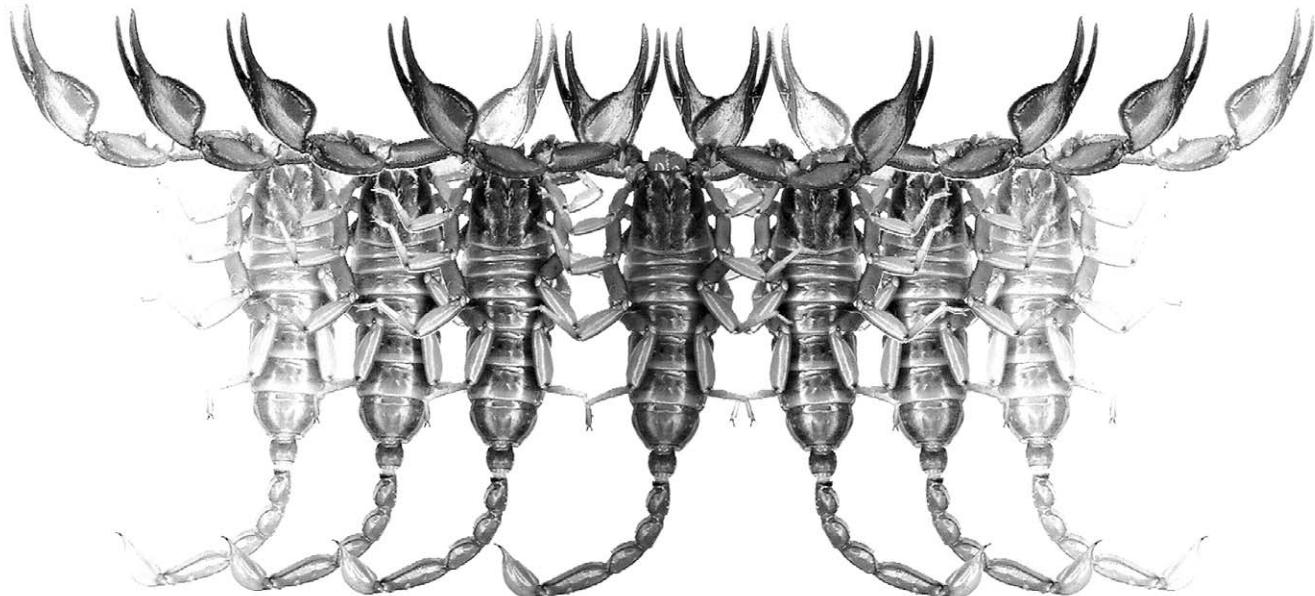


# *Euscorpius*

Occasional Publications in Scorpiology



**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)**

František Kovařík, Graeme Lowe, Pavel Just, Ahmed Ibrahim Awale,  
Hassan Sh Abdirahman Elmi & František Šťáhlavský

April 2018 – No. 259

# *Euscorpius*

## Occasional Publications in Scorpiology

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Publication date: 5 April 2018

<http://zoobank.org/urn:lsid:zoobank.org:pub:03DB9228-8B1E-455D-BADB-7946BC942F41>

# 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)

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<http://zoobank.org/urn:lsid:zoobank.org:pub:03DB9228-8B1E-455D-BADB-7946BC942F41>

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### Summary

We describe herein three new species of Buthidae: *Gint amoudensis* sp. n., *G. gubanensis* sp. n., and *G. maidensis* sp. n. from Somaliland. Additional information is provided on the taxonomy and distribution of other species of the genus *Gint*, fully complemented with color photos of live and preserved specimens, as well as of their habitat. The hemispermatophores of most *Gint* species are illustrated and described for the first time. In addition to the analyses of external morphology and hemispermatophores, we also describe the karyotype of four *Gint* species. The number of chromosomes is different for every one of the analysed species (*G. dabakalo* 2n=23, *G. gaitako* 2n=30, *G. amoudensis* sp. n. 2n=35–36, and *G. maidensis* sp. n. 2n=34).

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### Introduction

In recent years our studies have revealed a previously unappreciated diversity of small buthid scorpions in the Horn of Africa. We have uncovered a variety of novel taxa during intensive fieldwork conducted within the region. These include new species of *Compsobuthus*, *Lanzatus* and *Orthochirus* (Kovařík et al., 2016b, 2016e), as well as several new species of *Neobuthus* (Kovařík & Lowe, 2012; Lowe & Kovařík, 2016) and two new species belonging to a new genus, *Gint* (Kovařík et al., 2013; Kovařík & Mazuch, 2015). Here, we considerably expand the scope of *Gint* by describing three additional new species, also from the Horn of Africa, and review the taxonomic status of other species assigned to this genus.

We formulate differential diagnoses of *Gint* species based on a combination of external morphological characters: coloration, granulation, carination, and morphometrics. We also systematically compare the morphology of their hemispermatophores, which are seldom utilized in taxonomy of small, rare buthids due to limited availability and difficulty of extraction from older preserved specimens. Our field collection of a sub-

stantial quantity of fresh material has enabled us to examine intra- and interspecific variability of *Gint* hemispermatophores. We find that the form of the basal lobe of the capsule region is a potentially useful taxonomic character. Our material also provided tissue samples for karyotype analyses (reported here) and DNA sequencing (Just et al., in preparation). The results of these analyses support the taxonomy that we developed based on morphological characters.

### Methods, Material & Abbreviations

Nomenclature and measurements follow Stahnke (1971), Kovařík (2009), and Kovařík & Ojanguren Affilastro (2013), except for trichobothriotaxy (Vachon, 1974). The terminology “tarsal bristle comb” refers to the linear series of macrosetae located along the retro-superior margin of tarsomere I (= basitarsus) (Haradon, 1984).

Hemispermatophore terminology of buthids is adapted from several sources, and differs slightly from our previous notation (e.g. Kovařík et al., 2016c). Along the transverse axis, following Stockwell (1989) and Monod et al. (2017), opposing hemispermatophore mar-

gins bearing the sperm hemiduct and flagellum are referred to as ‘anterior’ and ‘posterior’ respectively, based on orientation of formed spermatophores when attached to the substrate, referred to the somatic axes of males positioned during mating with females. Surfaces that become interior or exterior in formed spermatophores are ‘concave’ and ‘convex’ respectively, terms that are self-explanatory. Along the longitudinal axis, terms apical/basal (or distal/proximal) refer to positions further from/closer to the substrate attachment point of the formed spermatophore (the pedicel, or foot). This terminology reduces ambiguity and potential confusion in terms like ‘external’, ‘internal’, ‘dorsal’ and ‘ventral’ referred to somatic axes of the male with hemispermatophore oriented *in situ* within the mesosoma. *In situ* orientation of hemispermatophore structures is variable, depending on taxa and individuals. We continue using descriptive terms ‘flagellum’ and ‘trunk’, which are unambiguous and long used in many taxonomic works (e.g. Francke & Stockwell, 1987; Kovařík et al., 2013, 2016a, 2016b, 2016c; Lamoral, 1979; Levy et al., 1973; Levy & Amitai, 1980; Lowe, 2001; Vachon, 1940, 1949, 1952; Sissom, 1990; Stockwell, 1989). The three lobes of the sperm hemiduct are labelled as ‘anterior’, ‘median’ and ‘posterior’ lobes, according to the above transverse axis convention (=‘external’, ‘median’ and ‘interior’ lobes respectively of Vachon, 1940, 1952). We continue using the generic term ‘basal lobe’ rather than ‘basal hook’ (Monod et al., 2017), because this process may not be shaped like a hook.

Hemispermatophores were dissected from freshly euthanized, or alcohol-fixed males. In the latter case, they were optically cleared if necessary by proteolytic digestion of soft tissue (1 mg/ ml bovine trypsin, 4 mM CaCl<sub>2</sub>, 200 mM Tris-NaOH, pH 7 .8, 50°C, 30 min) (Lowe, 2001).

Chromosome preparations were made using the plate spreading technique which is routinely used in scorpions (e. g. Kovařík et al., 2009; Plíšková et al., 2016). The chromosomes were stained by 5% Giemsa solution in Sörensen phosphate buffer for 30 min. Five spermatocyte nuclei were selected for a detailed karyotype analysis. The relative diploid set length was measured using the software Image J 1.45r (<http://rsbweb.nih.gov/ij>) with the plugin Levan (Sakamoto & Zácaro, 2009).

We intentionally use here the name Somaliland (Hargeisa) for the northern territory (Republic of Somaliland) corresponding to the former British colony (British Somaliland), which we distinguish from Somalia (Mogadisho). Somaliland has its own currency, a functional government with representation in several countries.

Specimens used for this study were collected and imported with permissions from Amoud and Hargeisa

Universities and Ministry of the Environment of the Republic of Somaliland. Specimens studied herein are preserved in 80% ethanol. *Depositories*: BMNH (The Natural History Museum, London, United Kingdom); FKCP (František Kovařík, private collection, Prague, Czech Republic); GLPC (Graeme Lowe, private collection, Philadelphia, USA). All analysed hemispermatophores are in GLPC.

## Systematics

### Family Buthidae C. L. Koch, 1837

**Gint** Kovařík, Lowe, Plíšková et Šťáhlavský, 2013  
(Figs. 1–202, Tables 1–3)

*Buthus* (*Buthacus*) (in part): Birula, 1917: 21.  
*Buthacus* (in part): Levy, Amitai & Shulov, 1973: 125;  
Fet & Lowe, 2000: 81; Kovařík, 2005: 1.  
*Gint* Kovařík et al., 2013: 1–18, figs. 1–4, 6–71; Kovařík & Mazuch, 2015: 1–23, figs. 1–89; ? Rossi, 2015: 53–63, figs. 1–10.

TYPE SPECIES. *Gint gaitako* Kovařík et al., 2013.

ETYMOLOGY. *Gint* (masculine) means scorpion in Amharian, the official language of Ethiopia.

DISTRIBUTION (Fig. 202). Ethiopia, Somalia, Somaliland.

DIAGNOSIS. Total length up to 24.5 mm (male) or 48.2 mm (female); carapace trapezoidal, in lateral view preocular area not distinctly inclined towards anterior margin, level with or higher than postocular area; surface of carapace densely granular, with only anterior median carinae developed; ventral aspect of cheliceral fixed finger with two denticles; tergites densely granular, with three carinae of which lateral pair on I and II are inconspicuous; sternites III–VI with finely micro-denticulate posterior margins, lacking larger non-contiguous denticles; pectinal tooth number 19–31; pectines with fulera, hirsute; hemispermatophore with flagellum separated from a 3-lobed sperm hemiduct, and with a projecting, scoop- or hook-like basal lobe; metasomal segments I–III with 8–10 carinae; metasoma I ventrally smooth, lacking ventromedial carinae; metasoma V with enlarged ‘lobate’ dentition on ventrolateral carinae which may be reduced (in *Gint puntlandus*); telson rather elongate (except for *G. maidensis* sp. n.), vesicle with moderate posterior slope, not sharply inclined or truncated, lacking subaculear tubercle, aculeus shorter than vesicle; all segments of metasoma and pedipalps sparsely hirsute, with long setae in both sexes, dentate margin of movable finger of

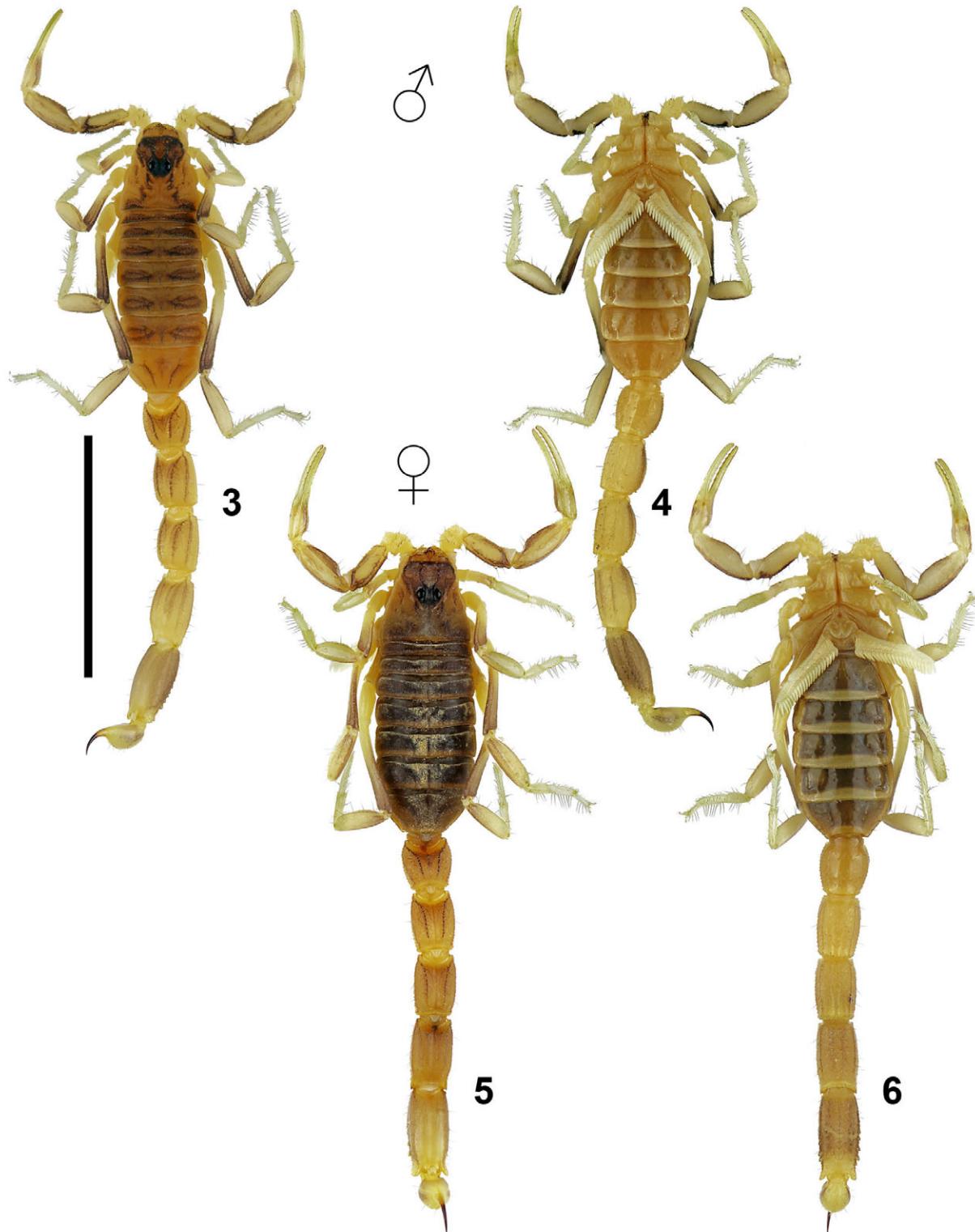


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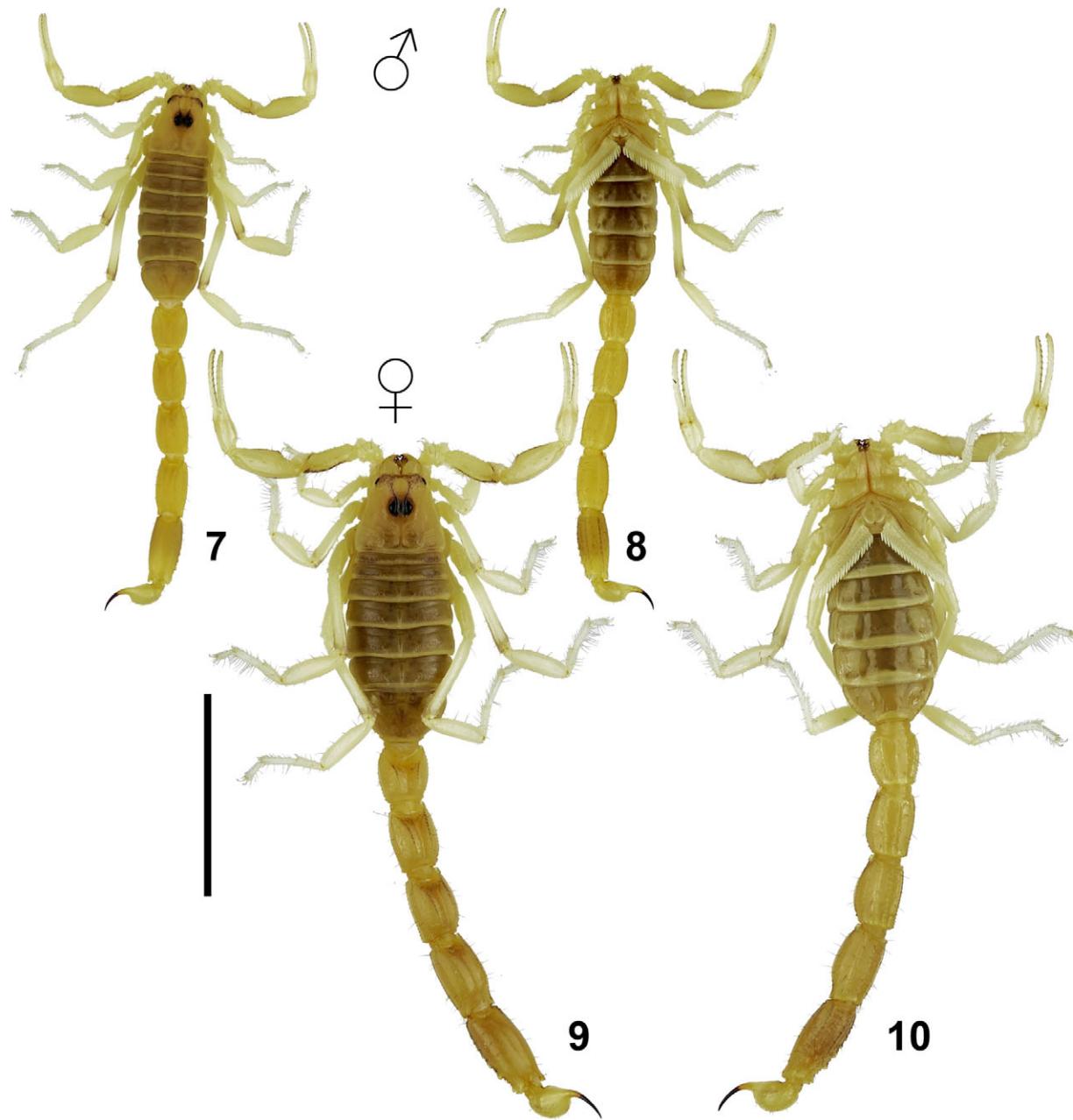


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**Figures 1–2:** *Gint amoudensis* sp. n., paratypes from locality No. 17SF (Laas Gel), *in vivo* habitus. **Figure 1.** Female and two males. **Figure 2.** Male.



