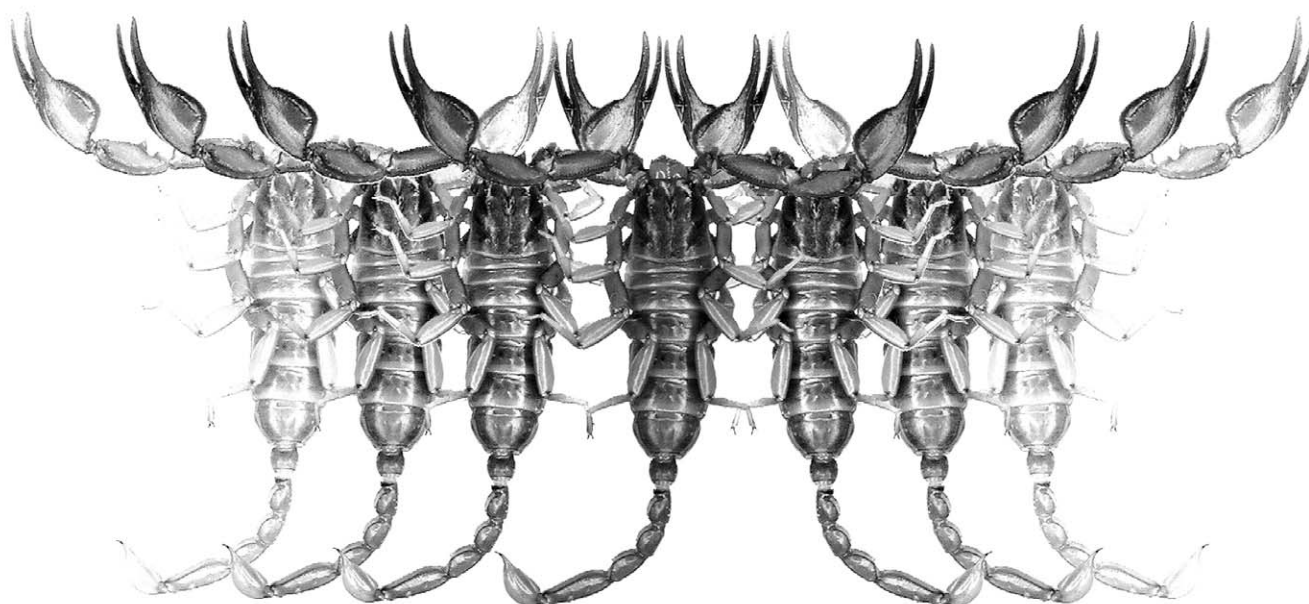


Euscorpius

Occasional Publications in Scorpiology



Review of the genus *Babycurus* Karsch, 1886 (Arachnida, Scorpiones, Buthidae), with descriptions of *Barbaracurus* gen. n. and two new species from Oman and Yemen

František Kovařík, Graeme Lowe & František Štáhlavský

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<http://zoobank.org/urn:lsid:zoobank.org:pub:6580A0C7-E18D-4B06-A158-522F089CEAF5>

Review of the genus *Babycurus* Karsch, 1886 (Arachnida, Scorpiones, Buthidae), with descriptions of *Barbaracurus* gen. n. and two new species from Oman and Yemen

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Summary

The genus *Babycurus* Karsch, 1886 sensu lato is split into two genera, a strictly African genus *Babycurus*, and the new genus *Barbaracurus* gen. n., which mainly includes species from the Horn of Africa and Arabian Peninsula. Two new species *Barbaracurus winklerorum* sp. n. from Oman and *B. yemenensis* sp. n. from Yemen are described, compared with other species, and fully illustrated with color photos of morphology, habitus, live specimens and collection localities. Males of *Barbaracurus somalicus* (Hirst, 1907) comb. n. and *Barbaracurus zambonellii* (Borelli, 1902) comb. n. are recorded for the first time and fully illustrated. *Babycurus ornatus* Werner, 1936 from Mozambique is shown to be a junior synonym of *Lychas burdoi* (Simon, 1882), a species from the same area. *Babycurus brignolii* Lourenço et Rossi, 2017 is designated to be a *nomen dubium*. Hemispermatothores are described and illustrated to show their differences between the species and genera. Analyses of karyotypes reveal a similar degree of interspecific variability of diploid chromosomal numbers within the genera *Babycurus* (2n=16–30) and *Barbaracurus* gen. n. (2n=22–36).

Introduction

In the years 2011–2017, one of the authors (F.K.) had the opportunity to participate in expeditions to the Horn of Africa, study scorpions at 113 localities, and publish several articles (e. g. Kovařík, 2011; Kovařík et al., 2015, 2018). Scorpions of the genus *Babycurus* Karsch, 1886 sensu lato are relatively rare in the Horn of Africa. Only six of 113 sampled localities yielded a total of four species including both sexes of the very rare species, *Barbaracurus somalicus* (Hirst, 1907) comb. n. (Somaliland) and *Barbaracurus zambonellii* (Borelli, 1902) comb. n. (Eritrea), that were previously known only from female types. Here we present photographs of the males for the first time, characterize their sexual dimorphism, and correct the erroneous assumption in the literature that the female holotype of *B. zambonellii* is a male. We also studied specimens collected by Alexander Winkler and his wife Birgit Winkler in Oman, and by Petr Kabátek and David Král in Yemen. The chance to study such a rich series of *Babycurus* (sensu lato) materials enabled us to gain a much better understanding of the genus, and motivated us to split it into two genera:

Babycurus which includes African species and *Barbaracurus* gen. n. which mainly includes species from the Horn of Africa and Arabian Peninsula. According to our diagnosis, we also transfer to this genus *Barbaracurus prudenti* (Lourenço, 2013) comb. n. from Cameroon and *B. ugartei* (Kovařík, 2000) comb. n. from Nigeria, species that we did not study in detail. Here we focus exclusively on species of *Barbaracurus* gen. n. from the Horn of Africa and Arabian Peninsula.

Methods, Material & Abbreviations

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), and hemispermatothore (Kovařík et al., 2018).

The numbers of rows of granules on the pedipalp chela movable finger was specified differently by various authors, depending on whether they included the short apical row, and whether the most proximal row was counted as one row, or as two rows divided by

external and internal accessory granules. In this paper, we counted all rows except the short apical row, and we counted as a single row (i.e. formed by ‘fusion’) the most proximal row which in the genus *Babycurus* sensu lato lacks an internal accessory granule (Figs. 1–23). Hence, the number of rows reported here can differ from counts given in previous papers (e. g. Kovařík, 2000, 2015; Lourenço, 2013; Prendini, 2004).

Karyotype analyses were based on chromosome preparations prepared by the spreading technique which is frequently used in scorpions (e. g. Kovařík et al., 2009; Plíšková et al., 2016). The chromosomes were stained by 5% Giemsa solution in Sörensen phosphate buffer for 20 min. Five spermatocyte nuclei were measured using the software Image J 1.45r (<http://rsbweb.nih.gov/ij>) with the plugin Levan (Sakamoto & Zacaro, 2009). The relative length of the chromosomes was calculated for the diploid set.

Specimens studied herein are preserved in 80% ethanol.

Depositories: BMNH (The Natural History Museum, London, United Kingdom); FKCP (František Kovařík, private collection, Prague, Czech Republic); GLPC (Graeme Lowe, private collection, Philadelphia, USA); MCSN (Museo Civico de Storia Naturale “Giacomo Doria”, Genoa, Italy); MZUT (Museo Regionale di Scienze Naturali of Turin, Italy); NHMB (Naturhistorisches Museum Basel, Switzerland); ZSMC (Bavarian State Collection of Zoology, Munich, Germany).

Systematics

Family Buthidae C. L. Koch, 1837

Babycurus Karsch, 1886

(Figures 11–23, 29–31, 37–39, 255–260, 265)

Babycurus Karsch, 1886: 77–79, figs. 1–2; Kraepelin, 1895: 88–89 (in part); Pocock, 1896: 427–431; Pocock, 1899: 835; Kraepelin, 1899: 61–64; Kraepelin, 1913: 179–183 (in part); Sissom, 1990: 101; Fet & Lowe, 2000: 76–80 (in part); Kovařík, 2000: 236–263, figs. 1–9, 11–12, 14–20, 23–25, 27–37, 39–40, tables 1–3 (in part); Prendini, 2004: 238–250, figs. 1–10; Kovařík, 2009: 30 (in part); Loria & Prendini, 2014: 19, 25; Loria & Prendini, 2018: 184.

Buthus (*Rhoptrurus*) (in part): Pocock, 1890: 122.

Rhoptrurus: Kraepelin, 1891: 238–241 (in part); Kraepelin, 1898: 3 (in part) (syn. by Kraepelin, 1899: 61).

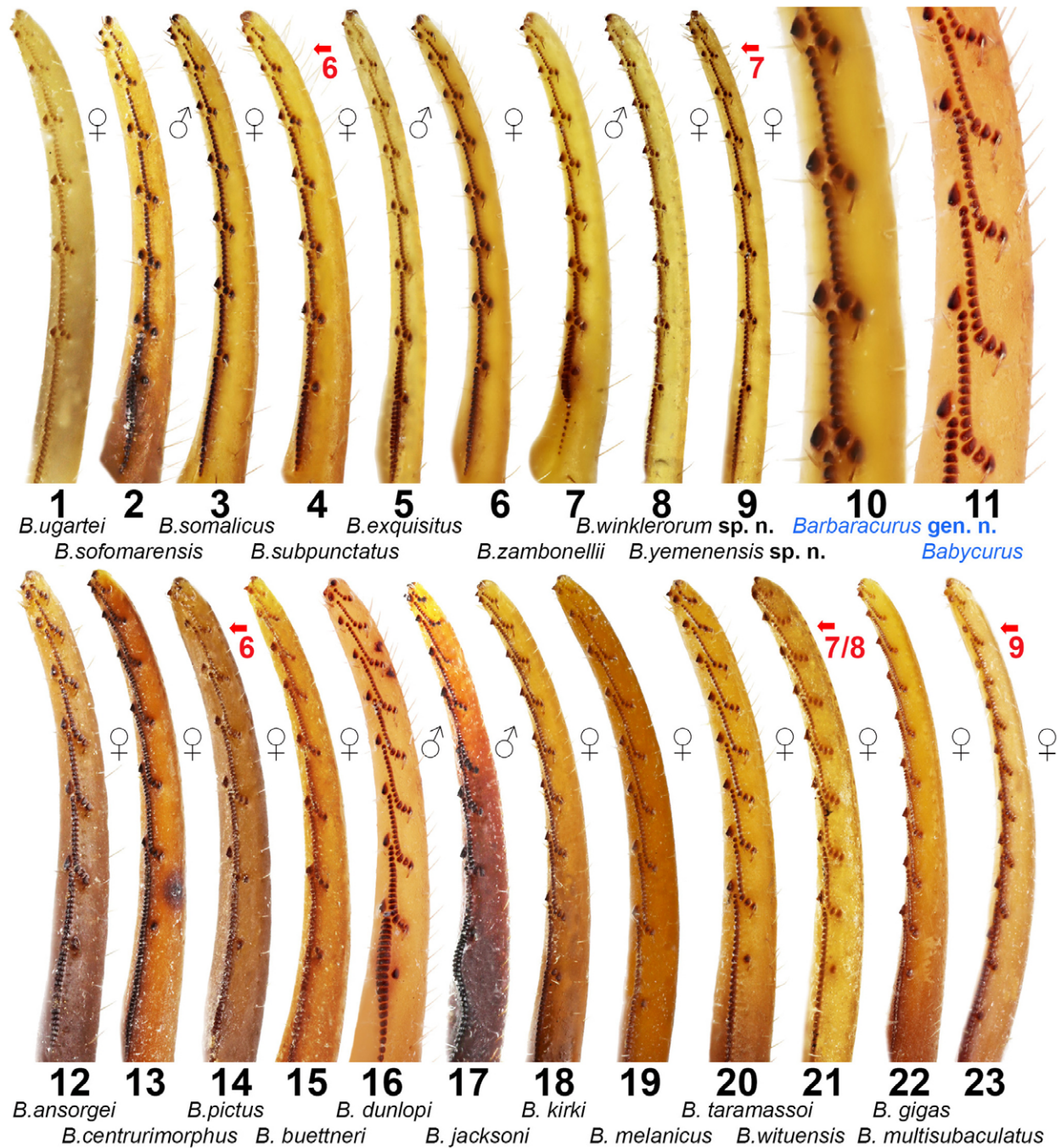
TYPE SPECIES. *Babycurus buettneri* Karsch, 1886.

DIAGNOSIS. Medium to large buthids, adults 30–100 mm. Carapace granular, lacking distinct carinae, flat, subrectangular with concave anterior margin. Median

eyes on low ocular tubercle in anterior half of carapace; usually with 4, or sometimes 5 pairs of lateral eyes (3 major ocelli, 1–2 minor ocelli). Anterior, central and posterior median furrows distinct, connected by median groove running over ocular tubercle. Sternum type 1, triangular in shape. Tergites I–VI granular, with single median carina which may be obsolete on I–II, tergite VII with 5 carinae. Metasoma elongate, segment I with 10 carinae, II–IV with 8 carinae, lacking lateral median carina. Metasoma V convex, sometimes dilated, carinae present or obsolete. Telson ellipsoidal or pyriform in shape, with distinct subaculear tooth. Pectines with fulcra. Hemispermatophore capsule with 2-lobed sperm hemiduct, basal lobe atrophied to a short, weak carina. Chelicerae with typical buthid dentition: movable finger dorsal margin with large subdistal and medial denticles and two smaller basal denticles, ventral margin with two large denticles, dorsal distal tine slightly shorter than ventral counterpart; fixed finger with subdistal denticle, and median and basal denticles formed as a bicuspid, ventral surface armed with two small denticles. Pedipalps orthobothriotaxic, type A β , femur trichobothrium d_2 internal, patella d_3 external to dorsomedian carina, chela db in distal half of fixed finger. Chela manus smooth, with carinae reduced or obsolete, dentate margins of chela movable finger armed with 6–9 imbricated rows of denticulate granules, successive rows overlapping by at least 2 granules, each row terminated proximally by an enlarged granule, in most cases flanked by two enlarged external accessory granules at oblique angle (single external accessory granule only in *B. gigas*), and single internal accessory granule displaced distally. Most proximal granule row with one or (rarely) two isolated external accessory granules midway along its length, no internal accessory granules. Pedipalp chelae sexually dimorphic, males with manus dilated and fingers proximally undulate on dentate margins, denticles of proximal granule rows bicuspid. Tibial spurs absent on leg III, present on leg IV, tibia and tarsus III–IV without bristle combs, ventral surfaces of tarsi equipped with two rows of setae, unguis stout.

SUBORDINATE TAXA. *Babycurus ansorgei* Hirst, 1911 (Angola, Congo), *B. buettneri* Karsch, 1886 (West Africa), *B. centrurimorphus* Karsch, 1886 (Congo, Tanzania, ?Mozambique, Rwanda), *B. dunlopi* Kovařík et al., 2015 (Ethiopia), *B. gigas* Kraepelin, 1896 (Tanzania), *B. jacksoni* (Pocock, 1890) (Kenya, Tanzania), *B. kirki* (Pocock, 1890) (West Africa), *B. melanicus* Kovařík, 2000 (Congo), *B. multi-subaculeatus* Kovařík, 2000 (Somalia), *B. pictus* Pocock, 1896 (Kenya, Tanzania), *B. solegladi* Lourenço, 2005 (Sudan), *B. taramassoi* Borelli, 1919 (Somalia), and *B. wituensis* Kraepelin, 1913 (Kenya).

CYTOGENETICS. The karyotype analyses of three species *Babycurus jacksoni* (2n=16) (Figs. 255, 256), *B. buett-*



Figures 1–23: Pedipalp movable finger, comparison of *Barbaracurus* gen. n. (1–10) and *Babycurus* (11–23) species. **Figures 1–4:** *Barbaracurus* gen. n., species with 6 non-imbricated almost linear rows of granules. **Figure 1.** *B. ugartei* comb. n., female holotype. **Figure 2.** *B. sofomarensis* comb. n., male paratype. **Figure 3.** *B. somalicus* comb. n., female from Somaliland, locality 17SR. **Figure 4.** *B. subpunctatus* comb. n., female from Ethiopia, locality 14EI. **Figures 5–10:** *Barbaracurus* gen. n., species with 7 non-imbricated almost linear rows of granules. **Figure 5.** *B. exquisitus* comb. n., male holotype. **Figures 6–7, 10.** *B. zambonellii* comb. n., female (6 and 10) and male (7) from Eritrea, locality 15EH. **Figure 8.** *B. winklerorum* sp. n., female paratype. **Figure 9.** *B. yemenensis* sp. n., female holotype. **Figures 12–14:** *Babycurus*, species with 6 imbricated rows of movable fingers. **Figure 12.** *B. ansorgei*, female, Congo, Bukama env., FKCP. **Figure 13.** *B. centrurimorphus*, female lectotype. **Figure 14.** *B. pictus*, female, Congo, Sampwe env., FKCP. **Figures 11, 15–21:** *Babycurus*, species with 7–8 imbricated rows of movable fingers. **Figure 11, 16.** *B. dunlopi*, male paratype. **Figure 17.** *B. jacksoni*, male, Tanzania, FKCP, No. 1189. **Figure 18.** *B. kirki*, female, Cote d'Ivoire, Comoe, FKCP. **Figure 19.** *Babycurus melanicus*, female holotype. **Figure 20.** *B. taramassoi*, female, Somalia, Belet Amin, MCSN. **Figure 21.** *Babycurus wituensis*, female lectotype. **Figures 22–23:** *Babycurus*, species with 9 imbricated rows of movable fingers. **Figure 22.** *B. gigas*, female lectotype. **Figure 23.** *B. multisubaculeatus*, female holotype. Numbers in red indicate number of granule rows in series of fingers on the left of each number (red arrows).

neri (2n=28) (Figs. 257, 258) and *B. gigas* (2n=30) (Figs. 259, 260) show considerable interspecific variability of the chromosome diploid numbers within this genus. The chromosomes have holocentric organization which is typical feature of the family Buthidae (Schneider et al., 2009a). Males display achiasmatic meiosis, which is characteristic to the whole order Scorpiones (Schneider et al., 2009b).

Taxonomic position of *Babycurus ornatus* Werner, 1936

Babycurus ornatus was described by Werner in 1936 from Mozambique and has been accepted as valid by other authors (Vachon, 1940: 179; Weidner, 1959: 98; Lamoral & Reynders, 1975: 498; Kovařík, 1998: 104; Fet & Lowe, 2000: 79; Kovařík, 2000: 252). The first author (F.K.) recently studied the types (Figs. 40–49) and found that legs III and IV both bear tibial spurs (Figs. 46–47). This character is diagnostic for the genus *Lychas* C. L. Koch, 1845, whereas in genera *Babycurus* and *Barbaracurus* **gen. n.**, leg III lacks tibial spurs (only present on leg IV) (e.g. Figs. 99–106). Moreover, it was found that the types of *Babycurus ornatus* and *Lychas burdoi* are precisely matched in the following key characters: trichobothrial pattern, pedipalp finger dentation (Figs. 44–45), pectinal tooth count and pectine lamellar structure, body and appendage proportions, setation, carination and sculpture of pedipalps, carapace, tergites, sternites, form of metasoma and telson (Figs. 40–49), as well as armature of chelicerae and pedipalp fingers. The inevitable conclusion is that *Babycurus ornatus* Werner, 1936 is a junior synonym of *Lychas burdoi* (Simon, 1882) **syn. n.**

Taxonomic position of *Babycurus brignolii* Lourenço et Rossi, 2017

Babycurus brignolii was based on a juvenile, which Lourenço & Rossi (2017) in the original description, incorrectly declared as a male. It is evident from the sternopectinal area and pectines that it is juvenile female, and it displays typical juvenile morphology and color, as shown in fig. 9 of Lourenço & Rossi (2017: 6). In addition to the above observations, we note that the juvenile holotype of *B. brignolii* and juveniles of *B. gigas* Kraepelin, 1896, that we have studied, match closely in the following key described characters: trichobothrial pattern, pectinal tooth count and lamellar structure, proportions, setation, carination and sculpture of pedipalps, carapace, tergites, sternites, and metasoma, shape of the telson, as well as armature of pedipalp fingers. However, the conclusion that *B. brignolii* is a junior synonym of *B. gigas* is complicated by the listed type locality of *B. brignolii* (Central African Republic, Bamingui-Bangoran Province) which lies outside the

known range of distribution of *B. gigas* (Tanzania). We therefore regard *Babycurus brignolii* Lourenço et Rossi, 2017 as a *nomen dubium* until either the true distribution of both species is revised, or an adult topotype specimen of *B. brignolii* is described.

