

Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part XXIX. A new species of *Neobuthus* from Somaliland (Buthidae)

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Abstract. A new species *Neobuthus fryntai* sp. nov. confirmed by DNA phylogeny (paper in preparation) is described according to morphological characters. It is morphologically most similar to *N. factorio* Kovařík, Lowe, Elmi et Hure, 2018. *Neobuthus fryntai* sp. nov. has pedipalp segments relatively slender than *N. factorio*, males with femur L/W 2.74–2.86 (2.42–2.70 in *N. factorio*), patella L/W 2.50–2.62 (2.18–2.28 in *N. factorio*), chela L/W 4.68–4.98 (4.25–4.48 in *N. factorio*). Included is actualized distribution map of the genus *Neobuthus* Hirst, 1911 with focus to Somaliland.

Key words. Taxonomy, new species, Scorpiones, Buthidae, *Neobuthus*, Somaliland, Afrotropical region.

INTRODUCTION

The genus *Neobuthus* Hirst, 1911 so far includes 16 small buthid scorpions distributed in northeastern Africa (Horn of Africa). The genus has been revised in Kovařík et al. (2018) and Kovařík (2019). However, the history of the genus was confusing until Kovařík & Lowe (2012) redefined its taxonomic concept and clarified its differences from the genus *Butheolus* Simon, 1882. In 2020–2022 continued the study of scorpion's fauna in Somaliland with cooperation of Charles University in Prague (Czech Republic) and Amoud University in Borama (Republic of Somaliland). This study produced another new species of the genus *Neobuthus* described here and new data about distributions added in the map with distribution of genus *Neobuthus* (Figs. 44–45).

MATERIAL AND METHODS

Nomenclature and measurements follow Vachon (1963), Stahnke (1971), Sissom (1990), Kovařík (2009), and Kovařík & Ojanguren Affilastro (2013), except for trichobothriotaxy (Vachon 1974, 1975), and morphology of sternum (Soleglad & Fet 2003).

Specimens used for this study were collected and imported with permissions from Amoud University and Ministry of the Environment of the Republic of Somaliland.

Specimens studied herein are preserved in 80% ethanol in the first author collection (FKCP, František Kovařík, private collection, Prague, Czech Republic; will in future be merged with the collections of the National Museum (Natural History), Prague, Czech Republic). Map documents for Figs. 44–45 were downloaded at <https://www.simplenamap.net/#tabs=1>.

TAXONOMY

Buthidae C. L. Koch, 1837

***Neobuthus* Hirst, 1911**

(Figs. 1–70, Table 1)

Neobuthus Hirst, 1911: 462; Kovařík & Lowe 2012: 1–25, figs. 1–6, 9–74, 86, 89, 92, 95–96, 100–101 (including complete generic synonymy prior to 2012); Kovařík et al. 2013: 4, 14; Lowe & Kovařík 2016: 1–46, figs. 1–165, tables 1–5; Kovařík et al. 2018: 1–82, figs. 1–438, tables 1–5; Kovařík 2019: 1–16, figs. 1–70, table 1.

TYPE SPECIES. *Neobuthus berberensis* Hirst, 1911.

DIAGNOSIS. Small buthid scorpions, total length 15–25 mm (males), 22–32 mm (females); carapace strongly trapezoidal, surface granular with only anterior median carinae developed; ventral aspect of cheliceral fixed finger with single denticle; tergites with three carinae, of which the lateral pair may be less conspicuous; sternites III–VI with finely micro-denticulate posterior margins, lacking larger non-contiguous denticles; pectines with fulcra, hirsute; metasomal segments I–III with 8–10 carinae, segment V with enlarged lobate dentition on posterior ventrolateral carinae; telson rather bulbous, vesicle steeply inclined posteriorly, aculeus shorter than vesicle; macrosetae on vesicle normal to surface (♂) or oriented in anterior direction (♀); pedipalps short with stout segments, movable finger of pedipalp with 4–6 subrows of primary denticles flanked by mid-row internal and proximal external accessory denticles, 3 denticles just proximal to terminal denticle; movable finger without dense terminal brush of setae on ventral surface; strongly spatulate macrosetae not present on termini of fixed and movable fingers; pedipalp finger margins straight, without proximal scalloping or basal lobe and notch; trichobothrial pattern type A, orthobothriotaxic or neobothri-



Fig. 1. *Neobuthus fryntai* sp. nov., female paratype in vivo habitus.

