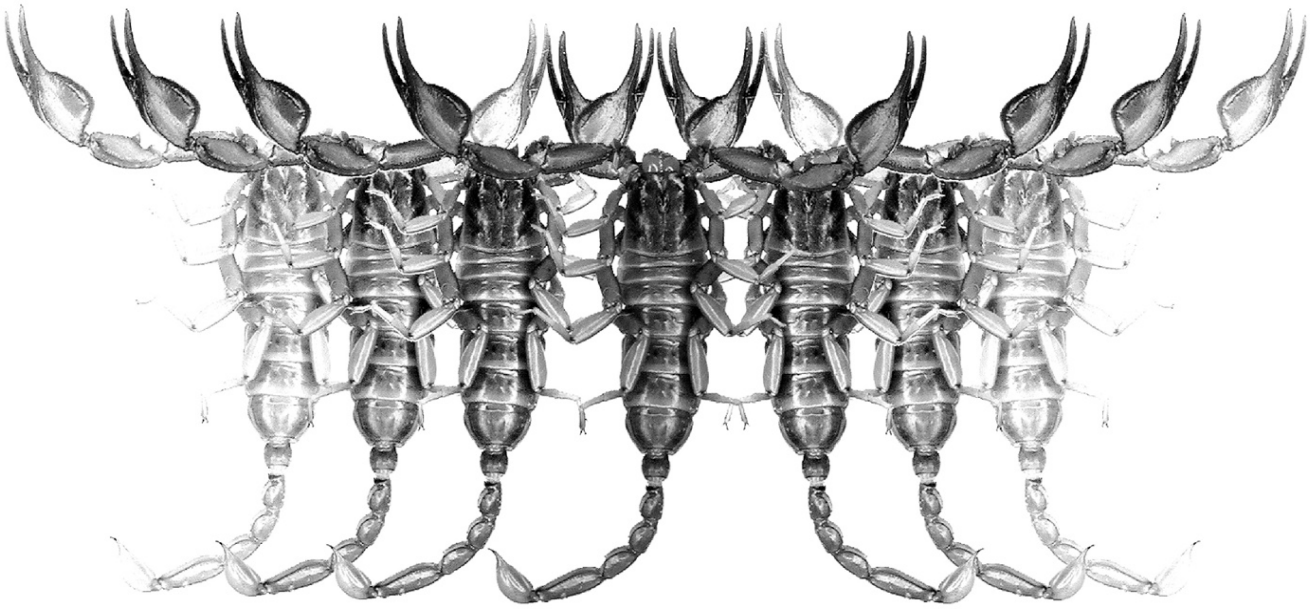
Euscorpius

Occasional Publications in Scorpiology



A new scorpion genus and species from China, *Qianxie solegladi* gen. et sp. n. (Scorpiones: Pseudochactidae)

Victoria Tang

May 2022 — No. 351

Euscorpius

Occasional Publications in Scorpiology

Euscorpius is the first research publication completely devoted to scorpions (Arachnida: Scorpiones). ***Euscorpius*** takes advantage of the rapidly evolving medium of quick online publication, at the same time maintaining high research standards for the burgeoning field of scorpion science (scorpiology). ***Euscorpius*** is an expedient and viable medium for the publication of serious papers in scorpiology, including (but not limited to): systematics, evolution, ecology, biogeography, and general biology of scorpions. Review papers, descriptions of new taxa, faunistic surveys, lists of museum collections, and book reviews are welcome.

Derivatio Nominis

The name ***Euscorpius*** Thorell, 1876 refers to the most common genus of scorpions in the Mediterranean region and southern Europe (family Euscorpiidae).

Euscorpius is located at: https://mds.marshall.edu/euscorpius/
Archive of issues 1-270 see also at: http://www.science.marshall.edu/fet/Euscorpius

(Marshall University, Huntington, West Virginia 25755-2510, USA)

ICZN COMPLIANCE OF ELECTRONIC PUBLICATIONS:

Electronic ("e-only") publications are fully compliant with ICZN (*International Code of Zoological Nomenclature*) (i.e. for the purposes of new names and new nomenclatural acts) when properly archived and registered. All ***Euscorpius*** issues starting from No. 156 (2013) are archived in two electronic archives:

- **Biotaxa,** http://biotaxa.org/Euscorpius (ICZN-approved and ZooBank-enabled)
- **Marshall Digital Scholar**, http://mds.marshall.edu/euscorpius/. (This website also archives all *Euscorpius* issues previously published on CD-ROMs.)

