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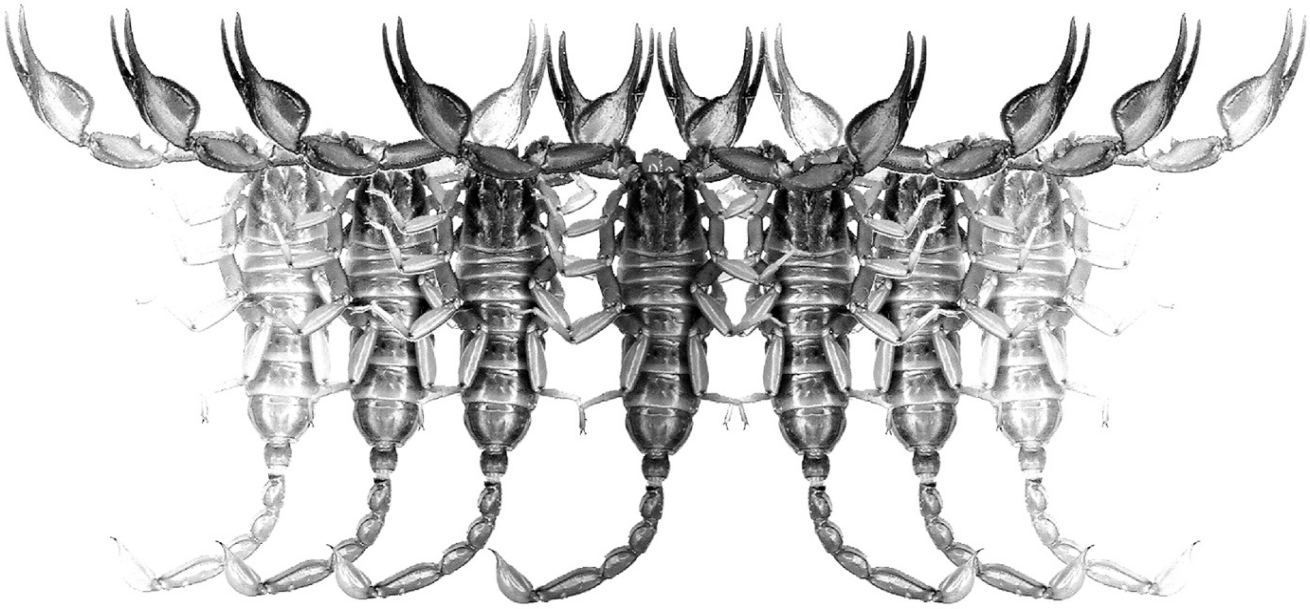

Taxonomic position of *Orthochirus olivaceus* (Karsch, 1881), the type species of the genus *Orthochirus* Karsch, 1892 (Scorpiones: Buthidae)

František Kovařík, Victor Fet & Manal Siyam

September 2020 — No. 319

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Publication date: 29 September 2020

http://zoobank.org/urn:lsid:zoobank.org:pub:8610A039-719F-4F4A-8E5E-5A3D202655EB

Euscorpius — Occasional Publications in Scorpiology. 2020, No. 319

Taxonomic position of *Orthochirus olivaceus* (Karsch, 1881), the type species of the genus *Orthochirus* Karsch, 1892 (Scorpiones: Buthidae)

František Kovařík[1], Victor Fet[2] & Manal Siyam[3]

[1]P. O. Box 27, CZ-145 01 Praha 45, Czech Republic; http://www.scorpio.cz
[2]Department of Biological Sciences, Marshall University, Huntington, West Virginia 25755-2510, USA; email: fet@marshall.edu
[3]University of Khartoum, Faculty of Science, Sudan Natural History Museum, Aljamaaavenue, P. O. Box 321, Khartoum, Sudan; email: manal.siyam@gmail.com

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Summary

We address the taxonomic position of *Orthodactylus olivaceus* Karsch, 1881, the type species of the genus *Orthochirus* Karsch, 1892. For over a century, this taxon was considered a synonym of *Orthochirus scrobiculosus* (Grube, 1873); however, the latter was recently limited to Central Asia (Turkmenistan) (Kovařík et al., 2020). Analysis of Karsch's holotype confirmed that *Orthochirus olivaceus* (Karsch, 1881), is a valid species. Its type locality published as "Sicily" is clearly incorrect. It is a senor synonym of *Butheolus aristidis* Simon, 1882, **syn**. **n**., described from Sudan (Nubia). We confirm its distribution in northern Sudan and southern Egypt.

Introduction

Small, dark buthid scorpions with a very characteristic, ventrally punctated metasoma have been collected and described from the different deserts of the Middle East, North Africa, and Central Asia since the early 1870s. These scorpions were usually assigned to the genera *Butheolus* Simon, 1882 or *Orthochirus* Karsch, 1892, but the identity and synonymy of many of these taxa still remain unclear. For over 100 years, several senior synonyms, especially *Orthochirus scrobiculosus* (Grube, 1873), were used as "umbrella" names for placement of many species. Only very recently, our detailed study of *O. scrobiculosus* allowed to limit this species to Central Asia (western Turkmenistan) (Kovařík et al., 2020). Currently, the genus *Orthochirus* includes 54 valid species found from North Africa to India. The taxonomic position of many taxa within this diverse genus, especially those from the Middle East and North Africa, requires further attention.

In this contribution, we address, for the first time, the identity of the type species of the genus *Orthochirus* Karsch, 1892. Described as *Orthodactylus olivaceus* Karsch, 1881, and based on a single female from an unclear locality ("Sicily", which is definitely incorrect), this taxon was never revised. Its holotype, which survived in Berlin through two world wars, never received any attention. Due to the kind help of Dr. Jason Dunlop (ZMHB), it became possible to loan this unique specimen and analyze it.