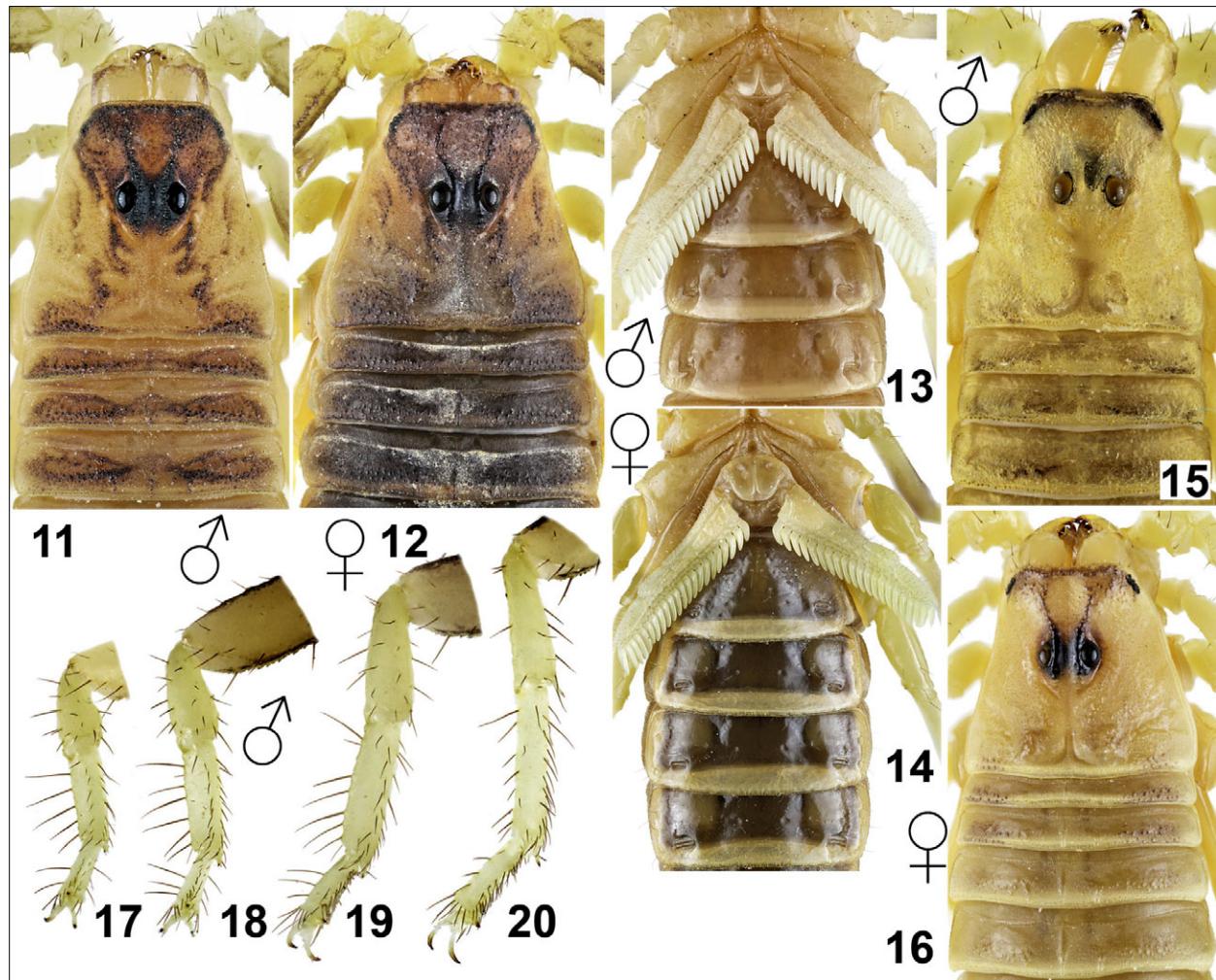
**Figures 3–6:** *Gint amoudensis* sp. n. from type locality. **Figures 3–4.** Holotype male, dorsal (3) and ventral (4) views. **Figures 5–6.** Paratype female, dorsal (5) and ventral (6) views. Scale bar: 10 mm.



**Figures 7–10:** *Gint amoudensis* sp. n., paratypes from Laas Gel. **Figures 7–8.** Male, dorsal (7) and ventral (8) views. **Figures 9–10.** Female, dorsal (9) and ventral (10) views. Scale bar: 10 mm.

pedipalp with 8–10 rows of granules, each with one external and one internal accessory granule, 5–6 terminal granules (4–5 terminal and one proximal terminal); trichobothrial pattern orthobothriotaxic type A; dorsal trichobothria of femur arranged in  $\beta$ -configuration; pedipalp patella with 7 external trichobothria; patella trichobothrium  $d_3$  internal to dorsomedian carina; tibial spurs present on legs III–IV.

**KARYOTYPES.** In this study, we investigated nine males of *Gint* spp. belonging to three species: one specimen of *G. dabakalo*, five of *G. amoudensis* sp. n. and three of *G. maidensis* sp. n. All of the studied species possess holocentric chromosomes, an attribute of buthid scorpions (e.g. Mattos et al., 2013) that was also described in *G. gaitako* ( $2n=30$ ) (Kovařík et al., 2013). Chromosomes gradually decreased in size in all ob-



**Figures 11–20:** *Gint amoudensis* sp. n. **Figures 11, 13, 15–20.** Holotype male, chelicerae, carapace and tergites I–III (11), sternopectinal region and sternites III–V (13), distal segments of right legs I–IV, retrolateral views (17–20 respectively). **Figures 12, 14.** Paratype female from type locality, chelicerae, carapace and tergites I–III (12), sternopectinal region and sternites III–VI (14). **Figure 15.** Paratype male from Laas Gel, chelicerae, carapace and tergites I–III. **Figure 16.** Paratype female from Laas Gel, chelicerae, carapace and tergites I–III.

served nuclei of all analyzed species. The diploid numbers of chromosomes were  $2n=23$  in *G. dabakalo* (locality 17SH, No. 1305, Fig. 198),  $2n=35$  in *G. amoudensis* sp. n. from locality 17SF (Nos. 1291, 1292, 1293, 1297, Fig. 199),  $2n=36$  in *G. amoudensis* sp. n. from locality 17SR (No. 1325 Fig. 200), and  $2n=34$  in *G. maidensis* sp. n. (locality 17SN, Nos. 1321, 1324, 1336, Fig. 201). The intraspecific variability in *G. amoudensis* sp. n. may be explained by balanced chromosomal rearrangements, a situation known from other buthid scorpions (Schneider et al., 2009). However, meiotic phases will need to be examined and some more advanced cytogenetic methods need to be applied to resolve the complex chromosomal rearrangements of *Gint* spp.

HEMISPERMATOPHORES. We have examined 29 hemispermatophores extracted from 15 males of the genus *Gint*, representing 5 different species, and found their overall morphologies to be similar. However, we observed one consistent difference that we propose as a diagnostic character. The basal lobe was larger, taller, subtriangular and hook-like in *G. maidensis* sp. n. (Figs. 180–182, 189–194, 197), in contrast to the smaller, lower, rounded, scoop-like basal lobes of *G. amoudensis* sp. n., *G. dabakalo*, *G. gaitako* and *G. gubanensis* sp. n.. At the species level, a similar distinction in basal lobe shape was utilized to separate *Mesobuthus cyprius* Gantenbein et Kropf, 2000 (with a pointed lobe), from *M. gibbosus* (Brullé, 1832) (with a blunt lobe) (Gantenbein et al., 2000). At the generic

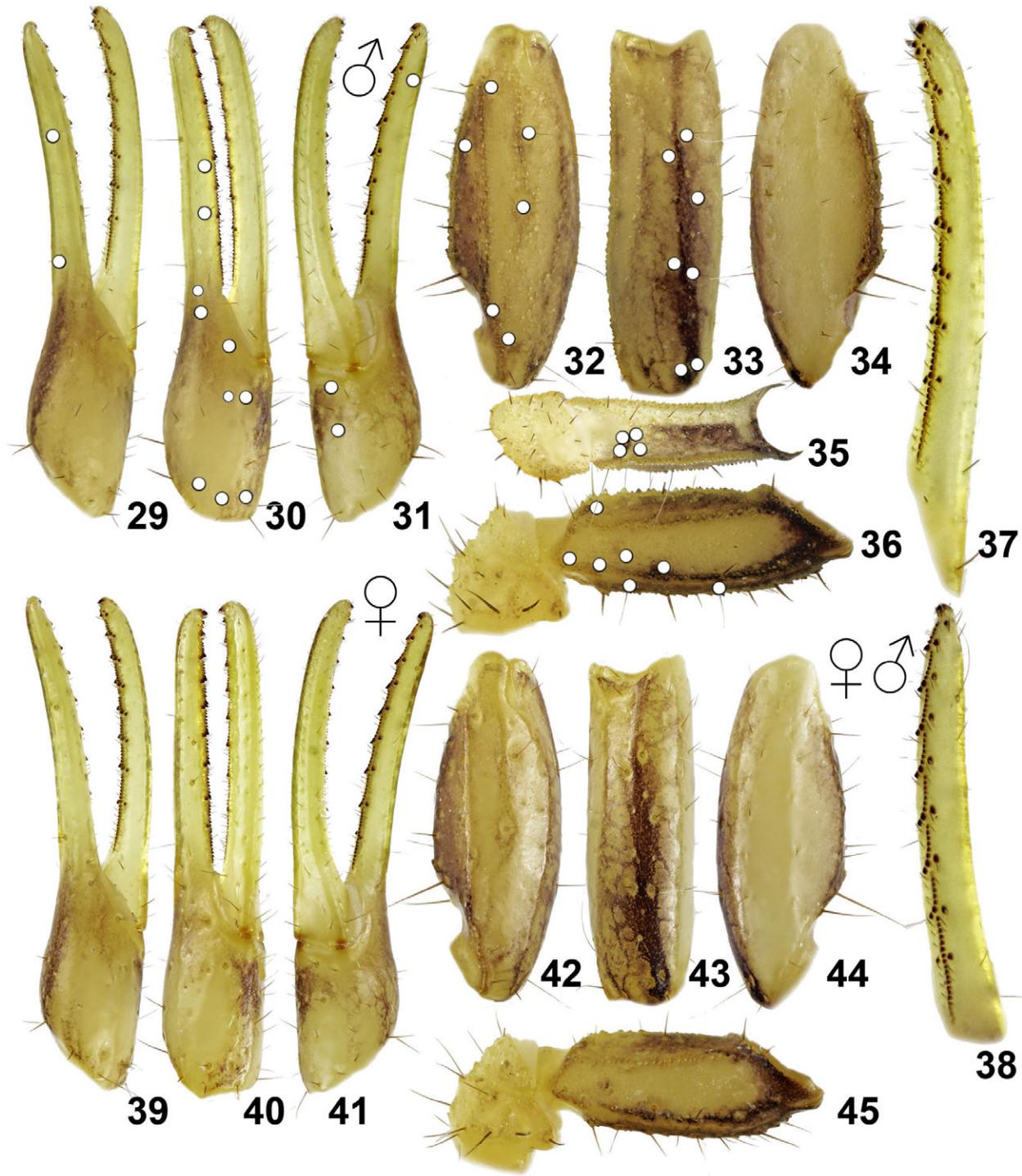


**Figures 21–28:** *Gint amoudensis* sp. n. **Figures 21, 23–25.** Holotype male, metasoma V and telson lateral view (21), metasoma and telson, lateral (23), dorsal (24), and ventral (25) views. **Figures 22, 26–28.** Paratype female from type locality, metasoma V and telson lateral view (22), metasoma and telson, lateral (26), dorsal (27), and ventral (28) views. Scale bar: 10 mm (23–28).

level, we note that the hook- or scoop-shaped basal lobes found in *Gint* clearly differ from those of *Buthacus* spp., which are small, rounded knobs (Kovařík et al., 2016d; Levy et al., 1973; Levy & Amitai, 1980; Vachon, 1949, 1952). This provides additional morphological justifi-

cation for our original decision to separate these two genera (Kovařík et al., 2013).

SUBORDINATE TAXA. *Gint amoudensis* sp. n.; *Gint calviceps* (Pocock, 1900); *Gint dabakalo* Kovařík et



**Figures 29–45:** *Gint amoudensis* sp. n. from type locality. **Figures 29–38.** Holotype male. Pedipalp chela, dorsoexternal (29), external (30), and ventrointernal (31) views. Pedipalp patella, dorsal (32), external (33), and ventral (34) views. Pedipalp femur and trochanter, internal (35) and dorsal (36) views. Pedipalp chela, movable (37) and fixed (38) finger dentate margins. **Figures 39–45.** Paratype female. Pedipalp chela, dorsoexternal (39), external (40), and ventrointernal (41) views. Pedipalp patella, dorsal (42), external (43), and ventral (44) views. Pedipalp femur and trochanter dorsal (45) view. The trichobothrial pattern is indicated in Figures 29–36 (white circles).



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**Figures 46–47:** *Gint amoudensis* sp. n., paratype male from type locality, in vivo habitus (46) and the type locality (47).



**Figure 48:** *Gint amoudensis* sp. n., locality No. 17SF, Laas Gel, 50 km NE Hargeisa.

		<i>G. amoudensis</i> sp. n., type locality		<i>G. amoudensis</i> sp. n., Laas Gel	
DIMENSIONS (MM)		♂ holotype	♀ paratype	♂ paratype	♀ paratype
Carapace	L / W	3.100 / 3.475	3.375 / 3.825	2.950 / 3.188	4.025 / 4.600
Mesosoma	L	7.850	8.500	8.250	10.100
Tergite VII	L / W	2.150 / 3.025	1.963 / 3.850	2.150 / 3.225	2.850 / 4.550
Metasoma + telson	L	17.600	18.338	17.850	23.855
Segment I	L / W / D	2.175 / 2.025 / 1.875	2.300 / 2.113 / 1.837	2.425 / 1.983 / 1.800	3.100 / 2.650 / 2.263
Segment II	L / W / D	2.525 / 1.900 / 1.725	2.563 / 1.900 / 1.850	2.650 / 1.775 / 1.750	3.605 / 2.437 / 2.288
Segment III	L / W / D	2.825 / 1.800 / 1.725	2.800 / 1.863 / 1.880	2.775 / 1.700 / 1.700	3.675 / 2.338 / 2.375
Segment IV	L / W / D	3.200 / 1.775 / 1.700	3.275 / 1.800 / 1.750	3.175 / 1.650 / 1.585	4.150 / 2.275 / 2.100
Segment V	L / W / D	3.600 / 1.750 / 1.500	3.775 / 1.825 / 1.500	3.675 / 1.625 / 1.445	4.800 / 2.225 / 1.875
Telson	L / W / D	3.275 / 1.225 / 1.100	3.625 / 1.286 / 1.250	3.150 / 1.125 / 1.125	4.525 / 1.525 / 1.125
Pedipalp	L	9.163	9.800	9.225	12.100
Femur	L / W	2.425 / 0.775	2.325 / 0.950	2.400 / 0.825	3.025 / 1.100
Patella	L / W	2.875 / 1.063	3.100 / 1.150	2.850 / 1.050	3.875 / 1.450
Chela	L	3.863	4.375	3.975	5.200
Manus	W / D	0.800 / 0.775	0.850 / 0.888	0.800 / 0.775	1.095 / 1.150
Movable finger	L	2.750	3.063	2.800	3.900
<b>Total</b>	<b>L</b>	<b>28.55</b>	<b>30.21</b>	<b>29.05</b>	<b>37.98</b>

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

Mazuch, 2015; *Gint gaitako* Kovařík et al., 2013; *Gint gubanensis* sp. n.; *Gint maidensis* sp. n.; *Gint puntlandus* Kovařík et Mazuch, 2015.

