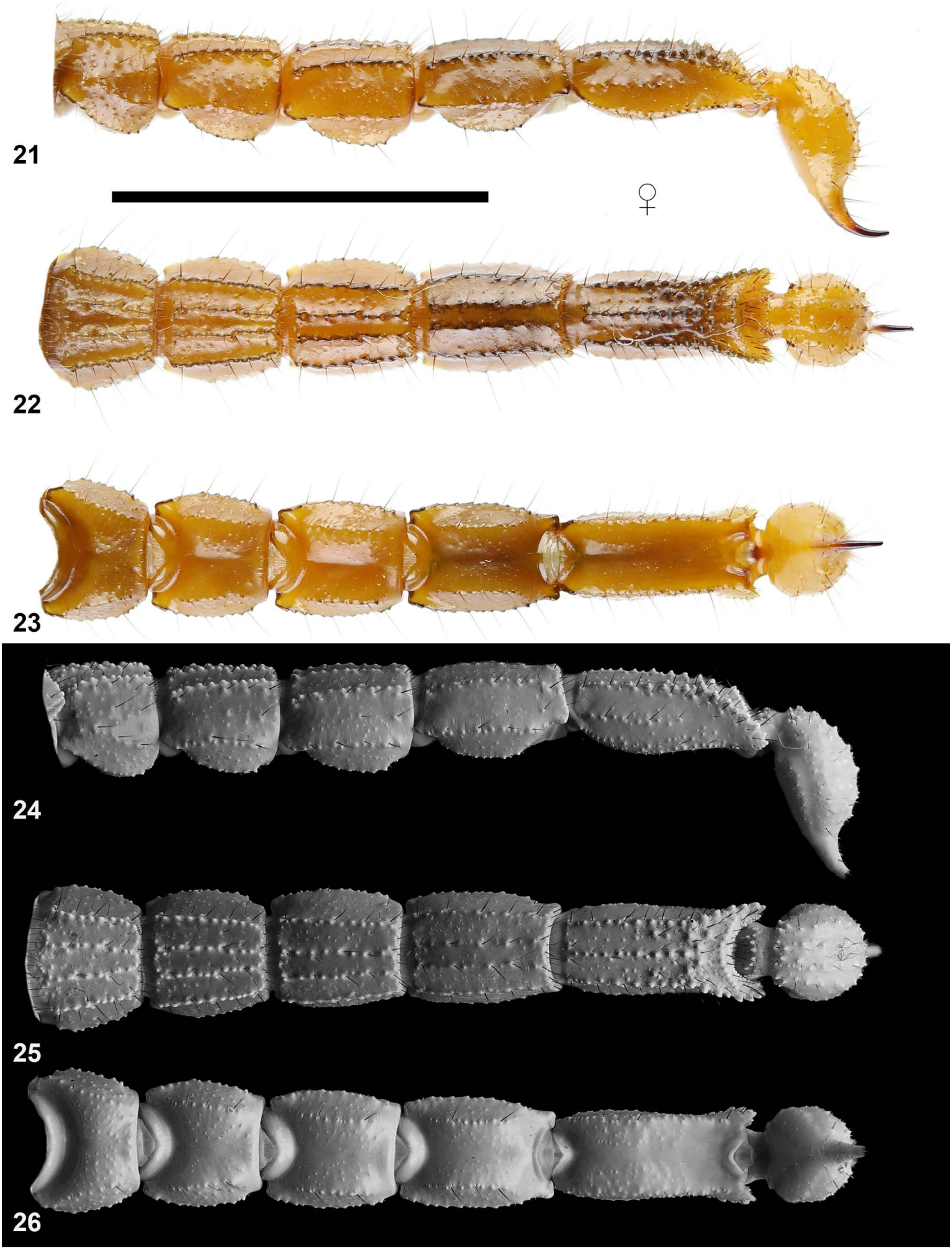
Figures 5–**12**: *Scorpio granulomanus* **sp**. **n**., female paratype (5–8) and male holotype (9–12). **Figures 5**, **7**, **9**, **11**. Carapace and mesosoma. **Figures 6**, **8**, **10**, **12**. Coxal and sternopectinal regions and sternites. **Figures 5-6**, **9-10**. Under white light. **Figures 7-8**, **11-12**. Under UV light. Scale bars: 10 mm (5–8) and 10 mm (9–12)