Methods, Material & Abbreviations

Nomenclature and measurements follow Stahnke (1971), Soleglad & Sissom (2001), Kovařík (2009), and Kovařík & Ojanguren Affilastro (2013), except for trichobothriotaxy (Vachon, 1974).

Specimen Depositories: 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); MNHN (Muséum national d'Histoire naturelle, Paris, France); ZMHB (Museum für Naturkunde der Humboldt-Universität, Berlin, Germany).

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

Specimen locality coordinates cited without square brackets were provided by the collectors, while coordinates in square brackets were estimated or inferred from online resources (e.g. Google Earth™).

Systematics

Family Buthidae C. L. Koch, 1837

Orthochirus Karsch, 1892

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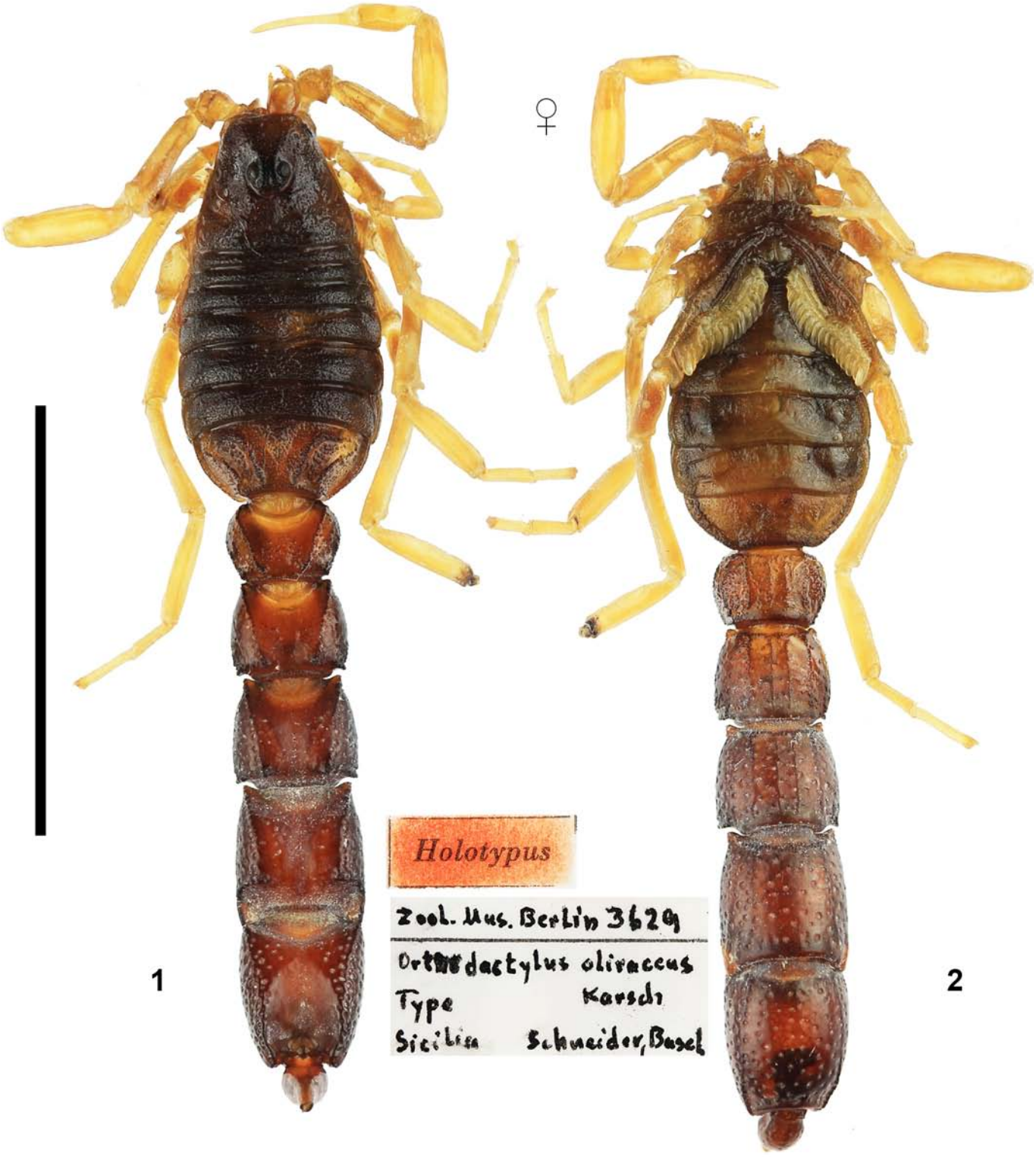


Figures 1–**2**. *Orthochirus olivaceus*, holotype female, dorsal (1) and ventral (2) views. Scale bar: 10 mm.

Dimensions (mm)		*O. olivaceus* ♀ holotype	*O. olivaceus* ♀ Wadi Halfa	*O. olivaceus* ♂ Wadi El-Ga'ab
Carapace	L / W	3.15 / 3.71	2.91 / 3.47	2.74 / 3.26
Mesosoma	L	5.83	5.34	6.72
Tergite VII	L / W	1.71 / 4.04	1.63 / 3.65	1.60 / 3.35
Metasoma + telson	L	16.32	17.00	14.29
Segment I	L / W / D	1.82 / 2.68 / 1.98	1.90 / 2.54 / 2.06	1.72 / 2.17 / 1.62
Segment II	L / W / D	2.13 / 2.72 / 2.06	2.10 / 2.56 / 2.22	1.89 / 2.08 / 1.59
Segment III	L / W / D	2.43 / 2.88 / 2.25	2.59 / 2.92 / 2.35	2.17 / 2.19 / 1.63
Segment IV	L / W / D	3.33 / 3.01 / 2.29	3.44 / 3.12 / 2.34	2.72 / 2.41 / 1.74
Segment V	L / W / D	3.61 / 2.85 / 2.06	3.70 / 3.09 / 2.20	3.04 / 2.35 / 1.70
Telson	L / W / D	ca 3.00 / 1.08 / 0.96	3.27 / 1.24 / 1.03	2.75 / 0.96 / 0.80
Pedipalp	L	9.66	9.93	8.30
Femur	L / W	2.64 / 0.67	2.60 / 0.67	2.12 / 0.64
Patella	L / W	3.05 / 0.86	3.08 / 0.86	2.64 / 0.83
Chela	L	3.97	4.25	3.54
Manus	W / D	0.66 / 0.70	0.69 / 0.73	0.60 / 0.65
Movable finger	L	-	2.96	2.42
Total	**L**	**25.30**	**25.25**	**23.75**