Rossi (2015) proposed that *Buthus insolitus* Borelli, 1925 from Somalia, which was previously regarded as *nomen dubium* by Kovařík (2003: 152), is in reality *Gint insolitus* (Borelli, 1925). Unfortunately, Rossi's paper fails to meet the minimum standards of scientific publication. Rossi neither discussed nor justified the morphological basis for including *Buthus insolitus* in the genus *Gint*. In the same paper, he described two other species, *Gint marialuisae* Rossi, 2015 and *Gint monicae* Rossi, 2015 from Somalia, each based upon a single, old type specimen. The descriptions are vague, poorly illustrated, and lack sufficient information about specific taxonomic characters that we consider here to be important both for differentiating between species within *Gint*, and for unequivocally establishing membership in the genus according to our revised diagnosis. Rossi studied three specimens collected in 1909, 1934 and 1936 from unclear localities (see Kovařík et al., 2016b: 55) and unclear sex/ maturity, and assigned each specimen to a different species in the genus *Gint*. In his key, he separated these species on the basis of pectinal tooth count: *G. monicae* 18–19 vs. 20–23 in the other two species; and body length/ tergite granulation: *G. marialuisae* 28 mm/ densely granulated vs. *G. insolitus* 33 mm/ incompletely granulated. As these characters can exhibit significant intraspecific variation, it is not possible to identify Rossi's species with any confidence. We therefore have no choice but to regard his taxa as *nomina dubia* until standard scientific descriptions are published.

#### *Gint amoudensis* Kovařík et al., sp. n.

(Figs. 1–48, 127–128, 129–131, 148–163, 196, 202, Tables 1, 3)

<http://zoobank.org/urn:lsid:zoobank.org:act:51A060CE-A0CA-4B30-94D7-B6861DC5D364>

*Gint* sp. n.: Kovařík et al., 2017b: 18.

TYPE LOCALITY AND TYPE DEPOSITORY. **Somaliland**, Borama, Amoud University campus, 09°56'49"N 43°13'23"E, 1394 m a.s.l.; FKCP.

TYPE MATERIAL EXAMINED. Somaliland, Borama, Amoud University campus, 09°56'49"N 43°13'23"E, 1394 m a.s.l. (Fig. 48, Locality No. **17SR** = 17SA), 9–13.IX.2017, 7♂3♀3♀juvs.2♂juvs. (holotype, Figs. 3–4, 11, 13, 17–21, 23–25, 29–38, 128–129, 131, paratypes, Figs. 5–6, 12, 14, 22, 26–28, 39–47, 130, 155–157, No. 1325), leg. F. Kovařík; Laas Gel, 50 km NE Hargeisa, 09°46'47"N 44°26'43"E, 1043 m a.s.l. (Locality No. **17SF**), 28.–30.VIII.2017, 22♂1♀2juvs. (paratypes, Figs. 1–2, 7–10, 127, 148–154, 158–163, 196, Nos. 1291,

1292, 1293, 1327), leg. F. Kovařík et P. Just. All types are in FKCP collections.

ETYMOLOGY. A patronym in honor of Amoud University of Republic of Somaliland.

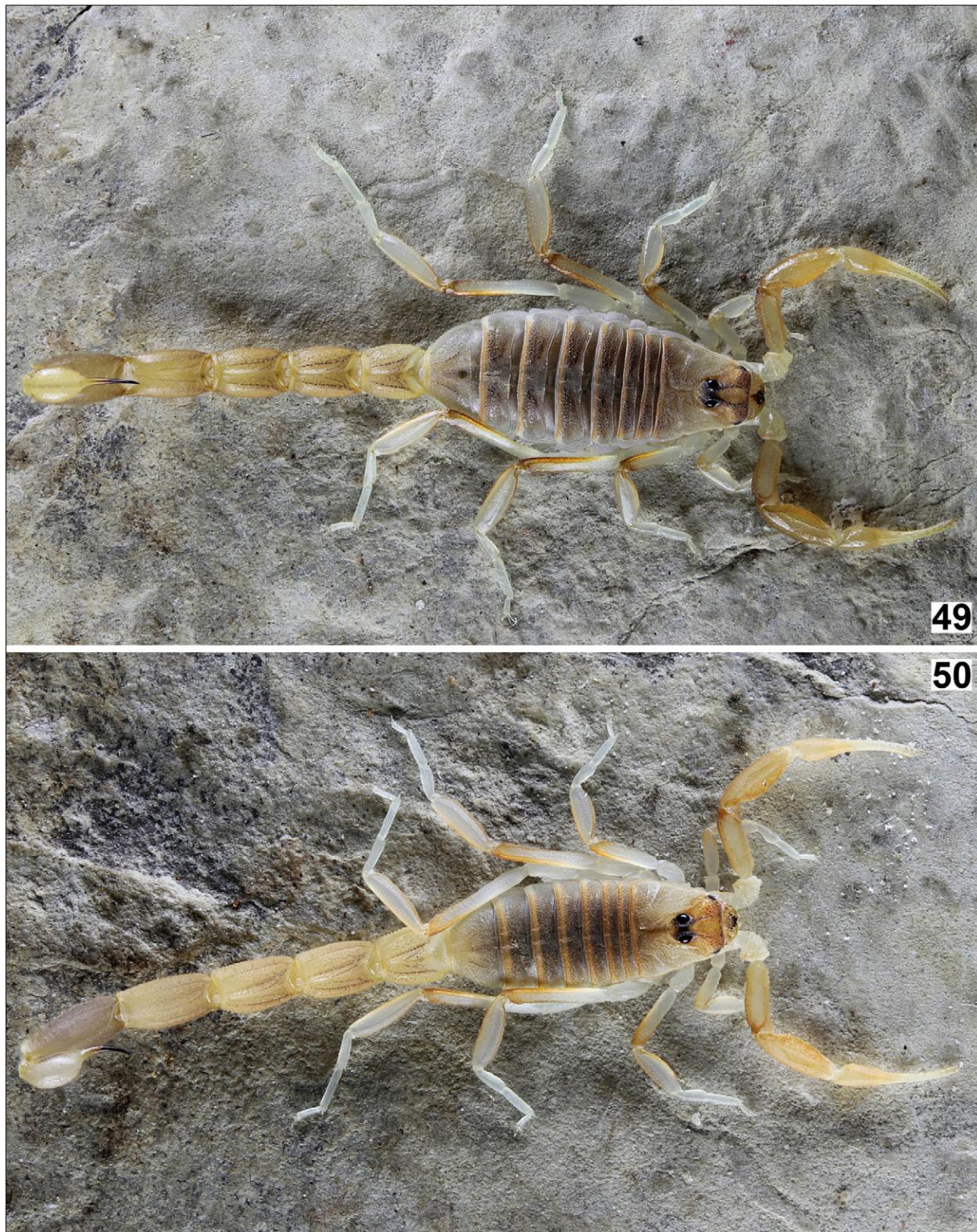
DIAGNOSIS. Total length 21mm (male) to 38 mm (female); chelicerae yellow with reticulation in anterior part or uniformly yellow; carapace densely granulated with only anterior median carinae developed; anterior margin of carapace straight; pectine teeth 20–22 in females and 21–25 in males; all sternites lacking carinae; sternite VII with four weakly indicated carinae, intercarinal surface weakly granulated (mainly in males); metasomal segment V length/width ratio 2.06–2.33 in male; metasomal segment II–IV intercarinal surfaces granulated in both sexes; metasomal segment IV bears 8 carinae that are complete and granulate in both sexes; metasomal segment V of both sexes has only ventromedial and ventrolateral carinae that in posterior halves bear several lobate granules; dorsal surface of segment V smooth and lateral surface may be weakly granulated (more so in males); all metasomal segments sparsely setose; metasomal segment V bearing ca. 48 long setae in both sexes; telson rather elongate without sexual dimorphism, aculeus slightly shorter than vesicle in both sexes; legs I–III with tarsal bristle combs composed of 5 to 9 long, thin setae; movable finger of pedipalp with 8 rows of granules, with external and internal accessory granules.

DESCRIPTION. Adult males are 21–29 mm long and the adult females are 27–38 mm long. For position and distribution of trichobothria of pedipalps see Figs. 29–36. Sexual dimorphism is noticeable. Males are substantially smaller, but there are no differences in the shape of the telson. Pedipalp patella and femur are granulate and matte in males, smooth and glossy in females.

COLORATION (Figs. 1–16, 46). Basic color is yellow to orange with strong dark patterning and spots (population from type locality), but expression of colors is quite variable. The dark spots can also occur on the legs, mainly on the femur. The carinae on the metasoma can be dark. Metasomal segment V is darker than the other metasomal segments. The chelicerae are yellow with reticulation in the anterior part (population from type locality) or uniformly yellow (population from Laas Gel); dentition is reddish.

CARAPACE (Figs. 11–12, 15–16). The surface is densely granulated. The anterior margin is straight and bears six to eight macrosetae. Anterior median carinae are coarsely granular. There are 5 lateral eyes on each side (3 larger, 2 smaller).

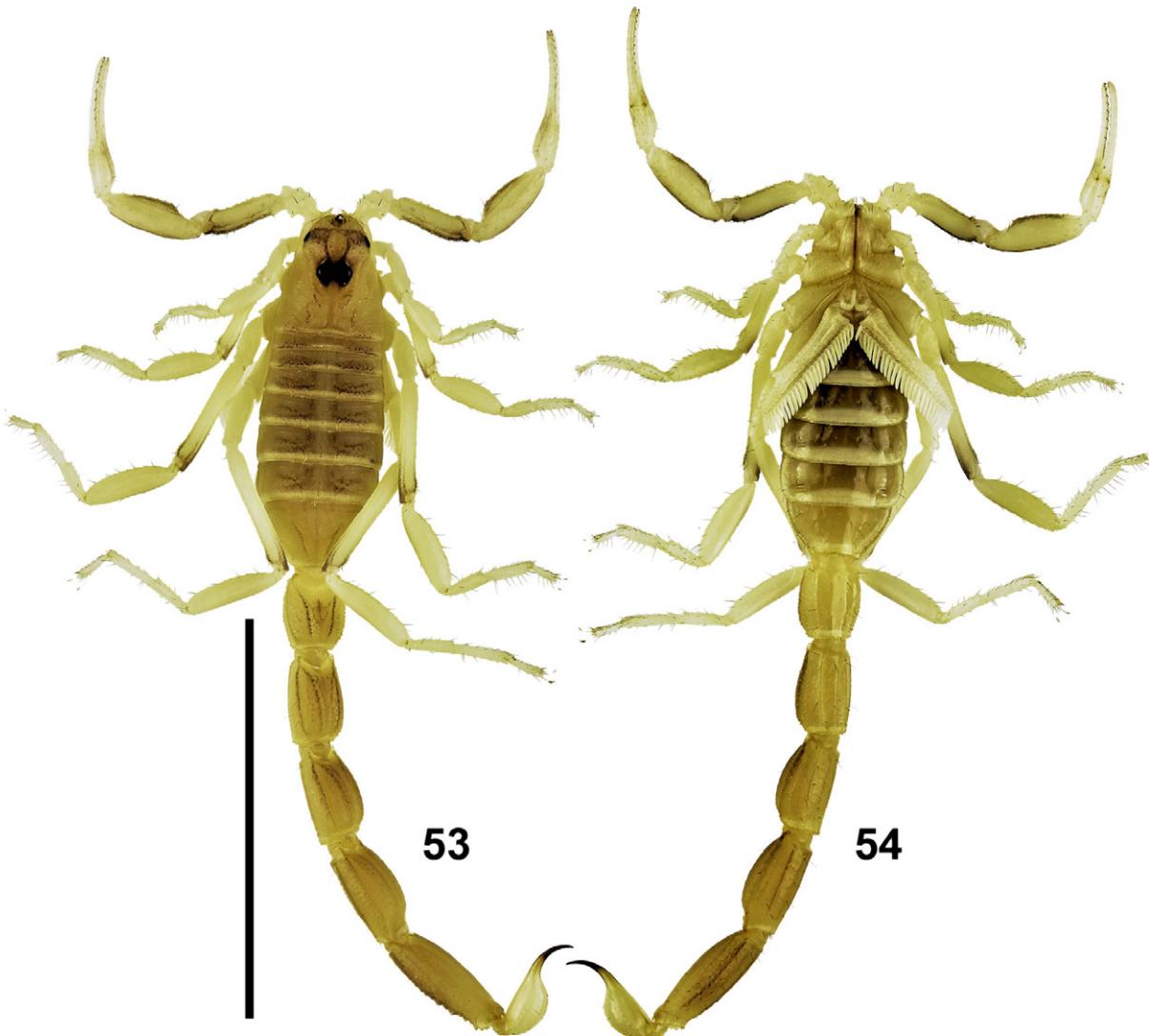
MESOSOMA (Figs. 11–16). The tergites bear three coarsely granular carinae, of which the lateral pair on



**Figures 49–50:** Figure 49. *Gint calviceps*, female from locality No. 17SE (Somaliland, Toon village near Hargeisa), in vivo habitus. Figure 50. *Gint dabakalo*, male from locality No. 17SC (Somaliland, Burao, airport), in vivo habitus.



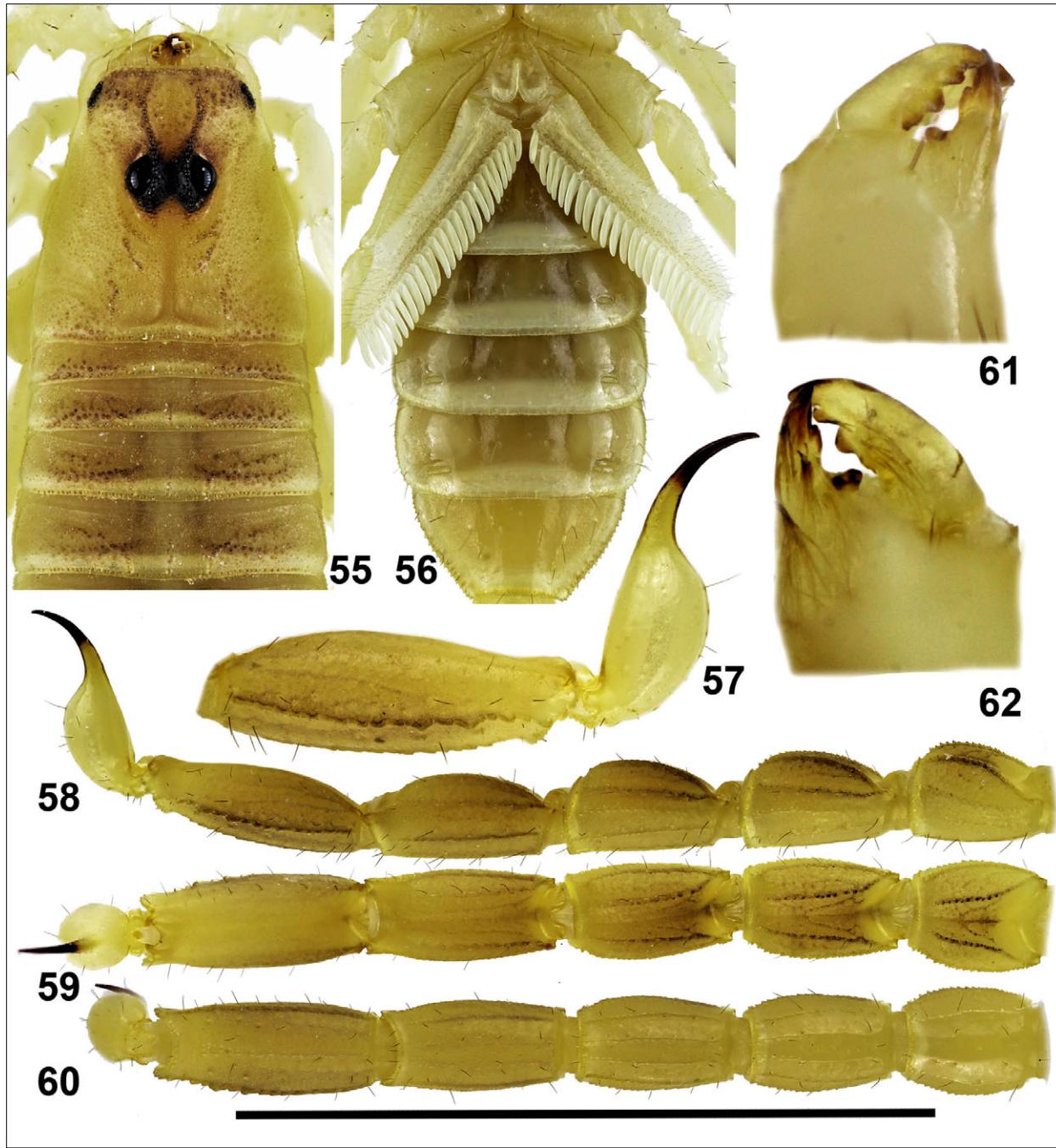
**Figures 51–52:** *Gint gaitako*, male (51) and female (52) from locality No. 16EH (Ethiopia, Oromia State, Sidamo Province, Wachile), *in vivo* habitus.



**Figures 53–54:** *Gint gubanensis* sp. n., holotype male, dorsal (53) and ventral (54) views. Scale bar: 10 mm.

tergites I–II are inconspicuous. All tergites with dense coarse and fine granulation. The pectinal tooth count is 21–25 (22.879) ( $\pm 0.860$ ) [58] in males and 20–22 (21.000) ( $\pm 0.633$ ) [16] in females. The marginal tips of the pectines extend from the third quarter to the end of sternite IV in females, and from the end of sternite IV to the first quarter of sternite V in males. The pectines have 3 marginal lamellae and 8–10 middle lamellae. The lamellae bear numerous dark setae, three to six on each fulcrum. Sternites III–VI lack carinae, their surfaces are smooth except for finely shagreened lateral areas on sternite III covered by the pectines. Sternite VII has two pairs of poorly indicated carinae and is weakly granulated in the area outside the lateral carinae, more so in males. All sternites bear many long macrosetae on their surfaces and margins.