Barbaracurus **gen. n.**

(Figures 1–10, 24–28, 32–36, 50–254, 261–265,
Tables 1–2)

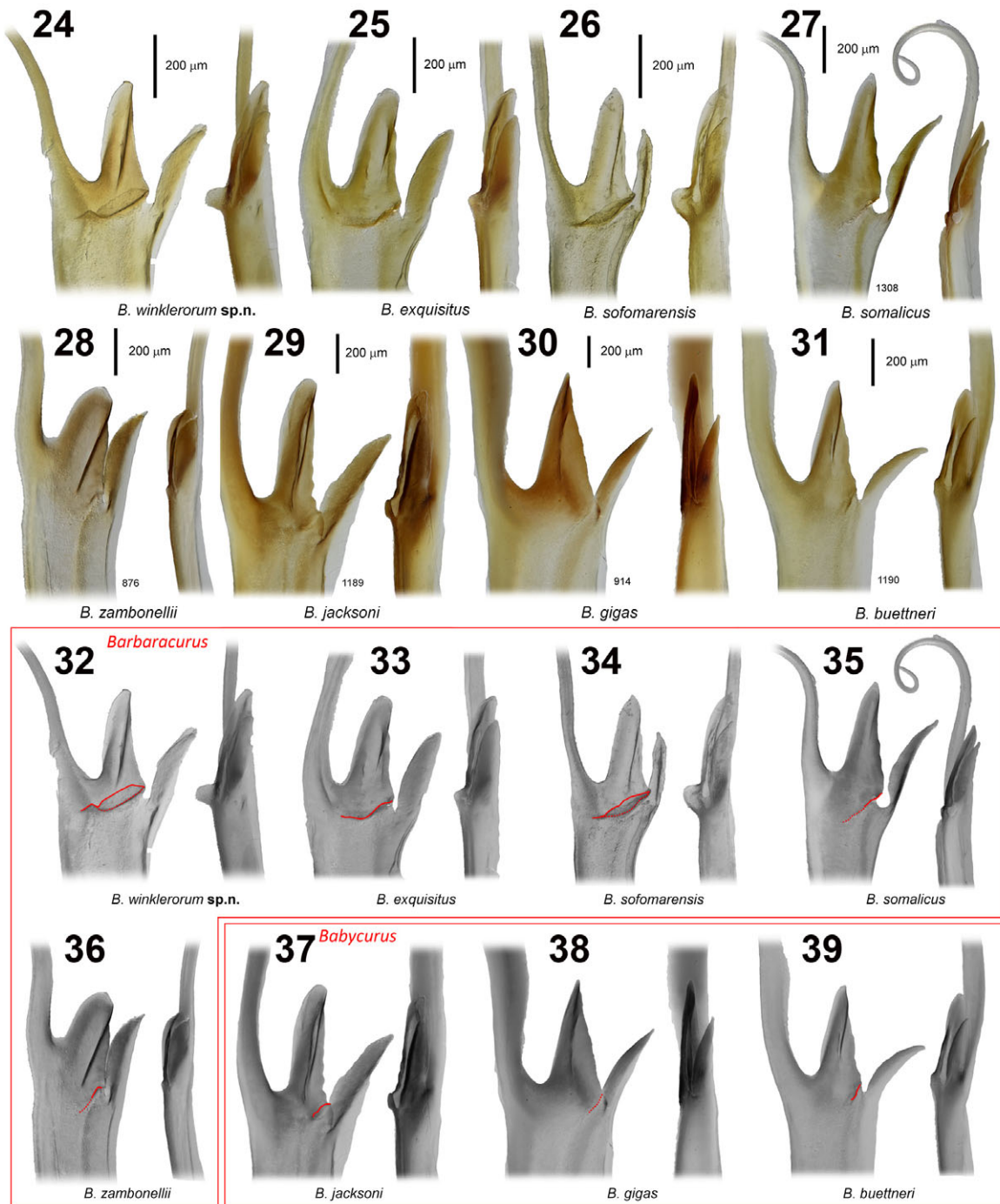
<http://zoobank.org/urn:lsid:zoobank.org:act:75EF2A5A-6CF8-4F3B-94AB-3374C2902E6C>

Babycurus: Kraepelin, 1913: 179–183 (in part); Fet & Lowe, 2000: 76–80 (in part); Kovařík, 2000: 244–245, 255–256, 260–262, figs. 10, 13, 21–22, 26, 38–40, tables 1–3 (in part); Kovařík, 2009: 30 (in part).

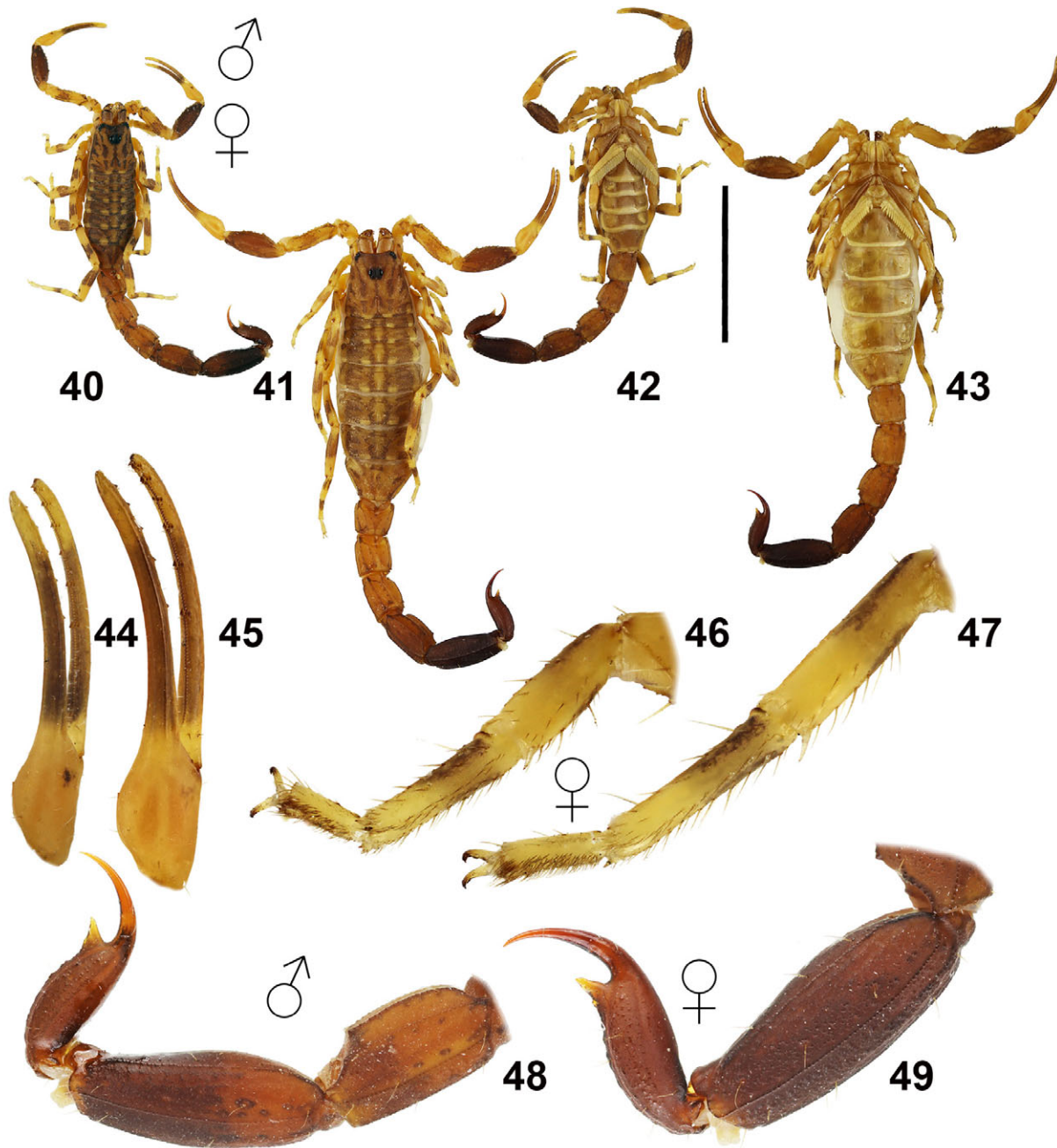
TYPE SPECIES. *Babycurus sofomarensis* Kovařík, Lowe, Seiter, Plíšková et Štáhlavský, 2015.

ETYMOLOGY. The genus-group name is a patronym honoring Dr. Barbara York Main for her lifelong contributions to arachnology, especially the systematics and natural history of Australian mygalomorph spiders, and also to many other topics in ecology, biogeography, evolution and conservation.

DIAGNOSIS. Small to medium buthids, adults 22–47 mm. Carapace granular, lacking distinct carinae, flat, subrectangular with concave anterior margin. Median eyes on low ocular tubercle in anterior half of carapace; usually with 4, or sometimes 5 pairs of lateral eyes (3 major ocelli, 1–2 minor ocelli). Anterior, central and posterior median furrows distinct, connected by median groove running over ocular tubercle. Sternum type 1, triangular in shape. Tergites I–VI granular, with single median carina which may be obsolete on I–II, tergite VII with 5 carinae. Metasoma elongate, segment I with 10 carinae, II–IV with 8 carinae, lacking lateral median carina. Metasoma V convex, sometimes dilated, carinae present or obsolete. Telson ellipsoidal, pyriform or slightly bulbous, with distinct subaculear tooth. Pectines with fulcra. Hemispermatophore capsule with 2-lobed sperm hemiduct and a long, carinate or scoop-like basal lobe. Chelicerae with typical buthid dentition: movable finger dorsal margin with large subdistal and medial denticles and two smaller basal denticles, ventral margin with two large denticles, dorsal distal tine slightly shorter than ventral counterpart; fixed finger with subdistal denticle, and median and basal denticles formed as a bicuspid, ventral surface armed with two small denticles (Figs. 252–254). Pedipalps orthobothriotaxic, type Aβ, femur trichobothrium d_2 internal, patella d_3 external to dorsomedian carina, chela db in distal half of fixed finger. Chela manus smooth, with carinae reduced or obsolete, dentate margins of chela



Figures 24–39: Hemispermaphore capsules of *Barbaracurus* gen. n. and *Babycurus* species, convex and anterior views. In each figure, left image is convex view with capsule compressed to show shape of lobes, right image anterior view to show profile of basal lobe. **Figures 24–31:** Color images. **Figures 24–28:** *Barbaracurus* gen. n. **Figure 24.** *B. winklerorum* sp. n., holotype. **Figure 25.** *B. exquisitus* comb. n., Oman, Jabal Akhdar hotel, 23°04'N 57°38'E. **Figure 26.** *B. sofomarensis* comb. n., paratype from the type locality. **Figure 27.** *B. somalicus* comb. n., Somaliland, Borama, locality 17SR. **Figure 28.** *B. zambonellii* comb. n., Eritrea, Filfil, locality 15EH. **Figures 29–31:** *Babycurus*. **Figure 29:** *B. jacksoni*, Tanzania. **Figure 30:** *B. gigas*, Tanzania, Usambara Mts. **Figure 31:** *B. buettneri*, Cameroon, Mamba vill., 04°07.311'N 10°11.615'E. Scale bars: 200 µm. Small numbered labels indicate specimen numbers (see lists of Material Examined). **Figures 32–39:** Gray scale images with basal lobes outlined in red. **Figures 32–36:** *Barbaracurus* gen. n.: *B. winklerorum* sp. n. (32), *B. exquisitus* comb. n. (33), *B. sofomarensis* comb. n. (34), *B. somalicus* comb. n. (35) and *B. zambonellii* comb. n. (36). **Figures 37–39:** *Babycurus*: *B. jacksoni* (37), *B. gigas* (38) and *B. buettneri* (39). Solid red curves indicate either the distal margin of a scoop-like basal lobe (32, 34) or a well developed carina (35–37, 39). Dashed red curves indicate either the line of attachment of a scoop-like basal lobe (32, 34) or a weakly developed carina (35–36, 38).



Figures 40–49: *Lychas burdoi* (Simon, 1882) **Figures 40, 42, 44, 48.** Male paralectotype of *Babycurus ornatus* Werner, 1936, dorsal (40) and ventral (42) views, pedipalp chela dorsal (44), metasoma IV–V and telson lateral (48). **Figures 41, 43, 45–47, 49.** Female lectotype of *Babycurus ornatus* Werner, 1936, dorsal (41) and ventral (43) views, pedipalp chela dorsal (45), Distal segments of right legs III (46) and IV (47) retrolateral views, and metasoma IV and telson lateral (49). Scale bar: 10 mm (40–43).

movable finger armed with 6–7 non-imbricated, almost linear or contiguous rows of denticulate granules, each row terminated proximally by an enlarged granule flanked by adjacent single internal and external accessory granules. Most proximal granule row without internal accessory denticle, and either with (species from Horn of Africa and Arabian Peninsula) or without (spe-

cies from Cameroon and Nigeria) a single isolated external accessory granule midway along its length. Pedipalp chelae sexually dimorphic, males typically with manus dilated and fingers proximally undulate on dentate margins, denticles of proximal granule rows bicuspid. Tibial spurs absent on leg III, present on leg IV, tibia and tarsus III–IV without bristle combs, ventral



Figures 50–69: Pedipalp chela dorsal and external views, comparison of *Barbaracurus* gen. n. species. **Figures 50–53:** *B. sofomarensis* comb. n., male (50–51) and female (52–53) paratypes. **Figures 54–57:** *B. somalicus* comb. n., male (54–55) and female (56–57) from Somaliland, locality 17SR. **Figures 58–61:** *B. zambonellii* comb. n., male (58–59) and female (60–61) from Eritrea, locality 15EH. **Figures 62–65:** *B. exquisitus* comb. n., male holotype (62–63) and female (64–65) paratype. **Figures 66–69:** *B. winklerorum* sp. n., male holotype (66–67) and female (68–69) paratype.

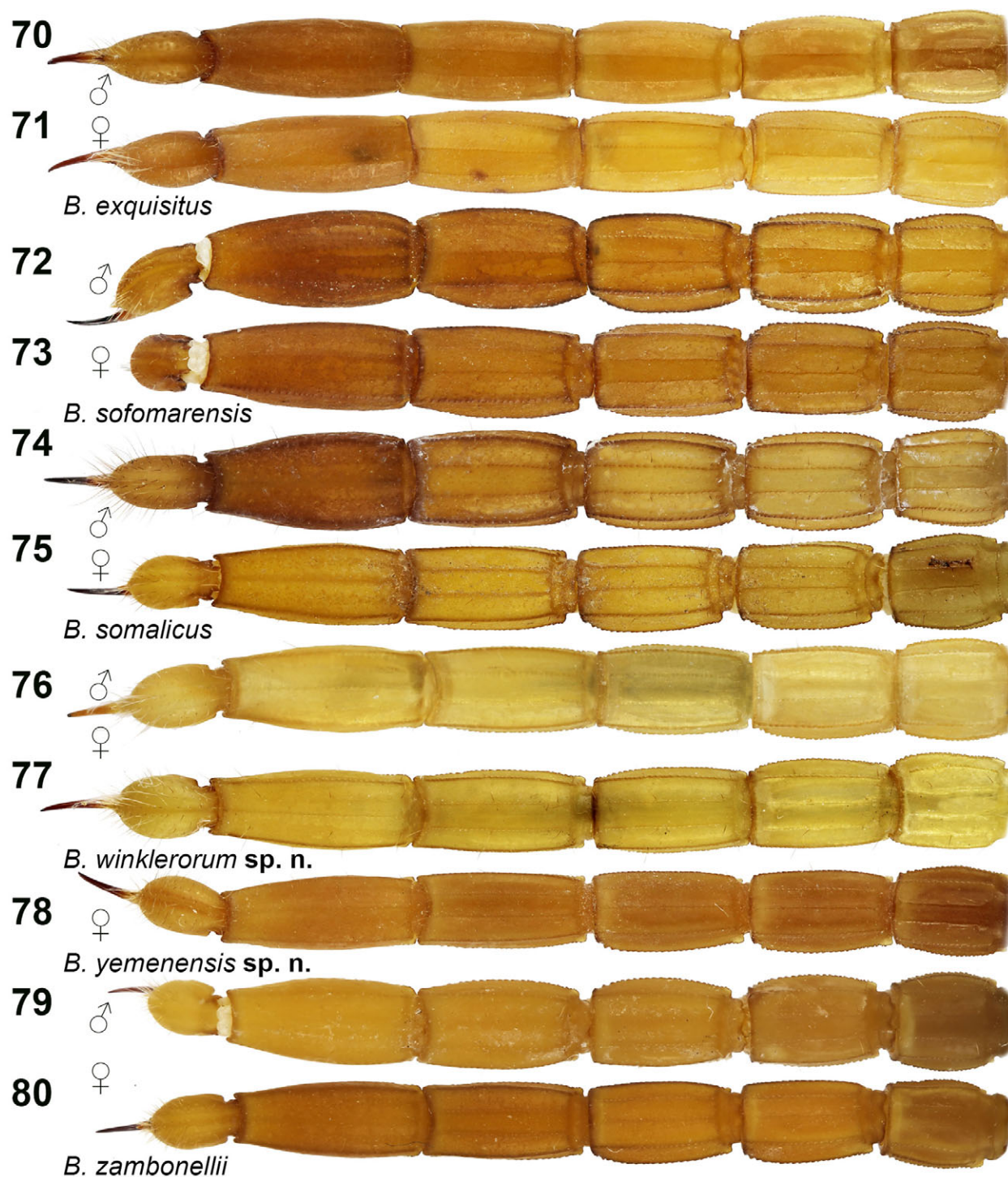
surfaces of tarsi equipped with two rows of setae, unguis stout.

SUBORDINATE TAXA. *B. exquisitus* (Lowe, 2000) comb. n. (Oman), *B. prudenti* (Lourenço, 2013) comb. n. (Cameroon), *B. sofomarensis* (Kovařík et al., 2015) comb. n. (Ethiopia), *B. somalicus* (Hirst, 1907) comb. n. (Somaliland), *B. subpunctatus* (Borelli, 1925) comb. n. (Ethiopia, Somalia), *B. ugartei* (Kovařík, 2000) comb. n. (Nigeria), *B. winklerorum* sp. n. (Oman), *B. yemenensis* sp. n. (Yemen), *B. zambonellii* (Borelli, 1902) comb. n. (Eritrea).

CYTOGENETICS. The karyotype analyses of three species *Barbaracurus sofomarensis* comb. n. ($2n=22$) (Kovařík et al., 2015), *B. zambonellii* comb. n. ($2n=26$) (Figs. 261, 262) and *B. somalicus* comb. n. ($2n=36$) (Figs. 263,

264) show considerable interspecific variability of the diploid chromosomal numbers within this genus. The chromosomes have holocentric organization which is the typical feature of the family Buthidae (Schneider et al., 2009a). Males display achiasmatic meiosis that is characteristic to the whole order Scorpiones (Schneider et al., 2009b).

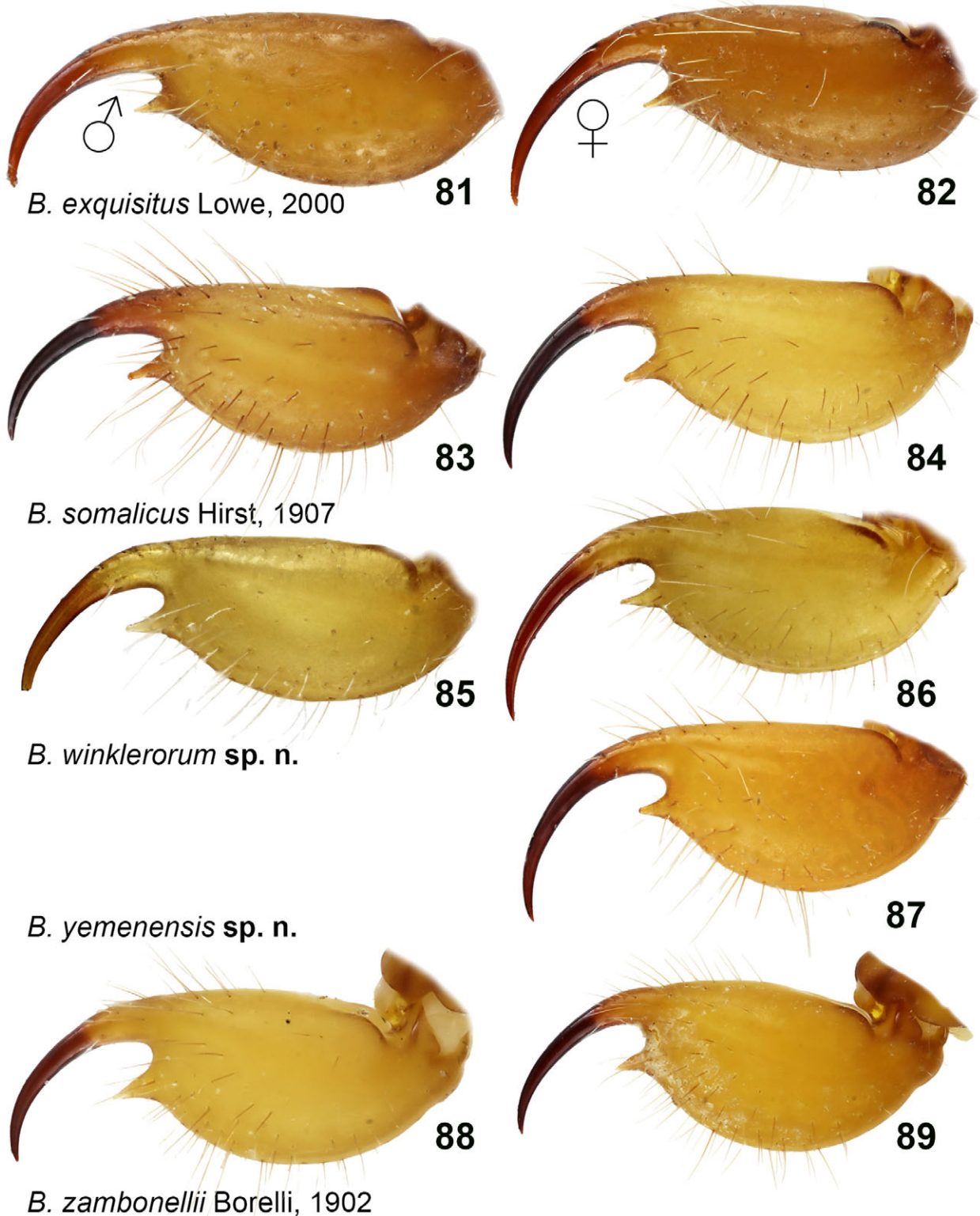
AFFINITIES. Seven of the species in this genus were previously included in *Babycurus* sensu lato. Here we transfer them to a new genus and describe two additional species in that genus. *Barbaracurus* gen. n. is a rather morphologically uniform assemblage of species that is distributed mainly in the Horn of Africa and the Arabian Peninsula (Fig. 265). It is differentiated from *Babycurus* primarily by its pedipalp finger dentition. In *Barbaracurus* gen. n., the pedipalp chela movable finger is



Figures 70–80: Metasoma and telson ventral views, comparison of *Barbaracurus* gen. n. species. **Figures 70–71:** *B. exquisitus* comb. n., male holotype (70) and female (71) paratype. **Figures 72–73:** *B. sofomarensis* comb. n., male (72) and female (73) paratypes. **Figures 74–75:** *B. somalicus* comb. n., male (74) and female (75) from Somaliland, locality 17SR. **Figures 76–77:** *B. winklerorum* sp. n., male holotype (76) and female (77) paratype. **Figures 78:** *B. yemenensis* sp. n., female holotype. **Figures 79–80:** *B. zambonellii* comb. n., male (79) and female (80) from Eritrea, locality 15EH.

armed with a nearly linear series of 6–7 non-imbricated rows of granules. Each row is terminated proximally by two contiguous enlarged granules, i.e., 1 enlarged pri-

mary + 1 external accessory granule, and distally by a single non-contiguous enlarged granule (internal accessory granule) (Fig. 10). The most proximal granule row



Figures 81–89: Telson, lateral views of both sexes, comparison of *Barbaracurus* gen. n. species. **Figures 81–82:** *B. exquisitus* comb. n., male holotype (81) and female (82) paratype. **Figures 83–84:** *B. somalicus* comb. n., male (83) and female (84) from Somaliland, locality 17SR. **Figures 85–86:** *B. winklerorum* sp. n., male holotype (85) and female (86) paratype. **Figures 87:** *B. yemenensis* sp. n., female holotype. **Figures 88–89:** *B. zambonellii* comb. n., male (88) and female (89) from Eritrea, locality 15EH.

is not terminated proximally by enlarged granules. However, a single enlarged external accessory granule is present midway along that row in species from Horn of Africa and Arabia (Figs. 2–9), and is absent in West African species, *Barbaracurus prudenti* (Lourenço, 2013) **comb. n.** from Cameroon and *B. ugartei* (Kovářík, 2000) **comb. n.** from Nigeria (e.g., Fig. 1). The proximal row is longer than other granule rows and may have a small gap adjacent to the external accessory granule, suggesting either a fusion or splitting of rows. *Babycurus* sensu stricto includes species distributed from the southern part of Ethiopia and Somalia, to Angola and West Africa (Fig. 265, and fig. 1 in Prendini, 2004: 245). The pedipalp chela movable finger is armed with a series of 6–9 slightly oblique, imbricated rows of granules, with successive rows overlapping by ≥ 2 granules. Typically, each row is terminated proximally by three more or less contiguous enlarged granules, i.e., 1 enlarged primary + 2 external accessory granules (except for *B. gigas* which has only has 1 enlarged primary + 1 external accessory granule), and distally by a single non-contiguous enlarged granule (internal accessory granule) (Fig. 11). One or rarely two enlarged external accessory granules are present midway along the proximal row.

