Euscorpius

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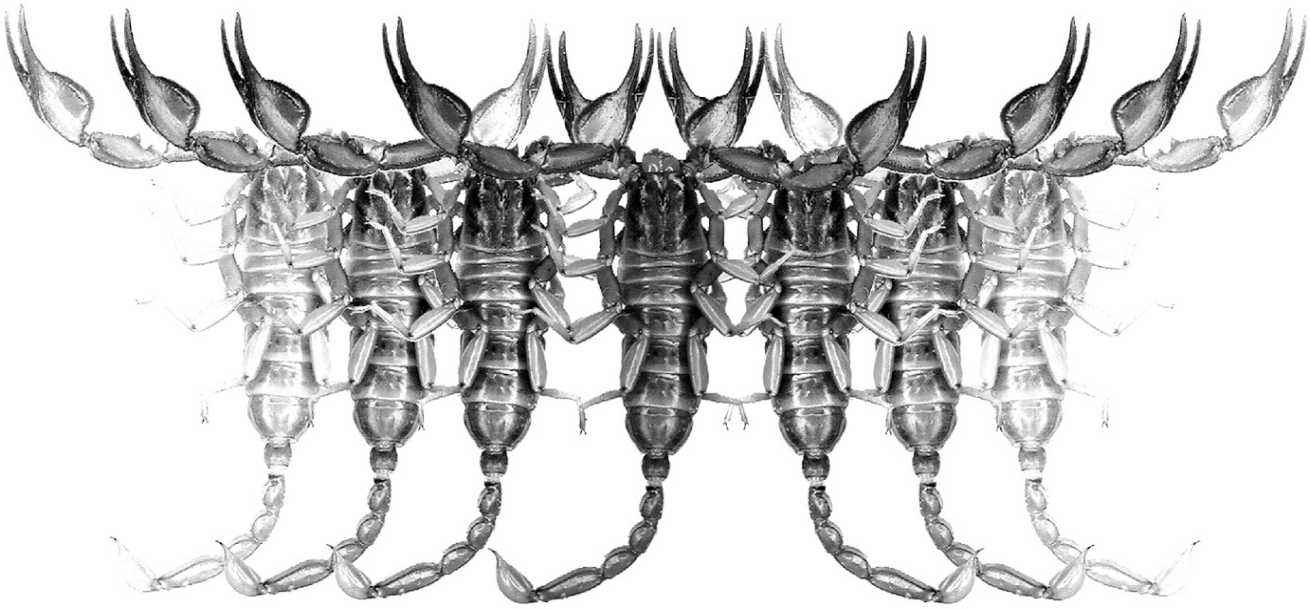

Scorpiops tangae sp. n. (Scorpiones: Scorpiopidae) from Laos

František Kovařík, František Šťáhlavský & Mark Stockmann

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Euscorpius

Occasional Publications in Scorpiology

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Euscorpius — Occasional Publications in Scorpiology. 2024, No. 399

Scorpiops tangae sp. n. (Scorpiones: Scorpiopidae) from Laos

František Kovařík [1], František Šťáhlavský [1] & Mark Stockmann [2]

[1] Department of Zoology, Charles University, Viničná 7, CZ-128 44 Praha 2, Czech Republic; www.scorpio.cz
[2] Im Hoek 20, D-48477 Hörstel-Riesenbeck, Germany; email: skorpionzuchtstockmann@gmail.com

http://zoobank.org/urn:lsid:zoobank.org:pub:92220FF0-D158-4075-91F2-95AB6CF4C8AF

Summary

A new species *Scorpiops tangae* **sp**. **n**. is described from Laos, fully illustrated with color photos showing its morphology and habitus. *Scorpiops tangae* **sp**. **n**. is the only species of the genus with a combination of the following five characters: chelal trichobothrium Eb_3 located in distal half of manus between trichobothria *Dt* and *Est*; patella of pedipalp with 11 ventral and 17 external trichobothria; fingers of pedipalps undulate in male; pedipalp movable finger with ca. 45 IAD; and chela length to width ratio 3.7 in male. In addition to morphology and hemispermatophore, we also present the information about the karyotype of *S. tangae* **sp**. **n**. (2n=105).

Introduction

Two recent studies by our research group (Kovařík et al., 2020; Šťáhlavský et al., 2020) summarized known data, described 15 new species of the genus *Scorpiops* Peters, 1861, and defined/analysed taxonomic characters for 95 species. The following genera or subgenera were synonymized with *Scorpiops*: *Dasyscorpiops* Vachon, 1974; *Alloscorpiops* Vachon, 1980; *Euscorpiops* Vachon, 1980; *Neoscorpiops* Vachon, 1980; *Alloscorpiops* (*Laoscorpiops*) Lourenço, 2013; *Vietscorpiops* Lourenço & Pham, 2015; and *Plethoscorpiops* Lourenço, 2017.

In 2021–2023, 12 more species were described or redescribed from India (Sulakhe et al., 2021), China (Lv & Di, 2022, 2023; Lv et al., 2023, Tang, 2022a, 2022b, 2023) and Thailand (Nawanetiwong et al., 2024). Here we describe another new species from Laos.