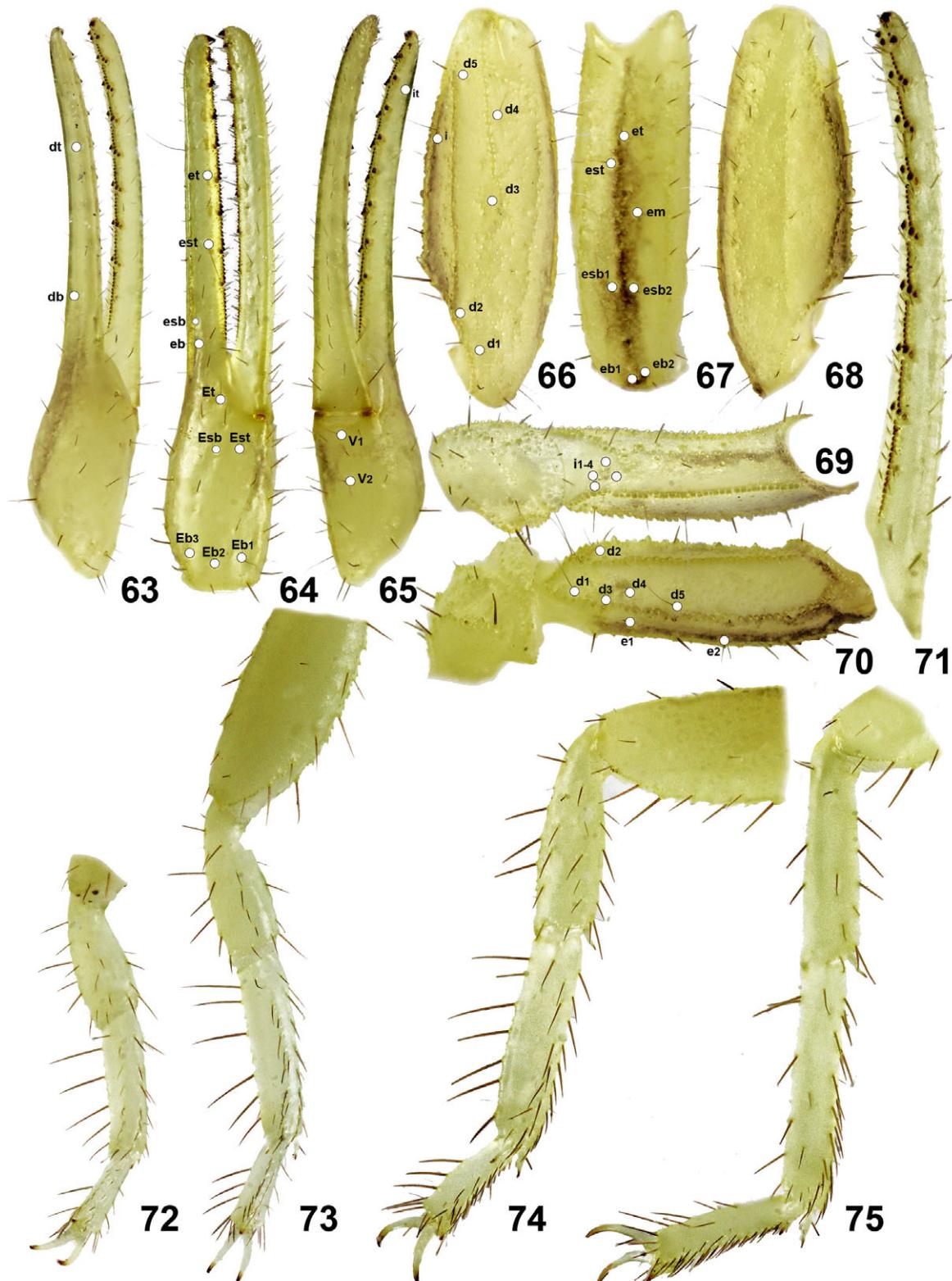
HEMISPERMATOPHORE (Figs. 148–163, 196). Flagelliform, trunk long and slender, capsule relatively short. Flagellum approximately as long as trunk, with shorter pars recta bearing a fin-like expansion along proximal anterior margin, and longer, hyaline pars reflecta. Capsule with 3+1 lobe structure typical of ‘*Buthus*’ group (Fet et al., 2005; Kovařík et al., 2016c). Sperm hemiduct separated from flagellum, tripartite with posterior lobe largest, median lobe shortest and apically acuminate, anterior lobe of intermediate size and apically tapered. Posterior margin of median lobe overhanging the posterior lobe, the two lobes fused along a robust carina. Basal lobe well developed as a low, rounded scoop of variable size (Figs. 149–163, 196). Morphology was consistent across 10 hemispermatoophores extracted from 5 males.



**Figures 55–62:** *Gint gubanensis* sp. n., holotype male, chelicerae, carapace and tergites I–IV (55), sternoplectal region and sternites III–VII (56), metasoma V and telson lateral view (57), metasoma and telson, lateral (58), dorsal (59), and ventral (60) views, left chelicera dorsal (61) and ventral (62) views. Scale bar: 10 mm (58–60).

METASOMA AND TELSON (Figs. 21–28, 127–128). Metasoma I–III bear 10 carinae, the ventromedial carinae on metasoma I are present but smooth. Median lateral carinae are complete or almost complete on I–III. Ventromedial and ventrolateral carinae on metasoma II–III are granulated, with larger granules posteriorly, and strong granulation in females. Metasoma IV bears 8

carinae that are complete and granulate in both sexes. Metasoma V of both sexes has only ventromedial and ventrolateral carinae, which in posterior halves bear several lobate granules. Intercarinal surfaces of segments II–IV are partly granulated in both sexes, with granules of approximately equal size. The ventral aspect of metasoma I is smooth in both sexes. Dorsal and lateral



**Figures 63–75:** *Gint gubanensis* sp. n., holotype male. Pedipalp chela, dorsal (63), external (64), and ventrointernal (65) views. Pedipalp patella, dorsal (66), external (67), and ventral (68) views. Pedipalp femur and trochanter, internal (69) and dorsal (70) views. Pedipalp chela, movable finger dentate margin (71). Distal segments of right legs I–IV, retrolateral views (72–75, respectively). The trichobothrial pattern is indicated in Figures 63–70 (labeled white circles).

surfaces of this segment are granulated in both sexes. The anal arch consists of three lobes in both sexes. All segments are sparsely setose; the fifth segment has ca. 48 long setae in both sexes. The telson is rather elongate without sexual dimorphism. The aculeus is slightly shorter than the vesicle in both sexes. The surface of the telson is smooth, sparsely hirsute, without a subaculear tubercle.

**LEGS** (Figs. 17–20). The tarsomeres bear two rows of macrosetae on the ventral surface and numerous macrosetae on the other surfaces, which on legs I–III form bristle combs with 5–9 bristles. The macrosetae are thin in both sexes. The femur and patella may bear four to six carinae. The femur bears only solitary macrosetae.

**PEDIPALPS** (Figs. 29–45). The femur and patella are matte and granulated in males, and smooth and glossy in females. The femur bears three to four carinae; the ventroexternal carina is absent, the other carinae are granular. The patella bears seven coarsely granular carinae. The chela is smooth in both sexes, with only traces of incomplete obsolete carinae. All pedipalp segments including the trochanter are sparsely hirsute, with long, dark macrosetae in both sexes. The dentate margin of the movable finger has eight rows of granules, each with one external and one internal granule, and 5 terminal granules (4 terminal and one proximal terminal). The fixed finger has eight or nine rows of granules, each with one external and one internal granule.

**AFFINITIES.** *G. amoudensis* sp. n. is morphologically similar to *G. gaitako*. The DNA analysis of *cox1* and *16S* gene fragments (Just et al., in preparation) indicates that these populations represent separate lineages with separate areas of distribution (Fig. 202). They can be also differentiated by morphology according to different metasomal granulation (see morphological key below) and according to the different chromosome numbers, which are  $2n=35$ , 36 in *G. amoudensis* sp. n. and  $2n=30$  in *G. gaitako* (Figs. 150–151, see also figs. 62–63 in Kovařík et al., 2013: 16). We described *G. amoudensis* sp. n. based on 40 specimens from two separate localities, 15 specimens from Borama (type locality) and 25 specimens from Laas Gel. We noticed some variability between these two populations, with noticeable differences in coloration (Figs. 1–2 vs. 46), e.g. all species from the type locality are dark with partially fuscous chelicerae (Figs. 11–12) while all specimens from Laas Gel are yellow with yellow chelicerae (Fig. 15–16). Other differences are listed in Tables 1 and 3. However, the DNA analysis (Just et al., in preparation) confirmed that these two populations form a monophyletic lineage and can be thus considered a single species.

**COMMENTS ON LOCALITIES AND LIFE STRATEGY.** The type locality, 17SR is a riverbed of an occasional river

(Fig. 47 and figs. 45–48 in Kovařík et al., 2017: 18). The locality lies in the grounds of Amoud University Campus and is a study site for detailed research. *G. amoudensis* sp. n. was recorded at night during ultraviolet (UV) light collecting together with *Neobuthus* sp., *Parabuthus abyssinicus* Pocock, 1901 (Buthidae), and *Pandinops pugilator* (Pocock, 1900) (Scorpionidae). At this locality, the first author recorded maximum daytime temperatures of 29.1 °C (10th September 2017) and 31.8 °C (12th September 2017), and a minimum nighttime temperature of 19.6 °C. The recorded humidity was between 31% (minimum at night) and 79% (maximum at day).

The second locality 17SF (Fig. 48, Laas Gel), is in rocky semi-desert terrain with the riverbed of an occasional river in the center. *G. amoudensis* sp. n. was recorded at night during UV light collecting together with *Neobuthus* sp., *Hottentotta polystictus* (Pocock, 1896), *Parabuthus heterurus* Pocock, 1897 (Buthidae), and *Pandiborellius somalilandus* (Kovařík, 2012) (Scorpionidae). At this locality, the first author recorded maximum daytime temperatures of 33.8 °C (28th August 2017) and 34.7 °C (29th August 2017), and a minimum nighttime temperature of 22.8 °C (29th August 2017) and 23.2 °C (30th August 2017). The recorded humidity was between 26% (minimum at night) and 54% (maximum at day).

***Gint calviceps* (Pocock, 1900)**  
(Figs. 49, 125, 132–134, 202, Table 3)

*Buthus calviceps* Pocock, 1900a: 54; Pocock, 1900b: 57; Moriggi, 1941: 84; Lamoral & Reynders, 1975: 505.

*Buthus (Buthacus) calviceps*: Birula, 1917: 214, 224.

*Buthacus calviceps* [sic]: Probst, 1973: 329; El-Hennawy, 1992: 112.

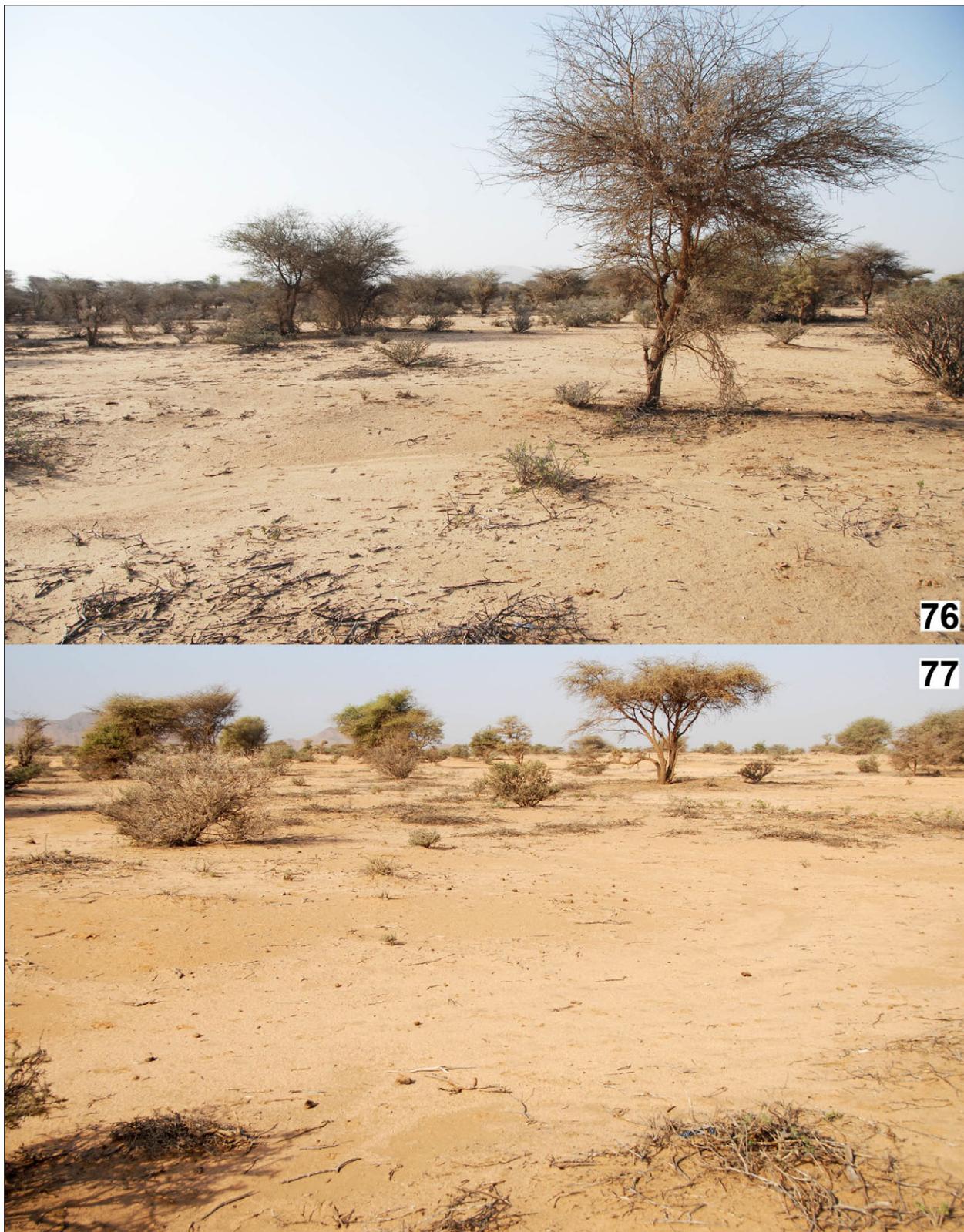
*Buthacus calviceps*: Levy, Amitai & Shulov, 1973: 138; Levy & Amitai, 1980: 76; Kovařík, 1998: 105; Fet & Lowe, 2000: 82; Kovařík, 2003: 137; Kovařík, 2005: 10.

*Gint calviceps*: Kovařík et al., 2013: 14–18, figs. 67–69 (in part); Kovařík & Mazuch, 2015: 6–10, figs. 1–16, 55–58, 85–86, 89; Rossi, 2015: 53; Kovařík et al., 2017a: 8, figs. 24–25.

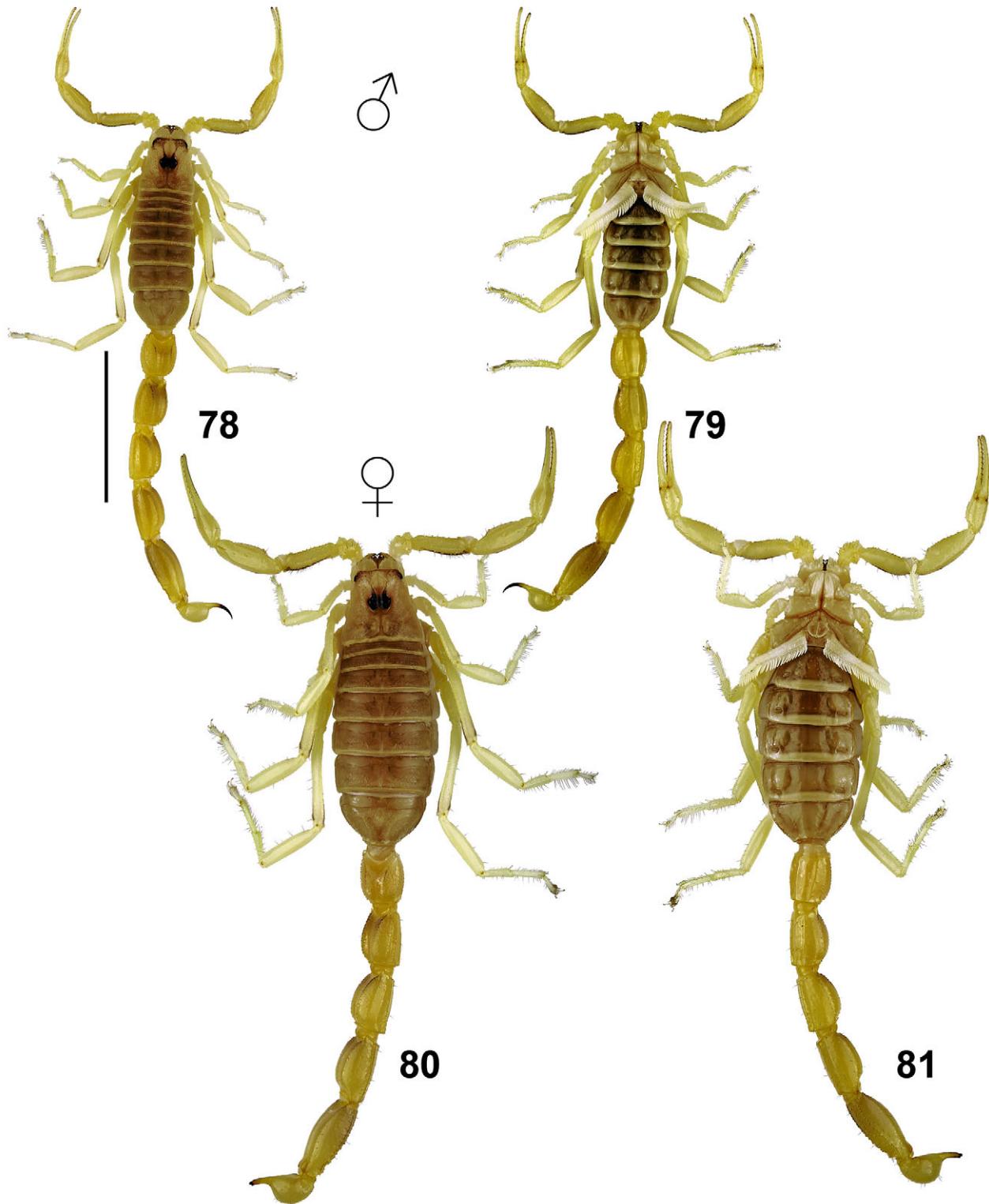
**TYPE LOCALITY AND TYPE DEPOSITORY.** **Somaliland**, Berbera or Hargaisa (see comments in Kovařík & Mazuch, 2015: 8–10); BMNH.

