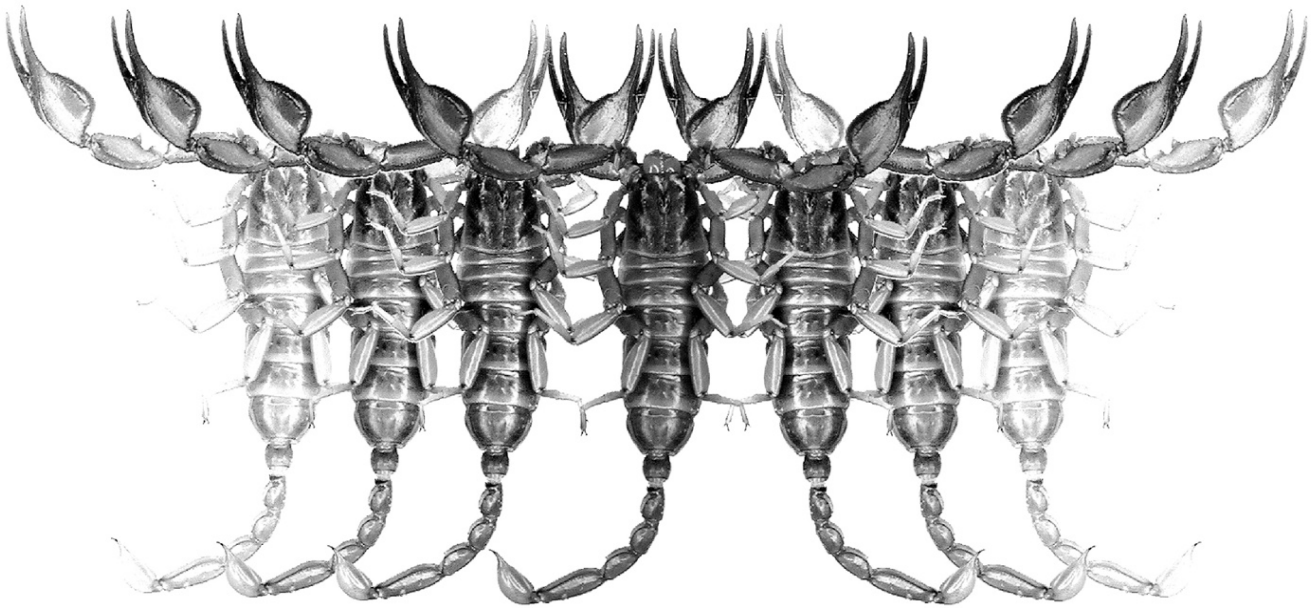


# ***Euscorpius***

**Occasional Publications in Scorpiology**



***Fetilinia dentator* gen. et sp. n. from Pakistan  
(Scorpiones: Buthidae)**

**Graeme Lowe & František Kovařík**

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# *Euscorpius*

## *Occasional Publications in Scorpiology*

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## *Fetilia dentator* gen. et sp. n. from Pakistan (Scorpiones: Buthidae)

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<http://zoobank.org/urn:lsid:zoobank.org:pub:4BB5A302-E475-4CFB-B7B9-73640C9E8F09>

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### Summary

We describe from northern Pakistan a new buthid genus *Fetilia* gen. n., monotypic with type species *F. dentator* sp. n., belonging to the Palearctic ‘*Buthus*’ group. It bears some similarities to *Kraepelinia* Vachon, 1974, in having enlarged metasomal dentition, and to *Orthochirus* Karsch, 1891, and related genera in having a trapezoidal carapace and small abbreviated pedipalps.

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### Introduction

In the buthid family, the ‘*Buthus*’ group comprises a major clade of predominantly Palearctic taxa, plus a few representatives in the Afrotropical and Oriental regions (Fet et al., 2005; Štáhlavský et al., 2020). It is believed to have descended from an ancient Laurasian lineage that radiated into arid environments during the Tertiary. The group includes the highest number of currently recognized genera (45 out of 99 genera) among all of the six major buthoid clades resolved by the cladistic analysis of Fet et al. (2005). Here we add another eastern genus to this widespread group: *Fetilia* gen. n., monotypic with type species *F. dentator* sp. n. This is a small scorpion bearing some resemblance to *Orthochirus* Karsch, 1891 and similar genera (an informal ‘orthochiroid’ complex), but differing from them in having a strongly dentate metasoma resembling that of another monotypic genus of the ‘*Buthus*’ group, *Kraepelinia* Vachon, 1974, from Iran and Turkmenistan. *Fetilia* gen. n. is known only from its type locality near the Bannu Basin, a hot arid depression in the Upper Indus Basin of northern Pakistan.

### Methods, Material & Abbreviations

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

*Specimen Depositories*: GLPC (Graeme Lowe, private collection, Auckland, new Zealand); 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).