The presence of imbricated granule rows and the number of enlarged external accessory granules per row, are potentially informative characters for discriminating buthid genera. For example, imbricated rows differentiate *Ananteroides* from *Ananteris* (Lourenço, 1985), and *Heteroctenus* from *Rhopalurus* (Esposito et al., 2017). Among 89 buthid genera with chela dentition arranged in discrete granule rows, imbrication (defined here as ≥ 2 granules overlap of sequential rows) is uncommon, occurring in only 11/89 genera: *Ananteroides*, *Babycurus* sensu stricto, *Buthoscorpio*, *Centruroides*, *Egyptobuthus*, *Grosphus*, *Heteroctenus*, *Mesotityus*, *Odonturus*, *Tityus* and *Zabius* (published data and examination of materials in our collections). To the extent of available data, this character was fairly consistent among species within the same genus, with a few exceptions. Its incidence correlated with the major suprageneric groups derived from cladistic analysis of trichobothriotaxy (Fet et al., 2005). The largest number of imbricated genera belong to the neotropical *Tityus* group (5/11, with 14 genera in the group) and the Afrotropical/ Madagascar *Uroplectes* group (3/11, with 17 genera in the group). In the *Isometrus* group, only *Babycurus* and *Odonturus* have imbricated rows among the 8 genera (including *Barbaracurus* **gen. n.**). Imbrication increases the number of dentate granules that can be packed onto the margins of pedipalp fingers, which is expected to enhance the ability of chelae to securely grasp struggling prey items. This biomechanical advantage could have propelled independent evolution of imbrication as adaptive specializations in different scorpion lineages. Interestingly, imbricated rows were conspicuously absent from

the large and successful Palaearctic *Buthus* group (40 genera, excluding *Microbuthus*, *Femto-buthus* and *Picobuthus*, which lack well defined granule rows).

We also compared numbers of proximal external accessory granules per row across 89 buthid genera. Two external granules were present in 16/88 genera: *Microananteris*, *Babycurus* sensu stricto, *Charmus*, *Thaicharmus*, *Butheoloides*, *Buthoscorpio*, *Egyptobuthus*, *Grosphus*, *Microcharmus*, *Neogrosphus*, *Neoprotobuthus*, *Odonturus*, *Pseudolychas*, *Tityobuthus*, *Troglotityobuthus* and *Uroplectes*. Most cases belong to the *Uroplectes* group, and none to the *Buthus* and *Tityus* groups. Pseudochactidae is hypothesized to be a basal scorpion family and sister of Buthidae (Prendini et al., 2006; Sharma et al., 2015), so it can serve as an outgroup to polarize buthid characters. All pseudochactids exhibit simple, non-imbricated linear series of granules with a single external accessory granule. Therefore, imbricated rows and dual external accessory granules may both be derived characters in buthids, implying that *Barbaracurus* **gen. n.** is the more plesiomorphic genus relative to *Babycurus*. Although *Babycurus* has both imbricated rows and dual external granules, it is one of only five genera in which these two characters occur together. Indeed, the two characters were poorly associated across genera (e.g. Jaccard index 0.2272, Dice coefficient 0.3704), indicating that they are neither ontogenetically nor functionally linked.

Another diagnostic character that we propose for separating *Barbaracurus* **gen. n.** from *Babycurus* is the form of the hemispermatophore basal lobe. Both genera have quite similar two-lobed sperm hemiducts, with a narrow anterior lobe and a broad, carinated posterior lobe separated by a key hole-like aperture at their base where sperm exits (Figs. 24–31). In contrast, the basal lobes show much greater variation. Although we were not able to conduct an exhaustive survey of all known species, comparison of basal lobe structures of 5/9 species of *Barbaracurus* **gen. n.** (Figs. 32–36) and 3/13 species of *Babycurus* (Figs. 37–39) revealed a distinct trend. In *Barbaracurus winklerorum* **sp. n.**, *B. exquisitus* and *B. sofomarensis*, the basal lobe is a moderately to strongly projecting, extensive, scoop-like lamina, oriented along an oblique transverse axis, with its distal end at the anterior base of the posterior lobe (figs. 32–34). In *B. somalicus* and *B. zambonellii*, the lobe is reduced to an oblique, transverse carina that may be weaker posteriorly (Figs. 35–36). In the three species of *Babycurus* examined, basal lobes are further atrophied to a short, weak carina near the anterior base of the posterior lobe (Figs. 37–39). Since strongly developed basal lobes are present in most buthid genera, we hypothesize that the projecting scoop-like basal lobe of the 3 *Barbaracurus* species is plesiomorphic, and that the progressively reduced forms in other species represent derived states. This further argues for the prim-

itive status of *Barbaracurus* **gen. n.** compared to *Babycurus*. We provisionally included this character in our generic diagnoses, pending a more complete analysis of the hemispermatophores of other species. As *Barbaracurus* **gen. n.** appears so far to be defined by plesiomorphic characters, we cannot yet infer anything about its affinities with respect to other genera in the *Isometrus* group.

Key to species of *Barbaracurus* **gen. n.**

- 1 Pedipalp movable finger without an external accessory granule midway along most proximal granule row (Fig. 1) 2
 - Pedipalp movable finger with an external accessory granule midway along most proximal granule row (Figs. 2–9) 3
- 2 Base color uniformly yellow or orange, without any darker markings; sternite VII with very weak carination *B. prudenti* (Lourengo, 2013)
 - Base color yellow with brown spots on carapace, dark stripes on tergites, dark pedipalp patella and metasoma V; sternite VII with 4 well developed carinae *B. ugartei* (Kovařík, 2000)
- 3 Pedipalp movable finger with 6 rows of granules (Figs. 2–4) 4
 - Pedipalp movable finger with 7 rows of granules (Figs. 5–9) 6
- 4 Pedipalp chela with narrower manus, chela length/width ratio 4.3–5.1, finger margins weakly undulate at base, not leaving gap when closed (figs. 81, 84, 86 in Kovařík et al., 2015) *B. subpunctatus* (Borelli, 1925)
 - Pedipalp chela with broader manus, chela length/width ratio 3.4–4.2, finger margins strongly undulate at base, leaving wide gap when closed 5
- 5 Telson vesicle pyriform in lateral profile, deeper anteriorly (Figs. 83–84); telson length/ depth ratio 2.75–2.89; pedipalp movable finger of female very weakly undulate at base (Fig. 57) *B. somalicus* (Hirst, 1907)
 - Telson vesicle symmetric in lateral profile (figs. 76–77 in Kovařík et al., 2015); telson length/ depth ratio 2.60–2.73; pedipalp movable finger of female moderately undulate at base (Fig. 53) *B. sofomarensis* (Kovařík et al., 2015)
- 6 Pedipalp chela with broader manus (Figs. 58, 60), chela length/ width ratio 4.28 (♀), 3.42 (♂); telson more bulbous (Figs. 88–89), length/depth ratio 2.27–2.37 (♀, ♂); distributed in Africa (Fig. 265) *B. zambonellii* (Borelli, 1902)
 - Pedipalp chela with narrower manus (Figs. 62, 64, 66, 68, 210, 212), chela length/ width ratio 4.73–6.12

(♀, ♂); telson ellipsoidal or pyriform (Figs. 82, 86–87), length/depth ratio 2.63–2.89 (♀); distributed in Arabia (Fig. 265) 7

7 Telson more slender (Figs. 81–82), length/depth ratio 2.89 (♀), 2.70 (♂); found in Al Hajar mountains of northern Oman (Fig. 265) *B. exquisitus* (Lowe, 2000)

- Telson less slender (Figs. 85–87), length/depth ratio 2.63–2.72 (♀); not found in northern Oman 8

8 Larger size, 40–42 mm (♀); less slender metasoma, metasoma V length/width ratio 2.30–2.46 (♀) *B. yemenensis* **sp. n.**

- Smaller size, 30–34 mm (♀), 25–29 mm (♂); more slender metasoma, metasoma V length/width ratio 2.56–2.58 (♀) *B. winklerorum* **sp. n.**

Barbaracurus exquisitus (Lowe, 2000) **comb. n.**

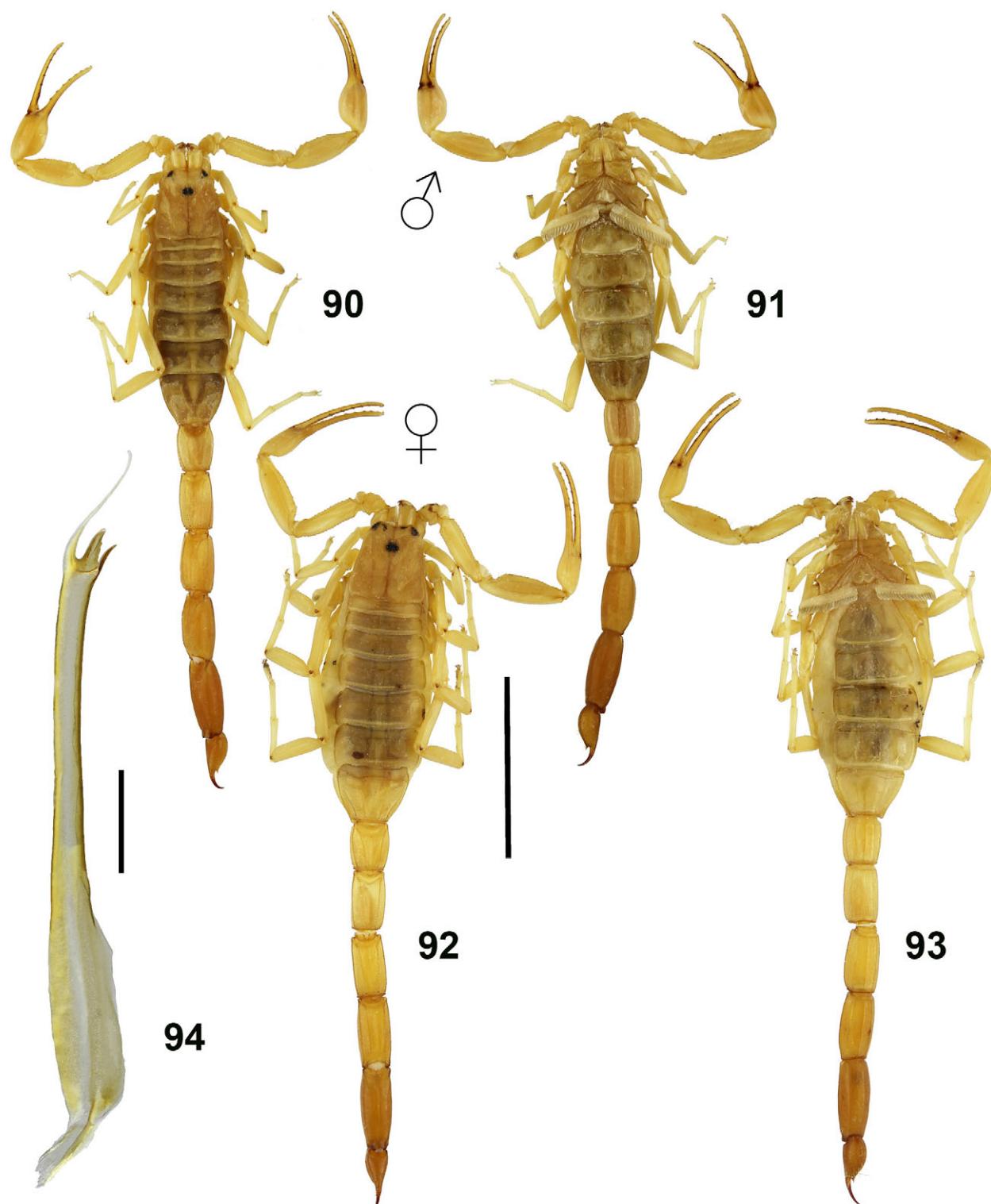
(Figures 5, 25, 33, 62–65, 70–71, 81–82, 90–100, 107–112, 194–205, 252–254, 265)

Babycurus exquisitus Lowe, 2000: 185–191, figs. 1–9; Kovařík, 2000: 244, fig. 38, tables 1–3; Soleglad & Fet, 2003a: 5; Soleglad & Fet, 2003b: 7; Fet et al., 2005: 14; Lowe, 2010: 17; Hendrixson, 2006: 109; Kovařík et al., 2015: 23.

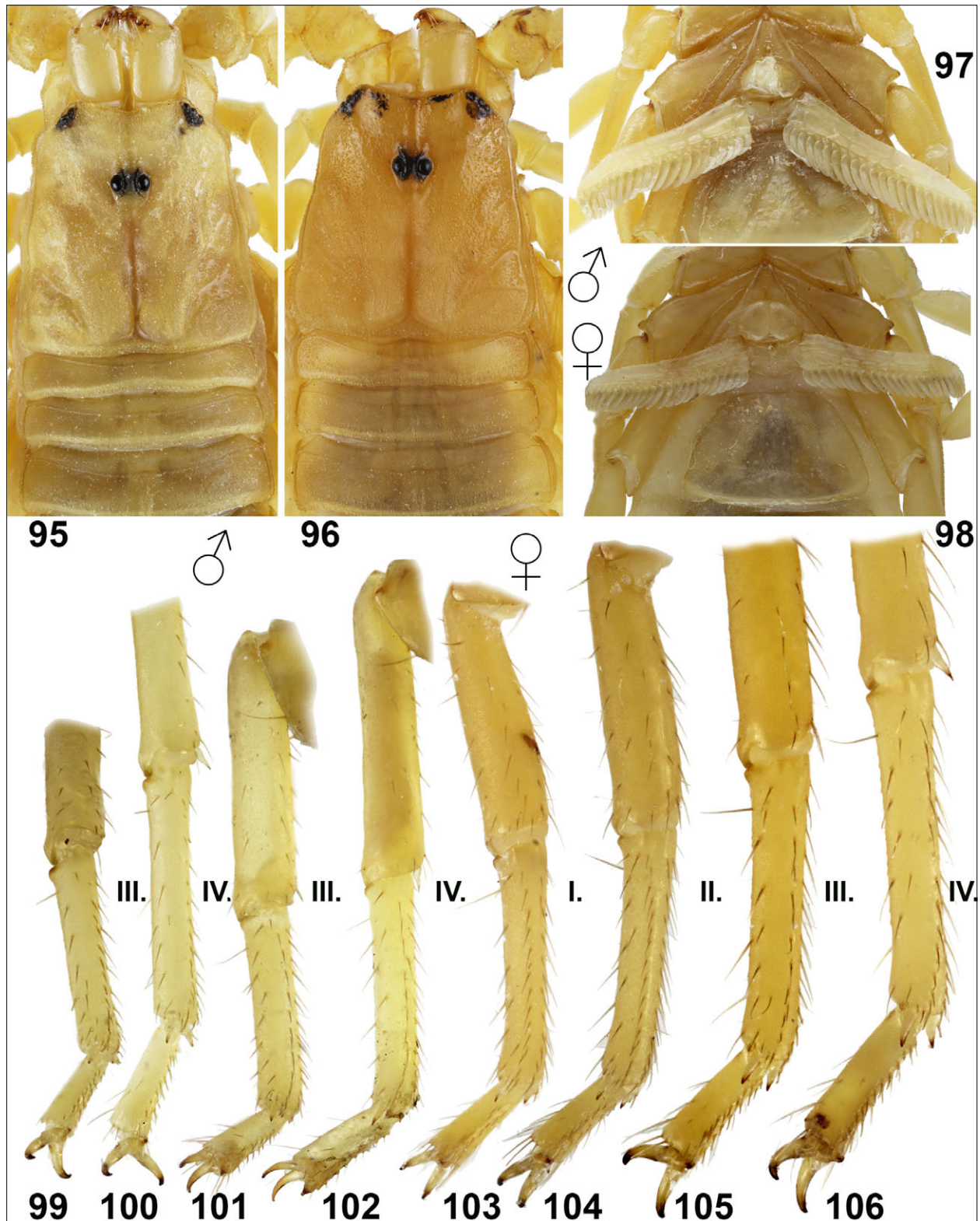
TYPE LOCALITY AND HOLOTYPE DEPOSITORY. Oman, Jabal Shams, Jabal Akhdar, Al Hajar Al Gharbi, 23°14.29'N 57°11.62'E, 1855 m a.s.l., NHMB.

MATERIAL EXAMINED. **Oman**, Jabal Shams, Jabal Akhdar, Al Hajar Al Gharbi (Fig. 112), 23°14.29'N 57°11.62'E, 1855 m a.s.l., 2.X.1994, leg. G. Lowe & M. D. Gallagher, 1♂ (holotype) 1♀1juv. (paratypes), NHMB; Jabal Shams, Jabal Akhdar, 23°14.31'N 57°11.64'E, 1900 m a.s.l., 14.X.1993, leg. G. Lowe & M. D. Gallagher, 1♂ (paratype), NHMB; Jabal Akhdar hotel, Sayq plateau, 23°04'N 57°38'E, 1850 m a.s.l., 21.VI.2002, 1♂, leg. G. R. Feulner, GLPC.

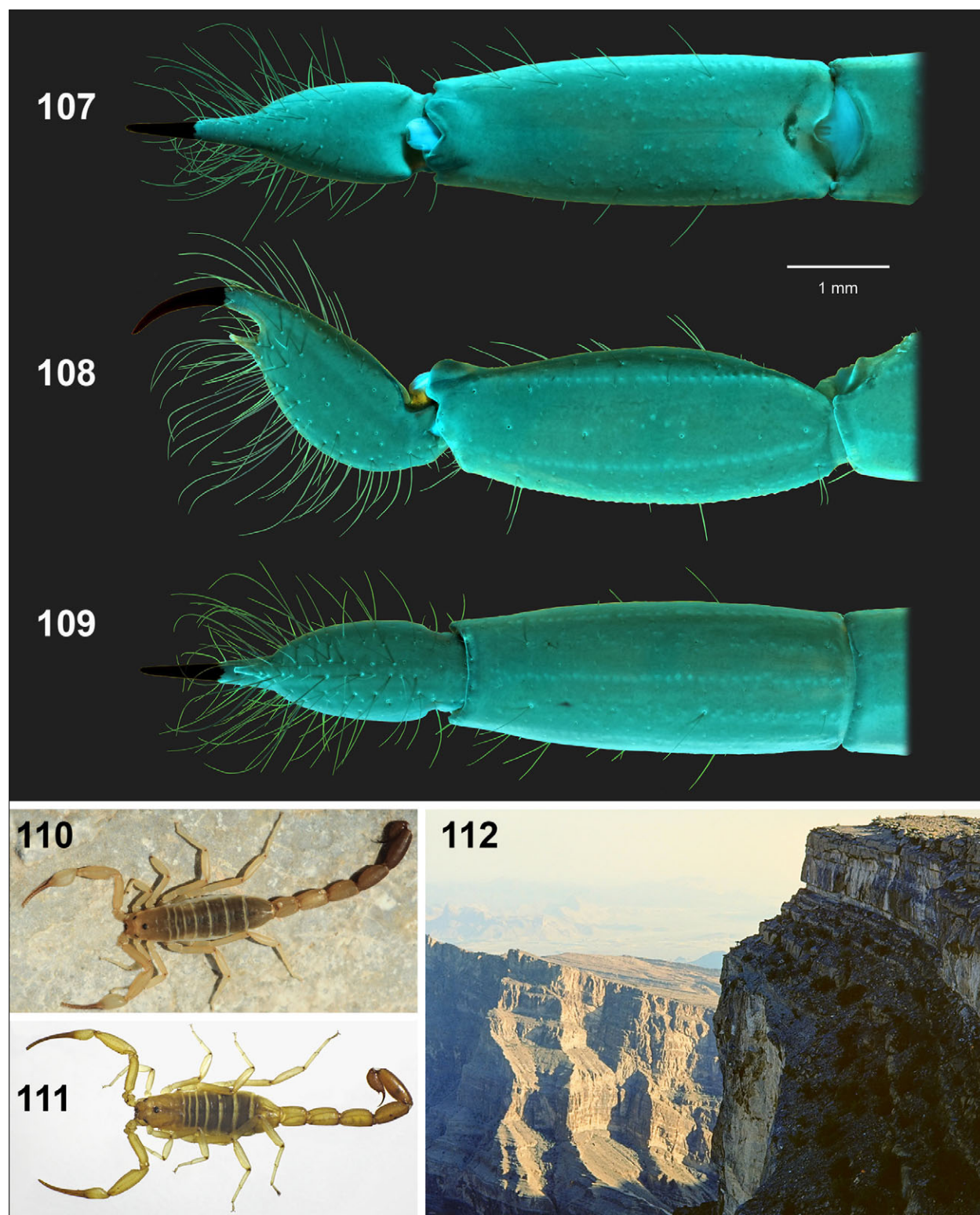
DIAGNOSIS. Total length of adult males 33–34 mm, adult female 39 mm. Coloration pale yellow, chela fingers, metasoma V and telson light orange, chelicerae yellow without reticulation (Figs. 252–253). Pedipalp chela manus much wider in male than female, chela length/width ratio 4.2–4.7 in males and 6.12 in female; proximal margins of pedipalp fingers of female straight (Figs. 65, 204), of male undulate so as to leave a gap with fingers closed (Figs. 63, 201); dentate margin of movable finger armed with 7 rows of granules, and a short apical row of 5 denticles (Fig. 6); most proximal granule row with one external accessory granule. Pectines with 21–22 teeth in both sexes. Hemispermatophore basal lobe a strongly raised carina (Figs. 25, 33). No sexual dimorphism in length and width of