**TYPE MATERIAL EXAMINED.** Northwest Somaliland, Berbera, 16.IV.1895 or Hargaisa, 25.–28.IV.1895, leg. C. V. A. Peel, 1♀ (holotype), BMNH.

**ADDITIONAL MATERIAL EXAMINED.** Somaliland, south of Qool-Cadday, between Hargeisa and Salahle, Woqooyi Galbeed, 09°11'56"N 44°09'50"E, 18.I.2015, 1♂ (Figs. 132, 134, figs. 1–6, 8–16, 55–58, 86 in Kovařík &



Figures 76–77: The type locality of *Gint gubanensis* sp. n., Somaliland, Gerissa, N of Borama.



**Figures 78–81:** *Gint maidensis* sp. n. **Figures 78–79.** Holotype male, dorsal (78) and ventral (79) views. **Figures 80–81.** Paratype female, dorsal (80) and ventral (81) views. Scale bar: 10 mm.

Mazuch, 2015: 6–10), leg. T. Mazuch, FKCP; Toon village near Hargeisa, 09°23'30"N 44°07'10"E, 1272 m a.s.l. (figs. 24–25 in Kovařík et al., 2017: 8, Locality No. 17SE), 8.II.2017, 1♀ (Figs. 49, 133, No. 1396), leg. F. Kovařík, FKCP.

**DIAGNOSIS.** Total length 30 mm (male) to 38 mm (female); chelicerae yellow without reticulation; carapace densely granulated with only anterior median carinae developed; anterior margin of carapace straight; pectine teeth 21–23 in female and 25 in male; all sternites lacking carinae; sternite VII with four distinct carinae, intercarinal surface weakly granulated laterally; metasomal segment V length/width ratio 2.03 in male; metasomal segment I–III intercarinal surfaces granulated, mainly in males; metasomal segment IV ventrally granulated densely in both sexes; metasomal segment V of both sexes has only ventrolateral carinae, which in posterior halves bear several lobate granules; dorsal and lateral surfaces of metasoma V granulated in males; all metasomal segments sparsely setose; metasomal segment V bearing sparse, long setae in both sexes; telson rather elongate, telson length/depth ratio 3.6 in male; aculeus slightly shorter than vesicle in both sexes; legs I–III with tarsal bristle combs composed of long, thin setae; patella of legs smooth; movable finger of pedipalp with 8 rows of granules, with external and internal accessory granules and four terminal and one proximal terminal granules.

***Gint dabakalo* Kovařík et Mazuch, 2015**  
(Figs. 50, 122, 135–137, 164–170, 202, Table 3)

*Gint calviceps* Kovařík et al., 2013: 14–18, figs. 70–71 (in part).

*Gint dabakalo* Kovařík & Mazuch, 2015: 13–18, figs. 30–54, 59–64, 63–66, 83–84, 89; Kovařík et al., 2016e: 9.

**TYPE LOCALITY AND TYPE DEPOSITORY.** **Somaliland**, N of Burao, Togdheer, surroundings of Egal Hotel, 9°33'24"N 45°31'58"E, 1052 m a.s.l.; FKCP.

**TYPE MATERIAL EXAMINED.** Somaliland, N of Burao, Togdheer, surroundings of Egal Hotel, 9°33'24"N 45°31'58"E, 1052 m a.s.l., 1♂ (holotype, Figs. 135, 137) 1♀ 1juv.♂ (paratypes, Fig. 136), 20.I.2015, leg. T. Mazuch, FKCP; between Sheikh and Laas Caanood, 09°36'40.1"N 45°29'35.7"E, 1089 m a.s.l. (Locality No. 11SL), 10.VII.2011, 1juv. (paratype), leg. F. Kovařík, FKCP.

**ADDITIONAL MATERIAL EXAMINED.** Somaliland, N of Burao, Togdheer, surroundings of Egal Hotel, 09°33'24"N 45°31'58"E, 1014 m a.s.l. (type locality, locality

No. 17SH), 30.-31.VIII.2017, 1♂ (Figs. 164–167, No. 1305) 1juv., leg. F. Kovařík, FKCP; Burao, airport, 09°31'51"N 45°33'15"E, 1040 m a.s.l (Locality No. 17SC), 6.II.2017, 1♂ (Figs. 50, 168–170, No. 1199) 6juvs., leg. F. Kovařík, FKCP.

**DIAGNOSIS.** Total length 25.2 mm (male) to 35.5 mm (female); chelicerae yellow without reticulation; carapace densely granulated with only anterior median carinae developed; anterior margin of carapace straight; pectine teeth 21–22 in female and 23–26 in males; all sternites lacking carinae; sternite VII with four weakly indicated carinae, intercarinal surface weakly granulated (mainly in males); metasomal segment V length/width ratio 2.40–2.41 in males; metasomal segment I–IV intercarinal surfaces granulated in both sexes; metasomal segment IV bears 8 carinae that are complete and granulate in both sexes; metasomal segment V of both sexes has only ventromedial and ventrolateral carinae that in posterior halves bear several lobate granules; dorsal surface of this segment smooth and lateral surface may be weakly granulated (more in males); all metasomal segments sparsely setose; metasomal segment V bearing ca. 35 long setae in both sexes; telson rather elongate, more so in males, telson length/depth ratio 3.38–3.46 in males; aculeus slightly shorter than vesicle in both sexes; legs I–III with tarsal bristle combs composed of long, thin setae; patellae of legs smooth; movable finger of pedipalp with 8–9 rows of granules, with external and internal accessory granules, with external and internal accessory granules.

***Gint gaitako* Kovařík, Lowe, Plíšková et Šťáhlavský, 2013**

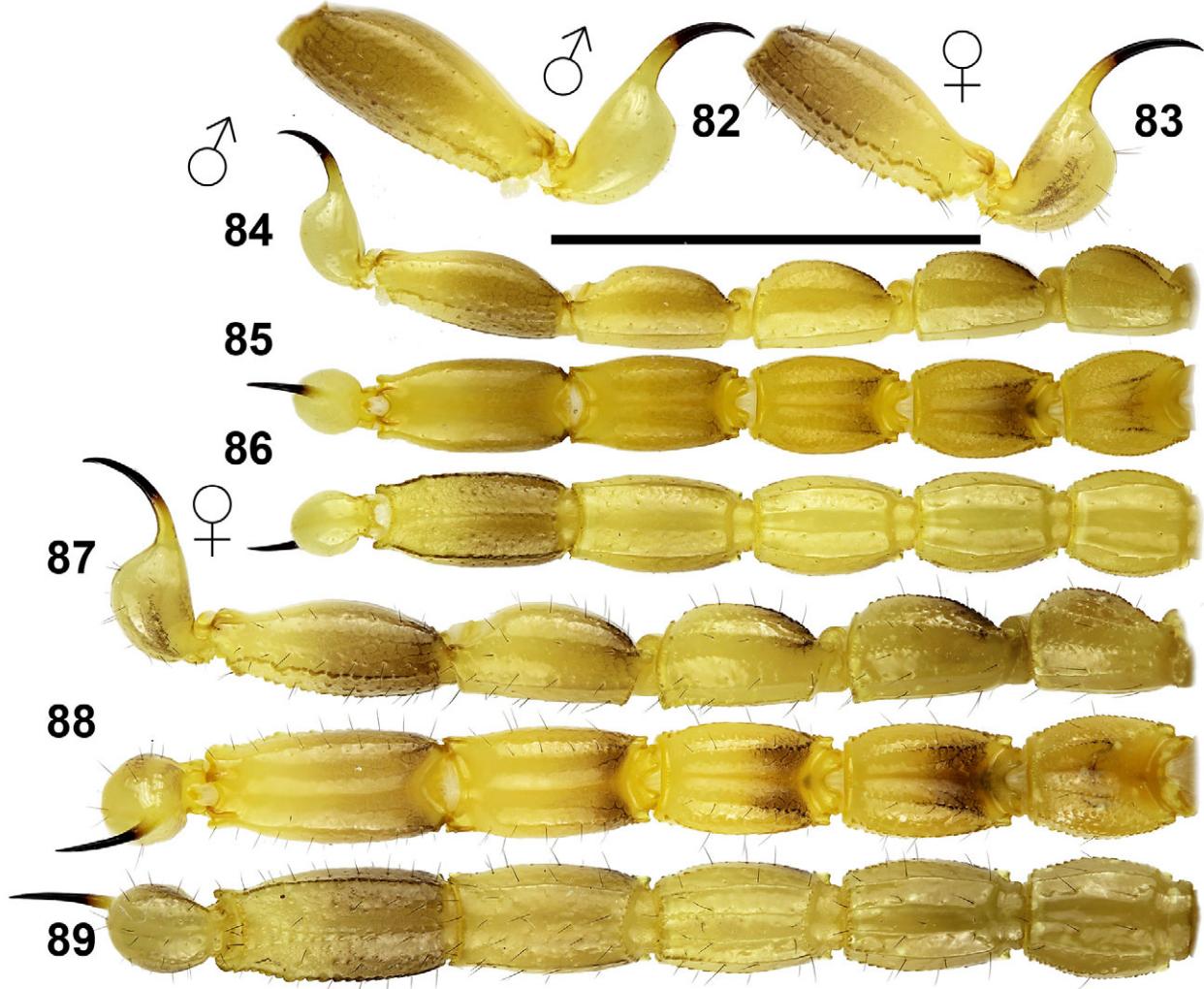
(Figs. 51–52, 126, 138–140, 171–174, 183–188, 195, 202, Table 3)

*Gint gaitako* Kovařík et al., 2013: 4–14, figs. 1–4, 6–63; Kovařík & Mazuch, 2015: 6–10, figs. 17–29, 87–89; Kovařík, 2016: 16, fig. 58; Kovařík et al., 2016a: 34.

**TYPE LOCALITY AND TYPE DEPOSITORY.** **Ethiopia**, Oromia State, Borana Province, 04°25'31.5"N 38°58'14"E, 1171 m a.s.l. (Locality No. 13EI), 27.–28.VI.2013, 1♂ (holotype), 1♀ 4♂ 3♀ 2juvs. (paratypes), FKCP, 1♂ 1♀ im. 1juv. (paratypes, No. 409), GLPC, leg. F. Kovařík.

**TYPE MATERIAL EXAMINED.** Ethiopia, Oromia State, Borana Province, 04°25'31.5"N 38°58'14"E, 1171 m a.s.l. (Locality No. 13EI), 27.–28.VI.2013, 1♂ (holotype), 1♀ 4♂ 3♀ 2juvs. (paratypes), FKCP, 1♂ 1♀ im. 1juv. (paratypes, No. 409), GLPC, leg. F. Kovařík.

**ADDITIONAL MATERIAL EXAMINED.** Ethiopia, Oromia State, Sidamo Province, Wachile env., 115 km N Moyale, 04°32'34"N 39°03'08"E, 1073 m a. s. l., 22–23.V.2015, 1♂ 3♀, leg. P. Kučera, FKCP; Oromia State, Sidamo Province, Goba Village env., 60 km SSW



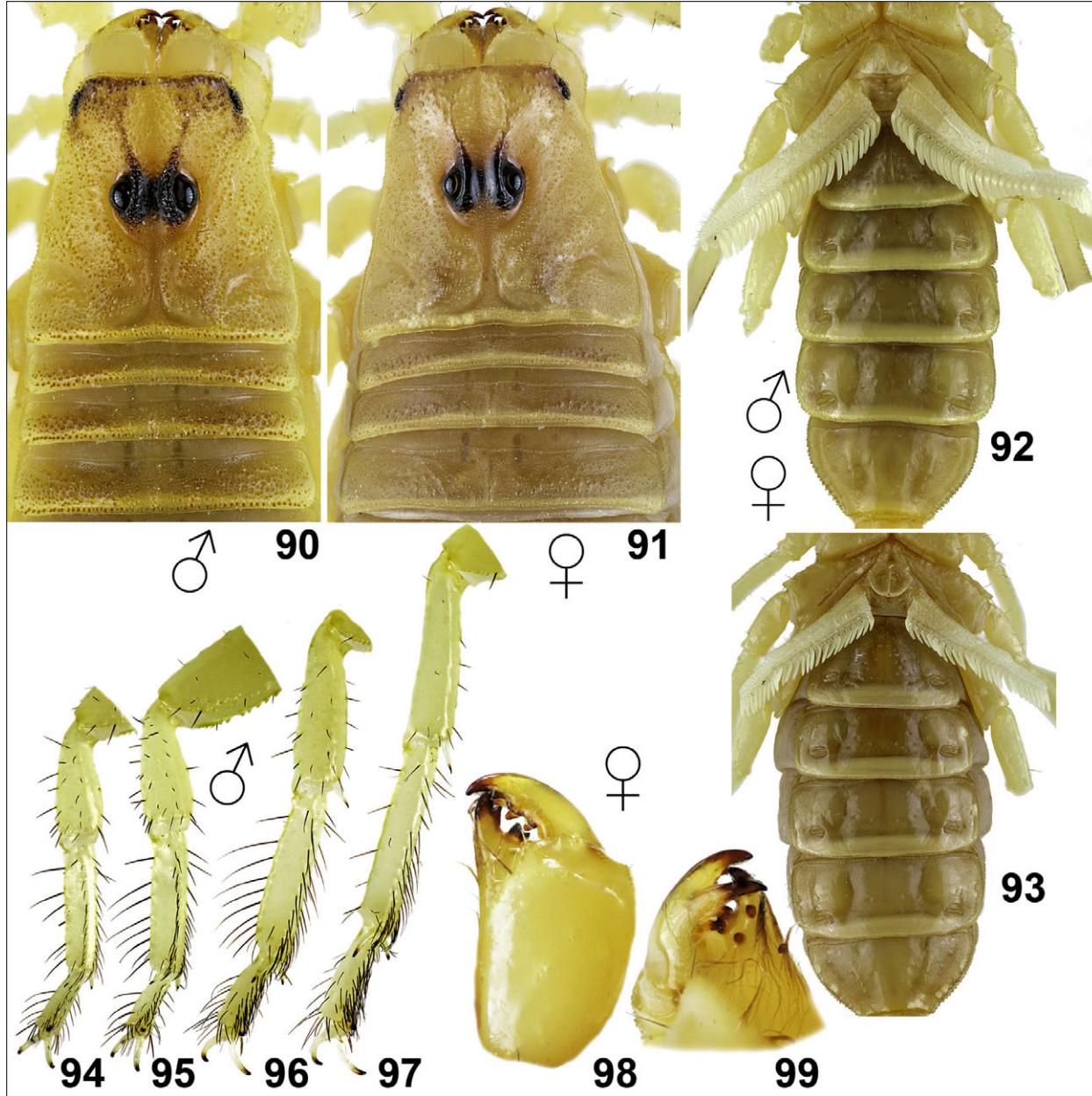
**Figures 82–89:** *Gint maidensis* sp. n. **Figures 82, 84–86.** Holotype male, metasoma V and telson lateral view (82), metasoma and telson, lateral (84), dorsal (85), and ventral (86) views. **Figures 83, 87–89.** Paratype female, metasoma V and telson lateral view (83), metasoma and telson, lateral (87), dorsal (88), and ventral (89) views. Scale bar: 10 mm (84–89).

Negele-Borana, 04°51'48"N 39°18'35"E, 750 m a. s. l., 24.V.2015, 2♂2♀, leg. P. Kučera, FKCP; Oromia State, Sidamo Province, Wachile, 04°32'33"N 39°03'07"E, 1051 m a.s.l. (fig. 58 in Kovařík, 2016: 14, locality No. 16EH), 16.–17.IV.2016, 7♂(Figs. 51, 126, 138, 140, 171–174, 183–188, 195, Nos. 951, 957, 958, 960, 961, 969) 2♀(Figs. 52, 139)12juvs., leg. F. Kovařík, FKCP, GLPC.

