Euscorpius

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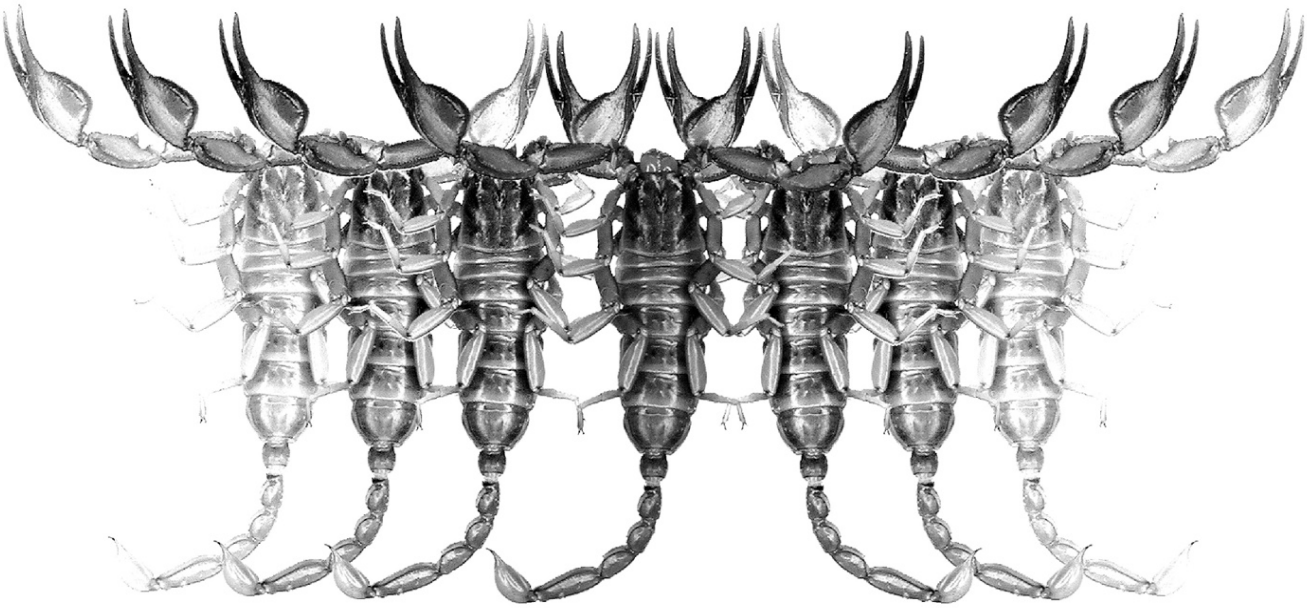

Scorpions of the Horn of Africa (Arachnida, Scorpiones). Part XXVIII. Scorpions of Djibouti

František Kovařík & Graeme Lowe

August 2022 — No. 357

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Derivatio Nominis

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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Euscorpius — Occasional Publications in Scorpiology. 2022, No. 357

Scorpions of the Horn of Africa (Arachnida, Scorpiones). Part XXVIII. Scorpions of Djibouti.

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http://zoobank.org/urn:lsid:zoobank.org:pub:8F0AFCDB-6F55-4889-97A5-D70DE24591F5

Summary

All scorpion species known from Djibouti are listed, with color photographs and maps of their distribution. *Buthus awashensis* Kovařík, 2011 known from Ethiopia and Somaliland is reported for the first time from Djibouti. The diagnosis of *Orthochirus afar* Kovařík & Lowe, 2016 is revised; *O. borrii* Rossi, 2017 is determined to be a junior synonym of *O. afar* Kovařík & Lowe, 2016 **syn. n.**; *O. aristidis* (Simon, 1882) **syn. res.** is returned to synonymy with *O. olivaceus* Karsch, 1881; and *O. arenicola* Lourenço & Ythier, 2021, is relegated to the status of *nomen dubium*. *Hemiscorpius lipsae* **sp. n.** is described and fully complemented with color photos of the female holotype and its habitat.

Introduction

Djibouti, officially the Republic of Djibouti, is a country located in the Horn of Africa. It is bordered by Somaliland in the south, Ethiopia in the southwest and Eritrea in the north. The country has a total area of 23,200 km^2. Thanks to Josiane Lips and her husband Bernard Lips who lived in Djibouti (2010-2014) and collected most of the scorpions cited here, we have an opportunity for the first time to compile more comprehensive information about the scorpion fauna of this country. There are still many areas of the country that await further exploration (see maps Fig. 113).

Methods, Material & Abbreviations

Nomenclature and measurements generally follow Stahnke (1971), Sissom et. al. (1990), Soleglad & Sissom (2001), Kovařík (2009), Kovařík & Ojanguren Affilastro (2013). Nomenclature of trichobothria largely follows Vachon (1974, 1975).
Specimen depositories: BMNH (The Natural History Museum, London, United Kingdom); FKCP (František Kovařík, private collection, Prague, Czech Republic; will in future be merged with the collections of the National Museum of Natural History, Prague, Czech Republic); GLPC (Graeme Lowe, private collection, Auckland, New Zealand), HNHM (Hungarian Natural History Museum, Budapest, Hungary); MZUF (Museo Zoologico de "La Specola", Firenze, Italy); NMPC (National Museum of Natural History, Prague, Czech Republic); ZISP (Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia); and ZMUH (Centrum für Naturkunde (CeNak), Center of Natural History Universität Hamburg, Zoological Museum, Hamburg, Germany). *Abbreviations*: morphometrics: D, depth; L, length; W, width; ID, inner accessory denticles of pedipalp fingers; OD, outer accessory denticles of pedipalp fingers.

Systematics

Results

List of scorpions known from Djibouti

Family **Buthidae** C. L. Koch, 1837
Buthus awashensis Kovařík, 2011
Compsobuthus vannii Rossi, 2017
Hottentotta polystictus (Pocock, 1896)
Microbuthus litoralis (Pavesi, 1885)
= *Microbuthus pusillus* Kraepelin, 1898
Neobuthus ferrugineus (Kraepelin, 1898)
Orthochirus afar Kovařík & Lowe, 2016
= *Orthochirus borrii* Rossi, 2017, **syn. n.**
Parabuthus abyssinicus Pocock, 1901
= *Parabuthus liosoma dmitrievi* Birula, 1903

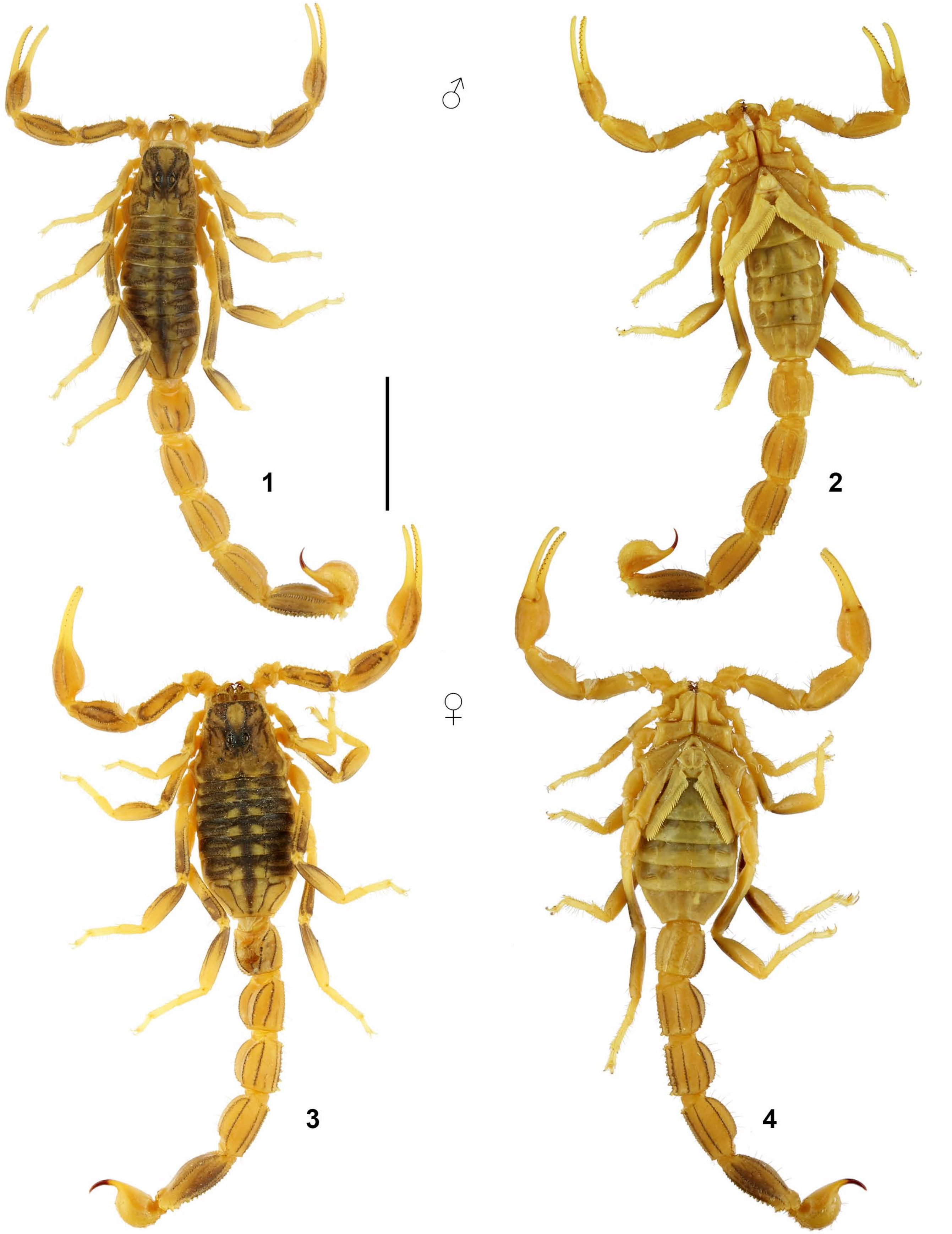
Family **Scorpionidae** Latreille, 1802
Pandiborellius nistriae (Rossi, 2014)

Family **Hemiscorpiidae** Pocock, 1893
***Hemiscorpius lipsae* sp. n.**

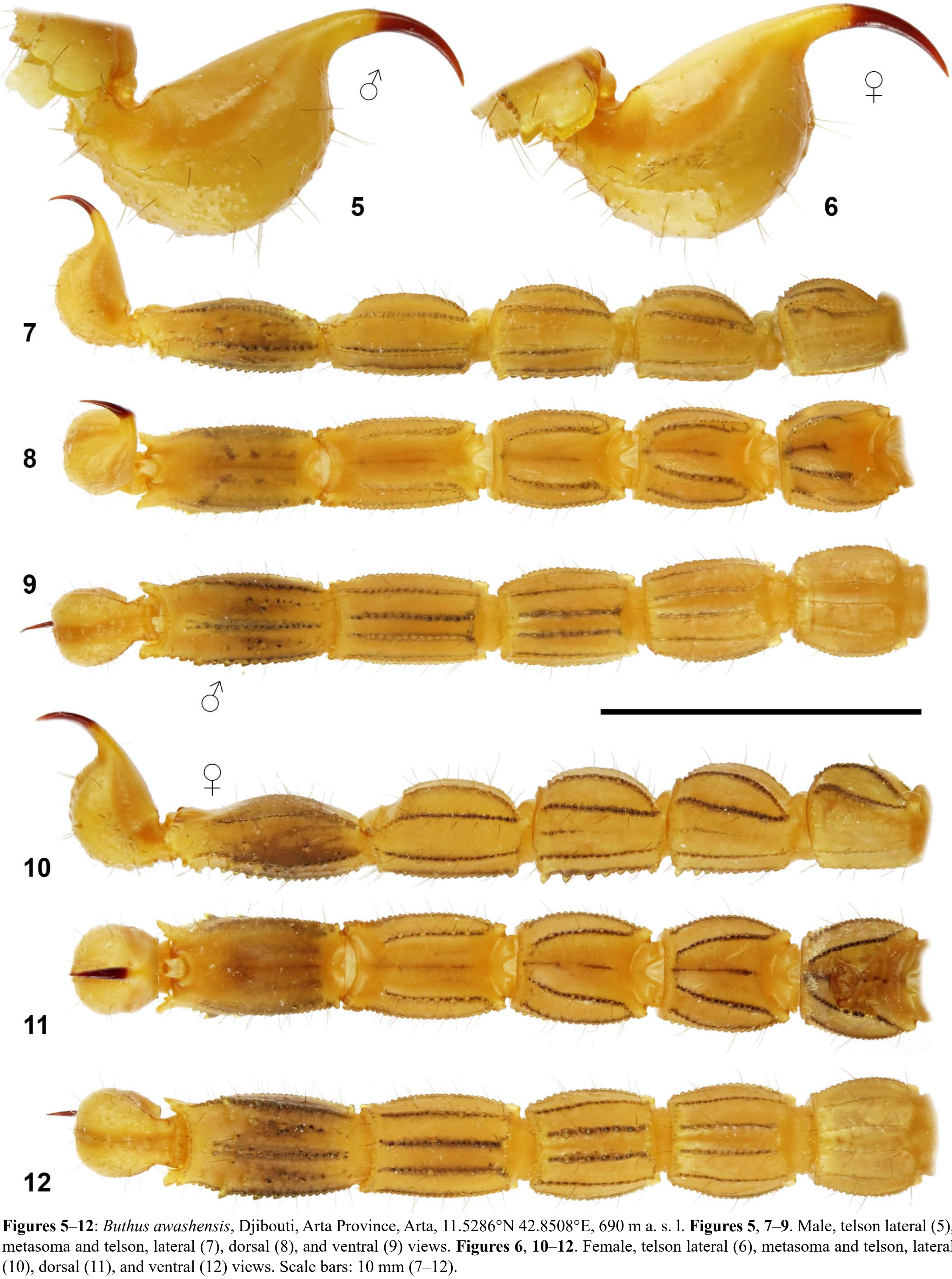
Family **Buthidae** C. L. Koch, 1837
Buthus awashensis Kovařík, 2011
(Figures 1–20, 113)

Buthus awashensis Kovařík, 2011: 1–6, figs. 5–17, 23; Sousa et al., 2017: 37; Kovařík et al., 2020c: 3, figs. 1–4, 176–177, 186, 191, 195–197, 210.