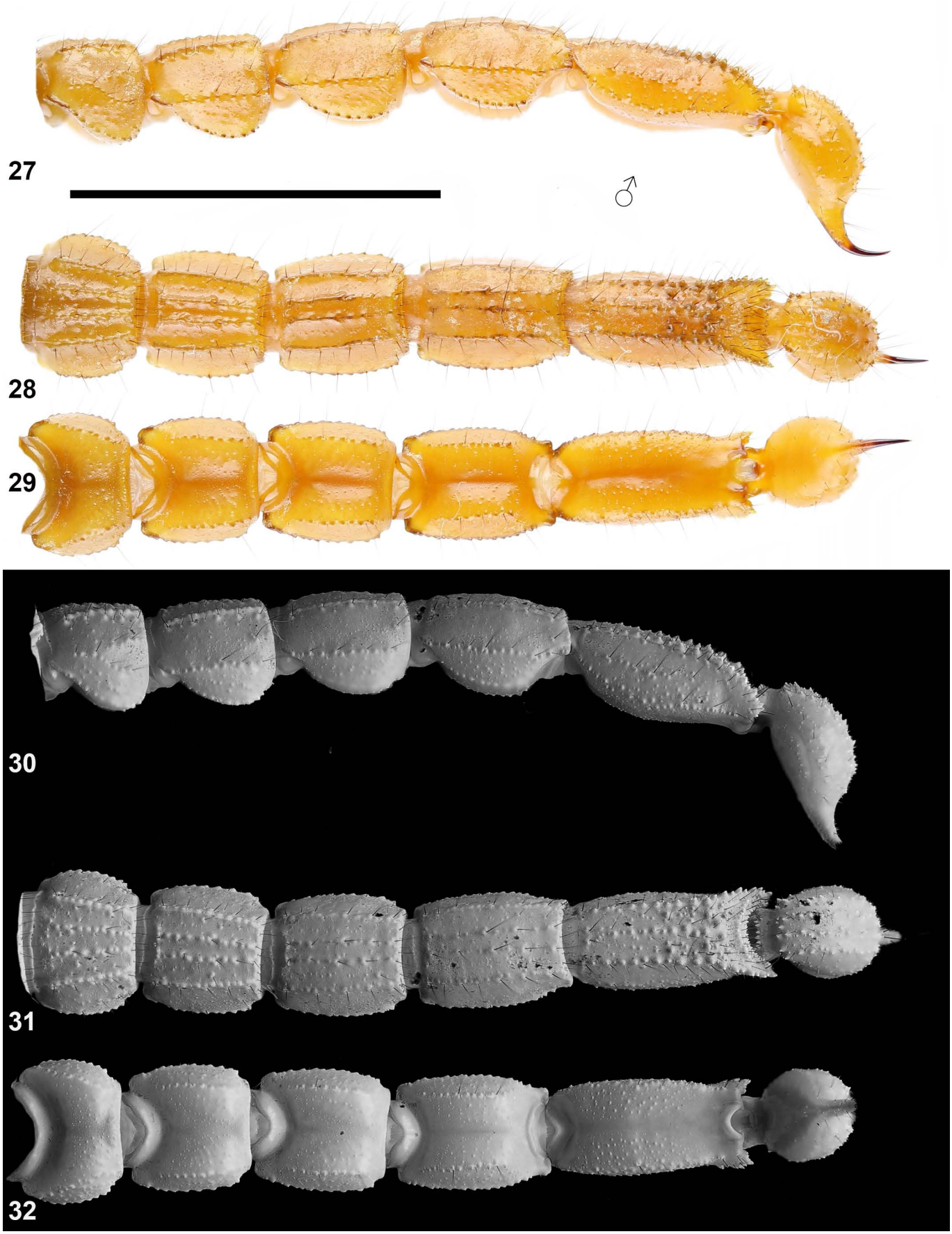
Figures 13–16: *Scorpio granulomanus* **sp. n.**, female paratype. **Figures 13**, **15**. Carapace and tergites I–III. **Figures 14**, **16**. Coxal and sternopectinal region. **Figures 13–14**. Under white light. **Figures 15–16**. Under UV light.



Figures 17–**20**: *Scorpio granulomanus* **sp**. **n**., male holotype. **Figures 17**, **19**. Carapace. **Figures 18**, **20**. Coxal and sternopectinal region. **Figures 17-18**. Under white light. **Figures 19-20**. Under UV light.



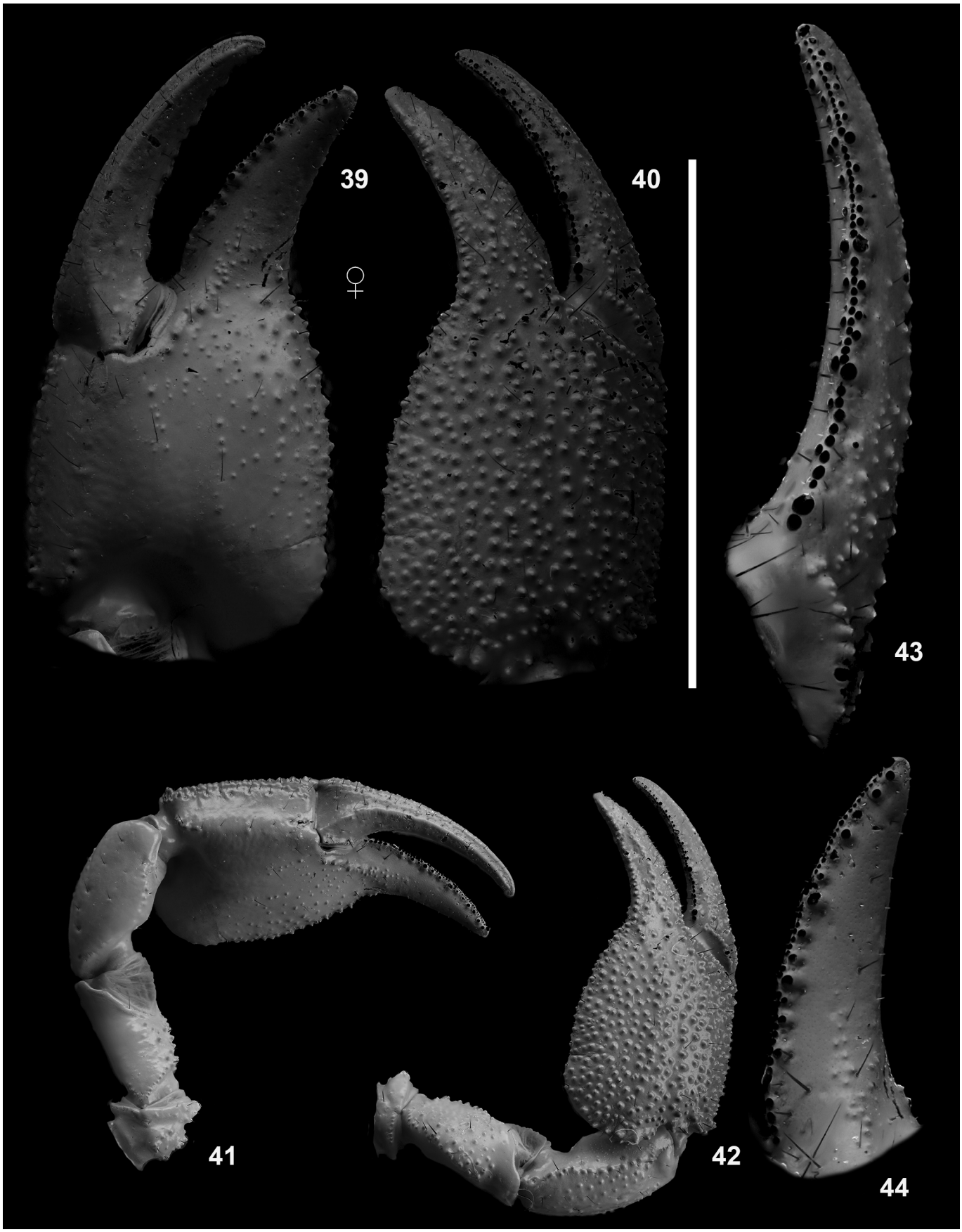
Figures 21–**26**: *Scorpio granulomanus* **sp. n.**, female paratype, metasoma and telson in lateral (21, 24), ventral (22, 25) and dorsal (23, 26) views. **Figures 21**–**23**. Under white light. **Figures 24**–**26**. Under UV light. Scale bar: 10 mm.