Table 1. Comparative measurements of *Orthochirus olivaceus* specimens. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

Orthochirus olivaceus (Karsch, 1881)

(Figures 1–41, Table 1)

http://zoobank.org/urn:lsid:zoobank.org:act:4A43E222-4EA9-4A41-81E0-9C87D4492BA0

Synonyms:

Butheolus aristidis Simon, 1882: 258–259, pl. VIII, fig. 23. **Syn. n.**

http://zoobank.org/urn:lsid:zoobank.org:act:D6F3AE77-5800-4B8A-B2B1-47FC1802C108

References:

Orthodactylus olivaceus Karsch, 1881: 90–91; Moritz & Fischer, 1980: 321; Francke, 2019: 22.

Orthodactylus schneideri: Karsch, 1886: 76.

Orthochirus aristidis: Birula, 1898: 282–283; Simon, 1910: 78, fig. 12; Birula, 1928: 83 (in part); Vachon, 1949: 139 (1952: 224); Vachon, 1959: 166; Lamoral & Reynders, 1975: 514 (in part); Levy & Amitai, 1980: 94; Fet & Lowe, 2000: 194 (complete reference list until 1998); Kovařík, 2004: 27; Kaltsas et al., 2008: 220; Lourenço & Leguin, 2011: 1–3 (in part), figs. 1–2; ?Badry et al., 2017: 6, fig. S3a (very probably misidentification); Dunlop et al., 2018: 451.

Butheolus aristidis: ?Kraepelin, 1903: 563.

Orthochirus olivaceus: Vachon, 1959: 166.

Orthochirus scrobiculosus: Fet & Lowe, 2000: 193 (in part).

Orthochirus sp.: Kovařík et al., 2020: 3.

Type locality and type depository. "Sicily" [incorrect type locality]; ZMHB.

Type material examined. "Sicily" [incorrect type locality; see below], ♀ holotype (Figs. 1–7), ZMHB No. 3629.

Other type material (not examined): Nubia (Egypt/Sudan border), near to the Nile, ♀ lectotype of *Butheolus aristidis* Simon, 1882, MNHN RS-1771 (designated by Lourenço & Leguin, 2011: 2, figs. 1–2), leg. Aristide Letourneux; paralectotypes: 1 adult ♀, 3 ♂, 2 juvenile ♀ MNHN RS-8832.

Other material examined. **Sudan**, Nubia, Wadi Halfa [21.79°N 31.32°E], 1983, 1♀ topotype of *Butheolus aristidis* Simon, 1882 (Figs. 8–12), FKCP; Northern State, Wadi El-Ga'ab, 219 m a. s. l., 19°27'47.5"N 30°15'23.3"E 15 September 2019, 1♂ (Figs. 13–40), leg. I. Alkhedir, ZMHB No. 49428.

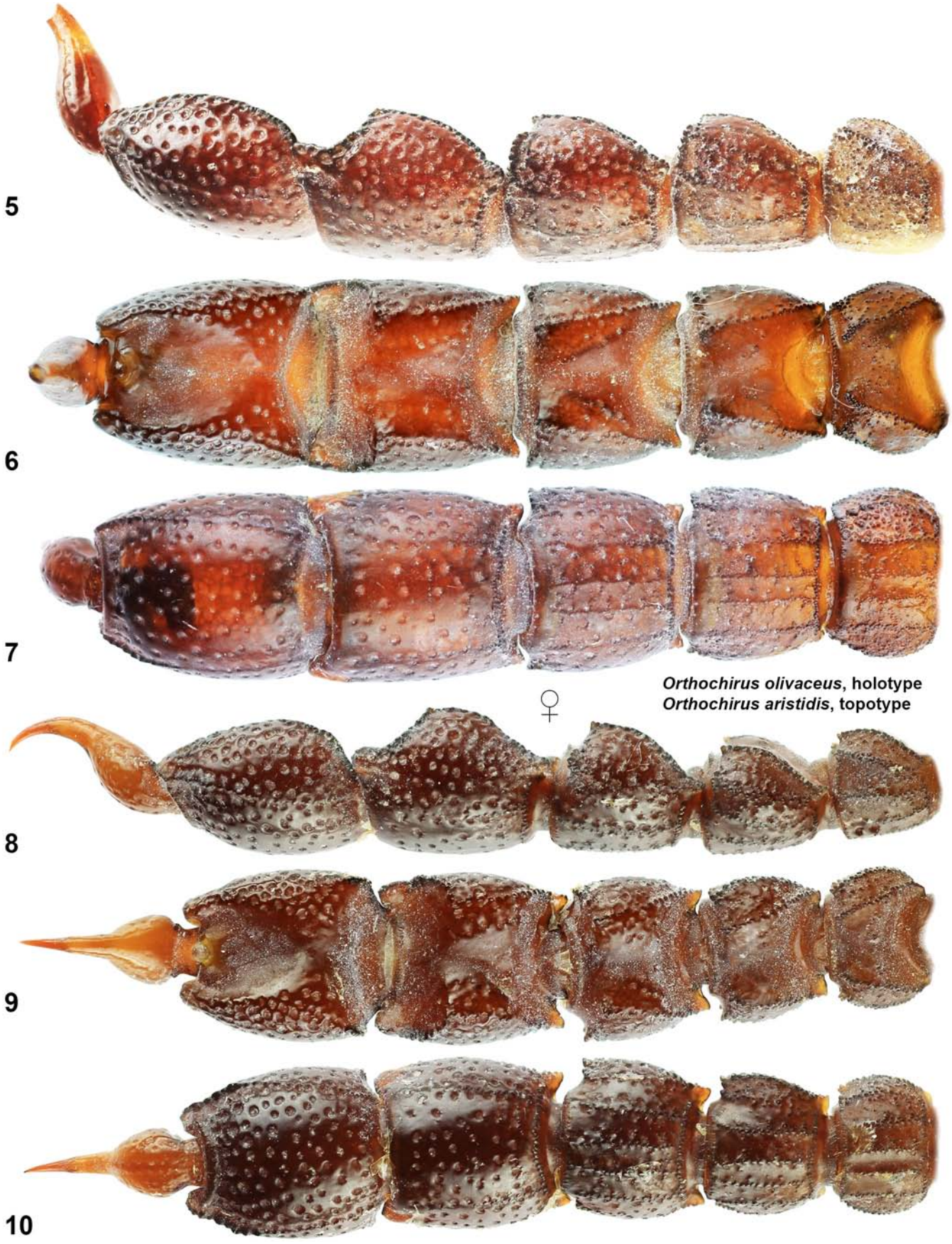
Diagnosis (♂♀). Total length of adults 23–30 mm. Carapace, tergites, and metasoma reddish brown to black. Pedipalp chela and legs yellow. Trichobothrium d_2 on dorsal surface of pedipalp femur present or reduced. Pectinal teeth number 15 in males and 15–20 in females. Movable finger of pedipalps with 9 rows of denticles, 6–7 inner denticles and 2–5 outer denticles. Dorsal carinae on pedipalp patella developed and smooth. Pedipalp femur dorsal smooth. Metasoma I with 10 carinae, metasoma II with 8–10 carinae, III with 6 carinae, metasoma IV–V with 2 dorsolateral carinae and 2 ventrolateral carinae. Ventral carinae of metasoma I–II consist of large granules in one or two rows. Metasoma III–V ventrally and laterally smooth with fine punctation developed, spaces among punctae smooth; metasoma I–