Methods, Material & Abbreviations

Nomenclature and measurements follow Stahnke (1971), Kovařík (2009), Kovařík & Ojanguren Affilastro (2013), and (Kovařík et al., 2020) except for trichobothriotaxy (Vachon, 1974), and sternum (Soleglad & Fet, 2003). Hemispermatophore terminology follows Kovařík et al. (2020).

Karyotype analyses were conducted on chromosome preparations prepared using the spreading technique already used in scorpiopid scorpions (e. g., Kovařík et al., 2015, 2020; Šťáhlavský et al., 2021). The chromosomes were stained with a 5% Giemsa solution in Sörensen phosphate buffer for 20 min. Measurements were performed using Image J 1.45r software (http://rsbweb.nih.gov/ij) with the Levan plugin (Sakamoto & Zacaro, 2009). The relative length of the chromosomes was calculated for the diploid set.

Specimen Depositories: FKCP (František Kovařík, private collection, Prague, Czech Republic; will in future be merged with the collections of the National Museum of Natural History, Prague, Czech Republic)

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

Systematics

Scorpiopidae Kraepelin, 1905

Genus ***Scorpiops*** Peters, 1862

(Figures 1–45, Table 1)

Scorpiops Peters, 1862: 510; Vachon, 1980: 143–159, figs. 1–40; Tikader & Bastawade, 1983: 403–452, figs. 1129–1246; Fet, 2000: 491–495 (in part); Kovařík, 2000: 162–198, figs. 1–7, 14–22, 25, 28, 29, 31–72 (in part); Soleglad & Sissom, 2001: 93–97, figs. 3, 13–14, 86, 96, 101, 114, 147, 159, 183, 202, 220 (in part); Kovařík et al., 2020: 1–132, figs. 1–75, 77–81, 90–103, 105–127, 129–254, 257–815, tabs. 1–9 (complete references list until 2020).

= *Dasyscorpiops* Vachon, 1974: 952–953, figs. 142, 147, 160–162 (type species *Dasyscorpiops grandjeani* Vachon, 1974) (syn. by Kovařík et al., 2020: 32).

= *Scorpiops* (*Neoscorpiops*) Vachon, 1980: 150, 151, figs. 10–16 (type species *Scorpiops montanus satarensis* Pocock, 1900); Tikader & Bastawade, 1983: 382–483, figs. 1060–1128 (syn. by Kovařík et al., 2020: 32).

= *Scorpiops* (*Alloscorpiops*) Vachon, 1980: 151, figs. 18–25

Figure 1. Holotype male of *Scorpiops tangae* **sp**. **n**. in vivo habitus.

Figures 2–**3**. *Scorpiops tangae* **sp**. **n**., male holotype in dorsal (2) and ventral (3) views. Scale bar: 10 mm.

(type species *Scorpiops anthracinus* Simon, 1887) (syn. by Kovařík et al., 2020: 32).

= *Scorpiops* (*Euscorpiops*) Vachon, 1980: 155, figs. 26–32 (type species *Scorpiops asthenurus* Pocock, 1900); Tikader & Bastawade, 1983: 452–476, figs. 1247–1305 (syn. by Kovařík, 2000: 164 and Kovařík et al., 2020: 32).

= *Alloscorpiops*: Stockwell, 1989: 120 (syn. by Kovařík et al., 2020: 32).

= *Alloscorpiops* (*Laoscorpiops*) Lourenço, 2013: 52–55, figs. 2–3 (type species *Alloscorpiops* (*Laoscorpiops*) *calmonti* Lourenço, 2013) (syn. by Kovařík et al., 2013: 1).

= *Scorpiops* (*Vietscorpiops*) Lourenço & Pham, 2015: 212–217, figs. 1–6 (type species *Scorpiops* (*Vietscorpiops*) *dentidactylus* Lourenço & Pham, 2015) (syn. by Kovařík et al., 2020: 32).

= *Plethoscorpiops* Lourenço, 2017: 352–357, figs. 6–10 (type species *Plethoscorpiops profusus* Lourenço, 2017) (syn. by Kovařík et al., 2020: 32).

Type species. *Scorpio hardwickii* Gervais, 1843.

Diagnosis. Total length 24–75 mm. Carapace anterior margin with deep median notch. Inner accessory denticles present on pedipalp chelal fingers. Median eyes and median ocular tubercle present. Lateral eyes with 2–3 larger ocelli, one small ocellus may also be present. Cheliceral movable finger with dorsal distal denticle slightly shorter than ventral distal denticle, dorsal margin with two large subdistal denticles, ventral margin with 4–7 smaller denticles or crenulations. Ventral aspect of cheliceral fixed finger smooth without denticles. Sternum pentagonal. Pectines short, with 4–14 teeth, fulcra present or absent. Hemispermatophore lamelliform, distal lamina long, slender, terminally curved and tapered, capsule conforming to 2-folds bauplan, truncal flexure absent, terminal membrane of sperm duct spiculate, trunk with mid-axial rib. Ovariuterus 6-celled, oocyte development apoikogenic. Pedipalp chela more or less compressed, flattened. Pedipalp fingers with median denticles aligned in linear row (or rows), outer denticles usually present and displaced externally, inner accessory denticles present. Trichobothrial pattern type C, with additive neobothriotaxy, trichobothrial counts: patella 16–75 external, 6–28 ventral, chela manus 4–16 ventral. External surface of chela with Eb_3 level with or distal to *Db*. Legs with two pedal spurs, tibial spurs absent. Tarsomere II with row of 3–11 stout spinules on ventral surface. Metasoma with paired ventrosubmedian carinae. Telson without subaculear tubercle, often with annular construction at base of aculeus.