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

dimensions (MM)		<i>Neobuthus fryntai</i> sp. nov. ♂ holotype (347)	<i>Neobuthus fryntai</i> sp. nov. ♀ paratype (356)
carapace	L / W	2.90 / 3.11	3.44 / 4.05
mesosoma	L	6.90	7.46
tergite VII	L / W	1.67 / 3.10	1.76 / 3.93
metasoma + telson	L	16.09	17.12
segment I	L / W / D	2.11 / 1.82 / 1.55	2.11 / 2.44 / 2.10
segment II	L / W / D	2.22 / 1.69 / 1.66	2.49 / 2.22 / 2.07
segment III	L / W / D	2.46 / 1.63 / 1.67	2.60 / 2.18 / 2.09
segment IV	L / W / D	2.81 / 1.57 / 1.44	3.03 / 2.04 / 1.94
segment V	L / W / D	3.34 / 1.52 / 1.37	3.67 / 2.00 / 1.62
telson	L / W / D	3.15 / 0.99 / 0.94	3.22 / 1.38 / 1.24
pedipalp	L	8.53	8.56
femur	L / W	2.06 / 0.72	2.09 / 0.78
patella	L / W	2.78 / 1.06	2.75 / 1.18
chela	L	3.69	3.76
manus	W / D	0.74 / 0.72	0.87 / 0.90
movable finger	L	2.56	2.20
total	L	25.89	28.02

otaxic minorante, dorsal trichobothria of femur arranged in β -configuration; trichobothrium d_2 of pedipalp femur present or absent on dorsal surface, d_2 of pedipalp patella present or absent, d_3 of pedipalp patella situated internal to dorsomedian carina, V_2 of chela manus strongly displaced internally relative to V_1 , chela fixed finger with db located in proximal half, proximal to est ; tibial spurs present on legs III–IV; sexual dimorphism in setation, granulation and metasomal dentition: pedipalps, legs and metasoma with weaker granulation and long, filiform macrosetae in females, stronger granulation and shorter (often spiniform) macrosetae in males, ventrosubmedian and ventrolateral carinae on segments II–III strongly developed with enlarged dentition in females and regular dentition in males; capsule of hemispermatophore with 4 lobes in typical 3+1 configuration, basal lobe a broad, robust, hook-like process, flagellum well separated from lobes.

***Neobuthus fryntai* sp. nov.**

(Figs. 1–45, Table 1)