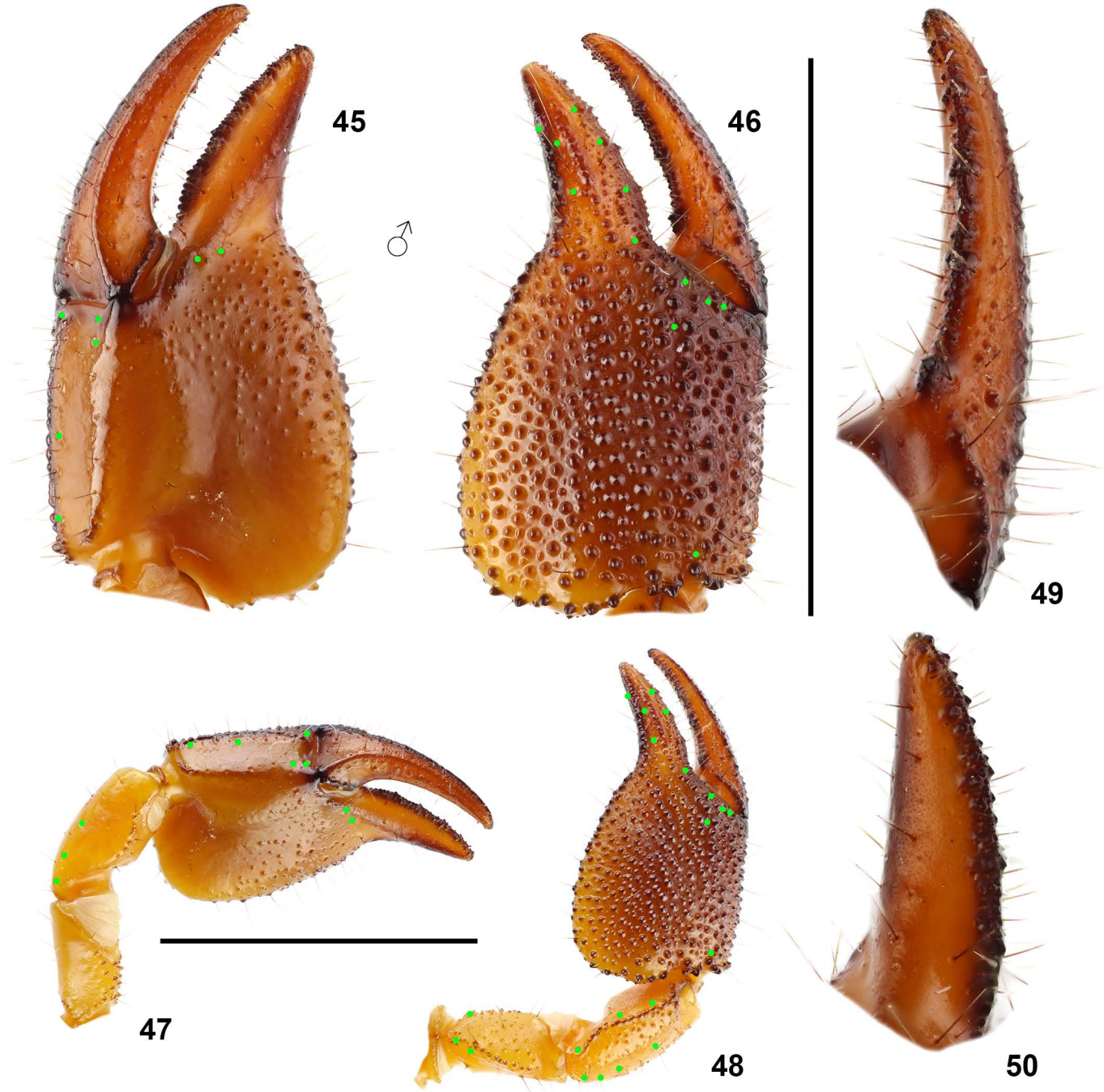
Figures 27–**32**: *Scorpio granulomanus* **sp**. **n**., male holotype, metasoma and telson in lateral (27, 30), ventral (28, 31) and dorsal (29, 32) views. **Figures 27**–**29**. Under white light. **Figures 30**–**32**. Under UV light. Scale bar: 10 mm.

