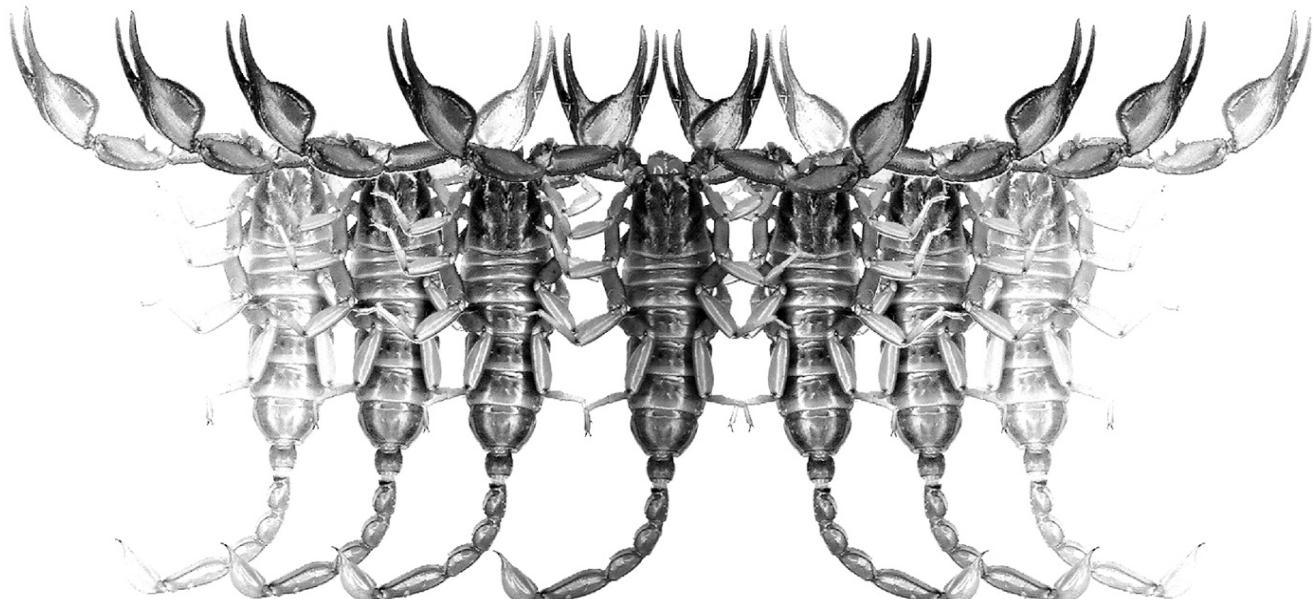


Euscorpius

Occasional Publications in Scorpiology



**Scorpions of the Horn of Africa
(Arachnida: Scorpiones).
Part XXIII. *Buthus* (*Buthidae*),
with description of two new species**

František Kovařík, František Šťáhlavský & Hassan Sh Abdirahman Elmi

April 2020 — No. 307

Euscorpius

Occasional Publications in Scorpiology

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Publication date: 2 April 2020

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Scorpions of the Horn of Africa (Arachnida: Scorpiones).

Part XXIII. *Buthus* (Buthidae), with description of two new species

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<http://zoobank.org/urn:lsid:zoobank.org:pub:881B2577-F367-469A-AB81-8AF742E7D00C>

Summary

New data are presented on the distribution of the genus *Buthus* Leach, 1815 in the Horn of Africa, mainly in Somaliland, acquired during expeditions in 2011–2019. *Buthus berberensis* Pocock, 1900, for which the exact locality was not known, was collected again. *B. zeylensis* Pocock, 1900 is restored from synonymy and elevated to species rank, based on a study of 75 recently collected specimens. Two new species, *B. pococki* sp. n. and *B. somalilandus* sp. n., are described, fully complemented with color photographs of live and preserved specimens, as well as their habitats. In addition to the analyses of external morphology we also described karyotypes of selected species. *B. awashensis*, *B. pococki* sp. n. and *B. zeylensis* have karyotypes with $2n=22$. The karyotype of *B. berberensis* possesses 21 chromosomes, probably as a consequence of heterozygous fusion that is evident as a trivalent during postpachytene in this species. A key and distribution map of *Buthus* in the Horn of Africa (five species) are included.

Introduction

In 2011–2019, two of the authors (FK, HE) had an opportunity to participate in expeditions to the Horn of Africa, to study scorpions at 141 localities, and to publish several articles (22 in this series). The genus *Buthus* Leach, 1815 has its southeastern boundary of distribution in the Horn of Africa; its species were detected in 22 localities. Here we present new data on all five species of *Buthus* from this region.

Methods, Material & Abbreviations

Nomenclature and measurements follow Stahnke (1971), Kovařík (2009), and Kovařík & Ojanguren Affilastro (2013), except for trichobothriotaxy (Vachon, 1974). Karyotype analyses were based on chromosome preparations prepared by the spreading technique which is frequently used in scorpions (e. g. Kovařík et al., 2009; Sadílek et al., 2015). The chromosomes were stained by 5% Giemsa solution in Sörensen phosphate buffer for 20 min. Ten spermatocyte nuclei were measured using the software Image J 1.45r (<http://rsbweb.nih.gov/ij>) with the plugin Levan (Sakamoto & Zacaro, 2009). The relative length of the chromosomes was calculated for the diploid set.

Specimen depositaries: AZMM (Zoology Museum of Alaşehir Vocational School, Celal Bayar University, Manisa, Turkey), BMNH (The Natural History Museum, London, United Kingdom), CASC (California Academy of Sciences, San Francisco, California, USA), FKCP (František Kovařík,

private collection, Prague, Czech Republic; will in future be merged with the collections of the National Museum of Natural History, Prague, Czech Republic), HNHM (Hungarian Natural History Museum, Budapest, Hungary), MRAC (Musée Royal de l'Afrique centrale, Tervuren, Belgium), NHMB (Naturhistorisches Museum Basel, Switzerland), RMNH (National Museum of Natural History, Leiden, Netherlands), RTOC (Rolando Teruel, private collection, Cuba), ZMHB (Museum für Naturkunde der Humboldt-Universität, Berlin, Germany), ZMUH (Centrum für Naturkunde (CeNak), Center of Natural History Universität Hamburg, Zoological Museum).

Morphometrics: D, depth; L, length; W, width.

Systematics

Family Buthidae C. L. Koch, 1837

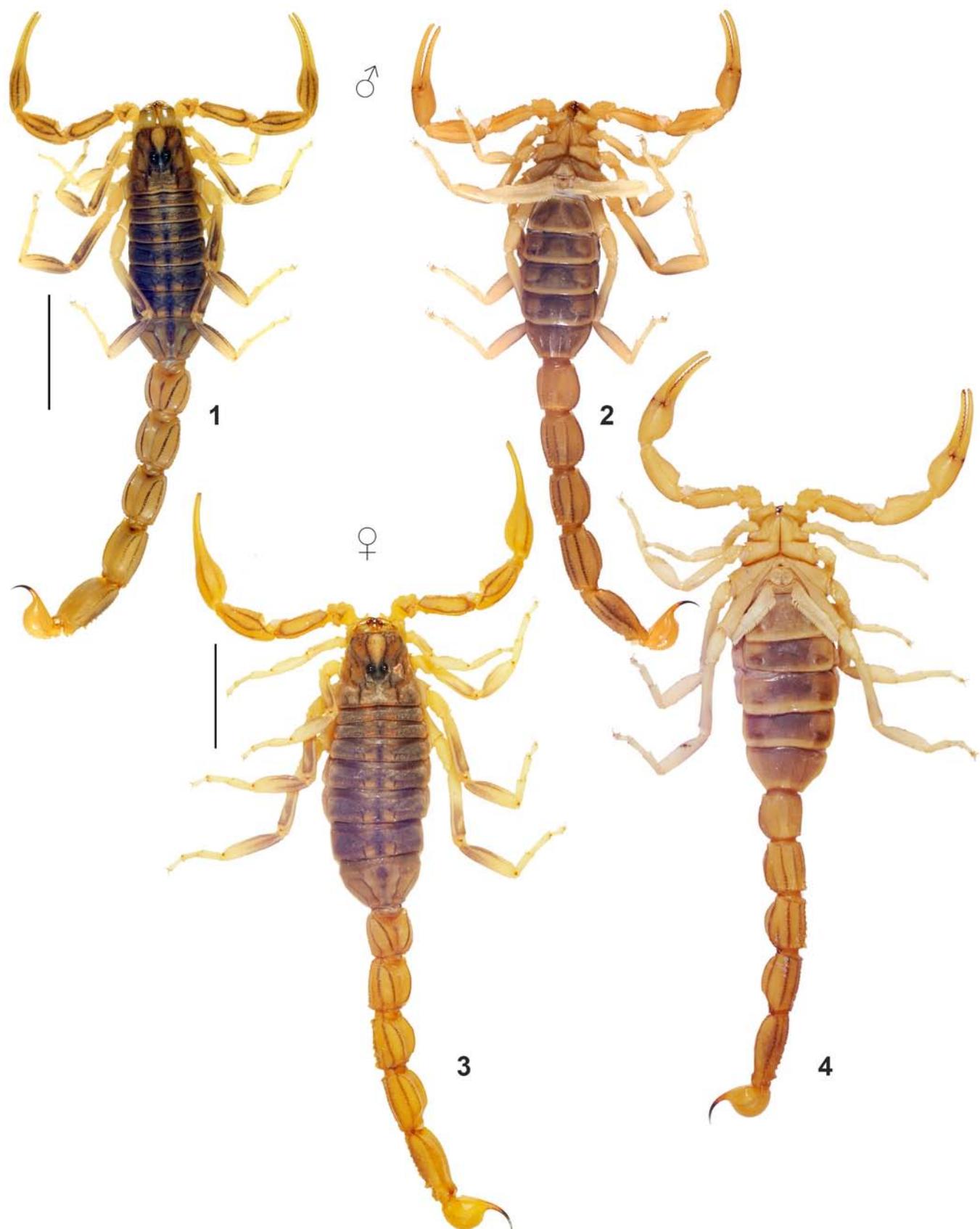
Buthus Leach, 1815

(Figures 1–211, Tables 1–3)

Buthus Leach, 1815: 391; Fet & Lowe, 2000: 91–97 (complete references list until 1998); Sousa et al., 2017: 15–84, figs. 1–16.

TYPE SPECIES. *Scorpio occitanus* Amoreux, 1789

DIAGNOSIS. Total length 25–90 mm. Carapace with distinct carinae joined to form a lyre-shaped configuration, in lateral view with entire dorsal surface horizontal or



Figures 1–4: *Buthus awashensis*. **Figures 2–3.** Male paratotype in dorsal (1) and ventral (2) views. **Figures 3–4.** Female paratotype in dorsal (3) and ventral (4) views. Scale bars: 10 mm.

nearly so. Five pairs of lateral eyes and eyespot present. Pectines with fulcra. Pectine teeth number ca 20–40. Mesosoma tergites I–VI with three carina which do not project beyond posterior margin as distinct spiniform processes. Telson without subaculear tubercle. Chelicera with typical buthid dentition, fixed finger with two ventral denticles. Orthobothriotic type B, dorsal trichobothria of pedipalp femur arranged in *beta*-configuration. Patellar trichobothrium d_2 located externally to dorsomedian carina. Trichobothrium eb located on fixed finger of chela. Dentate margin of pedipalp chela movable finger with distinct granules divided into 9–14 rows, 3 terminal granules and one basal terminal granule. Tibial spurs present on third and fourth pairs of legs.

REMARKS ON KARYOTYPES (Figs. 195–209). We analyzed male karyotypes of four *Buthus* species from the Horn of Africa (Table 3). The cytogenetic characteristics of all species correspond to the typical features of the family Buthidae such as holocentric organization, achiasmatic meiosis in males, and lower number of chromosomes (e.g. Mattos et al., 2013). All examined specimens of *Buthus awashensis*, *B. pococki* sp. n. and *B. zeylensis* possess $2n=22$ (Figs. 195, 201, 204, 205, 208). We found only 21 chromosomes in karyotype of analysed *Buthus berberensis* (Fig. 198). The reduction of the diploid number is probably consequence of heterozygous fusion of chromosomes. This type of chromosomal rearrangement forms conspicuous trivalent during postpachytene (Fig. 199). Moreover, fusion of two chromosomes form one extra large chromosome in the karyotype of this species (Fig. 200). Except *Buthus awashensis*, the karyotypes of the all analysed species are typical with one pair of chromosomes with distinctive length whereas the subsequent chromosomes are shorter and gradually decrease in length (Figs. 200, 203, 206, 209). Similar one longer pair of chromosomes is known also in karyotypes of all karyotyped *Androctonus* species (Sadílek et al., 2015). This similarity of karyotypes may reflect phylogenetic relationships that was already proposed in previous phylogenetic analysis (Fet et al., 2003). We observed multivalent association (ten chromosomes of different length) in *Buthus awashensis* during postpachytene (Figs. 196–197). This chain of chromosomes is consequence of multiple reciprocal translocations. Although this type of chromosome rearrangement does not affect chromosome numbers, it may however considerably change the size of the chromosomes (e.g. Kovařík et al., 2015). It is probably the reason why this species has not one extra large pair of chromosomes, the typical feature of the remaining species with only bivalents (Figs. 202, 205, 208). Despite of the mentioned small differences among analysed species, the karyotypes of species from the Horn of Africa fully correspond to those of *Buthus occitanus* from France (Guénin, 1961), and the karyotypes seem to be very conservative within the genus *Buthus*.

Buthus awashensis Kovařík, 2011

(Figures 1–4, 176–177, 186, 191, 195–197, 210, Table 3)

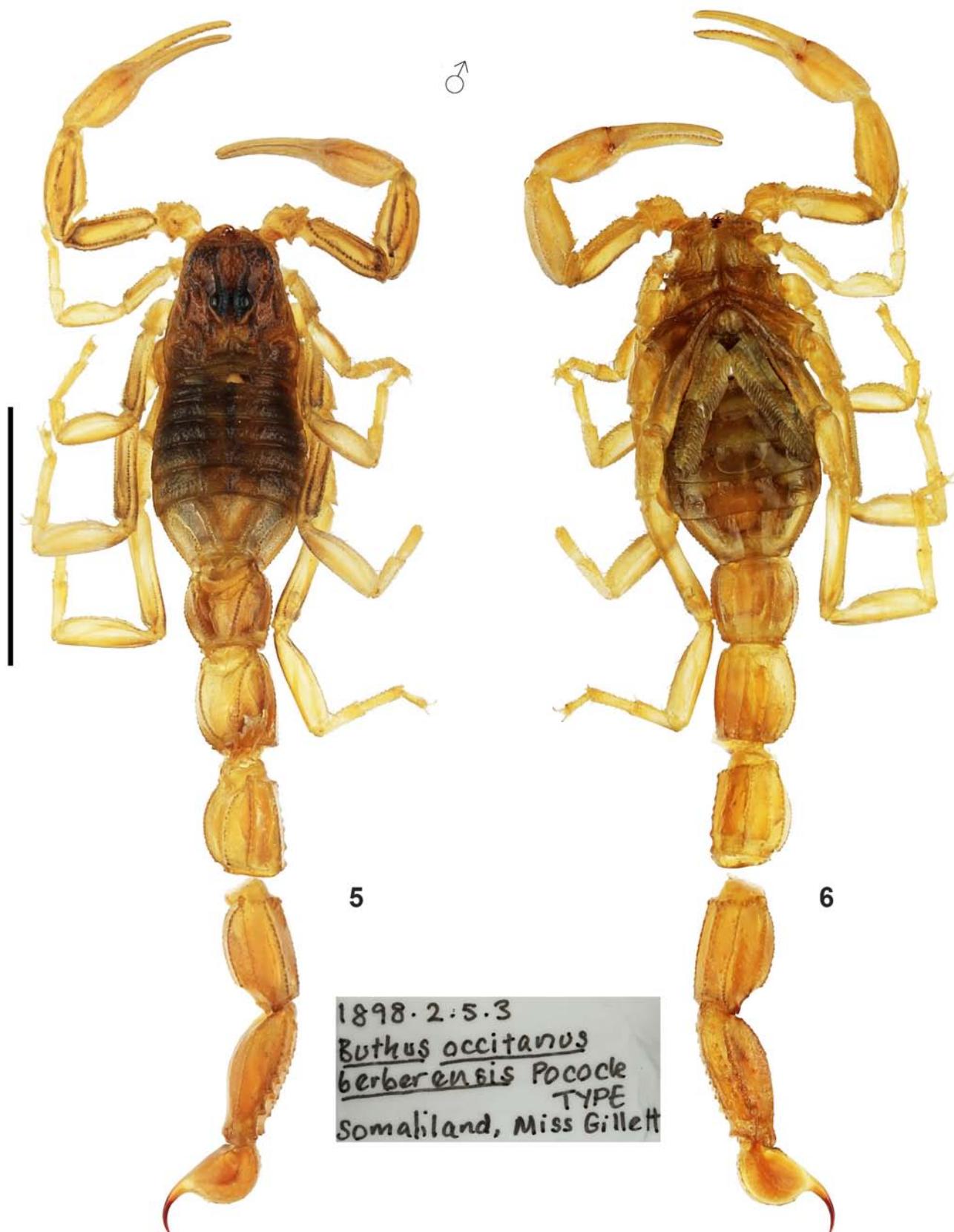
Buthus awashensis Kovařík, 2011: 1–6, figs. 5–17, 23; Sousa et al., 2017: 37.