Figures 3–4. *Orthochirus olivaceus*, holotype female, carapace and tergites (3), and sternopectinal region and sternites (4).

II ventrally and laterally granulated, more in male, with punctation reduced. Metasoma V dorsal surface mesially smooth; metasoma I dorsally coarsely granulated. Tergites roughly, densely granulated. Sternite VII granulated, with four granulated carinae present. Pedipalp, metasoma and telson glabrous. Moderate to strong tibial spurs present on legs III and IV. Tarsomere I of legs I–III with 5–6 long setae in both sexes. Ratio length/width of metasoma V 1.19–1.29 in both sexes. Metasoma IV longer as wide as long in female, length/width ratio is 1.10.

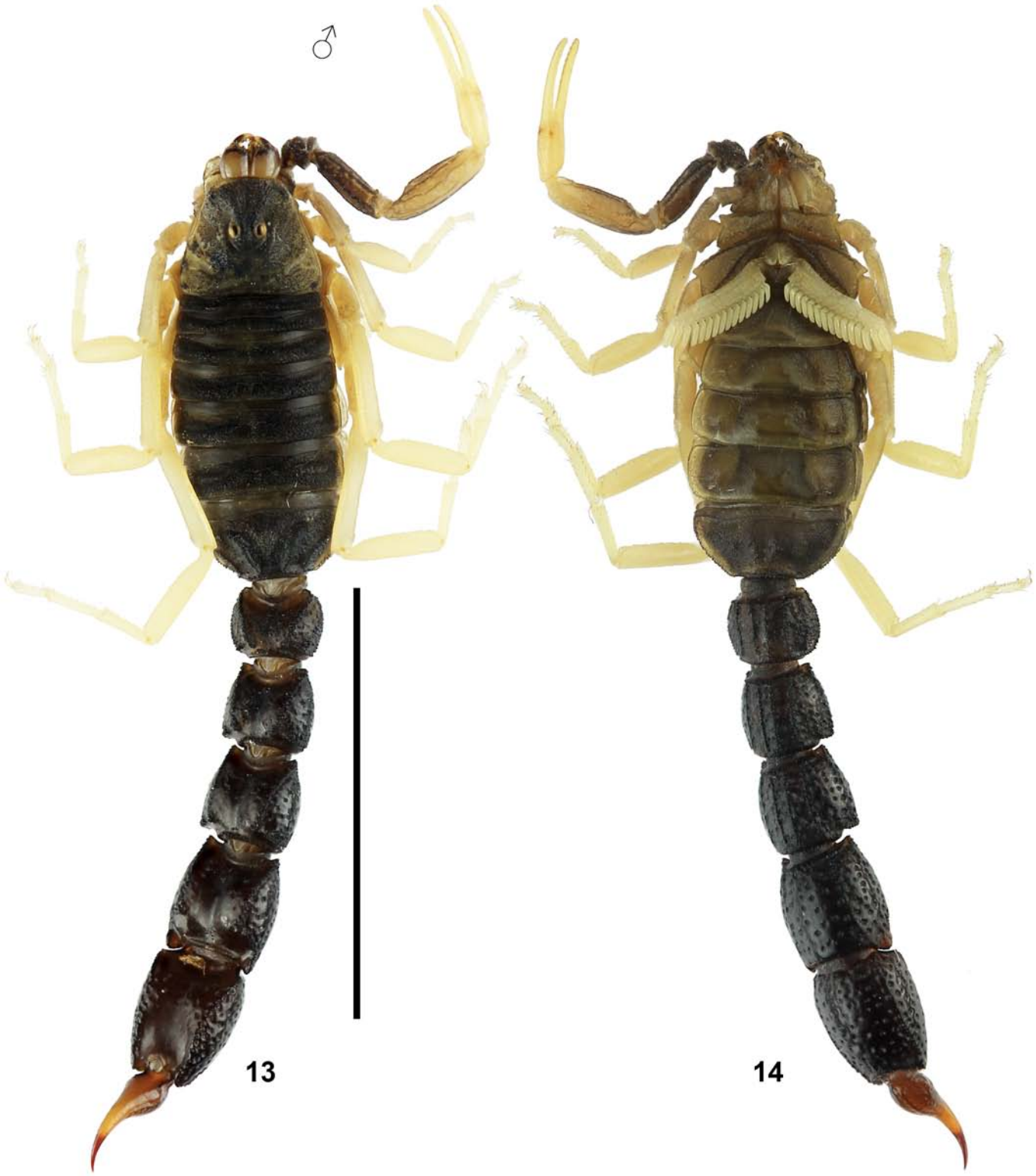
Comments. We compared the female holotype of *Orthodactylus olivaceus* Karsch, 1881 with a female lectotype of *Orthochirus scrobiculosus* (Grube, 1873) (Turkmenistan), a species, with which Karsch's taxon has been synonymized for over a century (see e.g. Fet & Lowe, 2000: 193). A detailed analysis shows that these two species have nothing in common; see Kovařík et al. (2020) for an exhaustive study of *O. scrobiculosus*.