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

### Systematics

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

##### *Fetilia* gen. n.

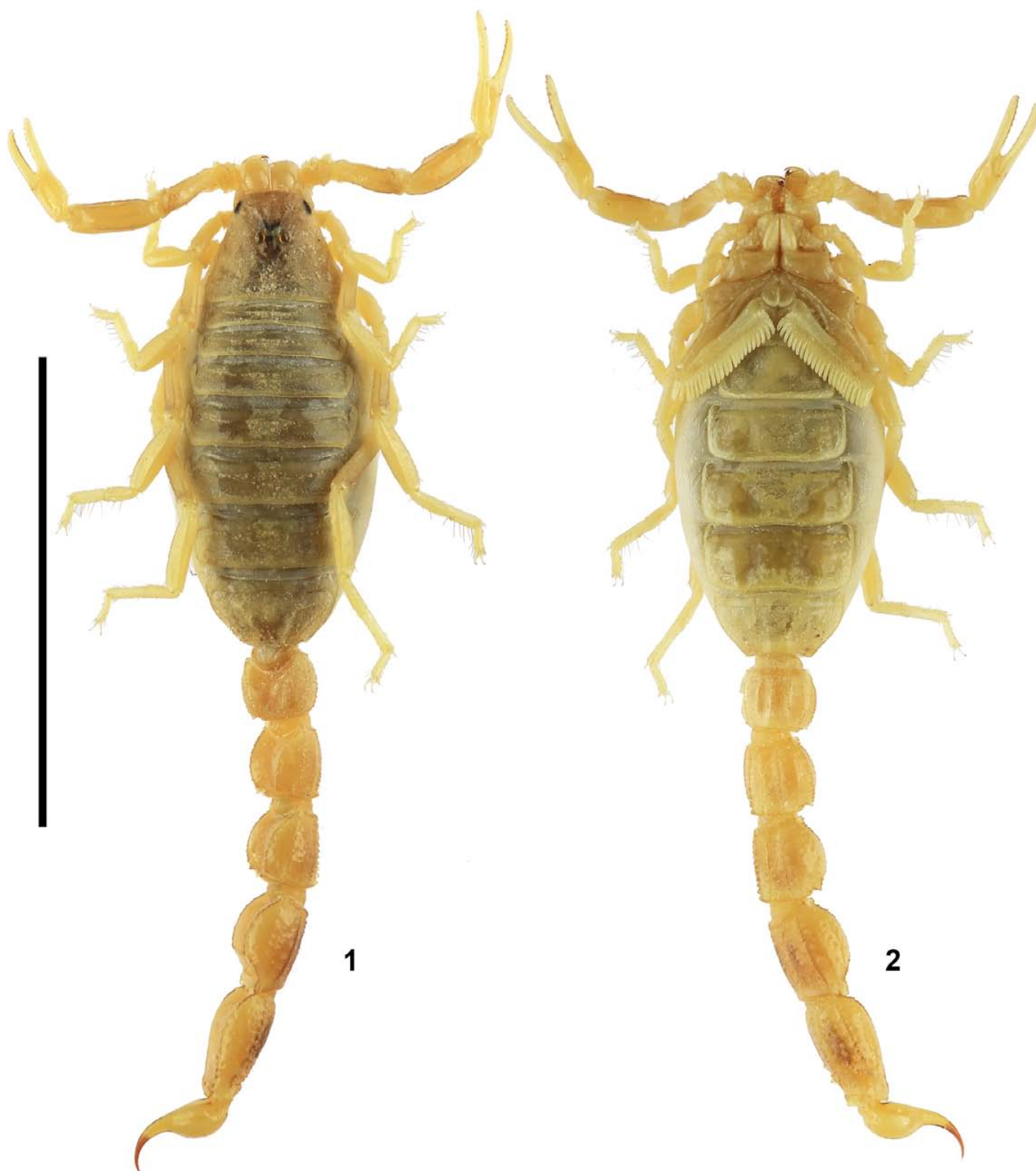
(Figures 1–31, Table 1)

<http://zoobank.org/urn:lsid:zoobank.org:act:4AC13359-2795-4F1B-A8A3-488CA834199D>

TYPE SPECIES. *Fetilia dentator* sp. n.

**ETYMOLOGY.** The generic epithet *Fetilia* (masculine; constructed to rhyme with *Kraepelinia*, a similar genus) is a patronym honoring Victor Fet (USA) in recognition of his many important contributions to the knowledge of scorpions and his generous support of many scorpologists. *Kraepelinia* is a very special genus for VF who published its first record from Turkmenistan where he started his scorpological career (Fet, 1984). At the time, the only known specimen of *K. palpator* (Birula, 1903) from Turkmenistan was collected in 1972 by Yuri Gorelov (1933–2018), an outstanding naturalist, whose life and work in Central Asia (Badkhyz Natural Reserve) has been an inspiration and role model for many young Russian zoologists, including VF.

**DIAGNOSIS.** Adult size small, total length of subadult male 22 mm. Carapace trapezoidal, densely granulate, without carinae, anterior margin almost straight; median eyes large, ocular tubercle raised; five pairs of lateral eyes present, two reduced in size. Sternum type 1, relatively small, and triangular to subpentagonal in shape; posterior depression very large and deep. Pectines large, with 23–23 teeth in subadult male and 19–19 teeth in juvenile female; fulcra present. Tergites I–VI tricarinate, all tergites densely granulate. Sternites with slit-like spiracles; sternite V without a well-defined smooth patch; sternite VII with weak carinae.



Figures 1–2. *Fetilia dentator* gen. et sp. n., subadult male holotype in dorsal (1) and ventral (2) views. Scale bar: 10 mm.

Dimensions (mm)		<i>Fetilia dentator</i> gen. et sp. n.	<i>Fetilia dentator</i> gen. et sp. n.
		♂ subadult, holotype	♀ juvenile, paratype
Carapace	L / W	2.41 / 3.03	2.46 / 3.18
Mesosoma	L	7.50	7.56
Tergite VII	L / W	1.64 / 3.00	1.57 / 3.04
Metasoma + telson	L	12.05	12.30
Segment I	L / W / D	1.45 / 1.75 / 1.43	1.47 / 1.77 / 1.49
Segment II	L / W / D	1.68 / 1.70 / 1.50	1.73 / 1.73 / 1.50
Segment III	L / W / D	1.80 / 1.74 / 1.53	1.88 / 1.74 / 1.55
Segment IV	L / W / D	2.23 / 1.73 / 1.42	2.25 / 1.75 / 1.48
Segment V	L / W / D	2.51 / 1.67 / 1.15	2.60 / 1.68 / 1.20
Telson	L / W / D	2.38 / 0.96 / 0.73	2.37 / 0.97 / 0.81
Pedipalp	L	6.60	6.69
Femur	L / W	1.67 / 0.58	1.74 / 0.62
Patella	L / W	2.10 / 0.78	2.08 / 0.78
Chela	L	2.83	2.87
Manus	W / D	0.56 / 0.54	0.60 / 0.57
Movable finger	L	1.75	1.85
<b>Total</b>	<b>L</b>	<b>21.96</b>	<b>22.32</b>

**Table 1.** Comparative measurements of types of *Fetilia dentator* gen. et sp. n. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