Between 2000 and 2013, ICZN ***did not accept online texts*** as "published work" (Article 9.8). At this time, *Euscorpius* was produced in two ***identical*** versions: online (*ISSN 1536-9307*) and CD-ROM (*ISSN 1536-9293*) (laser disk) in archive-quality, read-only format. Both versions had the identical date of publication, as well as identical page and figure numbers. ***Only copies distributed on a CD-ROM*** from ***Euscorpius*** in 2001-2012 represent published work in compliance with the ICZN, i.e. for the purposes of new names and new nomenclatural acts.

In September 2012, ICZN Article 8. What constitutes published work**,** has been amended and allowed for electronic publications, disallowing publication on optical discs. From January 2013, ***Euscorpius*** discontinued CD-ROM production; only online electronic version (ISSN 1536-9307) is published. For further details on the new ICZN amendment, see http://www.pensoft.net/journals/zookeys/article/3944/.

Publication date: 23 May 2022

http://zoobank.org/urn:lsid:zoobank.org:pub:DE7E2D6E-7F2F-4799-AA49-57690FBA31EB

Euscorpius — Occasional Publications in Scorpiology. 2022, No. 351

A new scorpion genus and species from China, *Qianxie solegladi* gen. et sp. n. (Scorpiones: Pseudochactidae)

Victoria Tang

Zhangyang Rd. 200120, Pudong New District, Shanghai, China; email: jibril.flueqel@gmail.com

http://zoobank.org/urn:lsid:zoobank.org:pub:DE7E2D6E-7F2F-4799-AA49-57690FBA31EB

Summary

A new monotypic genus belonging to the basal scorpion family Pseudochactidae Gromov, 1998, *Qianxie solegladi* **gen et. sp. n.**, is described from Yunnan Province of China. The family is recorded from China for the first time, vastly extending its known geographic range. The new genus shares morphological characters with both *Pseudochactas* Gromov, 1998 and *Troglokhammouanus* Lourenço, 2007. It differs from *Pseudochactas* and is similar to *Troglokhammouanus* in the shapes of anterior and posterolateral carapace margins, form of the circumocular sutures, distance between median ocelli, development of dorsoventral projection of patella, length of tarsal spinules, recurvature of the lateral margins and concavity of the surface of the sternum. It is similar to *Pseudochactas* in the degree of carapace granulation, pedipalp manus carination, secondary accessory and retroventral carinae of the chela manus, numbers of lamellae and teeth on the pectines, development of the median lateral carinae of metasomal segments III–IV and ventromedian carina of metasomal segment V. The new genus is hypothesized to be more closely related to *Troglokhammouanus* than to *Pseudochactas* and is placed in the subfamily Troglokhammouaninae.

Introduction

The family Pseudochactidae Gromov, 1998 is one of the most enigmatic scorpion families, and remained completely unknown until near the end of the last century. The type genus and species, *Pseudochactas ovchinnikovi* Gromov, 1998, was first described from Central Asia (Uzbekistan and Tajikistan). It was distinguished from all other scorpions by a unique combination of characters, including: 'Type D' trichobothrial pattern (defined by Soleglad & Fet, 2001), one pair of lateral eyes, circumocular sutures on anterior carapace, and paired ventrosubmedian carinae on metasomal segment V. Nine years later, Lourenço (2007a, 2007b) described a second genus in the family, *Troglokhammouanus*, monotypic with type species *T. steineri* from a cave system in Laos. A second species of *Pseudochactas* was described by Soleglad et al. (2012), *P. mischi* from Afghanistan. Lourenço & Pham (2010) described a third genus, *Vietbocap*, monotypic with eyeless cave species *V. canhi* from Vietnam. Lourenço (2012) added a second troglobitic species, *V. lao* from Laos, and proposed a new subfamily Vietbocapinae. Several additional species were subsequently described from caves in southeast Asia: *T. louisanneorum* Lourenço, 2017; *V. thienduongensisi* Lourenço & Pham, 2012; *V. quinquemilia* Lourenço et al., 2018; and *V. aurantiacus* Lourenço et al., 2018. In a recent revision of the family, Prendini et al. (2021) synonymized *T. louisanneorum* with *T. steineri*, defined a new genus *Aemngvantom* for *V. lao*, described a second species, *A. thamnongpaseuam*, and synonymized all the remaining *Vietbocap* species under *V. canhi*.

