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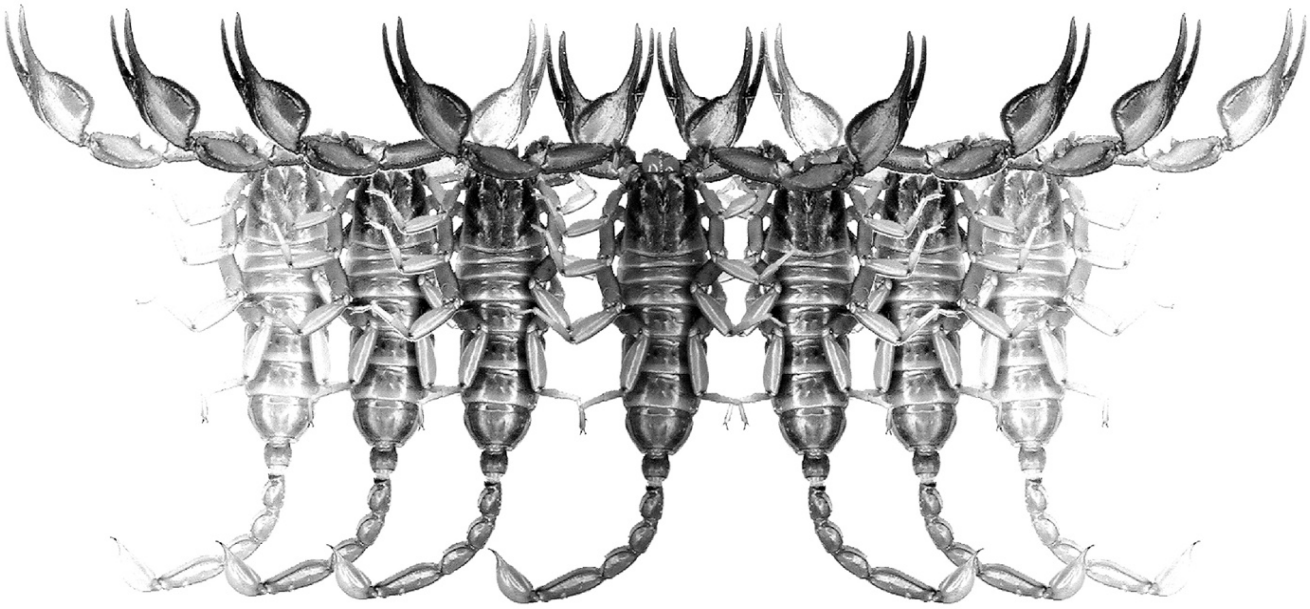

Somalibuthus sabae sp. n., a new buthid scorpion from Kenya (Scorpiones: Buthidae)

František Kovařík & Laban Njoroge

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The name ***Euscorpius*** Thorell, 1876 refers to the most common genus of scorpions in the Mediterranean region and southern Europe (family Euscorpiidae).

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Somalibuthus sabae sp. n., a new buthid scorpion from Kenya (Scorpiones: Buthidae)

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http://zoobank.org/urn:lsid:zoobank.org:pub:A0CE47FD-4F3E-4963-B9D4-9A41F577F4EA

Summary

The poorly known buthid genus *Somalibuthus* Kovařík, 1998, is recorded for the first time from Kenya, with the description of a new species, *S. sabae* **sp. n.**, from Kiwayu Island in the Kiunga Marine National Reserve. Based on a detailed study of the new materials, a revised diagnosis is given for the genus. Several generic characters suggest affinities with three other genera of small buthids found in the Horn of Africa: *Neobuthus* Hirst, 1911, *Gint* Kovařík, Lowe, Plíšková et Šťáhlavský, 2013, and *Lanzatus* Kovařík, 1998.

Introduction

Kovařík (1998) described a monotypic buthid genus *Somalibuthus*, with type species *S. demisi*, on the basis of three specimens, an adult male holotype (misidentified as female) and two juvenile paratypes collected by Italian expeditions in 1971 and 1973 from the coastal dune system of Sar Uanle, southern Somalia. No further specimens of this small, poorly known scorpion have come to light over the past 22 years. A second member of the genus is reported here: *S. sabae* **sp. n.**, collected from another coastal location in Kenya. The diagnosis of the genus is updated on the basis of the new material. Several diagnostic characters of *Somalibuthus* suggest affinities with three other genera of small buthids distributed in the Horn of Africa.

Abbreviations

Specimen depository: NMK (National Museums of Kenya, Nairobi, Kenya); NMPC (National Museum of Natural History, Prague, Czech Republic). *Biometrics*: L, length; W, width; D, depth. *Material*: juv, juvenile(s).

Materials & Methods

Nomenclature and measurements generally follow Stahnke (1971), Kovařík (2009), and Kovařík & Ojanguren Affilastro (2013), except for trichobothriotaxy (Vachon, 1974, 1975), chelicerae (Vachon, 1963), sternum (Soleglad & Fet, 2003), hemispermatophore (Kovařík et al., 2018), metasomal carination (Lowe et al., 2014) and tarsi (Haradon, 1984). Illustrations were prepared from digital images acquired with reflected or trans-illuminated white light, or UV epifluorescence illumination (Prendini, 2003; Volschenk, 2005). Image frames from different focal planes were merged in software (Zerene Stacker 1.04).

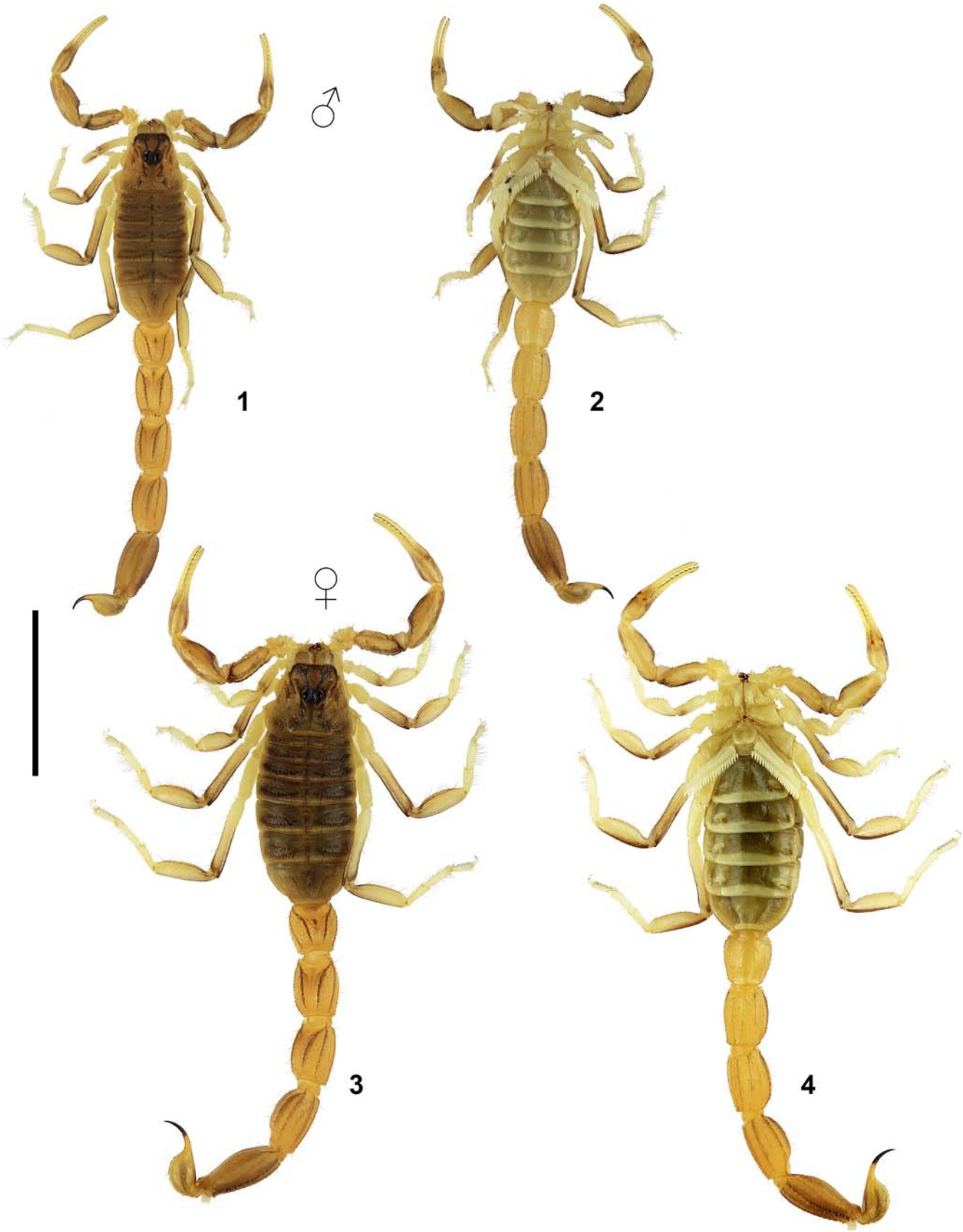
Comparative material. *Lanzatus somalilandus* Kovařík, Lowe & Šťáhlavský, 2016: Somaliland, Shanshade vill., 08°39'35"N 45°55'49"E, 790 m a. s. l. (Locality No. 18SJ), 29–31.VIII.2018, leg. F. Kovařík et al., 1♂, No. 1525 (Figs. 111–115).