TYPE LOCALITY AND TYPE REPOSITORY. Ethiopia, Awash, Metahara env., 08°54'N 39°54'E, 960–1050 m. a. s. l.; FKCP.

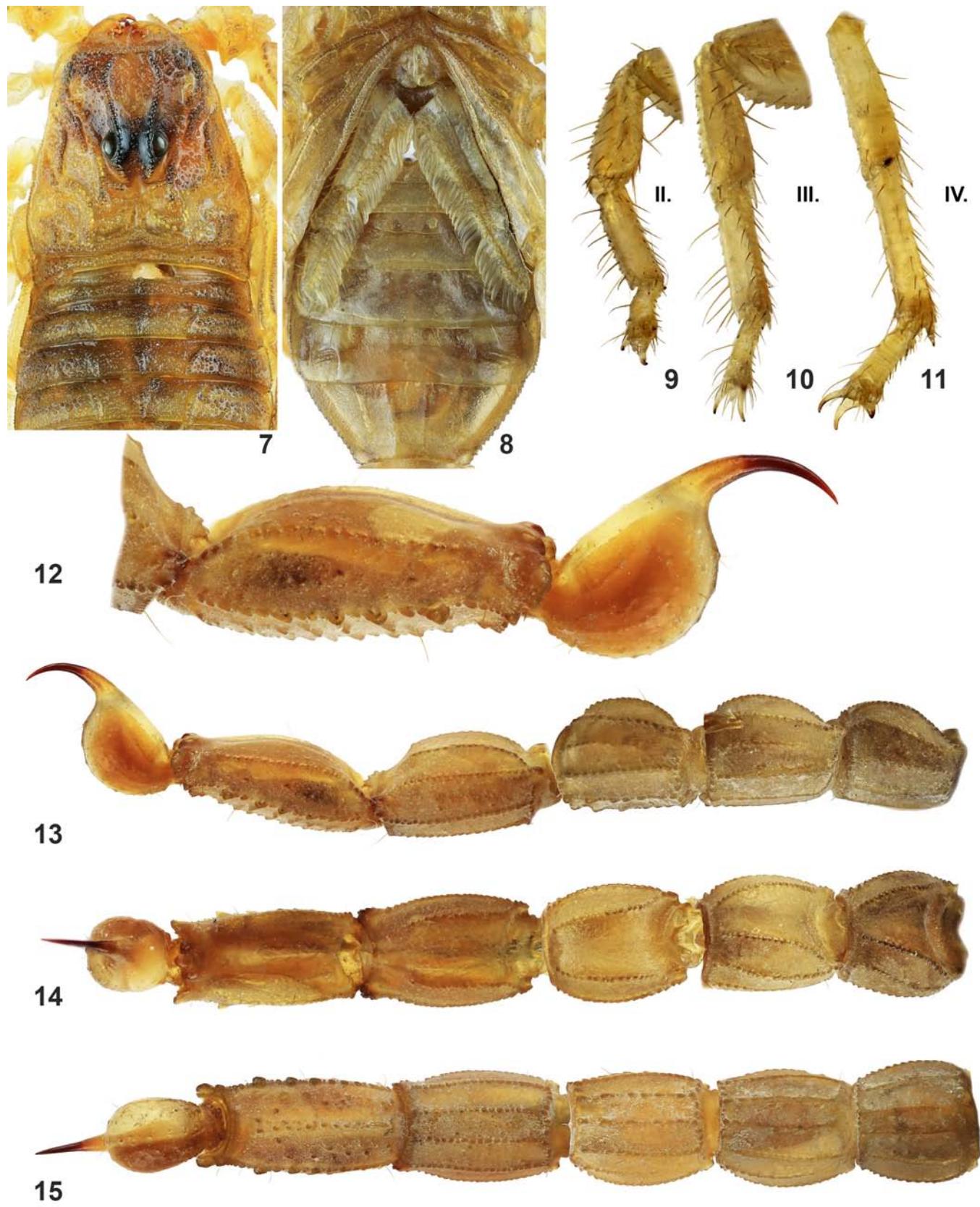
TYPE MATERIAL EXAMINED. **Ethiopia**, Awash, Metahara env., 08°54'N 39°54'E, 960–1050 m a. s. l., XI.2010, 2♂ (holotype and paratype), leg. T. Mazuch and P. Novák, FKCP, 19.–22. VII.2011, 31♂ (paratypes) 28♀ (allotype and paratypes) 25 juveniles (paratypes), FKCP, 1♂1♀ (paratypes), AZMM; 1♀im.2juvs. (paratypes), BMNH, 1♀1juv. (paratypes), CASC; 1♀1juv. (paratypes), HNHM, 1♀im.1juv. (paratypes), MRAC, 1♂1♀1♂im.1juv. (paratypes), NHMB, 1♀im.1juv. (paratypes), RMNH, 1♂1♀ (paratypes), RTOC, 1♀im.1juv. (paratypes), ZMHB, 1♀1juv. (paratypes), ZMUH, leg. F. Kovařík; Dire Dawa, 09°34.647'N 41°50.33'E, 1249 m a. s. l., XI.2010, 1♂ (paratype), leg. T. Mazuch and P. Novák, FKCP.

OTHER MATERIAL EXAMINED (FKCP). **Ethiopia**, 13°43'10"N 39°55'34"E, 879 m a. s. l. (Locality No. 12EI), 18.XI.2012, 1♂1♀, leg. F. Kovařík; 11°37'02"N 40°08'34"E, 819 m a. s. l. (Locality No. 12EKA), 20.XI.2012, 1♀1juv., leg. F. Kovařík; 11°43'22"N 40°56'52"E, 457 m a. s. l. (Locality No. 12EMA), 20.XI.2012, 1juv., leg. F. Kovařík (UV detection); 11°43'30"N 40°58'45"E, 404 m a. s. l. (Locality No. 12EM), 20.XI.2012, 3juvs., leg. F. Kovařík (UV detection); Gewane, 10°09'38"N 40°39'45"E, 631 m a. s. l. (Locality No. 12EO), 23.XI.2012, 5♂8♀41juvs., leg. F. Kovařík, (UV detection); 09°08'10.4"N 40°09'45.5"E, 835 m a. s. l. (Locality No. 12ER), 24.XI.2012, 1♀, leg. F. Kovařík; Awash, 09°00'34.5"N 40°17'56.5"E, 1012 m. a. s. l. (Locality No. 12EW), 25.XI.2012, 1♀, leg. F. Kovařík; Awash, Metahara env., 08°54'N 39°54'E, 960–1050 m a. s. l. (Locality No. 12EX), 25.XI.2012, 1♂1♀3juvs. (290), topotypes, leg. F. Kovařík; Afar State, 09°08'10.4"N 40°09'45.5"E, 835 m a. s. l. (Locality No. 14ET = 12ER), 26.–27.XI.2014, 2♂5juvs., leg. F. Kovařík; Afar State, Shewa Province, 20km N Awash, 09°11'52"N 40°08'04"E, 788 m a. s. l., 2.VI.2015, 4♂3♀15juvs., leg. Pavel Kučera, 27.–30.XI.2014, 1♀4juvs., leg. F. Kovařík; Afar State, Shewa Province, 10km N Metahara, 08°57'01"N 39°50'30"E, 980 m a. s. l., 5.VI.2015, 1♀, leg. Pavel Kučera.

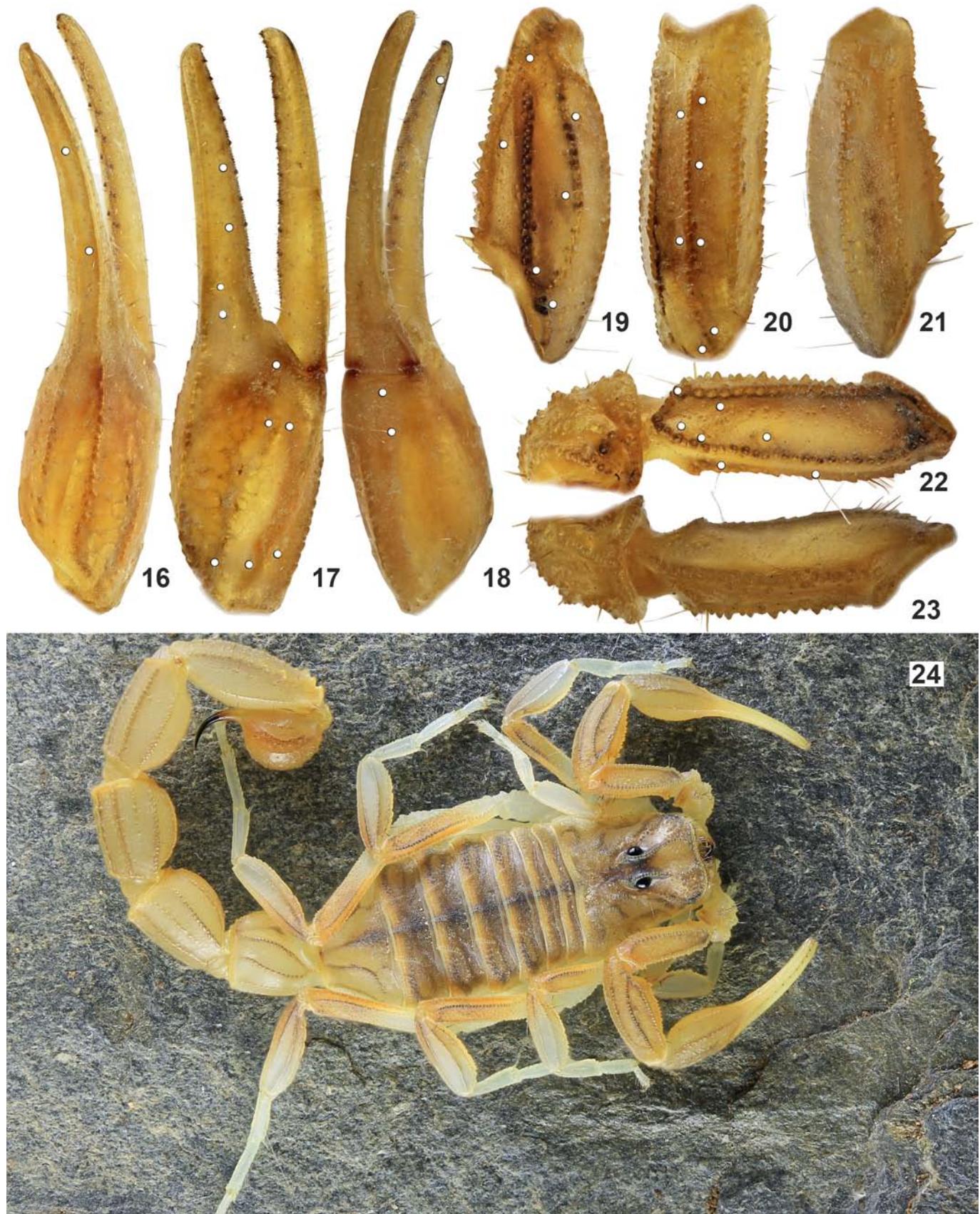
DIAGNOSIS. Total length 45–62 mm. Mesosoma and carapace dark (grey to black) with orange spots and median black strip. Base color of metasoma, pedipalps ad legs yellow or yellowish red with dark spots, reticulations and dark carinae; telson yellow; chelicerae pale yellow, reticulated only in anterior part. Pedipalp movable fingers bear 11–12 rows of granules, obviously with 12 outer and inner denticles and fixed finger with 11 outer and inner denticles. Sexual dimorphism minor; chela of pedipalp narrow in both sexes, its length to width ratio 3.5–4.3 in females and 4.1–4.8 in males. Telson bulbous, with aculeus shorter than vesicle. Pectinal teeth number 23–28 in females and 30–35 in males.



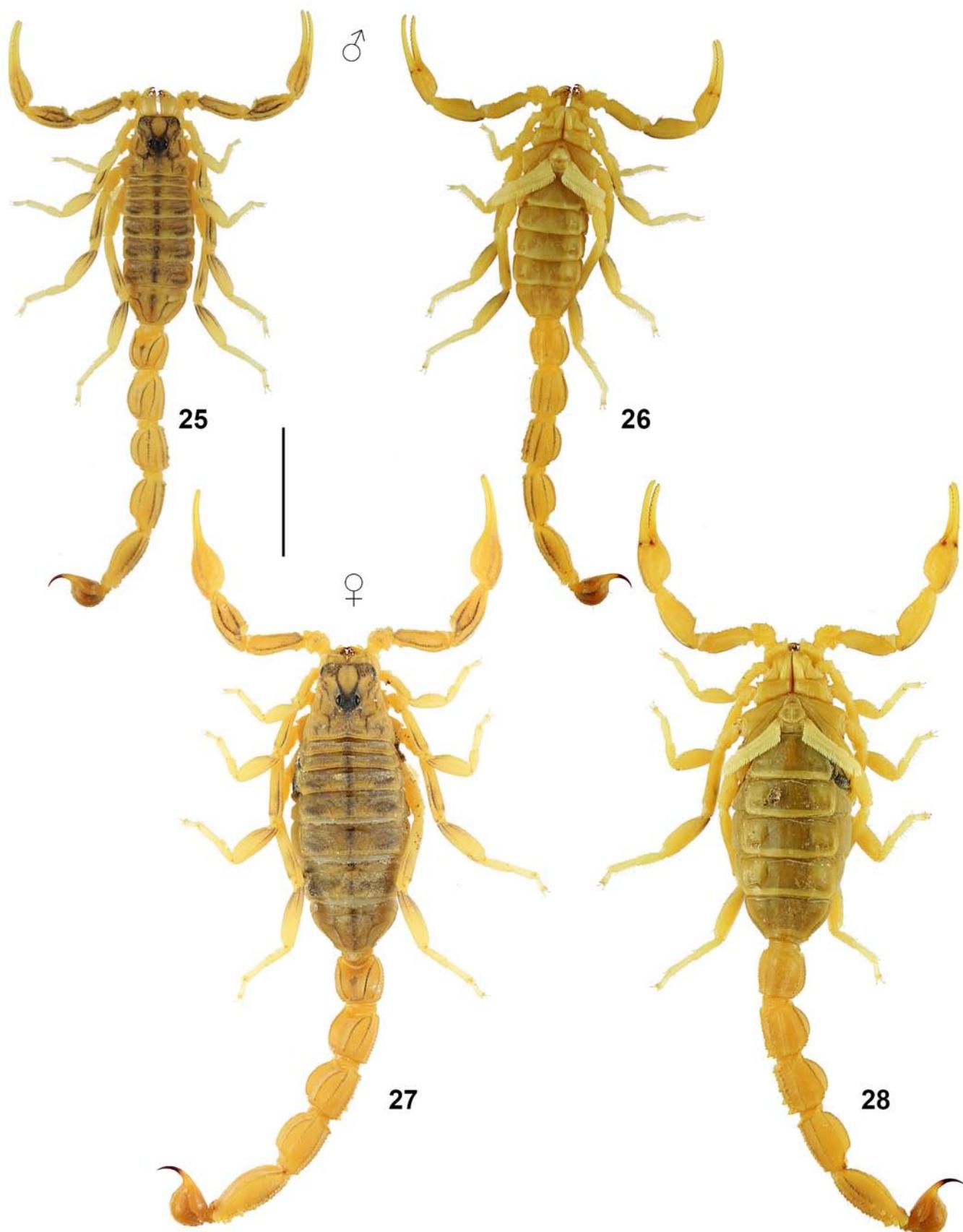
Figures 5–6. *Buthus berberensis*, male holotype in dorsal (5) and ventral (6) views.