Dimensions (mm)		*Scorpiops tangae* **sp. n.** ♂ **holotype**
Carapace	L / W	5.27 / 5.53
Mesosoma	L	8.87
Tergite VII	L / W	2.00 / 3.59
Metasoma + telson	L	18.70
Segment I	L / W / D	1.87 / 1.91 / 1.75
Segment II	L / W / D	2.11 / 1.71 / 1.52
Segment III	L / W / D	2.31 / 1.62 / 1.57
Segment IV	L / W / D	2.71 / 1.57 / 1.43
Segment V	L / W / D	4.54 / 1.57 / 1.55
Telson	L / W / D	5.16 / 1.86 / 1.63
Pedipalp	L	23.28
Femur	L / W	6.18 / 2.22
Patella	L / W	6.04 / 2.19
Chela	L	11.06
Manus	W / D	2.99 / 2.33
Movable finger	L	5.58
Total	**L**	**32.84**

Table 1. Comparative measurements of holotype male of *Scorpiops tangae* **sp. n.**. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

Scorpiops tangae **sp. n.**

(Figures 1–45, Table 1)

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Type locality and type repository. **Laos**, ca. 6 km W Vang Vieng, 18.933833°N 102.386833°E; FKCP.

Type material. **Laos**, ca. 6 km W Vang Vieng, 18.933833°N 102.386833°E, IX.2024, 1♂ (holotype), leg. Peter Kautt; FKCP.

Etymology. The species epithet honors Victoria Tang for her dedication to understanding Chinese scorpions.

Diagnosis (♂). Total length 33 mm. Base color reddish brown to black. Telson and legs yellowish brown. Pectine teeth number 7 in male, fulcra absent. Pectines with 2 marginal and 2–4 middle lamellae. Patella of pedipalp with 17 (5 *eb*, 2 *esb*, 2 *em*, 4 *est*, 4 *et*) external and 11 ventral trichobothria. Chela of pedipalp with 4 *V* series trichobothria located on ventral surface. Chelal trichobothrium Eb_3 located in distal half of manus between trichobothria *Dt* and *Est*. Fingers of pedipalps undulate in male. Chela length to width ratio 3.7 in male. Pedipalp movable finger with ca. 45 IAD which create a second row, parallel with MD (ca. 73 in number). There are also 4 ID and 11–13 OD present. Tarsomere II of legs with row of 5–8 stout median ventral spinules and two pairs of flanking setae. Metasoma I with 10 carinae and metasoma II–IV with 8 carinae. Telson elongate and smooth, length to depth ratio 2.8 in male; annular ring developed.

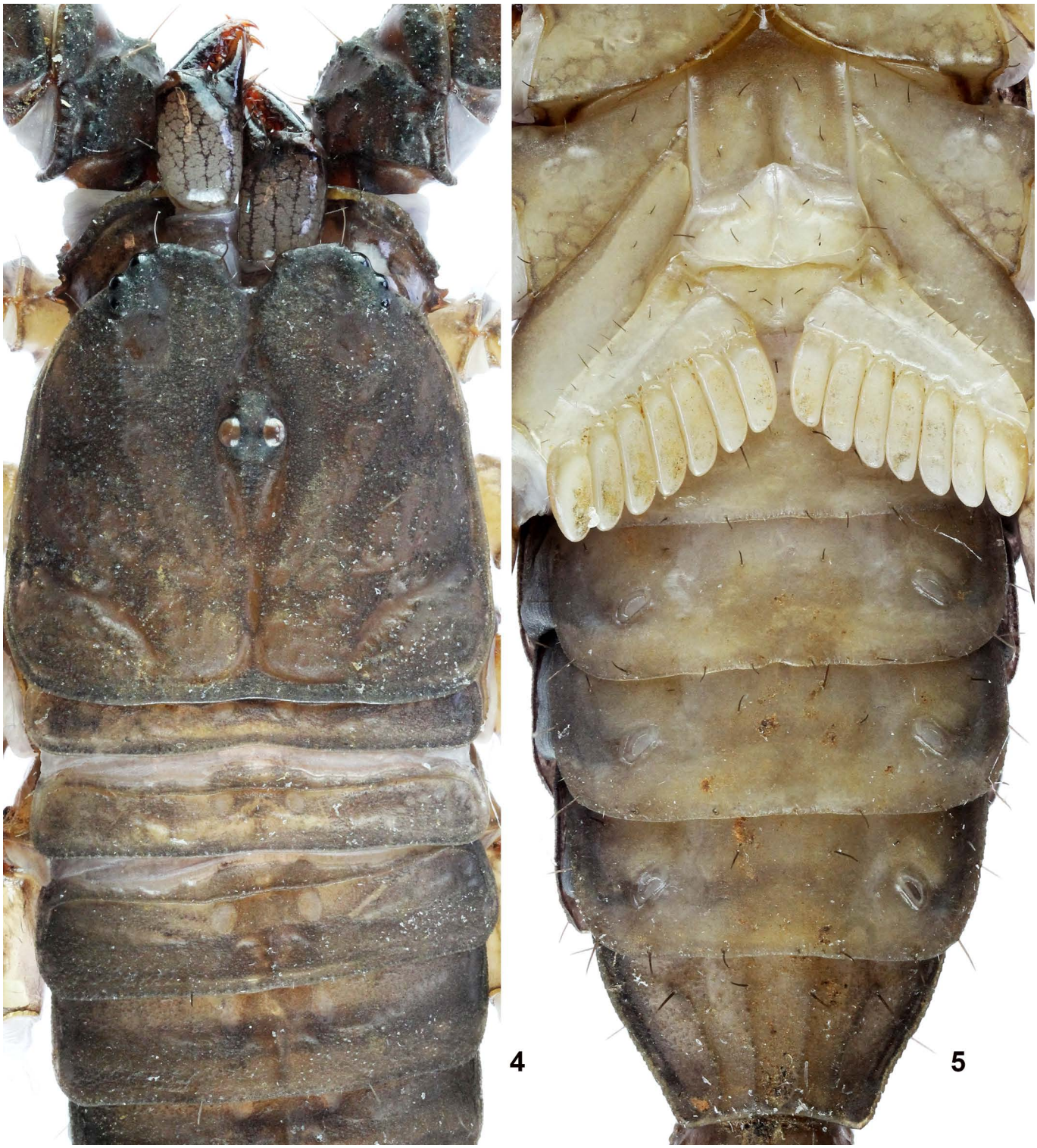
Description (♂ holotype). Total length 33 mm. Female unknown. Habitus as shown in Figs. 1–3. For position and distribution of trichobothria on pedipalps, see Figs. 15–21. Fingers of pedipalps undulate in male (Fig. 16).