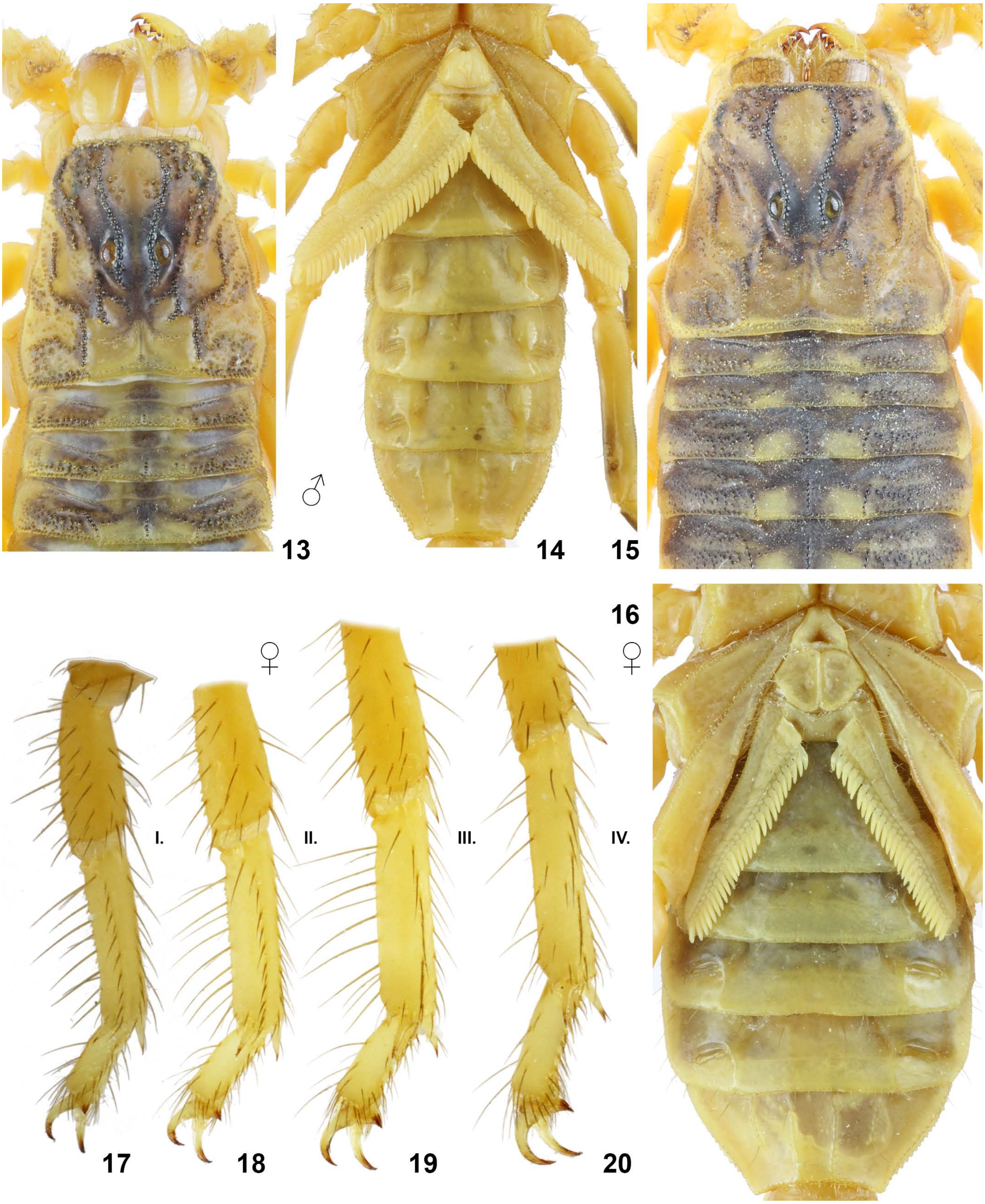
Type locality and type repository. Ethiopia, Awash, Metahara env., 08°54'N 39°54'E, 960-1050 m. a. s. l.; FKCP.



Figures 1–**4**: *Buthus awashensis*, Djibouti, Arta Province, Arta, 11.5286°N 42.8508°E, 690 m a. s. l. **Figures 1**–**2**. Male, dorsal (1) and ventral (2) views. **Figures 3**–**4**. Female, dorsal (3) and ventral (4) views. Scale bar: 10 mm.



Figures 5–**12**: *Buthus awashensis*, Djibouti, Arta Province, Arta, 11.5286°N 42.8508°E, 690 m a. s. l. **Figures 5**, **7**–**9**. Male, telson lateral (5), metasoma and telson, lateral (7), dorsal (8), and ventral (9) views. **Figures 6**, **10**–**12**. Female, telson lateral (6), metasoma and telson, lateral (10), dorsal (11), and ventral (12) views. Scale bars: 10 mm (7–12).



Figures 13–20: *Buthus awashensis*, Djibouti, Arta Province, Arta, 11.5286°N 42.8508°E, 690 m a. s. l. **Figures 13–14**. Male, carapace and tergites I–III (13), sternopectinal region and sternites (14), **Figures 15–20**. Female, carapace and tergites I–V (15), sternopectinal region and sternites (16). and left legs I–IV, retrolateral aspect (17–20).

Djibouti material examined (FKCP). **Djibouti**, Arta Province, Arta, 11.5286°N 42.8508°E, 690 m a. s. l., 22.III.2012, 1♂2♀5juvs (No. 6322, Figs. 1–20), 16.I.2014, 1♂ (No. 8622), leg. J. Lips; Ali Sabieh Province, Ali Sabieh, 11.1150°N 42.7449°E, 760 m a. s. l., 30.I.2014, 1♂ (No. 8665), leg. J. Lips; Djibouti Province, Djibouti, 11.5680°N 43.1461°E, 10 m a. s. l., 1.I.2014, 1juv. (No. 10047), leg. J. Lips.

Distribution. Djibouti (first report), Ethiopia, Somaliland (Fig. 113; Kovařík et al., 2020c: 30, fig. 210).

Compsobuthus vannii Rossi, 2017
(Figures 21–62, 113)

Buthus acutecarinatus abyssinicus: Werner, 1916: 79–80; Lampe, 1918: 190.
Compsobuthus acutecarinatus abyssinicus: El-Hennawy, 1992: 122 (in part); Kovařík, 1998: 109 (in part).
Compsobuthus abyssinicus: Fet & Lowe, 2000: 124 (in part); Kovařík & Ojanguren Affilastro, 2013: 146–147 (in part); Kovařík, 2018: 2 (in part);
Compsobuthus vannii Rossi, 2017 (2016): 3–5, figs. 1–2.

Type locality and type repository. Djibouti, Tadjoura Province, Bankoualé, 11°49'N 42°40'E (11.82°N 42.67°E); MZUF.

Djibouti material examined (FKCP). **Djibouti**, Arta Province, Arta, 11.5286°N 42.8508°E, 690 m a. s. l., 26.XI.2010, 2juvs. (No. 4711), leg. J. Lips; Arta Province, Arta plage, 11.5857°N 42.8286°E, 24.XII.2020, 1juv. (No. 23107), leg. J. Lips; Djibouti Province, Goubetto, 11.4182°N 42.9059°E, 560 m a. s. l., 26.I.2022, 1♂1juv. (No. 25588), leg. J. Lips; Tadjourah Province, Ditillou, 11.781°N 42.6934°E, 665 m a. s. l., 11.III.2001, 1.juv. (No. 4936), 6.XI.2011, 2♂3juvs, (No. 6697), 27.VI.2014, 1♀ (No. 9903), 27.VI.2014, 1♀ (No. 9897), leg. J. Lips; Tadjourah Province, Day, 11.7813°N 42.6408°E, 1490 m a. s. l., 24.I.2013, 1♂ (Figs. 21–22, 25, 27–29, 33, 35, 41–51, No. 7196), leg. J. Lips; Tadjourah Province, Abourma, 11.8941°N 42.4877°E, 800 m a. s. l., 27.XII.2013, 1♀ (Figs. 23–24, 26, 30–32, 34, 36–40, 52–62) 1juv. (No. 8500), leg. J. Lips; Barra Yer (Petit Barre), 11.31°N 42.71°E (11°18'33.56"N 42°42'39.17"E), 585 m. a. s. l., I. 2017, 1♂2juvs., leg. R. Štarha.

Comments. Rossi (2017) described *Compsobuthus vannii* from Djibouti in a paper titled “Complementi alla fauna del Corno d’Africa: famiglia Buthidae C. L. Koch, 1837 (Scorpiones), con la descrizione di tre nuove specie” in his self-published journal *Rivista Aracnologica Italiana*. This journal issue was publically accessible (i.e., published) in March 2017, but was falsely pre-dated 14 July 2016 (cf. Kovařík et al., 2019: 19).

Distribution. Djibouti.

Hottentotta polystictus (Pocock, 1896)
(Figures 63–70, 113)

Buthus polystictus Pocock, 1896: 178.
Hottentotta polystictus: Kovařík & Ojanguren, 2013: 171–172, 318, 338–339, figs. 1069–1072, 1206–1216 (complete reference list until 2013); Kovařík & Mazuch, 2015: 23, figs. 112–131, table 4; Kovařík & Lowe, 2021: 3–9, figs. 1–45, 137–138, 140–143, table 1.

Type locality and type repository. Somalia, Goolis Mountains, inland of Berbera; BMNH.

Type material examined. **Somaliland**, Goolis Mountains, inland of Berbera, 2♀1im. (holotype and paratypes, fig. 84 in Kovařík, 2007: 55), leg. E. Lort Phillips, BMNH No. 1895.6.1.46-7.

Djibouti material examined (FKCP). **Djibouti**, Arta Province, Arta, 11.5286°N 42.8508°E, 690 m a. s. l., 16.I.2014, 1juv. (No. 8622), leg. J. Lips; Djibouti Province, Goubetto, 11.4182°N 42.9059°E, 560 m a. s. l., 26.I.2022, 1♀ (No. 25588), leg. J. Lips; Tadjourah Province, Day, 11.7534°N 42.6560°E, 1680 m a. s. l., 30.I.2022, 1♀1juv. (No. 25607), leg. J. Lips; Tadjourah Province, Medeho, 11.9086°N 43.1356°E, 30 m a. s. l., 20.1.2022, 1♀ (Figs. 63–70, No. 25619), leg. J. Lips; Tadjourah Province, Randa, 11.8469°N 42.6578°E, 910 m a. s. l., 31.I.2022, 1juv. (No. 25584), leg. J. Lips; Barra Yer (Petit Barre), 11.31°N 42.71°E (11°18'33.56"N 42°42'39.17"E), 585 m a. s. l., I. 2017, 3juvs., leg. R. Štarha.

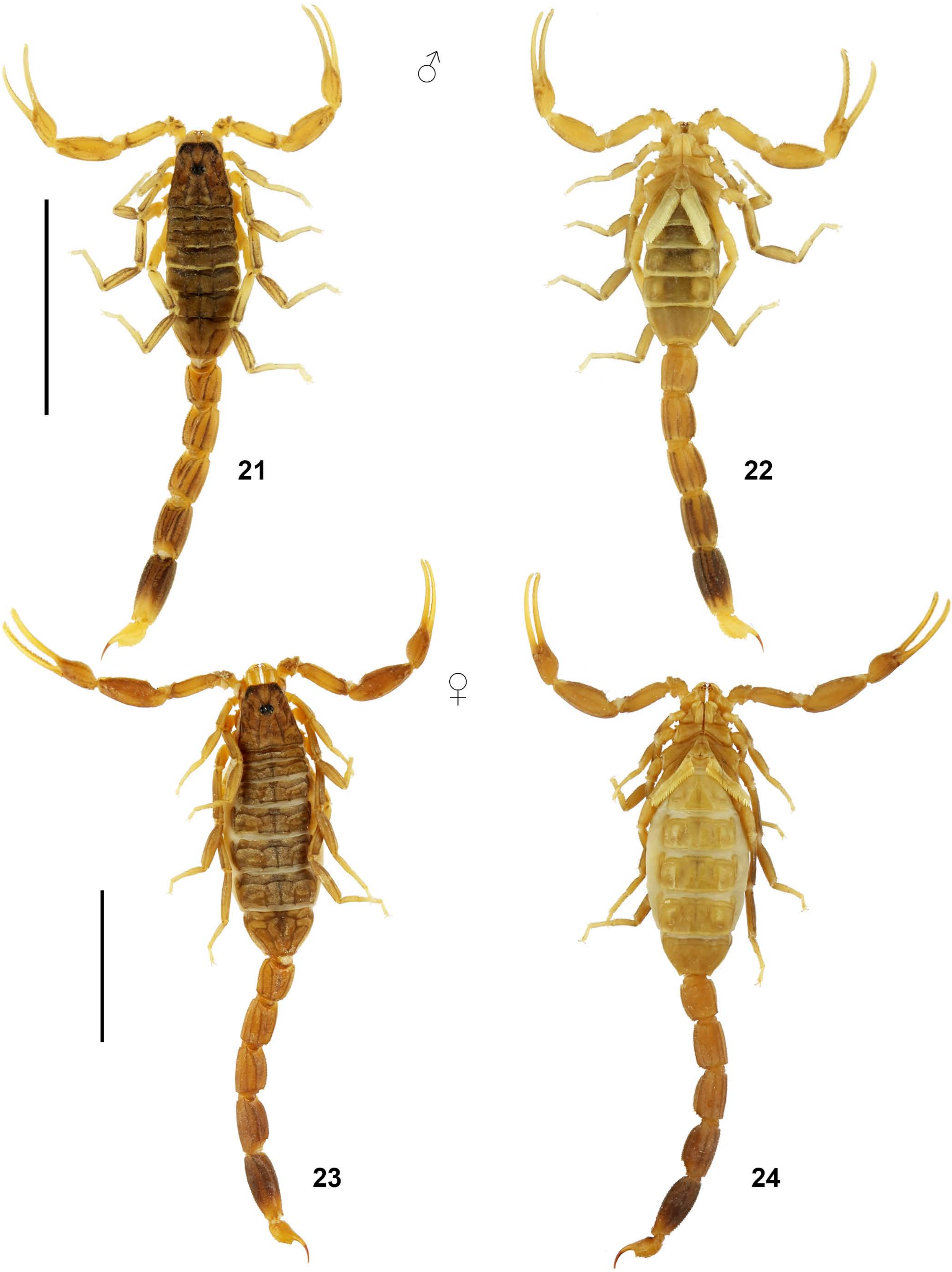
Distribution. Djibouti, Ethiopia, Somaliland (Fig. 113; Kovařík & Lowe, 2021: 25, fig. 138).