Figures 7–15. *Buthus berberensis*, male holotype, carapace and tergites I–IV (7), coxosternal area and sternites (8), left legs II–IV, retrolateral aspect (9–11 respectively), metasoma and telson lateral (12), and metasoma and telson lateral (13), dorsal (14), and ventral (15) views. Scale bar: 10 mm (13–15).



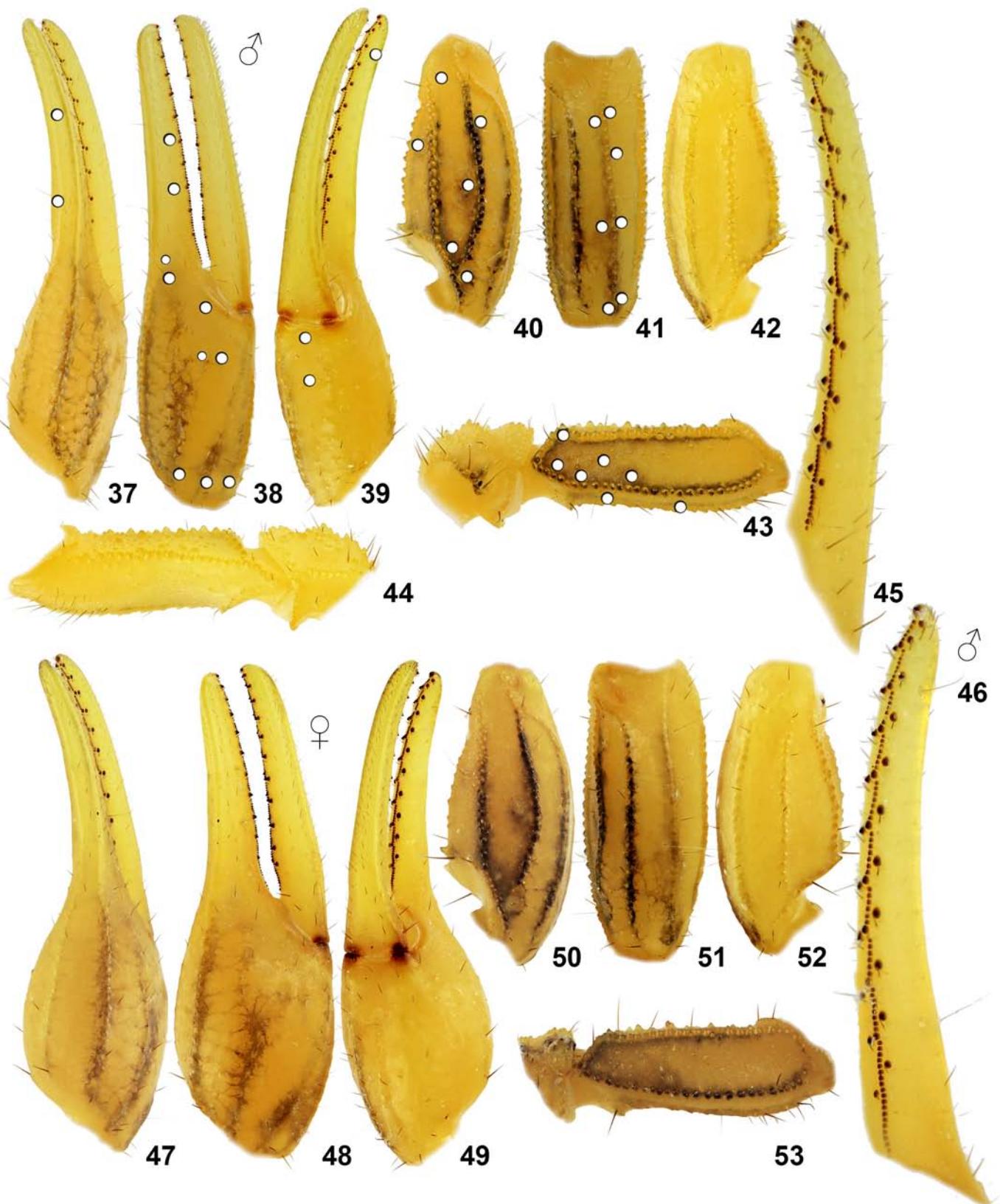
Figures 16–24: *Buthus berberensis*. **Figures 16–23.** Male holotype, pedipalp segments. Chela dorsal (16), external (17) and ventral (18) views. Patella dorsal (19), external (20) and ventral (21) views. Trochanter and femur dorsal (22) and ventral (23) views. Trichobothrial pattern is indicated by white circles (16–20, 22). **Figure 24.** Male from locality 19SO, *in vivo* habitus.



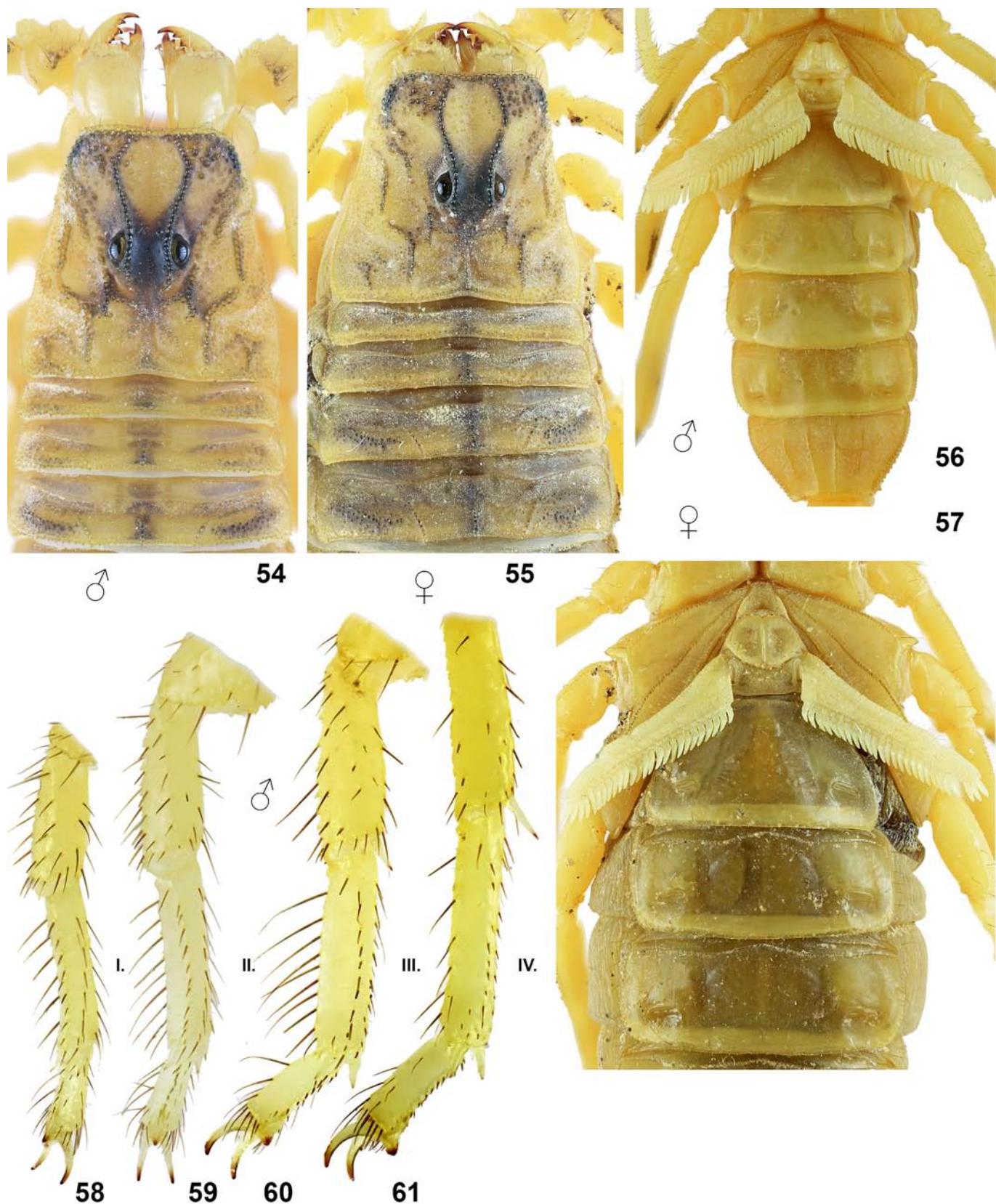
Figures 25–28: *Buthus berberensis* from locality 19SO. Figures 25–26. Male in dorsal (25) and ventral (26) views. Figures 27–28. Female in dorsal (27) and ventral (28) views. Scale bar: 10 mm.



Figures 29–36: *Buthus berberensis* from locality 19SO. **Figures 29, 31–33.** Male, telson lateral (29), and metasoma and telson lateral (31), dorsal (32), and ventral (33) views. **Figures 30, 34–36.** Female, telson lateral (30), and metasoma and telson lateral (34), dorsal (35), and ventral (36) views. Scale bars: 10 mm (31–33, 34–36).



Figures 37–53: *Buthus berberensis* from locality 19SO, pedipalp segments. **Figures 37–46.** Male. Chela dorsal (37), external (38) and ventral (39) views. Patella dorsal (40), external (41) and ventral (42) views. Trochanter and femur dorsal (43) and ventral (44) views. Movable (45) and fixed (46) finger dentition. Trichobothrial pattern is indicated by white circles (37–41, 43). **Figures 47–53.** Female. Chela dorsal (47), external (48) and ventral (49) views. Patella dorsal (50), external (51) and ventral (52) views. Trochanter and femur dorsal (53).



Figures 54–61: *Buthus berberensis* from locality 19SO. **Figures 54, 56, 58–61.** Male, carapace and tergites I–III (54), coxosternal area and sternites (56), left legs I–IV, retrolateral aspect (58–61 respectively). **Figures 55, 57.** Female, carapace and tergites I–IV (55), coxosternal area and sternites III–V (57).

Dimensions (mm)		<i>B. berberensis</i> ♂ holotype	<i>B. berberensis</i> ♂ 1684	<i>B. berberensis</i> ♀	<i>B. pococki</i> sp. n. ♂ holotype	<i>B. pococki</i> sp. n. ♀ paratype
Carapace	L / W	4.65 / 5.09	5.12 / 5.44	6.09 / 6.90	5.56 / 5.70	6.44 / 7.09
Mesosoma	L	8.35	8.11	16.19	13.34	16.14
Tergite VII	L / W	2.32 / 4.93	2.74 / 4.91	4.01 / 6.85	3.83 / 5.75	3.95 / 6.99
Metasoma + telson	L	24.83	26.44	30.11	29.46	32.48
Segment I	L / W / D	3.15 / 3.34 / 2.76	3.51 / 3.47 / 3.11	3.80 / 3.88 / 3.60	3.90 / 3.96 / 3.57	4.09 / 4.06 / 3.49
Segment II	L / W / D	3.67 / 3.06 / 2.85	3.83 / 3.27 / 3.12	4.42 / 3.74 / 3.56	4.46 / 3.81 / 3.51	4.60 / 3.91 / 3.46
Segment III	L / W / D	3.74 / 3.11 / 2.89	3.99 / 3.21 / 3.11	4.52 / 3.74 / 3.52	4.62 / 3.69 / 3.43	4.85 / 3.88 / 3.36
Segment IV	L / W / D	4.38 / 3.00 / 2.64	4.78 / 3.04 / 2.83	5.25 / 3.60 / 3.11	5.03 / 3.35 / 3.03	5.56 / 3.66 / 3.03
Segment V	L / W / D	5.27 / 2.67 / 2.18	5.55 / 2.85 / 2.41	6.48 / 3.29 / 2.76	5.92 / 3.15 / 2.48	6.87 / 3.39 / 2.77
Telson	L / W / D	4.62 / 2.07 / 2.07	4.78 / 2.32 / 2.29	5.64 / 3.03 / 2.94	5.53 / 2.59 / 2.37	6.51 / 3.11 / 3.00
Pedipalp	L	15.16	16.26	19.17	18.59	20.73
Femur	L / W	3.70 / 1.27	4.12 / 1.33	4.63 / 1.61	4.53 / 1.47	4.93 / 1.65
Patella	L / W	4.30 / 1.66	4.61 / 1.84	5.50 / 2.33	5.30 / 2.13	5.88 / 2.39
Chela	L	7.16	7.53	9.04	8.76	9.92
Manus	W / D	1.64 / 1.76	1.83 / 1.85	2.63 / 2.64	2.06 / 2.04	2.58 / 2.73
Movable finger	L	4.44	4.77	5.41	5.82	6.36
Total	L	37.83	39.67	52.39	48.36	55.06

Table 1. Comparative measurements of adults of *Buthus berberensis* and *B. pococki* sp. n. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

Buthus berberensis Pocock, 1900

(Figures 5–24, 178–179, 187, 198–200, 210, Tables 1, 3)

Buthus occitanus berberensis Pocock, 1900: 56; Levy & Amitai, 1980: 16, 21 (in part); Fet & Lowe, 2000: 95 (in part, complete references list until 1998).

Buthus berberensis: Lourenço, 2008: 46; Sousa et al., 2017: 38 (in part).

TYPE LOCALITY AND TYPE REPOSITORY. Somaliland; BMNH.

TYPE MATERIAL EXAMINED. Somaliland, coll. Miss Gillett, 1♂ (holotype, Figs. 5–23), BMNH No. 1898.2.5.3.

OTHER MATERIAL EXAMINED. **Somaliland**, Agabar, 09°53'04.8"N 43°57'40.9"E, 982 m a. s. l. (Locality No. 19SO, see fig. 69 in Kovařík, 2019: 13), 9.VII.2019, 3♂1♀ (No. 1684), leg. F. Kovařík & T. Mazuch, FKCP.

DIAGNOSIS. Total length 37–54 mm. Base color yellow with strong dark pattern, mainly on carina; telson orange to brown; chelicerae pale yellow, reticulated only in anterior part. Pedipalp movable fingers bear 11 rows of granules, with 11 outer and inner denticles and fixed finger with 10 outer and inner denticles. Chela of pedipalp narrower in male, its length to width ratio 3.4–3.6 in females and 4.1–4.3 in males. Telson bulbous, with aculeus shorter than vesicle. Pectinal teeth number 24–27 in females and 27–33 in males.

Buthus pococki sp. n.