Coloration (Fig. 1–3). Base color uniformly reddish brown to black. Telson and legs yellowish brown. Chelicerae grey and reticulate.

Carapace and mesosoma (Fig. 363). Entire carapace covered with both large and minute granules; carinae absent. Anterior margin of carapace with a deep median notch. Carapace with 3 pairs of lateral eyes. Mesosoma granulated, with one median carina. Tergite VII is pentacarinate. Sternites very finely granulated with two parallel furrows indicated except sternite VII, which has four completely developed granulate carinae. Pectine teeth number 7 in males, fulcra absent. Pectines with 2 marginal and 2–4 middle lamellae.

Metasoma and telson (Figs. 8–14). Metasoma very sparsely hirsute and granulated. Metasomal segment I with 10 carinae, II–IV with 8 carinae, and V with 5 carinae. Dorsolateral carinae of segments III–IV granulate with sharp granules, which terminate posteriorly with a barely pronounced tooth. Telson elongate and smooth with annular ring developed.

Pedipalps (Figs. 15–31). Pedipalps very sparsely hirsute. Patella with 17 (5 *eb*, 2 *esb*, 2 *em*, 4 *est*, 4 *et*) external trichobothria and 11 ventral trichobothria. Chela with 4 *V* series trichobothria which are located on the ventral surface. Femur and patella granulated. Femur with 5 granulose carinae



Figures 4–**5**: *Scorpiops tangae* **sp**. **n**., male holotype. **Figure 4**. Chelicera, carapace and tergites I–IV under white light. **Figure 5**. Coxosternal area and sternites under white light.