Systematics

Family Buthidae C. L. Koch, 1837
Genus *Somalibuthus* Kovařík, 1998
(Figures 1–110, 116–117, Table 1)

Type species. *Somalibuthus demisi* Kovařík, 1998.

revised diagnosis. Small to medium-sized scorpions, total length up to 32 mm (male) or 40 mm (female). Carapace trapezoidal, nearly flat in lateral view, preocular area slightly higher than postocular area. Carapace surface densely granular, with anterior median, central median, and posterior median carinae well developed, and posterior median carinae not joined to central median carinae. Carapace with 5 lateral eyes ('type 5' pattern; Loria & Prendini, 2014). Tergites densely granular, tergites I–II without carinae or weakly monocarinate, III–VI tricarinate, VII pentacarinate. Tergites I–VI with several macrosetae on posterior margins. Sternites III–VI medially smooth, with smooth posterior margins, stigmata narrow, slit-like. Sternite VII medially smooth with 2 granular lateral carinae. Pectines with fulcra, hirsute, pectinal tooth counts: ♂ 21–23, ♀ 20–23. Hemispermatophore flagelliform, with flagellum separated from a 3-lobed sperm hemiduct. Hemispermatophore capsule with oblique, scoop-like basal lobe. Metasoma elongate, gradually decreasing in width posteriorly, segments I–III with 10 complete carinae, IV with 8 complete carinae plus indicated lateral median carinae. Metasoma I ventrally smooth with ventrosubmedian carinae



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

smooth and weak. Ventrolateral carinae of metasoma V with slightly enlarged, non-lobate dentition on posterior half of segment. Telson with vesicle slightly elongate, posterior surface with moderate slope, not sharply inclined or truncated, lacking subaculear tubercle. Aculeus about the same length as vesicle or slightly shorter. Both metasoma and telson bearing numerous macrosetae of moderate length in both sexes. Tergite VII and metasoma I–III bear fringes of microsetae on posterior margins. Chelicerae with characteristic buthid dentition (Vachon, 1963: 162, fig. 1), ventral aspect of fixed finger with single denticle. Pedipalps short, chelae smooth, lacking carinae. Dentate margins of fixed and movable fingers armed with 8 non-imbricated median denticle rows, each row flanked by one external and one internal accessory denticle. Movable finger with 4 subterminal granules. Proximal dentate margins of fingers straight in both sexes, lacking sexually dimorphic scalloping or undulation. Trichobothrial pattern orthobothriotaxic type A (Vachon, 1974): femur d_1-d_3-d_4 in β configuration (non-reflex angle opening internally) (Vachon, 1975); femur trichobothrium d_2 situated dorsal to dorsointernal carina, patella d_3 situated internal to dorsomedian carina (Fet et al., 2005); manus Eb_1- Eb_2- Eb_3 in δ configuration (non-reflex angle opening distally) (Lowe & Kovařík, 2019); manus V_1-V_2 axis slightly inclined internally; fixed finger with *db* situated near base of finger, proximal to *est*, and *dt* situated distal to *et*. Tibial spurs present on legs III–IV. Basitarsi I–III with regular series of long macrosetae on retrosuperior margins (bristlecombs). Telotarsi with 2 irregular rows of macrosetae on ventral surfaces.

Affinities. Fet et al (2005) assigned *Somalibuthus* to the '*Buthus*' group, a major clade of arid-adapted Palearctic buthid genera, characterized by: trichobothrial pattern type A-β; femur trichobothrium d_2 on dorsal surface; patella trichobothrium d_3 internal to dorsomedian carina; and tibial spurs present on legs III–IV. The placement is confirmed here by additional characters that have been proposed as diagnostic for the '*Buthus*' group (Kovařík et. al., 2016b: 113, 115–116; Lowe et al., 2018; Lowe & Kovařík, 2019; Lowe & Kovařík, 2021), i.e.: manus Eb_1- Eb_2- Eb_3 in δ configuration; hemispermatophore with flagellum separated from sperm hemiduct, and with capsule lobes in 3+1-configuration (3-leaflet sperm hemiduct + 1 basal lobe); pedipalp finger median denticle rows non-imbricated; posterior margins of tergite VII & metasoma I–III bearing fringes of microsetae.

Within the '*Buthus*' group, *Somalibuthus* shares characters with three other genera of small scorpions in the Horn of Africa: *Gint* Kovařík, Lowe, Plíšková et Šťáhlavský, 2013; *Neobuthus* Hirst, 1911, and *Lanzatus* Kovařík, 2001). The genus *Gint* resembles *Somalibuthus* in: small to medium size (♂ < 25 mm, ♀ < 48 mm); similar pectinal tooth counts (♂ 21–31, ♀ 20–29); similar number of pedipalp movable finger median denticle rows (8–10); pedipalp fixed finger with trichobothrium *dt* distal to *et*, and *db* proximal to *est*; ventral surface of metasoma I smooth; and hemispermatophore basal lobe in the form of a broad scoop (except for the weakly developed hook in *G. maidensis*) (Kovařík et al., 2018a). However, *Gint* differs from *Somalibuthus* in: 2 denticles on ventral aspect of cheliceral fixed finger; carinae of carapace obsolete except for anterior median carinae; pedipalp chela manus with trichobothria V_1-V_2 axis parallel to manus axis; metasoma IV median lateral carinae obsolete; and metasoma V ventrolateral carinae with lobate dentition.

The genus *Neobuthus* resembles *Somalibuthus* in: similar habitus and color patterns; 1 denticle on ventral aspect of cheliceral fixed finger; pedipalp with manus trichobothrium V_1-V_2 axis inclined internally, and fixed finger with *db* proximal to *est*. However, *Neobuthus* differs from *Somalibuthus* in numerous other characters: smaller size (♂ 15–25 mm, ♀ 22–32 mm); lower pectinal tooth counts (♂ 15–22, ♀ 12–19); fewer pedipalp movable finger median denticle rows (4–6); pedipalp chela manus with trichobothria V_1-V_2 axis more strongly inclined internally; pedipalp fixed finger with trichobothrium *dt* proximal to *et*; ventral surface of metasoma I granulate; hemispermatophore basal lobe in the form of a broad hook; sexually dimorphic length of macrosetae on pedipalps and metasoma (♂ short, ♀ long); sternite VII with 4 carinae, medially granulate; and posterior surface of telson vesicle steeply inclined. Additional characters of *Neobuthus* that are different, and shared with *Gint*, include: carinae of carapace obsolete except for anterior medians; metasoma V median lateral carinae obsolete; and metasoma V ventrolateral carinae with lobate dentition.

The genus *Lanzatus* resembles *Somalibuthus* in: 1 denticle on ventral aspect of cheliceral fixed finger; similar number of pedipalp movable finger median denticle rows (7); pedipalp fixed finger with trichobothrium *dt* distal to *et*, and *db* proximal to *est*; and similar pectinal tooth counts (♂ 19–24, ♀ 18). However, *Lanzatus* differs from *Somalibuthus* in several other characters: carapace and sternite VII smooth, carinae obsolete; tergites monocarinate or lacking carinae; metasomal macrosetae short in both sexes; telson vesicle more elongate, posterior surface of telson vesicle with shallower slope; tibial spurs absent on legs III–IV; pedipalp chela manus with trichobothria V_1-V_2 axis parallel to manus axis; and femur trichobothrium d_2 situated internal to dorsointernal carina.

A single denticle on the ventral aspect of the cheliceral fixed finger is an informative character in buthid taxonomy at the genus level (Kovařík, 2009; Sissom, 1990; Stahnke, 1972). It is presumably derived by denticle loss, because two such denticles are present in the majority (37/47, 79%) of genera in the '*Buthus*' group. Chaerilids and pseudochactids, hypothesized as plesiomorphic outgroups for buthids, bear a higher number of ventral denticles (3–8), suggesting that reduced numbers are apomorphic (Soleglad & Fet, 2003). Among the four small Horn of Africa buthid genera, the single denticle is a potential synapomorphy uniting *Somalibuthus*, *Lanzatus* and *Neobuthus*. This would leave the genus *Gint*, with 2 denticles, as the most basal genus of the group. The form of the hemispermatophore basal lobe is another character that correlates with genus in the '*Buthus*' group (e.g., Kovařík et al., 2016a; Lowe, 2018; Lowe et al., 2019). The basal lobe is a broad, weakly projecting, oblique scoop in *Gint* (Kovařík et al., 2018a), *Somalibuthus* (Figs. 105–108, 110), and *Lanzatus*

Dimensions (mm)		*S. sabae* sp. n. ♂ holotype	*S. sabae* sp. n. ♂ paratype	*S. sabae* sp. n. ♀ paratype
Carapace	L / W	3.60 / 3.82	3.07 / 3.19	4.43 / 4.92
Mesosoma	L	7.83	6.78	9.55
Tergite VII	L / W	2.11 / 3.92	1.73 / 3.16	2.61 / 4.97
Metasoma + telson	L	20.54	17.44	24.7
Segment I	L / W / D	2.61 / 2.46 / 2.08	2.17 / 2.01 / 1.75	3.07 / 2.94 / 2.50
Segment II	L / W / D	3.00 / 2.26 / 2.17	2.57 / 1.84 / 1.76	3.65 / 2.80 / 2.54
Segment III	L / W / D	3.17 / 2.10 / 2.06	2.64 / 1.76 / 1.68	3.83 / 2.68 / 2.56
Segment IV	L / W / D	3.52 / 2.00 / 1.93	3.05 / 1.69 / 1.58	4.18 / 2.52 / 2.31
Segment V	L / W / D	4.29 / 1.97 / 1.81	3.62 /1.59 / 1.47	5.10 / 2.38 / 2.16
Telson	L / W / D	3.95 / 1.32 / 1.31	3.39 / 1.11 / 1.11	4.87 / 1.76 / 1.62
Pedipalp	L	10.91	9.48	12.87
Femur	L / W	2.80 / 1.05	2.36 / 0.89	3.25 / 1.23
Patella	L / W	3.45 / 1.32	3.06 / 1.15	4.09 / 1.61
Chela	L	4.66	4.06	5.53
Manus	W / D	0.94 / 0.93	0.82 / 0.80	1.18 / 1.20
Movable finger	L	3.19	2.73	3.82
Total	**L**	**31.97**	**27.29**	**38.68**

Table 1. Comparative measurements of types of *Somalibuthus sabae* **sp**. **n**. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

(Figs. 111–114). In contrast, the lobe is enlarged, robust and hook-like in *Neobuthus* (Kovařík et al., 2018b). It is suggested that this enlarged lobe is a derived character, an autapomorphy along with other unique characters of *Neobuthus*. The scoop is considered to be primitive as it is expressed in *Gint*. It was retained in both *Somalibuthus* and *Lanzatus* after the loss of a cheliceral ventral denticle. Internal angling of the V_1-V_2 trichobothrial axis on the pedipalp manus is a potential synapomorphy relating *Somalibuthus* to *Neobuthus*, leaving *Lanzatus* as the more basal outgroup. Other unique characters of *Lanzatus*, such as the loss of carinae and tibial spurs, may be autapomorphies associated with psammophilic adaptation (Kovařík et al., 2016c). In this hypothesized phylogeny, the lobate dentition on ventrolateral carinae of metasoma V that is shared by *Neobuthus* and *Gint* would be a homoplasy, an arenicolous adaptation that frequently arose independently in other buthid lineages (Lowe et al., 2019; Lowe & Kovařík, 2021).