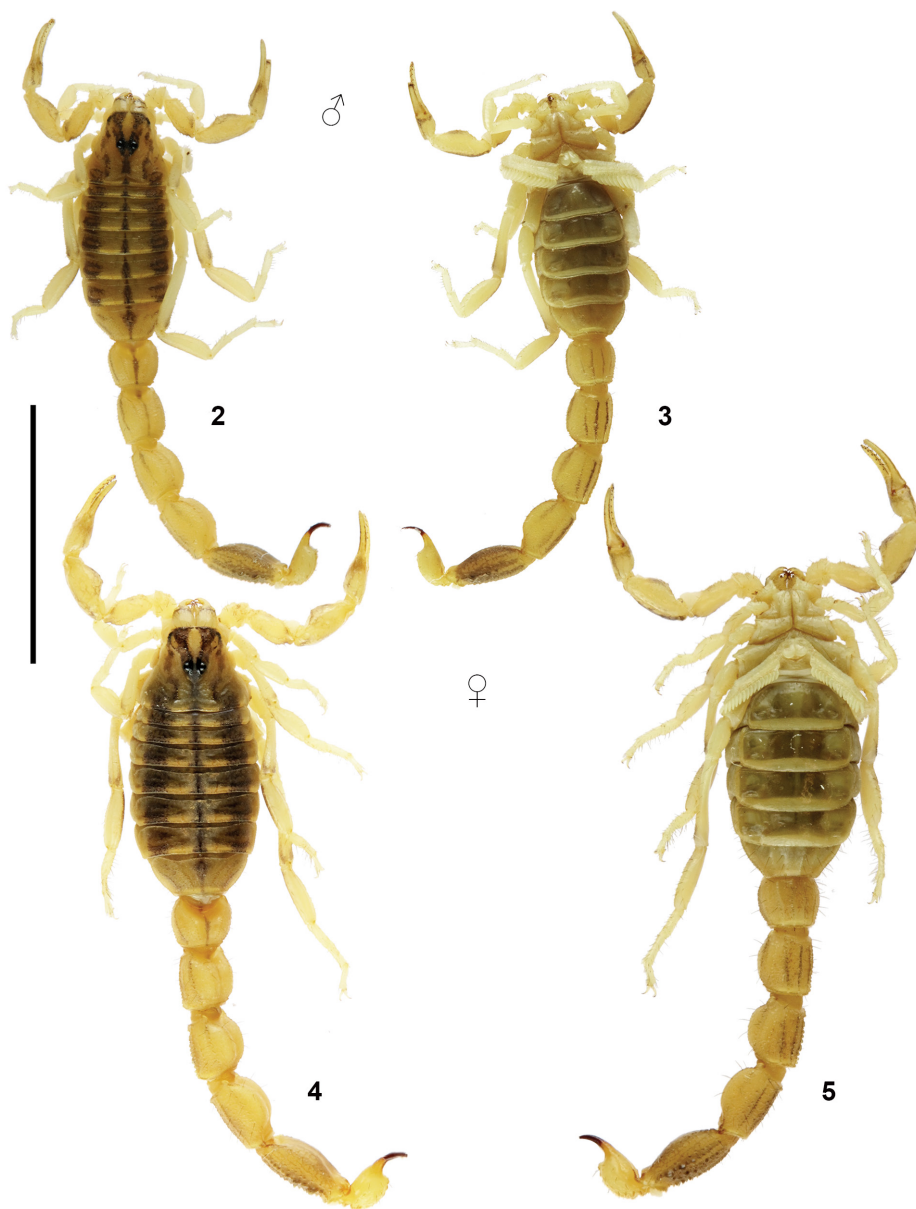
TYPE LOCALITY. Somaliland, Gacan Libaax Mts, Kalwarabe, 09°58'03"N, 45°03'11"E, ca. 1600 m a. s. l.

TYPE MATERIAL. **Somaliland**, Gacan Libaax Mts, Kalwarabe, 09°58'03"N, 45°03'11"E, ca. 1600 m a. s. l., 19–20 VI 2022, 8 ♂♂, 2 ♀♀, holotype, DNA No. 341 and paratypes, DNA Nos. 344, 347, 349, 352, 353, 356, 357, 361, 362), leg. Abdurahman Elmi et al.; FKCP.

ETYMOLOGY. The specific epithet honors Daniel Frynta, a zoologist and professor from Charles University in Czech Republic and our friend, who established an extensive research of species diversity in the Republic of Somaliland in 2016. He visited Somaliland several times and established a successful collaboration with Amoud University in Borama.

DIAGNOSIS. Total length 22–26 mm (males), 24–29 mm; carapace with area between anterior median carinae yellow to orange; tergites with 3 dark stripes, median stripe flanked on either side

by broad longitudinal yellow bands that may be broken by fuscidity extending across anterior tergites; pedipalp relatively slender, males with femur L/W 2.74–2.86, patella L/W 2.50–2.62, chela L/W 4.68–4.98; chela movable finger with 6 subrows of primary denticles, 4–5 external



Figs. 2–5. *Neobuthus fryntai* sp. nov. 2–3 – Male paratype (No. 341), dorsal (2) and ventral (3) views. 4–5 – Female paratype (No. 356), dorsal (4) and ventral (5) views. Scale bar 10 mm.