**DIAGNOSIS.** Total length 24.5–27.3 mm (males) and 37–39 mm (females); chelicerae yellow without reticulation; carapace densely granulated with only anterior median carinae developed; anterior margin of carapace straight; pectine teeth 19–22; all sternites lacking carinae; sternite VII with four smooth, weakly indicated carinae, intercarinal surface may be weakly granulated (mainly in males); metasomal segment V length/width ratio 2.11–2.12 in males; metasomal segment I–IV intercarinal

surfaces granulated in males, smooth or almost smooth in females; metasomal segment V of both sexes has only ventrolateral carinae that in posterior halves bear several lobate granules; dorsal and lateral surfaces of this segment smooth, without granules and carinae in both sexes; all metasomal segments sparsely setose; metasomal segment V bearing ca. 35 long setae in both sexes; telson rather elongate, telson length/depth ratio 3.05–3.22 in male; aculeus slightly shorter than vesicle in both sexes; legs I–III with tarsal bristle combs composed of long, thin setae; patellae of legs smooth; movable finger of pedipalp with 8 rows of granules, with external and internal accessory granules.

***Gint gubanensis* Kovařík et al., sp. n.**  
(Figs. 53–77, 123, 141–142, 175–178, 202, Tables 2, 3)  
<http://zoobank.org/urn:lsid:zoobank.org:act:589F71D7-2D23-4167-9D48-70E2DC7CBE2A>



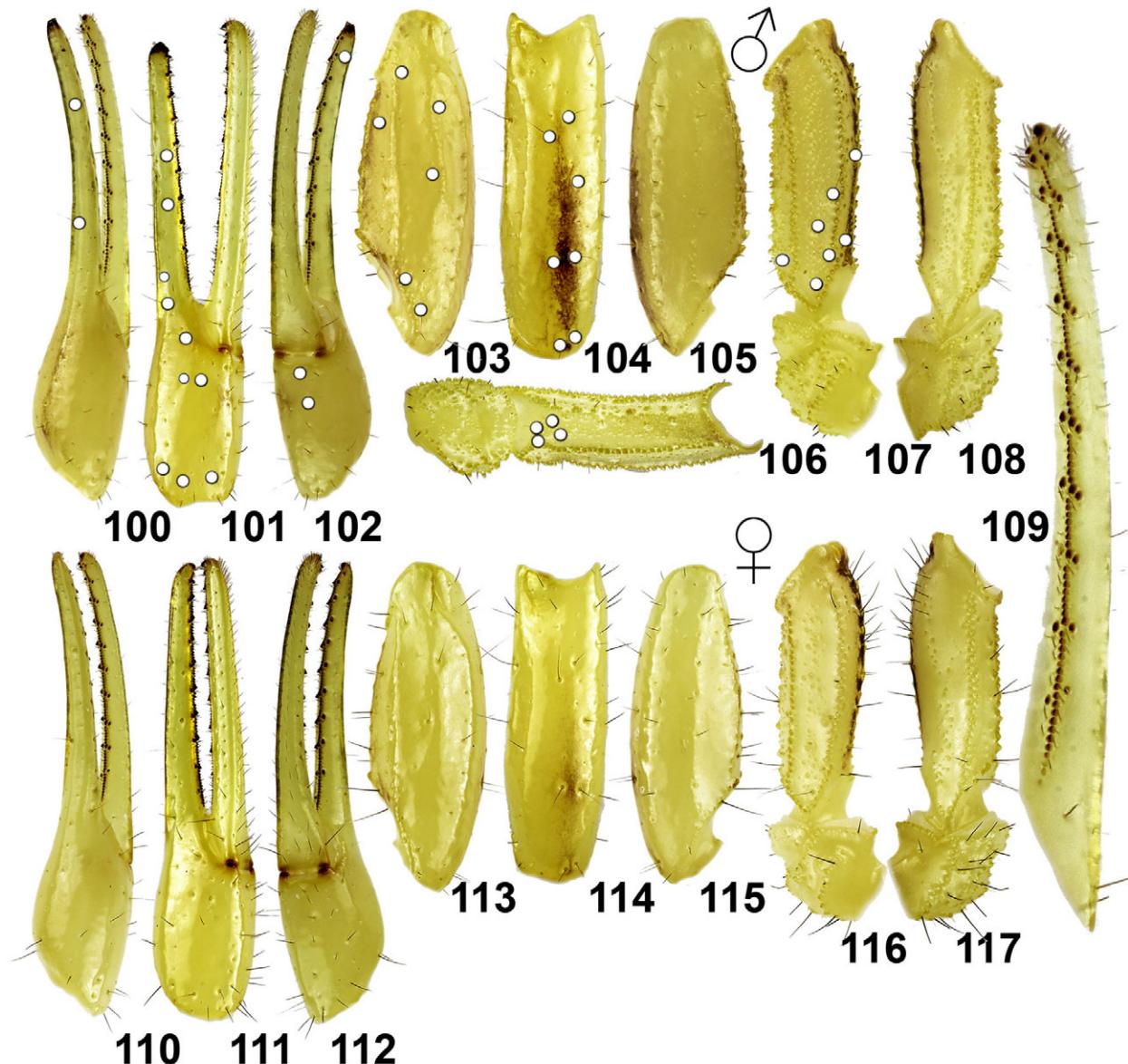
**Figures 90–99:** *Gint maidensis* sp. n. **Figures 90, 92, 94–97.** Holotype male, chelicerae, carapace and tergites I–III (90), sternoplectal region and sternites III–VII (92), distal segments of right legs I–IV, retrolateral views (94–97). **Figures 91, 93, 98–99.** Paratype female, chelicerae, carapace and tergites I–III (91), sternoplectal region and sternites III–VII (93), right chelicera dorsal (98) and ventral (99) views.

TYPE LOCALITY AND TYPE DEPOSITORY. **Somaliland**, Gerissa, N of Borama, 10°36'01"N 43°26'07"E, 245 m a.s.l.; FKCP.

TYPE MATERIAL EXAMINED. Somaliland, Gerissa, N of Borama, 10°36'01"N 43°26'07"E, 245 m a.s.l. (Figs. 76–77, locality No. 17ST), 11.–12.IX.2017, 1♂ (Figs. 53–75, 123, 141–142, 175–178, No. 1349), leg. F. Kovařík, FKCP.

ETYMOLOGY. Named after the Guban area (*guban* in Somali language means "burnt land"). It is the zone of hot and dry land along the sea between Djibouti and Puntland (Somalia). Gerissa village belongs to the Guban area.

DIAGNOSIS. Total length of male 25.68 mm, female unknown; chelicerae yellow without reticulation; carapace densely granulated with only anterior median and



**Figures 100–117:** *Gint maidensis* sp. n. **Figures 100–109.** Holotype male. Pedipalp chela, dorsal (100), external (101), and ventrointernal (102) views. Pedipalp patella, dorsal (103), external (104), and ventral (105) views. Pedipalp femur and trochanter, internal (106), dorsal (107) and ventral (108) views. Pedipalp chela, movable finger dentate margin (109). **Figures 110–117.** Paratype female. Pedipalp chela, dorsal (110), external (111), and ventrointernal (112) views. Pedipalp patella, dorsal (113), external (114), and ventral (115) views. Pedipalp femur and trochanter dorsal (116) and ventral (117) views. The trichobothrial pattern is indicated in Figures 100–107 (white circles).

partly central/posterior carinae developed; anterior margin of carapace straight; pectine teeth 25–26 in holotype male; all sternites lacking carinae; sternite VII with four distinct carinae, intercarinal surface weakly granulated; metasomal segment V length/width ratio 2.48 in male; metasomal segment I ventrally smooth; metasomal segment III–IV intercarinal surfaces granulated in male; metasomal segment IV bears 8 carinae that are complete and granulate; metasomal segment V has only ventro-medial and ventrolateral carinae that in posterior halves

bear several lobate granules; dorsal surface of this segment smooth and lateral surface weakly granulated; all metasomal segments sparsely setose; metasomal segment V bearing ca. 37 long setae; telson rather elongate, telson length/depth ratio 3.03 in male holotype; aculeus slightly shorter than vesicle; legs I–III with tarsal bristle combs composed of long, thin setae; patellae of legs very finely granulated; movable finger of pedipalp with 8 rows of granules, with external and internal accessory granules.



**Figures 118–119:** *Gint maidensis* sp. n., male (118) and female (119) paratypes, *in vivo* habitus.



**Figure 120:** The type locality of *Gint maidensis* sp. n., Somaliland, Maid.

Dimensions (MM)	<i>G. maidensis</i> sp. n.		<i>G. gubanensis</i> sp. n.	
	♂ holotype	♀ paratype	♂ holotype	♂ holotype
Carapace	L / W	3.800 / 4.025	4.620 / 5.950	2.800 / 2.950
Mesosoma	L	9.600	14.100	6.300
Tergite VII	L / W	2.900 / 3.950	3.750 / 5.750	1.725 / 2.750
Metasoma + telson	L	23.025	29.475	16.575
Segment I	L / W / D	3.100 / 2.550 / 2.215	3.750 / 3.075 / 2.525	2.150 / 1.650 / 1.450
Segment II	L / W / D	3.550 / 2.425 / 2.175	4.350 / 2.852 / 2.600	2.525 / 1.500 / 1.450
Segment III	L / W / D	3.700 / 2.400 / 2.250	4.650 / 2.825 / 2.700	2.625 / 1.450 / 1.450
Segment IV	L / W / D	4.100 / 2.300 / 2.150	5.200 / 2.855 / 2.650	2.925 / 1.386 / 1.375
Segment V	L / W / D	4.550 / 2.300 / 1.950	5.875 / 2.925 / 2.550	3.475 / 1.400 / 1.150
Telson	L / W / D	4.025 / 1.525 / 1.450	5.650 / 2.350 / 2.052	2.885 / 1.000 / 0.950
Pedipalp	L	12.600	16.030	8.538
Femur	L / W	3.250 / 1.000	4.130 / 1.150	2.025 / 0.650
Patella	L / W	3.950 / 1.350	5.050 / 1.750	2.775 / 0.900
Chela	L	5.400	6.850	3.738
Manus	W / D	1.085 / 1.100	1.550 / 1.550	0.700 / 0.725
Movable finger	L	3.350	4.800	2.662
<b>Total</b>	<b>L</b>	<b>36.43</b>	<b>48.20</b>	<b>25.68</b>

**Table 2:** Comparative measurements of adult males of *Gint maidensis* sp. n. and *Gint gubanensis* sp. n. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

DESCRIPTION. Adult male holotype is 25.68 mm long. No other specimens were available. For position and distribution of trichobothria of pedipalps see Figs. 63–70.

COLORATION (Figs. 53–54). Basic color is yellow to white with weak dark patterning and spots. Dorsal and ventral carinae on the metasoma can be dark. Metasomal segment V is usually darker than the other metasomal segments. The chelicerae are yellow without reticulation; dentition is reddish.

CARAPACE (Fig. 55). The surface is densely granulated. The anterior margin is straight and bears eight macrosetae. Anterior median and central/posterior median/lateral carinae coarsely granular. There are 5 lateral eyes on each side (3 larger, 2 smaller).

MESOSOMA (Figs. 53–56). The tergites bear three coarsely granular carinae, of which the lateral pair on tergites I–II are inconspicuous. All tergites with dense coarse and fine granulation. The pectinal tooth count is 25–26 in the male holotype. The marginal tips of the pectines extend to the posterior quarter of sternite V in the male. The pectines have 3 marginal lamellae and 8–9 middle lamellae. The lamellae bear numerous dark setae, four to six on each fulcrum. Sternites III–VI lack carinae, their surfaces are smooth except for finely shagreened lateral areas on sternite III covered by the pectines, and paired depressions on sternites IV–VI. Sternite VII has two pairs of poorly indicated carinae, and is weakly granulated in the area outside the lateral carinae. All sternites bear several long macrosetae on their surfaces and margins.

HEMISPERMATOPHORE (Figs. 175–178). Flagelliform, trunk long and slender, capsule relatively short. Flagellum slightly shorter than trunk, with shorter pars recta bearing a fin-like expansion along proximal anterior margin, and longer, hyaline pars reflecta. Capsule with 3+1 lobe structure typical of ‘*Buthus*’ group (Fet et al., 2005; Kovařík et al., 2016c). Sperm hemiduct separated from flagellum, tripartite with posterior lobe largest, median lobe shortest and apically acuminate, anterior lobe of intermediate size and apically tapered. Posterior margin of median lobe overhanging the posterior lobe, the two lobes fused along a robust carina. Basal lobe weakly developed as a low, narrow scoop (Figs. 176–178).

METASOMA AND TELSON (Figs. 57–60). Metasoma I bears 8 carinae, the ventromedial pair being obsolete. Metasoma II–III bear 10 carinae. Median lateral carinae are complete or almost complete. Ventromedial and ventrolateral carinae on metasoma II–III are partly granulated, with larger granules posteriorly. Metasoma IV bears 8 carinae that are complete and granulate. Metasoma V has only ventromedial and ventrolateral carinae, which in posterior halves bear several lobate granules. Intercarinal surfaces of segments I–IV are densely granulated, with granules of approximately equal size, except for the ventral aspect of metasoma I which is smooth. The anal arch consists of three or four lobes. All segments are sparsely setose; the fifth segment has ca. 37 long setae. The telson is rather elongate, telson length/depth ratio 3.03 in male holotype. The aculeus is slightly shorter than the vesicle. The surface of the tel-

Ratios of adult males	<i>G. amoudensis</i> sp. n. (n = 5), type locality	<i>G. amoudensis</i> sp. n. (n = 7) Laas Gel	<i>G. calviceps</i> (n = 1)	<i>G. dabakalo</i> (n = 3)
Metasomal segment I (L/W)	1.07–1.20	1.15–1.22	0.90	1.15–1.26
Metasomal segment II (L/W)	1.33–1.54	1.49–1.58	1.39	1.49–1.58
Metasomal segment IV (L/W)	1.80–2.06	1.92–2.00	1.82	1.80–2.08
Metasomal segment IV (L/D)	1.88–2.02	2.00–2.02	1.85	2.10–2.14
Metasomal segment V (L/W)	2.06–2.26	2.26–2.33	2.03	2.30–2.41
Metasomal segment V (L/D)	2.40–2.55	2.54–2.65	2.35	2.79–2.82
Telson (L/D)	2.98–3.21	2.80–3.21	3.60	3.14–3.46
Pedipalp chela (L/W)	4.83–5.29	4.97–5.11	4.51	4.97–5.45
Pedipalp chela (L) / movable finger (L)	1.40–1.43	1.37–1.43	1.39	1.34–1.43
<b>Total (L)</b>	<b>21–28.55</b>	<b>23–29.05</b>	<b>30.85</b>	<b>25.20–27.56</b>

Ratios of adult males	<i>G. gaitako</i> (n = 4)	<i>G. gubanensis</i> sp. n. (n = 1)	<i>G. maidensis</i> sp. n. (n = 8)	<i>G. puntlandus</i> (n = 1)
Metasomal segment I (L/W)	1.12–1.17	1.30	1.21–1.25	1.28
Metasomal segment II (L/W)	1.40–1.45	1.68	1.46–1.61	1.63
Metasomal segment IV (L/W)	1.70–1.83	2.11	1.78–1.84	2.06
Metasomal segment IV (L/D)	1.83–1.92	2.13	1.90–1.92	2.20
Metasomal segment V (L/W)	2.11–2.12	2.48	1.97–2.06	2.42
Metasomal segment V (L/D)	2.31–2.36	3.02	2.33–2.52	2.88
Telson (L/D)	3.05–3.22	3.03	2.67–2.78	3.45
Pedipalp chela (L/W)	5.34–5.40	5.34	4.97–5.52	4.94
Pedipalp chela (L) / movable finger (L)	1.42–1.49	1.40	1.61–1.41	1.44
<b>Total (L)</b>	<b>24.5–27.3</b>	<b>25.68</b>	<b>31.5–36.43</b>	<b>30.45</b>

**Table 3:** Comparison among *Gint* species (specimens), based upon selected morphometric ratios of adult males. Abbreviations: length (L), width (W), depth (D).

son is smooth, sparsely hirsute, without a subaculear tubercle.

LEGS (Figs. 72–75). The tarsomeres bear two rows of macrosetae on the ventral surface and numerous macrosetae on the other surfaces, which on legs I–III form bristle combs. The macrosetae are thin. The femur and patella may bear obsolete carinae. The femur bears only solitary macrosetae. The patella is very finely granulated.

PEDIPALPS (Figs. 63–71). The femur is granulated and bears three to four carinae; the ventroexternal carina is absent, the other carinae are granular. The patella is granular, with seven coarsely granular carinae. The chela is smooth, with only traces of incomplete obsolete carinae. All pedipalp segments including the trochanter are sparsely hirsute, with long, dark macrosetae. The dentate margin of the movable finger has eight rows of granules, each with one external and one internal granule, and 5 terminal granules (4 terminal and one proximal terminal). The fixed finger has nine rows of granules, each with one external and one internal granule.