The name *Pseudochactas* is literally translated as "false *Chactas*". However, it is not considered to be closely related to family Chactidae Pocock, 1893, but to Buthidae C. L. Koch, 1837 and Chaerilidae Pocock, 1893. Initial phylogenetic analysis of the morphology of *Pseudochactas* suggested a close relationship to the common ancestor of all Recent scorpions (Soleglad & Fet, 2003b), whereas more recent phylogenomic analyses suggested that Pseudochactidae is a sister family to Chaerilidae, from which it diverged ca. 329 Mya, the two forming a sister clade to Buthidae (Sharma et al., 2015, 2018). Prendini et al. (2021) revised the family based on both morphology and DNA analysis, and divided it into three subfamilies, namely Pseudochactinae Gromov, 1998, Troglokhammouaninae Lourenço, 2007, and Vietbocapinae Lourenço, 2012, containing four genera and six species in all. While the species of the latter two subfamilies occur in Laos and Vietnam, Pseudochactinae with a single genus, *Pseudochactas* Gromov, 1998, is so far recorded only from Afghanistan, Tajikistan and Uzbekistan. No records exist of this family in China. According to Prendini et al. (2021), applying the Schiner-Racovitza system for the classification of subterranean organisms, both Troglokhammouaninae and Vietbocapinae are exclusively hypogean (obligately cavernicolous) and were collected in caves, although only Vietbocapinae is considered troglobitic with a troglomorphic anatomy. On the other hand, both known species of Pseudochactinae are epigean, living above ground.

The present study describes a second genus of Troglokhammouaninae, *Qianxie* **gen. n.**, with a single epigean species *Q. solegladi* **sp. n.**, from Yunnan Province

Figures 1–2: *Qianxie solegladi* **gen**. **et sp**. **n**., female holotype, dorsal (1) and ventral (2) views, under white light.

in China. Yunnan Province borders Myanmar on the southwest, Laos on the south and Vietnam on the southeast, and Troglokhammouaninae and Vietbocapinae are distributed within the latter two countries. However, the currently known localities of the new species are far from these borders, and several other putative localities are known in Sichuan Province which is adjacent to Yunnan. *Qianxie* **gen**. **n**. shares morphological characters with both *Pseudochactas* and *Troglokhammouanus*. With a greater emphasis on similarities to the latter, it is assigned to subfamily Troglokhammouaninae. The discovery of *Q. solegladi* **sp**. **n**. in the southwest region of China is striking. It greatly extends the known distribution of the family and decreases the geographic distance separating Pseudochactinae from the other subfamilies. This increases the plausibility of more species of this family being found in the intervening regions.

The finding of this new species also suggests that there could be additional undiscovered scorpion taxa in China, and its scorpion fauna demands further investigation. There is a possibility of subterranean species in the cave systems of Yunnan Province, which borders Laos and Vietnam where the troglobitic pseudochactids were found. To date, only two groups of arachnids have been recorded there, Araneae and Opiliones. The study of Chinese troglobitic fauna was initiated only very

Dimensions (mm)		*Qianxie solegladi* gen. et sp. n. ♀ HT
Carapace	L / W	3.1 / 3.2
Mesosoma	L	8.1
Tergite VII	L / W	1.7 / 2.8
Metasoma + telson	L	13,5
Segment I	L / W / D	1.1 / 1.6 / 1.3
Segment II	L / W / D	1.4 / 1.5 / 1.3
Segment III	L / W / D	1.5 / 1.4 / 1.3
Segment IV	L / W / D	2.0 / 1.4 / 1.3
Segment V	L / W / D	3.8 / 1.4 / 1.3
Telson	L / W / D	3.7 / 1.5 / 1.4
Pedipalp	L	10.7
Femur	L / W	2.8 / 1.0
Patella	L / W	2.9 / 1.2
Chela	L	5
Manus	L / W / D	2.4 / 1.6 / 1.3
Fixed Finger	L	2.1
Movable finger	L	2.6
Total	**L**	**24.7**
Pectine Teeth Count	L / R	10 / 10

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

recently, and many karst caves await future exploration.