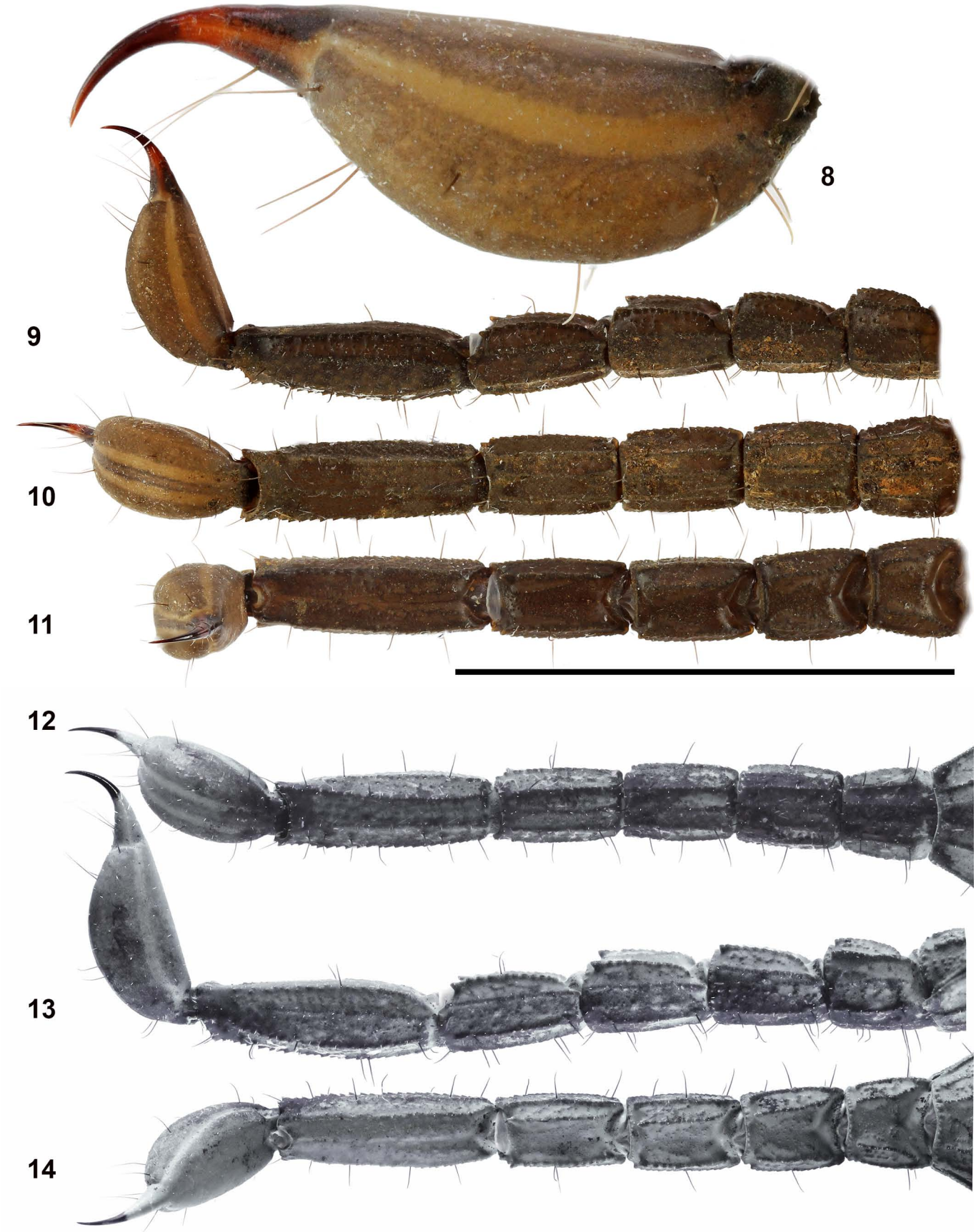
and patella with 5 complete carinae with dorsal and ventral patellar spurs pronounced. Manus dorsally with fine, rounded granules. External surface of chela covered by minute and larger sparse granules which indicate a external secondary carina. Movable fingers with ca. 45 IAD, which form a second row, parallel to MD (ca. 73 in number) and there are also 4 ID and 11–13 OD present.

Legs (Figs. 6–7, 32–35). Tibia and tarsomeres of legs with several setae not arranged into bristle combs on dorsal surfaces but with rows of spinules on dorsolateral and ventrolateral surfaces. Tarsomere II of legs I–IV with 5–8 stout median ventral spinules and two pairs of flanking setae. Femur with 3, and patella with 4 carinae; both femur and patella are finely granulated mainly on legs II–IV.

Figures 6–**7**: *Scorpiops tangae* **sp**. **n**., male holotype. **Figure 6**. Chelicera, carapace, tergites and part of right legs under UV fluorescence. **Figure 7**. Coxosternal area, sternites and part of right legs under UV fluorescence.