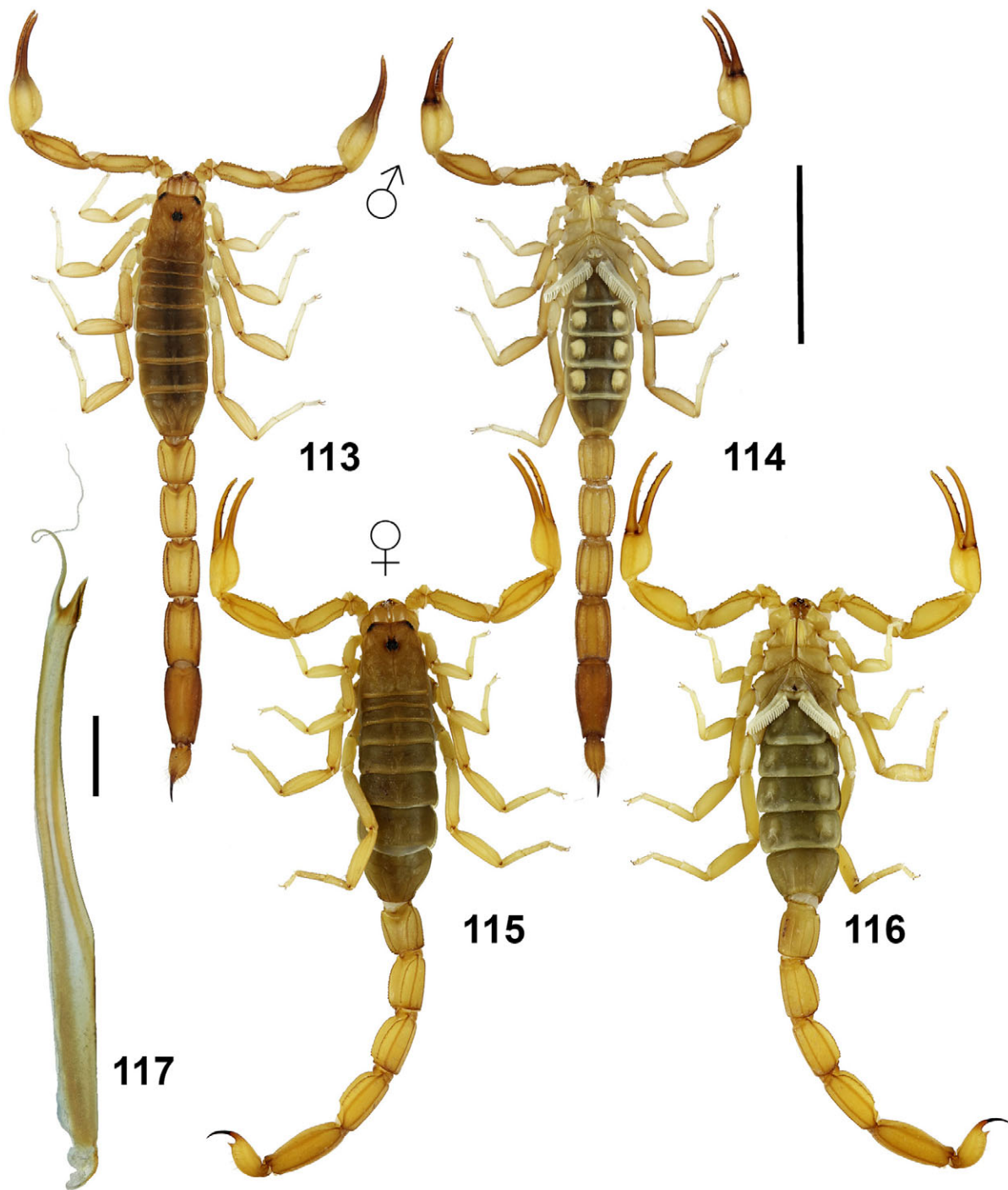
Figures 90–94: *Barbaracurus exquisitus* **comb. n.** **Figures 90–91.** Holotype male, dorsal (90) and ventral (91) views. **Figures 92–93.** Paratype female, dorsal (92) and ventral (93) views. **Figure 94.** Right hemispermatophore, convex aspect, Oman, Jabal Akhdar hotel. Scale bars: 10 mm (90–93), 1 mm (94).



Figures 95–106: *Barbaracurus* gen. n. **Figures 95–98:** *Barbaracurus exquisitus* comb. n. **Figures 95, 97.** Holotype male, chelicerae, carapace and tergites I–III (95) and sternoplectinal region (97). **Figures 96, 98.** Paratype female, chelicerae, carapace and tergites I–III (96) and sternoplectinal region (98). **Figures 99–106:** Distal segments of right legs, retrolateral views. **Figures 99–100.** *B. exquisitus* comb. n., male holotype, legs III (99) and IV (100). **Figures 101–102.** *B. winklerorum* sp. n., male holotype, legs III (101) and IV (102). **Figures 103–106.** *B. yemenensis* sp. n., female holotype, legs I–IV.



Figures 107–112: *Barbaracurus exquisitus* **comb. n.** **Figures 107–110.** Metasoma V and telson. Dorsal (107). lateral (108) and ventral (109) views. UV fluorescence. Paratype male, Oman, Jabal Akhdar. Scale bar: 1 mm. **Figures 110–111.** In vivo habitus, holotype male (110) and topoparatype female (111). **Figure 112.** Habitat, Oman, Jabal Shams, Jabal Akhdar.

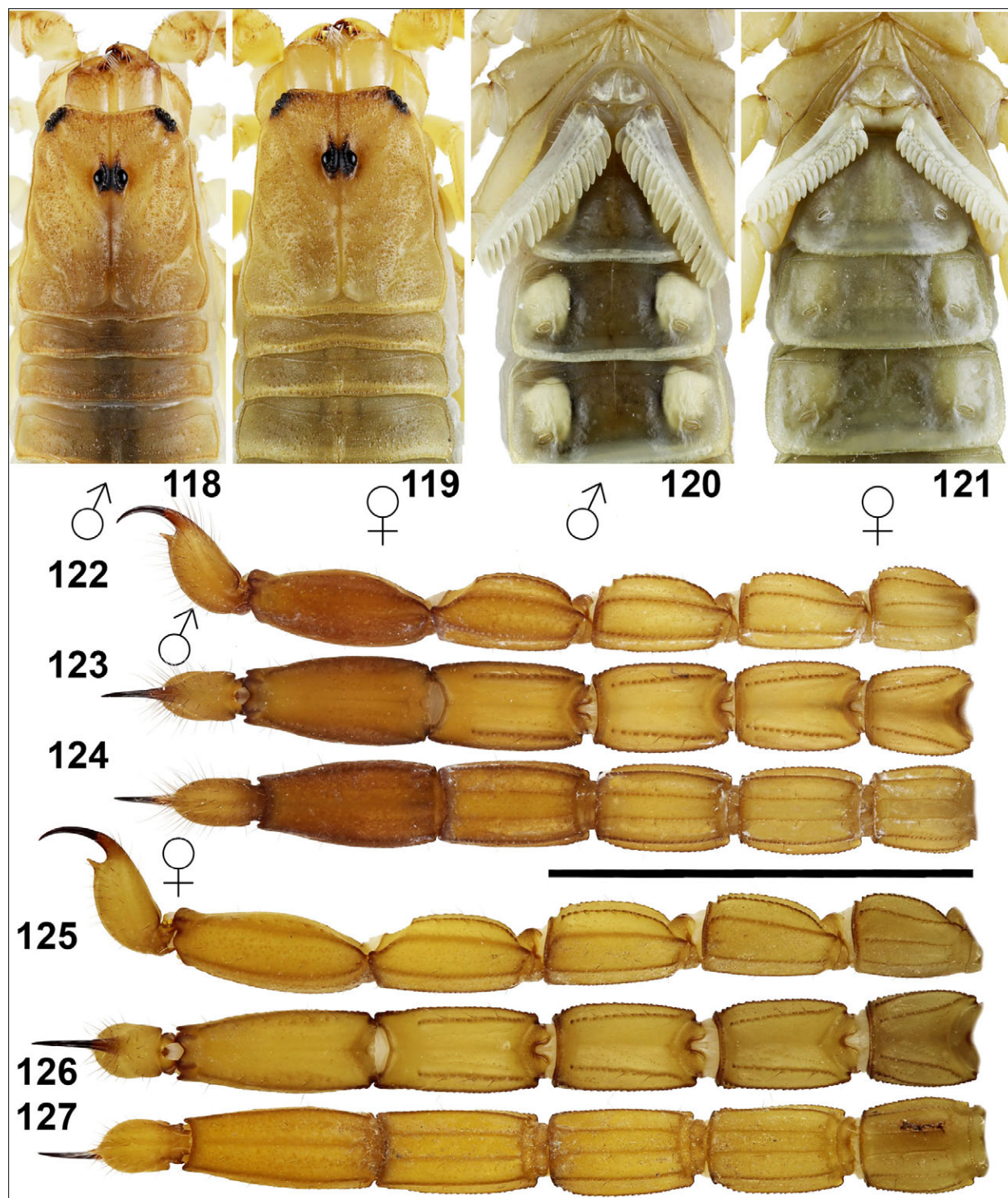


Figures 113–117: *Barbaracurus somalicus* **comb. n.** from Somaliland, locality 17SR. **Figures 113–114.** Male, dorsal (113) and ventral (114) views. **Figures 115–116.** Female, dorsal (115) and ventral (116) views. **Figure 117.** Right hemispermaphore, convex aspect. Scale bars: 10 mm (113–116), 1 mm (117).

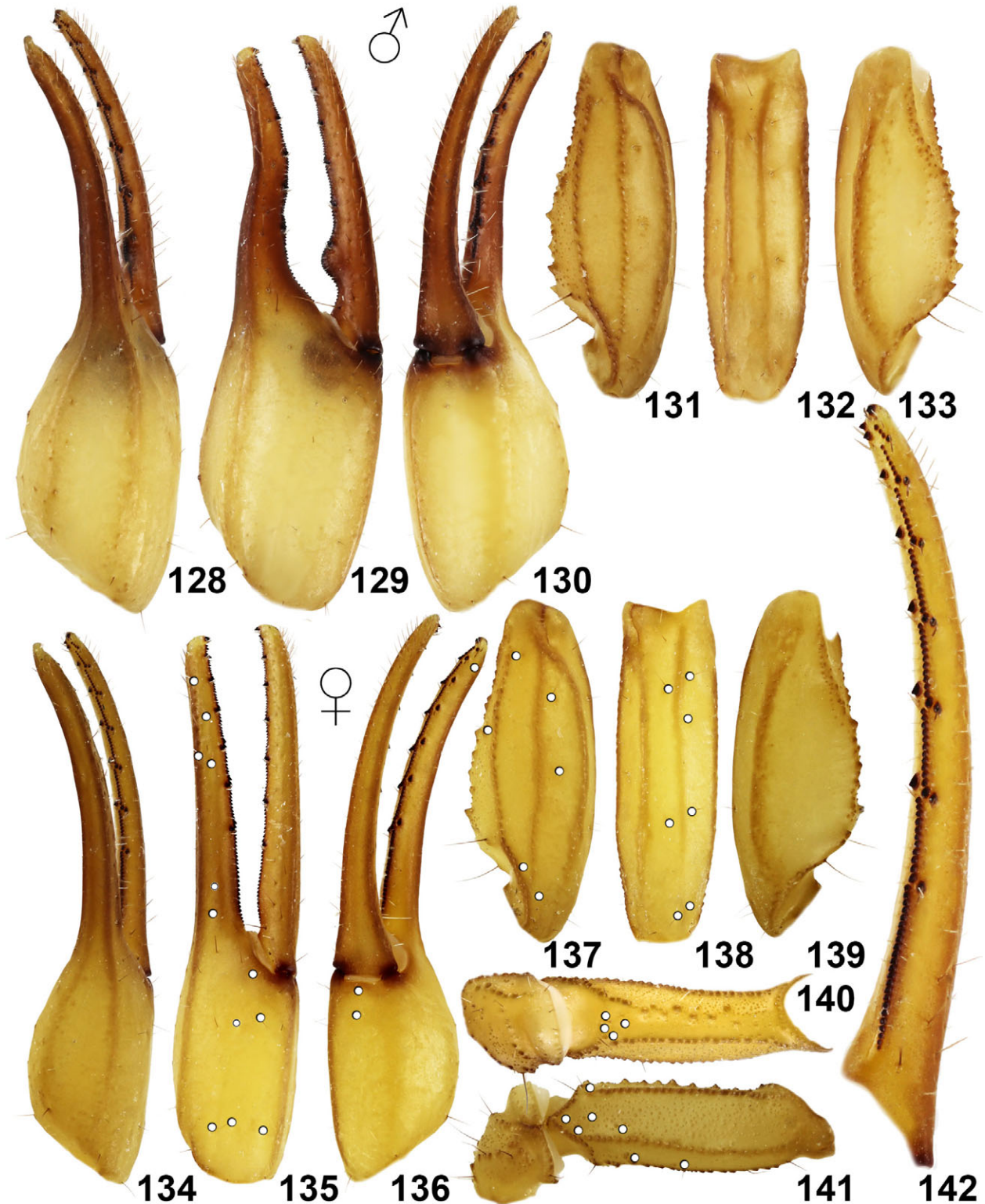
metasomal segments (Figs. 70–71); metasoma I with 10 carinae, II–IV with 8 carinae. Telson setose, bearing numerous long macrosetae and short, pointed subaculear tubercle (Figs. 80–82, 107–109); vesicle smooth, elongate, pyriform, telson length/depth ratio 2.70 in male, 2.89 in female; aculeus slender, curved, shorter than vesicle.

Barbaracurus sofomarensis (Kovařík, Lowe, Seiter, Plíšková et Štáhlavský, 2015) **comb. n.** (Figures 2, 26, 34, 50–53, 72–73, 265)

Babycurus sofomarensis Kovařík et al., 2015: 5–30, figs. 46–55, 58–61, 64–65, 67–77, 87–102, 123, table 2.



Figures 118–127: *Barbaracurus somalicus* **comb. n.** from Somaliland, locality 17SR. **Figures 118, 120, 122–124.** Male, chelicerae, carapace and tergites I–III (118), sternopectinal region and sternites III–V (120), metasoma and telson, lateral (122), dorsal (123), and ventral (124) views. **Figures 119, 121, 125–127.** Female, chelicerae, carapace and tergites I–III (119), sternopectinal region and sternites III–V (121), metasoma and telson, lateral (125), dorsal (126), and ventral (127) views. Scale bar: 10 mm (122–127).



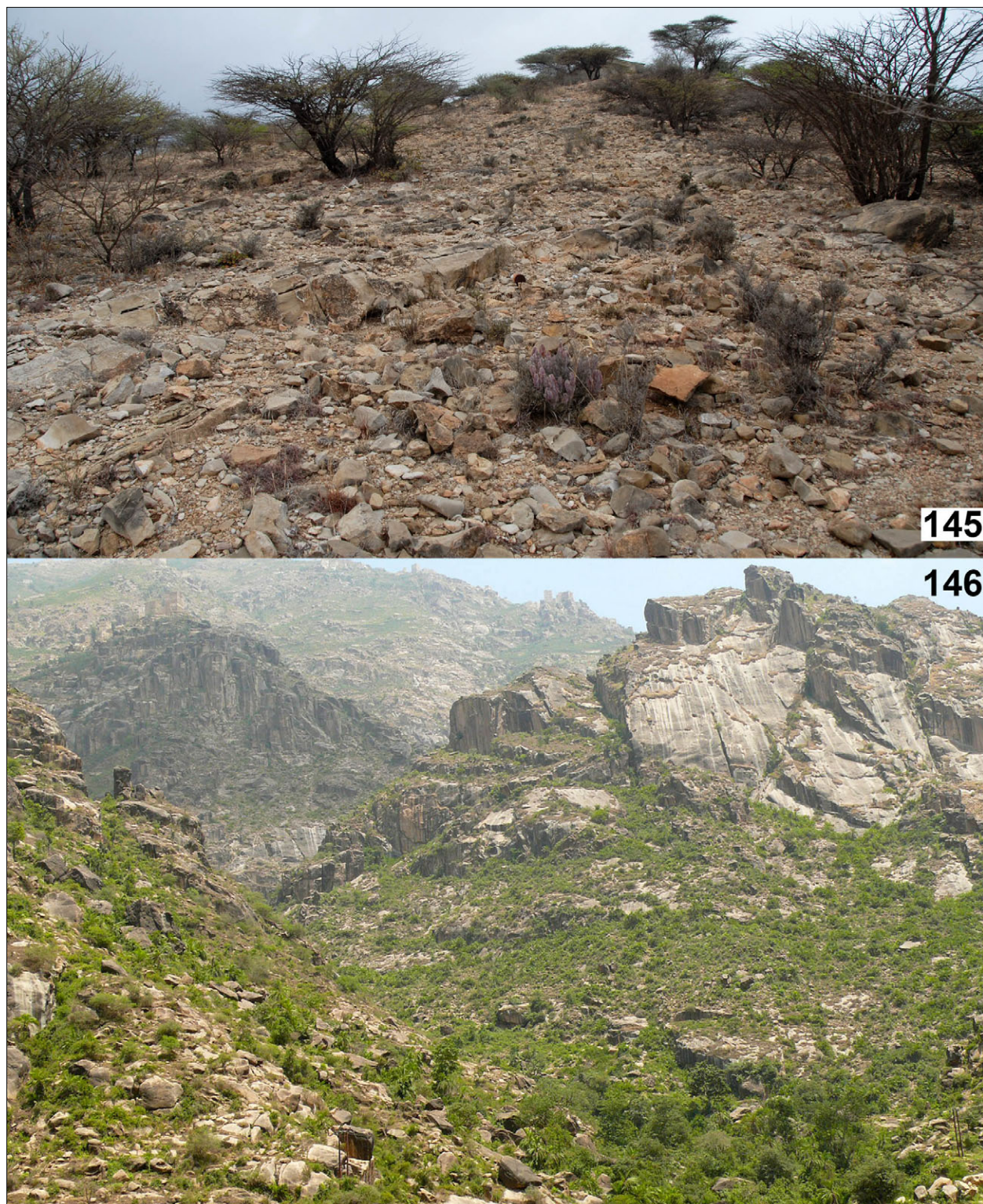
Figures 128–142: *Barbaracurus somalicus* comb. n. from Somaliland, locality 17SR. **Figures 128–133.** Male, pedipalp chela, dorsal (128), external (129), and ventral (130) views, pedipalp patella, dorsal (131), external (132) and ventral (133) views. **Figures 134–142.** Female, pedipalp chela, dorsal (134), external (135), and ventral (136) views, pedipalp patella, dorsal (137), external (138) and ventral (139) views, pedipalp femur and trochanter internal (140) and dorsal (141) views, pedipalp movable finger dentate margin (142). The trichobothrial pattern is indicated in Figures 135–138 and 140–141 (white circles).



Figures 143–144: *Barbaracurus somalicus* comb. n., in vivo habitus. Male (143) and female (144) from Somaliland, locality 17SR.

TYPE LOCALITY AND TYPE DEPOSITORY. Ethiopia, Oromia State, Arsi Province, Sof Omar, 06°54'19"N 40°51'04"E, 1200 m a.s.l.; FKCP.