Microbuthus litoralis (Pavesi, 1885)
(Figures 71–72, 113)

Butheolus littoralis Pavesi, 1885: 197–198; Kraepelin, 1899: 37.
Microbuthus litoralis: Birula, 1905: 445–449, fig. 1; Vachon, 1949: 389 (1952: 317, figs. 466, 469, 471, 476); Vachon, 1974: 909, fig. 42; Fet & Lowe, 2000: 182 (complete reference list until 2010); Lourenço, 2002: 169, 172, fig. 2; Lowe, 2010: 16; Lourenco, 2011: 329–332, figs. 1–8; Kovařík et al., 2016a: 11; Lowe et al., 2018: 20, figs. 36, 38–39, 64–65.
= *Microbuthus pusillus* Kraepelin, 1898: 42; Kraepelin, 1899: 37–38, fig. 19; Kovařík, 2003: 135, 142, 154, tab. 1; Lowe, 2010: 16 (syn. by Lourenco, 2011: 329).

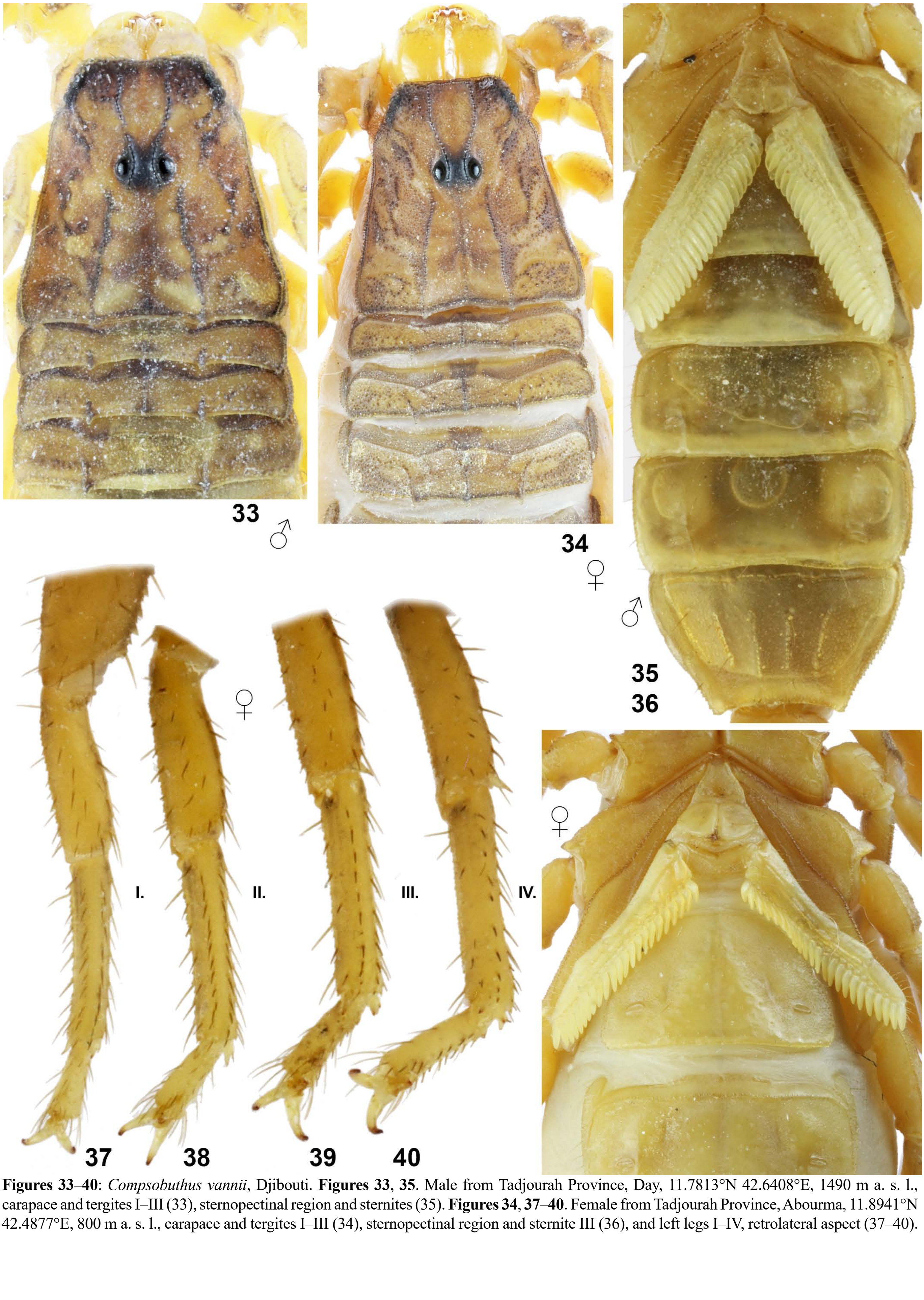
Type locality and type repository. Eritrea, S of Assab; ZMUH.

Type material examined. **Djibouti**, Gulf of Aden, Tadjura Bay, 1♀juv. (holotype of *Microbuthus pusillus* Kraepelin, 1898), ZMUH No. A22/11.

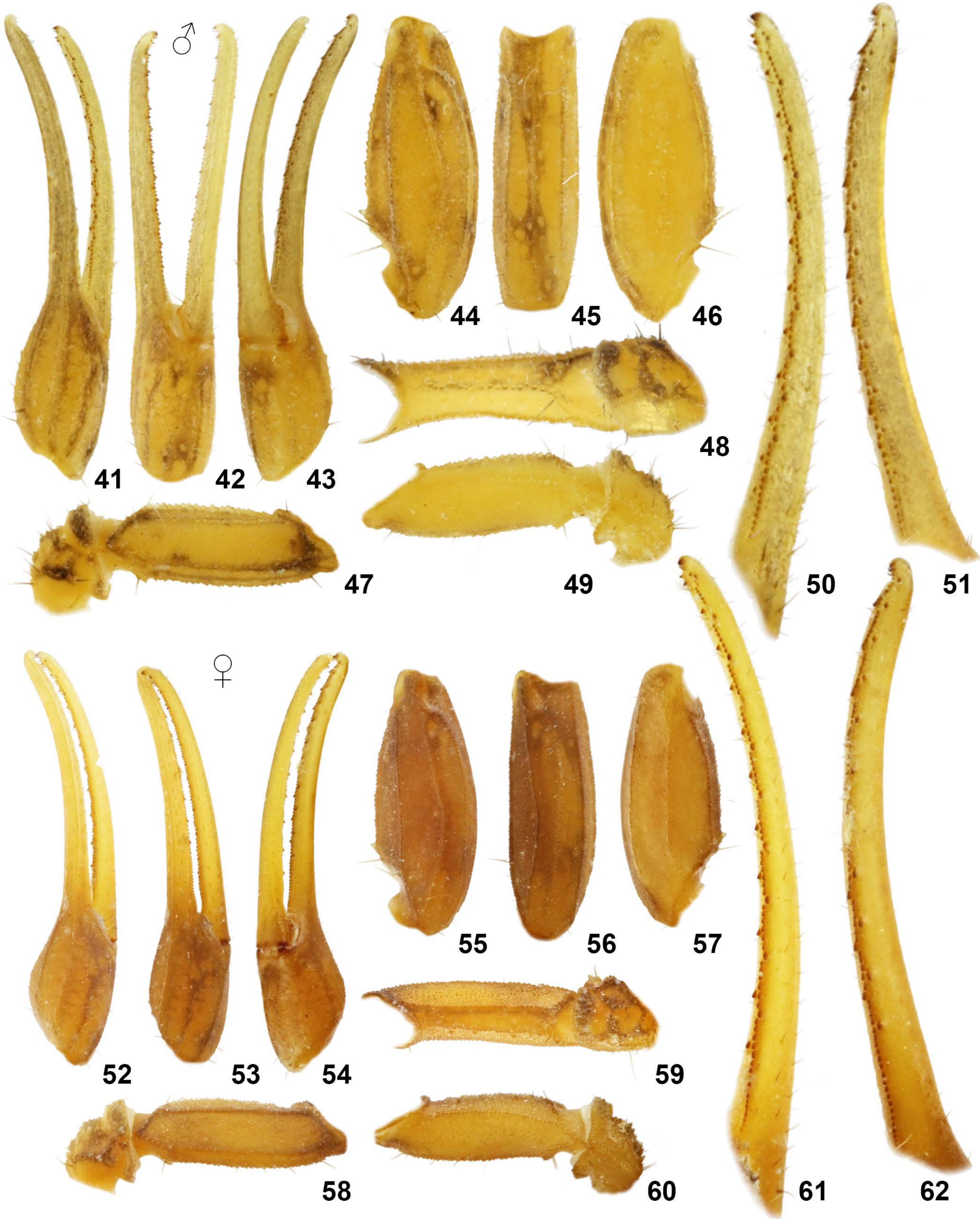


Figures 21–24: *Compsobuthus vannii*, Djibouti. **Figures 21–22**. Male from Tadjourah Province, Day, 11.7813°N 42.6408°E, 1490 m a. s. l., dorsal (21) and ventral (22) views. **Figures 23–24**. Female from Tadjourah Province, Abourma, 11.8941°N 42.4877°E, 800 m a. s. l., dorsal (23) and ventral (24) views. Scale bars: 10 mm (21–22, 23–24).

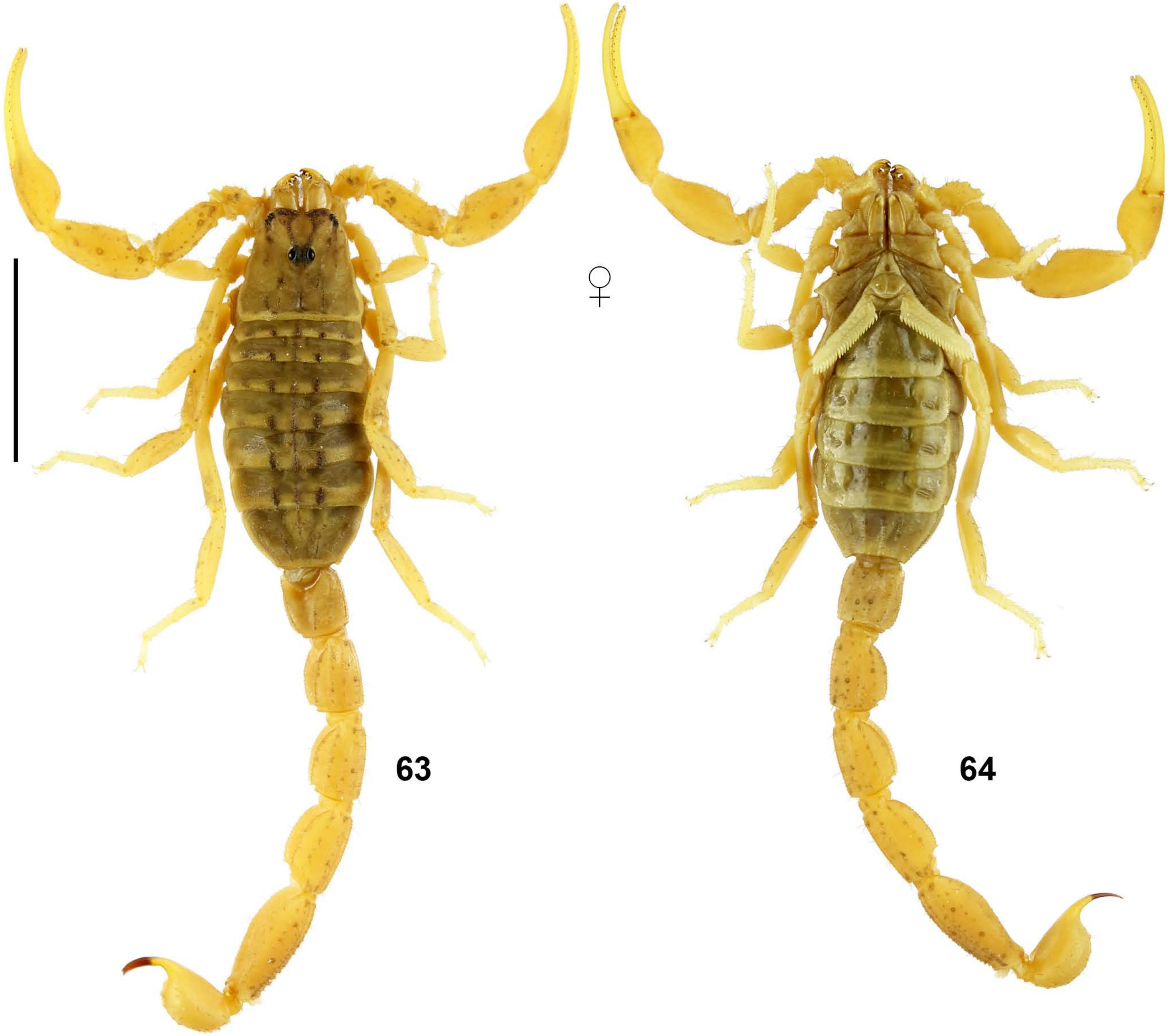
Figures 25–32: *Compsobuthus vannii*, Djibouti. **Figures 25**, **27–29**. Male from Tadjourah Province, Day, 11.7813°N 42.6408°E, 1490 m a. s. l., telson lateral (25), metasoma and telson, lateral (27), dorsal (28), and ventral (29) views. **Figures 26**, **30–32**. Female from Tadjourah Province, Abourma, 11.8941°N 42.4877°E, 800 m a. s. l., telson lateral 26), metasoma and telson, lateral (30), dorsal (31), and ventral (32) views. Scale bars: 10 mm (27–29, 30–32).