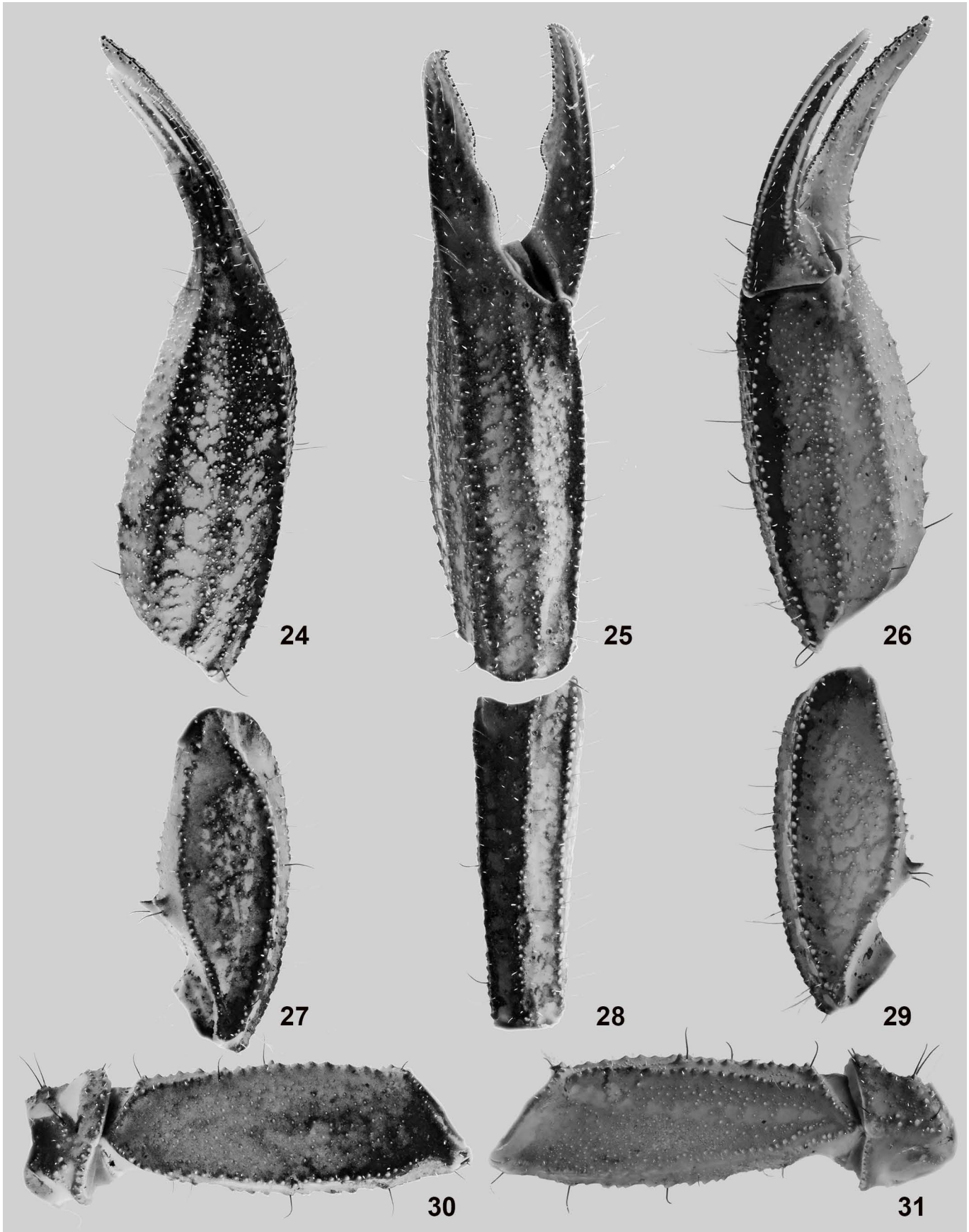
Karyotype (Figs. 40–43). We analyzed the karyotype of the male holotype, which consisted of 105 chromosomes exhibiting a typical monocentric organization (Figs. 42–43). Nearly all the chromosomes displayed acrocentric (one-armed) morphology, a feature that is common in other Scorpiopidae species with a high chromosome number (Kovařík et al., 2015, 2020; Šťáhlavský et al., 2021). The most distinct chromosome was a bi-armed chromosome, the largest in the karyotype, representing 2.38% of the diploid set. This chromosome, along with smaller acrocentric chromosomes, formed a conspicuous tetravalent during pachytene (Fig. 41) and postpachytene (Fig. 43). Unfortunately, the quality of the chromosomes did not permit a more precise determination of the number and size of additional bi-armed chromosomes, which were very small. At least three such small bi-armed chromosomes were observed in metaphase II (Fig. 42).

Aside from the largest chromosome that formed the trivalent, the remaining chromosomes decreased in size from 1.93% to 0.34% of the diploid set. The last chromosome pair was notably shorter (size of these chromosomes: 0.20% of the diploid set), being almost one-third smaller than the chromosomes of the preceding pair. The cytogenetic profile of *Scorpiops tangae* **sp**. **n**. correspond to the characteristics of other analyzed *Scorpiops* species, most of which have high chromosome counts (2n=87–109). Exceptions include *Scorpiops neradi* (2n=48), *Scorpiops schumacheri* (2n=67), and *Scorpiops thailandus* (2n=147), the latter having the highest diploid number within the family Scorpiopidae and one of the highest within the order Scorpiones



Figures 8–**14**: *Scorpiops tangae* **sp**. **n**., male holotype. **Figure 8**. Telson in lateral view under white light. **Figures 9**–**11**. Metasoma and telson lateral (9), ventral (10), and dorsal (11) views under white light. **Figures 12**–**14**. Metasoma and telson ventral (12), lateral (13), and dorsal (14) views under UV fluorescence. Scale bar: 10 mm (9–14).

Figures 15–23: *Scorpiops tangae* **sp. n.**, male holotype, pedipalp. **Figures 15–22**. Pedipalp segments under white light, chela dorsal (15), external (16), ventral (17) views, patella dorsal (18), external (19), and ventral (20) views, femur and trochanter dorsal (21), and ventral (22) views. **Figure 23**. Movable finger dentition under UV fluorescence. Trichobothrial pattern is indicated by white circles in Figures 15–21.