At the same time, our further comparison of the female holotype of *Orthodactylus olivaceus* Karsch, 1881 to a female topotype of *Orthochirus aristidis* (Simon, 1882) from Sudan (Wadi Hafa on the lake Nubia, near the Egyptian border) demonstrated that these specimens match each other precisely in all characters currently used for species resolution inside the genus *Orthochirus* (see Kovařík et al., 2020). For



Figures 5–**10**: *Orthochirus olivaceus*, females, metasoma and telson, lateral (5, 8), dorsal (6, 9) and ventral (7, 10). **Figures 5**–**7**. *O. olivaceus*, holotype. **Figures 8**–**10**. *O. aristidis*, topotype.

Figures 11–**12**. *Orthochirus olivaceus*, female topotype of *O. aristidis*, dorsal (11) and ventral (12) views. Scale bar: 10 mm.



Figures 13–**14**. *Orthochirus olivaceus*, male from Sudan, dorsal (13) and ventral (14) views. Scale bar: 10 mm.

Figures 15–**16**. *Orthochirus olivaceus*, male from Sudan, carapace and tergites (15), and sternopectinal region and sternites (16) under white light.

a detailed recent diagnosis of *O. aristidis*, see Lourenço & Leguin (2011).

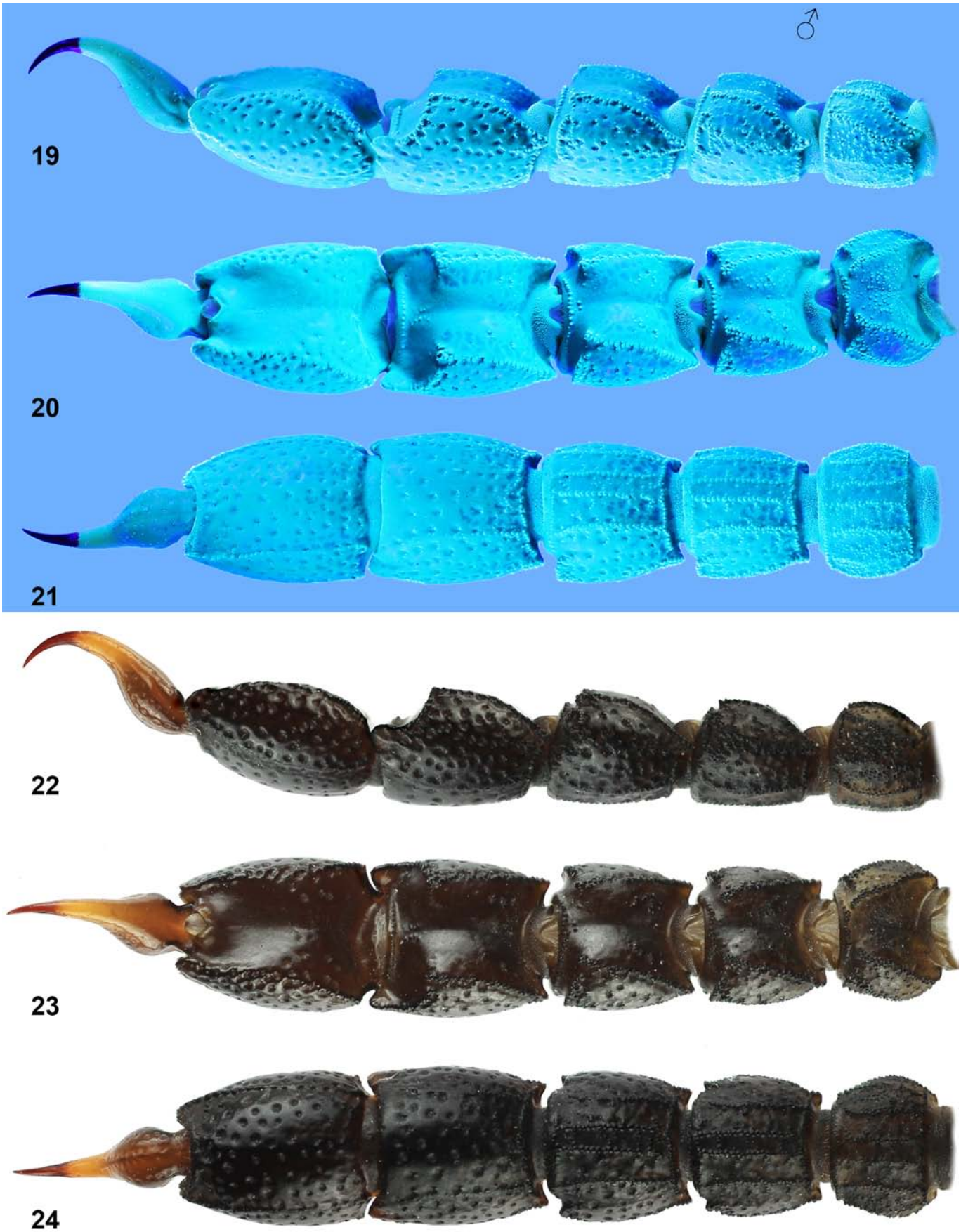
Our undeniable conclusion is that *Orthochirus aristidis* (Simon, 1882) is a junior synonym of the valid species *Orthochirus olivaceus* (Karsch, 1881).