Methods, **Materials & Abbreviations**

Measurements follow Stahnke (1971). Nomenclature of morphological characters mostly follow Prendini et al. (2021), which is based on Prendini et al. (2006) and further follows the terminology of trichobothriotaxy by Vachon (1974) and Soleglad & Fet (2001), sternum by Soleglad & Fet (2003a), and lateral ocelli by Loria & Prendini (2014), except for chelicera by Soleglad & Fet (2003b).

The adult female holotype was captured manually at night (approximately 20:00 h) with the aid of white light by a local collector. It was subsequently sent to the author, who observed it live for 5 days until it died from unknown causes. Photographic images were recorded from the fresh unfixed specimen, after removal of internal organs from the prosoma and mesosoma. The body was subsequently filled with cotton to record its dorsal and ventral structure more clearly. After completion of imaging, the holotype was preserved in 99% ethanol.

Specimen depositories: GLPC (Personal collection of Graeme Lowe, Auckland, New Zealand); VT (Personal collection of Victoria Tang, Pudong New District, Shanghai, China).

Videos of the living specimen available as two additional files at: https://mds.marshall.edu/euscorpius/vol2022/iss351/1

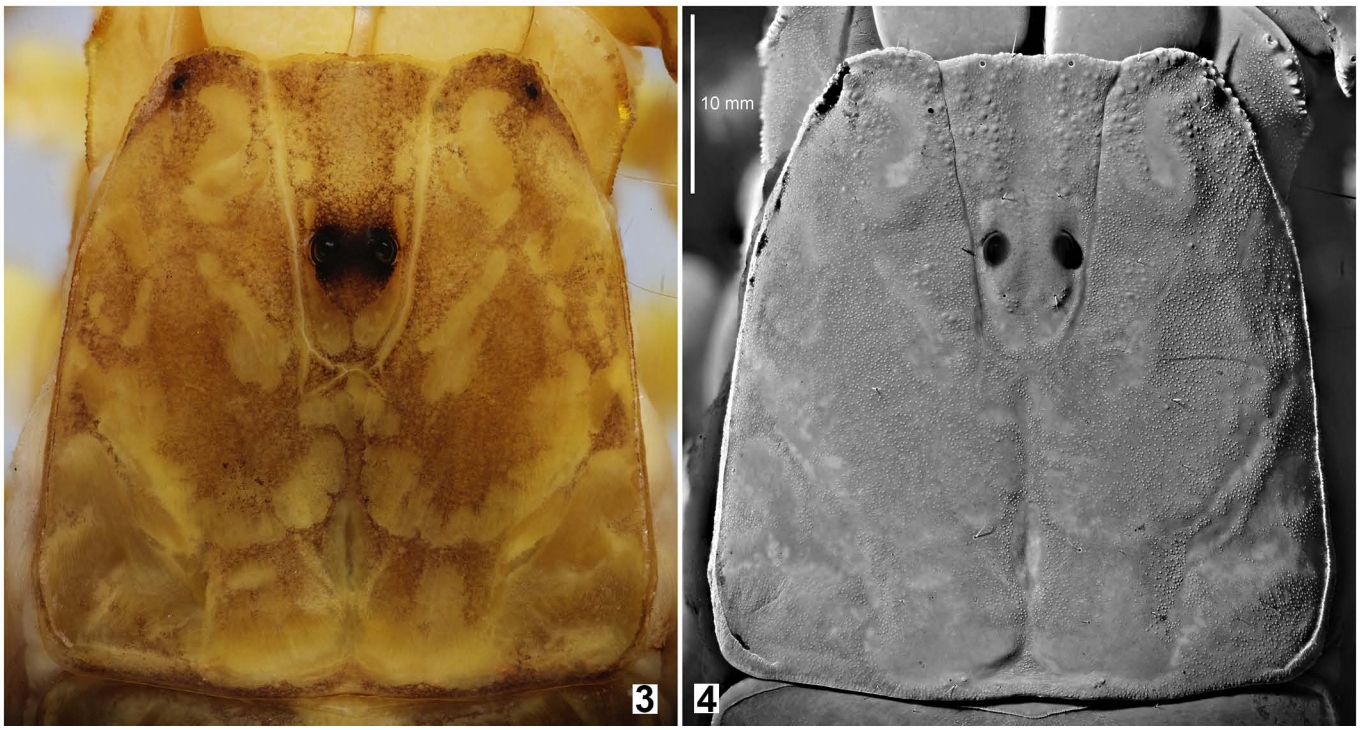
Systematics

Superfamily **Pseudochactoidea** Gromov, 1998
Family **Pseudochactidae** Gromov, 1998
Subfamily **Troglokhammouaninae** Lourenço, 2007

Qianxie Tang, **gen**. **n**.
http://zoobank.org/urn:lsid:zoobank.org:act:CACF42E8-D8CD-45A1-B75C-5E5CE44A3326

Type species, *Qianxie solegladi* **sp**. **n**.

Etymology. The generic epithet is a noun in apposition, the Pingyin for "钳蝎" (*qián xiē*) in Chinese. *Qian* (钳) refers to the pincer, i.e., the pedipalp, and *xie* (蝎) is the Chinese equivalent for "scorpion". This name is coined for two reasons: (1) the family Pseudochactidae is defined by the Type D trichobothrial pattern on the pedipalp femur, and (2) the genus *Buthus* Leach, 1815 has long been unreasonably assigned with a Chinese common name (钳蝎) that initially was applied exclusively to *Olivierus martensii* (Karsch, 1879) (see Tang, 2022) while the genus *Buthus* does not occur in China. The name of this new genus is not of the same concept as the Chinese common name for *O. martensii*.



Figures 3–4: *Pseudochactas ovchinnikovi* Gromov, 1998, female from Babatag Mountains, Uzbekistan; photos provided by G. Lowe. **Figure 3**. Carapace under white light. **Figure 4**. Carapace under UV light.