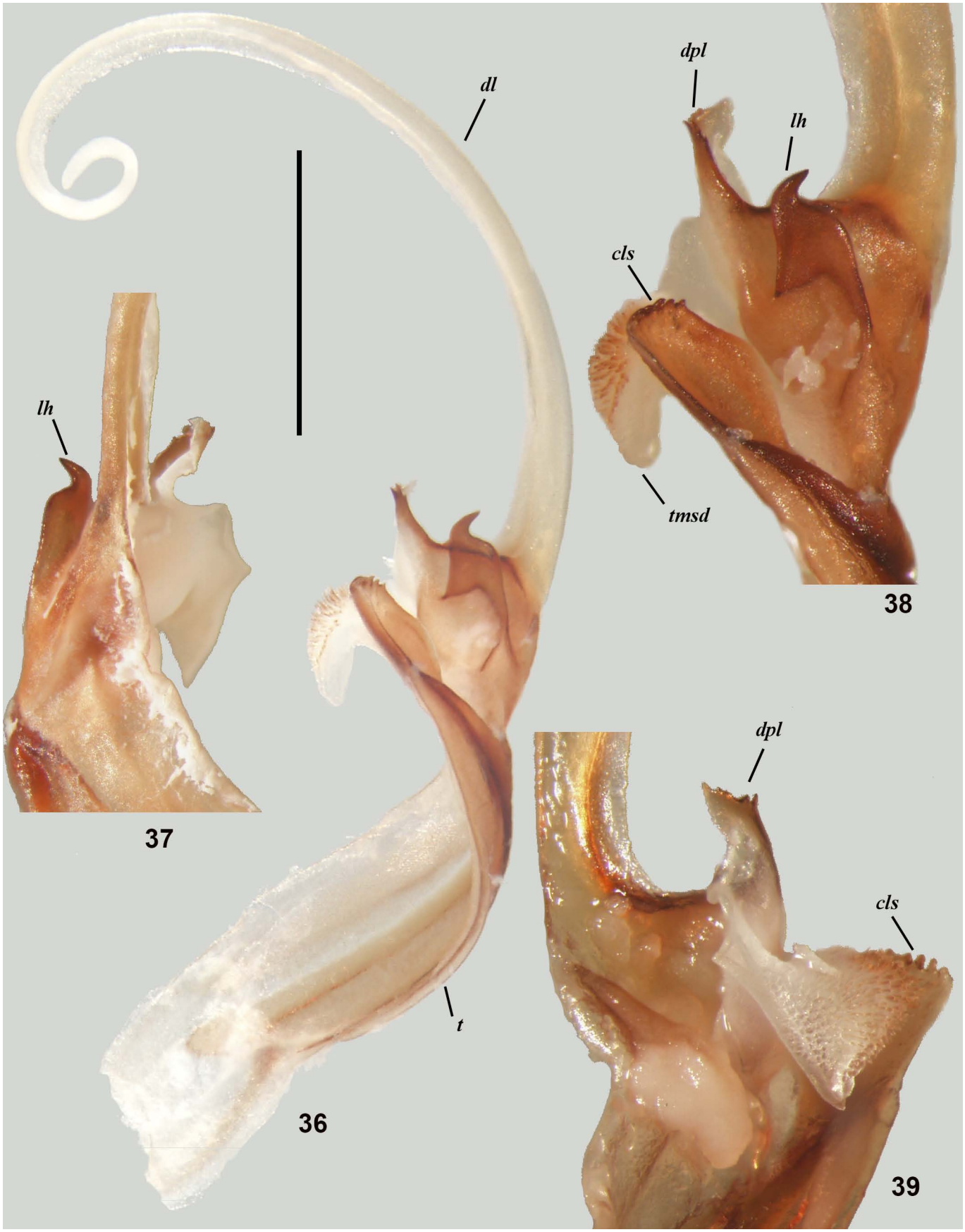
Figures 24–**31**. *Scorpiops tangae* **sp**. **n**., male holotype, pedipalp under UV fluorescence, chela dorsal (24), external (25), ventral (26) views, patella dorsal (27), external (28), and ventral (29) views, femur and trochanter dorsal (30), and ventral (31) views.

Figures 32–35. *Scorpiops tangae* **sp. n.**, right legs I–IV in retrolateral aspect (respectively).