Figs. 6–13. *Neobuthus fryntai* sp. nov. 6, 8–10 – Male paratype (No. 341), telson lateral (6), metasoma and telson lateral (8), dorsal (9), and ventral (10) views. 7, 11–13 – Female paratype (No. 356), telson lateral (7), metasoma and telson lateral (11), dorsal (12), and ventral (13) views. Scale bars 10 mm (8–10, 11–13).

accessory denticles flanking proximal end of each subrow; trichobothria d_2 usually present from femur and patella; dorsoexternal and ventroexternal carina on pedipalp patella in female weakly indicated to absent; smooth dorsal carinae on pedipalp chela present; posterior margins of tergites with 1–2 pairs of macrosetae; pedipalps, legs, metasoma and telson with moderately short, not spiniform macrosetae in males, and long, fine setae in females; males with sternites III–VI shagreened to smooth medially, sternite VII shagreened with 4, granulated carinae; females with sternites III–VI smooth, sternite VII with 4 weak granulated carinae; metasoma I–III with median lateral and dorsal carinae present in both sexes; lateral surface of metasoma V granulated in both sexes, with granules separated; soles of telotarsi with relatively sparse setation, leg III of adults with 9–13 ventral macrosetae on telotarsus; pectine teeth: 16–21 (males), 15–16 (females).

DESCRIPTION. Total length of adult males 22–26 mm, of adult females 24–29 mm; measurements of carapace, telson, segments of metasoma and pedipalps given in Table 1; positions and distribution of trichobothria of pedipalps shown in Figs. 15–18 and 20–21; trichobothrium d_2 usually present from femur and patella; base color pale yellow with variable fuscous pigmentation (Figs. 1–5) and patterns of dark maculation on metasoma, pedipalps and legs; chelicerae yellow with dark reticulation on anterior manus, dentition reddish. *Sexual dimorphism:* strong, adult males substantially smaller, but without differences in shapes of pedipalps, metasoma and telson; pedipalp patella and femur granulate and matte in males, smooth and glossy in females; sternites smooth in females and shagreened to smooth medially in males; macrosetae on pedipalps, legs, metasoma and telson much longer and finer in females than males; other sex differences cited below.

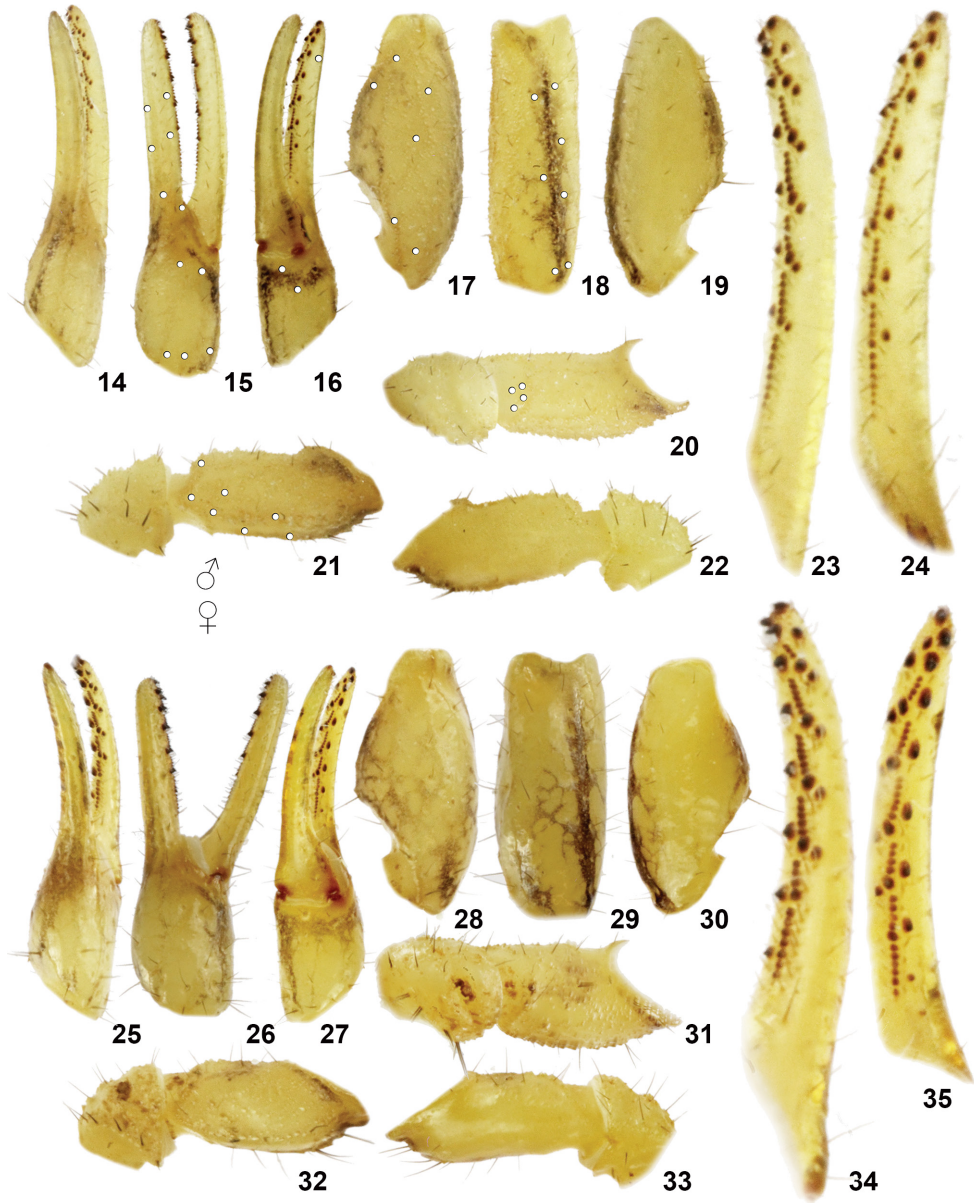
Pedipalp (Figs. 14–35). Pedipalp mostly sparsely hirsute; finely granulated in males and smooth except femur in females; femur with five conspicuously granulose carinae, more strongly developed in males; patella with seven granulose carinae, weakly developed in males and weakly indicated in females; chela with at least dorsal carinae present.