Figures 33–38: *Scorpio granulomanus* **sp. n.**, female paratype, pedipalp segments under white light. Chela ventral (33) and dorsal (33). Pedipalp ventral (35) and dorsal (36). Movable (37) and fixed (38) fingers dentition. Trichobothrial pattern indicated by green circles. Scale bars: 10 mm (33–34) and 10 mm (35–36).

decreased granules anteriorly. Fixed and movable fingers with 4 or 5 strong accessory denticles. Mesosoma: 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



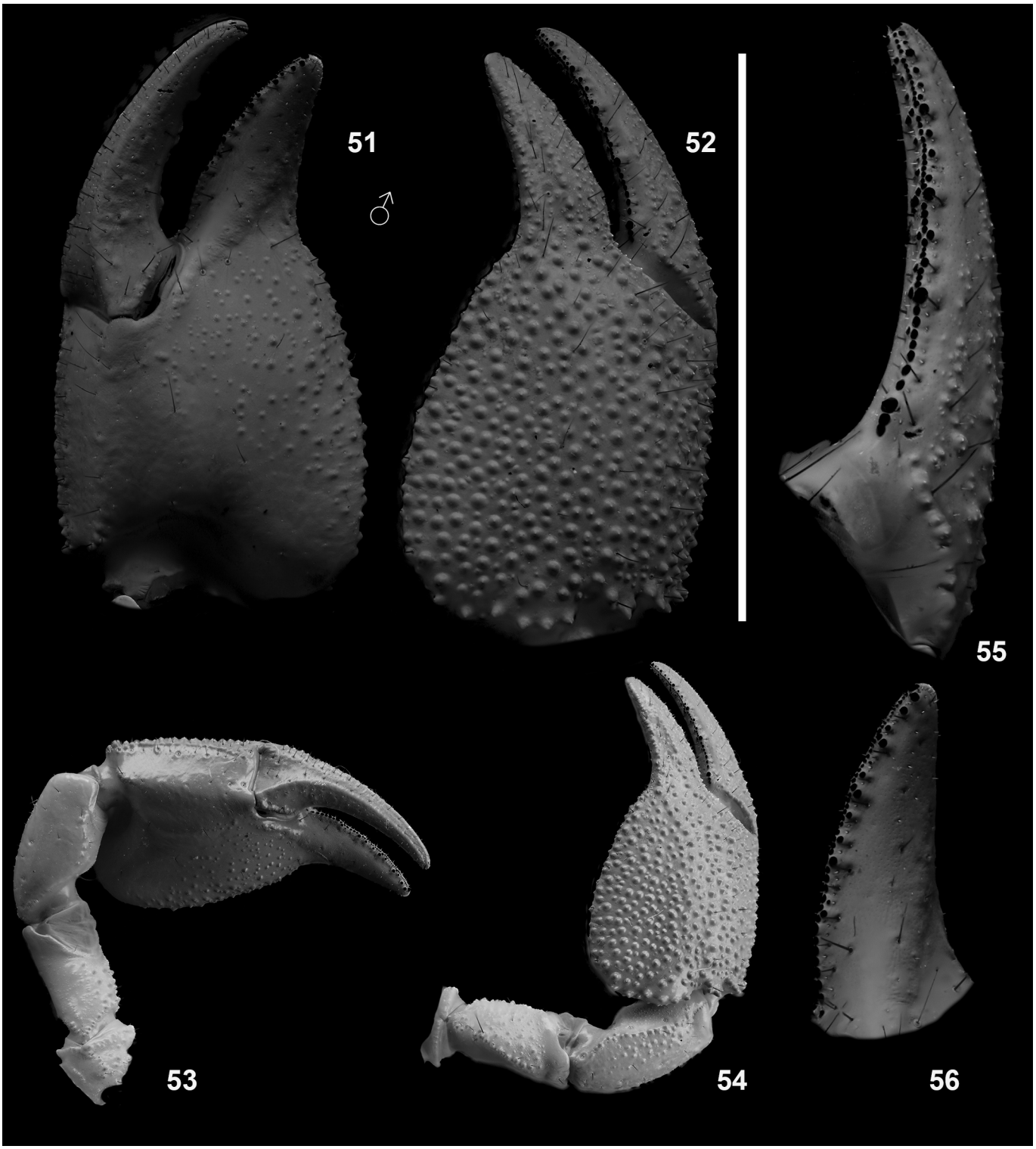
Figures 39–**44**. *Scorpio granulomanus* **sp**. **n**., female paratype, pedipalp segments under UV light. Chela ventral (39) and dorsal (40). Pedipalp ventral (41) and dorsal (42). Movable (43) and fixed (44) fingers dentition. Scale bar: 10 mm (39–40).



Figures 45–50: *Scorpio granulomanus* **sp. n.**, male holotype, pedipalp segments under white light. Chela ventral (45) and dorsal (46). Pedipalp ventral (47) and dorsal (48). Movable (49) and fixed (50) fingers dentition. Trichobothrial pattern indicated by green circles. Scale bars: 10 mm (45–46) and 10 mm (47–48).