Somalibuthus sabae sp. n.

(Figures 1–110, 116–117, Table 1)

http://zoobank.org/urn:lsid:zoobank.org:act:8D0A23BD-093B-46AE-9AE2-525CFF648549

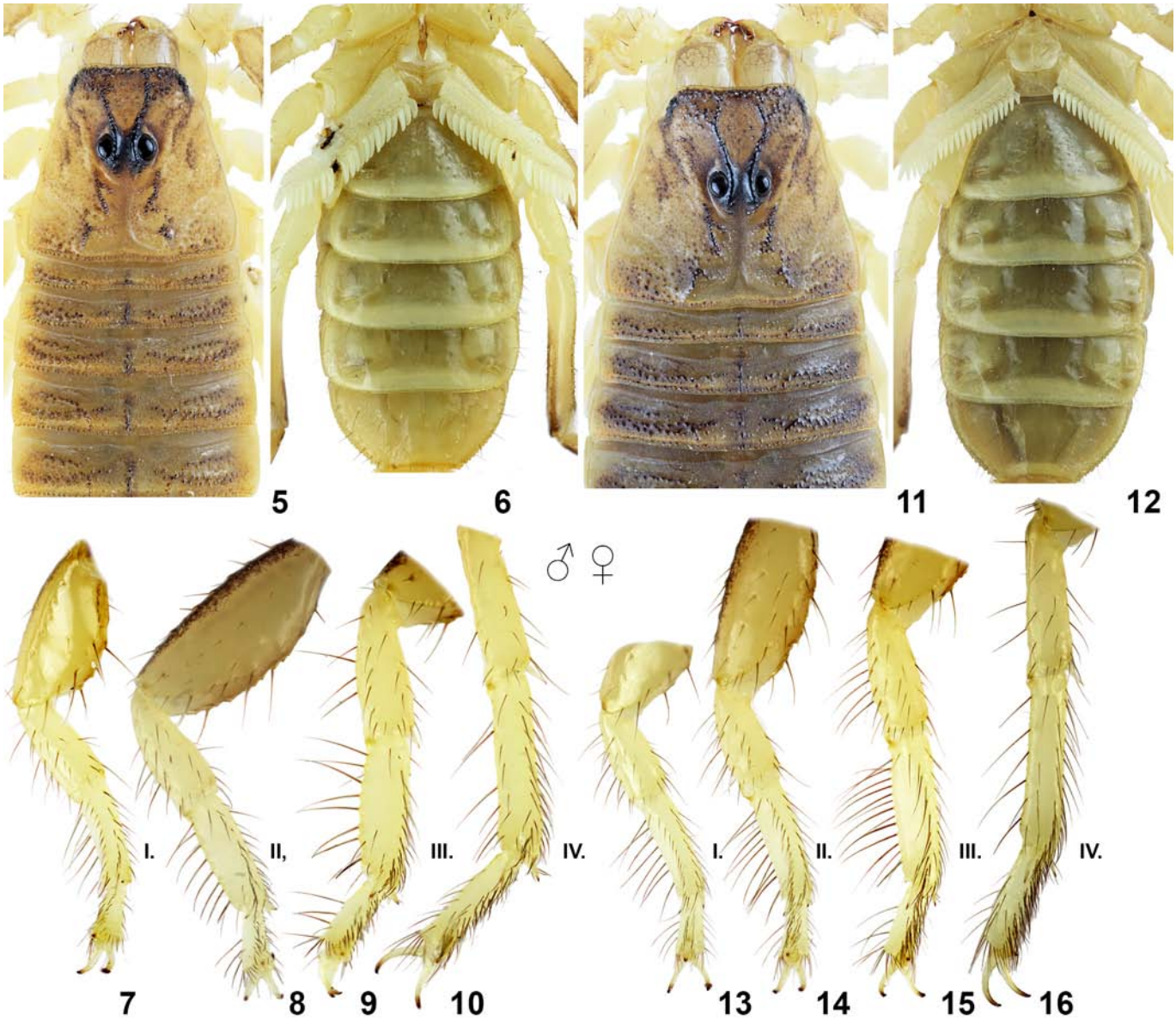
Type locality and type repository. **Kenya**, Kiwayu Island, Lamu County, 1°59'36.32"S 41°17'08.59"E; NMK.

Type material (NMK, NMPC). **Kenya**, Kiwayu Island, Lamu County, 1°59'36.32"S 41°17'08.59"E (Fig. 117), 14.XII.2020, 1♂ (holotype, NMK/INV/T-238), 2♂4♀ (paratypes, NMK/INV/T-239-244), leg. S. Douglas-Hamilton.

Etymology. The species is named in honor of the collector of the type series, Saba Douglas-Hamilton.

Diagnosis. As for the genus, augmented with the following characters: base color yellow to orange-yellow, with fuscous markings on body and appendages, tergites with variable diffuse fuscosity; pedipalp patella smooth, dorsomedian carina obsolete in proximal half; pedipalp L/W ratios, ♂: femur 2.65–2.78, patella 2.61–2.65, chela 4.95–5.01; ♀: femur 2.64, patella 2.54–2.60, chela 4.69–4.77; metasoma with sparse fine granulation on dorsal surfaces of all segments; ventromedian carinae on metasoma II smooth anteriorly, weakly granulose posteriorly, on metasoma III weakly granulose anterior, moderately granulose posteriorly; metasomal segment L/W ratios, ♂: segment I 1.06–1.12, segment II 1.33–1.40, segment III 1.50–1.53, segment IV 1.76–1.83, segment V 2.18–2.28; ♀: segment I 1.04–1.06, segment II 1.30–1.36, segment III 1.43–1.50, segment IV 1.66–1.72, segment V 2.14–2.16; telson L/W ratios, ♂: 2.79–3.05; ♀: 2.50–2.77.

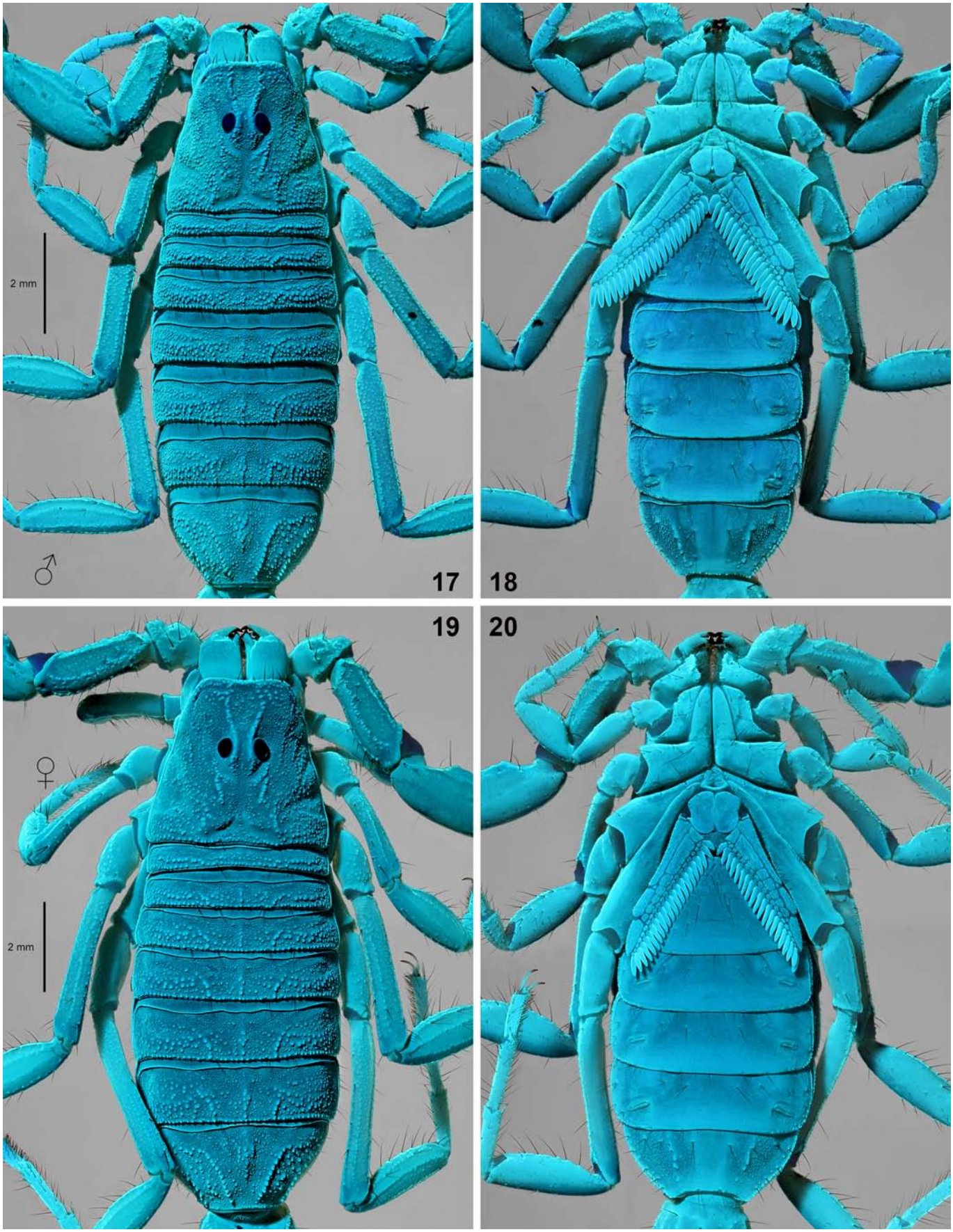
Description (♂♀). Total length 27 mm (♂) to 40 mm (♀).
Coloration (Figs. 1–16, 21, 23, 25, 27, 29–48, 91–98). Base color yellow to orange-yellow. Carapace and tergites with underlying diffuse fuscosity. Dark brown or black markings on: anterior margin, carinae, granules and median ocular tubercle of carapace, carinae and granules of tergites, distal half of cheliceral manus (reticulate pattern), internal and external carinae of pedipalp femur and patella, pedipalp chela manus, bases of pedipalp fingers, superior and inferior carinae of leg femora and patellae, metasomal carinae, and telson vesicle. Base color of metasoma V and telson weakly fuscous.