Figures 33–40: *Compsobuthus vannii*, Djibouti. **Figures 33**, **35**. Male from Tadjourah Province, Day, 11.7813°N 42.6408°E, 1490 m a. s. l., carapace and tergites I–III (33), sternopectinal region and sternites (35). **Figures 34**, **37–40**. Female from Tadjourah Province, Abourma, 11.8941°N 42.4877°E, 800 m a. s. l., carapace and tergites I–III (34), sternopectinal region and sternite III (36), and left legs I–IV, retrolateral aspect (37–40).



Figures 41–62. *Compsobuthus vannii*, Djibouti. **Figures 41–51**. Male from Tadjourah Province, Day, 11.7813°N 42.6408°E, 1490 m a. s. l. **Figures 52–62**. Female from Tadjourah Province, Abourma, 11.8941°N 42.4877°E, 800 m a. s. l. **Figures 41–62**. Pedipalp segments. Chela in dorsal (41, 52), external (42, 53) and ventral (43, 54) views. Patella in dorsal (44, 55) and external (45, 56) views. Femur and trochanter in dorsal (47, 58), internal (48, 59) and ventral (49, 60) views. Movable (50, 61) and fixed (51, 62) fingers dentation.



Figures 63–64. *Hottentotta polystictus*, female from Djibouti, Tadjourah Province, Medeho, 11.9086°N 43.1356°E, 30 m a. s. l. in dorsal (63) and ventral (64) views. Scale bar: 10 mm.

Other Djibouti material examined. **Djibouti**, Obok, II.1893, 2♀, ZMUH; northeast, 8.V.2009, 1♀4juvs., leg. T. Anthony, ZMUH No. A23/11; Arta Province, Djalelo, 11.3652°N 42.8404°E, 690 m a. s. l., 11.X.2013, 1♀ (Figs 71–72, No. 7964) 1im., leg. J. Lips, FKCP; Ali Sabieh Province, Gestir, 11.02°N 42.96°E, 440 m a. s. l., 31.I.2014, 1juv. (No. 8743), leg. J. Lips; FKCP; Ali Sabieh Province, Ali Sabieh, 11.15°N 42.69°E, 750 m a. s. l., 31.I.2014, 1juv. (No. 8756), leg. J. Lips, NMPC; Arta Province, Arta, 11.4771°N 42.7710°E, 445 m a. s. l., 15.V.2014, 1im. (No. 9395), leg. J. Lips, FKCP.

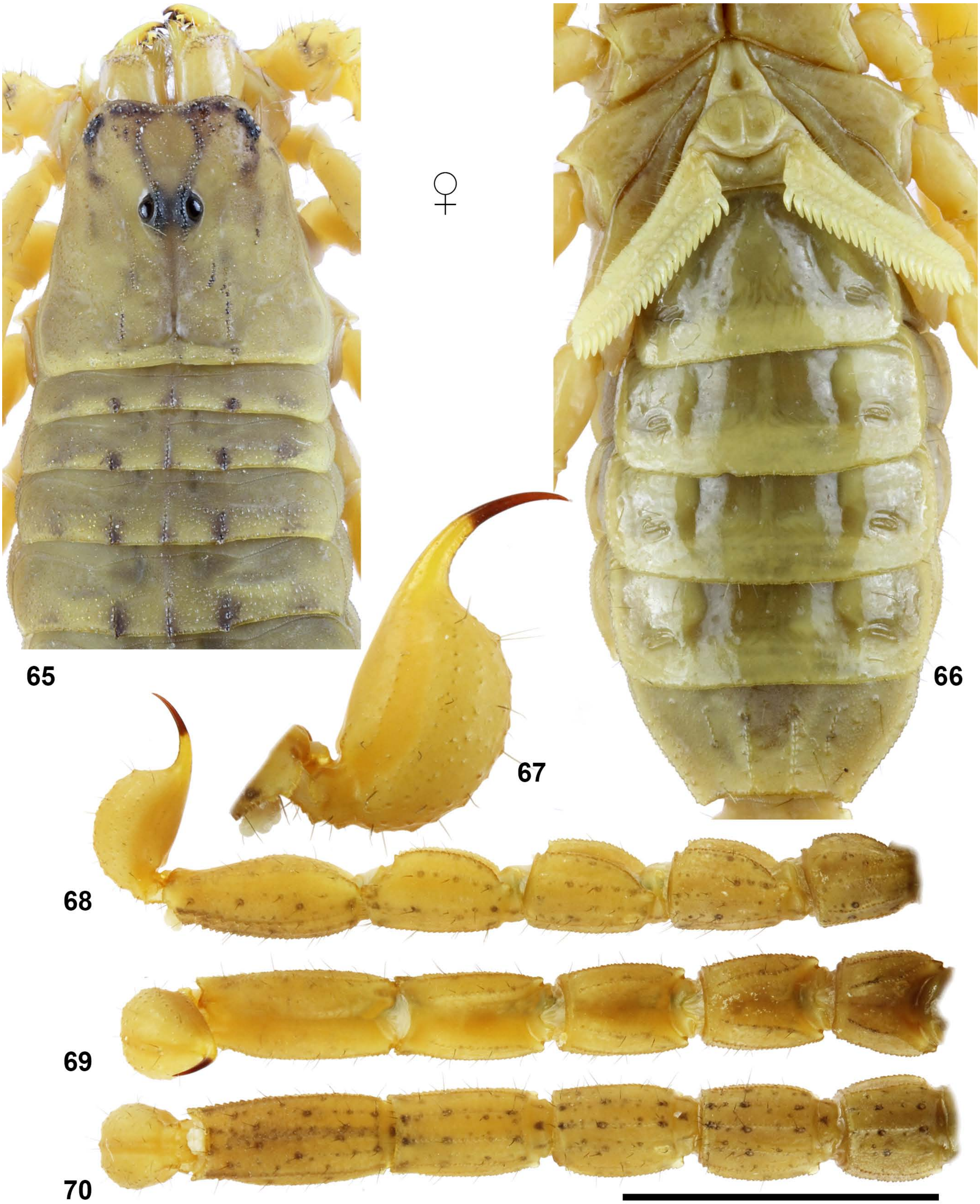
Distribution. Djibouti, Eritrea, Yemen (Fig. 113; Lowe et al., 2018: 19, fig. 138).

Neobuthus ferrugineus (Kraepelin, 1898)
(Figures 73–76, 113)

Butheolus ferrugineus Kraepelin, 1898: 43; Fet & Lowe, 2000: 88; Lourenço, 2001: 177, fig. 12; Kovařík, 2003: 137 (in part); Kovařík, 2004: 4 (in part); Lourenço, 2005: 27, fig. 31; Lourenço & Qi, 2006: 91–93.

Neobuthus ferrugineus: Kraepelin, 1903: 563–564; Vachon, 1980: 255; Kovařík & Lowe, 2012: 3–7, figs. 60–61, 72 (in part); Kovařík et al., 2018: 37, figs. 182–212, 410, 438, table 1).

Type locality and type depository. Djibouti, Gulf of Aden, Tadjura Bay, ZMUH.



Figures 65–70. *Hottentotta polystictus*, female from Djibouti, Tadjourah Province, Medeho, 11.9086°N 43.1356°E, 30 m a. s. l., carapace and tergites I–IV (65), sternopectinal region and sternites (66), telson lateral (67), metasoma and telson, lateral (68), dorsal (69), and ventral (70) views. Scale bar: 10 mm (68–70).

Figures 71–**72**. *Microbuthus litoralis*, female from Djibouti, Arta Province, Djalelo, 11.3652°N 42.8404°E, 690 m a. s. l. in dorsal (71) and ventral (72) views. Scale bar: 10 mm.

Type material examined. Djibouti, Gulf of Aden, Tadjura Bay, 1♂, ZMUH.

Other Djibouti material examined. **Djibouti**, Barra Yer (Petit Barre), 11.31°N 42.71°E (11°18'33.56"N 42°42'39.17"E), 585 m a. s. l., I. 2017, 1♂2♀ (Figs. 73–76), FKCP, 1♂1♀, GLPC, leg. R. Štarha; Arta Province, Arta plage, 11.5857°N 42.8286°E, 1.XI.2013, 1♂ (No. 8159), leg. J. Lips, FKCP; Arta Province, Oueah, 11.501902°N 42.860266°E, 448 m a. s. l., 4.XII.2013, 1♀ (No. 9043), leg. J. Lips, FKCP; Tadjourah Province, Day, 11.7579°N 42.6349°E, 1700 m a. s. l., 16.XI.2012, 1juv.♀ (No. 7045), leg. J. Lips, NMPC; Tadjourah Province, Randa, 11.8469°N 42.6578°E, 910 m a. s. l., 6.XII.2013, 1♀ (No. 8780), leg. J. Lips, FKCP; Tadjourah Province, Dorra, 11.9017°N 42.6244°E, 980 m a. s. l., 19.XI.2020, 1juv. (No. 23183), leg. J. Lips; FKCP; Tadjourah Province, Day, 11.7707°N 42.6519°E, 1500 m a. s. l., 12.VI.2014, 1♂ (No. 11144), leg. J. Lips, NMPC; Tadjourah Province, Sagalou, 11.6774°N 42.7446°E, 30 m a. s. l., 16.I.2022, 1♂ (No. 25621), leg. J. Lips, FKCP.

Distribution. Djibouti (Fig. 113).

Orthochirus afar Kovařík & Lowe, 2016
(Figures 77–82, 113)

Orthochirus afar Kovařík & Lowe, 2016, in Kovařík et al., 2016c: 10–18, figs. 41–77, 155, tab 1.
= *Orthochirus borrii* Rossi, 2017 (2016): 6–7, figs. 3–4 (type locality: Djibouti, Dihdaoua´ad, MZUF). **Syn. n.**
Orthochirus aristidis: Lourenço & Leguin, 2011: 1–3 (in part), figs. 3–5 (misidentification); Lourenço & Ythier, 2021: 336–337 (in part), figs. 1–2 (misidentification).

Type locality and type repository. Ethiopia, Afar Region, Gewane, 10°09'38"N 40°39'45"E, 631 m a. s. l., FKCP.

Type material Examined. **Eritrea**, Assab, 1♂2♀ (paratypes of *Orthochirus borrii* Rossi, 2017), 10.I.–15.II.1907, leg. K. Katona, HNHM. **Ethiopia**, Afar Region, Gewane, 10°09'38"N 40°39'45"E, 631 m a.s.l. (Locality No. **12EO**), 23–24.XI.2012, 1♂ (holotype, figs. 41–42, 45–46, 49, 59–60, 66–68, 74 in Kovařík et al., 2016c) 1♂1♀ (paratypes, figs. 43–44, 47–48, 50–58, 61–65, 69–71, 75 in Kovařík et al., 2016c) 1♂juv. (paratype), leg. F. Kovařík, FKCP; 11°43'22"N

Figures 73–76: *Neobuthus ferrugineus*, Djibouti, Barra Yer, 11.31°N 42.71°E, 585 m a. s. l. **Figures 73–74**. Male, dorsal (73) and ventral (74) views. **Figures 75–76**. Female, dorsal (75) and ventral (76) views. Scale bar: 10 mm.

Figures 77–78. *Orthochirus afar*, male from Djibouti, Tadjourah Province, Ditillou, 11.7811°N 42.6934°E, 665 m a. s. l. in dorsal (77) and ventral (78) views. Scale bar: 10 mm.

40°56'52"E, 457 m a.s.l. (Locality No. **12EM**), 20.XI.2012, 1♀juv. (paratype), leg. F. Kovařík, FKCP.

Djibouti material examined (FKCP). **Djibouti**, Arta Province, Arta plage, 11.5857°N 42.8286°E, 22.XII.2013, 1♂ (No. 8978), leg. J. Lips; Arta Province, Goubetto, 11.4234°N 42.7327°E, 615 m a. s. l., 29.V.2014, 2♀ (No. 9528), leg. J. Lips; Djibouti Province, Djibouti, 11.5680°N 43.1461°E, 10 m a. s. l., 15.IX.2013, 1♂ (No. 7864), leg. J. Lips; Djibouti Province, Goubetto, 11.4640°N 43.0341°E, 240 m a. s. l., 26.I.2022, 2juvs. (No. 25598), leg. J. Lips; Tadjourah Province, Bankouale, 11.8246°N 42.6737°E, 650 m a. s. l., 15.IV.2011, 1♂ (No. 5071), leg. J. Lips; Tadjourah Province, Tadjourah, 11.7829°N 42.9010°E, 17.10.2013, 2juvs. (No. 8347), leg. J. Lips; Tadjourah Province, Raissali, 11.7731°N 42.9355°E, 15 m a. s. l., 10.IV.2013, 1♂ (No. 10993), leg. J. Lips; Tadjourah Province, Daylmoli, 11.8672°N 42.8982°E, 340 m a. s. l., 16.I.2022, 1♂ (No. 25637), leg. J. Lips; Tadjourah Province, 11.7707°N 42.6519°E, 1500 m a. s. l., 12.VI.2014, 1♀ (No. 11144), leg. J. Lips; Tadjourah Province, Sagalou, 11.6774°N 42.7446°E, 16.I.2022, 1♀ (No. 25621), leg. J. Lips; Tadjourah Province, Ditillou, 11.7811°N 42.6934°E, 665 m a. s. l., 27.VI.2014, 1♂ (Figs. 77–78, No. 9897), leg. J. Lips; Barra Yer (Petit Barre), 11.31°N 42.71°E (11°18'33.56"N 42°42'39.17"E), 585 m., I. 2017, 2♂2♀4juvs, leg. R. Štarha.