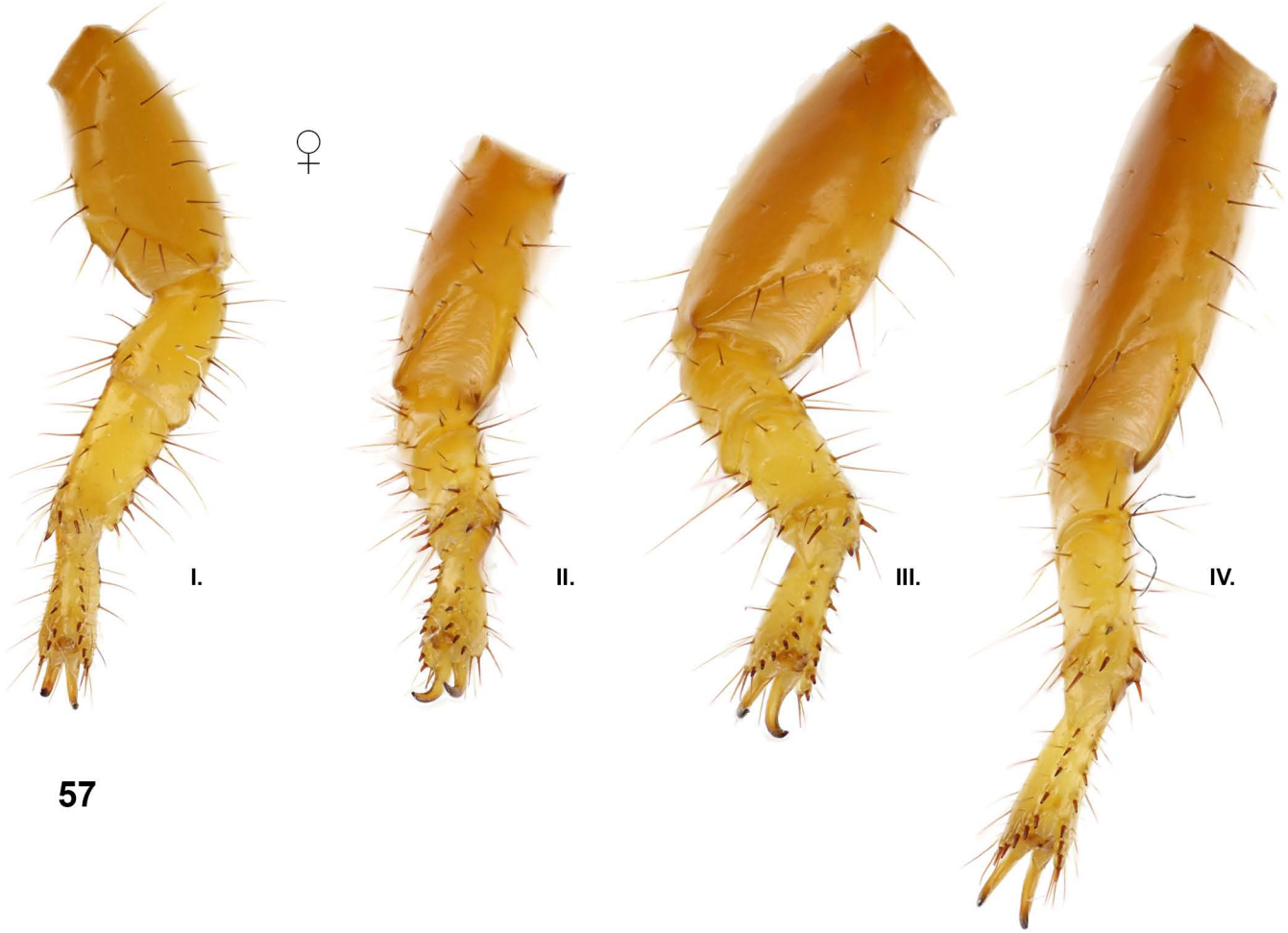
margin bears numerous moderate setae. Metasoma: Segment I with 10 carinae, segment II-IV with 8, and segment V with 5 carinae. Lateral inframedian carinae on segment I indistinct. Ventral submedian and ventrolateral carinae moderate to strong, with moderate rounded granules, size and numbers of granules 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. Telson globular in females and relatively slender in males. 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.