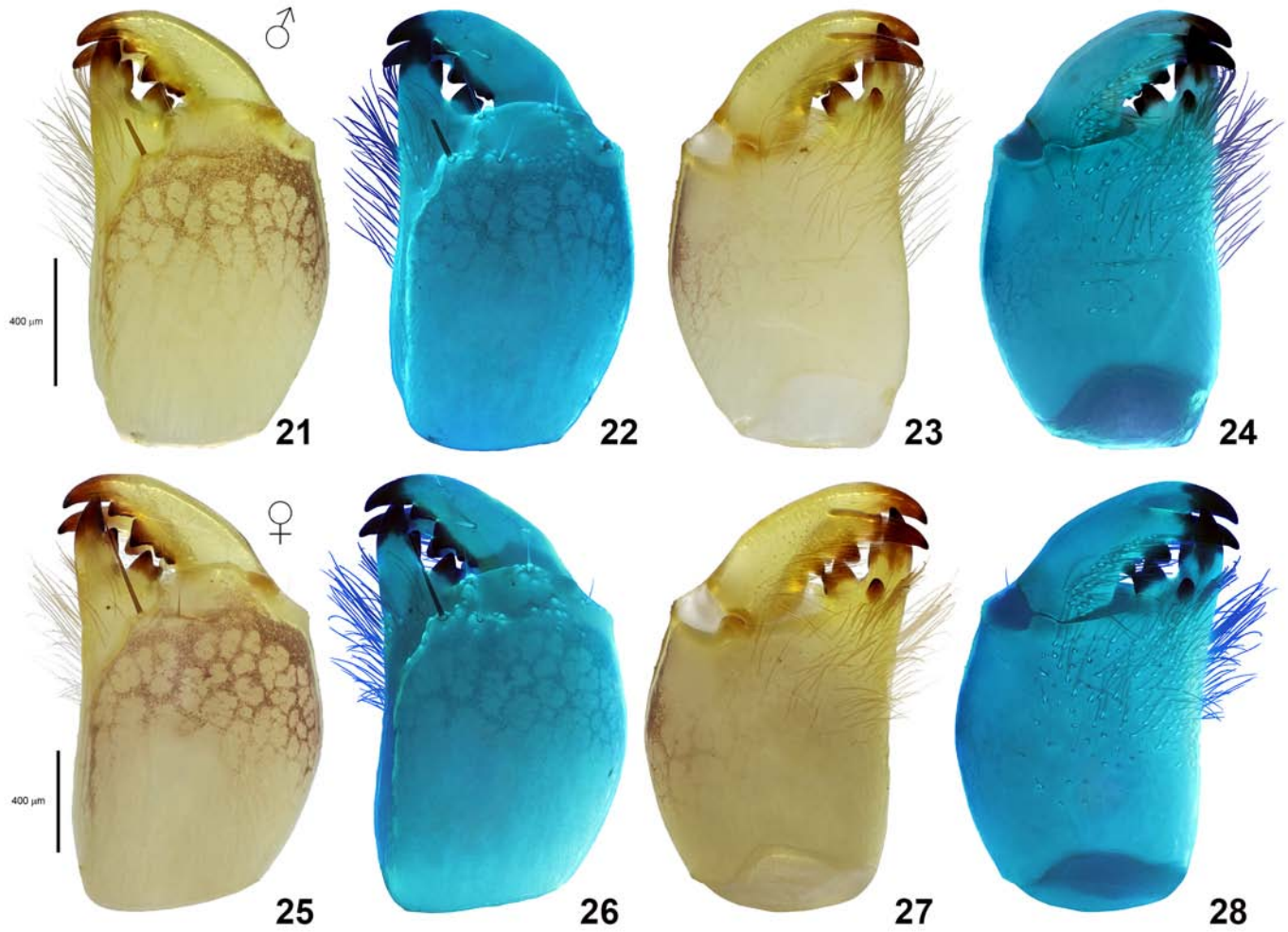
Figures 5–16: *Somalibuthus sabae* **sp**. **n**. **Figures 5–10**. Holotype male. Carapace and tergites I–V (5), sternopectinal area and sternites (6), and left legs I–IV, retrolateral aspect (7–10). **Figures 11–16**. Paratype female. Carapace and tergites I–IV (11), sternopectinal area and sternites (12), and left legs I–IV, retrolateral aspect (13–16).

Carapace (Figs. 5, 11, 17, 19). Trapezoidal, L/W 0.89–0.97. Median ocular tubercle prominent, median eyes relatively large, eye diameter/carapace midline length ratio 0.12–0.14. Five pairs of lateral eyes present (3 large major ocelli, 2 small minor ocelli). Anterior margin very weakly emarginate, nearly straight, bearing 10–13 macrosetae. Superciliary carinae strong, with coarse, fused granulation. Anterior median carinae strong, granulose, continuous over posterior 2/3 of distance from ocular tubercle to anterior margin, breaking into non-contiguous granules in anterior 1/3. Central median carinae strong, granulose, posteriorly convergent. Posterior median carinae strong but short, irregular, with large granules, not connected to central median carinae. Other carinae absent. Intercarinal surfaces with dense fine, medium and coarse granulation. Carinal and intercarinal granules polished. Central median furrow finely granulate or shagreened, posterior median and posterior marginal furrows smooth.

Chelicerae (Figs. 21–28). Dorsal surface of manus smooth, glabrous, with two short, pale microsetae on apical margin, each ringed by granules. Dorsointernal carina strong, smooth to granulate, distally bearing one long, dark macroseta. Subdistal transverse carina with sparse granules, and one short, pale microseta. Fingers robust, movable finger with large dorsal distal tine slightly shorter than large ventral distal tine, dorsal margin armed with 4 denticles (subdistal, large median, 2 small basal), ventral margin with 2 denticles (larger median, smaller basal). Fixed finger with large distal tine, subdistal denticle and proximal bicusp, and single denticle on ventral surface adjacent to bicusp. Dorsal surface of movable finger smooth, with 3 short microsetae. Numerous, long fine, microsetae distributed over dorsal surface of fixed finger, internal and ventrointernal surface of distal manus, and ventrointernal surface of movable finger.



Figures 17–**20**: *Somalibuthus sabae* **sp. n.**, carapace and tergites (17, 19) and coxosternal area and sternites (18, 20), under UV fluorescence. **Figures 17**–**18**. Paratype male. **Figures 19**–**20**. Paratype female. Scale bar: 2 mm (17–18, 19–20).



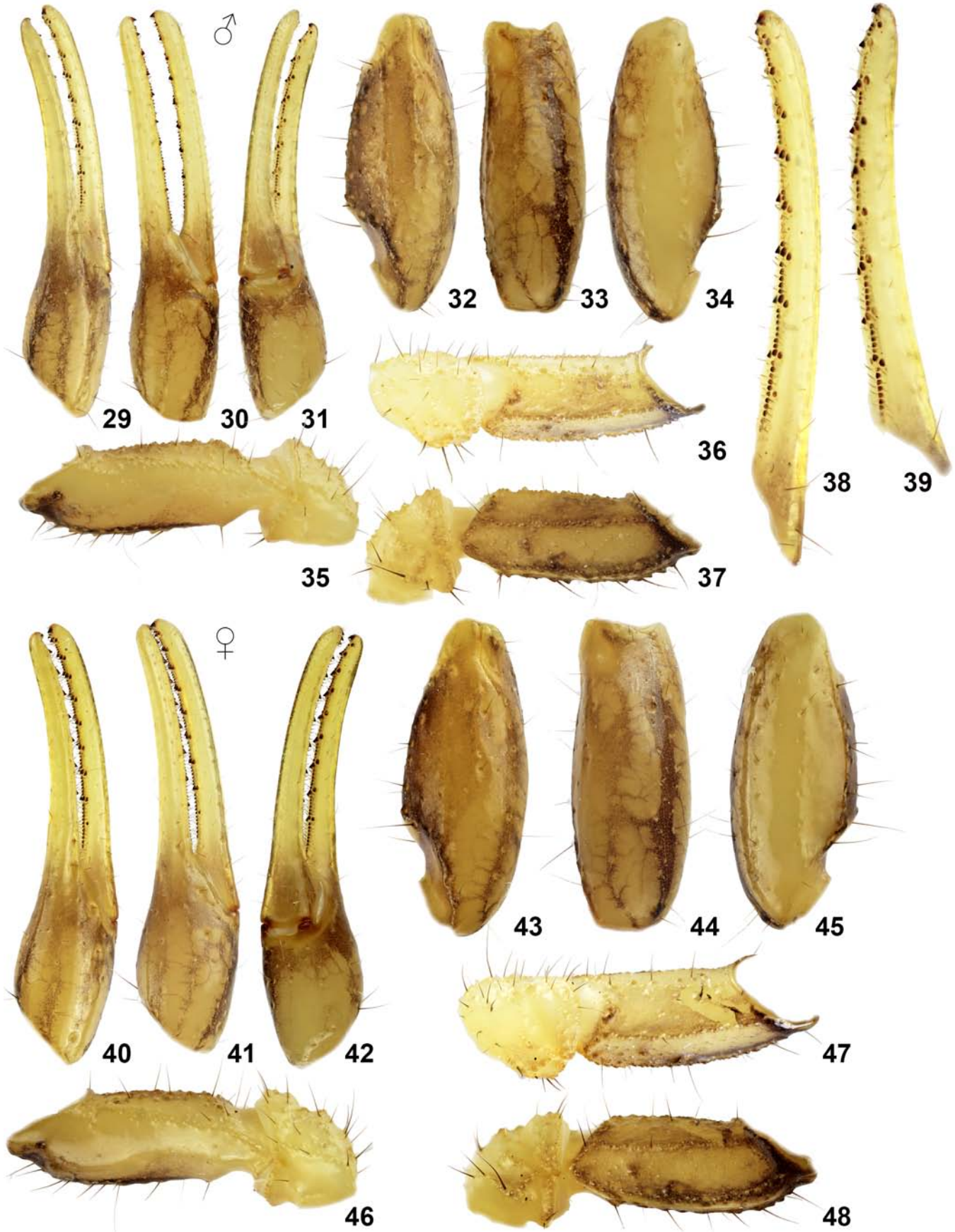
Figures 21–**28**: *Somalibuthus sabae* **sp**. **n**., chelicerae. **Figures 21**–**24**. Paratype male, right chelicera in dorsal (21–22) and ventral (23–24) views, under white light (21, 23) and UV fluorescence (22, 24). **Figures 25**–**28**. Paratype female, right chelicera in dorsal (25–26) and ventral (27–28) views, under white light (25, 27) and UV fluorescence (26, 28). Scale bars: 400 µm (21–24, 25–28).