Diagnosis (based on the holotype female). Scorpion of small size, total length (anterior margin of carapace to tip of telson) 24.7 mm (probably reaching 30 mm). General coloration brownish orange to brownish yellow, with prominent fuscous maculae and stripes on dorsal prosoma, mesosoma, pedipalps and legs, and ventral metasoma, and distinct pale yellow bands on posterior margins of carapace and tergites. Carapace rounded (similar to isosceles trapezoid), essentially flat and weakly granulated; acarinate except for a pair of obsolete, granular anterosubmedian carinae within the circumocular sutures, anterior to median ocular tubercle; anterior margin trisected by pair of distinct circumocular sutures that are complete but unconnected posteriorly; anterior margin between sutures slightly protruding, almost sublinear; posterolateral margins of the carapace gently curved. Median ocular tubercle situated anteromedially on carapace, raised; one pair of lateral ocelli (= posterolateral major ocellus, PLMa). Dorsal margin of cheliceral movable finger with three teeth (dorsal distal, subdistal and median); ventral surface of cheliceral fixed finger with four or five accessory denticles. Sternum type 1, pentagonal; ventral surface of sternum shallowly concave, with round posteromedian depression moderately developed. Genital operculum completely divided longitudinally. Pectines with 9–10 median lamellae, 10 teeth. Spiracles small, oval in shape. Most pedipalp carinae smooth and costate. Secondary accessory and retroventral carinae of the pedipalp chela manus entirely fused. Anterior process on prolateral surface of pedipalp patella pronounced. Trichobothrial pattern type D, orthobothriotaxic; pedipalp femur dorsal trichobothria in β configuration. Tibiae of legs III and IV with spurs; basitarsi with pair of prolateral and retrolateral pedal spurs; spinules on legs I–IV basitarsi and telotarsi moderate in length. Metasomal segments with dorsolateral carinae posteriorly convergent on I–III and V, subparallel on IV; ventrosubmedian carinae costate-granular on segment II; ventrolateral carinae of segment I posteriorly divergent; segment V with ventrosubmedian carinae complete. Telson sub-oval, lateral and ventral surfaces of vesicle finely and sparsely granular, subaculear tubercle nearly absent, aculeus short.

Distribution. China (inland of southwest region, Yunnan and Sichuan Provinces, Figs. 60–61).