Carapace (Figs. 36, 38). Strongly trapezoidal (narrower anteriorly), wider than long (L/W 0.84–0.93); posterior median postocular area flat, anterior median preocular area gently sloped downwards towards anterior margin; lateral flanks steeply sloped; ocular tubercle broad, prominent, located slightly anterior to middle of carapace; anterior margin straight, finely microdenticulate, with coarser granules overlapping edge, bearing 8 macrosetae; anterior median carinae present, coarsely granular, other carinae indistinct; dense granulation covering most of carapace.

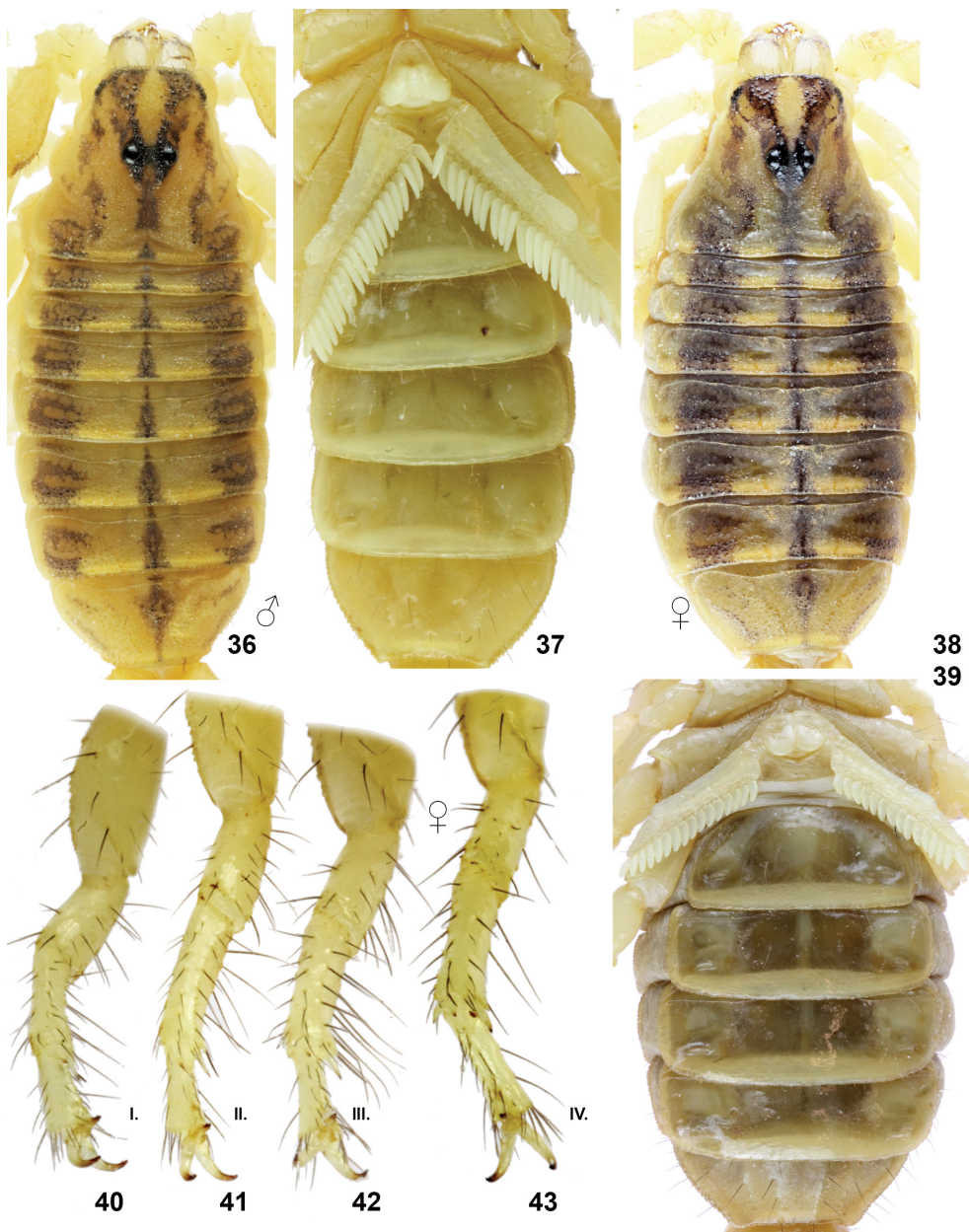
Chelicera (Figs. 36, 38). Fingers with typical buthid dentition (Vachon 1963, Lowe & Kovařík 2016); fixed finger with large distal denticle, 1 subdistal denticle and 2 basal denticles fused into bicuspid, single denticle on ventral surface at level of bicuspid; dorsal margin of movable finger with 5 denticles: 1 large distal denticle, medium-sized subdistal and medial, and 2 small, partially fused basal denticles; ventral margin with 2 denticles.