Coxosternal area (Figs. 6, 12, 18, 20). Coxa I smooth, endite with weak medial and anterior marginal granulation. Coxa II with very sparse, fine granules (♂) or smooth (♀), endite smooth except for weak, fine granulation on posterior marginal and posterior medial areas. Coxa III with very sparse, fine granules (♂) or smooth (♀). Coxa IV: in ♂ mostly smooth with very sparse, fine granules, except for medium to coarse granulation along proximal 2/3 of anterior margin, and fine granules near proximal posterior margin; in ♀ smooth except for row of fine granules near proximal posterior margin. Macroseta counts: coxa I, medial endite 2–3, distal margin 5–6; coxa II, endite 1–2, anterior margin 4–5, distal margin 2–4; coxa III, anterior margin 3–5; coxa IV, single proximal seta. Sternum type 1, subtriangular, weakly shagreened, with deep posteromedian pit, bearing 2 macrosetae. Genital opercula smooth, each sclerite with 4–5 (♂), or 9–10 (♀) macrosetae, lateral margins concave. Male with genital papillae.

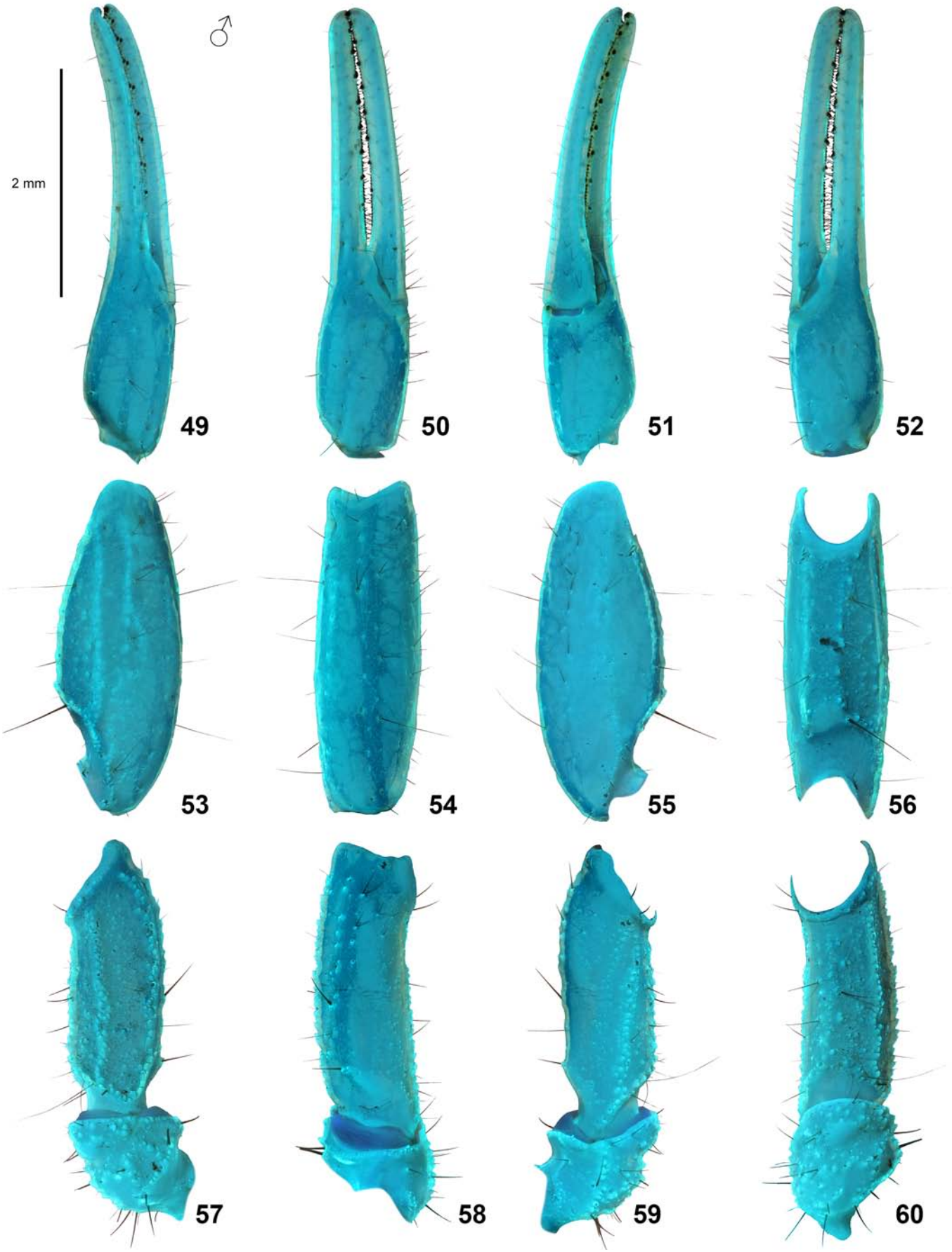
Pectines (Figs. 6, 12, 18, 20). Basal piece smooth with anterior margin concave with median pit that is deeper in males, bearing 7 (♂) – 14 (♀) macrosetae. Pectines with 3 marginal lamellae, 8–10 middle lamellae including small displaced sclerite at distal end of proximal marginal lamella. Pectines extending to distal end of coxa IV in both sexes. Pectine teeth only slightly more elongate in males than females, basal tooth shorter than other teeth. Fulcra present, paired one-to-one with pectine teeth, including small fulcrum of basal tooth. Marginal and middle lamellae with numerous macrosetae, fulcra with 2–8 setae.

Hemispermatophore (Figs. 105–110). Flagelliform, trunk elongate, ca. 6 times length of capsule region; flagellum with linear pars recta and pars reflecta, separated from sperm hemiduct lobes. Sperm hemiduct with 3 lobes: posterior lobe large, broadly laminate; median lobe small, acuminate; anterior lobe of intermediate length, tapered. Posterior margin of median lobe slightly overlapping posterior lobe, the two partially joined along axial suture. Basal lobe a broad, curved scoop, obliquely-angled, almost parallel to proximal-distal axis, distally connected to axial suture.

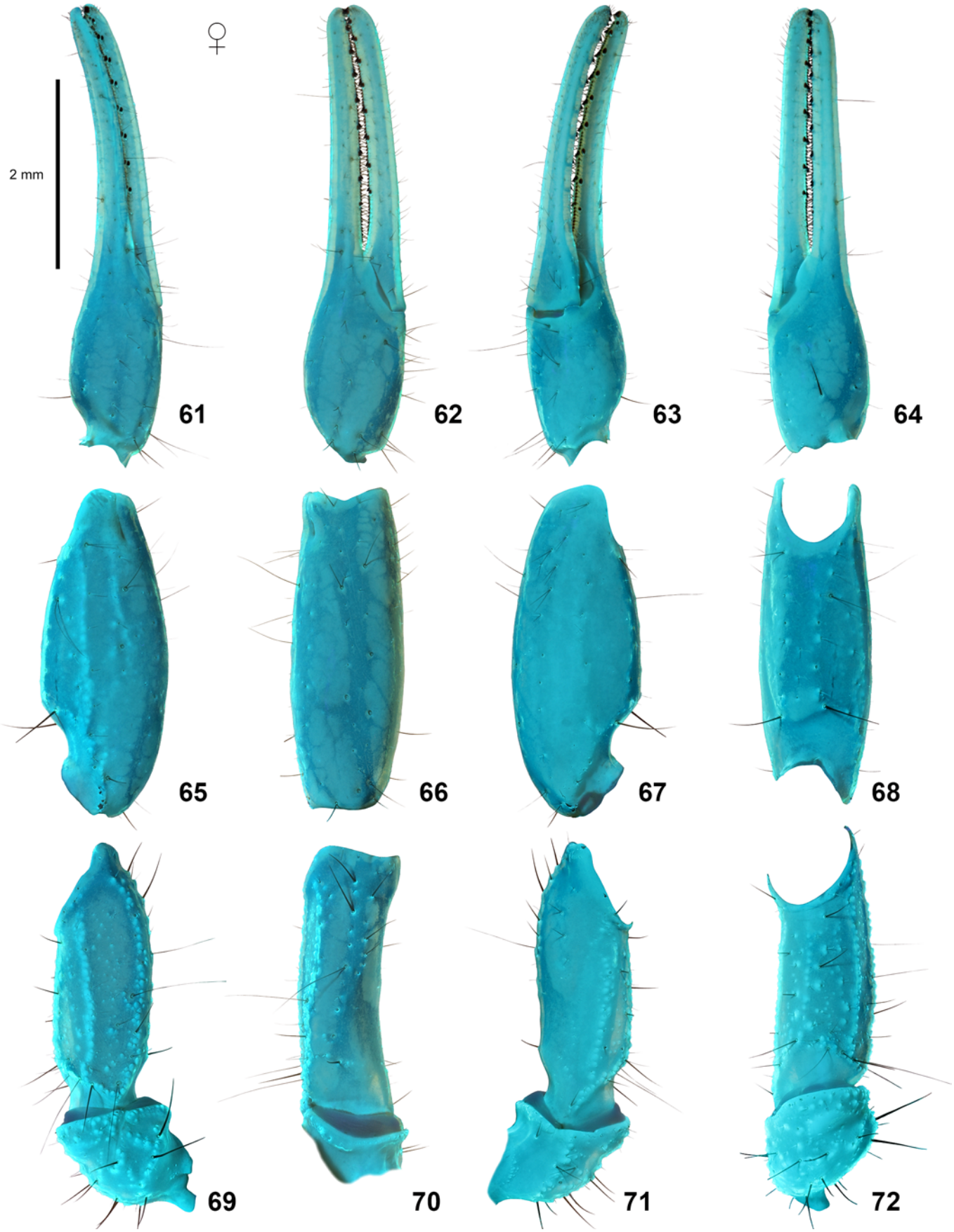
Mesosoma (Figs. 1–6, 11–12, 17–20). *Tergites*. Pretergites smooth, with weakly sinuous, finely corrugated posterior margins. Tergites densely granulated, with fine granules on anterior and medial areas, coarse granules on posterior and lateral areas. Tergite I without longitudinal carinae. A median carina and posteriorly convergent, paired lateral carinae