(Figures 62–100, 180–181, 198, 192, 201–6, 210, Tables 1, 3)

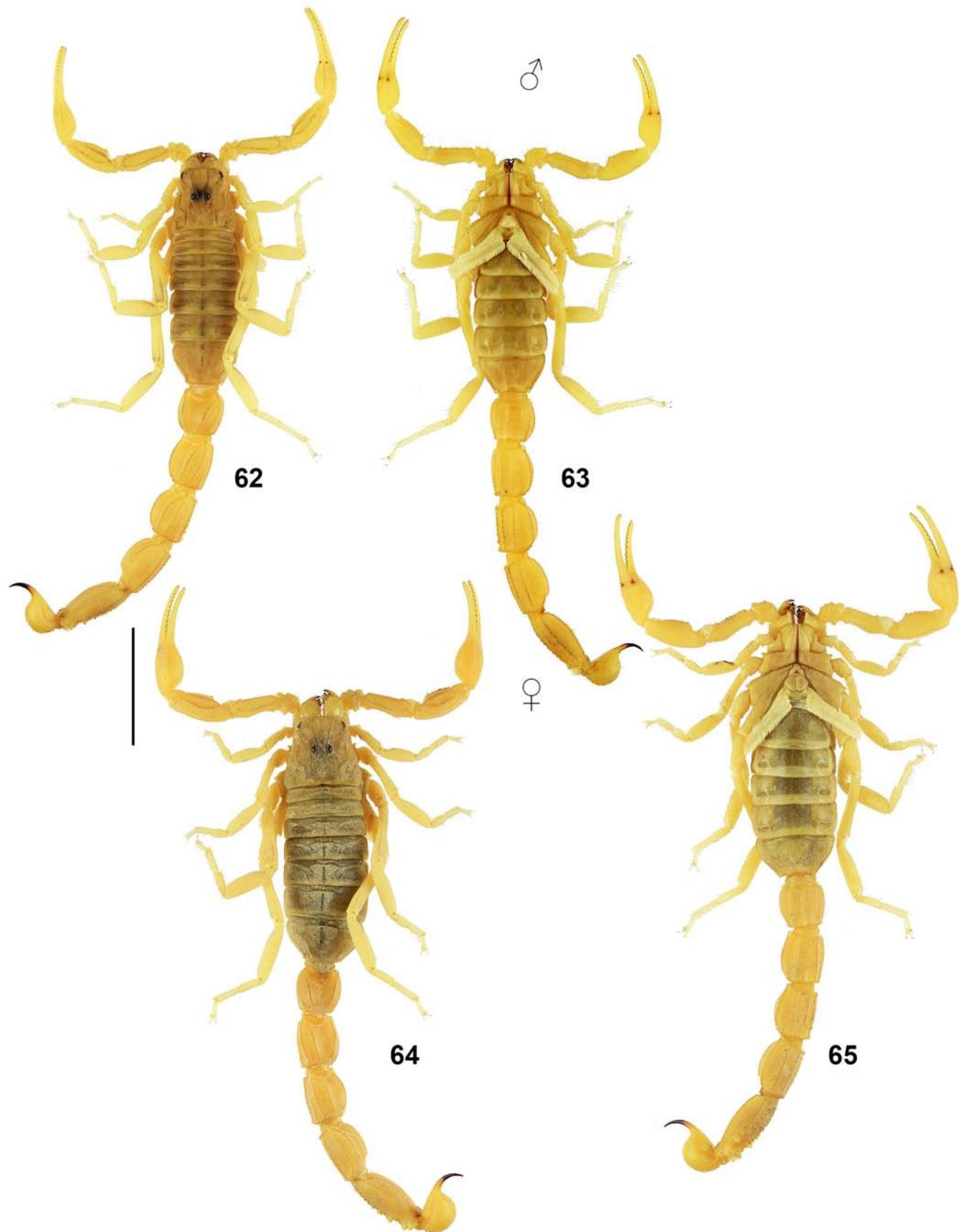
<http://zoobank.org/urn:lsid:zoobank.org:act:CC1B5A69-6788-433B-B25F-2887F7539B3F>

TYPE LOCALITY AND TYPE REPOSITORY. Somaliland, near Bown village, 10°14'23.6"N 43°03'04.3"E, 1255 m a. s. l. (Locality No. 19SC); FKCP.

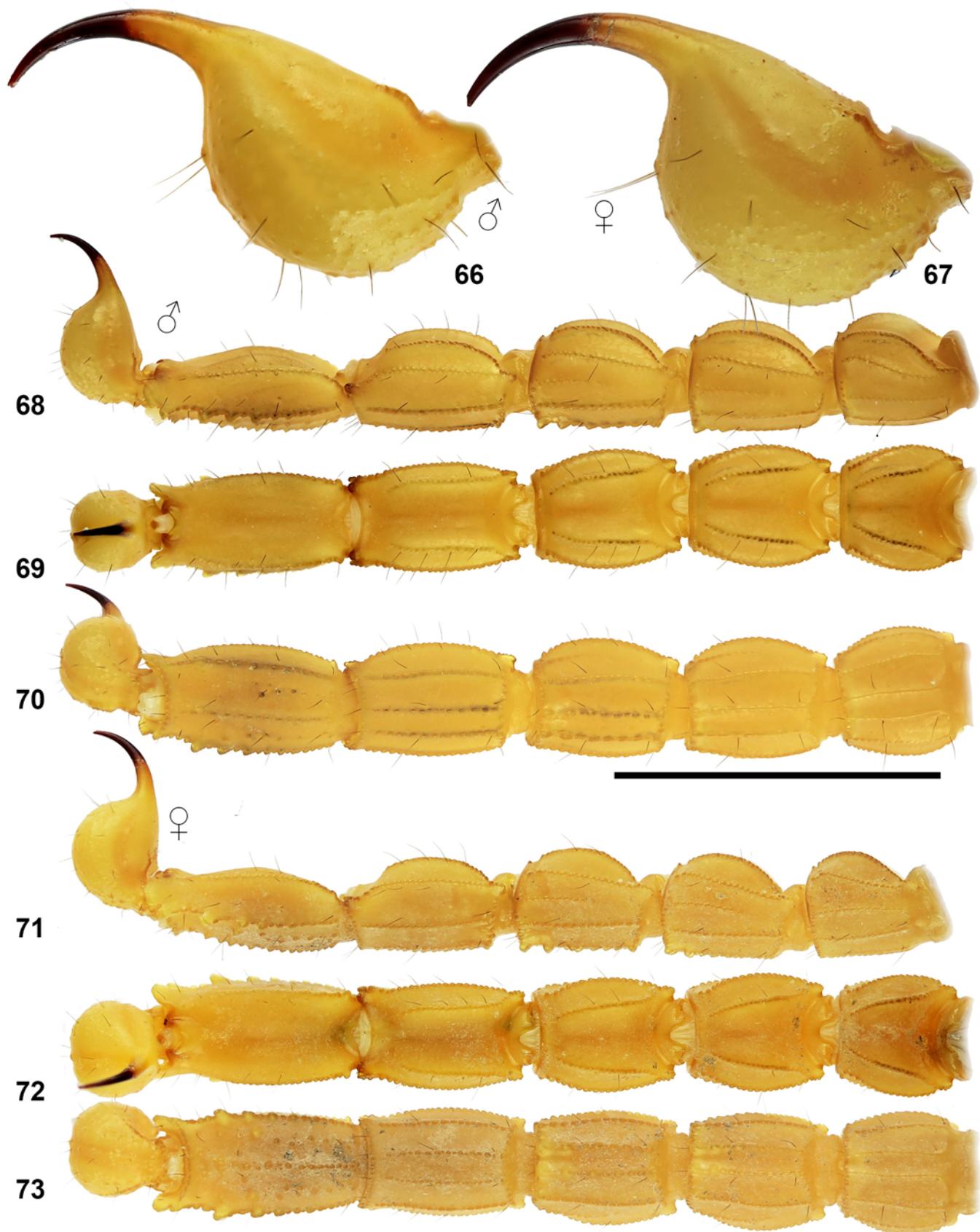
TYPE MATERIAL (FKCP). **Somaliland**, Kidile, 20 km of Borama, 10°00'06.6"N 43°12'26.3"E, 1427 m a. s. l. (Locality No. 19SB), 28.VI.2019, 2♂2juvs. (paratypes, 1652, 1653, 1680), leg. T. Mazuch; near Bown village, 10°14'23.6"N 43°03'04.3"E, 1255 m a. s. l. (Locality No. 19SC), 29.VI.2019, 1♂ (holotype) 13♂3♀2♂juvs. 4♀juvs. (paratypes, 1655, 1677), leg. F. Kovařík; Cali Haidh, 10°02'50.6"N 43°47'08.7"E, 1056 m a. s. l. (Locality No. 19SN), 3♂1♀ (paratypes, 1688), 8.VII.2019, leg. F. Kovařík; Habas village, 10°24'42.6"N 42°48'40.1"E, 866 m a. s. l. (Locality No. 19SD), 30.VI.2019, 4♂3♀1juv. (paratypes), leg. F. Kovařík.

ETYMOLOGY. The name honors Reginald Innes Pocock (1863–1947) who described two *Buthus* species from Somaliland.

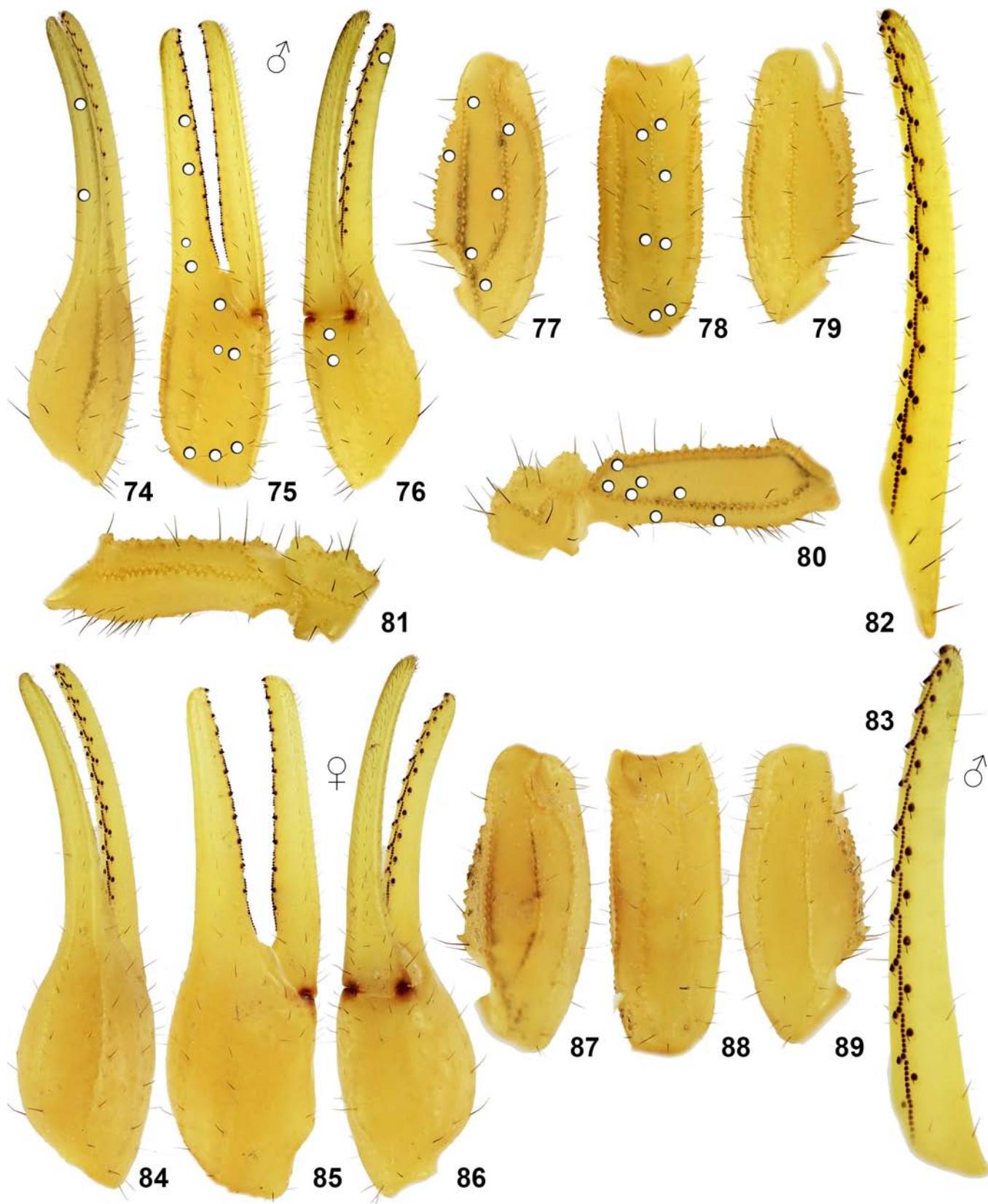
DIAGNOSIS. Total length 41–65 mm. Base color yellow dark pattern reduced; telson yellow; chelicerae pale yellow without reticulation. Pedipalp movable fingers bear 11 rows of granules, with 12 outer and inner denticles and fixed finger with 11 outer and 12 inner denticles. Chela of pedipalp narrower in male, its



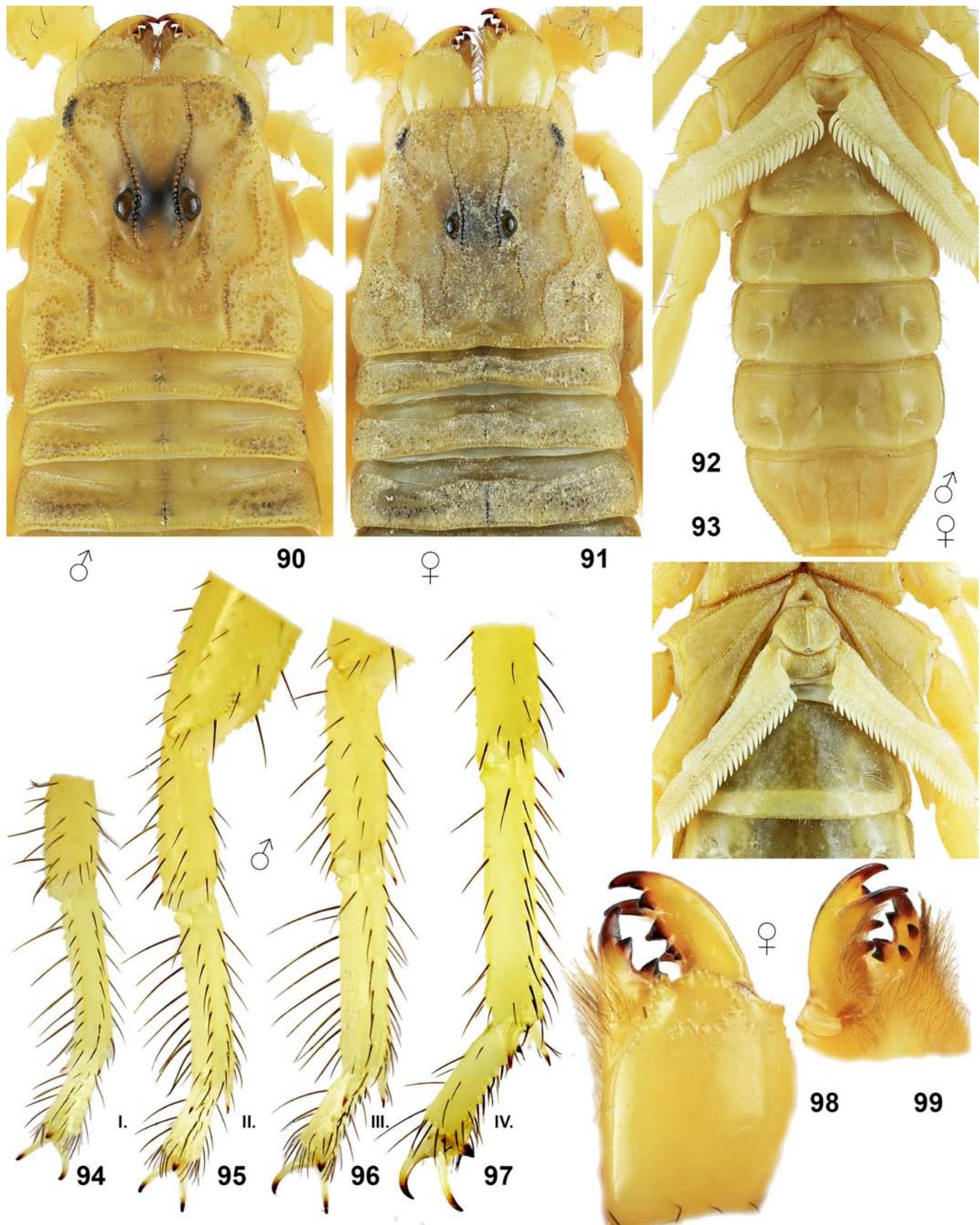
Figures 62–65: *Buthus pococki* sp. n. **Figures 62–63.** Male holotype in dorsal (62) and ventral (63) views. **Figures 64–65.** Female paratotype in dorsal (64) and ventral (65) views. Scale bar: 10 mm.