Diagnosis. Total length of adults 23–30 mm (♂), 29 mm (♀). Base color a uniform black; sternites III–VI brown with transverse posteromedian yellow patches on IV–VI (♂), or V (♀); pedipalp fingers pale, fixed finger yellow to orange-yellow, movable finger yellow; tarsomeres of legs yellow to white, telson reddish brown. Carapace densely, finely granulate, including preocular triangle, and median ocular tubercle; superciliary carinae smooth, lustrous. Tergites densely, finely granulate; tergites I–III without distinct carinae, IV–VI with single weak median carina. Sternites III–VI without carinae, moderately to sparsely shagreened laterally and anteromedially, smooth medially and posteromedially; sternite VII densely finely granulate or shagreened, with one median pair of carinae; spiracles narrow, slit-like. Metasoma glabrous, widened posteriorly, metasoma V W/ I W 1.13–1.20; dorsal surface sparsely granulate on metasoma I–II, smooth on III–V; metasomal II–V with large punctae on ventral and lateral surfaces, IV with mean puncta diameter 6–8% of segment length, inter-punctal surfaces smooth; metasoma I, II and III with 10, 8 and 6 carinae, respectively, metasoma IV–V with 4 carinae; V with ventrolateral carinae smooth in anterior half, weakly or moderately crenulate in posterior half; metasoma V L/W 1.07–1.18. Telson elongate, but relatively stout for the genus, telson L/ vesicle D 3.00–3.27; vesicle ventrally punctate; aculeus short, thick, about same length as vesicle. Pedipalp patella with dorsointernal, dorsomedian and dorsoexternal carinae present, smooth. Neobothriotaxic type Aβ; pedipalp femur with 'trichobothrium' d_2 absent. Pedipalp movable finger with 10–11 rows of median denticles, 9–10 ID, 8–9 OD, 4 subterminal and one terminal denticle. Fixed finger with 9 rows of median denticles, 8 ID, 8 OD. Leg coxae sparsely, finely granulate, margins densely finely granulate; tibial spurs present on legs III and IV; tarsal setation sparse on all legs, basitarsi with short, spiniform macrosetae, without bristlecombs; telotarsi with two series of short spiniform macrosetae on ventral surface. Pectines long in both sexes, extending to (♂), or almost to (♀) distal limit of coxa IV; pectinal tooth counts, 17–20 (♂), 16–19 (♀).

Comments. Rossi (2017) described *Orthochirus borrii* from Djibouti and Eritrea in a paper titled "Complementi alla fauna del Corno d'Africa: famiglia Buthidae C. L. Koch, 1837 (Scorpiones), con la descrizione di tre nuove specie" in his self-published journal *Rivista Aracnologica Italiana*. This journal issue was publically accessible (i.e., published) in March 2017, but was falsely pre-dated 14 July 2016 (cf. Kovařík et al., 2019: 19). The description of *O. afar* was published on 11 October 2016. It is determined here that the types of *Orthochirus afar* and paratypes of *Orthochirus borrii* match each other precisely in the following key characters: coloration, trichobothrial pattern, pedipalp finger dentation, pectinal tooth count and lamellar structure, proportions, setation, carination and sculpture of pedipalps, carapace, tergites, sternites, and metasoma, morphometrics of metasomal punctae, shape of the telson, as well as armature of chelicerae and pedipalp fingers. We conclude that *Orthochirus borrii* Rossi, 2017 is a junior synonym of *Orthochirus afar* Kovařík & Lowe, 2016, **syn. n.**

Kovařík et al. (2020a) synonymized *O. aristidis* (Simon, 1883) with *O. olivaceus* (Karsch, 1881) and confirmed its distribution in northern Sudan and southern Egypt. Lourenço & Ythier (2021: 337) reversed this synonymy and restored *O. aristidis*. They based their decision on differences between the colors of *O. olivaceus* ("*pale*" or "*partially pale*") shown in Kovařík et al. (2020a: 2, 4–8, figs. 1–16) and *O. aristidis* ("*typical very dark to blackish colouration*") which they assumed was represented by a dark female from Nubia (leg. Brignoli, 1975), the type locality (Lourenço & Leguin, 2011: 3, figs. 3–4; republished in Lourenço & Ythier, 2021: 338, figs. 1–2). However, it is difficult to reach firm conclusions by comparing colors of old museum specimens. Darker pigmentation patterns can fade to a uniform pale brown, orange or yellow color after long storage in fluid preservatives, a fact that these authors themselves acknowledged when referring to the holotype of *O. olivaceus* ("*… pale colouration most certainly associated with its age and faded condition*"). This also appears to be the present condition of the old type material of *O. aristidis* (Lourenço & Leguin, 2011: 2, figs. 1–2), which precludes any determination of natural color patterns from that material. To ascertain the colors of fresh material of *O. aristidis*, we consulted the original description by Simon (1882):

> "*Truncus caudaque supra nigro-virescentes, vesica rufeola, segmenta abdominalia subter Testacea, pedes albo-testacei, pedes maxillares trochantero femoreque fusco-virescentibus, tibia testacea fusco costata, manu albo-testacea.*"

(dorsal trunk (= prosoma/ mesosoma) and metasoma black-green, telson vesicle rufous, sternites testaceous, legs white-testaceous, pedipalps with trochanter and femur brown-green, patella testaceous with brown carinae, manus white-testaceous; N.B.: "testaceous" = brownish-red or brownish-yellow, and "white-testaceous" = pale brownish-red or pale brownish-yellow), and the subsequent diagnosis by Simon (1910):

> "*… patte-mâchoire jaune pàle avec le trochanter et le femur noirs, le tibia légèrement rembruni, pattes entièremert jaune pale.*"

(pedipalp pale yellow with black trochanter and femur, patella slightly darkened, entire legs pale yellow). Thus, according Simon (1882, 1910), *O. aristidis* is indeed "*partially pale*". This color pattern matches the color pattern of *O. olivaceus* as originally described by Karsch (1881):

> "*… die Kämme, Beine, Mandibeln und Palpen gelb, nur der Humerus der letzteren braun angedunkelt.*"

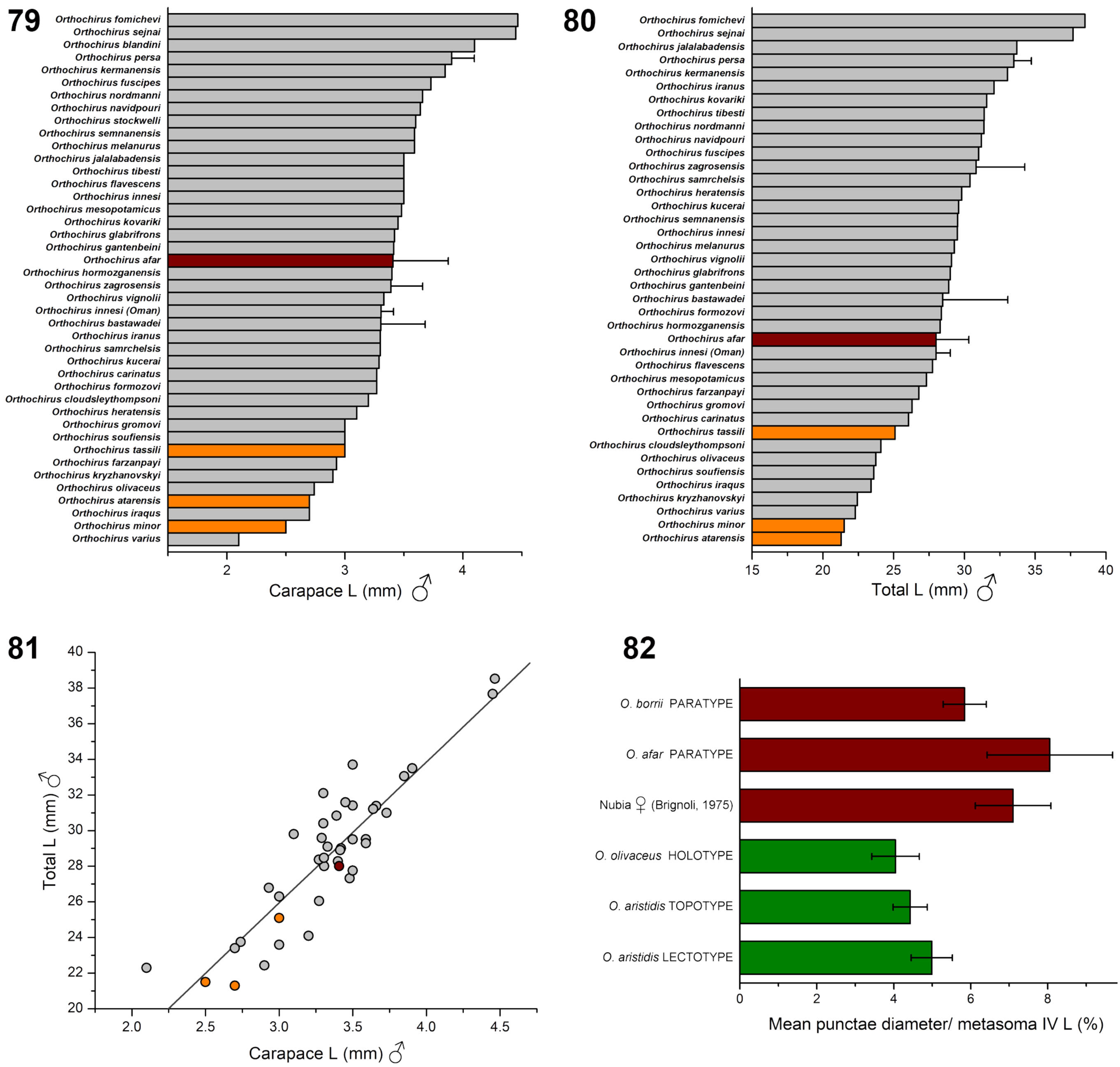
(pectines, legs, chelicerae and pedipalps yellow; only the femur of the latter is dark brown). The adjectives "*nigro-virescentes*" and "*fusco-virescentibus*" (black-green and brownish-green), applied to *O. aristidis*, are significant because Karsch (1881) also characterized the base color of *O. olivaceus* as "*dunkel-olivengrün*" (dark olive green), and named the species accordingly. The agreement between the color patterns and dark greenish hues in the original descriptions of *O. aristidis* and *O. olivaceus* supports their synonymy by Kovařík et al. (2020). These color patterns also match that of a recently collected male from northern Sudan, consistent with its identification as *O. olivaceus* (Kovařík et al., 2020a: 7, figs. 13–14).

The dark female from Nubia (leg. Brignoli, 1975) that was assumed to be a "*topotype*" of *O. aristidis* (Lourenço & Leguin, 2011: 2–3, figs. 3–4) has a black pedipalp patella and chela manus, both of which are as dark as the femur, and the legs are black except for lighter distal tibial and tarsal segments. This is most likely the natural color because the specimen is "*… well preserved and presents ... typical very dark to blackish colouration …*" (Lourenço & Ythier, 2021: 337), and a photograph of a very similar live female from Djibouti, identified as conspecific, has identical coloration (Lourenço & Leguin, 2011: 4, fig. 5). This coloration differs markedly from the originally described color pattern of *O. aristidis*. The dark female from Nubia also differs from *O. aristidis* in having larger punctae on the posterior metasomal segments. Image analysis of the photographs yields a puncta diameter on metasoma IV ventral and lateral surfaces of 7.10 ± 0.98 % (n = 37) (mean ± SD, expressed as a percentage of metasoma IV L), as opposed to 4.99 ± 0.54 % (n = 19) for the lectotype female of *O. aristidis*. These conspicuous differences in both color and morphometrics lead us to conclude that the dark female from Nubia (leg. Brignoli, 1975) cannot be *O. aristidis*. On the other hand, the puncta diameters of the lectotype of *O. aristidis* are statistically matched to those of the *O. olivaceus* holotype female (4.05 ± 0.61 %; n = 37), and a female from Wadi Halfa, Nubia (4.43 ± 0.44 %; n = 36) that was proposed to be a topotype of *O. aristidis* (Kovařík et al., 2020a: 6, figs. 11–12) (Fig. 82). We therefore reject the restoration of *O. aristidis* by Lourenço & Ythier (2021: 337), an act based on a misidentified topotype, and we return *O. aristidis* (Simon, 1882) **syn. res.** to synonymy with *O. olivaceus* (Karsch, 1881).

The dark female from Nubia (leg. Brignoli, 1975) (misidentified topotype) exhibits habitus and coloration identical to that of *O. afar* (Kovařík et al., 2016c: 10, figs. 41–44), and the morphometrics of its metasoma IV punctae are statistically matched to those of *O. afar* (♀ 8.06 ± 1.63 %; n = 55) (Fig. 82). It is either *O. afar*, or a closely similar species. The statement by Lourenço & Ythier (2021: 336) that "Orthochirus afar *is most certainly a synonym of* Orthochirus aristidis" is incorrect, being based on their misidentified topotype. The photographed live dark female from Djibouti (Lourenço & Leguin, 2011: 4, fig. 5) is probably also *O. afar*, as the presence of *O. afar* in Djibouti is confirmed here by examination of new materials. Rossi (2017) independently concluded that this photographed live female had been misidentified as *O. aristidis*, and regarded it as a synonym of *O. borrii* (= *O. afar*). Most of the distinctions between *O. afar* and "*O. aristidis*" previously offered by Kovařík et al. (2016a: 13, under 'AFFINITIES') were based on the incorrect assumption that the misidentified topotype of Lourenço & Leguin (2011) represented *O. aristidis*. In hindsight, these differences may represent either intraspecific variation in *O. afar*, or morphological differences between *O. afar* and a closely similar species in Nubia. It appears that at least two species of *Orthochrius* occur sympatrically in the area of Nubia, *O. olivaceus* and *O. afar* or a closely similar species.