History of Study. In 1881, Karsch described a new scorpion genus *Orthodactylus*, with the type species *Orthodactylus olivaceus* (by monotypy). It was soon discovered that the new generic name was a homonym of the reptilian genus *Orthodactylus* Hitchcock, 1858 (a fossil crocodile, now a

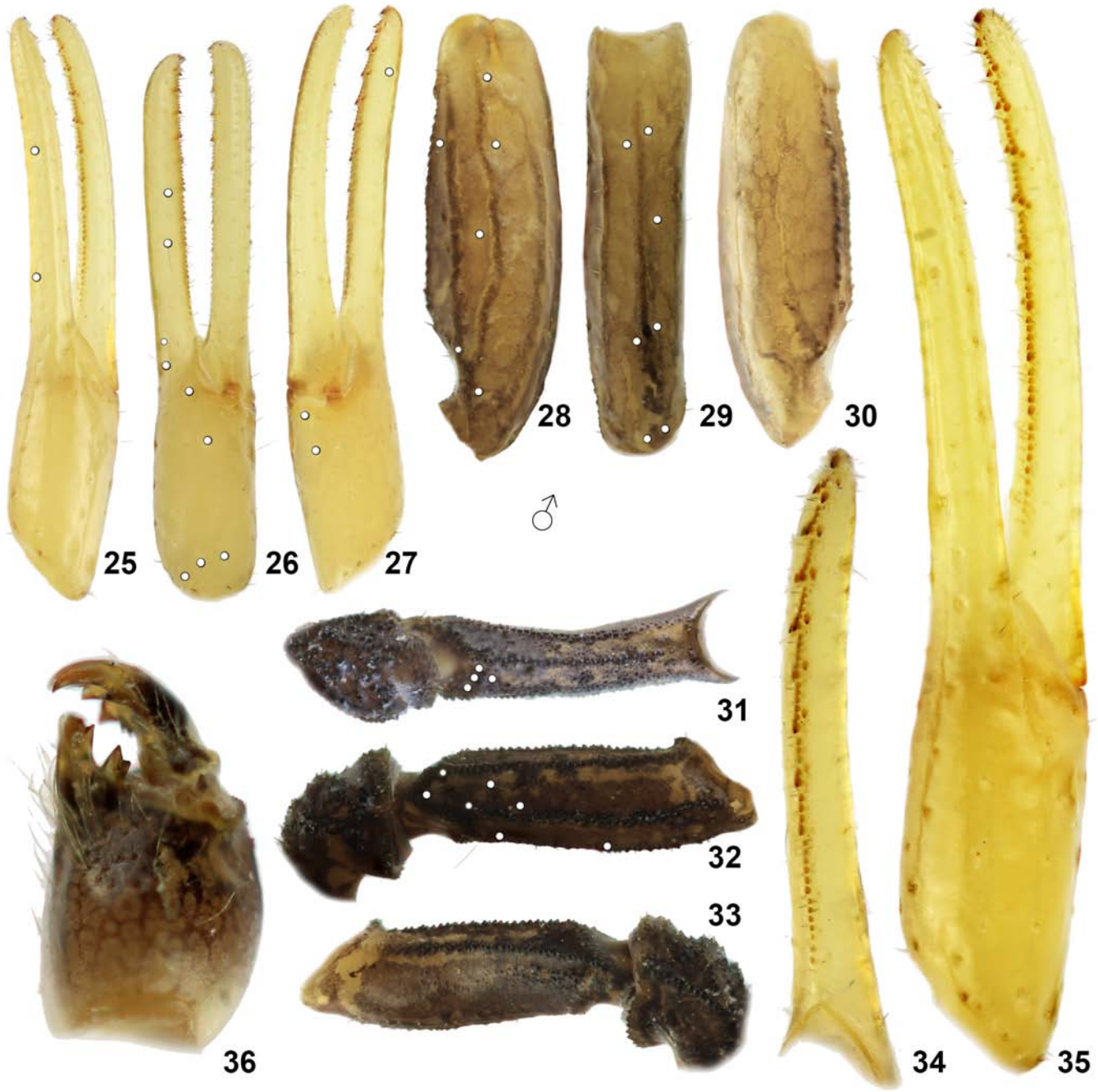
Figures 17–18. *Orthochirus olivaceus*, male from Sudan, carapace and tergites (17), and sternopectinal region and sternites (18) under UV light.

synonym of *Batrachopus* Hitchcock, 1845). To replace the junior homonym, Karsch himself published a new genus name, *Orthochirus* Karsch, 1892. While the genus *Orthochirus* became well-known and used over the next 100 years (e.g. Vachon, 1949; Levy & Amitai, 1980; Fet & Lowe, 2000), the identity of its type species, *Orthodactylus olivaceus* Karsch, 1881, was never investigated.

One reason for this neglect was that the type locality of *O. olivaceus* is unclear. The holotype label (Figs. 1–2) says "Sicilia". This is clearly an incorrect locality since there are no *Orthochirus* species found in Sicily—or anywhere in Europe. The type was obtained from Gustav Schneider (1834–1900), a famous taxidermist and merchant in Basel, Switzerland, and, based on our analysis, we suggest that it possibly originated



Figures 19–24. *Orthochirus olivaceus*, male from Sudan, metasoma and telson, lateral (19, 22), dorsal (20, 23) and ventral (21, 24), under UV white light (19–21) and white light (22–24).