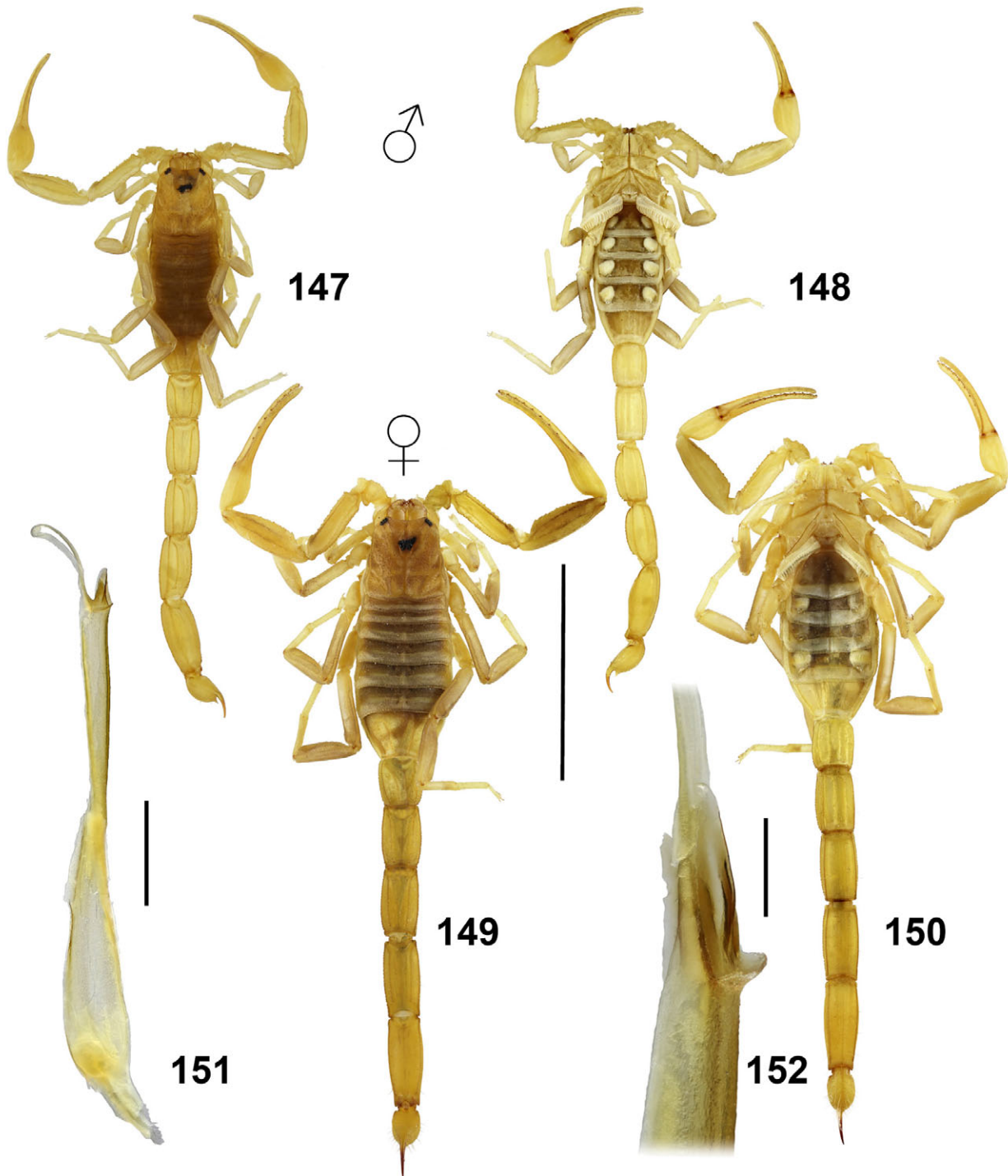
MATERIAL EXAMINED (FKCP). **Ethiopia**, Oromia State, Arsi Province, Sof Omar, 06°54'19"N 40°51'04"E, 1200 m a.s.l. (locality No. 13EC), 24.-25.VI.2013, 4♂ (para-



Figures 145–146: **Figure 145.** Locality of *Barbaracurus somalicus* **comb. n.**, Somaliland, locality 17SR. **Figure 146.** Yemen, Jabal Bura NEE Al Hudaydah, 14°53'N 43°26'E, 557 m a.s.l., locality of paratype of *Barbaracurus yemenensis* **sp. n.**

		<i>B. zambonellii</i>		<i>B. somalicus</i>	
DIMENSIONS (MM)		♂ (876)	♀	♂	♀
Carapace	L / W	4.050 / 3.575	5.375 / 5.015	4.075 / 3.725	4.750 / 4.500
Mesosoma	L	8.400	13.600	9.550	11.250
Tergite VII	L / W	2.200 / 3.500	3.850 / 5.360	2.525 / 3.550	3.500 / 4.650
Metasoma + telson	L	20.875	27.225	21.875	24.650
Segment I	L / W / D	2.550 / 2.375 / 2.150	3.350 / 2.762 / 2.350	2.700 / 2.275 / 2.175	3.050 / 2.500 / 2.325
Segment II	L / W / D	3.150 / 2.250 / 2.175	4.100 / 2.575 / 2.375	3.200 / 2.175 / 2.125	3.500 / 2.350 / 2.125
Segment III	L / W / D	3.400 / 2.250 / 2.215	4.450 / 2.550 / 2.400	3.475 / 2.225 / 2.150	3.850 / 2.300 / 2.250
Segment IV	L / W / D	3.900 / 1.965 / 2.225	5.025 / 2.525 / 2.575	4.000 / 2.225 / 1.950	4.375 / 2.350 / 2.175
Segment V	L / W / D	4.575 / 2.000 / 1.875	5.850 / 2.500 / 2.400	4.600 / 2.250 / 1.925	5.400 / 2.300 / 2.075
Telson	L / W / D	3.300 / 1.400 / 1.450	4.450 / 1.762 / 1.875	3.900 / 1.275 / 1.400	4.475 / 1.625 / 1.550
Pedipalp	L	14.950	19.337	15.450	17.550
Femur	L / W	3.725 / 1.150	4.800 / 1.875	3.750 / 1.175	4.275 / 1.275
Patella	L / W	4.250 / 1.650	5.537 / 1.850	4.450 / 1.600	5.025 / 1.850
Chela	L	6.975	9.000	7.250	8.250
Manus	W / D	2.038 / 2.000	2.100 / 1.9500	2.100 / 2.200	1.975 / 1.813
Movable finger	L	4.100	5.800	4.450	5.450
Total	L	33.33	46.20	35.50	40.65

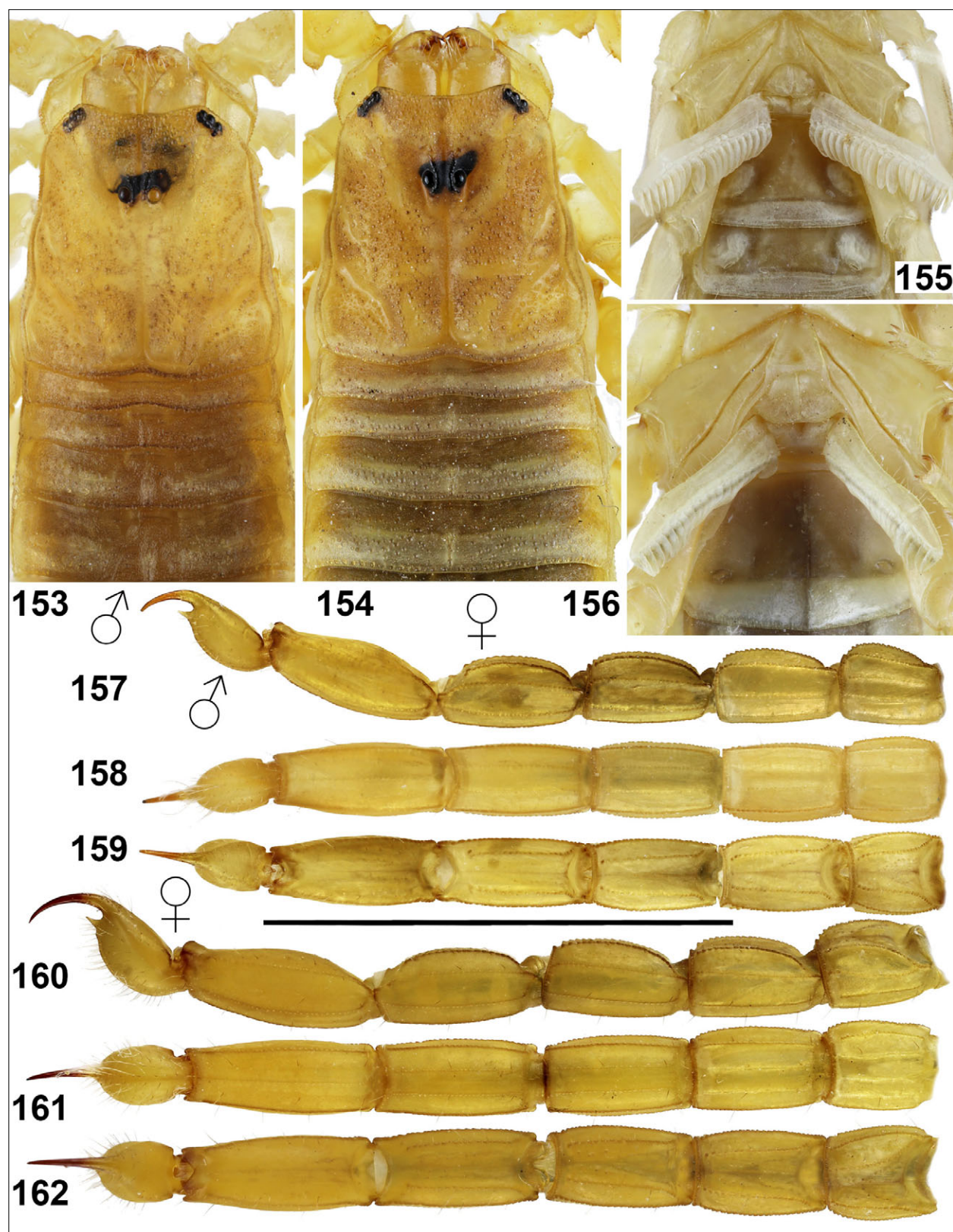
Table 1: Measurements of *Barbaracurus zambonellii* **comb. n.** and *B. somalicus* **comb. n.** Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).



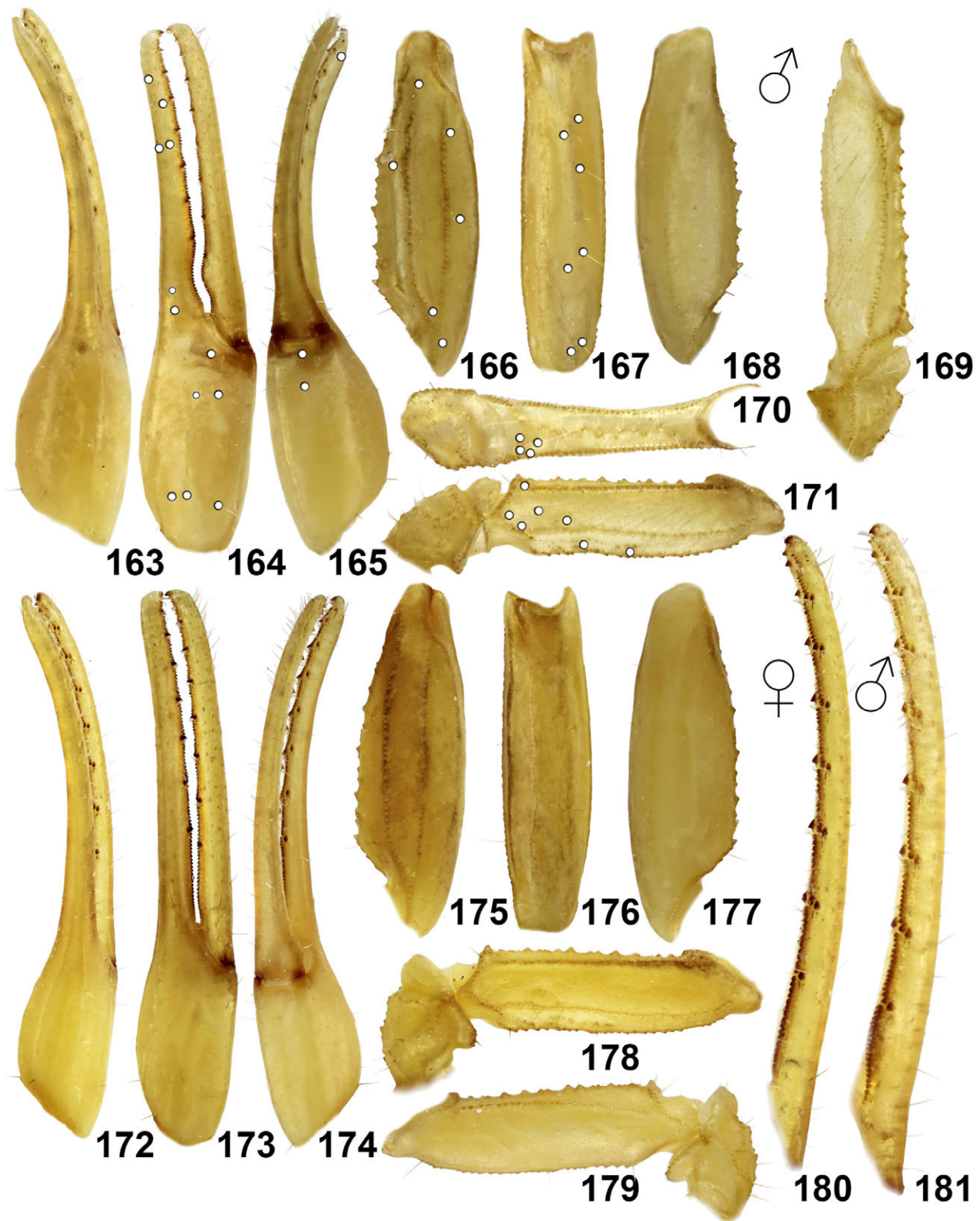
Figures 147–152: *Barbaracurus winklerorum* sp. n. **Figures 147–148.** Male holotype, dorsal (147) and ventral (148) views. **Figures 149–150.** Female paratype, dorsal (149) and ventral (150) views. **Figures 151 – 152.** Right hemispermatophore, convex aspect (151), posterior aspect of capsule region (152). Scale bars: 10 mm (147–150), 1 mm (151), 200 µm (152).

types) (UV detection), leg. F. Kovařík, J. Plíšková et P. Novák, 23.-24.XI.2014, 2♂ (paratypes) 1♀ (holotype) (UV detection), leg. F. Kovařík; Oromia State, West Harerge, 07°44'37"N 40°42'39.5"E, 1234 m a.s.l. (local-

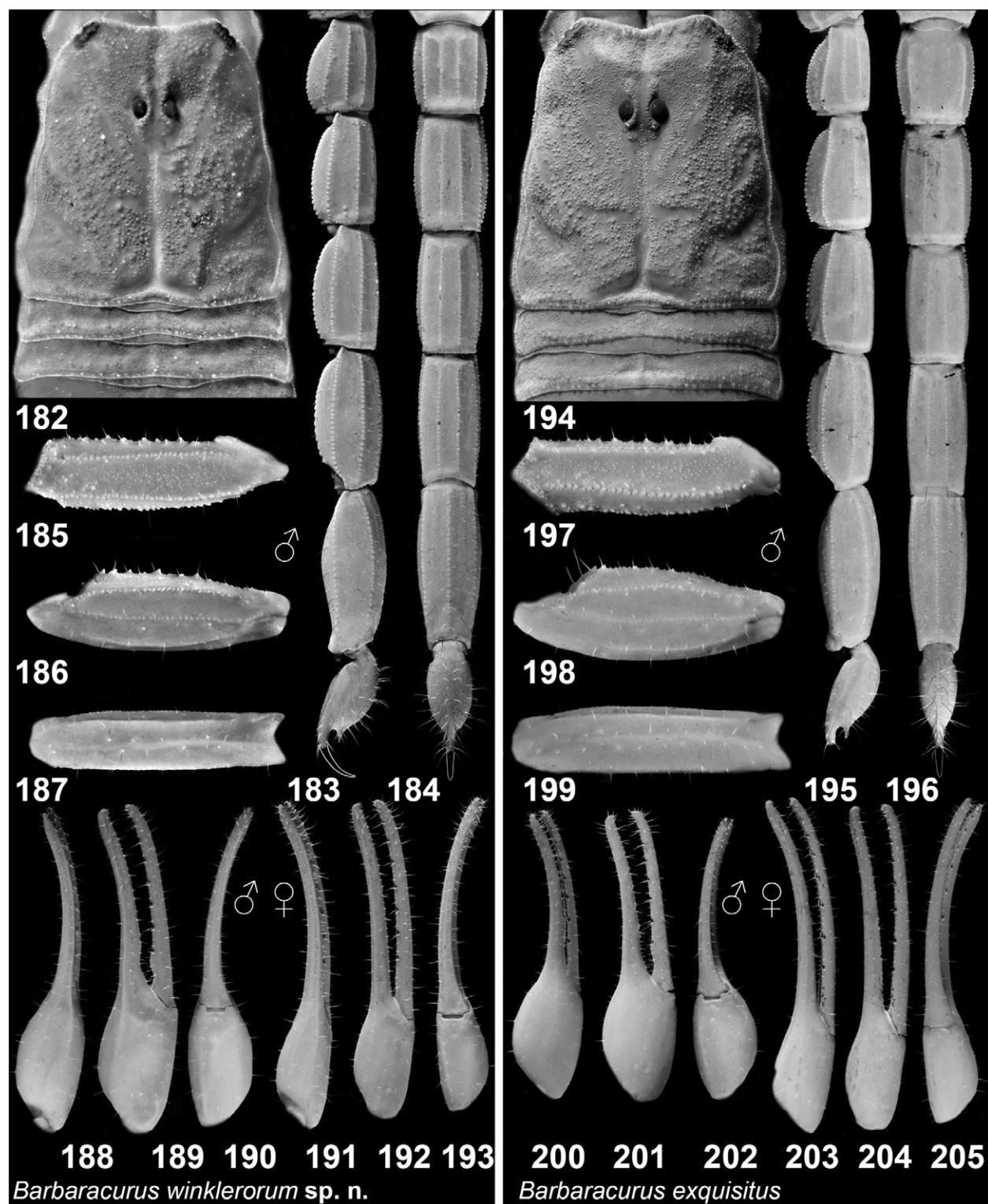
ity No. **14EO**), 24.-25.XI.2014, 1♂ (paratype) (UV detection), Oromia State, West Harerge, 07°46'39.7"N 40°37'12.4"E, 800 m a.s.l. (locality No. **14EP**), 25. XI.2014, 1juv. (paratype).



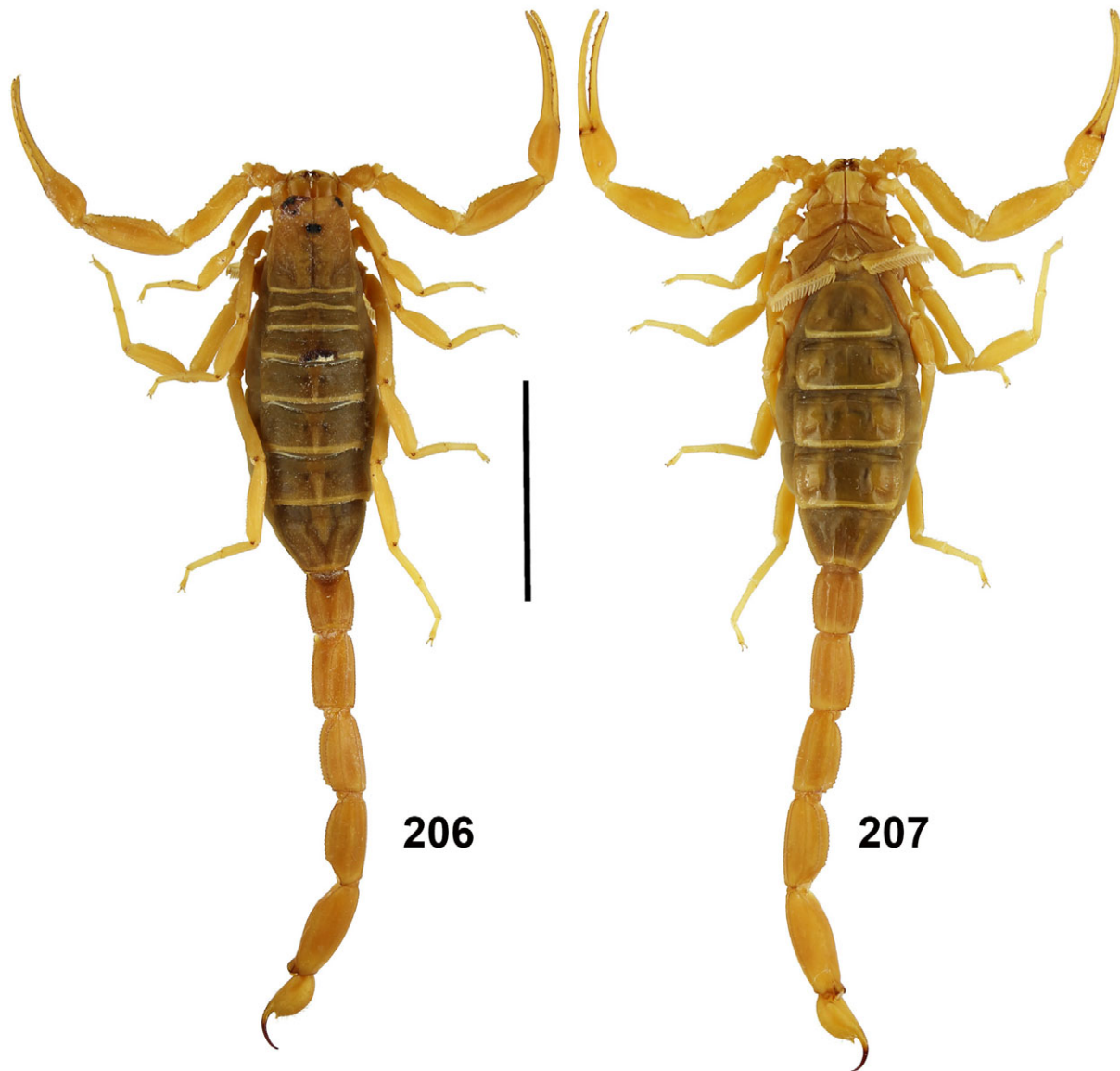
Figures 153–162: *Barbaracurus winklerorum* sp. n. **Figures 153, 155, 157–159.** Male holotype, chelicerae, carapace and tergites I–IV (153), sternopectinal region and sternites III–IV (155), metasoma and telson, lateral (157), ventral (158), and dorsal (159) views. **Figures 154, 156, 160–162.** Female, chelicerae, carapace and tergites I–IV (154), sternopectinal region and sternite III (156), metasoma and telson, lateral (160), ventral (161), and dorsal (162) views. Scale bar: 10 mm (157–162).



Figures 163–181: *Barbaracurus winklerorum* sp. n. **Figures 163–171, 181.** Male holotype, pedipalp chela, dorsal (163), external (164), and ventral (165) views, pedipalp patella, dorsal (166), external (167) and ventral (168) views, pedipalp femur and trochanter ventral (169), internal (170) and dorsal (171) views, pedipalp movable finger dentate margin (181). **Figures 172–180.** Female, pedipalp chela, dorsal (172), external (173), and ventral (174) views, pedipalp patella, dorsal (175), external (176) and ventral (177) views, pedipalp femur and trochanter dorsal (178) and ventral (179) views, pedipalp movable finger dentate margin (180). The trichobothrial pattern is indicated in Figures 164–167 and 170–171 (white circles).



Figures 182–205: Comparative morphology of adults of *Barbaracurus winklerorum* sp. n. (male holotype 182–190 and female paratype 191–193) and *B. exquisitus* comb. n. (male holotype 194–202 and female paratype 203–205), under UV fluorescence. **Figures 182, 194.** Carapace and tergites I–II. **Figures 183–184, 195–196.** Metasoma and telson lateral. **Figures 185, 197.** Pedipalp femur dorsal. **Figures 186, 198.** Pedipalp patella dorsal. **Figures 187, 199.** Pedipalp patella external. **Figures 188, 191, 200, 203.** Pedipalp chela dorsal. **Figures 189, 192, 201, 204.** Pedipalp chela external. **Figures 190, 193, 202, 205.** Pedipalp chela ventral.