Kovařík et al. (2020a) viewed the type locality 'Sicilien' of *O. olivaceus* as a labeling error, as there are no confirmed records of *Orthochirus* in Sicily, or elsewhere in Europe. They reasoned that the specimen most likely originated from Egypt, along with other scorpion materials acquired by the same collector (Schneider). This viewpoint was supported by the precise match in morphology between the holotype and a female from Nubia. It gains further credence from the synonymy of *O. aristidis* (from Nubia) with *O. olivaceus*, a conclusion independently supported by exact matches of color patterns and morphometrics, as shown above. Lourenço & Ythier (2021: 337) took the opposing position that Sicily can be the type locality, arguing that: "*… Sicily does have habitats which could be in adequation with* Orthochirus *species' biology. The original population could have vanished since the 19th century, as it happened for other populations (Lourenço & Rossi, 2013).*" Their hypothesis poses a perplexing biogeographic puzzle: how to explain the existence two widely disjunct populations of *O. olivaceus*, one in the Nubian desert around the Nile of southern Egypt/ northern Sudan, and the other isolated on the island of Sicily, separated from each other by ~ 2,500 km of intervening Sahara Desert and Mediterranean Sea? Sicily was connected to North Africa in the past, during the Messinian Salinity Crisis at the end of the Miocene. However, this connection was through Tunisia, not the Nile basin. During this period, and during later Pleistocene glacial regressions, faunal interchange could occur between Sicily and Tunisia (Schmitt et al., 2021). If any *Orthochirus* were once present in Sicily, they were most likely to have been *O. innesi*, which is broadly distributed in Tunisia, northern Libya and northern Egypt (Lourenço & Leguin, 2011: 15, fig. 39). This puzzle can be solved most simply by assuming a labeling error.

ADDITIONAL COMMENTS. Lourenço & Ythier (2021: 340–345) diagnosed and described another species of *Orthochirus*: *O. arenicola* from coastal Somalia. Their diagnosis suffers from many problems. First and foremost, it is based on a single type specimen that is an early instar juvenile male. Descriptions of new species from single specimens are only defensible when there are unique qualitative characters, or distinct quantitative characters without overlapping variation in other species. Description of new species from early instar juveniles is problematic because many scorpion taxonomic characters (e.g., morphometrics, setation, carination, granulation, and secondary sexual characters) exhibit ontogenetic variation between juveniles and adults. Diagnoses based on juveniles require systematic comparisons with same stage juveniles of other species, which is usually difficult or impossible because



Figures 79–82: Morphometric comparisons of *Orthochirus* species. **Figures**. **79–80**. Rank ordered horizontal bar plots of adult male carapace lengths of 42 species (79), and adult male total lengths of 40 species (= anterior margin of carapace to tip of aculeus of extended telson) (80). **Figure 81**. Bivariate scatter plot of adult male total length vs. adult male carapace length for 39 species. Dark brown bars and symbols highlight the species *O. afar*; orange bars and symbols highlight the species chosen by Lourenço & Ythier (2021: 345) to represent "*moderate-size* Orthochirus *species*". **Figure 82**. Horizontal bar plot of mean punctae diameters on ventral and lateral surfaces of metasoma IV, expressed as percentage of metasoma IV length, in six females of *Orthochirus*. Dark brown bars: specimens assigned to the species *O. afar* Kovařík & Lowe, 2016 (or a closely similar species); green bars: specimens assigned to the species *O. olivaceus* (Karsch, 1881). The dark female from Nubia (leg. Brignoli, 1975) is statistically grouped with *O. afar*. In all figures, plotted values are either single measurements or means, and error bars are standard deviations (SD).

most species were described from adults, and many are only known from adults. Even if such comparisons can be made, they may not yield useful diagnostic information because many species-specific characters are only expressed in later instars or upon reaching sexual maturity. This only exacerbates the problem of determining whether the characters of a single type specimen are unique or overlap with those of other species. One of the differential diagnostic characters is: "*carapace and tergites less granulated*". Granulation is known to exhibit ontogenetic variation. It can be weak or absent in early instars of species that develop strong granulation in adults. In the absence of adults, it is impossible to know if this is a species-specific character, or a juvenile-specific character. Similarly, the diagnostic character: "*Ventral aspect of metasomal* *segment V without any granulations posteriorly*" could be restricted to juveniles, with granulation developing in later instars or adults.

Another problem is the use of size as a diagnostic character: "… *probably small to moderate in size compared to other known species of the genus, reaching a total length of 21 to 25 mm for males*." The cited adult size is an *assumption*, not an observed character state. It is impossible to know the size of adults, because only an early instar juvenile is available. Diagnoses should not include unknown assumed characters unless there is evidence to support the assumptions. The authors' rationale for assuming this size range is that it is: "*... the average total length (21 to 25 mm) of moderate-size* Orthochirus *species such as* O. tassili *...,* O. atarensis *... or* O. minor *...*". However, there is no independent evidence (e.g., animal tracks in the sand, photographs of adults, observer reports) to support an assumption of "*moderate-size*"; it could be a smaller or larger species of *Orthochirus*. Indeed, the authors' proposed size is a nebulous, shifting character. The diagnosis specifies "*small to moderate*" size, instead of "*moderate-size*". In the absence of data, the value of an unknown variable could be estimated statistically by taking the mean value ("*average total length*") for the taxonomic group of interest, i.e., the genus *Orthochirus*. Figs. 79–80 show the size distribution of male *Orthochirus*, as measured by carapace length (CL) and total length (TL). Carapace length is included here because total length measurements may be distorted by mesosomal expansion or contraction. It is evident that the three species, *O. tassili*, *O. atarensis* and *O. minor* are not of "*moderate*" (i.e., "*average*" for the genus) size. Their sizes are skewed towards the extreme lower end of the distribution, and two of them are among the smallest members of the genus. Mean values and ranges for these species are: CL, 2.73 ± 0.25, 2.5–3.0 mm; TL, 22.63 ± 2.14 mm, 21.30–25.10 mm (n = 3). The last values correspond to the diagnostic character "*21 to 25 mm*". In contrast, the overall mean values and ranges for male *Orthochirus* are: CL, 3.35 ± 0.46, 2.50–4.47 mm (n = 42); TL, 28.60 ± 3.99, 21.30–38.52 mm (n = 40). Why would the authors assume that adults of *O. arenicola* are among the smallest members of the genus, and not of "*moderate*" or "*average*" size?

The apparently arbitrary assumption of 21–25 mm adult size was used to extrapolate the developmental stage of the specimen as third instar, using a morphometric progression factor ("… *it is possible to suggest that the described specimen is a third instar juvenile*"). The theoretical progression factor of length measurements for arthropod molts is 1.26 (the cube root of 2, assuming mass and volume doubling in each molt). The holotype measurements are (mm): CL, 1.80; TL, 14.55. Predicted lengths for subsequent instars are: CL × $(1.26)^n$, or 2.27, 2.86, 3.60; TL × $(1.26)^n$, or 18.33, 23.10, 29.11 (where n = 1, 2, 3 are the number of molts). Therefore, only two molts are required to attain a mean adult size of 21–25 mm. Shulov & Amitai (1960) analyzed the growth of *O. innesi negebensis* and proposed that males matured at the fifth instar. Assuming that adult males of *O. arenicola* are also fifth instars, an adult size of 21–25 mm predicts that the holotype is third instar. However, if the adult size is assumed instead to be the mean size for *Orthochirus* (CL 3.35 mm, TL 28.60 mm), three molts would be required to attain adult size, and the holotype is predicted to be second instar. By avoiding the true "*average*" or "*moderate*" adult size of *Orthochirus* (a statistically unbiased assumption), and choosing the lower end of the size range (a statistically biased assumption), the authors obtained the result of third instar, not second instar. Although inferred from a biased assumption, the authors boldly claimed that their specimen is "*most certainly a third instar juvenile*". Certainty comes from observation, not from biased assumption and extrapolation. The illusory morphing of confidence levels of instar prediction from "*possible to suggest*" to "*probably*" to "*certainly*" has the bogus ring of propaganda, not science.

One of the key diagnostic characters proposed for *O. arenicola* is the absence of femur trichothrium i_2. As the authors noted, absence of i_2 is a known developmental trait of second instar juveniles of species belonging to diverse buthid genera (e.g., *Androctonus*, *Buthacus*, *Buthiscus*, *Buthus*, *Hottentotta*, *Heteroctenus* and *Tityus*). In those species, i_2 is normally present in later instars or adults. If the holotype is second instar, the absence of i_2 is more likely to be a general buthid condition without diagnostic value at the species level. If it is third instar, it may be more plausible as a diagnostic character. This is a motivation for the biased assumption that adults are only 21–25 mm in size, i.e., to achieve third instar status and obtain a diagnostic character. However, even if it were third instar, the value of this character for species recognition is unknown, because early ontogeny of i_2 in other *Orthochirus* has not been characterized. The authors themselves admitted as much: "… *not enough elements are available to suggest a particular ontogenetic variation in* Orthochirus *species*." It should also be noted that the absence of a single trichobothrium in a single specimen is sometimes observed as an irregularity in one pedipalp segment, but the authors did not rule this out by showing bilateral loss of i_2. Consistent neobothriotaxic loss of i_2 in adults is rare in buthids. It occurs in the very small genera *Femtobuthus* and *Picobuthus* (Lowe, 2010), but has not been found in most other buthids.

Another questionable diagnostic character is: "*General colouration brownish-yellow*", along with the differential diagnostic character: "*a distinct and paler pigmentation pattern, even supposing that the adults may be darker*". This does not allow for the likelihood that the specimen may have faded after long museum storage (46 years). Also, if it is supposed that "*adults may be darker*", then this is a juvenile-specific character and its validation requires systematic comparison of pigmentation in same instar juveniles of other *Orthochirus* species. No such comparison was provided. Fading is suggested by their fig. 21, which shows a lack of UV fluorescence. However, they considered this lack of fluorescence to be another taxonomic character for their diagnosis ("… *no reaction to UV light was observed* …"), rather than an artifact of fading. Variable loss of scorpion fluorescence occurs during long storage in fluid preservatives, and an isolated observation of reduced fluorescence in a single old museum specimen is insufficient for constructing a diagnosis (Lowe & Kovařík, 2019, 2022).

According to the differential diagnosis: "Orthochirus arenicola *sp. n. can be distinguished from the other African species of* Orthochirus*, and in particular from* Orthochirus aristidis *Simon, which presents the most close geographic distribution, by the following main features: (i) a smaller size in adults ….*". The authors' concept of *O. aristidis* is based in part on their misidentified female topotype, which, as shown above, is actually *O. afar* or a closely similar species. The populations they referenced as having the "*most close geographic distribution*" to *O. arenicola* would correspond to *O. afar* (in Djibouti, Eritrea, Ethiopia and Somaliland). Adult males of *O. afar* can range in size from from 26 mm (Kovařík et al., 2016c: 18, tab. 1; *O. borrii* male paratype, examined) to 30 mm (Figs. 77–78). This is around the average size for the genus *Orthochirus* (Figs. 79–81), and is certainly larger than the size range of 21–25 mm given in the diagnosis of *O. arenicola*. However, since the latter size range was arbitrarily chosen (or perhaps biased to force third instar status), it has no validity as a diagnostic character. If the holotype of *O. arenicola* is a juvenile *O. afar*, the adult size range of 26–30 mm would imply second instar status, and the absence of i_2 would be a character shared with many other second instar buthids. Several ontogenetically invariant characters are either shared or overlap between *O. afar* and *O. arenicola*: pectinal tooth count 17–20 in males (vs. 17 in *O. arenicola*); pedipalp chela fingers with 9–11 subrows of median denticles (vs. 8–9 in *O. arenicola*); femur petite 'trichobothrium' d_2 absent (vs. d_2 absent in *O. arenicola*). *O. afar* has contrasting pale pedipalp chela fingers and tarsi, and the same contrasting pattern is seen in *O. arenicola* (chela fingers and tarsi more pale than proximal segments and body). This suggests that the body and proximal pedipalp and leg segments of *O. arenicola* were originally darker, but faded to a lighter shade of brown. A pattern of contrasting pale leg tarsi and pedipalp chela fingers is found in many *Orthochirus* with dark bodies (Kovařík et al., 2019, 2020c; Kovařík & Navidpour, 2020). It does not occur in known species with naturally pale bodies: e.g., *O. kryzhanovskyi* Kovařík, Fet & Yağmur, 2020 (cf. Kovařík et al., 2020b: 23, figs. 106–107), *O. pallidus* (Pocock, 1897) and *O. flavescens* (Pocock, 1897) (cf. Zambre et al., 2011: 11, figs. 18A, 18B), *O. minor* and O. *tibesti* (Lourenço et al., 2012: 328–329; verbal descriptions). The more parsimonious hypothesis is that the holotype of *O. arenicola* is a faded second instar juvenile of *O. afar*, the geographically most proximate *Orthochirus* species in the region, rather than an exotic, small new species of the genus, lacking both femoral trichobothrium i_2 and UV fluorescence.

The diagnosis of *O. arenicola* contains many uncertainties and assumptions, being based on a single early instar juvenile. It is not possible to know if *O. arenicola* is a distinct species, or a juvenile of a previously described species. The juvenile characters are taxonomically uninformative, and may be symptomatic of juvenile status, rather than species identity or phylogenetic position. The species cannot be reliably compared to other *Orthochrius* diagnosed by adult characters. It is premature to name a new species on the basis of such tenuous information. The diagnosis seems to be a product of wishful thinking, with fictitious characters conjured to differentiate imaginary adults from other *Orthochirus*. We have no choice but to consider *O. arenicola* Lourenço & Ythier, 2021 a *nomen dubium*.

Lourenço & Ythier (2021: 339) synonymized *Orthochiroides* Kovařík, 1998 with *Orthochirus* Karsch, 1891. We already showed that this synonymy was unjustified, and restored the genus (Kovařík & Lowe, 2022). Hence, all of their taxonomic acts are invalidated. Do they offer anything other than misguided attempts to negate our results? The last section of their paper, reviewing the ecology of the Somali coast, could be an original contribution. However, that entire section is duplicated verbatim (86% text, the rest cosmetic wording changes), without citation, from the copyrighted online work of other authors (Magin & Burdette, 2013–2020).