Metasomal segments relatively short and stout, nearly uniform in width, with carination well developed; metasoma I–III with 8–10 carinae; metasoma II–III with enlarged dentition on ventrolateral and ventromedian carinae; metasoma V with irregular, enlarged lobate dentition on ventrolateral carinae; posterior margins of tergite VII and metasoma I–III with fine fringes of microsetae. Telson with elongate vesicle, aculeus stout, about same length as vesicle, subaculear tubercle absent. Cheliceral dentition follows typical buthid pattern (Vachon, 1963), fixed finger with two denticles on ventral surface. Pedipalps slender, chelae narrower than patella; trichobothrial pattern neobothriotaxic type C, femur with trichobothrium  $d_2$  absent,  $d_1$ – $d_3$ – $d_4$  arranged in  $\beta$ -configuration (non-reflex angle opening internally), patella  $d_3$  located between dorsomedian and dorsointernal carinae, chela manus  $Eb_1$ – $Eb_2$ – $Eb_3$  in  $\delta$ -configuration (non-reflex angle opening distally),  $V_1$ – $V_2$  axis slightly inclined internally,  $eb$  on distal manus (not fixed finger), fixed finger with  $db$  situated near base of finger and distal to  $est$ ,  $dt$  at mid-finger and level with  $et$ ; dentate margins of pedipalp fingers straight, without lobe/ notch combination, equipped with 8 rows of median denticles arranged nearly linearly, non-imbricated, each flanked by a single external and internal accessory granule; 5 subterminal granules. Legs I–III with tibia and tarsi short, curved, flat, with setation modified into bristlecombs on basitarsi only, telotarsi with two rows of long setae on ventral surface; tibial spurs moderate, tarsal spurs well-developed.

**AFFINITIES.** *Fetilia* gen. n. belongs to the Palearctic ‘*Buthus*’ group of Fet et al., 2005, according to the following characters: trichobothrial pattern type A- $\beta$ ; patella trichobothrium  $d_3$  internal to dorsomedian carina, manus  $Eb_1$ – $Eb_2$ – $Eb_3$  in  $\delta$  configuration;

tibial spurs present on legs III–IV; pedipalp chela finger median denticle rows non-imbricated; and posterior margins of tergite VII & metasoma I–III bearing fringes of microsetae. Within this group, it is similar to another small monotypic genus, *Kraepelinia* Vachon, 1974, which also has: enlarged dentition on ventrolateral and ventromedian carinae of metasoma II–III; irregular, enlarged lobate dentition on ventrolateral carinae of metasoma V; and trichobothrium  $eb$  located on distal manus. However, *Kraepelinia* differs from *Fetilia* gen. n. in several other characters: thickened pedipalp fingers that are atypical for buthids; smooth carapace and tergites; metasoma V with large, lobate denticles on ventral surface; telson bulbous and granulate. *Fetilia* gen. n. is also similar to five other small ‘*Buthus*’ group genera: *Butheolus* Simon, 1882, *Orthochirus* Karsch, 1891, *Baloorthochirus* Kovařík, 1996, *Orthochiroides* Kovařík, 1998, and *Xenobuthus* Lowe, 2018. These display a similar habitus, with a trapezoidal carapace and small, short pedipalps. *Orthochirus* and *Orthochiroides* have telson shapes quite similar to that of *Fetilia* gen. n., but they differ in having metasomal segments IV–V dilated and punctate. *Butheolus*, *Xenobuthus* and *Orthochiroides* differ in having bulbous telsons. All five of these genera further differ in lacking enlarged or lobate metasomal dentition. It is possible that *Fetilia* gen. n. is phylogenetically associated with this ‘orthochiroid’ complex, but has evolved its own specialized metasomal structure. The pattern of enlarged metasomal dentition in *Kraepelinia* and *Fetilia* gen. n. also occurs in several other ‘*Buthus*’ group genera: *Buthus* Leach, 1815, *Femtobuthus* Lowe, 2010, *Odontobuthus* Vachon, 1950, *Pantobuthus* Lourenço & Duhem, 2009, and *Trypanothacus* Lowe, Kovařík, Stockmann & Šťáhlavský, 2019, and seems to be an adaptation of burrowing scorpions (Lowe et al., 2019).

REMARKS. We based *Fetilia* **gen. n.** on two type specimens, an immature (subadult) male and a juvenile female. Immaturity of the male is evidenced by a laterally swollen mesosoma in a well fed individual, a condition typical of immatures of many other scorpions that we have reared. The characters supporting an affinity with the 'orthochoirid' complex of small scorpions (most ca. 25–40 mm), imply that the adult of *Fetilia* **gen. n.** is also likely to be small in size. The size, strongly granulated integument and pectinal tooth count of the male are consistent with a late instar subadult, one ecdysis before maturity. Even if it were an earlier instar, the characters of trapezoidal carapace and small, short pedipalps are also partially present in early juveniles of 'orthochoirid' complex scorpions. However, caution is certainly advisable when diagnosing a new genus from immature specimens. We therefore considered the alternative interpretation, that the type specimens represent earlier instars of a larger scorpion belonging to an already existing genus in the '*Buthus*' group. A conspicuously dentate metasoma is usually present in early instars of species that exhibit this character in adults. This narrows the list of likely alternative taxa known from this geographic region to four genera: *Kraepelinia*, *Buthus*, *Mesobuthus* or *Pantobuthus*. Could *Fetilia* **gen. n.** be an early instar juvenile of one of those genera? The slender pedipalps and elongate telson vesicle of *Fetilia* **gen. n.** are quite different from the robust pedipalps and bulbous telson typical of those four genera. However, these structures can often be quite tenuous in early instars, and later develop to become robust in adults. *Kraepelinia palpator* is a relatively small scorpion, with adult carapace length ca. 4 mm (Birula, 1903; Lourenço & Leguin, 2010), which would predict an adult body length of ca. 35 mm. We studied a subadult male *Kraepelinia* with carapace length 2.9 mm and body length 24 mm, similar in size to the subadult male of *Fetilia* **gen. n.** (Figs. 30–35). The thickened pedipalp fingers and bulbous telson that are unique diagnostic characters of *Kraepelinia* are already strongly expressed in the subadult, showing that *Fetilia* **gen. n.** is not a juvenile of this genus. The other genera in question (*Buthus*, *Mesobuthus*, *Pantobuthus*) possess a subrectangular carapace, a shape that differs markedly from the strongly trapezoidal carapace of *Fetilia* **gen. n.** An ontogenetic change from trapezoidal in juveniles to subrectangular in adults is implausible, being the reverse of the predicted polarity of such transformations (i.e., from primitive to derived). Another argument against *Fetilia* **gen. n.** being a juvenile of the other genera stems from their differing trichobothriotaxy, which would violate the established rule that trichobothrial patterns are nearly always conserved ontogenetically (Vachon, 1974). In *Pantobuthus*, and most *Buthus* and *Mesobuthus*, fixed finger trichobothrium *db* is located distal to *et*, whereas it is level with or proximal to *dt* in *Fetilia* **gen. n.** Distal translocation of *db* is typically associated with stretching and elongation of chela fingers, a trend that opposes the hypothetical ontogenetic transformation of slender fingers in *Fetilia* **gen. n.** to short robust fingers in the other genera. Furthermore, *Fetilia* **gen. n.** is neobothriotaxic, with femur *d*<sub>2</sub> absent, in contrast to the other genera which are orthobothriotaxic. In scorpions, there is only one documented precedent in which reductive