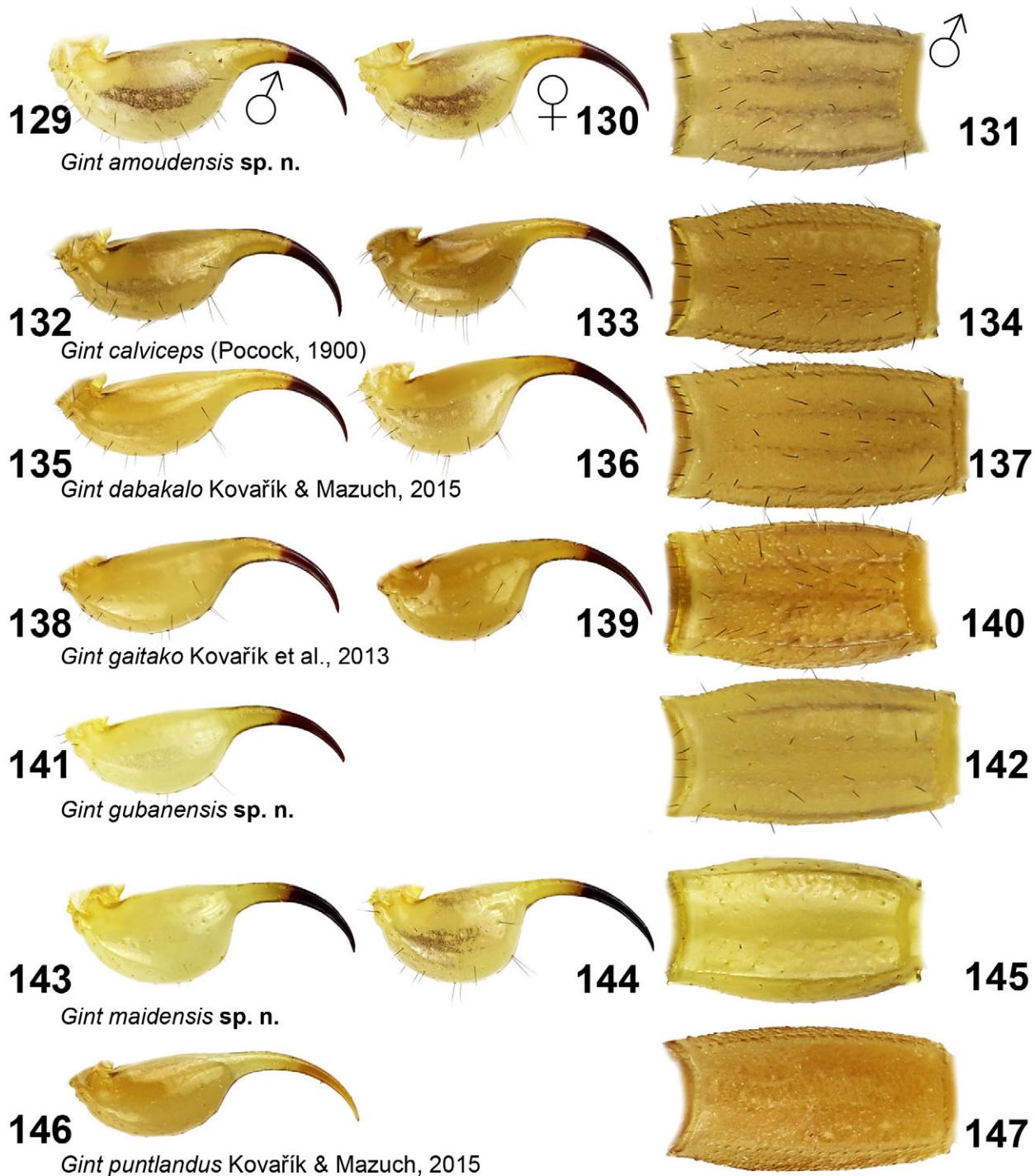
AFFINITIES. *G. gubanensis* sp. n. is morphologically similar to *G. dabakalo*. Nevertheless, these two species

can be distinguished by several characters, e. g. *G. gubanensis* sp. n. has developed or indicated dark colored central/posterior median/lateral carinae on the carapace (see Fig. 55 versus fig. 30 in Kovařík & Mazuch, 2015: 8) and very finely granulated leg IV patella. The dark colored carapacial carinae and the granulation of leg IV are absent in *G. dabakalo*. The basal lobe of the hemispermatophore is longer and lower in profile in *G. gubanensis* sp. n. (Figs. 176–178) compared to that of *G. dabakalo* (Figs. 164–170). Furthermore, *G. gubanensis* sp. n. and *G. dabakalo* have isolated areas of distribution (Fig. 202), and the DNA analysis indicates a divergence between these two species (Just et al., in preparation).

COMMENTS ON LOCALITIES AND LIFE STRATEGY. The type locality, 17ST is sandy semi-desert (Figs. 76–77). The holotype of *Gint gubanensis* sp. n. was recorded at night during UV collecting together with *Buthus berberensis* Pocock, 1900, *Compsobuthus somalilandus* Kovařík, 2012, *Hottentotta polystictus* (Pocock, 1896), *Neobuthus* sp., *Orthochirus* sp. (first record for Somaliland), and *Parabuthus granimanus* Pocock, 1895 (Buthidae). The first author arrived at the locality at night on 11th September 2017 at 23.00. In this time,



**Figures 121–128:** Metasoma and telson, ventral views, comparison of males of *Gint* species. **Figure 121.** *Gint puntlandus*, holotype. **Figure 122.** *Gint dabakalo*, holotype. **Figure 123.** *Gint gubanensis sp. n.*, holotype. **Figure 124.** *Gint maidensis sp. n.*, holotype. **Figure 125.** *Gint calviceps*, Somaliland, south of Qool-Cadday, between Hargeisa and Salahle, Woqooyi Galbeed, 09°11'56"N 44°09'50"E. **Figure 126.** *Gint gaitako*, Ethiopia, Oromia State, Sidamo Province, Wachile env., 115 km N Moyale, 04°32'34"N 39° 03'08"E, 1073 m a. s. l. **Figures 127–128.** *Gint amoudensis sp. n.*, from Laas Gel (127) and holotype from type locality (128).



**Figures 129–147:** Telson, lateral views of both sexes and metasoma IV ventral views of males, comparison of *Gint* species. 129–131. *Gint amoudensis* sp. n., holotype (129, 131) and female from type locality (130). 132–134. *Gint calviceps*, male from Somaliland, south of Qool-Cadday, between Hargeisa and Salahle, Woqooyi Galbeed, 09°11'56"N 44°09'50"E (132, 134) and female from locality 17SE (133). 135–137. *Gint dabakalo*, holotype (135, 137) and paratype (136). 138–140. *Gint gaitako*, male (138, 140) and female (139) from Ethiopia, Oromia State, Sidamo Province, Wachile env., 115 km N Moyale, 04°32'34"N 39°03'08"E, 1073 m a. s. l. 141–142. *Gint gubanensis* sp. n., holotype. 143–145. *Gint maidensis* sp. n., holotype (143, 145) and paratype (144). 146–147. *Gint puntlandus*, holotype.

there was temperature 32.7 °C and humidity 58%. He recorded a minimum temperature 29.9 °C and humidity 47% on 12th September 2017 early morning.

***Gint maidensis* Kovařík et al., sp. n.**

(Figs. 78–120, 124, 143–145, 179–182, 189–194, 197, 202, Tables 2, 3)

<http://zoobank.org/urn:lsid:zoobank.org:act:27A902B0-0636-472F-AF81-0A793B75C2AE>

TYPE LOCALITY AND TYPE DEPOSITORY. **Somaliland**, Maid, 11°00'03"N 47°06'30"E, 52 m a.s.l.; FKCP.

TYPE MATERIAL EXAMINED. Somaliland, Maid, 11°00'03"N 47°06'30"E, 52 m a.s.l. (Fig. 120, Locality No. 17SN), 3.-4.IX.2017, 11♂9♀1im.♂1im.♀ (holotype, Figs. 78–79, 82, 84–86, 90, 92, 94–97, 100–109, 124, 143, 145, paratypes, Figs. 80–81, 83, 87–89, 91, 93, 98–99, 110–119, 144, 179–182, 189–194, 197, Nos. 1321, 1324, 1336) leg. F. Kovařík, FKCP.

ETYMOLOGY. Named after the village of collection.

DIAGNOSIS. Total length 31.5–36.43 mm (male) to 39–48.2 mm (female); chelicerae yellow without reticulation; carapace densely granulated with only anterior median carinae developed; anterior margin of carapace straight or almost straight; pectine teeth 25–29 in females and 27–31 in males; all sternites lacking carinae; sternite VII with four indicated carinae, intercarinal surface weakly granulated; metasomal segment V length/width ratio 1.97–2.06 in male; ventral surface of metasomal segment IV smooth without granules and carinae in both sexes; metasomal segment IV bears four smooth carinae; metasomal segment V of both sexes has only ventromedial and ventrolateral carinae that in posterior halves bear several lobate granules; dorsal and lateral surfaces of this segment smooth; all metasomal segments sparsely setose; metasomal segment V bearing ca. 45 long setae in both sexes; telson rather bulbous, telson length/depth ratio 2.67–2.78 in males; aculeus slightly shorter than vesicle in both sexes; legs I–III with tarsal bristle combs composed of 7 to 11 long, thin setae; movable finger of pedipalp with 9–10 rows of granules, with external and internal accessory granules.

DESCRIPTION. Adult males are 31.5–36.43 mm long and the adult females are 39–48.2 mm long. For position and distribution of trichobothria of pedipalps see Figs. 100–107. Sexual dimorphism is noticeable. Males are substantially smaller, and have a somewhat more bulbous telson and longer pectines than females. Other differences, such as in metasomal carination, are described below.

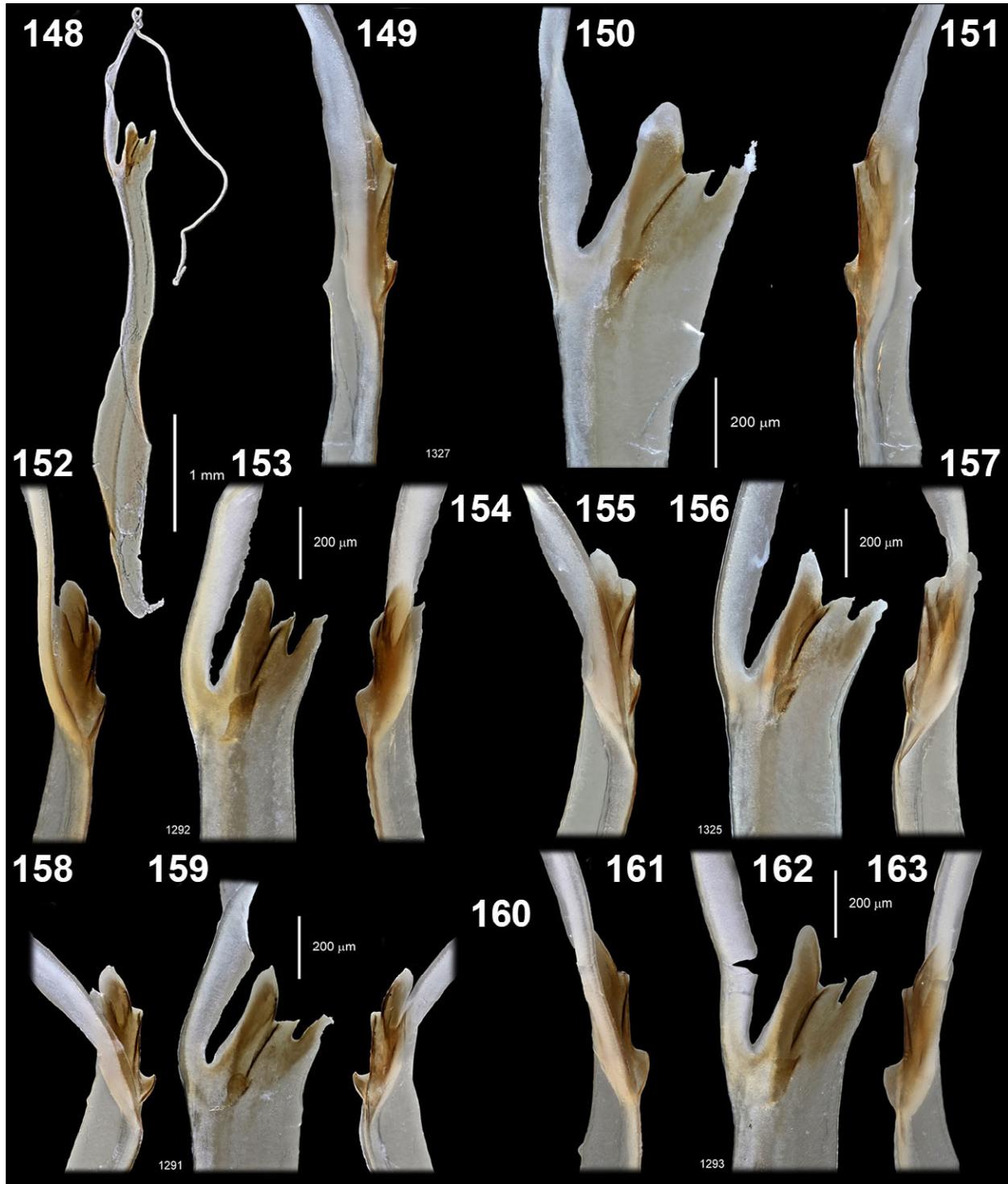
COLORATION (Figs. 78–81, 118–119). Basic color is yellow to white with dark patterning and spots, but expression of colors is quite variable. Dorsal surfaces of metasomal segments with a conspicuous dark spot in anterior part. Metasomal segment V is usually darker than the other metasomal segments, but may also be quite light-colored. The chelicerae are yellow without reticulation; dentition is reddish.

CARAPACE (Figs. 90–91). The surface is densely granulated. The anterior margin is straight or almost straight and bears six conspicuous macrosetae. Anterior median carinae coarsely granular. There are 5 lateral eyes on each side (3 larger, 2 smaller).

MESOSOMA (Figs. 90–93). The tergites bear three coarsely granular carinae, of which the lateral pair on tergites I–II are inconspicuous. All tergites with dense coarse and fine granulation. The pectinal tooth count is 27–31 (28.708) ( $\pm 1.233$ ) [24] in males and 25–29 (26.688) ( $\pm 1.302$ ) [16] in females. The marginal tips of the pectines extend to the posterior quarter of sternite IV in females, and to the anterior half of sternite V in males. The pectines have 3 marginal lamellae and 8–9 middle lamellae. The lamellae bear numerous dark setae, four to six on each fulcrum. Sternites III–VI lack carinae, and their surfaces are smooth except for being finely shagreened on lateral areas of sternite III covered by the pectines, and on medial parts of other sternites mainly in males. Sternite VII has two pairs of indicated carinae weakly granulated in the area outside the lateral carinae, more so in males. All sternites bear many long macrosetae on their surfaces and margins.

HEMISPERMATOPHORE (Figs. 179–182, 189–194, 197). Flagelliform, trunk long and slender, capsule relatively short. Flagellum as long as trunk, with shorter pars recta bearing a fin-like expansion along proximal anterior margin, and longer, hyaline pars reflecta. Capsule with 3+1 lobe structure typical of 'Buthus' group (Fet et al., 2005; Kovařík et al., 2016c). Sperm hemiduct separated from flagellum, tripartite with posterior lobe largest, median lobe shortest and apically acuminate, anterior lobe of intermediate size and apically tapered. Posterior margin of median lobe overhanging the posterior lobe, the two lobes fused along a robust carina. Basal lobe a large, tall, subtriangular hook (Figs. 179–182, 189–194, 197). Morphology was consistent across 6 hemispermatoophores extracted from 3 males.

METASOMA AND TELSON (Figs. 82–89). Metasoma I bears 8 carinae, the ventromedial pair being obsolete. Metasoma II–III bear 10 carinae. Median lateral carinae are complete or almost complete on I–III. Ventromedial and ventrolateral carinae on metasoma II–III are smooth or only indicated as traces. Metasoma IV bears 4 to 6 smooth obsolete carinae without granules in both sexes. Metasoma V of both sexes has only ventromedial and ventrolateral carinae, which in posterior halves bear sev-



**Figures 148–163:** **Figures 148–151:** *Gint amoudensis* sp. n., paratype male, No. 1327 from Laas Gel (Locality No. 17SF), right hemispermatoophore. **148.** Whole hemispermatoophore. **149–151.** Capsule region. Views of posterior (flagellar) margin (149), convex side (150), and anterior (sperm duct) margin (151). Scale bars: 1 mm (148), 200 µm (149–151). **Figures 152–163:** *Gint amoudensis* sp. n., capsule region of right hemispermatoophores from four additional paratype males, showing morphological variation. Nos. 1291 (158–160), 1292 (152–154) and 1293 (161–163) from Laas Gel (Locality No. 17SF). No. 1325 (155–157) from Borama, Armoud University (Locality No. 17SR). Views of posterior (flagellar) margin (152, 155, 158, 161), convex side (153, 156, 159, 162), and anterior (sperm duct) margin (154, 157, 160, 163). Scale bars: 200 µm (152–154; 155–157; 158–160; 161–163).