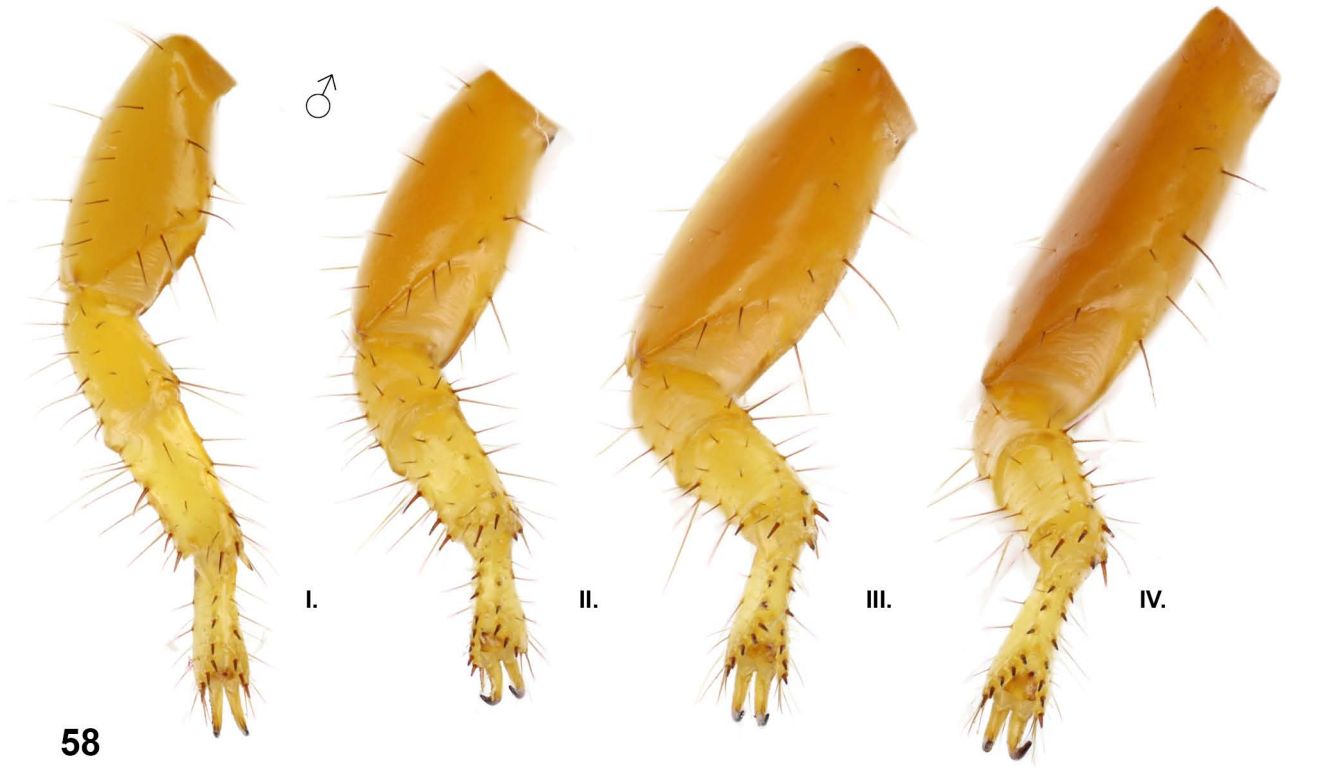
Description: Based on male holotype (unless otherwise specified). Measurements are in Table 1.



Figures 51–**56**: *Scorpio granulomanus* **sp**. **n**., male holotype, pedipalp segments under UV light. Chela ventral (51) and dorsal (52). Pedipalp ventral (53) and dorsal (54). Movable (55) and fixed (56) fingers dentition. Scale bar: 10 mm (51–52).

Coloration (Figures 1–2). Carapace is light reddish brown with darker reticulations medially. Mesosoma: Tergites I-VI reddish brown with some reticulations medially but dark yellow laterally. Tergite VII reddish brown medially, dark yellow laterally and posteriorly. Sternites pale dark 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 reddish yellow. Metasoma and legs dark yellow. The upper half of external surface of chela manus and basal part of fixed finger dark yellow, the lower half of external surface of chela manus, the distal part of fixed finger, and movable finger reddish





Figures 57–58: *Scorpio granulomanus* **sp. n.**, right legs I–IV, retrolateral aspect. **Figure 57**. Female paratype. **Figure 58**. Male holotype.

brown. Ventrointernal surface of chela manus dark yellow to reddish brown. Granules reddish brown or black on apex. Finger denticles and movable finger condyles black. Metasoma dark yellow, darker in ventral surface. Granules on dorsolateral, ventrolateral, ventral and ventral submedian carinae light reddish brown. Vesicle of telson dark yellow, aculeus reddish yellow at the base and dark reddish brown at the tip. Legs: dark yellow, spinules and condyles red or reddish black. Chelicerae: Chelicera manus dark yellow with brown reticulations, fingers brown, teeth reddish black.

Chelicerae (Figures 17, 19). Cheliceral dentition characteristic for the family of Scorpionidae (Vachon, 1963); subdistal tooth and basal teeth conspicuous rather than on the movable finger.

Prosoma (Figures 17–20). Carapace anterior margin distinctly bilobed. Carapace acarinate, only posteriomedian carina visible, finely granular but triangular region between median eyes and anterior margin smooth with scattered moderate granules. Anterior margin with 13 medium to large setae and a distinct depression. There is a protrusion in the middle of the depression. 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. Anteriomedian furrow moderate but posterior median and posterior lateral furrows distinct. 6 moderate setae exist on the carapace.

Mesosoma (Figures 9–12). Tergites I–VI acarinate, matte, covered with fine granules completely in males. Tergite VII finely granular 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. Sternite VII granular and feebly wrinkled medially; shagreened laterally with four tuberculate carinae with lobated granules; posterior margin bears numerous moderate setae. Genital operculum ovoid. Pectines short. Stigmas linear, angled 45° and conspicuous.

Metasoma and telson (Figures 27–32). Segment I with 10, 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. Dorsolateral carinae strong on I–IV with pointed and spaced, small granules; moderate on segment V with spinoid granules. Lateral supramedian carinae moderate with spaced granules on I–IV. Segment V with a row of granules laterally. Intercarinal surfaces on segments I-V covered with fine granules on I–IV, and with moderate granules on segment V. Segments I–V covered moderately with red setae of variable size, denser 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 (Figures 45–56). 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. 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 dorsal margin. Ventroexternal carina strong with dark rather fused granules, ventrointernal carina smooth. 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).