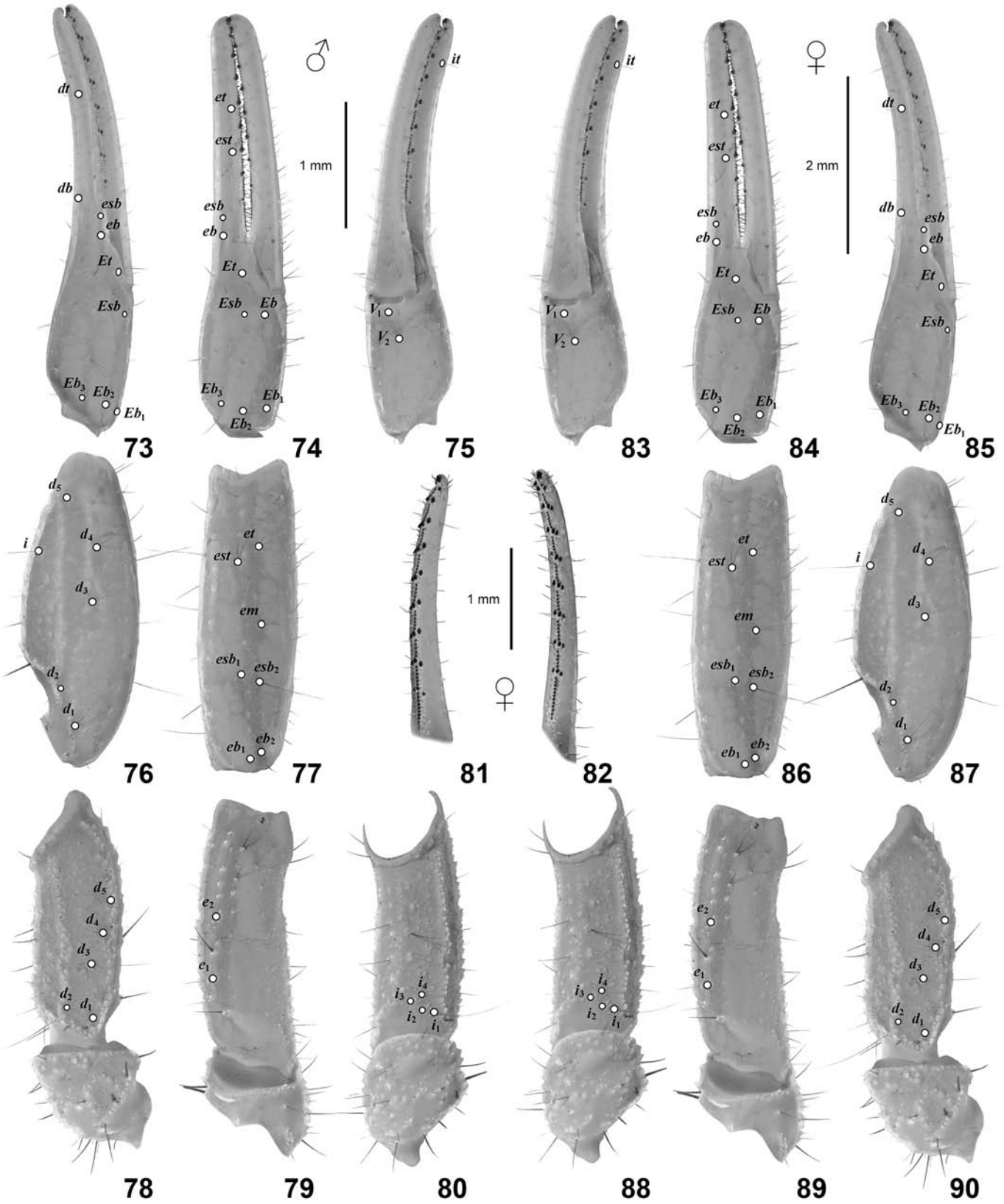
Figures 29–**48**: *Somalibuthus sabae* **sp**. **n**., right pedipalp under white light. **Figures 29**–**39**. Holotype male, chela in dorsal (29), external (30) and ventral (31) views, patella in dorsal (32), external (33) and ventral (34) views, femur in ventral (35), internal (36) and dorsal (37) views, dentate margins of movable finger (38) and fixed finger (39). **Figures 40**–**48**. Paratype female, chela in dorsal (49), external (41) and ventral (42) views, patella in dorsal (43), external (44) and ventral (45) views, femur in ventral (46), internal (47) and dorsal (48) views.



Figures 49–**60**: *Somalibuthus sabae* **sp**. **n**., paratype male, right pedipalp under UV fluorescence. **Figures 49**–**52**. Chela in dorsal (49), external (50), ventral (51) and internal (52) views. **Figures 53**–**56**. Patella in dorsal (53), external (54), ventral (55) and internal (56) views. **Figures 57**–**60**. Femur and trochanter in dorsal (57), external (58), ventral (59) and internal (60) views. Scale bar: 2 mm.

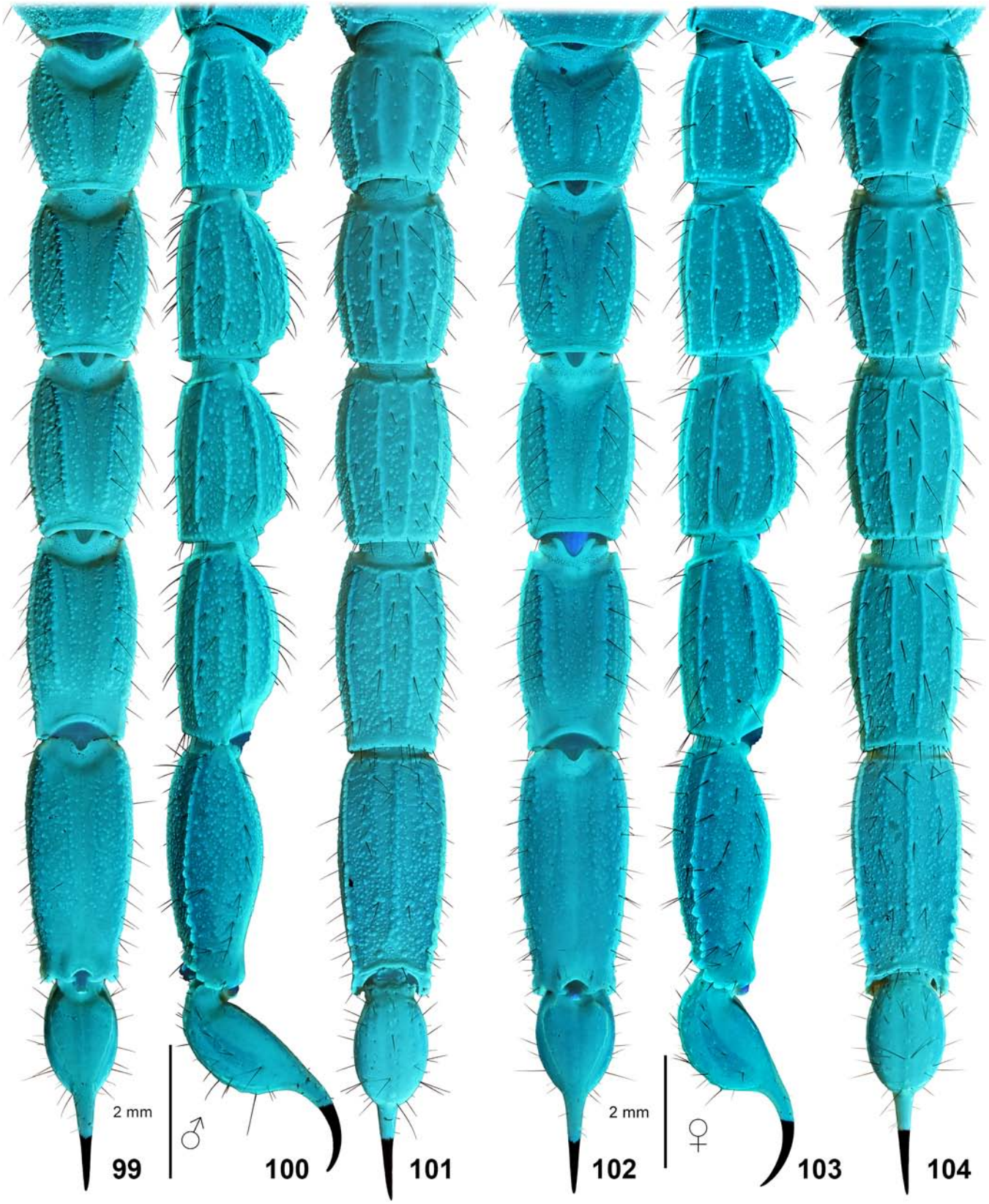


Figures 61–**72**: *Somalibuthus sabae* **sp**. **n**., paratype female, right pedipalp under UV fluorescence. **Figures 61**–**64**. Chela in dorsal (61), external (62), ventral (63) and internal (64) views. **Figures 65**–**68**. Patella in dorsal (65), external (66), ventral (67) and internal (68) views. **Figures 69**–**72**. Femur and trochanter in dorsal (69), external (70), ventral (71) and internal (72) views. Scale bar: 2 mm.