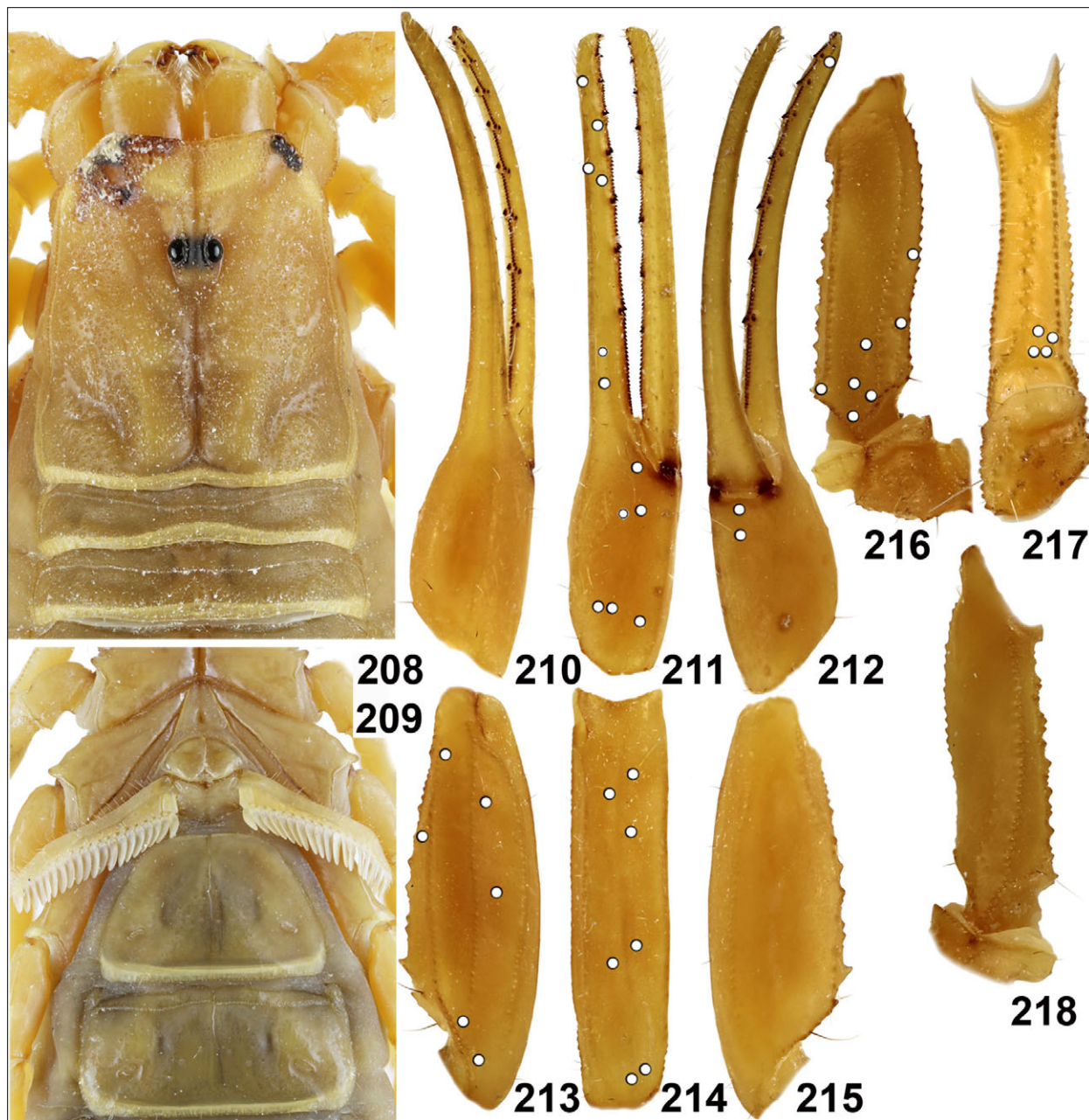
Figures 206–207: *Barbaracurus yemenensis* sp. n., Female holotype, dorsal (206) and ventral (207) views. Scale bar: 10 mm.

DIAGNOSIS. Total length of adult males 32–35 mm, adult female 46 mm. Coloration yellowish brown to grey with darker markings, chelicerae yellow without reticulation. Pedipalp chela manus much wider in male than female, chela length/width ratio 4.2–4.7 in males and 6.12 in female; proximal margins of pedipalp fingers of female weakly undulate (Fig. 53), of male strongly undulate so as to leave a gap with fingers closed (Fig. 51); dentate margin of movable finger armed with 6 rows of granules, and a short apical row of 4 denticles (Fig. 6); most proximal granule row with one external accessory granule. Pectines with 18–20 teeth in both sexes. Hemispermaphore basal lobe a strongly raised carina (Figs. 26, 34). No sexual dimorphism in length and width of metasomal segments (Figs. 72–73); metasoma I with 10

carinae, II–IV with 8 carinae. Telson setose, bearing numerous long macrosetae and short, pointed subaculear tubercle; vesicle smooth, elongate, ellipsoidal, telson length/depth ratio 2.60–2.73 in both sexes; aculeus slender, curved, shorter than vesicle.

***Barbaracurus somalicus* (Hirst, 1907) comb. n.**
(Figures 3, 27, 34, 54–57, 74–75, 83–84, 113–146, 263–265, Table 1)

Babycurus somalicus Hirst, 1907: 208; Lamoral & Reynders, 1975: 498; Kovařík, 1998: 104; Fet & Lowe, 2000: 79; Kovařík, 2000: 255–256, figs. 10, 21, tables 1–3; Kovařík, 2003: 134.



Figures 208–218: *Barbaracurus yemenensis* sp. n. Female holotype, chelicerae, carapace and tergites I–II (208), sternopectoral region and sternites III–IV (209), pedipalp chela, dorsal (210), external (211), and ventral (212) views, pedipalp patella, dorsal (213), external (214) and ventral (215) views, pedipalp femur and trochanter dorsal (216), internal (217), and ventral (218) views. The trichobothrial pattern is indicated in Figures 211–214 and 216–217 (white circles).

TYPE LOCALITY AND TYPE DEPOSITORY. Somaliland, Berbera and Durbar; BMNH.

1308, 1309, 1332), leg. F. Kovařík, T. Mazuch & P. Just, FKCP.

MATERIAL EXAMINED. **Somaliland**, Berbera and Durbar, 400 ft., leg. G. W. Bury, 1♀ (holotype), BMNH; Borama, campus Aound University, 09°56'49"N 43°13'23"E, 1394 m a.s.l., 4-5.II.2017 (locality No. **17SA**), 1♀, 9.-13.IX.2017, (locality No. **17SR**, Fig. 145), 4♂3♀4juvs. (Figs. 27, 35, 113–144, 260–261, Nos.

DIAGNOSIS. Total length of adult males 32–36 mm, adult female 38–47 mm. Coloration yellowish brown to grey with darker markings, chelicerae yellow without or with traces of reticulation. Pedipalp chela manus much wider in male than female, chela length/width ratio 3.45 in male and 4.15 in female; proximal margins of pedipalp

fingers of female almost straight (Fig. 57, 135), of male strongly undulate so as to leave a gap with fingers closed (Figs. 55, 129); dentate margin of movable finger armed with 6 rows of granules, and a short apical row of 4 denticles (Fig. 3); most proximal granule row with one external accessory granule. Pectines with 17–20 teeth in both sexes. Hemispermatophore basal lobe a weak carina (Figs. 27, 35). No sexual dimorphism in length and width of metasomal segments (Figs. 74–75); metasoma I with 10 carinae, II–IV with 8 carinae. Telson setose, bearing numerous long macrosetae and short, pointed subaculear tubercle; vesicle smooth, elongate, pyriform, telson length/depth ratio 2.75–2.89 in both sexes; aculeus slender, curved, shorter than vesicle.

NOTE. Until now, only the holotype and paratype females were known. The recent collection of both sexes of *B. somalicus* by one of us (F.K.) enables us to show photographs of live specimens, especially of the male, for the first time, and to characterize their sexual dimorphism.

COMMENTS ON LOCALITY AND LIFE STRATEGY. The first author (F.K.) visited the locality 17SA on 4–5 February 2017 (winter dry season). At this locality, the author recorded a daytime temperature of 24.7 °C (4 February, 16:08 h), and nighttime temperatures of 21.4 °C shortly after sunset, dropping to 19.3 °C (minimum temperature on 5 February at 19:20 h). The recorded humidity was 41% on 5 February at 19:20 h. The first author (F.K.) again visited the same locality on 9–13 September 2017 (summer minor dry season, 17SR) and recorded maximum daytime temperatures of 29.1 °C (10th September 2017) and 31.8 °C (12 September 2017), and a minimum nighttime temperature of 19.6 °C. The recorded humidity was between 31% (minimum at night) and 79% (maximum at day). All specimens were collected at night by ultraviolet (UV) detection near rocks. At this locality, in addition to *B. somalicus*, the first author also recorded *Neobuthus* sp., *Parabuthus abyssinicus* Pocock, 1901 (Buthidae) and *Pandinurus kmoniceki* Kovařík et al., 2017 (type locality) (Scorpionidae). Fifty metres from this rocky site is a riverbed of an occasional river (figs. 45–48 in Kovařík et al., 2017: 18) where in addition the author recorded *Gint amoudensis* Kovařík et al., 2018 (type locality) (Buthidae), and *Pandinops pugillator* (Pocock, 1900) (Scorpionidae).

***Barbaracurus subpunctatus* (Borelli, 1925) comb. n.**
(Figures 4, 265)

Babycurus subpunctatus Borelli, 1925: 318–319; Lamoral & Reynders, 1975: 498; Kovařík, 1998: 104; Fet & Lowe, 2000: 79–80; Kovařík, 2000: 256, fig. 22, tables 1–3; Kovařík, 2003: 134; Kovařík et al.,

2015: 30, figs. 56–57, 62–63, 66, 78–86, 103–123, table 2.

TYPE LOCALITY AND TYPE DEPOSITORY. Somalia, Cuban Cubu, MCSN.

MATERIAL EXAMINED. **Ethiopia**, Somali State, Liben region, between Filtu and Dolo Odo, 04°50'07.5"N 40°55'13.5"E, 912 m a.s.l. (locality No. **14EI**), 1♂1♀, 20.XI.2014, leg. F. Kovařík, FKCP. **Somalia**, Cuban Cubu, IX.1923, 1♀ (holotype), leg. S. Patrizi, MCSN.

DIAGNOSIS. Total length of adult male 22.5 mm, adult female 32.25 mm. Coloration yellowish brown to orange, chelicerae without reticulation. Pedipalp chela without strong sexual dimorphism, fingers almost straight, chela length/width ratio 4.3–5.1 in both sexes; dentate margin of movable finger armed with 6 rows of granules, and a short apical row of 4 denticles (Fig. 4); most proximal granule row with one external accessory granule. Pectines with 16–17 teeth in both sexes. No sexual dimorphism in length and width of metasomal segments; metasoma I with 10 carinae, II–IV with 8 carinae. Telson setose, bearing numerous long macrosetae and short, pointed subaculear tubercle; vesicle smooth, elongate, ellipsoidal, telson length/depth ratio 2.52–2.83 in both sexes; aculeus slender, curved, shorter than vesicle.

***Barbaracurus winklerorum* sp. n.**

(Figures 8, 24, 32, 66–69, 76–77, 85–86, 101–102, 147–193, 265, Table 2)

<http://zoobank.org/urn:lsid:zoobank.org:act:AB816A91-BF29-49A3-B3BC-E07486594EDF>

TYPE LOCALITY AND TYPE DEPOSITORY. Oman, Jabal Sayq, Deem, 16°41'78"N 53°08'20"E, ca 680 m a.s.l., ZSMC.

TYPE MATERIAL EXAMINED. **Oman**, Jabal Sayq, Deem, 16°41'78"N 53°08'20"E, ca 680 m a.s.l. (Fig. 265), 20.XII.2001, UV detection, between and on high grass, 22.00–22.45 hour, leg. A. Winkler, 1♂ (holotype), ZSMC, 2♂ (paratypes), FKCP, GLPC; Jabal Sayq, Kadrafi, 16°41'09"N 53°08'09"E, ca 780 m a.s.l., 20.XII.2001, UV detection, between high grass, 21.00–21.45 hour, leg. A. Winkler, 1♀ (paratype), ZSMC; Jabal Sayq, Deem, 16°41'09"N 53°08'20"E, ca 680 m a.s.l., 20.XII.2001, UV detection, 22.00–22.45 hour, leg. A. & B. Winkler, 1♀ (paratype), FKCP; Jabal Sayq, W. of Daykhut, 16°43'40"N 53°16'45"E, ca 250 m a.s.l., 29.I.2000, UV detection, rocky slope, under wood on sandy soil in smaller shrubs, leg. A. Winkler, 1♂1♀ (paratypes), NHMB.

		<i>B. winklerorum</i> sp. n.		<i>B. yemenensis</i> sp. n.	
DIMENSIONS (MM)		♂	♀	♂	♀
Carapace	L / W	3.525 / 3.300	4.125 / 4.125	4.65 / 4.55	4.90 / 4.35
Mesosoma	L	6.800	8.000	13.40	11.81
Tergite VII	L / W	2.025 / 3.025	2.150 / 3.800	3.30 / 4.45	3.15 / 4.32
Metasoma + telson	L	17.750	20.638	24.03	24.16
Segment I	L / W / D	2.150 / 1.775 / 1.650	2.475 / 2.125 / 2.050	2.90 / 2.39 / 2.20	3.03 / 2.53 / 2.25
Segment II	L / W / D	2.750 / 1.650 / 1.525	2.975 / 1.950 / 1.950	3.70 / 2.13 / 1.98	3.48 / 2.27 / 2.20
Segment III	L / W / D	2.900 / 1.575 / 1.663	3.188 / 1.850 / 1.875	4.05 / 2.13 / 2.10	3.85 / 2.33 / 2.30
Segment IV	L / W / D	3.250 / 1.525 / 1.650	3.775 / 1.775 / 1.775	4.40 / 2.10 / 2.07	4.60 / 2.20 / 2.32
Segment V	L / W / D	3.650 / 1.520 / 1.550	4.500 / 1.750 / 1.750	5.05 / 2.05 / 2.01	4.95 / 2.15 / 2.13
Telson	L / W / D	3.050 / 1.100 / 1.125	3.725 / 1.350 / 1.375	3.93 / 1.48 / 1.45	4.25 / 1.50 / 1.61
Pedipalp	L	13.300	15.975	18.11	17.80
Femur	L / W	3.275 / 0.900	3.925 / 1.050	4.48 / 1.26	4.45 / 1.23
Patella	L / W	3.875 / 1.250	4.650 / 1.475	5.23 / 1.65	5.30 / 1.80
Chela	L	6.150	7.400	8.40	8.05
Manus	W / D	1.313 / 1.325	1.250 / 1.250	1.43 / 1.40	1.70 / 1.60
Movable finger	L	4.250	5.050	5.90	5.35
Total	L	28.08	32.76	42.08	40.87

Table 2: Measurements of *Barbaracurus winklerorum* sp. n. and *B. yemenensis* sp. n. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

ETYMOLOGY. The specific epithet honors Alexander Winkler and his wife Birgit Winkler (Munich, Germany) for their invaluable contributions to the knowledge of the scorpion fauna of Oman.

DIAGNOSIS. Total length of adult males 25–29 mm, adult females 30–34 mm. Coloration pale yellow to light orange, chelicerae yellow without reticulation. Pedipalp chela manus wider in male than female, chela length/width ratio 4.5–4.7 in males and 5.8–5.9 in females; proximal margins of pedipalp fingers of female straight (Fig. 69, 173, 192), of male weakly undulate but leave no gap with fingers closed (Figs. 67, 164, 189); dentate margin of movable finger armed with 6 rows of granules, and a short apical row of 4 denticles (Fig. 8, 180–181); most proximal granule row with one external accessory granule. Pectines with 18–20 teeth in both sexes. Hemispermaphore basal lobe a prominent scoop-like lamina (Figs. 24, 32). Metasoma narrow, metasoma V length/width ratio is 2.40–2.46 in males and 2.56–2.58 in females (Figs. 76–77); metasoma I with 10 carinae, II–IV with 8 carinae. Telson setose, bearing numerous long macrosetae and short, pointed subaculear tubercle; vesicle smooth, elongate, ellipsoidal or pyriform, telson length/depth ratio 2.70–2.72 in both sexes; aculeus slender, curved, shorter than vesicle.

DESCRIPTION. Total length of adult males 25–29 mm, of adult females 30–34 mm. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps are given in Table 2. Base color is pale yellow to light orange (Figs. 147–150, 153–181). Chelicerae are yellow without reticulation (Figs. 153–154). *Sexual dimorphism* minor, adult males with wider pedipalp chela than females, pedipalp chela length/width ratio 4.5–4.7 in males and 5.8–5.9 in females; pedipalps fingers are shorter in males, the fingers of females are straight, while those of males are proximally undulate with opposing margins that make contact and leave no gap when the fingers are closed (Figs. 67, 164); no sexual difference in length and width of metasomal segments.

PEDIPALP (Figs. 163–181, 185–193). Pedipalp mostly very sparsely hirsute, but more densely so on ventral surface of movable finger. Femur granulated, with five granulate carinae. Patella almost smooth with seven granulate carinae developed. Chela smooth with traces of carinae visible; fingers long, curved, with 7 granule rows and short apical row of 4 denticles on dentate margins; the most proximal row with one external and no internal accessory granule.

CARAPACE (Figs. 153–154, 182). Slightly trapezoidal (narrower anteriorly) and slightly longer than wide, or as long as wide; anterior margin concave, with some short microsetae. Carination absent. Median and posterior lateral furrows wide and deep, others vestigial to absent.

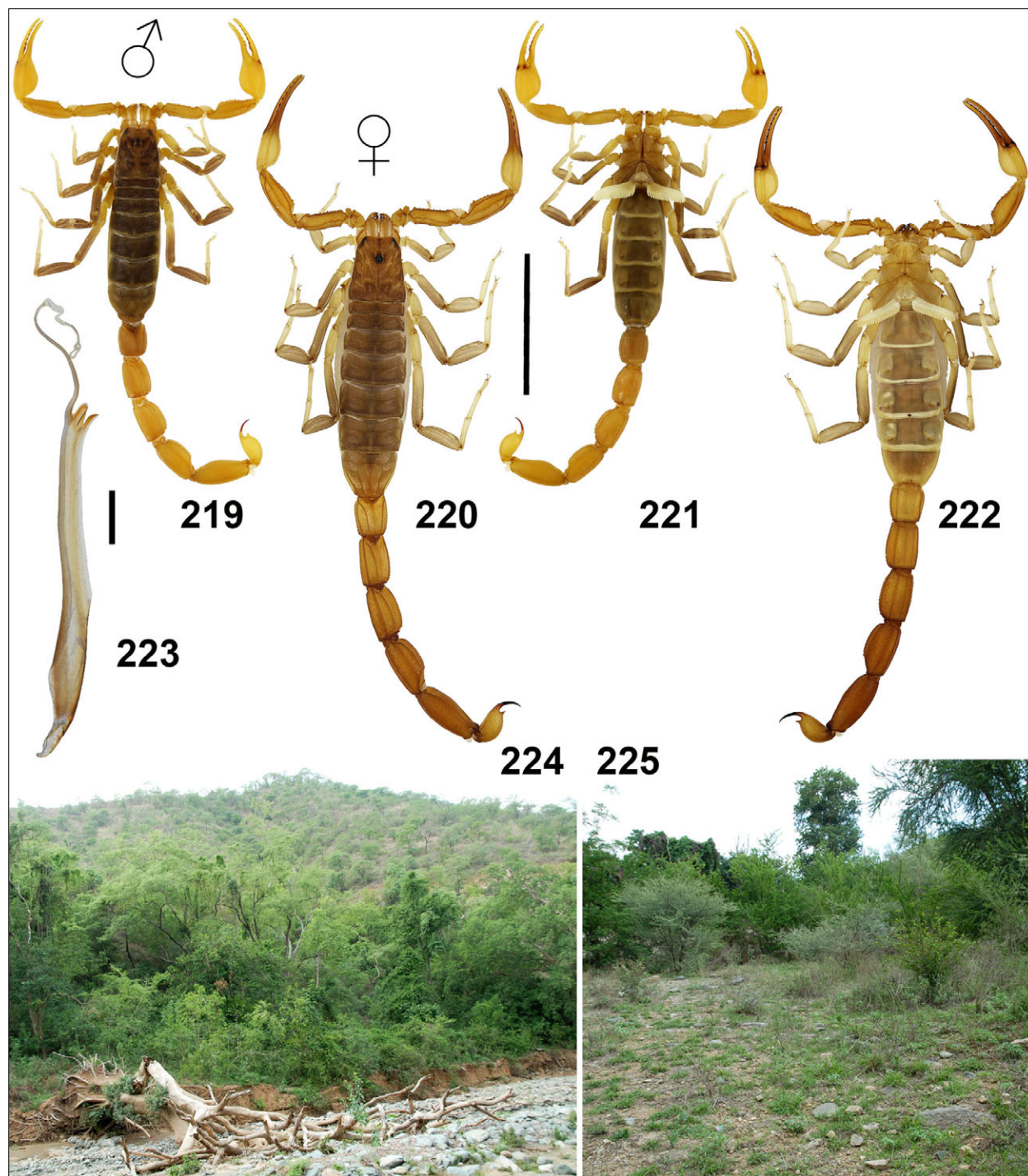
Tegument densely and coarsely granulate. Median eyes large and raised; four or five pairs of lateral eyes: three major ocelli aligned along each anterolateral corner, plus two minor ocelli that may be vestigial or absent.

MESOSOMA (Figs. 147–150, 153–156). Tergites I–VI bear a single conspicuous median carina; tergite VII bears five well-defined carinae (median, submedians and laterals), which are long and serrate to crenulate. All tergites densely and coarsely granulate mainly on posterior parts. Sternum type 1, triangular in shape; medial depression large. Pectines extending to around a quarter of sternite IV in male and third quarter of sternite III in female. Tooth count 18–20 in both sexes (mean: 19.333 5♂ combs, 19.666 6♀ combs). Pectines with 3 marginal lamellae and 7–8 middle lamellae. Sternites lacking carinae, surfaces smooth and sparsely setose. Posterior margin of sternite V without smooth median patch in both sexes. Sternite VII with four well-defined carinae, which are long and serrate to crenulate.

HEMISPHERMAPHORE (Figs. 24, 32, 151–152). Flagelliform. Trunk long, narrow, gradually widening basally. Capsule region very short, length measured from basal lobe only 9% of trunk length. Flagellum short, pars recta ca. 2.5 times length of capsule, pars reflecta tapering to thin, hyaline filament at least as long as pars recta. Sperm hemiduct with 2 elongated lobes, posterior lobe broad, subtriangular with distinct carina extending its entire length, anterior lobe narrow, more uniform in width, separated from posterior lobe by rounded aperture at base. Basal lobe forming a long, scoop-like lamina, prominently projecting from convex surface of capsule, extending along oblique, transverse axis from anterior base of posterior lobe to base of flagellum where it terminates in blunt, thickened protrusion.