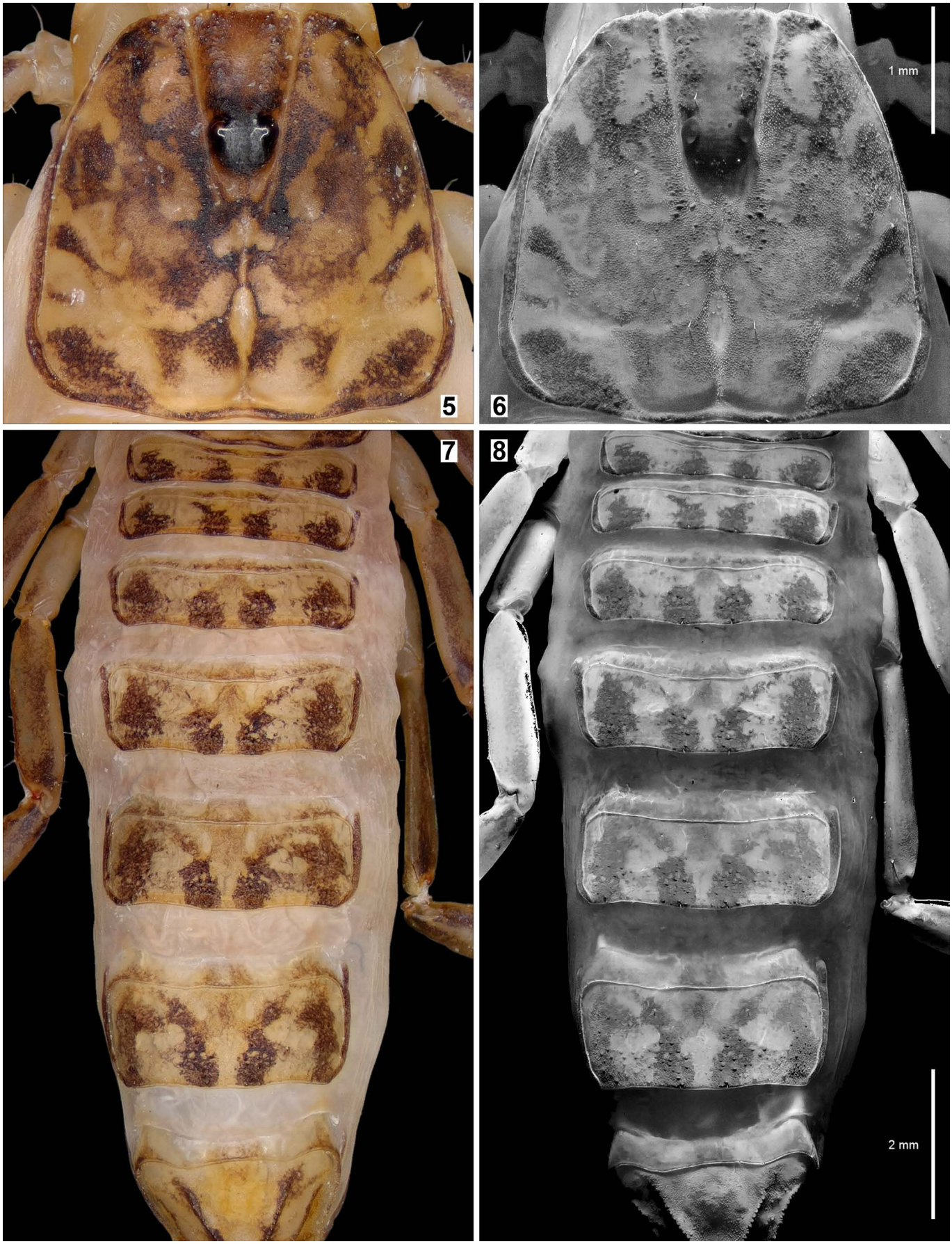
Ecology. The only known species in the new genus is epigean, occurring above ground and exhibiting no troglomorphism, which is different from its presumed sister genus, *Troglokhammouanus* Lourenço, 2007. The habitat and habitus of this genus are consistent with a lapidicolous ecomorphotype (*sensu* Prendini, 2001), or the lithophilous ecomorph (*sensu* Coelho et al., 2022).

Qianxie solegladi gen. et sp. n.