Figures 66–73: *Buthus pococki* sp. n. **Figures 66, 68–70.** Male holotype, telson lateral (66), and metasoma and telson lateral (68), dorsal (69), and ventral (70) views. **Figures 67, 71–73.** Female paratotype, telson lateral (67), and metasoma and telson lateral (71), dorsal (72), and ventral (73) views. Scale bars: 10 mm (68–70, 71–73).



Figures 74–89: *Buthus pococki* sp. n., pedipalp segments. **Figures 74–83.** Male holotype. Chela dorsal (74), external (75) and ventral (76) views. Patella dorsal (77), external (78) and ventral (79) views. Trochanter and femur dorsal (80) and ventral (81) views. Movable (82) and fixed (83) finger dentition. Trichobothrial pattern is indicated by white circles (74–78, 80). **Figures 84–89.** Female paratype. Chela dorsal (84), external (85) and ventral (86) views. Patella dorsal (87), external (88) and ventral (89) views.



Figures 90–99: *Buthus pococki* sp. n. **Figures 90, 92, 94–97.** Male holotype, carapace and tergites I–III (90), coxosternal area and sternites (92), left legs I–IV, retrolateral aspect (94–97 respectively). **Figures 91, 93, 98–99.** Female paratotype, carapace and tergites I–III (91), coxosternal area and sternite III (93), and right chelicera in dorsal (98) and ventral (99) views.



Figures 100–101: Localities. **Figure 100.** *Buthus pococki* sp. n., type locality (19SC). **Figure 101.** *B. zeylensis*, locality 19SH.

length to width ratio 3.7–3.9 in females and 4.1–4.3 in males. Telson bulbous, with aculeus shorter than vesicle. Pectinal teeth number 24–28 in females and 25–36 in males.

DESCRIPTION. The adults are 41 mm (male) – 65 mm (female) long. The habitus is shown in Figs. 62–65, 192. For position and distribution of trichobothria of pedipalps see Figs. 74–78, and 80. Sexual dimorphism minor: adult males with pedipalp chela broader. Female with basal middle lamella wide (Fig. 93).

Coloration (Figs. 62–65, 192). The base color is uniformly yellow with dark pattern reduced, tergites yellow. The pedipalps and legs are yellow with dark carina indicated in males and often absent in females. Telson is yellow.

Carapace and mesosoma (Figs. 62–65, 90–93). The entire carapace is covered with granules small along much of the midline and large anteriorly, posteriorly and laterally. The carinae are typical for genus *Buthus*, strongly developed and composed of large, round granules. The anterior margin of the carapace is straight, and bears 8–10 long, symmetrically placed macrosetae. The tergites are granulated in posterior parts and bear very strong median carinae. A pair of denticulate lateral carinae is strong on tergites II–VI. Tergite VII is pentacarinate, with all carinae strong and granulated. The pectinal tooth count is 24–28 (1x24, 1x25, 8x26, 6x27, 6x28) in the females and 25–36 (1x25, 3x26, 2x30, 6x31, 14x32, 12x32, 9x34, 1x35, 1x36) in the males. The pectinal marginal tips extend to the end of the fourth sternite in males and half of the fourth sternite in females. The pectines have three marginal lamellae and seven or eight middle lamellae. The lamellae bear numerous dark setae, each fulcrum with three to six dark setae. All sternites are smooth or very finely granulated. The seventh sternite bears four strongly developed ventral crenulate carinae.

Metasoma and telson (Figs. 66–73). The first metasomal segment bears 10 carinae, the second through fourth segments bear eight to 10 carinae (the lateral surface of the second and third segments bears a row of granules that exceeds three-quarters of the second and one-half of the third segment length). The fourth segment bears eight carinae and the fifth segment bears five carinae. The ventrolateral carinae of the fifth segment terminate in two lobes. The ventral keels on the second and third segments posteriorly bear two to four large granules. The surface between the carinae is smooth. All segments are sparsely setose. The telson is bulbous, with aculeus shorter than the vesicle. The surface of the telson is unevenly granulated and bears an incomplete lateral carina.

Pedipalps (Figs. 74–89). The pedipalps are smooth or finely granulated. The femur bears four to five carinae; the ventroexternal carina is incomplete, the other carinae are coarsely granular. The patella bears seven coarsely granular carinae. The chela bears five carinae, which may be weak and incomplete. The movable and fixed fingers bear 11 rows of granules, with 12 outer and inner denticles and fixed finger with 11 outer and 12 inner denticles.

Legs (Figs. 94–97). Pairs III and IV bear long tibial spurs. Retrolateral and prolateral pedal spurs are present on all legs.

The tarsomeres bear two rows of macrosetae on the ventral surface and numerous macrosetae on the other surfaces. Bristlecombs are present on the first to third legs. The femur bears four carinae and the patella bears four to six carinae. The femur and patella bear only solitary macrosetae.

Measurements. See Table 1.

AFFINITIES. The described features distinguish *B. pococki* sp. n. from all other species of the genus. They are recounted in the key below. *B. pococki* sp. n. has reduced dark pigmentation similar to *B. somalilandus* sp. n. and *B. zeylensis*. Both of these species differ from *B. pococki* sp. n. by orange to brown telson (see Fig. 192 versus Figs. 193–194).

Buthus somalilandus sp. n.

(Figures 102–139, 182–183, 189, 193, 210–211, Table 2)

<http://zoobank.org/urn:lsid:zoobank.org:act:2D740F55-9522-4911-87A8-5119B727F228>

Buthus berberensis: Kovařík, 2011: 2, 4–6, figs. 1–4, 18–23.

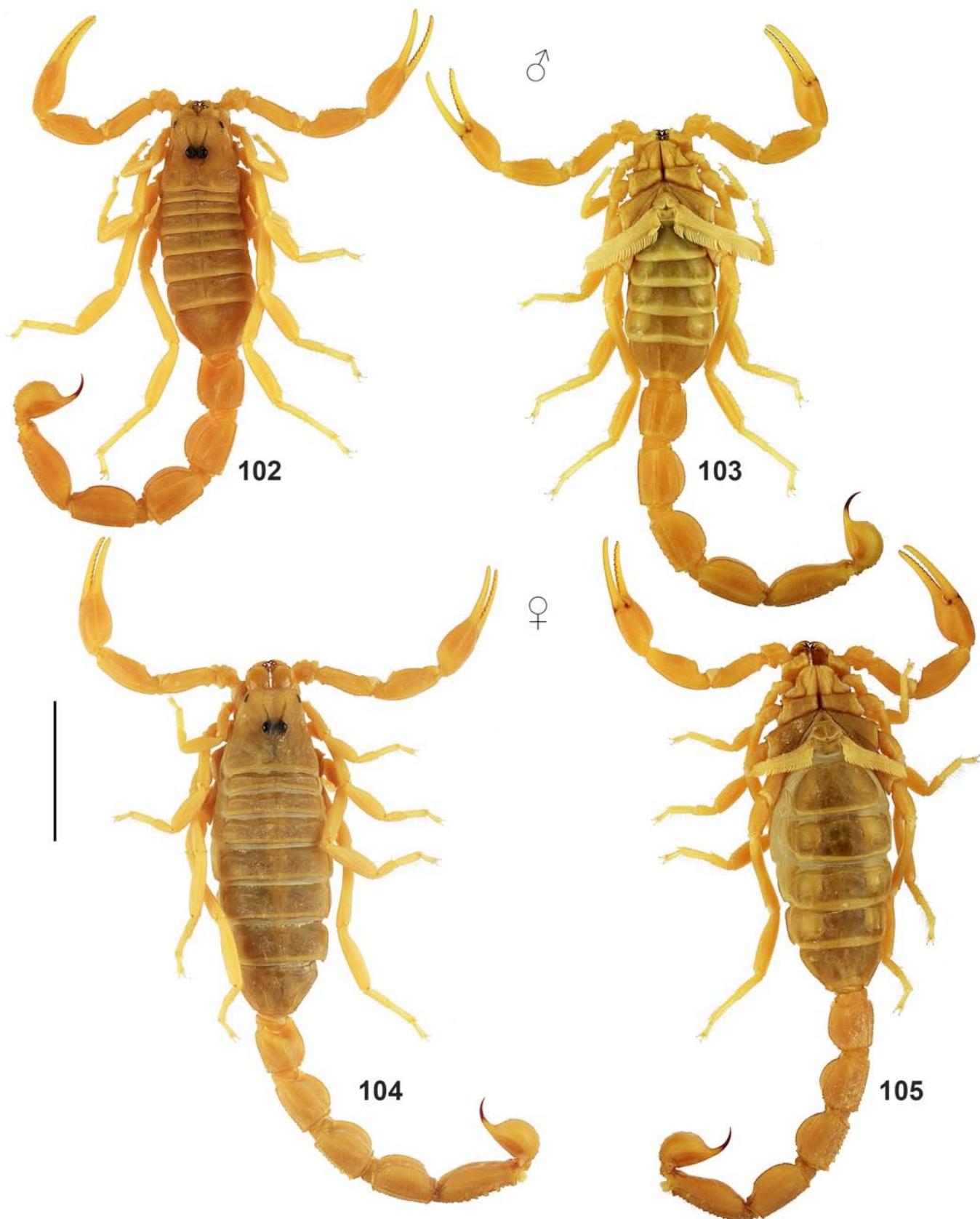
TYPE LOCALITY AND TYPE REPOSITORY. Somaliland, near Berbera, 10°15'30.5"N 45°06'04.2"E, 376 m a. s. l. (Locality No. 11SO); FKCP.

TYPE MATERIAL (FKCP). **Somaliland**, near Berbera, 10°15'30.5"N 45°06'04.2"E, 376 m a. s. l. (Locality No. 11SO), 12.VII.2011, 1♂ (holotype) 1♂ 2♀ 1♀ juv. (paratypes), leg. F. Kovařík; between Berbera and Burao, 10°02'12"N 44°47'21"E, 60 m a. s. l. (Locality No. 17SG), 21.VIII.2018, 1♂ 1♀ (paratypes), leg. F. Kovařík; Hamas, between Hargeisa and Berbera, 10°02.267'N 44°47.299"E, 650 m a. s. l., 4♂ 1♀ (paratypes), XI.2010, leg. T. Mazuch; between Hargeisa and Berbera, 09°56'41"N 44°41'03"E, 817 m a. s. l. (Locality No. 11SD), 8.VII.2011, 1♂ (paratype), leg. F. Kovařík; between Berbera and Sheikh, 10°05'49.9"N 45°11'40.1"E, 628 m a. s. l. (Locality No. 11SH), 10.VII.2011, 1♀ juv. (paratype), leg. F. Kovařík; between Berbera and Hargeisa, 09°51'35"N 44°32'08"E, 933 m a. s. l. (Locality No. 18SM), 2.IX.2018, 1♀ (paratype), leg. F. Kovařík.

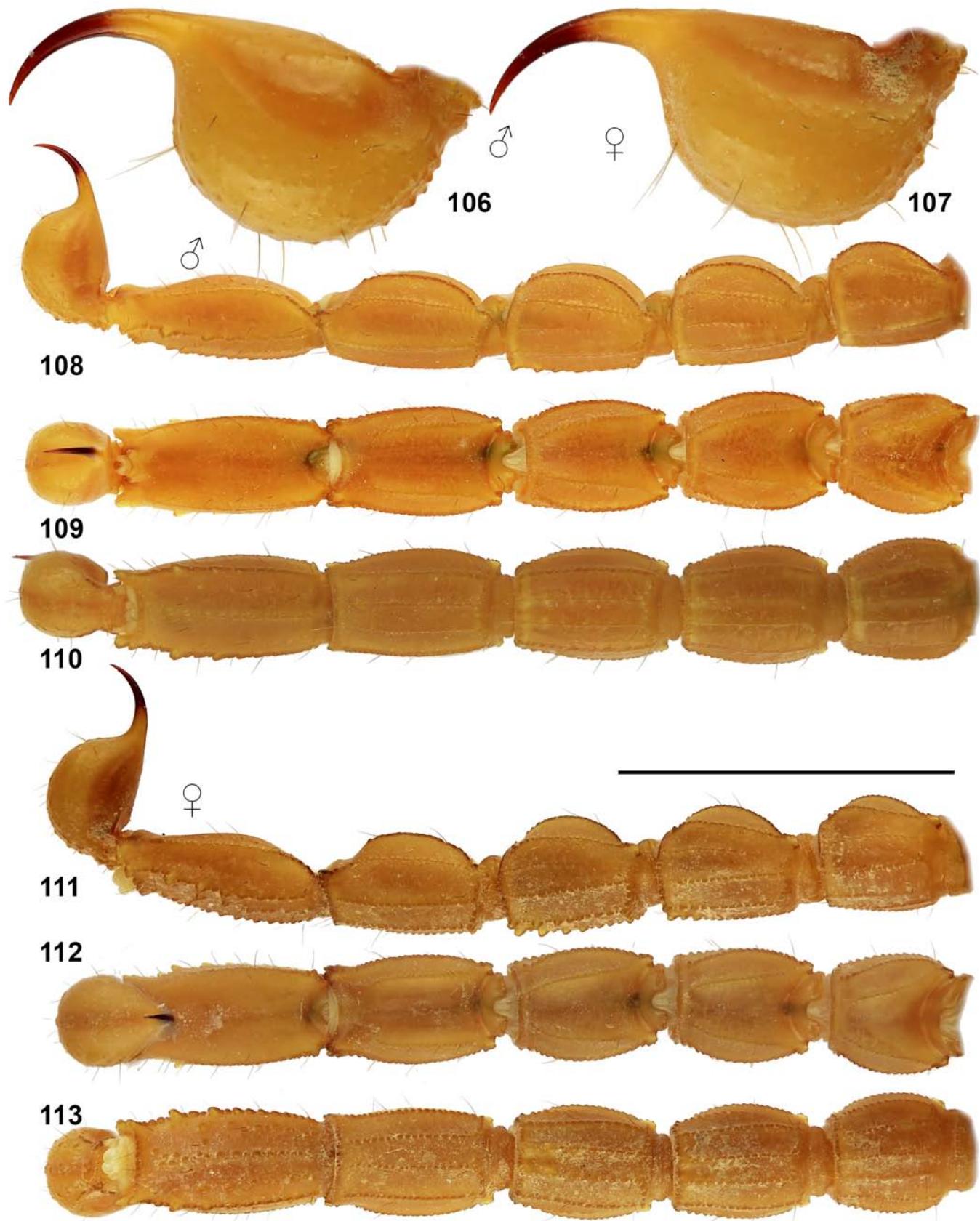
ETYMOLOGY. Named after the country of occurrence.

DIAGNOSIS. Total length 42–55 mm. Base color yellow dark pattern reduced; telson orange; chelicerae pale yellow without reticulation. Pedipalp movable fingers bear 10–11 rows of granules, with 11 outer and inner denticles and fixed finger with 9 outer and 10 inner denticles. Chela of pedipalp narrower in male, its length to width ratio 3.6–3.9 in females and 4.2–4.4 in males. Telson bulbous, with aculeus shorter than vesicle. Pectinal teeth number 23–26 in females and 30–35 in males.