Distribution. Djibouti, Eritrea, Ethiopia, Somaliland, ? Sudan (Fig. 113, fig. 155 in Kovařík et al., 2016b: 34).

Parabuthus abyssinicus Pocock, 1901

(Figures 83–86, 113)

Parabuthus abyssinicus Pocock, 1901: 1; Kovařík et al., 2016b: 12–19, figs. 1–6, 8–27, 166–167, 171, 181, 193, 204, Table 1; Kovařík et al., 2019: 2, figs. 1–4, 274–277, 305, table 5.

Parabuthus liosoma abyssinicus: Kraepelin, 1913: 172.

Parabuthus leiosoma abyssinicus: Fet & Lowe, 2000: 206 (complete reference list until 2000).

= *Parabuthus liosoma dmitrievi* Birula, 1903: 113 (syn. by Kovařík, 2003: 144).

Parabuthus liosoma dimitrivi: Borelli, 1925: 12–13.

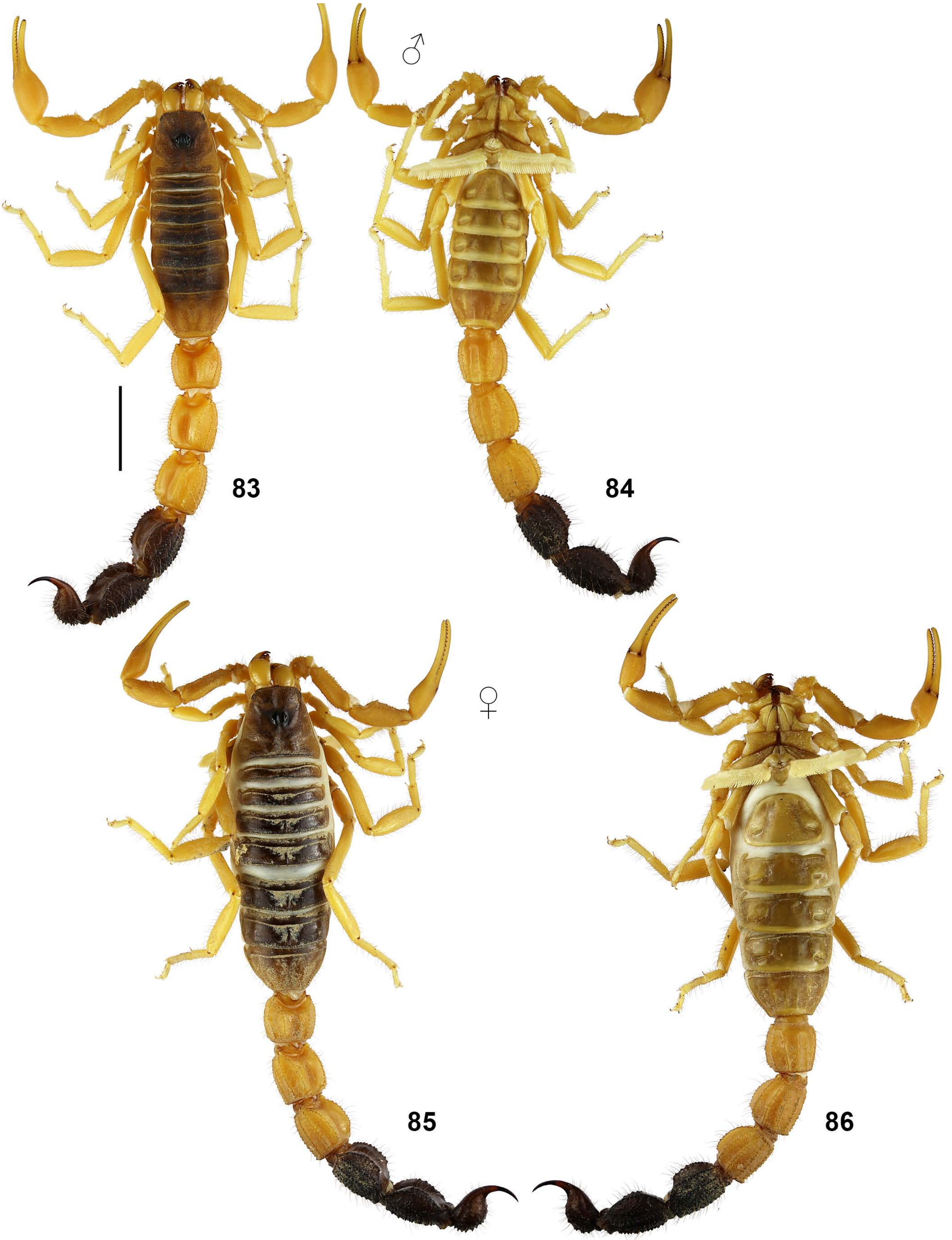
Parabuthus liosoma dmitrievi: Fet & Lowe, 2000: 206 (complete reference list until 2000).

Parabuthus leiosoma (in part): Fet & Lowe, 2000: 205–206 (complete reference list until 2000); Kovařík, 2003: 144, figs 8–9; Kovařík & Whitman, 2005: 110–111.

Type locality and type repository. Ethiopia, Abyssinia, Shoa (= now Ethiopia, Shewa Province); BMNH.

Djibouti material examined (FKCP). **Djibouti**, Tadjourah Province, Day, 11.77°N 42.65°E, 1.VI.1990, 1♀, 14.VII.1990, 1♂; Djibouti Province, Djibouti, 11.5137°N 43.1884°E, 6 m a. s. l., 12.XII.2013, 1juv. (No. 10334), leg. J. Lips; Djibouti Province, 11.4182°N 42.9059°E, 560 m a. s. l., Goubetto, 26.I.2022, 1juv. (No. 25588), leg. J. Lips; Djibouti Province, Goubetto, 11.4640°N 43.0341°E, 240 m a. s. l., 26.I.2022, 1juv. (No. 25598), leg. J. Lips; Tadjourah Province, Randa, 11.4182°N 42.6413°E, 1020 m a. s. l., 31.I.2022, 1im.♂ (No. 25584), leg. J. Lips.

Distribution. Djibouti, Eritrea, Ethiopia, Somaliland, ? Sudan (Fig. 113, fig. 305 in Kovařík et al., 2019: 61).



Figures 83–86: *Parabuthus abyssinicus*, Somaliland, Borama, campus Amound University, 09°56'49"N 43°13'23"E, 1394 m a. s. l. **Figures 83–84**. Male, dorsal (83) and ventral (84) views. **Figures 85–86**. Female, dorsal (85) and ventral (86) views. Scale bar: 10 mm.

Figures 87–88. *Pandiborellius nistriae*, male holotype in dorsal (87) and ventral (88) views.

Family **Scorpionidae** Latreille, 1802
Pandiborellius nistriae (Rossi, 2014)
(Figures 87–88, 113)

Pandinus (*Pandinurus*) *nistriae* Rossi, 2014a: 13–15, figs. 3, 5a, 6–9; Rossi, 2014b: 7; Rossi, 2014c: 3–11, figs. 1–6, 9–10 (in part).
Pandinurus (*Pandiborellius*) *nistriae*: Rossi, 2015a: 34, 63, figs. 114–118 (in part); Rossi, 2015b: 9–10 (in part).
Pandinurus (*Pandipavesius*) *nistriae*: Rossi, 2015c, 42–44.
Pandiborellius nistriae: Kovařík et al., 2017: 35: figs. 21, 95, 130–131, 191, 396.

Type locality and type repository. Djibouti, Obock District, Medeho, 11°58'15"N 43°01'30"E; MZUF.

Type material examined. **Djibouti**, Obock District, Medeho, 11°58'15"N 43°01'30"E, 1♂ (holotype, Figs. 87–88 and figs. 21, 95, 130–131, 191 in Kovařík et al., 2017: 35), 25.II.2013, leg. P. Agnelli, A. Nistri et A. Ugolini, MZUF No. 4133.

Distribution. Djibouti (Fig. 113).

		Hemiscorpius lipsae **sp. n.**
Dimensions (MM)		♀ **holotype**
Carapace	L / W	4.42 / 3.93
Mesosoma	L	14.42
Tergite VII	L / W	2.22 / 3.83
Metasoma + telson	L	16.69
Segment I	L / W / D	2.01 / 1.92 / 1.60
Segment II	L / W / D	2.17 / 1.75 / 1.51
Segment III	L / W / D	2.24 / 1.70 / 1.50
Segment IV	L / W / D	2.65 / 1.61 / 1.39
Segment V	L / W / D	3.85 / 1.40 / 1.38
Telson	L / W / D	3.77 / 1.57 / 1.51
Pedipalp	L	14.94
Femur	L / W	3.79 / 1.59
Patella	L / W	3.79 / 1.65
Chela	L	7.36
Manus	W / D	2.90 / 2.14
Movable finger	L	4.08
Total	**L**	**35.53**

Table 1. Measurements of female holotype of *Hemiscorpius lipsae* **sp. n**. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

Family **Hemiscorpiidae** Pocock, 1893

Hemiscorpius lipsae **sp. n.**

(Figs. 89–113, Table 1)

http://zoobank.org/urn:lsid:zoobank.org:act:DDB10ED0-C16F-4C5E-BFB3-066E611BC94E

Type locality and type repository. Djibouti, Arta Province, Goubet, 11.5632°N 42.5862°E, FKCP.

Type material (FKCP). **Djibouti**, Arta Province, Goubet, 11.5632°N 42.5862°E, 14.II.2014 (Fig. 112), 1♀ (holotype, No. 8769), 11.43°N 42.6°E, 500 m a. s. l., 1.XI.2013, 1♂juv. (paratype, No. 8113), leg. J. Lips; Arta Province, Arta plage, 11.5857°N 42.8286°E, 26.II.2014, 1♂juv. (paratype, No. 9622), leg. J. Lips; Tadjourah Province, Dalay-Af, 11.8360°N 43.0762°E, 17.I.2022, 1♀juv. (paratype, No. 25617), leg. J. Lips.

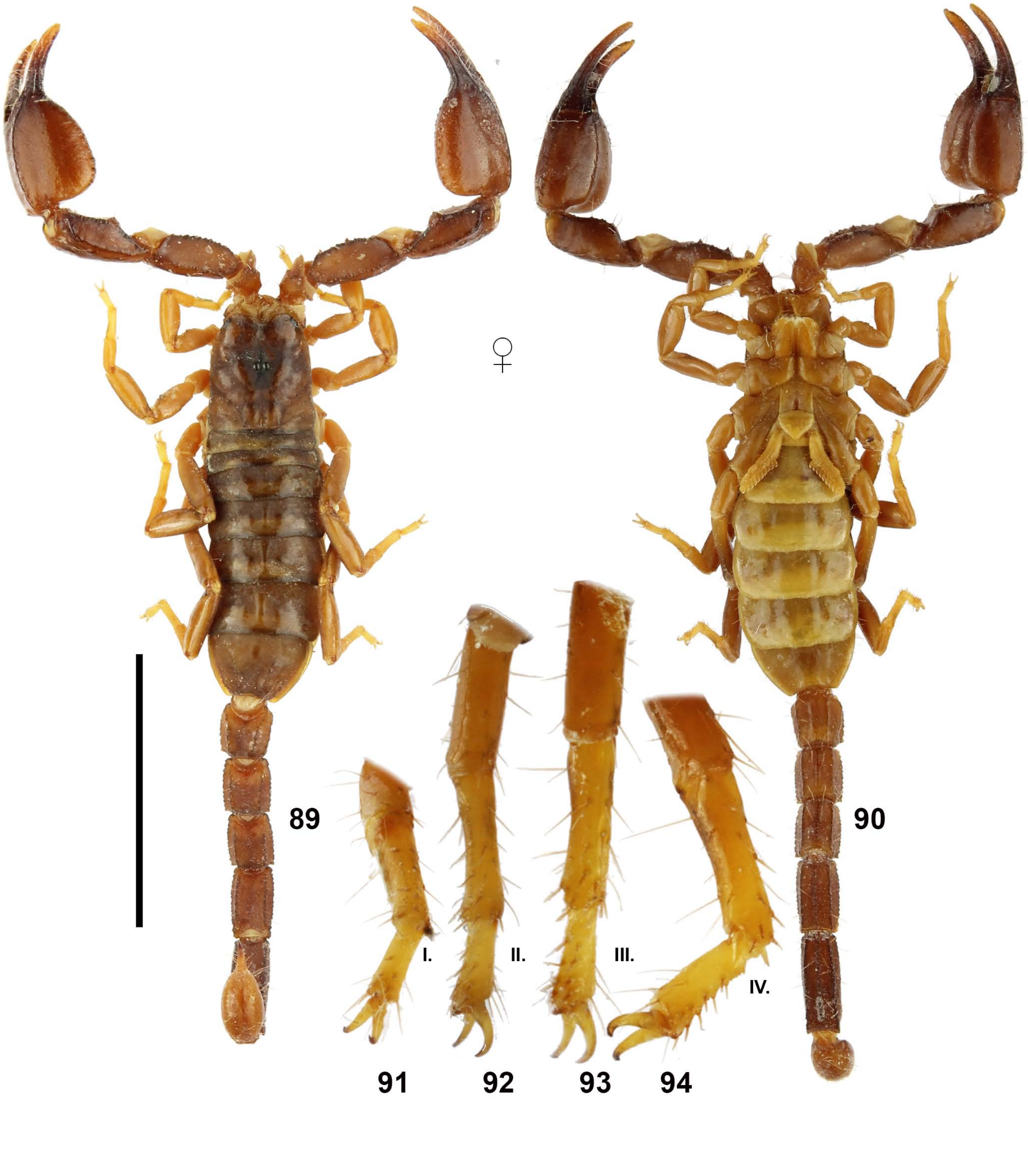
Etymology. Named after Josiane Lips (France) who together with her husband Benard Lips lived in Djibouti (2010-2014), were interested in the fauna of Djibouti and collected most of the specimens cited in this paper, including all types of the new species. Benard Lips is also author of the photo of the type locality (Fig. 112).