LEGS (Figs. 101–102). Tarsomeres bearing two rows of macrosetae on their ventral surface and numerous macrosetae on other surfaces; bristle combs absent. Femur bearing only solitary macrosetae. Femur surface coarsely granulate, femur and patella with carinae developed. Moderate tibial spurs present on leg IV.

METASOMA AND TELSON (Figs. 76–77, 157–162, 183–184). All segments with granulate, completely developed carinae, including carinae on segment V in males. The carinae are composed of minute, rounded, equal-sized, evenly spaced granules. The first metasomal segment has a total of 10 carinae, the second through fourth segments have eight carinae, and the fifth segment has five carinae. All metasomal segments are very sparsely granulated. Metasoma is very sparsely hirsute. Telson smooth with only a weakly indicated ventral carina and a dense cover of long setae mainly on the ventral surface. Subaculear tubercle short and pointed. Vesicle elongate, ellipsoidal or pyriform, telson length/depth ratio 2.70–2.72 in both sexes. Aculeus slender, curved, shorter than vesicle.



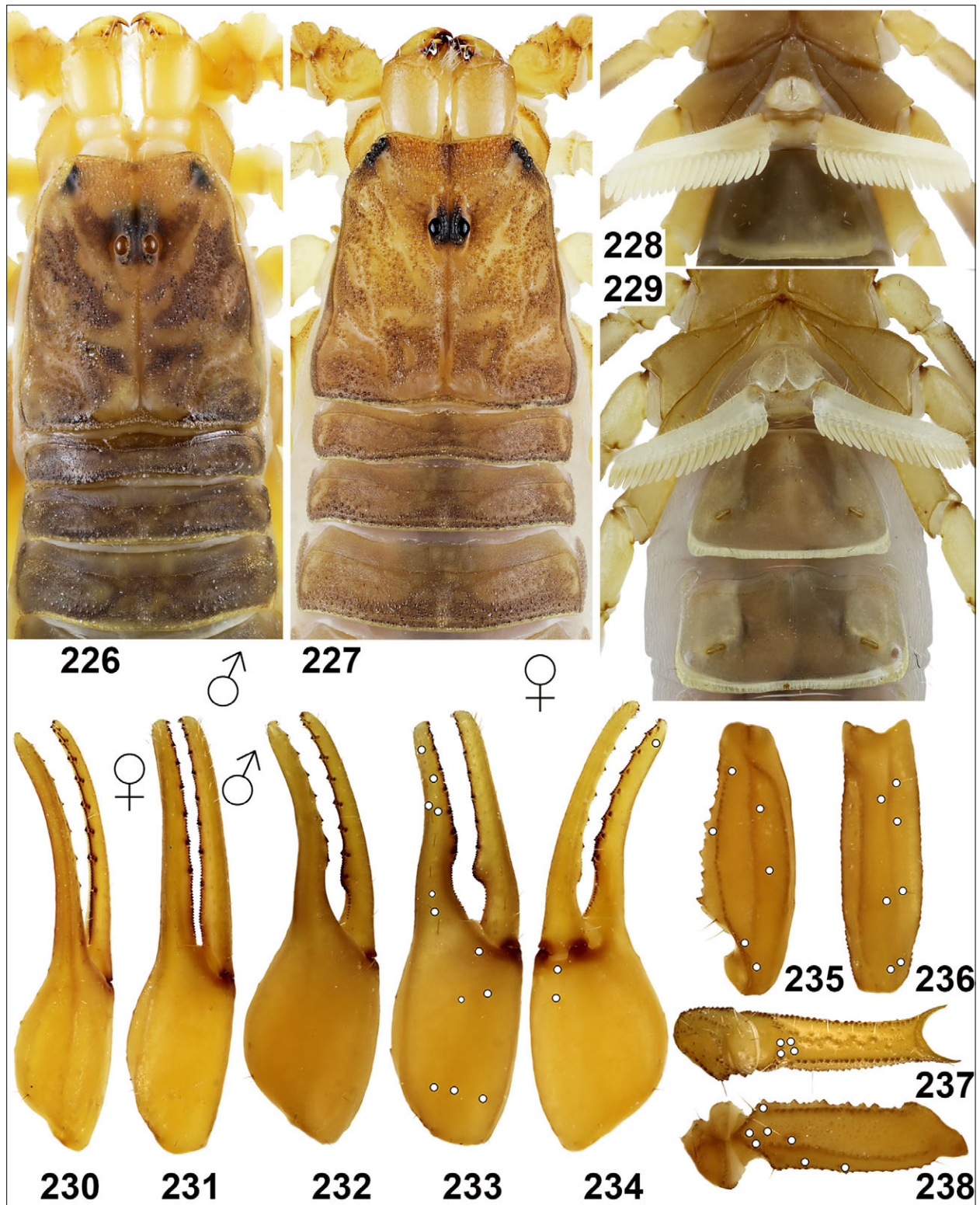
Figures 219–225: *Barbaracurus zambonellii* comb. n. from Eritrea, locality 15EH. **Figures 219, 221.** Male, dorsal (219) and ventral (221) views. **Figures 220, 222.** Female, dorsal (220) and ventral (222) views. **Figure 223.** Right hemispermatophore, convex aspect. **Figures 224–225.** Eritrea, locality 15EH. Scale bars: 10 mm (219–222), 1 mm (223).

***Barbaracurus yemenensis* sp. n.**

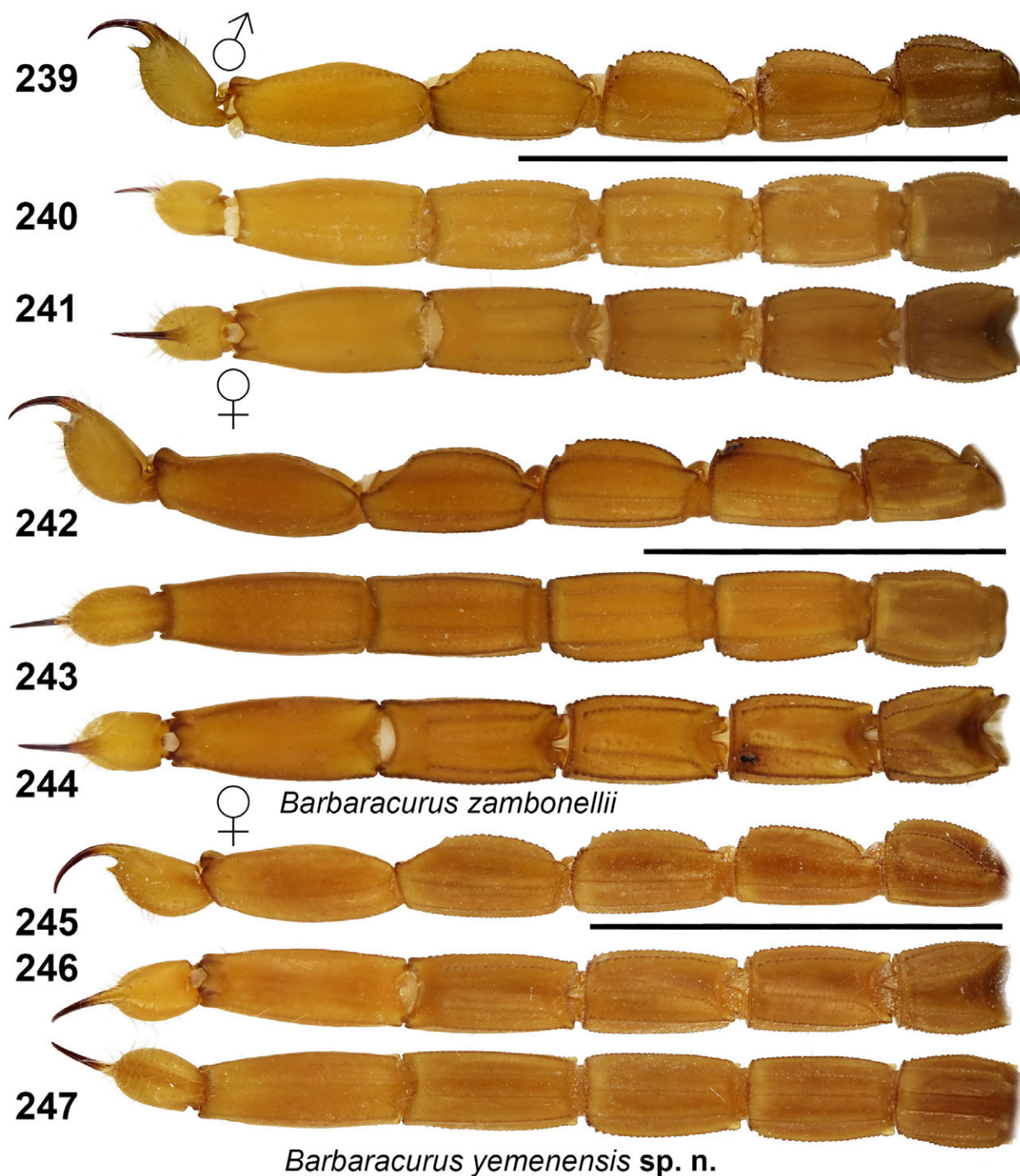
(Figures 9, 78, 87, 103–106, 206–218, 245–247, 265, Table 2)

<http://zoobank.org/urn:lsid:zoobank.org:act:FBEDE C29-0D9D-40C4-A2EE-84AC7FAA257E>

Babycurus zambonellii (in part, Yemen): Sissom, 1994: 5–6, figs. 1–7; Kovařík, 1998: 104; Fet & Lowe, 2000: 80; Kovařík, 2000: 260–261, figs. 13, 26; Lowe, 2000: 185–191; Kovařík & Whitman, 2005: 106; Hendrixson, 2006: 109.



Figures 226–238: *Barbaracurus zambonellii* comb. n. from Eritrea, locality 15EH. **Figures 226, 228, 232–238.** Male, chelicerae, carapace and tergites I–III (226), sternopectinal region and sternite III (228), pedipalp chela, dorsoexternal (232), external (233), and ventrointernal (234) views, pedipalp patella, dorsal (235) and external (236) views, pedipalp femur and trochanter internal (237) and dorsal (238) views. **Figures 227, 229–231.** Female, chelicerae, carapace and tergites I–III (227), sternopectinal region and sternites III–IV (229), pedipalp chela, dorsoexternal (230) and external (231) views. The trichobothrial pattern is indicated in Figures 233–238 (white circles).



Figures 239–247: **Figures 239–244:** *Barbaracurus zambonellii* **comb. n.** from Eritrea, locality 15EH. **Figures 239–241.** Male, metasoma and telson, lateral (239), ventral (240), and dorsal (241) views. **Figures 242–244.** Female, metasoma and telson, lateral (242), ventral (243), and dorsal (244) views. **Figures 245–247:** *Barbaracurus yemenensis* **sp. n.**, Female holotype, metasoma and telson, lateral (245), dorsal (246), and ventral (247) views. Scale bars: 10 mm (239–241, 242–244, 245–247).

TYPE LOCALITY AND TYPE DEPOSITORY. Yemen, Wadi Dawan NW Al Mukalla, 15°09'N 48°26'E, 946 m a.s.l.; FKCP.

TYPE MATERIAL EXAMINED. **Yemen**, Wadi Dawan NW Al Mukalla, 15°09'N 48°26'E, 946 m a.s.l., 3.IV.2007, 1♀ (holotype), leg. P. Kabátek, FKCP; Jabal Bura NEE

Al Hudaydah, 14°53'N 43°26'E, 557 m a.s.l. (Fig. 146), 19.-21.III.2007, 1♀ (paratype), leg. P. Kabátek, FKCP; Hajjah gov., 2.-3. XI.2007, Halhal vill. env., NE Hajjah by road, 15°43'42"N 43°37'25"E, 998 m a.s.l., (locality No. 14), 1juv. (paratype), leg. D. Král, FKCP.

ETYMOLOGY. Named after the country of occurrence.

DIAGNOSIS. Total length of adult females 40–42 mm, males unknown. Coloration pale yellow to light orange, chelicerae yellow without reticulation. Pedipalp chela length/width ratio 3.4–4.2 in females; pedipalp fingers of females straight (Fig. 211); dentate margin of movable finger armed with 7 rows of granules, and a short apical row of 4 denticles (Fig. 9); most proximal granule row with one external accessory granule. Pectines with 19–21 teeth. Metasoma very narrow, metasoma V length/width ratio is 2.30–2.46 in females (Figs. 79); metasoma I with 10 carinae, II–IV with 8 carinae. Telson setose, bearing numerous long macrosetae and short, pointed subaculear tubercle; vesicle smooth, ellipsoidal, slightly bulbous, telson length/depth ratio 2.78–2.88; aculeus slender, curved, shorter than vesicle.

DESCRIPTION. Total length of adult females 40–42 mm, males unknown. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps are given in Table 2. Base color base is pale yellow to light orange (Figs. 206–218). Chelicerae are yellow without reticulation. (Fig. 208). *Sexual dimorphism* unknown.

PEDIPALP (Figs. 210–217). Pedipalp mostly very sparsely hirsute, more densely so on ventral surface of movable finger. Femur granulated, with five granulate carinae. Patella almost smooth with seven granulate carinae. Chela smooth with traces of carinae visible; fingers long, curved, with 7 granule rows and short apical row of 4 denticles on dentate margins; the most proximal row with one external and no internal granule. Pedipalp fingers straight in females.

CARAPACE (Figs. 206, 208). Slightly trapezoidal (narrower anteriorly) and slightly longer than wide, or as long as wide; anterior margin convex, with some short microsetae. Carination absent. Median and posterior lateral furrows wide and deep, others vestigial to absent. Tegument densely and coarsely granulate. Median eyes large and raised; four or five pairs of lateral eyes: three major ocelli aligned along each anterolateral corner, plus two minor ocelli that are vestigial to absent.

MESOSOMA (Figs. 206–209). Tergites I–VI bear a single conspicuous median carina; tergite VII bears five well defined carinae (median, submedians and laterals), which are long and serrate to crenulate. All tergites densely and coarsely granulate mainly on posterior parts. Sternum type 1, triangular in shape; medial depression large. Pectines extending to around end of ster-

nite III in females. Tooth count 19–21 (mean 20, 6 ♀combs). Pectines with 3 marginal lamellae and 7 middle lamellae. Sternites lack carinae, surfaces smooth and sparsely setose. Posterior margin of sternite V without smooth median patch in both sexes. Sternite VII with four well defined carinae.

LEGS (Figs. 103–106). The tarsomeres bear two rows of macrosetae on their ventral surface and numerous macrosetae on other surfaces; bristle combs absent. Femur bears only solitary macrosetae. Femur coarsely granulate, femur and patella with carinae developed. Moderate tibial spurs present on leg IV.

METASOMA AND TELSON (Figs. 78, 87, 245–247). All segments with granulate, completely developed carinae. The carinae are composed of minute, rounded, equal-sized, and evenly spaced granules. The first metasomal segment has a total of 10 carinae, the second through fourth segments have eight carinae, and the fifth segment has five carinae. All metasomal segments are very sparsely granulated. Metasoma is very sparsely hirsute. Telson smooth with only a weak trace of a ventral carina and a dense cover of long setae mainly on the ventral surface. Subaculear tubercle short and pointed. Vesicle elongate, ellipsoidal, telson length/depth ratio 2.78–2.88 in females. Aculeus curved, shorter than vesicle.

***Barbaracurus zambonellii* (Borelli, 1902) comb. n.**

(Figures 7, 28, 36, 58–61, 79–80, 88–89, 219–244, 248–251, 261–262, 265, Table 1)

Babycurus zambonellii Borelli, 1902: 1–4; Hirst, 1907: 209; Kraepelin, 1913: 181; Caporiacco, 1947: 232; Probst, 1973: 329; Lamoral & Reynders, 1975: 498; Kovařík, 1998: 104 (in part); Fet & Lowe, 2000: 80 (in part); Lowe, 2000: 185–191 (in part); Kovařík, 2000: 260–261 (in part); Kovařík, 2003: 137 (? in part); Chiarle et al., 2012: 21.

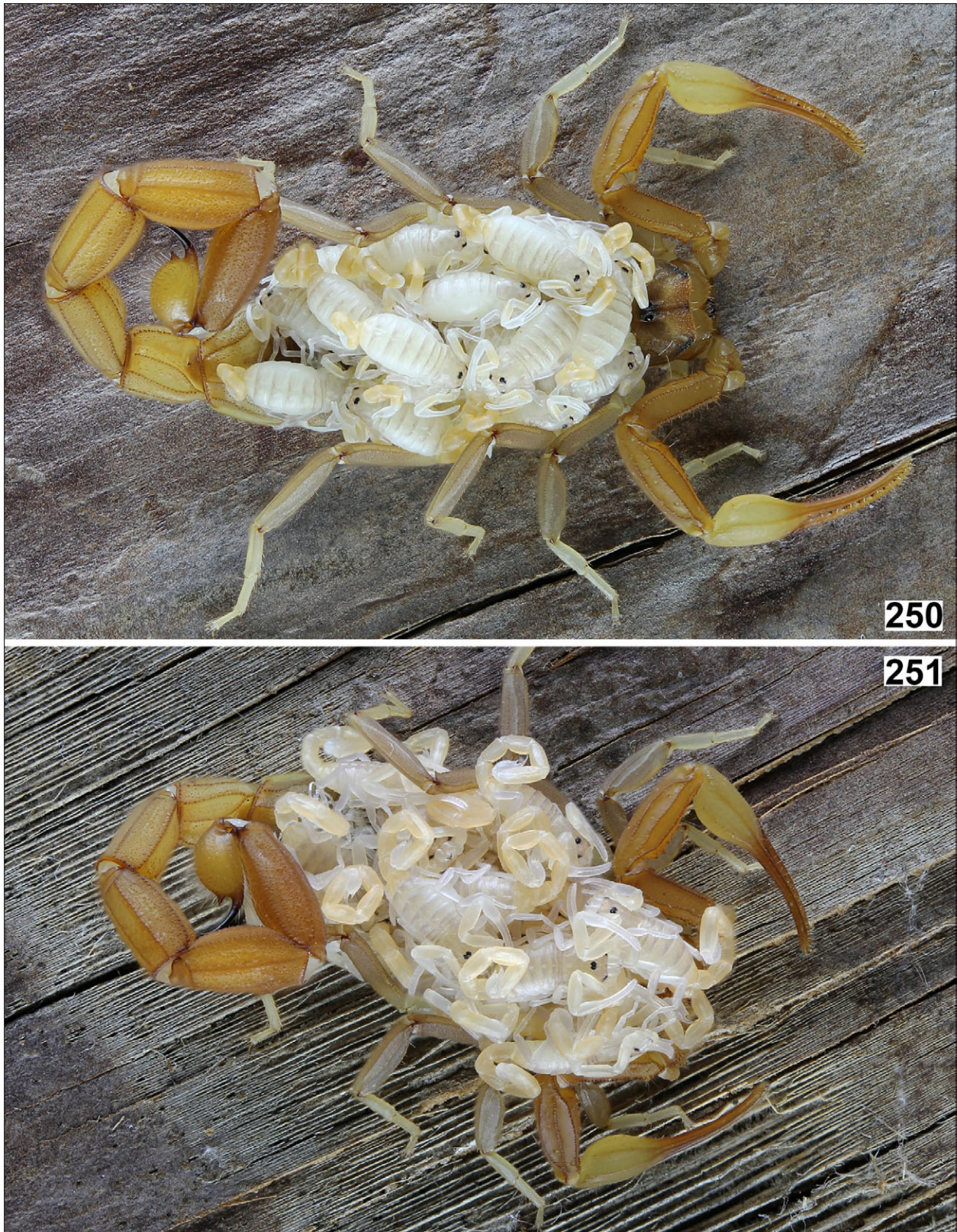
TYPE LOCALITY AND HOLOTYPE DEPOSITORY. Eritrea, Chenafena; MZUT.

MATERIAL EXAMINED. **Eritrea**, Chenafena (14.786N 39.018E), 1♀ (holotype), MZUT; Filfil, Salamuna river, 15°36'34.6"N 38°57'22.8"E, 817 m a.s.l., 3.-4.XI.2015, (Figs. 224–225, Locality No. **15EH**), 3♂3♀1♀im.3juvs. (No. 876, Figs. 28, 36, 219–223, 226–244, 258–251, 258–259), leg. F. Kovařík, FKCP.

DIAGNOSIS. Total length of adult males 32–35 mm, adult females 46–52 mm. Coloration yellowish brown to grey with darker markings, chelicerae yellow without or with traces of reticulation. Pedipalp chela manus much wider in male than female, chela length/width ratio 3.42 in males and 4.29 in female; proximal margins of pedipalp fingers of female straight (Figs. 61, 231), of male un-



Figures 248–249: *Barbaracurus zambonellii* comb. n., in vivo habitus. Male (248) and female (249) from Eritrea, locality 15EH.



Figures 250–251: *Barbaracurus zambonellii* comb. n. female with newborns (first instar) before first ecdysis (250) and female with juveniles (second instar) after first ecdysis (251) from Eritrea, locality 15EH.



Figures 252–254: *Barbaracurus exquisitus* **comb. n.** Right chelicera of male, dorsal (252), dorsointernal (253) and ventral (254) views. Paratype male, Jabal Shams, Oman, 14.X.1993. Scale bar: 500 µm.

dulate so as to leave a gap with fingers closed (Figs. 59, 233); dentate margin of movable finger armed with 7 rows of granules, and a short apical row of 3–4 denticles (Fig. 7); most proximal granule row with one external accessory granule. Pectines with 17–19 teeth in both sexes. Hemispermatophore basal lobe a weak, oblique carina (Figs. 28, 36). Metasoma narrow, metasoma V length/width ratio is 2.40–2.46 in males and 2.56–2.58 in females (Figs. 76–77); metasoma I with 10 carinae, II–IV with 8 carinae. Telson setose, bearing numerous long macrosetae and short, pointed subaculear tubercle; vesicle smooth, elongate, ellipsoidal, slightly bulbous, telson length/depth ratio 2.27–2.37 in both sexes; aculeus slender, curved, shorter than vesicle.