neobothriotaxy in juveniles transforms into orthobothriotaxy in adults. In many, if not all buthids, femoral trichobothrium *i*<sub>2</sub> is absent in the second instar (first nymph), and only appears in the third and later instars (Armas, 1986: 22; Lourenço, 1979: 100; Stockmann, 1979: 408; Vachon, 1974: 873; R. Teruel, personal communication). However, similar abrupt early developmental changes have not been reported for buthid petite trichobothria including femur *d*<sub>2</sub>, whose presence or absence is normally consistent across instars. The size and well developed carination and granulation of the holotype male *Fetilia* **gen. n.** indicates that it is not a second instar nymph, and it also has femur *i*<sub>2</sub> already expressed (Fig. 21). In summary, available evidence supports our hypothesis that *Fetilia* **gen. n.** is a new genus that does not fit into any of the existing '*Buthus*' group genera.

DISTRIBUTION. Known only from the type locality in northern Pakistan. The collection site lies at the edge of the Kohat Plateau, northeast of the Bannu Basin, an intermontane depression in the tectonically active orogenic belt at the western end of the Himalayas. The local substrate consists of Quaternary alluvial fan deposits produced by erosion of surrounding high mountain ranges (Abir et al., 2017).

*Fetilia dentator* **sp. n.**

(Figs. 1–31, Table 1)

<http://zoobank.org/urn:lsid:zoobank.org:act:2883418A-AB1A-4991-AE48-FFBB13854627>

TYPE LOCALITY AND TYPE DEPOSITORY. Pakistan, Khyber Pakhtunkhwa (formerly North-Western Frontier) Province, Karak, 33.102°N 71.049°E; FKCP.

TYPE MATERIAL EXAMINED. **Pakistan**, Khyber Pakhtunkhwa (formerly North-Western Frontier) Province, Karak, 33.102°N 71.049°E, 23 June 2010, 1♂ subadult (holotype) 1♀ juvenile (paratype), leg. Z. Ahmed, FKCP.

ETYMOLOGY. The specific epithet refers to the prominently enlarged dentition on the metasoma, and is chosen to rhyme with the specific epithet *palpator* of *Kraepelinia*.

DIAGNOSIS. See generic diagnosis.

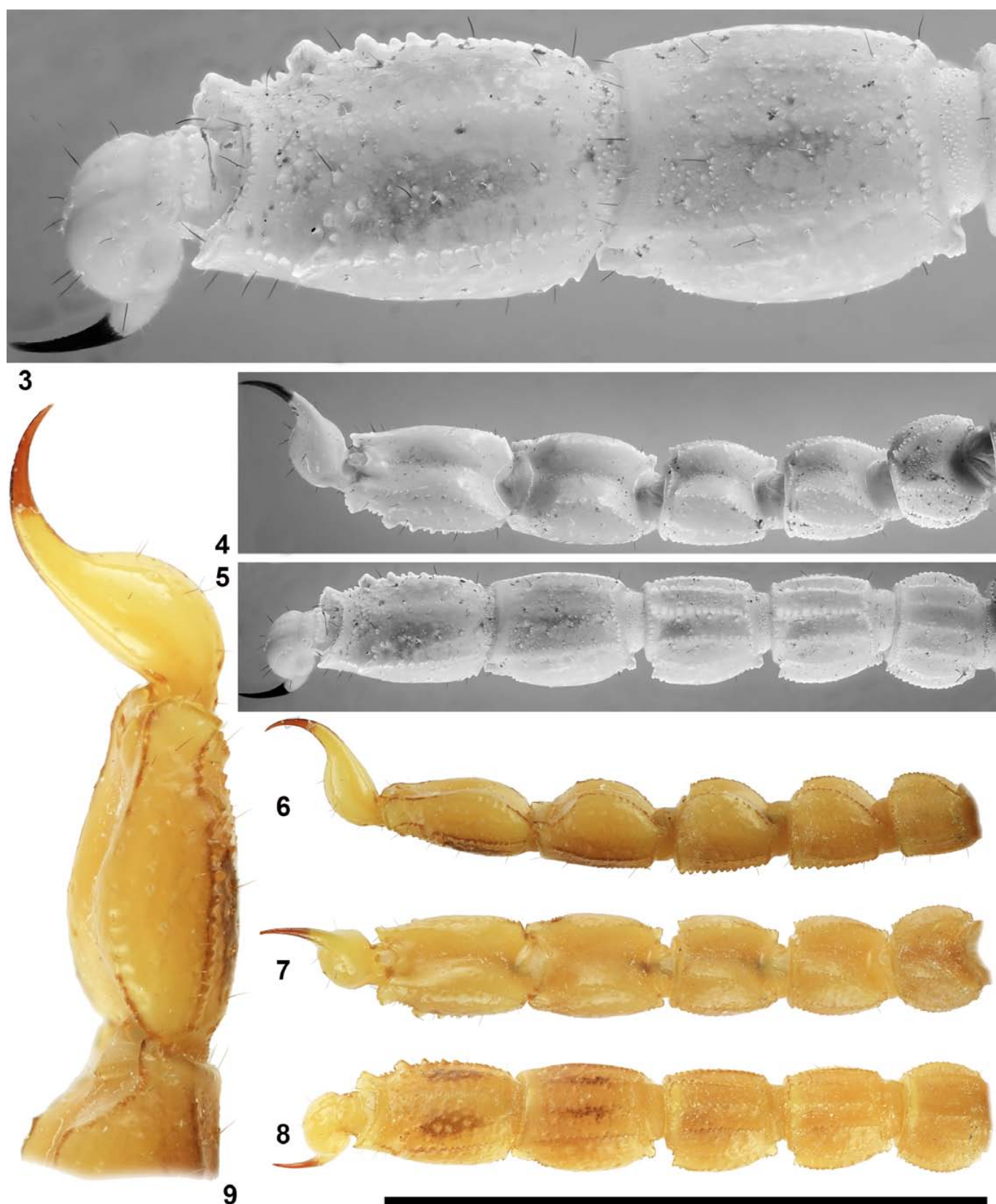
DESCRIPTION (subadult ♂). The subadult male is 22 mm long. The habitus is shown in Figs. 1–2 and 30–31. For position and distribution of trichobothria of pedipalps see Figs. 15–18, and 20–21.