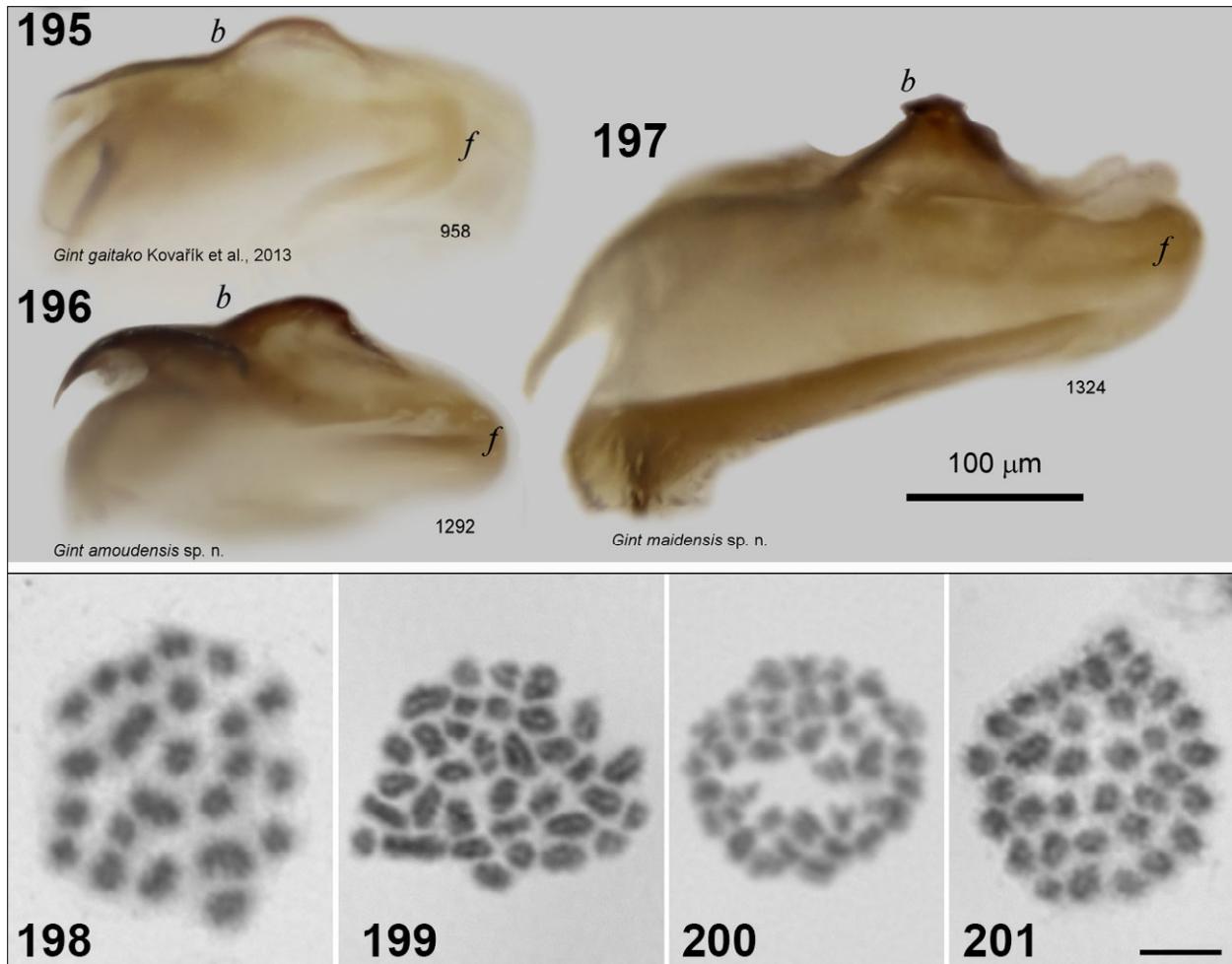
**Figures 164–170:** *Gint dabakalo* Kovařík & Mazuch, 2015, hemispermatoophores. **164–167.** No. 1305 from north of Burao, Togdheer (locality No. 17SH), left hemispermatoiphore, shown in mirror image for comparison. **164.** Whole hemispermatoaphore. **165–167.** Capsule region. Views of posterior (flagellar) margin (165), convex side (166), and anterior (sperm duct) margin (167). Scale bars: 1 mm (164), 200  $\mu\text{m}$  (165–167). **168–170.** No. 1199 from Burao airport (locality No. 17SC), right hemispermatoiphore, capsule region. Views of posterior (flagellar) margin (168), convex side (169), and anterior (sperm duct) margin (170). Scale bars: 1 mm (164), 200  $\mu\text{m}$  (165–167; 168–170).



**Figures 171–178:** Figures 171–174: *Gint gaitako* Kovařík et al., 2013, No. 951 from Wachile (Locality No. 16EH), right hemispermatoophore. 171. Whole hemispermatoophore. 172–174. Capsule region. Views of posterior (flagellar) margin (172), convex side (173), and anterior (sperm duct) margin (151). Scale bars: 1 mm (171), 200 µm (172–174). **Figures 175–178:** *Gint gubanensis* sp. n., holotype male (No. 1349), right hemispermatoophore. 175. Whole hemispermatoophore. 176–178. Capsule region. Views of posterior (flagellar) margin (176), convex side (177), and anterior (sperm duct) margin (178). Scale bars: 1 mm (175), 200 µm (176–178).



**Figures 179–194:** Figures 179–182: *Gint maidensis* sp. n., No. 1321 paratype male from Maid (Type locality No. 17SN), right hemispermatoaphore. 179. Whole hemispermatoaphore. 180–182. Capsule region. Views of posterior (flagellar) margin (180), convex side (181), and anterior (sperm duct) margin (182). Scale bars: 1 mm (179), 200 µm (180–182). Figures 183–194: Capsule region of right hemispermatoophores from two additional males of *Gint gaitako* Kovařík et al., 2013 (183–188); and two additional paratype males of *Gint maidensis* sp. n., (189–194), showing morphological variation. *Gint gaitako*: Nos. 957 & 958, from Wachile (Locality No. 16EH). *Gint maidensis* sp. n.: Nos. 1324 & 1336, from Maid (Locality No. 17SN). Views of posterior (flagellar) margin (183, 186, 189, 1921), convex side (184, 187, 190, 193), and anterior (sperm duct) margin (185, 188, 191, 194). Scale bars: 200 µm (183–185; 186–188; 189–191; 192–194).



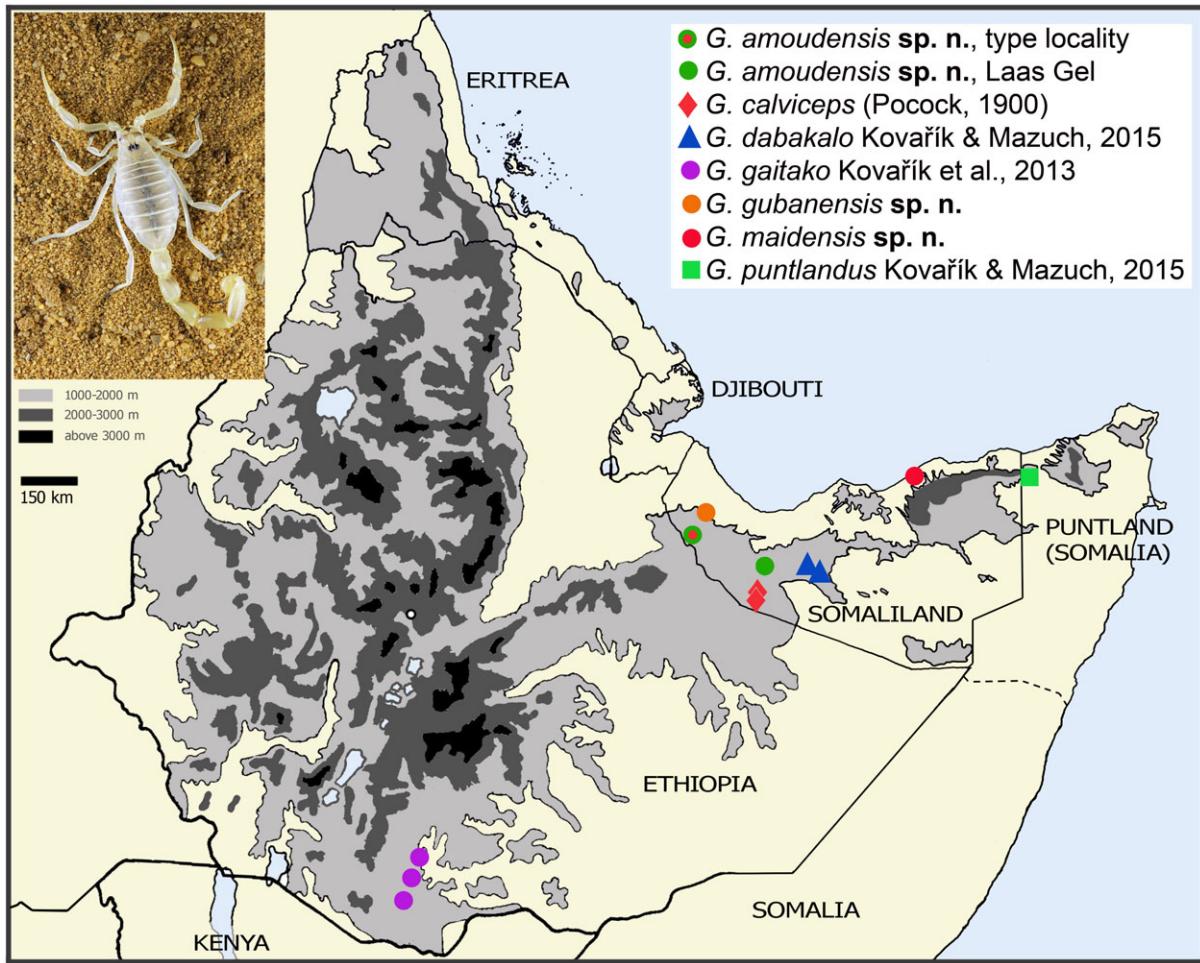
**Figures 195–201:** Figures 195–197: Profiles in distal view, along the longitudinal axis, of the convex surfaces at the level of the basal lobe of the right hemispermatophores of three species of *Gint*, showing different development of the basal lobe. **195.** *Gint gaitako* Kovařík et al., 2013, No. 958 from Wachile (Locality No. 16EH). **196.** *Gint amoudensis* sp. n., paratype male, No. 1292 from Laas Gel (Locality No. 17SF). **197.** *Gint maidensis* sp. n., No. 1321 paratype male from Maid (Type locality No. 17SN). Abbreviations: *b*, basal lobe, *f*, flagellum. **Figures 198–201:** Mitotic metaphases of *Gint* spp. males. **198.** *G. dabakalo* from locality 17SH ( $2n=23$ ). **199.** *G. amoudensis* sp. n., paratype from Laas Gel ( $2n=35$ ). **200.** *G. amoudensis* sp. n., paratype from type locality ( $2n=36$ ). **201.** *G. maidensis* sp. n., paratype ( $2n=34$ ). Scale bar: 5 µm.

eral lobate granules. Intercarinal surfaces of segments II–IV are smooth to rough in both sexes, without granules. Dorsal surfaces of these segments are smooth or finely granulated mainly in males. The anal arch lacks developed lobes in both sexes. All segments are sparsely setose; the fifth segment has ca. 45 long setae in both sexes. The telson is rather bulbous, more so in males. The aculeus is slightly shorter than the vesicle in both sexes. The surface of the telson is smooth, sparsely hirsute, without a subaculear tubercle.

LEGS (Figs. 94–97). The tarsomeres bear two rows of macrosetae on the ventral surface and numerous macrosetae on the other surfaces, which on legs I–III form bristle combs composed of 7 to 11 long, thin setae. The femur and patella may bear four to six carinae. The femur bears only solitary macrosetae.

PEDIPALPS (Figs. 100–117). The femur is granulated and bears three to four carinae; the ventroexternal carina is absent, the other carinae are granular. The patella is smooth, with seven smooth, weakly indicated carinae. The chela is smooth, with only traces of incomplete obsolete carinae. All pedipalp segments including the trochanter are sparsely hirsute, with long, dark macrosetae in both sexes. The dentate margin of the movable finger has 9–10 rows of granules, each with one external and one internal granule, and 5 terminal granules (4 terminal and one proximal terminal). The fixed finger has nine rows of granules, each with one external and one internal granule.

AFFINITIES. The described features distinguish *G. maidensis* sp. n. from all other species of the genus *G.*



**Figure 202:** Map showing confirmed distribution of *Gint* spp. Points indicate sites sampled during 2011–2017 expeditions and type locality of *G. puntlandus*. Scorpion shown in the photo inset is a female paratype of *G. maidensis* sp. n.

*maidensis* sp. n. can be separated from all other species by: 1) larger size, total length 31.5–36.43 mm in males, 39–48.2 mm in females of *G. maidensis* sp. n. vs. total length 21–30.85 mm in males, 26–38 mm in females of other species; 2) ventral surface of metasomal segment IV in males smooth without granules and carinae in *G. maidensis* sp. n. (Fig. 145) vs. granulated with median carinae present or indicated in other species (Figs. 131, 134); 3) telson rather bulbous, length/depth ratio 2.67–2.78 in males of *G. maidensis* sp. n. (Fig. 143) vs. rather elongate, length/depth ratio 2.98–3.60 in males of other species (Figs. 132, 135); 4) dentate margin of pedipalp movable finger with 9–10 rows of granules in *G. maidensis* sp. n. (Fig. 109) vs. 8–9 rows in other species (Fig. 71); 5) pectinal tooth count 27–31 in males, 25–29 in females of *G. maidensis* sp. n. vs. 20–26 in males, 19–23 in females of other species; 6) basal lobe of hemispermatophore large, tall, subtriangular and hook-like in *G. maidensis* sp. n. (Figs. 180–182, 189–194, 197) vs. small, low, rounded and scoop-like in other species

(Figs. 149–163, 165–170, 172–174, 176–178, 183–188, 195–196).

**COMMENTS ON LOCALITIES AND LIFE STRATEGY.** The type locality, 17SN is sandy semi-desert to desert (Fig. 120). The types of *Gint maidensis* sp. n. were obtained at night during UV collecting together with *Compsobuthus* sp., *Hottentotta* sp., *Leiurus* sp., and *Neobuthus* sp. (Buthidae). The first author arrived at the locality at night on 3rd September 2017 at 21.00. At this time the temperature was 38.6 °C and humidity 52%. Minimum temperature of 31.9 °C and humidity of 46% were recorded on 4th September 2017 in the early morning.

#### *Gint puntlandus* Kovařík et al., 2015 (Figs. 121, 146–147, 202, Table 3)

*Gint calviceps* Kovařík et al., 2013: 14–18, Figs. 64–66 (in part).

*Gint puntlandus* Kovařík & Mazuch, 2015: 18–21, figs. 67–82, 89.

TYPE LOCALITY AND TYPE DEPOSITORY. **Somalia** (Puntland), Galgalo, 10°59'N 49°03'E; FKCP.

TYPE MATERIAL EXAMINED. Somalia (Puntland), Galgalo, 10°59'N 49°03'E, 1980, 1♂ (Figs. 121, 146–147), leg. Dorsak, FKCP.

DIAGNOSIS. Total length of male holotype 30.45 mm, female unknown; chelicerae yellow without reticulation; carapace densely granulated with only anterior median carinae developed and posterior median carinae indicated; anterior margin of carapace straight; pectine teeth 26 in male; all sternites lacking carinae; sternites III–VI wrinkled; sternite VII without carinae, intercarinal surface weakly granulated; metasomal segment V length/width ratio 2.42 in male; metasomal segment I–IV intercarinal surfaces granulated; metasomal segment IV bears 8 carinae that are complete and granulate; metasomal segment V has only ventromedial and ventrolateral carinae; ‘lobate’ dentition on ventrolateral carinae of metasoma V reduced; dorsal surface of this segment smooth and lateral surface weakly granulated; all metasomal segments sparsely setose; telson rather elongate, telson length/depth ratio 3.45 in male; aculeus slightly shorter than vesicle in both sexes; legs I–III with tarsal bristle combs composed of long, thin setae; patellae of legs granulated; movable finger of pedipalp with 8 rows of granules, with external and internal accessory granules.

### Key to species of genus *Gint*

1. Total length 31.5–36.43 mm in males, respectively 39–48.2 mm in females. Pectinal tooth count 27–31 in males, 25–29 in females. Ventral surface of metasomal segment IV of male smooth without granules and carinae (Fig. 145). Telson length/depth ratio 2.67–2.78 in males. Hemispermatophore with large, tall, subtriangular, hook-like basal lobe ..... *G. maidensis* sp. n.  
— Total length 21–30.85 mm in males, respectively 26–38 mm in females. Pectinal tooth count 20–26 in males, 19–23 in females. Ventral surface of metasomal segment IV of male granulated with median carinae present or indicated (Figs. 131, 134, 137). Telson length/depth ratio 2.98–3.60 in males. Hemispermatophore with small to medium sized, low, rounded, scoop-like basal lobe ..... 2
2. Telson exhibiting an annular ring at the vesicle/aculeus juncture (Fig. 146). Metasoma V with enlarged ‘lobate’ dentition on ventrolateral carinae reduced ..... *G. puntlandus* Kovařík et Mazuch, 2015  
— Telson without annular ring (Figs. 129, 132, 135). Metasoma V with enlarged ‘lobate’ dentition on ventrolateral carinae present ..... 3

3. Metasoma elongate, metasomal segment V length/width ratio 2.40–2.48 in males (Figs. 122–123, Table 3) ..... 4  
— Metasoma short and wide, metasomal segment V length/width ratio 2.03–2.33 in males (Figs. 125–128, Table 3) ..... 5
4. Central, posterior median and lateral carinae of carapace developed and dark colored. Patella of leg IV very finely granulated ..... *G. gubanensis* sp. n.  
— Central, posterior median and lateral carinae of carapace not developed, all granules colored uniformly. Patella of leg IV smooth ..... *G. dabakalo* Kovařík et Mazuch, 2015
5. Telson narrow, telson length/depth ratio 3.38–3.60 in male ..... *G. calviceps* (Pocock, 1900)  
— Telson length/depth ratio 2.98–3.22 in male ..... 6
6. Metasomal segment IV ventrally granulated in both sexes ..... *G. amoudensis* sp. n.  
— Metasomal segment IV ventrally granulated only in males and smooth in females ..... *G. gaitako* Kovařík et al., 2013

COMMENTS ON KEYS TO SPECIES. The taxonomic positions of most *Gint* species are supported mainly by DNA and karyotype analysis. However, the species key is created strictly according to morphological characters which we verified from the specimens examined in this study. The key could be used for a quick orientation in conjunction with the distribution data (see Fig. 202). There is a possibility that additional specimens may show intraspecific variability in some characters used in this key for separation at the species level.

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