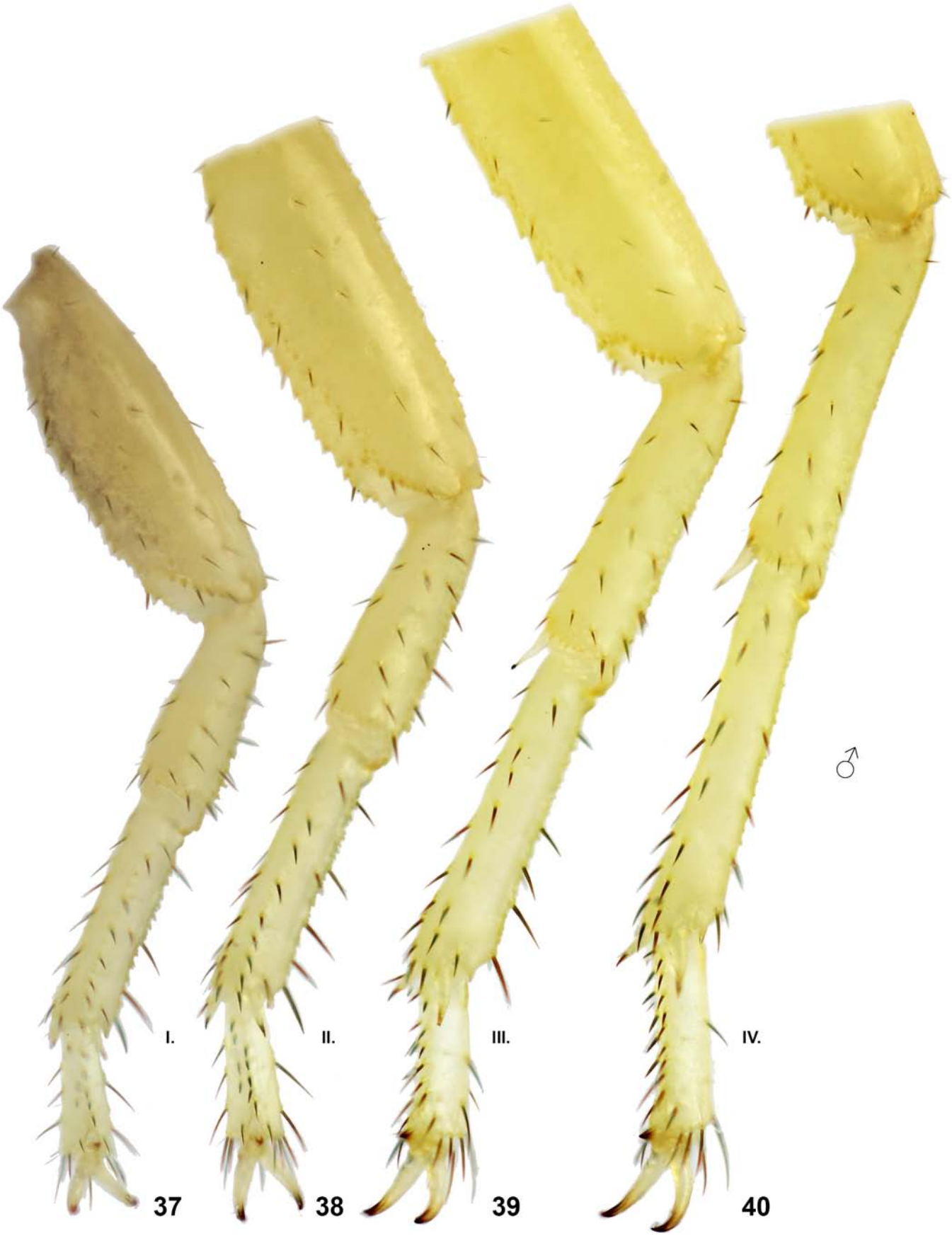


Figures 25–**36**: *Orthochirus olivaceus*, male from Sudan. **Figures 25**–**35**. Segments of pedipalps. Pedipalp chela, dorsal (25, 35), external (26), and ventral (27) views. Pedipalp patella, dorsal (28), external (29), and ventral (30) views. Pedipalp femur and trochanter, internal (31), dorsal (32), and ventral (33) views. Pedipalp chela, fixed finger dentate margins (34). The trichobothrial pattern is indicated in Figures 25–29, 31–32 (white circles). **Figure 36**. Right chelicera dorsal aspect.

from Egypt since there are other Egyptian buthids obtained from Schneider in ZMHB collection (J. Dunlop, pers. comm.).

Meanwhile, Karsch (1886: 75) himself synonymized this "sicilianischer Skorpion"—as well as *Butheolus aristidis* Simon, 1882, described from North Africa—with *Buthus schneideri* L. Koch, 1878 (as *Orthodactylus schneideri*), described from Central Asia. Thus, the name *Orthodactylus olivaceus* Karsch, 1881 has disappeared from usage for almost 140 years already five years after its description. It was usually only mentioned in literature (in synonymy under *Orthochirus scrobiculosus*) when the type species of the genus *Orthochirus* was listed (e.g. Fet & Lowe, 2000: 193; Francke, 2019: 22).

In its turn, *Buthus schneideri* L. Koch, 1878 was later synonymized with *Androctonus scrobiculosus* Grube, 1873 (a synonymy, which still stands; Kovařík et al., 2020). The latter name, which was eventually moved to *Orthochirus*, became an "umbrella" taxon, never seriously revised until the 21st century. As Kovařík (2004: 1) noted, "The genus *Orthochirus*



Figures 37–40. *Orthochirus olivaceus*, male from Sudan, left legs I–IV, retrolateral aspect.