Figures 73–**90**: *Somalibuthus sabae* **sp**. **n**., right pedipalp, trichobothrial maps and finger dentition. **Figures 73**–**80**. Paratype male trichobothria, chela in dorsal (73), external (74) and ventral (75) views. patella in dorsal (76) and external (77) views, femur in dorsal (78), external (79) and internal (80) views. **Figures 81**–**82**. Paratype female dentition of fixed (81) and movable (82) fingers. **Figures 83**–**90**. Paratype female trichobothria, chela in ventral (83), external (84) and dorsal (85) views. patella in external (86) and dorsal (87) views, femur in internal (88), external (89) and dorsal (90) views. Scale bars: 1 mm (73–80), 1 mm (81–82), 2 mm (83–90).

Figures 91–**98**: *Somalibuthus sabae* **sp**. **n**., metasoma and telson under white light. **Figures 91**–**92**. Telson in right lateral view of holotype male (91) and paratype female (92). **Figures 93**–**95**. Paratype female, metasoma and telson in right lateral (93), ventral (94) and dorsal (95) views. **Figures 96**–**98**. Holotype male, metasoma and telson in right lateral (96), ventral (97) and dorsal (98) views. Scale bars: 10 mm (93–95), 10 mm (96–98).



Figures 99–**104**: *Somalibuthus sabae* **sp**. **n**., metasoma and telson under UV fluorescence. **Figures 99**–**101**. Paratype male, metasoma and telson in dorsal (99), left lateral (100) and ventral (101) views. **Figures 102**–**104**. Paratype female, metasoma and telson in dorsal (102), left lateral (103) and ventral (103) views. Scale bars: 2 mm (99–101), 2 mm (102–104).

present on tergites II–VI, but may be indistinct on tergite II. Tergite VII with 5 carinae, median carina a granulated hump, 2 pairs of lateral carinae strongly developed. All carinae coarsely granular, confined to posterior tergites. Tergite granulation and carination somewhat weaker in females than males. Posterior margin of tergites I–VI with 2–5 macrosetae, of VII with fine fringe of microsetae. *Sternites.* Sternites III–VI lacking carinae, smooth and glabrous except for sparse fine granulation on areas lateral to stigmata in males. Stigmata narrow, slit-like. Sternite III finely shagreened in lateral areas covered by pectines. Posterior margins of sternites III–VI smooth. Sternite VII smooth medially, finely granulated laterally, median pair of carinae obsolete, lateral carinae distinct, with dentate granules, confined to posterior 3/4 of sternite, more weakly developed in females. Sternite III with one to two dozen medial macrosetae, less than a dozen posterior marginal macrosetae. Sternites IV–VI with transverse series of 6 macrosetae extending across middle of sclerite, 4 sub-medial, 2 marginal. Sternites IV–V with 10–12 posterior marginal macrosetae, VI with 5–6. Sternite VII with 5–6 non-marginal, single pair of posterior marginal macrosetae, and a posterior fringe of microsetae.

Metasoma (Figs. 93–104). Elongate, all segments longer than wide, posterior segments slightly narrower than anterior segments. For morphometric ratios, see diagnosis. *Carination*. Segments I–III with 10 complete carinae, IV with 8 complete carinae. Dorsosubmedian, dorsolateral and ventrolateral carinae strong, crenulate-granulate on segments I–IV. Lateral median carinae strong, crenulate-granulate on segments I–III, more weakly marked by series of granules on IV. Ventrosubmedian carinae smooth, weak or nearly obsolete on segment I, smooth to weakly crenulate-granulate on II–III, strong and crenulate-granulate on IV. Segment V with 3 complete carinae; ventrolateral carinae strong, crenulate-dentate, dentition smaller and uniform in anterior half, larger and non-uniform in posterior half; ventromedian carinae irregularly granulate, with larger granules posteriorly; ventrosubmedian carinae indistinct (♂) or weakly marked anteriorly by granules (♀); dorsolateral surfaces rounded, without carinae; lateral anal margin with 2–3 lobes, ventral anal margin with 10–12 crenulations. *Intercarinal surfaces.* Dorsal and lateral surfaces of all segments with fine granulation, except for smooth posterior surfaces of segments IV–V. Ventral surfaces of segments II–V with fine granulation, more sparse on II–III, more dense on IV–V. Ventral surfaces of segment I smooth. Anterior peduncles of segments I–IV densely shagreened over entire surface, of segment V shagreened only on anterior margin. *Setation*. All segments with long macrosetae. Variable numbers of macrosetae distributed on carinae and medial intercarinal surface of segments I–IV. Segment V with series of dorsolateral macrosetae and scattered macrosetae on lateral and ventral surfaces. Ventral posterior margins of all segments with variable numbers of macrosetae (ca. 4–9). Dorsal and ventral posterior margins of segments I–III with fine fringes of microsetae.

Telson (Figs. 91–104). Vesicle ovoid, more bulbous in female than in male, smooth dorsally and laterally. Ventral surface smooth except for a medial series of weak granules. Several long macrosetae on ventrolateral and ventral surfaces. Aculeus slightly shorter (♂) or about the same length (♀) as vesicle, moderately curved.

Pedipalps (Figs. 29–90). *Femur.* Tetracarinate, ventrointernal, dorsointernal and dorsoexternal carinae strong, coarsely granulose, internal carina weak, granulose; external, ventroexternal and ventromedian carinae absent. Dorsal surface with dense, fine granulation, internal surface with dense (♂) or sparse (♀) fine granulation, ventral surface with sparse fine granulation (♂) or smooth (♀), external surface smooth dorsally and sparsely shagreened ventrally (♂), or entirely smooth (♀), with 7–9 distal external macrosetae. *Patella*. Tetracarinate, dorsomedian, dorsointernal and ventrointernal carinae strong, coarsely granulose; internal carina moderate (♂) or weak (♀), granulose; dorsomedian carina continuous in distal half (i.e., distal to trichobothrium d_3), marked by scattered granules (♂) or obsolete (♀) in proximal half. All intercarinal surfaces smooth. *Chela*. Slender, smooth, carinae obsolete except for digital carina on fixed finger. Sparse macrosetae on ventral manus and fixed finger. Fingers weakly curved, dentate margins of fixed and movable fingers armed with 8 non-imbricated rows of dentate granules, each row flanked proximally by one external and one internal accessory granule. Movable finger with 4 subterminal granules. Proximal dentate margins of fingers straight in both sexes. *Trichobothriotaxy*. Orthobothriotaxic, type A-β, pattern as characterized under diagnosis of the genus. For morphometric ratios, see diagnosis.

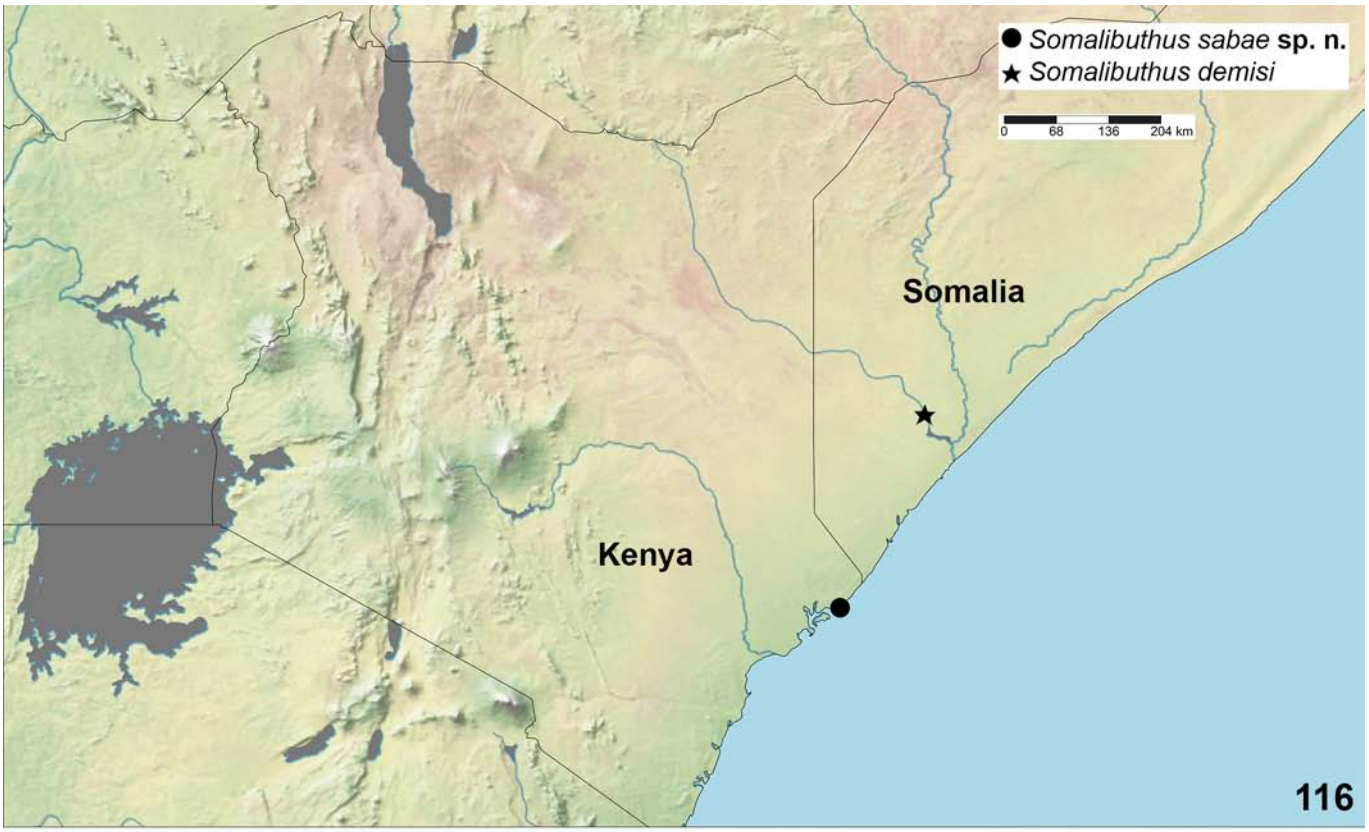
Legs (Figs. 7–20). Femora I–IV with finely denticulate inferior carinae, granulate prosuperior carinae, crenulate retrosuperior carinae. Surfaces finely granulate, prolateral surfaces granulate, retrolateral surfaces smooth. Patellae I–IV with crenulate-granulate inferior, prolateral, prosuperior and retrosuperior carinae. Prolateral surfaces smooth or very weakly granular, retrolateral surfaces smooth. Series of several long macrosetae on inferior carinae, increasing in count for more posterior legs. Tibiae I–IV smooth, with long macrosetae. Tibial spurs present on legs III–IV, spurs larger on leg IV. Basitarsi I–III smooth, compressed, retrosuperior margins with dense, regular series of long macrosetae (bristle-combs), and 2 regular series of shorter macrosetae on retroinferior and proinferior margins. Basitarsus IV not compressed, with numerous macrosetae not arranged in regular series. Retrolateral basitarsal spurs on all legs simple, prolateral basitarsal spurs basally bifurcate. Telotarsi I–II with ventral macrosetae arranged in two regular (I) or irregular (II) rows. Telotarsi III–V with ventral macrosetae dense, long, irregular and not arranged in discrete rows. Tarsal ungues long, slender.