**Coloration** (Figs. 1–2, 6–9). The base color is uniformly yellow, with dark carinae indicated on the pedipalp femur and patella, and on metasoma III–V.

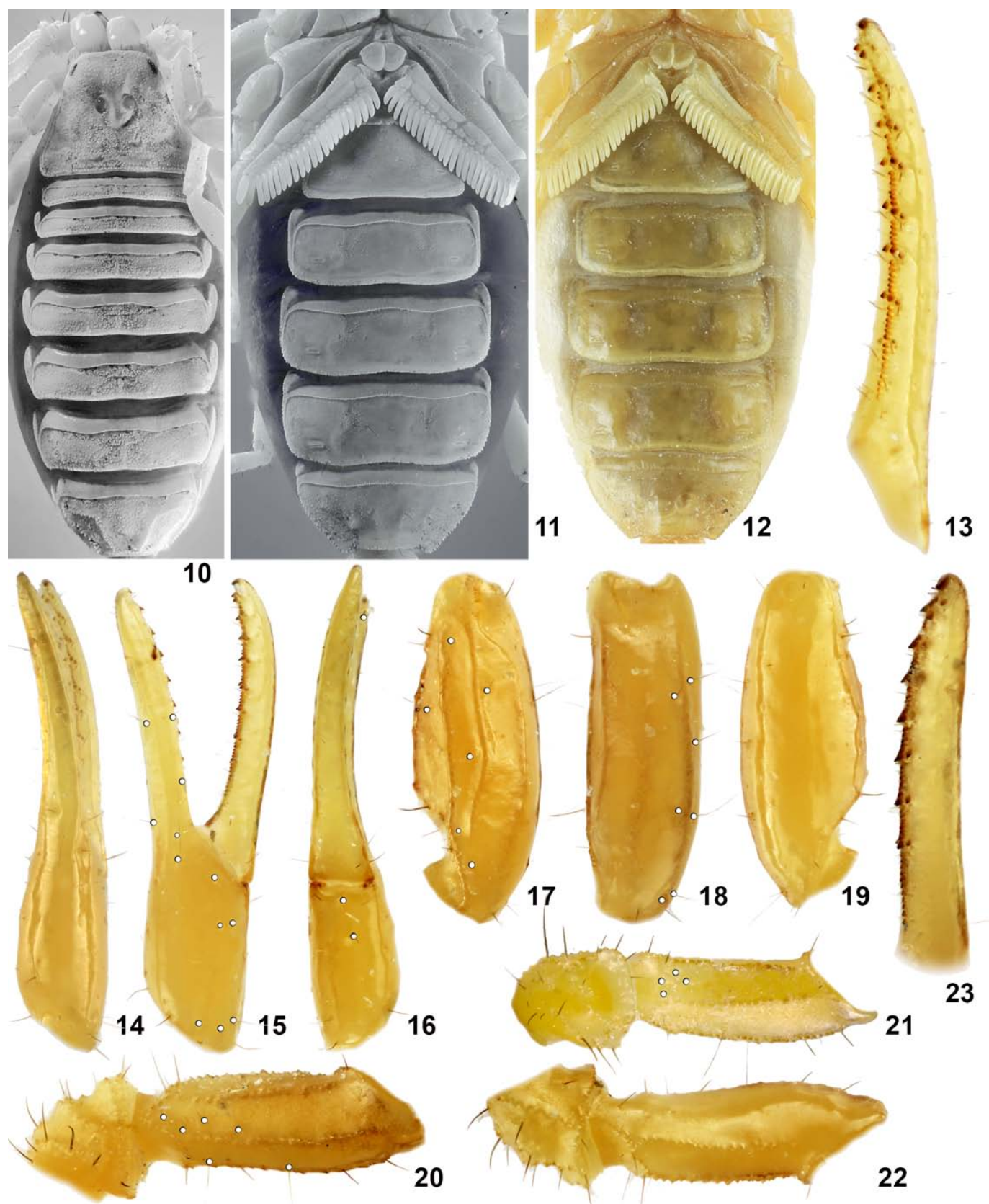
**Carapace** (Figs. 10, 25). Trapezoidal, anterior margin almost straight, with 10 marginal macrosetae; surface with dense, coarse granulation, weaker anteriorly; carinae absent; area between anterior median carinae smooth; median ocular tubercle smooth, except for a few posterior granules; median eyes large, well separated; 5 lateral eyes (3 larger, 2 smaller).