Legs (Figures 58). tarsi of right legs I to IV with 4/7, 6/8, 7/8, 7/8 internal and external spines arranged in series.

Sexual dimorphism: Males differed from females as follows: (**a**) tergites I–VI matte, 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 ratio 0.37–0.40 with average 0.39 in males (n=7); 0.42–0.43 with average 0.42 in females (n=7); (**c**) vesicle of telson is more elongated in males than in females; vesicle length to width ratio 1.27–1.40 with average 1.33 in males (n=7), 1.23–1.26 with average 1.24 in females (n=7); (**d**) genital operculum ovoid in males, but heart-shaped in females. (Figs. 14, 18); (**e**) pectinal teeth number in males 9–12 (18 combs) (1 comb with 9 teeth, 4 with 10, 12 with 11, 1 with 12), in females 8-11 (44 combs) (1 comb with 8 teeth, 12 with 9, 21 with 10, 10 with 11); average pectinal tooth count per pecten in males is 10.7 (18 combs, n=9), 9.9 in females (44 combs, n=22) (**f**) tergite VII finely granulate with moderate, pointed granules posteriorly and laterally in males (Fig. 11) but smooth anteriorly, granulate posteriorly and laterally in females (Fig. 7); (**g**) in general, females are darker in color than males (Fig. 59).

Affinities

Scorpio granulomanus **sp**. **n**. can be distinguished from all species of the genus *Scorpio* and from *Scorpio* species previously recorded in Jordan by a combination of following characters:

(a) the presence of large, rounded, somewhat pointed granules on the dorsal surface of chela manus (Figs. 34, 40, 46, 52);

(b) a remarkably elongated chela manus compared to other species of this genus; in the new species the manus length to manus depth ratio 1.20–1.29 with average 1.25 in males (n=5); 1.24–1.29 with average 1.27 in females (n=7); for

Figures 59–60: *Scorpio granulomanus* **sp. n. Figure 59**: Female in vivo habitus. **Figure 60**: Type locality.

comparison, in *S. palmatus*, 0.90–0.96 in males (n=2) (Birula, 1910, Tab. II); in *S. fuscus*, 0.88–0.96 in males (n=4), 0.91–0.98 in females (n=3) (Birula, 1910, Tabs. II & III); and in *S. kruglovi*, 1.05–1.13 in males (n=4), 1.00–1.02 in females (n=8) (Birula, 1910, Tab. III);

(c) its general coloration: *S. granulomanus* **sp**. **n**. is generally reddish brown while *S. fuscus* is dark and has reticulated swollen granules on the manus surface, whereas *S. palmatus* is yellow with small granules on the manus surface;

(d) pectinal teeth number: *S. granulomanus* **sp**. **n**. can be distinguished from *S. propinquus* by having 9–11 pectines teeth in females, while in the latter species females have 14–14 pectinal teeth;

(e) *S. granulomanus* **sp**. **n**. has relatively short chela fingers compared to *S. kruglovi* (Fixed finger L / Chela L ratio 0.37–0.40 in males, n=7, 0.42–0.43 in females, n=7) and a less elongated telson (Telson L / W ratio 2.07–2.12 in males, n=7, 2.08–2.13 in females, n=7); at the same time, *S. kruglovi* has very elongated chela fingers (Fixed F. L / Chela L ratio 0.43–0.46 in males, n=4, 0.45–0.48 in females, n=10) and telson (Telson L / W ratio 2.76–3.04 in males, n=4, 2.50–2.86 in females, n=10) (Birula, 1910, Tab. III).

Ecology

Dibbeen Forest extends over 60 km^2 of mountainous terrain with elevation varies between 570 to 1050 m a.s.l. within the Mediterranean biogeographic region (Fig. 60). The climate of Dibbeen Forest is characterized by its humid, cold winters with an average temperature of 9.6°C reaching a minimum of 5°C. Summer is with an average temperature of 27°C and a maximum temperature of 35–40°C. The average rainfall in the area is around 400 mm per year. Snow fall occurs in some years (Amr et al., 2006).

The Aleppo pine (*Pinus halepensis*) dominates in the lower elevations of this forest, while pine-oak (*Pinus halepensis* and *Quercus calliprinos*) association is dominant and extends over most of the middle elevations. At the upper elevations, evergreen oak, *Quercus calliprinos*, is dominant with small stands of deciduous oak (*Quercus infectoria*). Other trees present in the forest include arbutus, *Arbutus andrachne*, pistachio, *Pistacia palaestina*, and wild olive, *Olea eu"ropa*; the soil is predominantly terra rossa. Other species of scorpions that are known to occur in this forest include two buthids, *Hottentotta judaicus* (Simon, 1872) and *Compsobuthus schmiedeknechti* Vachon, 1949.

References

ABU AFIFEH, B., M. AL-SARAIREH, M. ABU BAKER, Z. S. AMR & W. R. LOURENÇO. 2022. The genus *Buthacus* Birula, 1908 in Jordan; description of a new species and comments on possible micro-endemic populations (Scorpiones: Buthidae). *Arthropoda Selecta*, 31: 51–62.

AL-SARAIREH, M., B. ABU AFIFEH, A. ALOUFI, Z. S. AMR & W.R. LOURENÇO. 2021. First record of the genus *Trypanothacus* Lowe, Kovařík, Stockmann & Šťáhlavský, 2019 in Jordan and description of a new species (Scorpiones: Buthidae). *Serket*, 18(1):11–21.