Mesosoma (Figs. 36–39). Tergites I–VI bear three carinae of which the lateral pair may be less conspicuous mainly on tergites I–IV; tergite VII bears five well-defined carinae (median, submedians and laterals); tergites I–VI densely granular, with coarser granules on posterior lateral areas; tergite VII densely granular; sternites III–VI smooth in females, and shagreened to smooth medially and granulate laterally in males; sternite VII granulated in both sexes, more so in males, with four weak to well-defined carinae; sternum type 1, triangular in shape; smooth, with deep posteromedian invagination; genital opercula smooth; genital papillae present; pectines extending to around end of sternite IV in male and around a quarter of sternite IV in female; pectine teeth 16–21 in males, 15–16 in females; combs with 3 marginal lamellae and 7–8 middle lamellae; marginal lamellae, middle lamellae and fulcra with dense cover of short dark reddish macrosetae; fulcra with 2–4 setae.

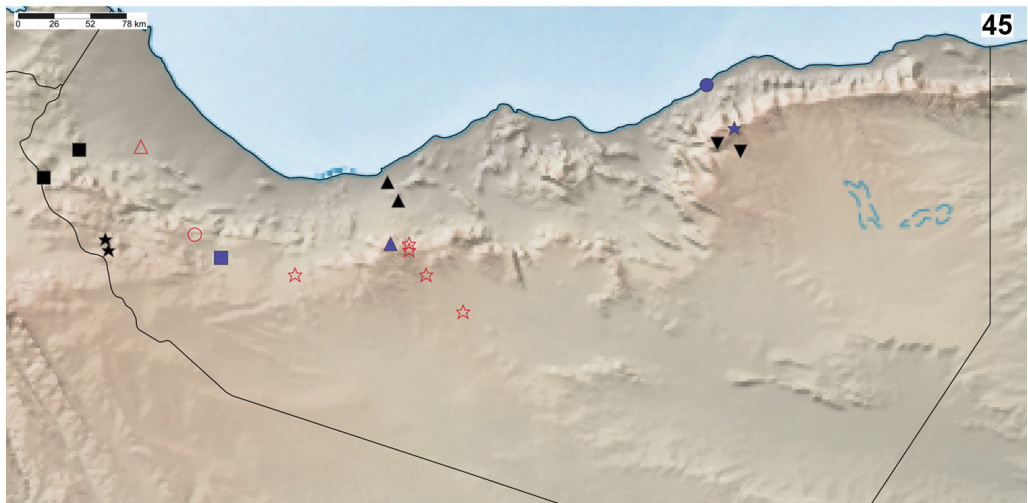
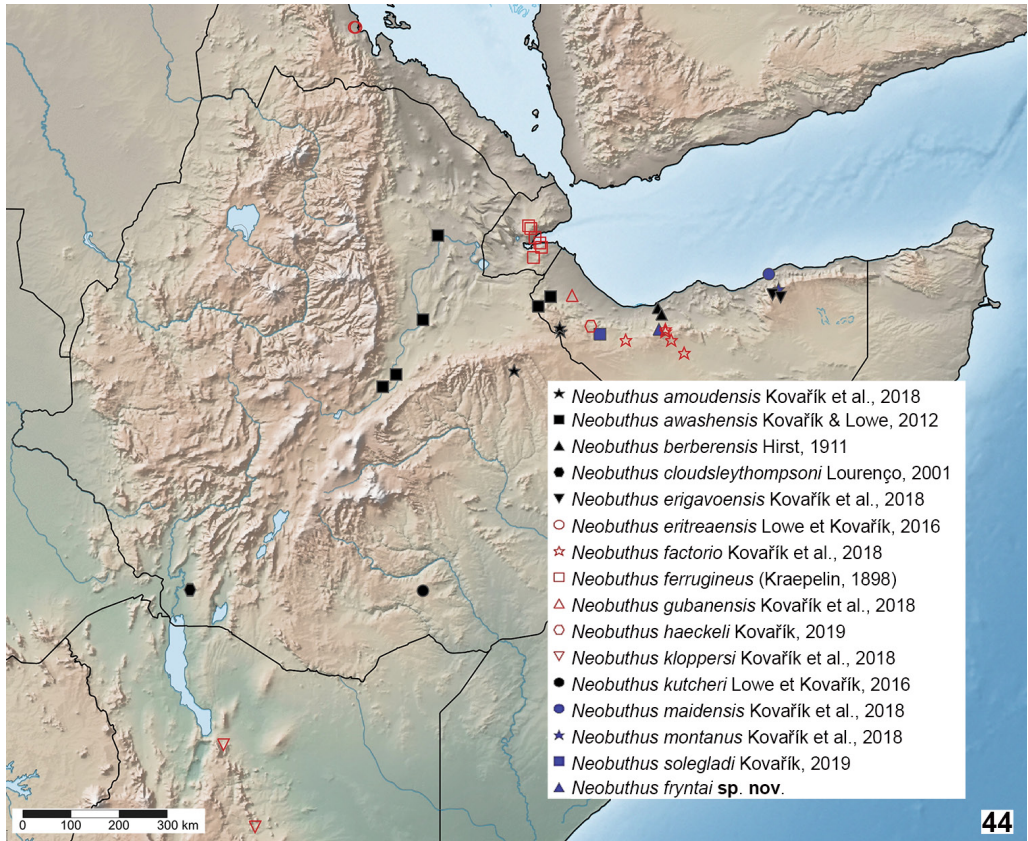
Legs (Figs. 40–43). Coxa, femora, patella and tibia of all legs bearing variable numbers of medium length, straight, dark-reddish macrosetae; tarsi with mix of short and longer, dark-reddish



Figs. 14–35. *Neobuthus fryntai* sp. nov., pedipalp. 14–24 – Male holotype (No. 347), chela dorsal (14), external (15), and ventral (16) views, patella dorsal (17), external (18) and ventral (19) views, femur and trochanter internal (20), dorsal (21), and ventral (22) views, movable (23) and fixed (24) finger dentate margin. 25–35 – Female paratype (No. 356), chela dorsal (25), external (26), and ventral (27) views, patella dorsal (28), external (29) and ventral (30) views, femur and trochanter internal (31), dorsal (32) and ventral (33) views, movable (34) and fixed (35) finger dentate margin. The trichobothrial pattern is indicated in Figs 15–18, 20–21 (white circles).