(Figures 1–2, 5–61, Table 1)

http://zoobank.org/urn:lsid:zoobank.org:act:68B4B597-4B4B-48E6-B1BC-D1FC49A020C6

Type locality and type repository. **China**, Yunnan Province, Kunming City, Luquan County, Wumeng Township, Zhongping Village, 25°89'59"N 102°72'47"E, 1192 m a. s. l.; VT.



Figures 5–8: *Qianxie solegladi* **gen**. **et sp**. **n**., female holotype, carapace (5, 7) and tergites I–V (6, 8). **Figures 5–6**. Carapace (5) and tergites I–V (6), under white light. **Figures 7–8**. Carapace (7) and tergites I–V (8), under UV light.

Type material. **China**, Yunnan Province, Kunming City, Luquan County, Wumeng Township, Zhongping Village, 25°89'59"N 102°72'47"E, 1192 m a. s. l., 29 April 2022, 1♀ (holotype), leg. Hao He (何豪), VT.

Comparative material. *Pseudochactas ovchinnikovi* Gromov, 1998 (Figs. 3–4). **Uzbekistan**, Surkhondaryo Province, Okmachit District, Babatag Mountains, Dukhone sai (ravine), Chagam uchastok (area) of Shurchi leskhoz (Forest Management District), 38°01'39"N 68°14'45"E, 763 m a. s. l, 4 May 2002; 2♂1♀; leg. V. Fet; GLPC.

Etymology. The specific epithet is named in honor of Michael E. Soleglad (Winchester, California, USA), one of the best scorpiologists in the world, who with Victor Fet (Marshall University, USA) formalized the definition of the 'Type D' trichobothrial pattern characteristic of *Pseudochactas*.

Chinese equivalent. 索氏钳蝎 (roughly as "Soleglad's pincer scorpion" in English; see Tang (2022) for the rules of designation).

Diagnosis. As for the genus.

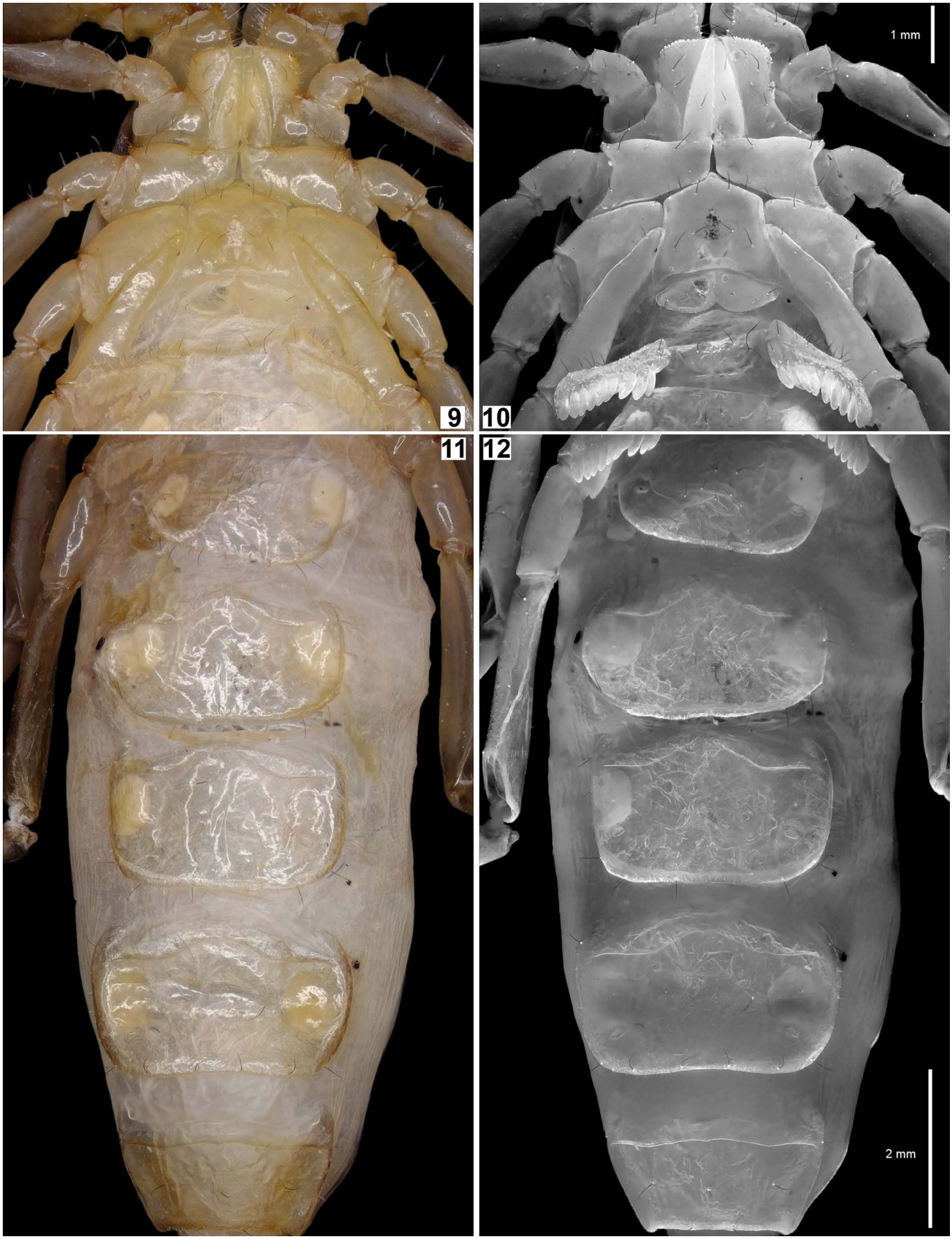
Description. The *in vivo* habitus of holotype female is shown in Fig. 47. Coloration of the cuticle is shown in Figs. 1–2, 5–6, 9–10, 13, 16–24, 35–37, 41 and 43–46 (internal organs removed from prosoma and mesosoma). Base color of prosoma and mesosoma in Figs. 1–2, 5–12, appears lighter than *in vivo*, due to removal of internal organs which were replaced with white cotton. Cuticular morphosculpture under UV fluorescence is shown in Figs. 7–8, 11–12, 14–15, 25–34, 38–40 and 42. Measurements are given in Table 1.