AMR, Z. S. 2015. Scorpionism and dangerous species of Jordan. Pp. 181–200 in: Possani, L. D., Schwartz, E. F. & Rodríguez de la Vega, R. C. (eds.). *Toxinology*: *Scorpion Venoms.* Springer.

AMR, Z. S., O. A. ABED, T. AL SHARE, N. HAMIDAN & L. PRENDINI. 2016. New records of Jordanian scorpions. *Jordan Journal of Natural History*, 2: 30–38.

AMR, Z. S. & M. ABU BAKER. 2004. The scorpions of Jordan. *Denisia*, 14: 237–244.

AMR, Z. S. & R. AL-ORAN. 1994. Systematics and distribution of scorpions (Arachnida, Scorpionida) in Jordan. *Bollettino di Zoologia,* 61: 185–190.

BIRULA, A. A. 1910. Ueber *Scorpio maurus* Linné und seine Unterarten. *Horae Societatis Entomologicae Rossicae*, 39: 115–192.

EL-HENNAWY, H. K. 1992. A catalogue of the scorpions described from the Arab countries (1758–1990) (Arachnida: Scorpionida). *Serket*, 2 (4): 95–153.

FRANCKE, O. F. 1977. Scorpions of the genus *Diplocentrus* from Oaxaca, Mexico (Scorpionida, Diplocentridae). *Journal of Arachnology*, 4: 145–200.

HJELLE, J. T. 1990. Anatomy and morphology. Pp. 9-63 *in:* Polis, G.A. (ed.), *Biology of Scorpions.* Stanford, CA: Stanford University Press.

KABAKIBI, M. M., N. KHALIL & Z. S. AMR. 1999. Scorpions of southern Syria. *Zoology in the Middle East,* 17: 79–89.

KOVAŘÍK, F. 2009. *Illustrated catalog of scorpions. Part I. Introductory remarks; keys to families and genera; subfamily Scorpioninae with keys to Heterometrus and Pandinus species*. Clairon Production, Prague, 170 pp.

KRAEPELIN, K. 1891. Revision der Skorpione. I. Die Familie des Androctonidae. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, 8(1890): 144–286 (1–144).

LOURENÇO, W. R. 2009. Reanalysis of the genus *Scorpio* Linnaeus 1758 in sub-Saharan Africa and description of one new species from Cameroon (Scorpiones, Scorpionidae). *Entomologische Mitteilungen aus dem Zoologischen Museum Hamburg*, 15: 99–113.

LOURENÇO, W. R., B. ABU AFIFAH, M. AL-SARAIREH, M. ABU BAKER & Z. AMR. 2021a. New insights on the taxonomy of the genus *Buthus* Leach, 1815 in Jordan and description of a new species (Scorpiones: Buthidae). *Zoology in the Middle East*, 67: 168–176.

LOURENÇO, W. R., M. AL-SARAIREH, B. ABU AFIFAH, M. ABU BAKER, A. BADER-KATBEH & Z. AMR. 2021b. New insights on the taxonomy of the genus *Birulatus* Vachon, 1974 (Scorpiones: Buthidae), and description of a new remarkable species from Jordan. *Bulletin de la Société Entomologique de France,* 126: 123–132.

POCOCK, R. I. 1900. The scorpions of the genus *Heterometrus*. *Annals and Magazine of Natural History*, 7(6): 362–365.

PRENDINI, L., T. M. CROWE & W. C. WHEELER. 2003. Systematics and biogeography of the family Scorpionidae Latreille, with a discussion of phylogenetic methods. *Invertebrate Systematics*, 17, 185–259.

SHEHAB, A. H., Z. S. AMR & J. A. LINDSELL. 2011. Ecology and biology of scorpions in Palmyra, Syria. *Turkish Journal of Zoology*, 35(3): 333–341.

SIMON, E. 1872. Arachnides de Syrie, rapportés par M. Charles Piochard de la Brulerie (Scorpions et Galéodes). *Annales de la Sociéte Entomologique de France*, (5)2: 245–266.

SISSOM, W. D. 1990. Systematics, biogeography and paleontology. Pp. 64–160 *in*: POLIS, G. A. (Ed.) *The Biology of Scorpions*. Stanford, California: Stanford University Press.

STAHNKE, H. L. 1971. Scorpion nomenclature and mensuration. *Entomological News*, 81: 297–316.

TALAL, S., I. TESLER, J. SIVAN, R. BEN-SHLOMO, H. M. TAHIR, L. PRENDINI, S. SNIR & E. GEFEN. 2015. Scorpion speciation in the Holy Land: Multilocus phylogeography corroborates diagnostic differences in morphology and burrowing behavior among *Scorpio* subspecies and justifies recognition as phylogenetic, ecological and biological species. *Molecular Phylogenetics & Evolution*, 91: 226–237.

VACHON, M. 1963. De l'utilité, en systématique, d'une nomenclature des dents des chélicères chez les Scorpions. *Bulletin du Muséum national d'Histoire naturelle, Paris*, *2e sér.*, 35(2): 161–166.

VACHON, M. 1974. Etude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. *Bulletin du Muséum national d'Histoire naturelle, Paris, 3e sér*., *n° 140, Zool.*, 104: 857–958.

VOLSCHENK, E. S. 2005. A new technique for examining surface morphosculpture of scorpions. *The Journal of Arachnology*, 33(3): 820–825.

VACHON, M. 1974. Etude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en arachnologie. Sigles trichobothriauxet types de trichobothriotaxie chez les Scorpions. *Bulletin du Muséum National d'Histoire Naturelle Paris*, 140: 857–958.