**Chelicera** (Figs. 24–25). Fingers comply with the basic pattern of buthid dentition (Vachon, 1963); fixed finger with



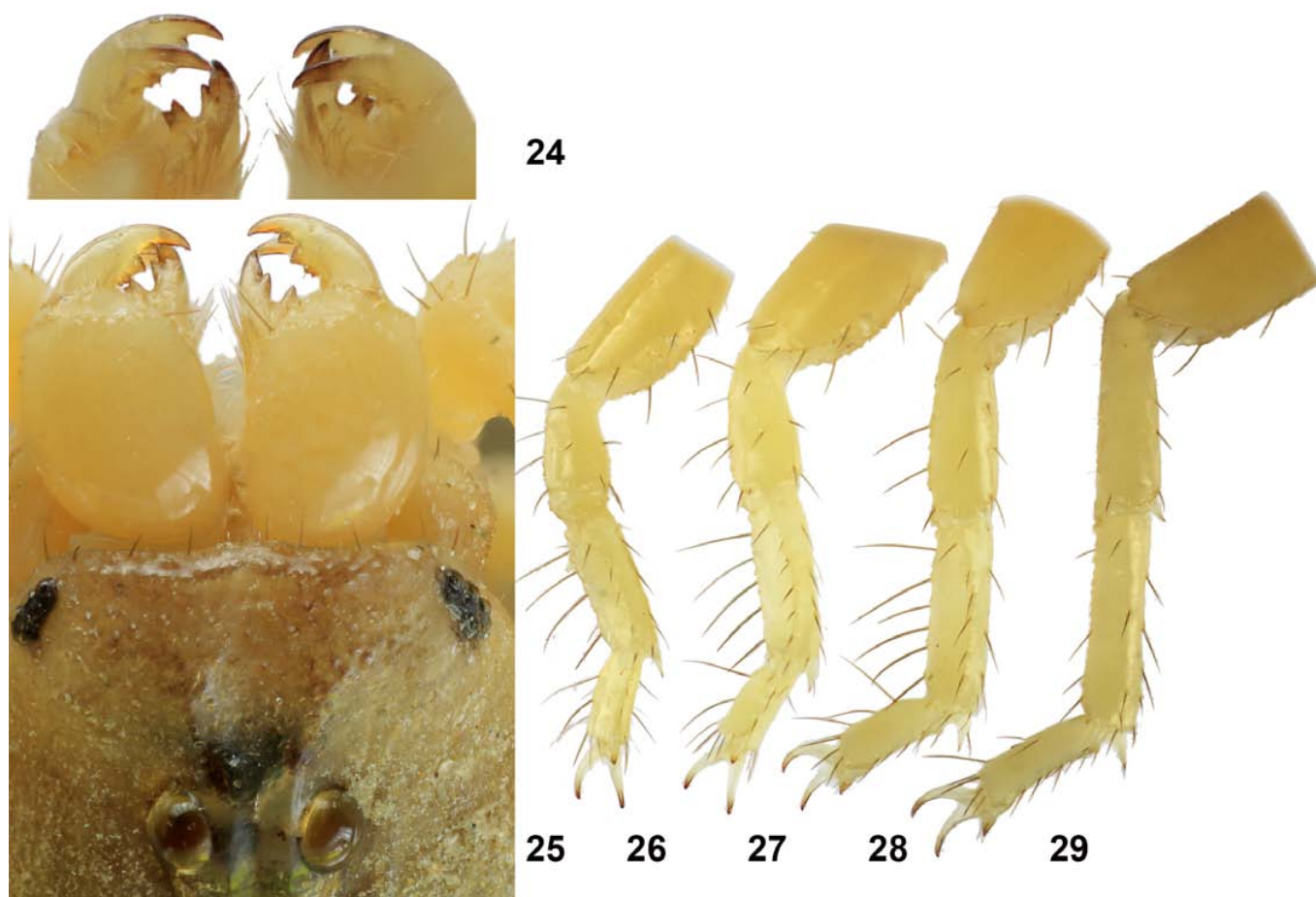


**Figures 3–9.** *Fetilia dentator* gen. et sp. n., subadult male holotype, metasoma IV–V and telson ventral view (3), metasoma and telson dorsal (4, 7), ventral (5, 8), and lateral (6) views, metasoma V and telson lateral view (9). Figures 3–5 are under UV light. Scale bar: 10 mm (4–8).



**Figures 10–23:** *Fetilinia dentator* gen. et sp. n., subadult male holotype. **Figures 10–12.** Carapace and tergites (10) and sternopectinal area and sternites (11–12) **Figures 13–23.** Pedipalp segments, chela dorsal (14), external (15), ventral (16) views, patella dorsal (17), dorsoexternal (18), and ventral (19) views, femur and trochanter dorsoexternal (20), internal (21), and ventral (22) views, movable (13) and fixed (23) finger dentition. Trichobothrial pattern is indicated by white circles in Figures 15–18 and 20–21. Figures 10–11 under UV light.