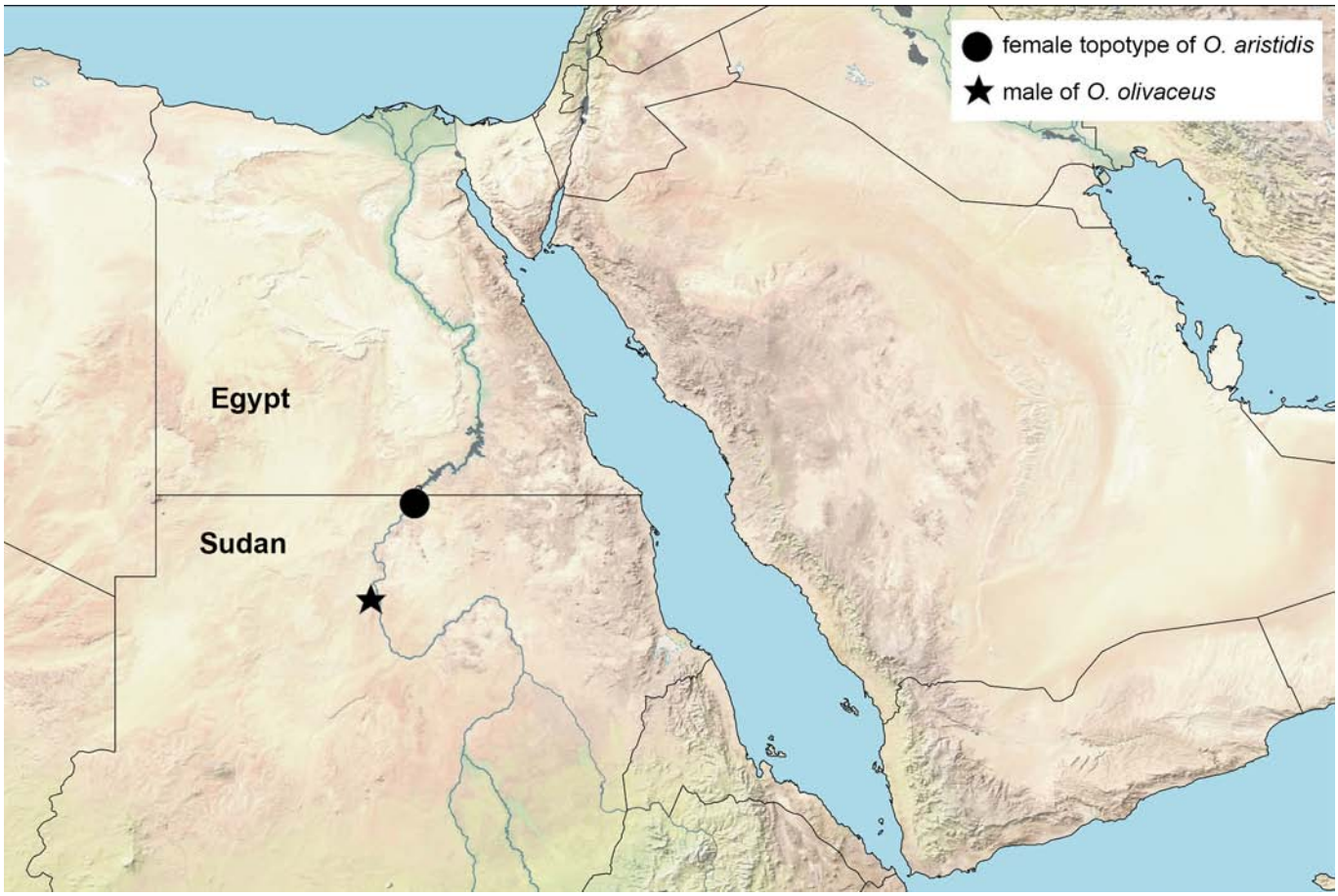


Figure 41. Confirmed distribution of *Orthochirus olivaceus*.

has not been revised for many years, although most authors (recently, Fet & Lowe, 2000: 193) consider it complex and in need of a revision. The situation has often been oversimplified by labeling African populations as *O. innesi* and those from Asia as *O. scrobiculosus.*"

Only recently (Kovařík et al., 2020), our detailed study based on the type specimen of *O. scrobiculosus*, allowed to limit this species to Central Asia (western Turkmenistan). Therefore, all taxa previously considered synonyms or subspecies of *O. scrobiculosus* are in need of re-evaluation. Some of those taxa were already revised and restored to species status, such as *O. melanurus* (Kessler, 1874) and *O. persa* (Birula, 1903) from Central Asia (Kovařík et al., 2020).

Although the type locality of *Orthodactylus olivaceus* remains undefined, the name itself is a perfectly available synonym. After our analysis of the holotype, we consider this name valid as *Orthochirus olivaceus* (Karsch, 1881), and a senior synonym of *Butheolus aristidis* Simon, 1882, **syn. n.**, which was described from Nubia on the Egypt/Sudan border. The latter species was addressed in several publications dealing with North African scorpion fauna, most recently by Lourenço & Leguin (2011). Following Vachon (1949, 1952), they clearly distinguished *O. aristidis* from another Egyptian species, *O. innesi* Simon, 1910 (described from Cairo). However, the detailed analysis of North African *Orthochirus* is still pending.

Distribution. Based on studied specimens, we can confirm distribution of *Orthochirus olivaceus* in northern Sudan and southern Egypt (Fig. 41). All other populations from Africa cited in literature under *O. aristidis* probably represent different species.

Acknowledgments

We are grateful to Jason Dunlop (ZMHB) for his great help with this paper. We also thank Eduard Stöckli and Ambros Hänggi (Naturhistorisches Museum Basel, Basel, Switzerland) for clarification of the identity of Gustav Schneider. We thank two anonymous reviewers for their comments.

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