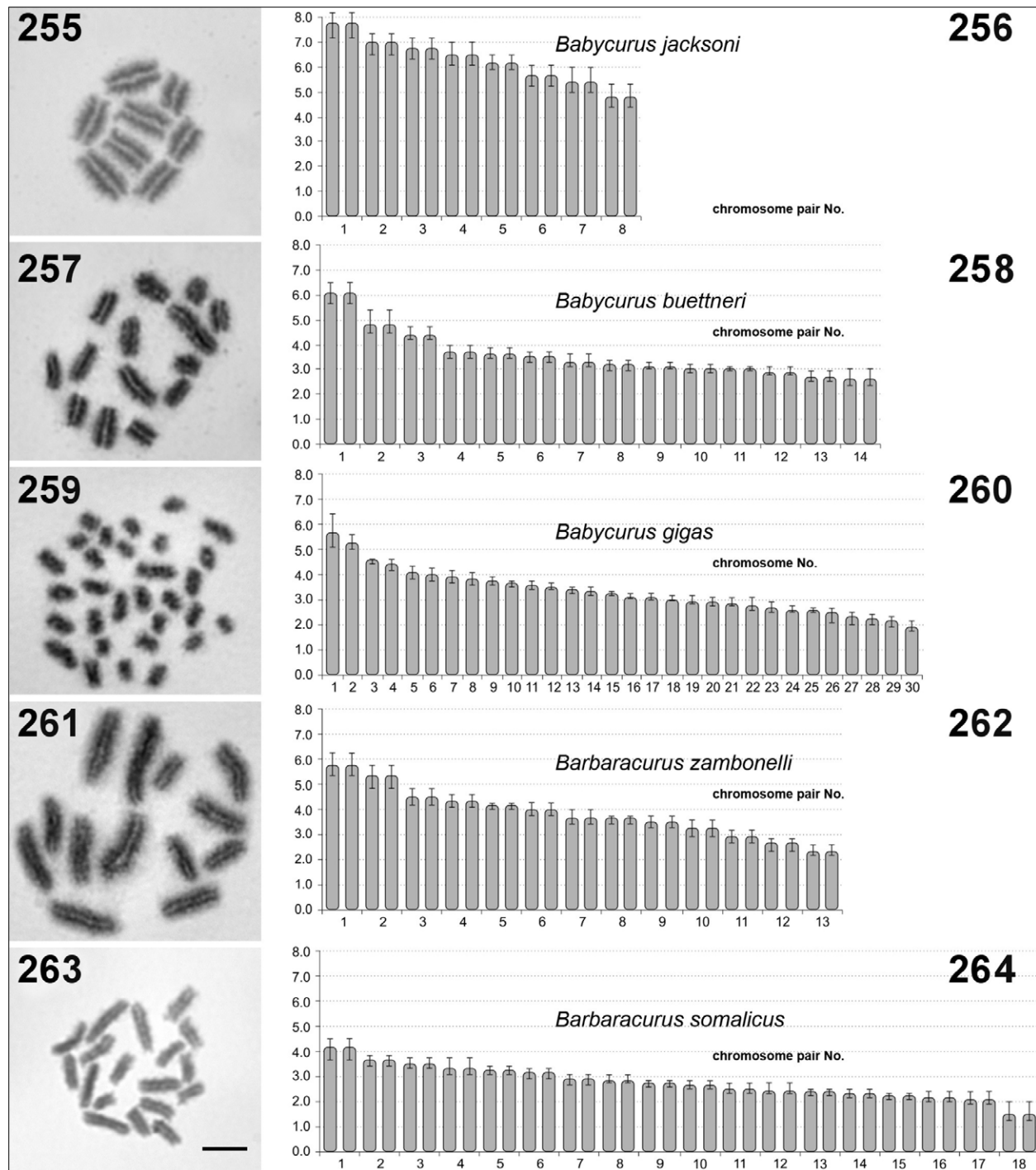
NOTE. In his original description, Borelli (1902: 3) assumed that the holotype was a male, and this was accepted by most subsequent authors. Only Lowe (2000: 190–191) questioned this assumption, observing that the holotype exhibited some characters more consistent with females of other species of *Babycurus* sensu lato, and noted that “Study of additional material is needed to clarify variation and sexual dimorphism in *B. zambonellii*”. Recently, the first author (F.K.) was able to finally settle this question by collecting additional material representing both sexes of *B. zambonellii*. The

new specimens clearly demonstrated that the holotype is indeed female, not male. *B. zambonellii* is an Eritrean endemic and the female which Sissom (1994) cited from Yemen represents a new species which we describe here as *B. yemenensis* **sp. n.**

COMMENTS ON LOCALITY AND LIFE STRATEGY. The first author (F.K.) visited the locality 15EH (Figs. 224–225), a montane, forested habitat along a riverbed of an occasional river, on 3–4 November 2015. At this locality, the author recorded a maximum daytime temperature of 30.3 °C, and minimum nighttime temperatures of 19.6 °C. The recorded humidity was between 46% and 92%. In addition to *B. zambonellii* the first author also recorded *Hottentotta minax* (L. Koch, 1875) at this locality.

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Figures 255–264: Male postpachytene (255, 257, 261, 263), mitotic metaphase (259), and ideograms (256, 258, 260, 262, 264) (y axis - % of the diploid chromosome length) of *Babycurus* (255–260) and *Barbaracurus* **gen. n.** (261–264) species. *Babycurus jacksoni* (1189), Tanzania (2n=16) (255, 256), *B. buettneri* (1190) from Cameroon, Mamba vill., 04°07.311'N 10°11.615'E (2n=28) (257, 258) and *B. gigas* (914) from Tanzania (2n=30) (259, 260); *Barbaracurus zambonelli* **comb. n.** (876) from Eritrea, locality 15EH (2n=26) (261, 262) and *B. somalicus* **comb. n.** (1332), Somaliland, locality 17SR (2n=36) (263, 264). Scale bar: 5 μ m (255, 257, 259, 261, 263).

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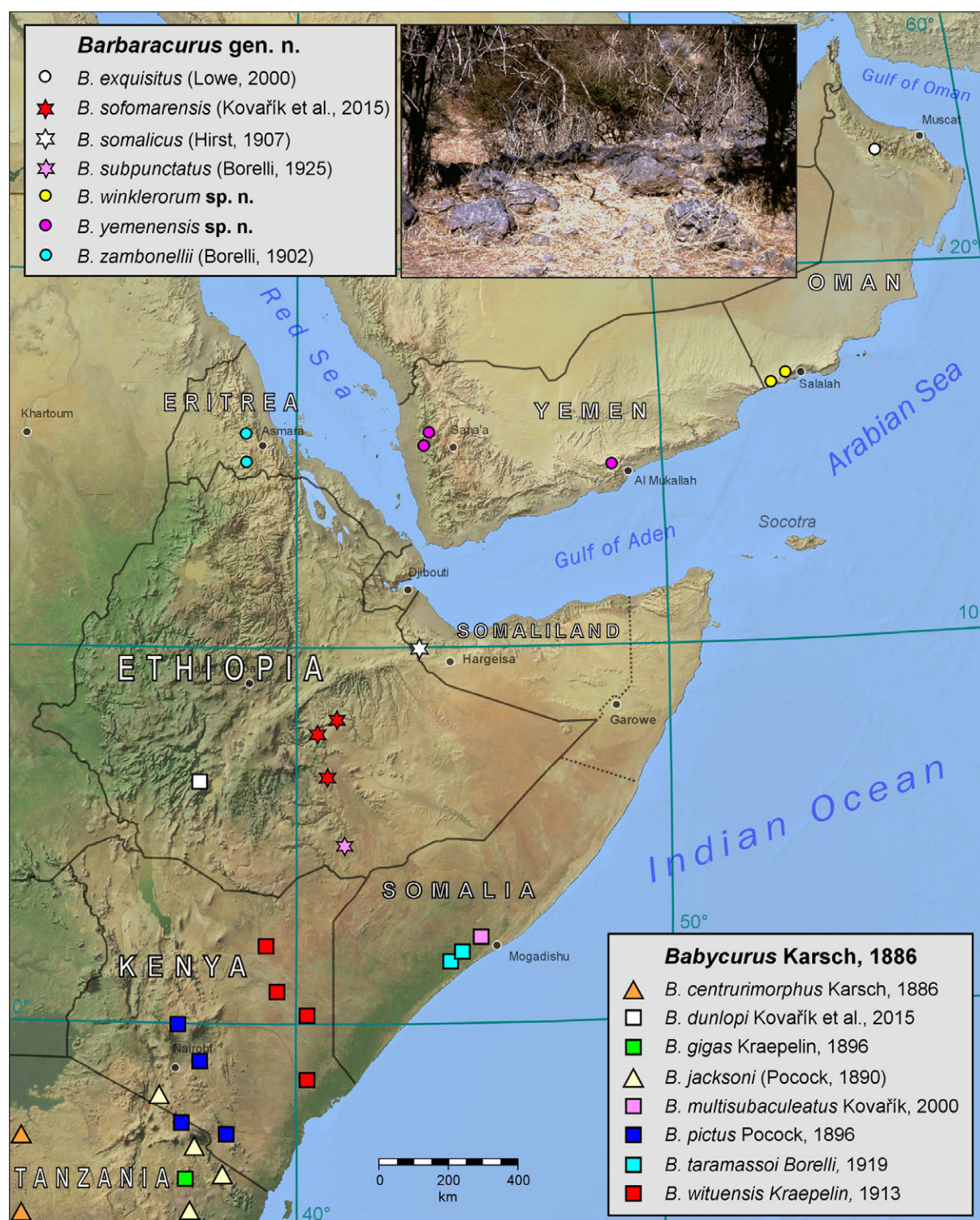


Figure 265: Map showing the known distribution of genera *Barbaracurus* gen. n. and *Babycurus* in the Arabian Peninsula, Horn of Africa, Kenya and partially in Tanzania. The upper photo inset shows the type locality of *Barbaracurus winklerorum* sp. n.

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References

- BORELLI, A. 1902. Di una nuova specie di scorpione della Colonia Eritrea. *Bollettino dei Musei di Zoologia ed Anatomia Comparata della Reale Università di Torino*, 17 (422): 1–4.
- BORELLI, A. 1925. Di alcuni Scorpioni della Somalia Italiana. *Annali del Museo Civico di Storia Naturale di Genova*, 51: 316–326.
- CAPORACCO, L. DI 1947. Scorpioni dell'Eritrea del Museo zoologici di Firenze. *Acta Pontificae Academiae Scientiarum Novi Lyncei*, 11(19): 227–233.
- CHIARLE, A., F. KOVAŘÍK, L. LEVI & E. GAVETTI. 2012. The scorpion collections (Arachnida, Scorpiones) held in the Museo Regionale di Scienze Naturali of Turin (Italy). *Arachnologische Mitteilungen*, 43: 17–23.
- ESPOSITO, L.A., H.Y. YAMAGUTI, C.A. SOUZA, R. PINTO-DA-ROCHA & L. PRENDINI. 2017. Systematic revision of the neotropical club-tailed scorpions, *Physoctonus*, *Rhopalurus*, and *Troglo-rhopalurus*, revalidation of *Heteroctenus*, and descriptions of two new genera and three new species (Buthidae: Rhopalurusinae). *Bulletin of the American Museum Of Natural History*, 145: 1–134.
- FET, V. & G. LOWE. 2000. Family Buthidae C. L. Koch, 1837. Pp. 54–286 in Fet, V., W. D. Sissom, G. Lowe & M. E. Braunwalder. *Catalog of the Scorpions of the World (1758–1998)*. New York: The New York Entomological Society, 689 pp.
- FET, V., M.E. SOLEGLAD & G. LOWE. 2005. A new trichobothrial character for the high-level systematics of Buthoidea (Scorpiones: Buthida). *Euscorpius*, 23: 1–40.
- HENDRIXSON, B.E. 2006. Buthid scorpions of Saudi Arabia, with notes on other families (Scorpiones: Buthidae, Liochelidae, Scorpionidae). *Fauna of Arabia*, 21: 33–120.
- HIRST, S. 1907. Notes on scorpions, with descriptions of two new species. *Annals and Magazine of Natural History*, VII(19): 208–211.
- KARSCH, F. 1886. Skorpionologische Beiträge. *Berliner Entomologische Zeitschrift*, 30: 75–79.
- KOVAŘÍK, F. 1998. *Štíři [Scorpiones]*. Jihlava (Czech Republic): Publishing House "Madagaskar", 176 pp (in Czech).
- KOVAŘÍK, F. 2000. Revision of *Babycurus* with descriptions of three new species (Scorpiones: Buthidae). *Acta Societatis Zoologicae Bohemicae*, 64: 235–265.
- KOVAŘÍK, F. 2003. Scorpions of Djibouti, Eritrea, Ethiopia, and Somalia (Arachnida: Scorpiones) with a key and descriptions of three new species. *Acta Societatis Zoologicae Bohemicae*, 67: 133–159.
- KOVAŘÍK, F. 2009. *Illustrated catalog of scorpions. Part I. Introductory remarks; keys to families and genera; subfamily Scorpioninae with keys to Heterometrus and Pandinus species*. Prague: Clairon Production, 170 pp.
- KOVAŘÍK, F. 2011. *Buthus awashensis* sp. n. from Ethiopia (Scorpiones, Buthidae). *Euscorpius*, 128: 1–6.
- KOVAŘÍK, F., G. LOWE, P. JUST, A. I. AWALE, H. SH. A. ELMİ & F. ŠTÁHLAVSKÝ. 2018. Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part XVI. Review of the genus *Gint* Kovařík et al., 2013, with description of three new species from Somaliland (Scorpiones, Buthidae). *Euscorpius*, 258: 1–41.
- KOVAŘÍK, F., G. LOWE, M. SEITER, J. PLÍŠKOVÁ & F. ŠTÁHLAVSKÝ. 2015. Scorpions of Ethiopia (Arachnida: Scorpiones), Part II. Genus *Babycurus* Karsch, 1886 (Buthidae), with description of two new species. *Euscorpius*, 196: 1–31.
- KOVAŘÍK, F. & A. A. OJANGUREN AFFILASTRO. 2013. *Illustrated catalog of scorpions. Part II. Bothriuridae; Chaerilidae; Buthidae I. Genera Compsobuthus, Hottentotta, Isometrus, Lychas, and Sassanidotus*. Prague: Clairon Production, 400 pp.

- KOVAŘÍK, F., F. ŠTÁHLAVSKÝ, T. KOŘÍNKOVÁ, J. KRÁL & T. VAN DER ENDE. 2009. *Tityus ythieri* Lourenço, 2007 is a synonym of *Tityus magnimanus* Pocock, 1897 (Scorpiones: Buthidae): a combined approach using morphology, hybridization experiments, chromosomes, and mitochondrial DNA. *Euscorpius*, 77: 1–12.
- KOVAŘÍK, F. & S. WHITMAN 2005. Cataloghi del Museo di Storia Naturale dell'Università di Firenze – sezione di zoologia «La Specola» XXII. Arachnida Scorpiones. Tipi. Addenda (1998–2004) e checklist della collezione (Euscorpiinae esclusi). *Atti della Società Toscana di Scienze Naturali, Memorie*, serie B, 111 (2004): 103–119.
- KRAEPELIN, K. 1891. Revision der Skorpione. I. Die Familie des Androctonidae. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, 8(1890): 144–286 (1–144).
- KRAEPELIN, K. 1895. Nachtrag zu Theil I der Revision der Skorpione. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, 12(1894): 73–96.
- KRAEPELIN, K. 1898. Neue Pedipalpen und Scorpione des Hamburger Museums. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, 15: 39–44.
- KRAEPELIN, K. 1898. Die Skorpione Ostafrikas. In K. Moebius (ed), *Die Thierwelt Ost-Afrikas und der Nachbargebiete Wirbellose Thiere Berlin*, 4(5): 1–5.
- KRAEPELIN, K. 1899. Scorpiones und Pedipalpi. In: F. DAHL (ed.), *Das Tierreich. Herausgegeben von der Deutschen Zoologischen Gesellschaft*. Berlin: R. Friedländer und Sohn Verlag, 8. Lieferung. 265 pp.
- KRAEPELIN, K. 1913. Neue Beiträge zur Systematik der Gliederspinnen. III. A. Bemerkungen zur Skorpionenfauna Indiens. B. Die Skorpione, Pedipalpen und Solifugen Deutsch-Ostafrikas. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, 30: 123–196.
- LAMORAL, B. H. & S. REYNDERS 1975. A catalogue of the scorpions described from the Ethiopian Faunal Region up to December 1973. *Annals of the Natal Museum*, 22: 489–576.
- LORIA, S.F. & L. PRENDINI. 2014. Homology of the lateral eyes of Scorpiones: a six-ocellus model. *PLoS ONE* 9(12): e112913.
- LORIA, S.F. & L. PRENDINI. 2018. Ultrastructural comparison of the eyespot and ocelli of scorpions, and implications for the systematics of Chaerilidae Pocock, 1893. *Zoologischer Anzeiger*, 273: 183–191.
- LOURENÇO, W.R. 1985. Le véritable statut des genres *Ananteris* Thorell, 1891 et *Ananteroides* Borelli, 1911 (Scorpiones, Buthidae). *Annals of Natal Museum*, 26 (2): 407–416.
- LOURENÇO, W. R. 2013. A new species of *Babycurus* Karsch, 1886 from northern Cameroon (Scorpiones: Buthidae). *Arthropoda Selecta*, 22 (4): 343–348.
- LOURENÇO W. R. & A. ROSSI. 2017. A new species of *Babycurus* Karsch, 1886 from dry savannahs in Central African Republic (Scorpiones: Buthidae). *Onychium*, 13: 3–8.
- LOWE, G. 2000. A new species of *Babycurus* (Scorpiones: Buthidae) from northern Oman. *Entomological News*, 111: 185–192.
- LOWE, G. 2010. Two new species of *Hottentotta* Birula, 1908 (Scorpiones: Buthidae) from northern Oman. *Euscorpius*, 103: 1–23.
- PLÍŠKOVÁ, J., F. KOVAŘÍK, O. KOŠULIČ & F. ŠTÁHLAVSKÝ. 2016. Description of a new species of *Heterometrus* Ehrenberg, 1828 (Scorpiones: Scorpionidae) from Thailand with remarks about the utilization of cytogenetic data in taxonomy of the genus. *Annales Zoologici (Warszawa)*, 66(3): 467–476.
- POCOCK, R. I. 1890. A revision of the genera of scorpions of the family Buthidae, with descriptions of some South-African species. *Proceedings of the Zoological Society of London*, 1890: 114–141.
- POCOCK, R. I. 1896. On the Scorpions, Centipedes, and Millipedes obtained by Dr. Gregory on his Expedition to Mount Kenia, East Africa. *Annals and Magazine of Natural History*, (6) 17: 425–444.
- POCOCK, R. I. 1899. On the scorpions, pedipalps, and spiders from tropical West Africa represented in the collection of the British Museum. *Proceedings of the Zoological Society of London*, 1899: 833–885.
- PRENDINI, L. 2004. On the scorpions of Gabon and neighboring countries, with a reassessment of the synonyms attributed to *Babycurus buettneri* Karsch and a redescription of *Babycurus melanicus* Kovařík. *California Academy of Sciences Memoir*, 28: 235–267.

- PRENDINI, L., E.S. VOLSCHEK, S. MAALIKI & A.V. GROMOV. 2006. A 'living fossil' from Central Asia: The morphology of *Pseudochactas ovchinnikovi* Gromov, 1998 (Scorpiones: Pseudochactidae), with comments on its phylogenetic position. *Zoologischer Anzeiger*, 245 (3-4): 211–248.
- PROBST, P. 1973. A review of the scorpions of East Africa with special regard to Kenya and Tanzania. *Acta Tropica*, 30: 312–335.
- SAKAMOTO, Y. & A. A. ZACARO. 2009. LEVAN, an ImageJ plugin for morphological cytogenetic analysis of mitotic and meiotic chromosomes. Available at: <http://rsbweb.nih.gov/ij/plugins/levan/levan.html>. Accessed 3rd June 2016.
- SCHNEIDER, M. C., A. A. ZACARO, R. PINTO-DARROCHA, D. M. CANDIDO & D. M. CELLA. 2009a. Complex meiotic configuration of the holocentric chromosomes: the intriguing case of the scorpion *Tityus bahiensis*. *Chromosome Research*, 17(7): 883–898.
- SCHNEIDER, M. C., A. A. ZACARO, R. PINTO-DARROCHA, D. M. CANDIDO & D. M. CELLA. 2009b. A comparative cytogenetic analysis of 2 Bothriuridae species and overview of the chromosome data of Scorpiones. *Journal of Heredity*, 100: 545–555.
- SHARMA, P.P., R. FERNÁNDEZ, L.A. ESPOSITO, E. GONZÁLEZ-SANTILLÁN & L. MONOD. 2015. Phylogenomic resolution of scorpions reveals multilevel discordance with morphological phylogenetic signal. *Royal Society Proceedings. Biological Sciences*, 282 (1804): 2014–2953.
- SISSOM, W. D. 1990. Systematics, biogeography and paleontology. Pp. 64–160 in POLIS, G. A. (Ed.) *The Biology of Scorpions*. Stanford University Press, Stanford, California.
- SISSOM, W. D. 1994. Descriptions of new and poorly known scorpions of Yemen (Scorpiones: Buthidae, Diplocentridae, Scorpionidae). *Fauna of Saudi Arabia*, 14: 3–39.
- SOLEGLAD, M. E. & V. FET 2003a. The scorpion sternum: structure and phylogeny (Scorpiones: Orthosterni). *Euscorpius*, 5: 1–34.
- SOLEGLAD, M. E. & V. FET 2003b. High-level systematics and phylogeny of the extant scorpions (Scorpiones: Orthosterni). *Euscorpius*, 11: 1–175.
- STAHNKE, H. L. 1971. Scorpion nomenclature and mensuration. *Entomological News*, 81: 297–316.
- VACHON, M. 1940. Voyage en A. O. F. de L. Berland et J. Millot. Scorpions. V. *Bull. Soc. Zool. France* 65: 170–184.
- VACHON, M. 1963. De l'utilité, en systématique, d'une nomenclature des dents de chélicères chez les scorpions. *Bulletin du Muséum National d'Histoire Naturelle, Paris*, (2), 35 (2): 161–166.
- VACHON, M. 1974. Études des caractères utilisés pour classer les familles et les genres des scorpions (Arachnides). 1. La trichobothriotaxie en arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. *Bulletin du Muséum national d'Histoire naturelle*, 3e série, 140 (Zoologie, 104): 857–958.
- VACHON, M. 1975. Sur l'utilisation de la trichobothriotaxie du bras des pedipalps des Scorpions (Arachnides) dans le classement des genres de famille des Buthidae Simon. *Compte rendus hebdomadaires des séances de l'Académie des Sciences, Paris Ser.D Sciences Naturelles*, 281 (21): 1597–1599.
- WEIDNER, H. 1959. Die Entomologischen Sammlungen des Zoologischen Staatsinstituts und Zoologischen Museums Hamburg, I. Teil, Pararthropoda und Chelicerata I. *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut*, 57: 89–142.