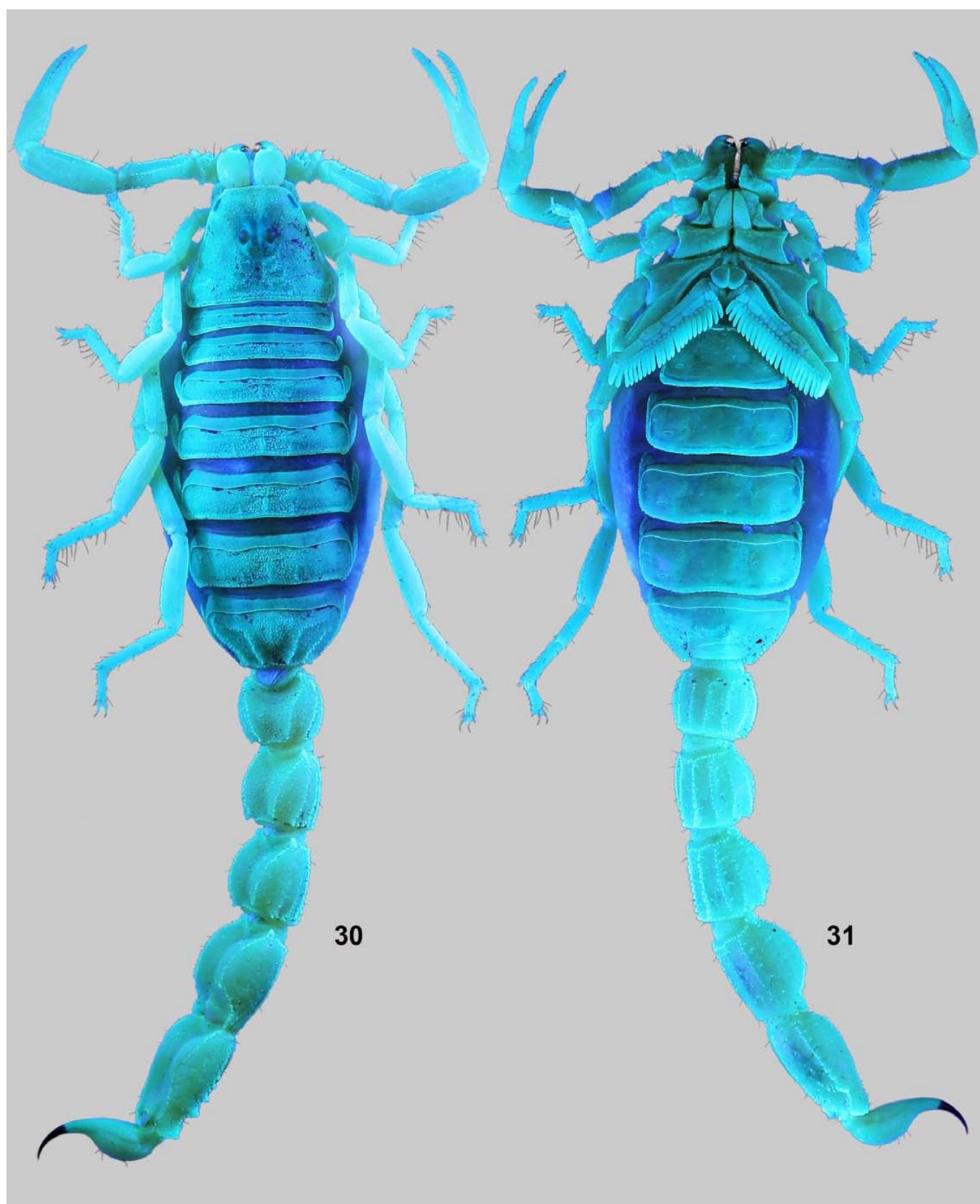
**Figures 24–29:** *Fetilinia dentator* gen. et sp. n., subadult male holotype. **Figures 24–25.** Chelicerae ventral (24) and chelicerae dorsal with anterior part of carapace with median and lateral eyes (25). **Figures 26–29.** Left legs I–IV, retrolateral aspect (respectively).

large distal denticle, one subdistal denticle and two basal denticles fused into bicuspid, two denticles on ventral surface; dorsal margin of movable finger with 5 denticles: one large distal denticle, medium-sized subdistal denticle, large medial denticle, and two small, partially fused basal denticles; ventral margin with 3 denticles: one large distal denticle, and two smaller denticles in medial and basal positions.

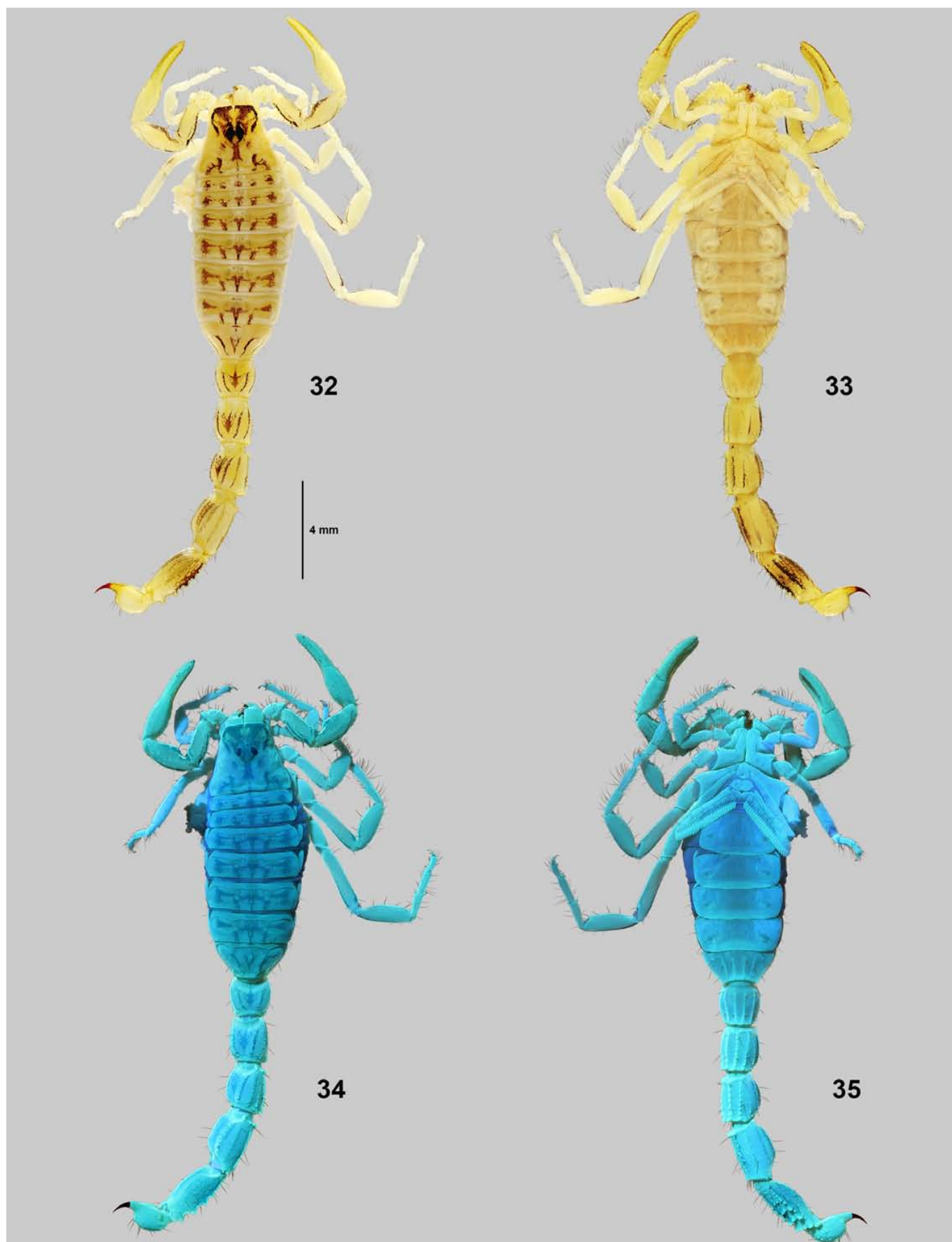
**Mesosoma** (Figs. 10–12). *Tergites* I–VI tricarinate with a median carina, and a weak pair of lateral carinae; carinae coarsely granular, the lateral pair on tergites I–II rather indistinct; all carinae short with only ca. 2–5 granules, confined to posterior half or third of tergite; entire tergites covered with dense, coarse granulation; pretergites smooth; tergite VII pentacarinate, median carina a granulated hump, lateral carinae well developed, coarsely granular; *sternites* with smooth surfaces locally finely granulated, more so on sternite III and VII; sternite III–VI without carinae, VII with 2 pairs of weak to moderate, smooth to granulated carinae; *sternal chaetotaxy*: sternite III–VI posterior margins bearing 3 macrosetae, III bearing 5–7 macrosetae on medial surface, IV–VII with 2–4 macrosetae; *pectines* with margins extending to half of sternite IV in males, with 3 marginal lamellae, 6–8 middle lamellae; lamellae and fulcra bear numerous short, fine, dark macrosetae; pectine basal piece and genital opercula smooth with fine macrosetae; pectinal tooth count 23–23 in male.