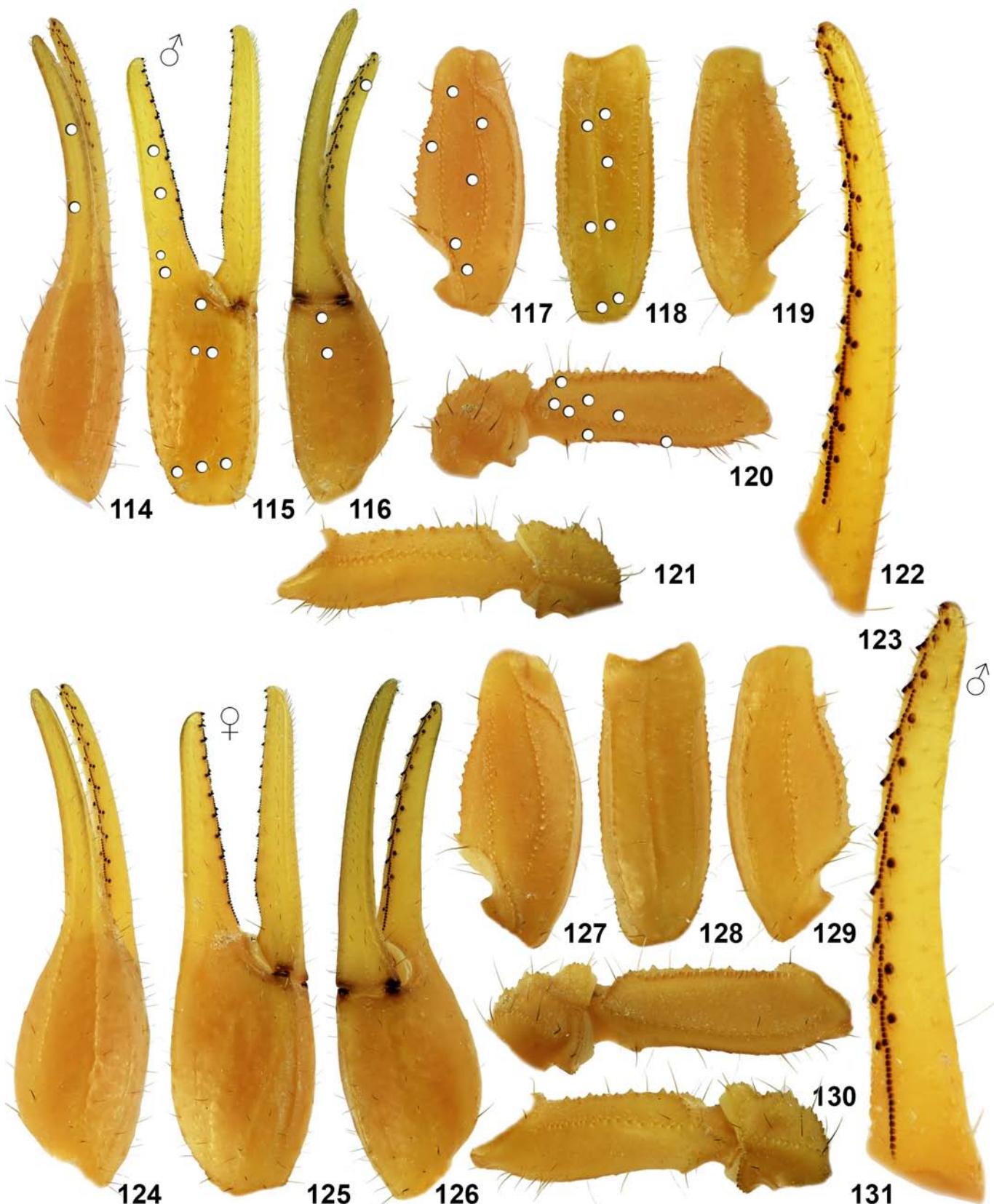
DESCRIPTION. The adults are 42 mm (male) – 55 mm (female) long. The habitus is shown in Figs. 102–105, 193. For position and distribution of trichobothria of pedipalps see Figs. 114–118, and 120. Sexual dimorphism minor: adult males with



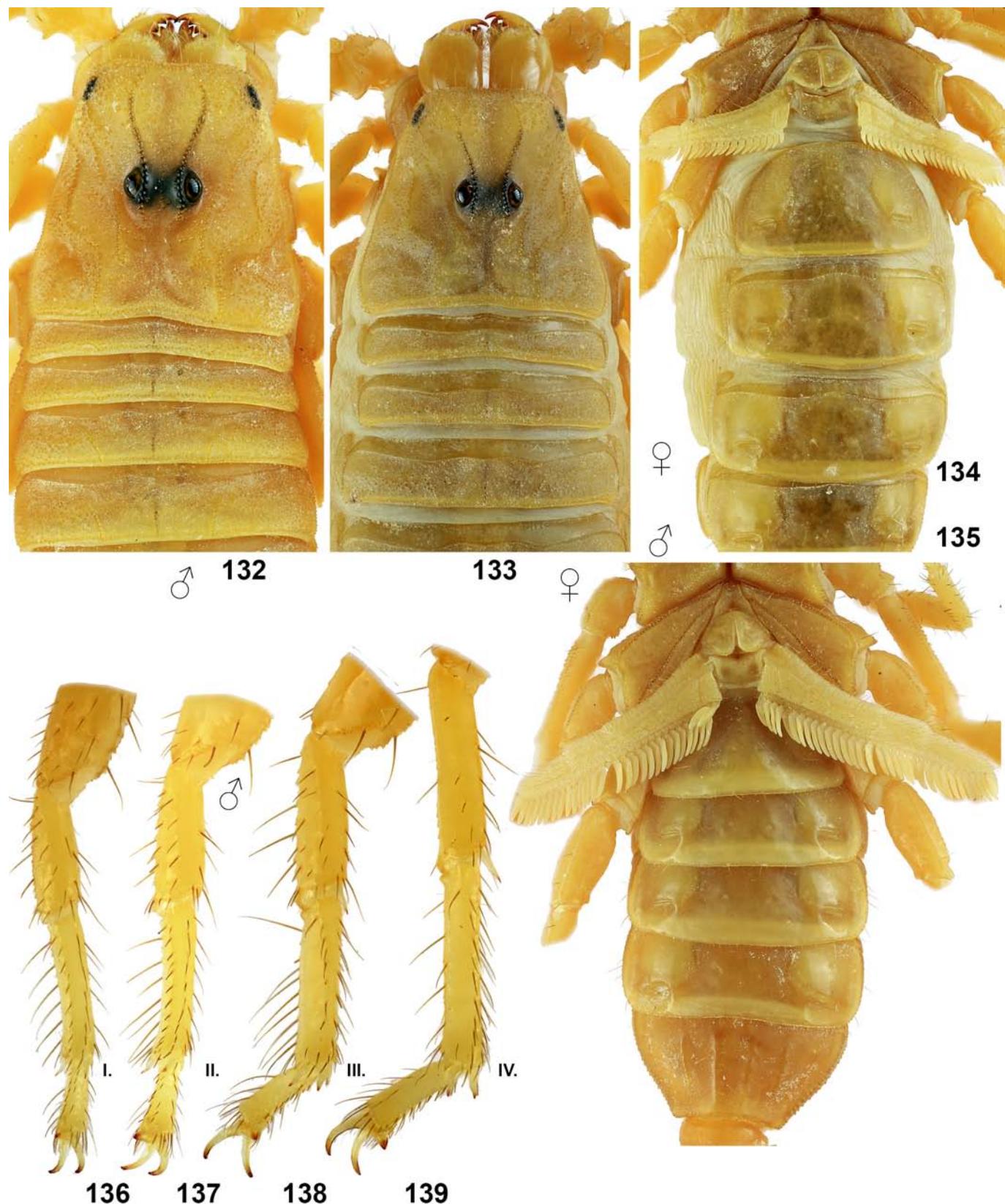
Figures 102–105: *Buthus somalilandus* sp. n. **Figures 102–103.** Male in dorsal (102) and ventral (103) views. **Figures 104–105.** Female in dorsal (104) and ventral (105) views. Scale bar: 10 mm.



Figures 106–113: *Buthus somalilandus* sp. n. **Figures 106, 108–110.** Male, telson lateral (106), and metasoma and telson lateral (108), dorsal (109), and ventral (111) views. **Figures 107, 111–113.** Female, telson lateral (107), and metasoma and telson lateral (111), dorsal (112), and ventral (113) views. Scale bar: 10 mm (108–113).



Figures 114–131: *Buthus somalilandus* sp. n. **Figures 114–123.** Male. Chela dorsal (114), external (115) and ventral (116) views. Patella dorsal (117), external (118) and ventral (119) views. Trochanter and femur dorsal (120) and femur ventral (121) views. Movable (122) and fixed (123) finger dentition. Trichobothrial pattern is indicated by white circles (114–118, 120). **Figures 124–129.** Female. Chela dorsal (124), external (125) and ventral (126) views. Patella dorsal (127), external (128) and ventral (129) views. Trochanter and femur dorsal (130) and ventral (131) views.



Figures 132–139: *Buthus somalilandus* sp. n. **Figures 132, 136–139.** Male holotype, carapace and tergites I–IV (132), coxosternal area and sternites (134), left legs I–IV, retrolateral aspect (136–139 respectively). **Figures 133–134.** Female paratotype, carapace and tergites I–III (133), coxosternal area and sternites III–VI (134).

Dimensions (mm)		<i>B. somalilandus</i> sp. n. ♂ holotype	<i>B. somalilandus</i> sp. n. ♀ paratype	<i>B. zeylensis</i> ♂	<i>B. zeylensis</i> ♀
Carapace	L / W	5.60 / 5.70	6.24 / 6.87	4.80 / 5.62	5.46 / 5.80
Mesosoma	L	12.13	18.23	11.59	14.07
Tergite VII	L / W	3.53 / 5.80	3.92 / 6.08	2.61 / 5.06	3.26 / 5.69
Metasoma + telson	L	29.55	29.41	22.91	24.73
Segment I	L / W / D	3.89 / 3.66 / 3.17	3.97 / 3.56 / 3.40	2.86 / 2.82 / 2.57	3.20 / 3.21 / 2.86
Segment II	L / W / D	4.25 / 3.49 / 3.19	4.23 / 3.42 / 3.25	3.18 / 2.76 / 2.46	3.68 / 3.05 / 2.73
Segment III	L / W / D	4.37 / 3.27 / 3.17	4.28 / 3.32 / 3.17	3.45 / 2.71 / 2.47	3.54 / 3.00 / 2.82
Segment IV	L / W / D	5.19 / 3.21 / 2.91	4.96 / 3.21 / 2.79	4.00 / 2.55 / 2.30	4.43 / 2.85 / 2.47
Segment V	L / W / D	6.27 / 2.78 / 2.40	6.28 / 2.87 / 2.44	4.97 / 2.49 / 2.06	5.10 / 2.84 / 2.27
Telson	L / W / D	5.58 / 2.35 / 2.57	5.69 / 2.74 / 2.50	4.45 / 2.25 / 2.14	4.78 / 2.57 / 2.42
Pedipalp	L	17.81	18.45	14.92	16.32
Femur	L / W	4.28 / 1.32	4.45 / 1.43	3.61 / 1.18	3.77 / 1.33
Patella	L / W	4.94 / 1.97	5.08 / 2.19	4.31 / 1.79	4.70 / 1.82
Chela	L	8.59	8.92	7.00	7.85
Manus	W / D	1.96 / 1.98	2.31 / 2.35	1.66 / 1.68	2.28 / 2.21
Movable finger	L	5.46	5.25	4.33	4.85
Total	L	47.28	53.88	39.30	44.26

Table 2. Comparative measurements of adults of *Buthus somalilandus* sp. n. and *B. zeylensis*. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

pedipalp chela broader. Female with a wide basal middle lamella (Fig. 134).

Coloration (Figs. 102–105, 193). The base color is uniformly yellow with dark pattern reduced in juveniles and often absent in adults, tergites yellow. The pedipalps and legs are yellow without dark carina in adults. Telson is orange.

Carapace and mesosoma (Figs. 102–105, 132–135). The entire carapace is covered with granules small along much of the middline and large anteriorly, posteriorly and laterally. The carinae are typical for genus *Buthus*, strongly developed and composed of large, round granules. The anterior margin of the carapace is straight, and bears 10–12 long, symmetrically placed macrosetae. The tergites are granulated in posterior parts and bear very strong median carinae. A pair of denticulate lateral carinae is strong on tergites II–VI. Tergite VII is pentacarinate, with all carinae strong and granulated. The pectinal tooth count is 23–26 (1x23, 6x24, 6x25, 1x26) in the females and 30–35 (2x30, 4x31, 5x33, 3x34, 2x35) in the males.

The pectinal marginal tips extend to the end of the fourth sternite or to the quoter of the fifth sternite in males and to the end of the third sternite in females. The pectines have three marginal lamellae and seven or eight middle lamellae. The lamellae bear numerous dark setae, each fulcrum with three to six dark setae. All sternites are smooth or finely granulated. The seventh sternite bears four strongly developed ventral crenulate carinae.

Metasoma and telson (Figs. 106–113). The first metasomal segment bears 10 carinae, the second through fourth segments bear eight to 10 carinae (the lateral surface of the second and third segments bears a row of granules that exceeds three-quarters of the second and one-half of the

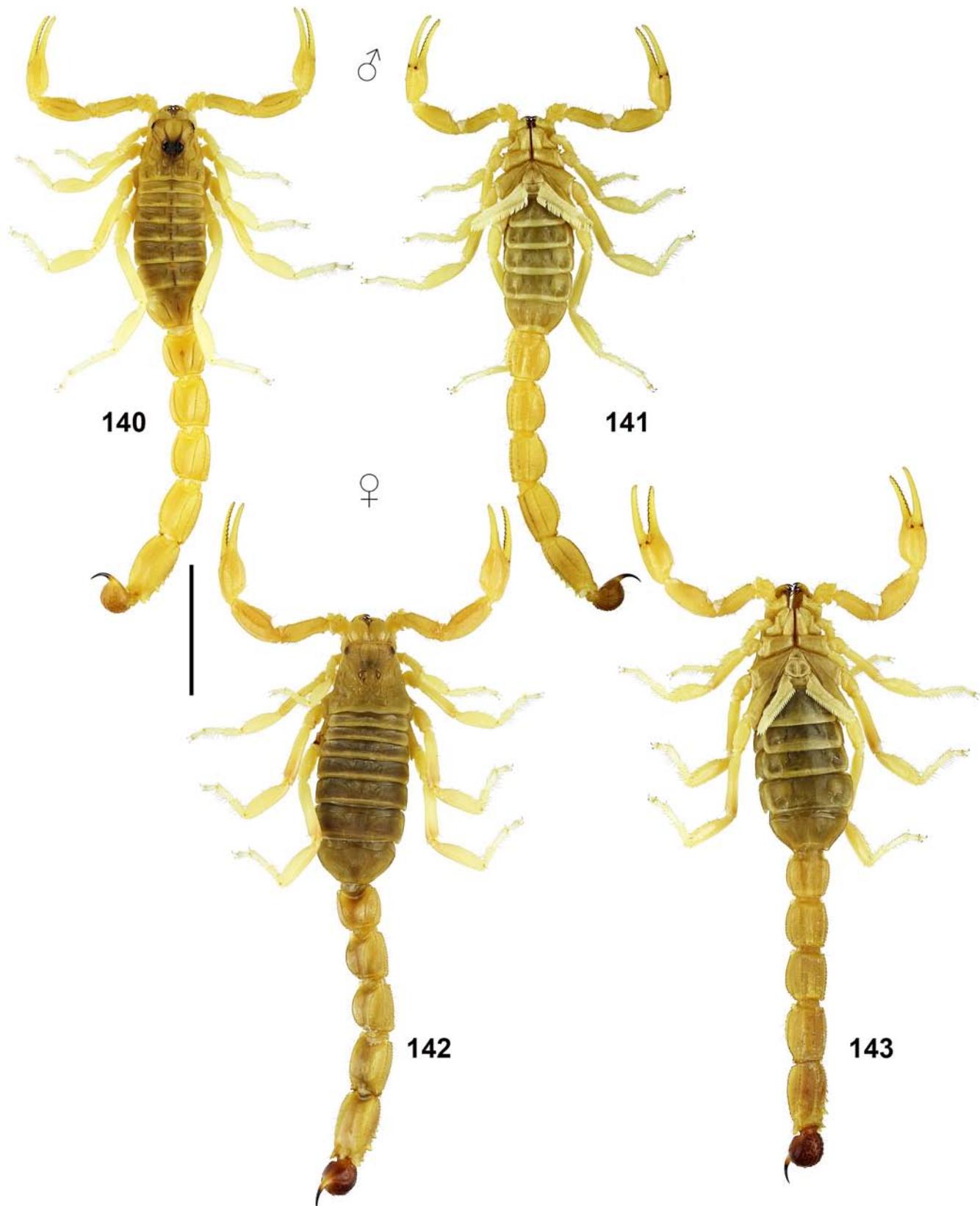
third segment length). The fourth segment bear eight carinae and the fifth segment bears five carinae. The ventrolateral carinae of the fifth segment terminate in two lobes. The ventral keels on the second and third segments posteriorly bear two to four large granules. The surface between the carinae is smooth. All segments are sparsely setose. The telson is bulbous, with aculeus shorter than the vesicle. The surface of the telson is unevenly granulated and bears an incomplete lateral carina.