Diagnosis (female). Total length 36 mm. Color reddish to yellowish brown. Sternite VII finely granulate, with two smooth carinae. All metasomal segments longer than wide; metasoma IV L/D 1.90. Telson elongate, ventral profile hemielliptic, aculeus robust, markedly shorter than vesicle. Pedipalp segments relatively short, robust; patella without external or ventromedian carinae; chela relatively short with broad manus, chela L/W 2.53 (♀); manus with granulate ventroexternal (V3) carina; distal movable finger with dual linear rows of denticles. Orthobothriotaxic type C; pedipalp patella with 13 external, 3 ventral trichobothria, esb_1 proximal to esb_2, em_1 distal to em_2, V_3-V_2 separation more than two times V_1-V_2 separation; chela manus with V_2 external to V_1. Genital opercula strongly cordate. Pectinal tooth count, 10 (♀). Leg segments relatively short, robust; formula of ventral macrosetae on telotarsi: 3/3-4: 4/5: 5/5: 5/5.

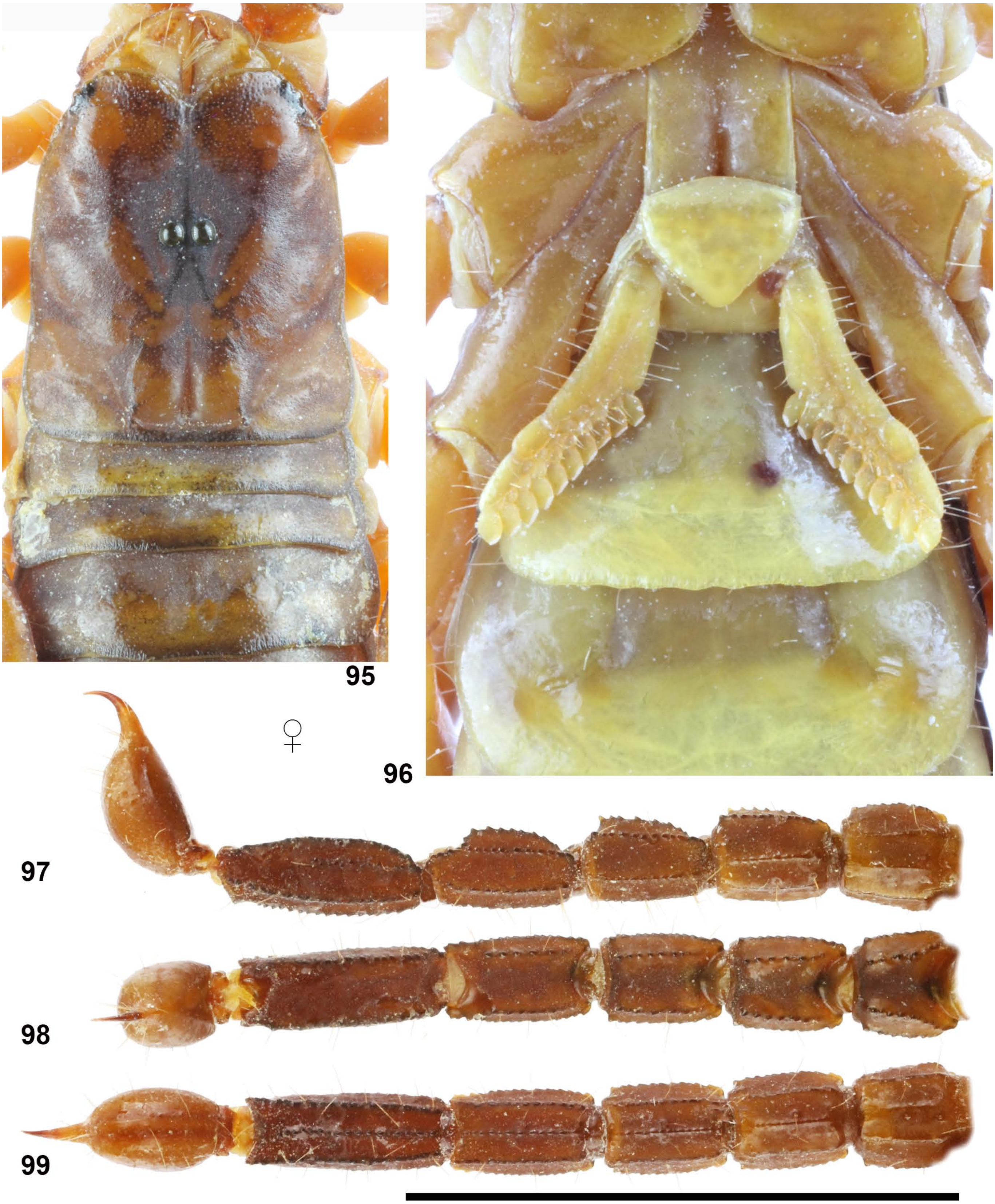
Description. Adult female total length 36 mm long, adult male unknown. Habitus as shown in Figs. 1–2. Measurements are in Table 1.

Coloration (Figs. 89–90). Base color uniformly reddish to yellowish brown. Pedipalp fingers and anterior margin of carapace black. Chelicerae pale yellow with reddish denticles.

Pedipalps (Figs. 100–109). Pedipalps relatively short and robust, finely granulate. Femur with 4 granulate carinae; ventroexternal carina incomplete. Patella with 5 coarsely granulate carinae. Chela with 4–5 carinae; interomedian carina (I) weak and incomplete. Dentate margin of movable finger armed with two parallel rows of denticles extending entire length of finger, including OD and ID that appear to indicate six or seven subrows. Dentate margin of fixed finger armed



Figures 89–94. *Hemiscorpius lipsae* **sp**. **n**. female holotype. **Figures 89–90**. Dorsal (89) and ventral (90) views. **Figures 91–94**. Left legs I–IV, retrolateral aspect. Scale bar: 10 mm (89–90).



Figures 95–99. *Hemiscorpius lipsae* **sp**. **n**. female holotype, carapace and tergites I–III (95), sternopectinal region and sternites III–IV (96), metasoma and telson, lateral (97), dorsal (98), and ventral (99) views. Scale bar: 10 mm (73–75).

Figures 100–111: **Figures 100–110**: *Hemiscorpius lipsae* **sp**. **n**. female holotype, pedipalp (100–109) and telson lateral (110). **Figures 100–109**. Chela, dorsal (100), external (101), and ventral (102) views. Patella, dorsal (103), external (104) and ventral (105) views. Femur and trochanter, dorsal (106), and ventral (107) views. Movable (108) and fixed (109) fingers dentation. The trichobothrial pattern indicated in Figures 100–106 by white circles. **Figure 111**. *Hemiscorpius tellini*, female holotype, pedipalp chela dorsal.

Figure 112. *Hemiscorpius lipsae* **sp**. **n**., type locality.

with one or two parallel rows of denticles with OD and ID that appear to indicate six subrows. Orthobothriotaxic type C (Figs. 76–82); patella with 13 external, 3 ventral trichobothria.

Metasoma and telson (Figs. 97–99, 110). Metasoma and telson sparsely hirsute, smooth to finely granulate. Metasoma I–IV with a total of 7 finely granulate carinae with spiniform granules. Metasoma V with 5 carinae, lateral carinae replaced by irregular row of minute granules. Telson elongate, with aculeus shorter than vesicle.

Carapace and mesosoma (Figs. 95–96). Carapace longer than wide, lacking carinae, with deep sagittal furrow and forked, V-shaped furrow extending on each side posteriorly. Anteromedial margin of carapace strongly concave with deep median emargination. A pair of median eyes and 3 pairs of lateral eyes present. Carapace and mesosoma finely covered with variable-sized granules, surfaces ranging from minutely shagreened to more coarsely granulate. Tergites I–II lacking carinae, tergites III–VI with a sagittal carina. Tergite VII with 4 incomplete carinae. Sternites I–VI lacking carinae, smooth, except for sternite VII which is finely granulate with 2 smooth carinae. Pectinal tooth count, 10 (♀). Pectinal marginal tips extending to proximal 4/5 of sternite III in female. Pectines with 3 marginal lamellae, 6–7 middle lamellae. Marginal lamellae bearing several white setae, middle lamellae and each fulcrum bearing 1–3 white setae. Genital opercula of female together forming a strongly cordate profile with prominent posterior vertex.

Legs (Figs. 91–94). All legs finely granulated on dorsal surfaces. Tarsomeres hirsute with microsetae and macrosetae, including ventral microsetae. Leg I–III basitarsi with 4-6/ 4-6 spiniform macrosetae. Telotarsi with two axial series of ventral spiniform macrosetae, arranged according to formula: 3/3-4: 4/5: 5/5: 5/5.

Variation. Juvenile female has pectinal tooth count 10 (10:10) but juvenile males have 11–13 (11:12, 13:13) pectine tooth.

Affinities. The described features distinguish *H. lipsae* **sp**. **n**. from all other known species of the genus. The genital opercula together form a strongly cordate profile with a prominent posterior vertex (Fig. 96), a shape known in only one other member of the genus, *H. tellinii* Borelli, 1904 from Eritrea (Kovařík & Mazuch, 2011: 4, fig. 18). Other African species of *Hemiscorpius* (*H. egyptiensis* Lourenço, 2011 from

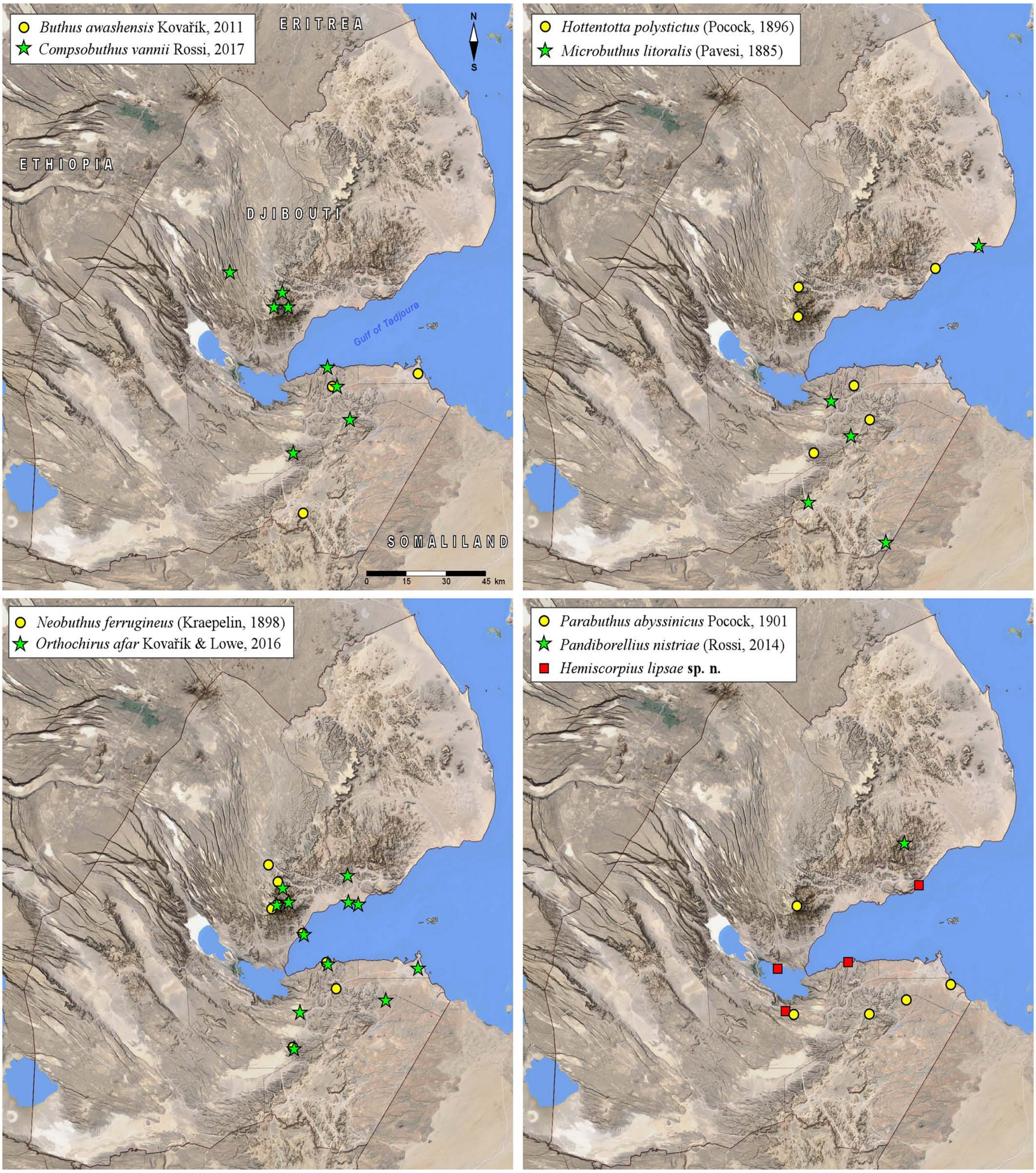


Figure 113. Confirmed geographic distribution of scorpions in Djibouti. Maps created in Google Maps (2022).

Egypt; *H. novaki* Kovařík & Mazuch, 2011 from Somaliland; and *H. somalicus* Lourenço, 2011 from Somalia) have genital opercula with oval profiles (Kovařík & Mazuch, 2011: 4, figs. 21–22). *H. tellinii* is known only from the female holotype, which can be distinguished from the female holotype of *H. lipsae* **sp. n.** by having a narrower metasoma and pedipalp chela: metasoma IV L/D 2.43 (*H. tellinii*; Kovařík & Mazuch, 2011: 4, fig. 17), vs, 1.90 (*H. lipsae* **sp. n.**; fig. 73); pedipalp chela L/W 2.97 (*H. tellinii*; Fig. 111) vs. 2.53 (*H. lipsae* **sp. n.**; Fig. 100). On the external pedipalp patella, trichobothrium esb_1 is distal to esb_2 in *H. tellinii* (vs. proximal in *H. lipsae* **sp. n.**, *H. somalicus* and *H. novaki*).

Distribution. Djibouti (Fig. 113).

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