**Metasoma and telson** (Figs. 3–9). *Metasoma* I–III with 10 granulated carinae, median lateral carinae on segments I–II complete, median lateral carinae on segment III incomplete, indicated by ca. 10–18 granules on posterior part; ventromedian and ventrolateral carinae stronger on segments II–III, with conspicuously enlarged, dentate granules increasing in size posteriorly; metasoma IV with 4, and metasoma V with 2–4 granulated or crenulated carinae, dorsolateral carinae granulated on IV and incomplete on V, ventrolateral carinae strong, irregularly crenulated on V with several enlarged, lobate granules that become larger posteriorly; ventromedian carinae of metasoma IV–V absent; intercarinal surfaces partly smooth and partly irregularly granulated, with granules mostly on dorsomedial and ventral surfaces; lateral anal arch divided into 3 lobes; ventral anal arch armed with a regular series of ca. 10 coarse granules; *telson* with distinctly elongated, smooth vesicle; aculeus robust, equal to or shorter than vesicle in length, moderately curved; subaculear tubercle absent; *chaetotaxy*: metasomal segments and telson sparsely setose; long macrosetae dispersed irregularly on lateral and ventral surfaces.

**Pedipalps** (Figs. 13–23). Segments slender, with chelae narrower than patella; *femur* with 3 strong, granulated carinae: dorsoexternal, dorsointernal, and ventrointernal, other carinae obsolete; dorsal, lateral and ventral surfaces smooth except for a few small solitary granules, internal surface smooth except



**Figures 30–31.** *Fetilinia dentator* gen. et sp. n., subadult male holotype in dorsal (30) and ventral (31) views, under UV light.



**Figures 32–35:** *Kraepelinia palpator* (Birula, 1903), subadult male habitus in dorsal (32, 34) and ventral (33, 35) views, under white light (32–33) under UV light (34–35). Turkmenistan, Badkhyz, Eroilanduz, 35°42'04"N 61°48'53"E, el. 348 m, 7.IV.2002, leg. A. Gromov, GLPC. Scale bar: 4 mm.



for several coarse solitary granules; *patella* with 7 smooth, obsolete carinae; setation very sparse, with a few large solitary macrosetae; *chela* smooth, carinae obsolete, a few large macrosetae present; dentate margins of movable finger with 8 rows of granules, of fixed finger with 7 rows of granules, each flanked by a single external and internal accessory granule, distal ends of fingers with 5 subterminal granules; trichobothrial pattern type A- $\beta$  with reductive neobothriotaxy (femur petite  $d_2$  absent).

**Legs** (Figs. 26–29). Legs with robust patellae, tibiae and tarsi; femora with a few solitary macrosetae; tibiae I–III with 3–6 long macrosetae in dorsal (retrosuperior) series, not forming a tibial ‘bristle comb’; basitarsi I–III compressed, with two irregular series of shorter ventral (proinferior and retroinferior) macrosetae, and a single linear series of longer dorsal macrosetae (forming a basitarsal ‘bristle comb’ with 4–5 setae on leg I, 5 setae on leg II, 6 setae on leg III); leg IV without basitarsal compression, longer than legs I–III, leg I–IV femora and patella with indications of 4–6 carinae, which are usually obsolete; paired ventral carinae on femora granulate or denticulate; tibial spur on legs III–IV moderate; prolateral pedal spurs basally bifurcate; retrolateral pedal spurs simple; telotarsi with 2 ventral rows of fine macrosetae; unguis elongate, curved.

**Measurements.** See Table 1.

## Acknowledgements

We sincerely thank Zubair Ahmed (Pakistan), collector of the types of *Fetilia dentator* **gen. et sp. n.** Special thanks to Rolando Teruel for his thoughtful critical comments on a preliminary version of the manuscript, and to Victor Fet for donating specimens of *Kraepelinia palpator* for our study. We also thank an anonymous reviewer for their comments.

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