Pedipalps (Figs. 114–131). The pedipalps are smooth or finely granulated. The femur bears four to five carinae; the ventroexternal carina is incomplete, the other carinae are coarsely granular. The patella bears seven coarsely granular carinae. The chela bears five carinae, which may be weak and incomplete. The movable and fixed fingers bear 10–11 rows of granules, with 11 outer and inner denticles and fixed finger with 9 outer and 10 inner denticles.

Legs (Figs. 136–139). Pairs III and IV bear long tibial spurs. Retrolateral and prolateral pedal spurs are present on all legs. The tarsomeres bear two rows of macrosetae on the ventral surface and numerous macrosetae on the other surfaces. Bristlecombs are present on the first to third legs. The femur bears four carinae and the patella bears four to six carinae. The femur and patella bear only solitary macrosetae.

Measurements. See Table 2.

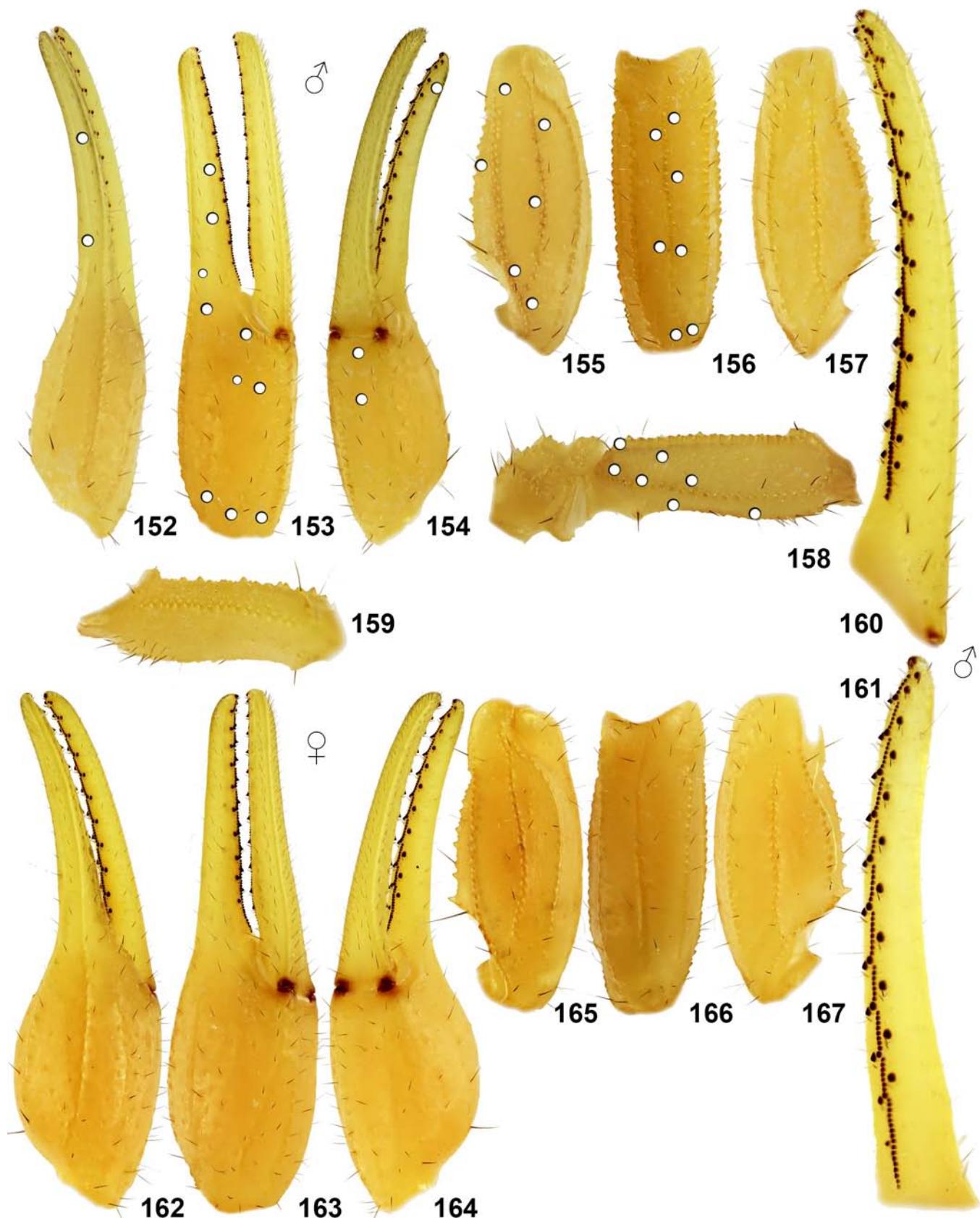
AFFINITIES. The described features distinguish *B. somalilandus* sp. n. from all other species of the genus. They are recounted in the key below. *B. somalilandus* sp. n. is similar to *B. zeylensis*. It is possible to mainly differentiate these two species mainly according to pedipalp movable finger dentition (see key below).



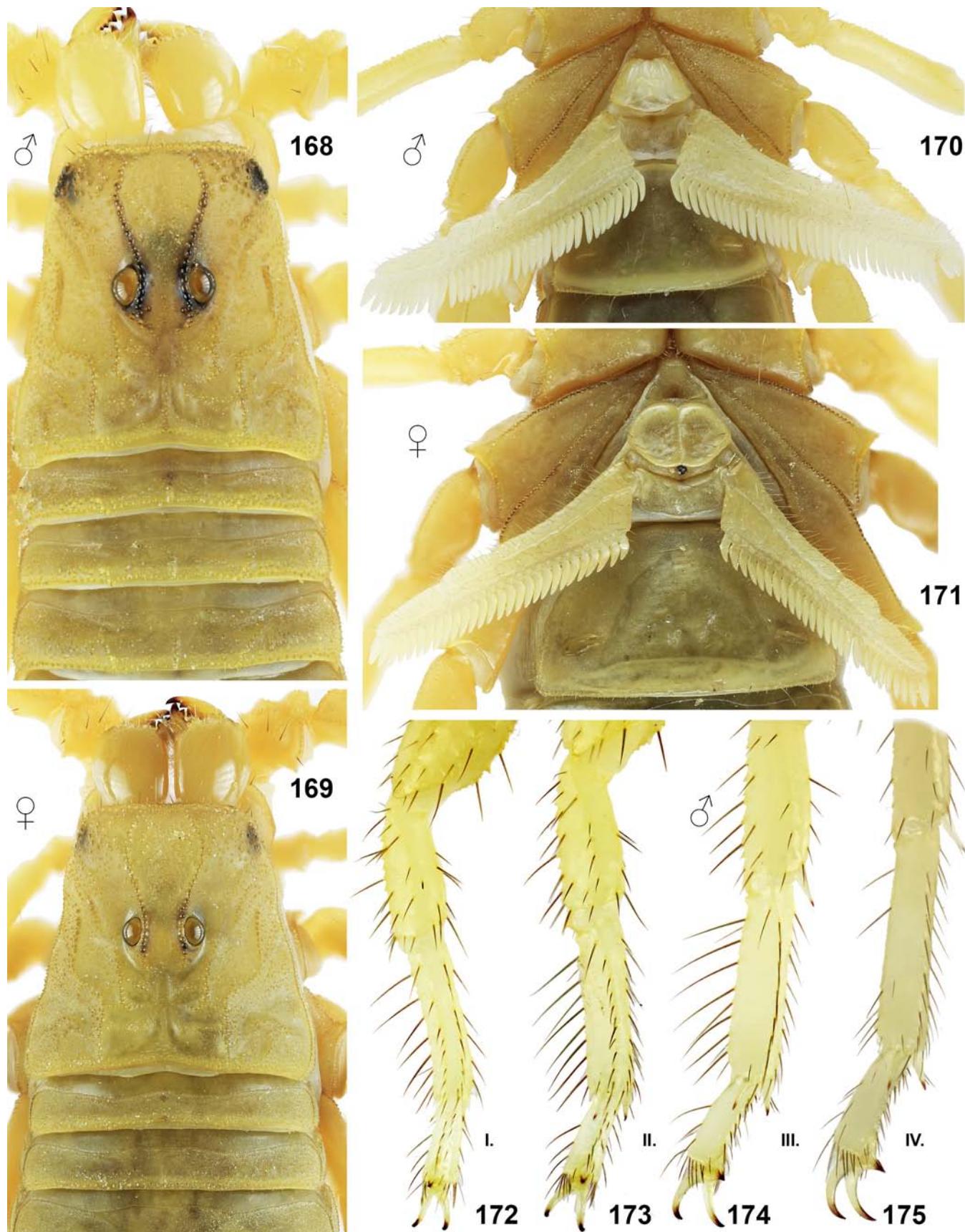
Figures 140–143: *Buthus zeylensis* from locality 19SH. **Figures 140–141.** Male in dorsal (140) and ventral (141) views. **Figures 142–143.** Female in dorsal (142) and ventral (143) views. Scale bar: 10 mm.



Figures 144–151: *Buthus zeylensis* from locality 19SH. **Figures 144, 146–148.** Male, telson lateral (144), and metasoma and telson lateral (146), dorsal (147), and ventral (148) views. **Figures 145, 149–151.** Female, telson lateral (145), and metasoma and telson lateral (149), dorsal (150), and ventral (151) views. Scale bar: 10 mm (146–151).



Figures 152–167: *Buthus zeylensis* from locality 19SH, pedipalp segments. **Figures 152–161.** Male. Chela dorsal (152), external (153) and ventral (154) views. Patella dorsal (155), external (156) and ventral (157) views. Trochanter and femur dorsal (158) and ventral (159) views. Movable (160) and fixed (161) finger dentition. Trichobothrial pattern is indicated by white circles (152–156, 158). **Figures 162–167.** Female. Chela dorsal (162), external (163) and ventral (164) views. Patella dorsal (165), external (166) and ventral (167) views.



Figures 168–175: *Buthus zeylensis* from locality 19SH. **Figures 168, 170, 172–175.** Male, carapace and tergites I–IV (168), coxosternal area and sternites (170), left legs I–IV, retrolateral aspect (172–175 respectively). **Figures 169, 171.** Female, carapace and tergites I–III (169), coxosternal area and sternites III–VI (171).



Figures 176–190: Comparison of pdipalp chela (176, 178, 180, 182, 184), pedipalp patella (177, 179, 181, 183, 185), and telson (186–190) of males of *Buthus*. **Figures 176–177, 186.** *B. awashensis*, holotype. **Figures 178–179, 187.** *B. berberensis* from locality 19SO. **Figures 180–181, 188.** *B. pococki* sp. n., holotype. **Figures 182–183, 189.** *B. somalilandus* sp. n., holotype. **Figures 184–185, 190.** *B. zeylensis* from locality 19SH.

Buthus zeylensis Pocock, 1900, stat. n.

(Figures 101, 140–175, 184–185, 190, 194, 207–209, 210, Tables 2–3)

Buthus occitanus zeylensis Pocock, 1900: 56–57.

Buthus occitanus berberensis (in part): Levy & Amitai, 1980: 16, 21; Fet & Lowe, 2000: 95 (complete references list until 1998).

Buthus berberensis: Lourenço, 2008: 46; Sousa et al., 2017: 38 (in part).

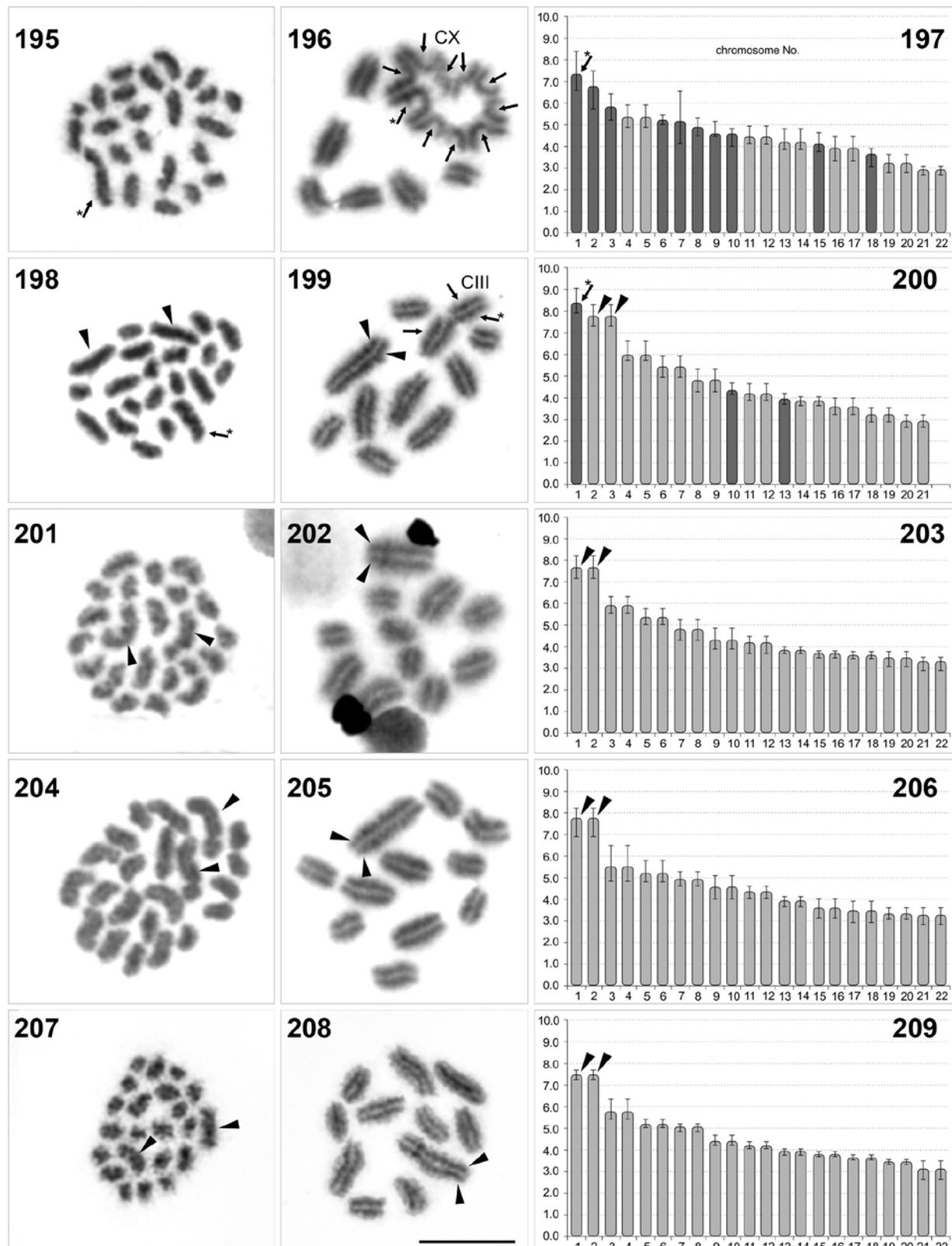
TYPE LOCALITY AND TYPE REPOSITORY. Somaliland, Zeyla; BMNH.