Measurements. See Table 1.

Variation. Color patterns were similar in all type specimens. Meristic and morphometric variation are summarized in Table 1 and under the species diagnosis.

Figures 105–**110**: *Somalibuthus sabae* **sp**. **n**., right hemispermatophore, paratype male. **Figures 105**–**107**. Capsule in posterior (105), convex (106) and anterior (107) views. **Figure 108**. Capsule in convex view, compressed to show form of sperm hemiduct lobes. **Figure 109**. Whole hemispermatophore, convex view. **Figure 110**. Capsule in convex view, cross stereoscopic pair showing 3-dimensional structure. Scale bars: 200 µm (105–108), 1 mm (109), 200 µm (110).

Figures 111–**115**: *Lanzatus somalilandus* Kovařík, Lowe & Šťáhlavský, 2016, right hemispermatophore. **Figures 111**–**113**. Capsule in posterior (111), convex (112) and anterior (113) views. **Figure 114**. Capsule in convex view, compressed to show form of sperm hemiduct lobes. **Figure 115**. Whole hemispermatophore, convex view. Scale bars: 200 μm (111–113), 500 μm (115).



Figures 116–**117**: **Figure 116**. Map showing type locality of *Somalibuthus sabae* **sp**. **n**. and *S*. *demisi* Kovařík, 1998. **Figure 117**. Type locality of *Somalibuthus sabae* **sp**. **n**.

Affinities. The new species is differentiated morphologically from the type species, *S. demisi*, in having more robust pedipalps and metasoma. Comparative morphometric ratios (♂): *S. sabae* **sp. n.** (n = 3): metasoma II L/W 1.33–1.40, metasoma III L/W 1.51–1.53, metasoma IV L/W 1.76–1.83, and pedipalp patella L/W 2.61–2.66; *S. demisi* (holotype ♂): metasoma II L/W 1.42, metasoma III L/W 1.61, metasoma IV L/W 1.94, and pedipalp patella L/W 3.00.

Distribution. Known only from the type locality (Fig. 117).

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References

FET, V., M. E. SOLEGLAD & G. LOWE. 2005. A new trichobothrial character for the high-level systematics of Buthoidea (Scorpiones: Buthida). *Euscorpius*, 23: 1–40.

HARADON, R. M. 1984. New and redefined species belonging to the *Paruroctonus baergi* group (Scorpiones, Vaejovidae). *Journal of Arachnology*, 12: 205–221.

KOVAŘÍK, F. 1998. Three new genera and species of scorpions (Buthidae) from Somalia. *Acta Societas Zoologicae Bohemoslovenicae*, 62: 115–124.

KOVAŘÍK, F. 2001. *Lanzatus somalicus* gen. n. et sp. n. (Scorpiones: Buthidae) from Somalia. *Acta Societas Zoologicae Bohemoslovenicae*, 65 (1): 41–44.

KOVAŘÍK, F. 2009. *Illustrated catalog of scorpions. Part I.* Jakub Rolčík – Clairon Production, Prague, 170 pp.

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. 2012. Review of the genus *Neobuthus* Hirst, 1911 with description of a new species from Ethiopia (Scorpiones: Buthidae). *Euscorpius*, 138: 1–25.

KOVAŘÍK, F. & G. LOWE. 2019. Scorpions of the Horn of Africa (Arachnida, Scorpiones). Part XVIII. *Gint banfasae* sp. n. from Somaliland (Buthidae). *Euscorpius*, 272: 1–19.

KOVAŘÍK, F., G. LOWE, A.I. AWALE, H.S.A. ELMI & A.A. HURRE. 2018b. Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part XVII. Revision of *Neobuthus*, with description of seven new species from Ethiopia, Kenya and Somaliland (Buthidae). *Euscorpius*, 271: 1–81.

KOVAŘÍK, F., G. LOWE, P. JUST, A.I. AWALE, H.S.A. ELMI & F. ŠŤÁHLAVSKÝ. 2018a. Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part XV. Review of the genus *Gint* Kovařík et al., 2013, with description of three new species from Somaliland (Scorpiones, Buthidae). *Euscorpius*, 259: 1–41.

KOVAŘÍK, F., G. LOWE, J. PLÍŠKOVÁ & F. ŠŤÁHLAVSKÝ. 2013. A new scorpion genus, *Gint* gen. n., from the Horn of Africa (Scorpiones, Buthidae). *Euscorpius*, 173: 1–19.

KOVAŘÍK, F., G. LOWE, J. PLÍŠKOVÁ & F. ŠŤÁHLAVSKÝ. 2016a. Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part VI. *Compsobuthus* Vachon, 1949 (Buthidae), with a description of *C. eritreaensis* sp. n. *Euscorpius*, 209: 1–21.

KOVAŘÍK, F., G. LOWE, K. B. RANAWANA, D.HOFEREK, V. A. SANJEEWA JAYARATHNE, J.PLÍŠKOVÁ & F. ŠŤÁHLAVSKÝ. 2016b. Scorpions of Sri Lanka (Arachnida, Scorpiones: Buthidae, Chaerilidae, Scorpionidae) with description of four new species of the genera *Charmus* Karsch, 1879 and *Reddyanus* Vachon, 1972 stat. n. *Euscorpius*, 220: 1–133.

KOVAŘÍK, F., G. LOWE & F. ŠŤÁHLAVSKÝ. 2016c. Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part IX. *Lanzatus*, *Orthochirus*, and *Somalicharmus* (Buthidae), with description of *Lanzatus somalilandus* sp. n. and *Orthochirus afar* sp. n. *Euscorpius*, 232: 1–38.

KOVAŘÍK, F. & T. MAZUCH. 2015. Review of the genus *Gint* Kovarik et al., 2013, with description of two new species from Somaliland and Somalia (Puntland) (Scorpiones: Buthidae). *Euscorpius*, 209: 1–23.

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.

LORIA, S.F. & L. PRENDINI. 2014. Homology of the lateral eyes of Scorpiones: a six-ocellus model. *PLoS ONE* 9(12): e112913. doi:10.1371/journal.pone.0112913.

LOWE, G. 2018. The genera *Butheolus* Simon, 1882 and *Xenobuthus* gen. n. (Scorpiones: Buthidae) in Oman. *Euscorpius*, 261: 1–73.

LOWE, G. & F. KOVAŘÍK. 2016. Scorpions of the Horn of Africa (Arachnida, Scorpiones). Part V. Two new species of *Neobuthus* Hirst, 1911 (Buthidae), from Ethiopia and Eritrea. *Euscorpius*, 224: 1–46.

LOWE, G. & F. KOVAŘÍK. 2019. Review of *Grosphus* Simon, 1880, with description of *Teruelius* gen. n., a new buthid genus from Madagascar (Scorpiones: Buthidae). *Euscorpius*, 281: 1–128.

LOWE, G. & F. KOVAŘÍK. 2021. *Fetilinia dentator* sp. n. from Pakistan (Scorpiones: Buthidae). *Euscorpius*, 328: 1–10.

LOWE, G., F. KOVAŘÍK, M. STOCKMANN & F. ŠŤÁHLAVSKÝ. 2018. Review of *Microbuthus* with Description of *M. satyrus* sp. n. (Scorpiones, Buthidae) from Oman and Yemen. *Euscorpius*, 263: 1–22.

LOWE, G., F. KOVAŘÍK, M. STOCKMANN & F. ŠŤÁHLAVSKÝ. 2019. *Trypanothacus* gen. n., a new genus of burrowing scorpion from the Arabian Peninsula (Scorpiones: Buthidae). *Euscorpius*, 277: 1–30.

LOWE, G., E. A. YAĞMUR & F. KOVAŘÍK. 2014. A review of the genus *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae) with description of four new species from the Arabian Peninsula. *Euscorpius*, 191: 1–129.

PRENDINI, L. 2003. Discovery of the male of *Parabuthus muelleri*, and implications for the phylogeny of *Parabuthus* (Scorpiones: Buthidae). *American Museum Novitates*, 3408: 1–24.

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

SOLEGLAD, M. E. & V. FET. 2001. High-level systematics and phylogeny of the extant scorpions (Scorpiones: Orthosterni). *Euscorpius*, 11: 1–175.

SOLEGLAD, M. E. & V. FET. 2003. The scorpion sternum: structure and phylogeny (Scorpiones: Orthosterni). *Euscorpius*, 5: 1–34.

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

STAHNKE, H. L. 1972. A key to the genera of Buthidae (Scorpionida). *Entomological News*, 83 (5): 121–133.

VACHON, M. 1963. De l'utilité, en systématique, d'une nomenclature des dents de chélicères chez les scorpions. *Bulletin du Musèum National d'Histoire Naturelle, Paris*, (2), 35 (2): 161–166.

VACHON, M. 1974. Étude des caractères utilisés pour classe les familles et les genre de Scorpiones (Arachnides). 1. La trichobothriotaxie en Arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les scorpions. *Bulletin du Muséum National d'Histoire Naturalle Paris, Zoologie*, (3) 104 (140): 857–958.

VACHON, M. 1975. Sur l'utilisation de la trichobothriotaxie du bras des pedipalps des Scorpions (Arachnides) dans le classement des genres de famille des Buthidae Simon. *Compte rendus hebdomadaires des séances de l'Academie des Sciences, Paris Ser.D Sciences Naturelles*, 281 (21): 1597–1599.

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