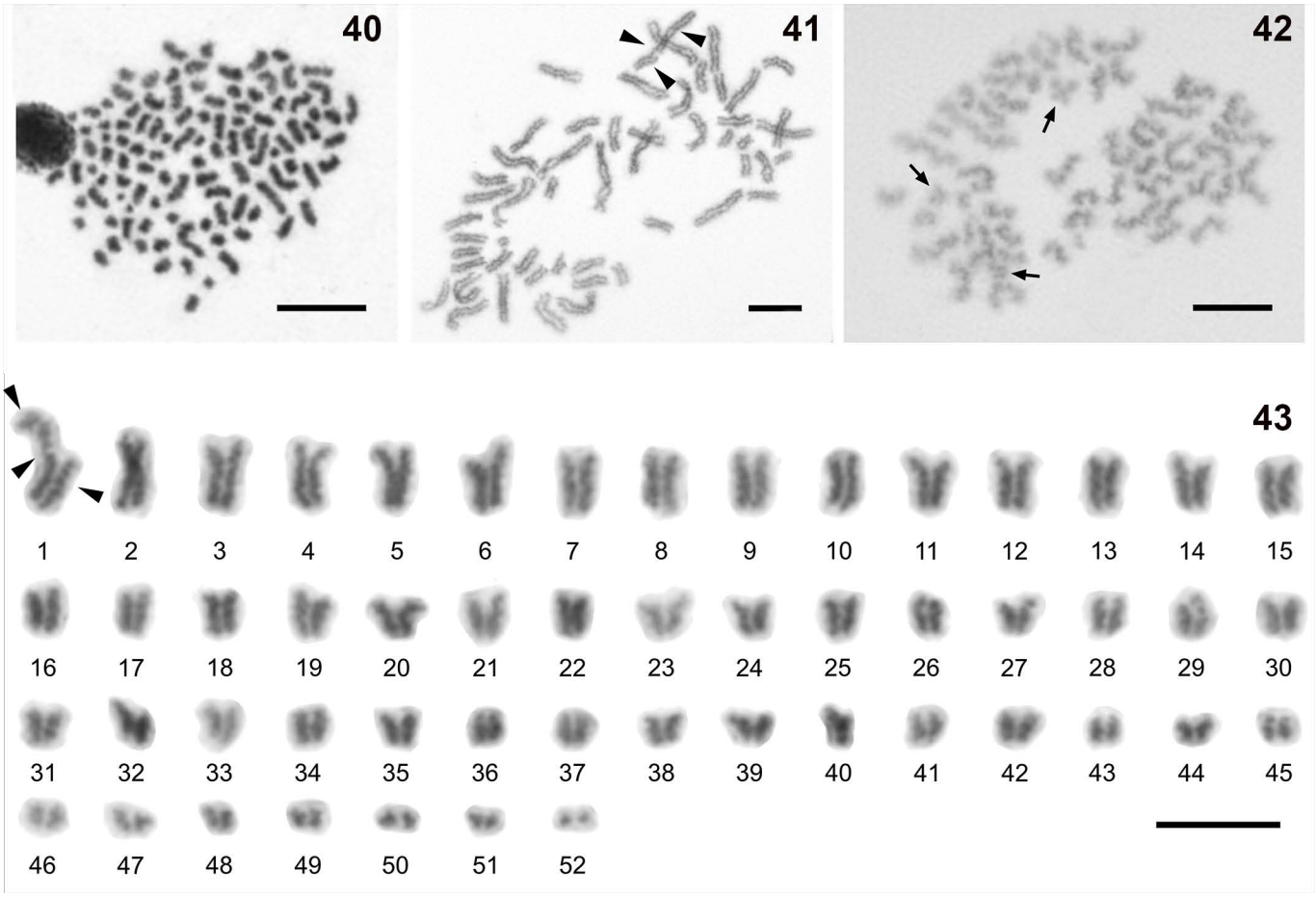
(Schneider et al., 2024). Trivalent associations are also common feature in this family, having been documented in 13 out of the 19 species analyzed (Kovařík et al., 2015, 2020; Šťáhlavský et al., 2021).

Hemispermatophore (Figs. 36–39). Lamelliform. Distal lamina (*dl*) long, narrow, apically coiled. Trunk (*t*) broader and shorter than distal lamina, with sclerotized mid-axial rib. Capsule large. Basal carina a wide sclerotized plate with posterior crest, apical margin forming crown-like structure (*cls*) bearing 5 evenly spaced denticles. Distal carina with both lateral hook (*lh*) and distal posterior lobe (*dpl*) strongly developed. Lateral hook with wide base, terminating in robust spiniform process pointing distally outwards on convex surface of capsule. Distal posterior lobe prominent, apical margin with several denticulations. Distal carina connected to mid-axial rib of trunk by a narrow junction. Terminal membrane of sperm duct (*tmsd*) with numerous spicules. *Comments*. The hemispermatophore structure is typical for the genus (Kovařík et al., 2020). The low *cls* denticle count associates it with hemispermatophores of *S. oligotrichus*, *S. citadelle* and *S. sherwoodae*, i.e., Group 1 species (oligodentate) of Kovařík et al., 2020.

Measurements. See Table 1.



Figures 36–**39**. *Scorpiops tangae* **sp**. **n**., left hemispermatophore. **Figure 36**. Whole hemispermatophore. **Figures 37**–**39**. Capsule in posterior (37), antero-convex (38) and concave (39) views. Abbreviations: *cls*, crown-like structure; *dl*, distal lamina; *dpl*, distal posterior lobe; *lh*, lateral hook; *t*, trunk; *tmsd*, terminal membrane of sperm duct. Scale bar: 1 mm (Fig. 36).



Figures 40–43: The chromosomes of male holotype of *Scorpiops tangae* **sp**. **n**. (2n=105). (40) Spermatogonial metaphase, (41) pachytene, (42) metaphase II (n=53), the cell without large biarmed chromosome and (43) karyogram of analysed adult male based on postpachytene. Arrowheads show chromosomes in trivalent association; arrows show evident biarmed chromosomes in metaphase II. Scale bar: 10 μm.

Affinities. The combination of five characters (chelal trichobothrium Eb_3 located in distal half of manus between trichobothria *Dt* and *Est*; patella of pedipalp with 11 ventral and 17 external trichobothria; fingers of pedipalps undulate in male; pedipalp movable finger with ca. 45 IAD; and chela length to width ratio 3.7 in male) is unique in the entire genus *Scorpiops*. The most similar species is *S. binghamii* Pocock, 1893 from Myanmar and Thailand which differs from *Scorpiops tangae* **sp**. **n**. by total length 50–65 mm; patella of pedipalp with 12–13 ventral and 20–21 external trichobothria; and fingers of pedipalps strongly undulate in male.

Distribution. Laos.

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Figures 44–**45**. *Scorpiops tangae* **sp**. **n**., type locality, habitat (44) and male holotype directly on the type locality (45).

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