MATERIAL EXAMINED. **Somaliland**, Gerissa, 10°36'01"N 43°26'07"E, 245 m a. s. l. (Locality No. 19SH = 17ST), 11.–12.IX.2017, 22♂7♀21juvs. (Nos. 1294, 1295, 1297), FKCP, 1♂1♀, RTOC, 3.VII.2019, 8♂3♀12juvs. (No. 1686), FKCP, leg. F. Kovařík.

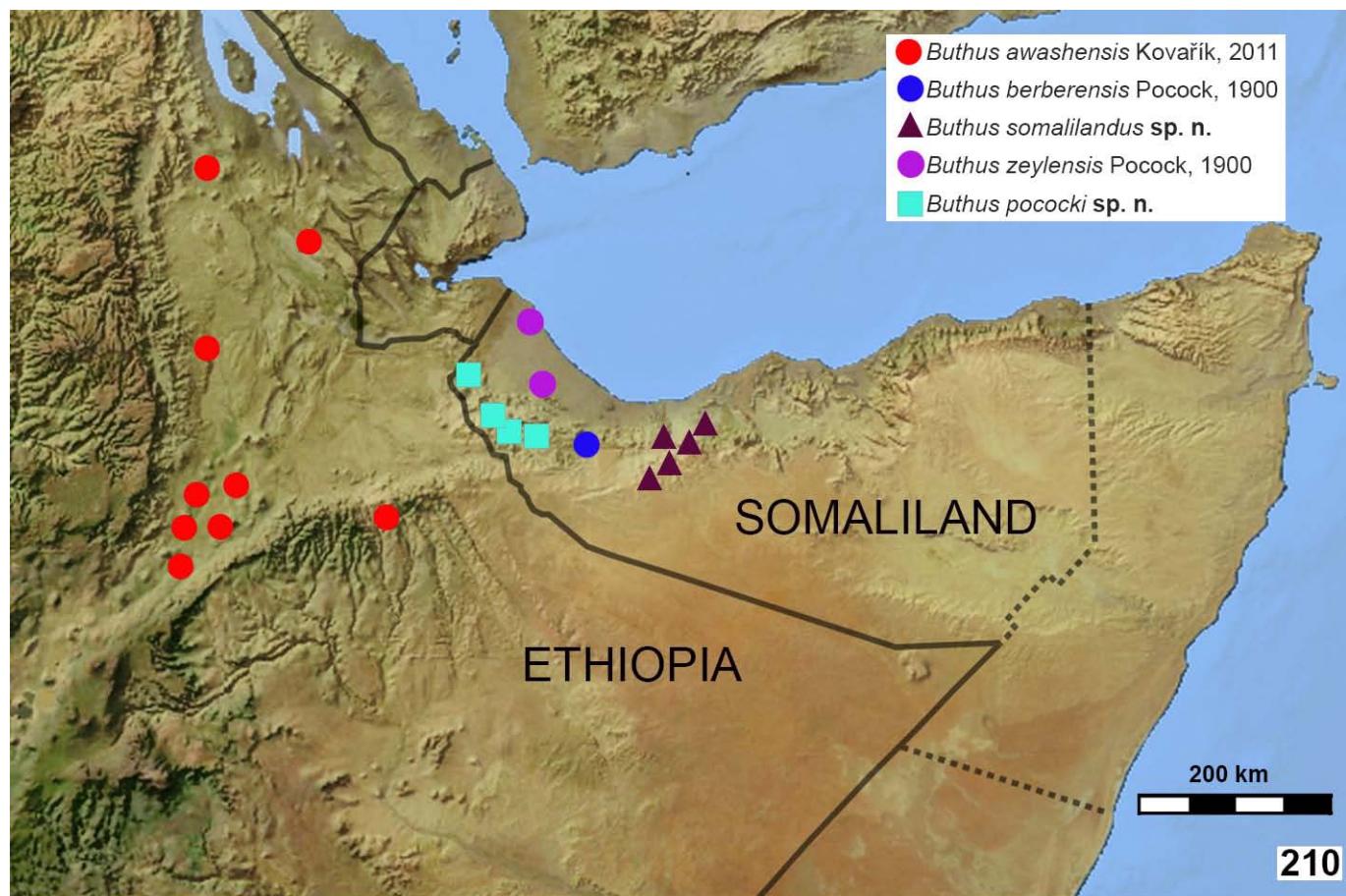
DIAGNOSIS. Total length 37–54 mm. Base color yellow dark pattern reduced; telson brown; chelicerae pale yellow without reticulation. Pedipalp movable fingers bear 10–11 rows of granules, with 12 outer and inner denticles and fixed finger with 10–11 outer and inner denticles. Chela of pedipalp narrower in male, its length to width ratio 3.4–3.6 in females and 4.1–4.3 in males. Telson bulbous, with aculeus shorter than vesicle. Pectinal teeth number 25–29 in females and 28–35 in males.



Figures 191–194: *Buthus*, *in vivo* habitus. Figure 191. *B. awashensis*, female paratype. Figure 192. *B. pococki* sp. n., male paratype. Figure 193. *B. somalilandus* sp. n., female, paratype. Figure 194. *B. zeylensis* from locality 19SH.



Figures 195–209: Male mitotic metaphases (195, 198, 201, 204, 207), postpachytene (196, 199, 202, 205, 208) and ideograms (197, 200, 203, 206, 209) of *Buthus* species from the Horn of Africa. **Figures 195–197.** *B. awashensis*, topotype from locality 12EX ($2n=22$, 6II+CX). **Figures 198–200.** *B. berberensis* from locality 19SO ($2n=21$, 9II+CIII). **Figures 201–203.** *B. pococki* sp. n., paratopotype ($2n=22$, 11II). **Figures 204–206.** *B. pococki* sp. n., paratype from locality 19SN ($2n=22$, 11III). **Figures 207–209.** *B. zeylensis* from locality 19SH ($2n=22$, 11II). Arrows show chromosomes in multivalent association during postpachytene. Asterisks show extra-large chromosome from multivalents. Arrowheads indicate large chromosome pair. Scale bar: 10 µm (195–196, 198–199, 201–202, 204–205, 207–208).



Figures 210–211. Distribution of genus *Buthus* in Ethiopia and Somaliland (210) and type locality of *B. somalilandus* sp. n. (211).

Species (code)	2n	Ppt configuration	% TCL	Locality
<i>B. awashensis</i> (290)	22	6II+CX	7.32-2x2.91	Ethiopia (12EX)
<i>B. berberensis</i> (1684)	21	9III+CIII	8.35, 2x7.76+2x5.98-2.90	Somaliland (19SO)
<i>B. pococki</i> sp. n. (1677)	22	11II	2x7.65+2x5.89-2x3.29	Somaliland (19SC)
<i>B. pococki</i> sp. n. (1688)	22	11II	2x7.74+2x5.52-2x3.26	Somaliland (19SN)
<i>B. zeylensis</i> (1294, 1295, 1297)	22	11II	2x7.45+2x5.77-2x3.13	Somaliland (19SH)

Table 3. The diploid numbers, the postpachytene configuration (Ppt configuration), the percentage of the total chromosome length of the diploid set (% TCL) and the localities of *Buthus* species from the Horn of Africa.

COMMENTS. Levy & Amitai (1980: 21) synonymized *Buthus occitanus zeylensis* Pocock, 1900 with *Buthus occitanus berberensis* Pocock, 1900. They argued that “examination of Pocock’s types and of additional material from Somalia showed that these two forms are in fact the two sexes of the same subspecies, the first the male, the second the female.” We studied in detail a large collection of Somaliland specimens collected during expeditions of 2011–2019; this study, including cytogenetic and DNA analysis, confirmed that these two taxa are valid species. Here, we restore *Buthus occitanus zeylensis* Pocock, 1900 from synonymy and elevate it to species rank.

COMMENTS ON LOCALITIES AND LIFE STRATEGY. In 2019, two of us (FK, HE) visited the city of Zeyla, the type locality of *Buthus zeylensis* Pocock, 1900. It is an extremely hot place, with heavily salted soils. We collected scorpions several km from the city (11°19'31.2"N 43°22'16.9"E) and found there *Hottentotta polystictus* (Pocock, 1896), *Microbuthus litoralis* (Pavesi, 1885) (first record for Somaliland), *Orthochirus afar* Kovařík et Lowe, 2016 and *Parabuthus granimanus* Pocock, 1895 (topotypes) but no *Buthus* specimens. *Buthus zeylensis* is common in Gerissa, a very hot, sandy semidesert area (Fig. 101) where we recorded also *H. polystictus*, *O. afar*, and *P. granimanus*, but also *Compsobuthus somalilandus* Kovařík, 2012, *Gint gubanensis* Kovařík et al., 2018 (type locality), and *Neobuthus gubanensis* Kovařík et al., 2018 (type locality).

Key to the species of *Buthus* in the Horn of Africa

1. Telson orange to brown (Figs. 193–194). 3
 - Telson yellow (Figs. 191–192). 2
2. Mesosoma, legs, and pedipalps with strong dark pattern (Figs. 176–177). Chelicerae pale yellow, reticulated only in anterior part. *B. awashensis* Kovařík, 2011
 - Base color yellow, dark pattern reduced (Figs. 180–181). Chelicerae pale yellow without reticulation. *B. pococki* sp. n.
3. Mesosoma, legs, and mainly pedipalps with strong dark pattern (Figs. 178–179). Chelicerae pale yellow, reticulated only in anterior part. *B. berberensis* Pocock, 1900
 - Base color yellow, dark pattern reduced (Figs. 182–185). Chelicerae pale yellow without reticulation. 4

4. Telson brown (Fig. 194). Movable pedipalp finger with 12 outer and inner denticles and fixed finger with 10–11 outer and inner denticles. *B. zeylensis* Pocock, 1900
 - Telson orange (Fig. 193). Movable pedipalp finger with 11 outer and inner denticles and fixed finger with 9 outer and 10 inner denticles. *B. somalilandus* sp. n.

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References

- FET, V., B. GANTENBEIN, A. V. GROMOV, G. LOWE & W. R. LOURENÇO. 2003. The first molecular phylogeny of Buthidae (Scorpiones). *Euscorpius*, 4: 1–10.
- FET, V. & G. LOWE. 2000. Family Buthidae C. L. Koch, 1837. Pp. 54–286 in Fet, V., W. D. Sissom, G. Lowe & M. E. Braunwalder. *Catalog of the Scorpions of the World (1758–1998)*. New York: The New York Entomological Society, 689 pp.
- GUÉNIN, H. A. 1961. Contribution à la connaissance cytologique des scorpions: les chromosomes de *Buthus occitanus* Amor. (I). *Vie et Milieu*, 12: 89–96.
- KOVARÍK, F. 2009. *Illustrated catalog of scorpions. Part I. Introductory remarks; keys to families and genera; subfamily Scorpioninae with keys to Heterometrus and Pandinus species*. Prague: Clairon Production, 170 pp.

- KOVAŘÍK, F. 2011. *Buthus awashensis* sp. n. from Ethiopia (Scorpiones, Buthidae). *Euscorpius*, 128: 1–6.
- KOVAŘÍK, F. 2019. Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part XXII. Two new species of *Neobuthus* from Somaliland (Buthidae). *Euscorpius*, 294: 1–16.
- KOVAŘÍK, F., G. LOWE, M. SEITER, J. PLÍŠKOVÁ & F. ŠTÁHLAVSKÝ. 2015. Scorpions of Ethiopia (Arachnida: Scorpiones). Part II. Genus *Babycurus* Karsch, 1886 (Buthidae), with description of two new species. *Euscorpius*, 196: 1–31.
- KOVAŘÍK, F. & A. A. OJANGUREN AFFILASTRO. 2013. *Illustrated catalog of scorpions. Part II. Bothriuridae; Chaerilidae; Buthidae I. Genera Compsobuthus, Hottentotta, Isometrus, Lychas, and Sassanidotus*. Prague: Clairon Production, 400 pp.
- KOVAŘÍK, F., F. ŠTÁHLAVSKÝ, T. KOŘÍNKOVÁ, J. KRÁL & T. VAN DER ENDE. 2009. *Tityus ythieri* Lourenço, 2007 is a synonym of *Tityus magnimanus* Pocock, 1897 (Scorpiones: Buthidae): a combined approach using morphology, hybridization experiments, chromosomes, and mitochondrial DNA. *Euscorpius*, 77: 1–12.
- LEACH, W. E. 1815. A tabular view of the external characters of four classes of animals, which Linné arranged under Insecta; with the distribution of the genera composing three of these classes into orders, etc. and descriptions of several new genera and species. *Transactions of the Linnean Society of London*, 11: 306–400.
- LEVY, G. & P. AMITAI. 1980. *Fauna Palaestina, Arachnida I. – Scorpiones*. Jerusalem: The Israel Academy of Sciences and Humanities, 132 pp.
- LOURENÇO, W. R. 2008. About the presence of the genus *Buthus* Leach, 1815 in the Arabian Peninsula and description of a new species (Scorpiones, Buthidae). *Entomologische Mitteilungen aus dem Zoologischen Museum Hamburg*, 15(179): 45–52.
- MATTOS, V. F., D. M. CELLA, L. S. CARVALHO, D. M. CANDIDO & M. C. SCHNEIDER. 2013. High chromosome variability and the presence of multivalent associations in benthid scorpions. *Chromosome Research*, 21: 121–136.
- POCOCK, R. I. 1900. On a collection of insects and arachnids made in 1895 and 1897 by Mr. C. A. V. Peel, F. Z. S. in Somaliland, with descriptions of new species. 10. General list of the scorpions of Somaliland and the Boran Country. *Proceedings of the Zoological Society of London*, 1900: 55–63.
- SADÍLEK, D., P. NGUYEN, H. KOÇ, F. KOVAŘÍK, E. A. YAĞMUR & F. ŠTÁHLAVSKÝ. 2015. Molecular cytogenetics of *Androctonus* scorpions: an oasis of calm in the turbulent karyotype evolution of the diverse family Buthidae. *Biological Journal of the Linnean Society*, 115: 69–76.
- SAKAMOTO, Y. & A. A. ZACARO. 2009. LEVAN, an ImageJ plugin for morphological cytogenetic analysis of mitotic and meiotic chromosomes. Available at: <http://rsbweb.nih.gov/ij/plugins/levan/levan.html>. Accessed 3rd June 2016.
- SOUZA P., M. A. ARNEDO & D. J. HARRIS. 2017. Updated catalogue and taxonomic notes on the Old-World scorpion genus *Buthus* Leach, 1815 (Scorpiones, Buthidae). *ZooKeys*, 686: 15–84.
- STAHNKE, H. L. 1971. Scorpion nomenclature and mensuration. *Entomological News*, 81: 297–316.
- VACHON, M. 1974. Études des caractères utilisés pour classer les familles et les genres des scorpions (Arachnides). 1. La trichobothriotaxie en arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. *Bulletin du Muséum national d'Histoire naturelle*, 3e série, 140 (Zoologie, 104): 857–958.