Figs. 36–43. *Neobuthus fryntai* sp. nov. 36–37 – Male holotype (No. 347), carapace and tergites (36), coxosternal area and sternites (37). 38–43 – Female paratype (No. 356), carapace and tergites (38), coxosternal area and sternites (39), and left legs I–IV, retrolateral aspect (40–43).



Figs. 44–45. Map showing confirmed distribution of *Neobuthus* spp. (44) with detail for Somaliland (45).

macrosetae; basitarsi I–III slightly compressed with flat retrolateral surfaces, with bristle combs consisting of retrosuperior series of longer macrosetae, plus retroinferior and proinferior series of shorter macrosetae; telotarsi with two rows of short macrosetae on ventral aspect, 9–13 macrosetae on telotarsus III; tibial spurs moderate to reduce on legs IV and almost reduced on legs III.

Metasoma and telson (Figs. 6–13). Metasoma and telson sparsely hirsute, macrosetae moderately short in male and longer in female, straight and reddish; metasomal segments I–III with 10 carinae, IV with 8 carinae, V with 2 carinae; segments I–III with moderate, granulate dorsolateral carinae, other carinae relatively well developed; segment IV with weakly indicated dorsolateral carinae; segment V with strong, granulate to dentate-lobate ventrolateral carinae; segments I–IV with dense granulation on all intercarinal surfaces except dorsal surfaces which are sparsely granulated in male and almost smooth in female; segment V densely granular on lateral and ventral surfaces, more coarsely so on ventral surface, granules not arranged along any traces of carinae; telson tuberculate, ventral surface sparsely, weakly granular; vesicle slightly elongated; aculeus stout, shorter than vesicle, tip of aculeus almost vertically directed.

AFFINITIES. The described features distinguish *Neobuthus fryntai* sp. nov. from all other species of the genus. According to the characters used in the key published in Kovařík et al. (2018), the new species which is also confirmed by DNA phylogeny (paper in preparation) is most similar to *N. factorio* Kovařík, Lowe, Awale, Elmi et Hurre, 2018. *Neobuthus fryntai* sp. nov. has pedipalp segments relatively slender than *N. factorio*, males with femur L/W 2.74–2.86 (2.42–2.70 in *N. factorio*), patella L/W 2.50–2.62 (2.18–2.28 in *N. factorio*), chela L/W 4.68–4.98 (4.25–4.48 in *N. factorio*).

DISCUSSION

The *Neobuthus* genus from the family Buthidae is distributed in the Horn of Africa including Eritrea, Djibouti, Ethiopia, Kenya, Somalia, and Somaliland (Figs. 44–45). The Horn of Africa is a hotspot region of the fauna had a long evolutionary history of ecological, climatic, geological, and erosional processes that could influence the evolution of the scorpion fauna (Redfield et al. 2003, Keir et al. 2013, Aghová et al. 2019). Moreover, the geographical separations of the region led by physical barriers like mountain ranges, rivers, and vegetative zones could result in the effective isolation of the *Neobuthus* genus in the region. Therefore, some species of the genus *Neobuthus* are widely spread in Somaliland see distribution (Figs. 44–45) whereas most of species are endemic there (e. g., *N. haeckeli* Kovařík, 2019, *N. solegladi* Kovařík, 2019, *N. berberensis* Hirst, 1911, *N. erigavoensis* Kovařík, Lowe, Awale, Elmi et Hurre, 2018, *N. factorio*, *N. gubanensis* Kovařík, Lowe, Awale, Elmi et Hurre, 2018, *N. maidensis* Kovařík, Lowe, Awale, Elmi et Hurre, 2018, *N. montanus* Kovařík, Lowe, Awale, Elmi et Hurre, 2018). The newly discovered *Neobuthus fryntai* sp. nov. represents one more endemic species and makes the number of known species of the genus *Neobuthus* sixteen. Somaliland corresponding former British Somaliland (British colony) host many diverse ecological zones and climatic conditions (Kovařík 2019, Salah et al. 2019) and its landscape is divided into many topo-graphical characteristics (Resource et al. 2018), including the coastal regions, the rocky mountain area in central regions (Kovařík 2019), hot sand deserts at a lower elevation, rocky semi-desert at a higher elevation, and sandy semi-desert habitats with volcanic rock (Kovařík & Lowe 2016).

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