Coloration (***in vivo***) (Fig. 47). Basic color of integument brownish orange to brownish yellow. Carapace diffusely maculate, with brownish marbled pattern, predominately covering the lateral sides of circumocular sutures, from anterolateral margin to posteromedian region, lateromedian margin and posterolateral corners. Chelicerae generally yellow, except for anterior margin of dorsal surface of manus, which is fuscous. Tergites with a pair of lateral and submedian longitudinal stripes throughout the mesosoma, formed by intermittent, nearly successive, dark brown patches, extended from posterior margin of carapace. Distinct pale yellow bands present on posterior margins of carapace and tergites, interrupted by longitudinal dark stripes, and pale yellow patches on posterior dorsal surfaces of metasoma I–III. Ventral surface of prosoma and mesosoma light yellow, with pectines more pale. Metasoma with brown stripes along carinae. Aculeus black. Pedipalps with maculae mainly along carinae, except for the femur which has infuscate patches near the femur-trochanter articulation. Pedipalp fingers brownish to reddish brown, except for the tips, which are the same as the base color. Legs slightly paler in basic color, with brownish stripes primarily on the prolateral surface from femur to patella, the stripes being paler on retrolateral surfaces.

Carapace (Figs. 5, 7). Carapace essentially similar to isosceles trapezoid in dorsal profile, slightly wider than long. Anterior margin trisected by a pair of distinct circumocular sutures which are complete but unconnected posteriorly. Anterior margin between sutures slightly protruding, almost sublinear; anterior margin as a whole slightly convex, curving outward. Anteromedian depression between sutures narrow, shallow, smooth. Posterolateral margins of carapace gently curved. Surface acarinate, except for a pair of obsolete, granular anterosubmedian carinae between the circumocular sutures, anterior to median ocular tubercle. One pair of very small anterolateral major (ALMa) ocelli situated close to anterolateral margins of carapace, other lateral ocelli absent. Median ocular tubercle raised, situated anterior to midpoint. Median ocelli considerably larger than lateral ocelli, with a pair of weakly developed, smooth superciliary carinae. Interocular sulcus, central lateral sulci and posterolateral sulci relatively shallow and smooth. Posteromarginal sulcus deeper and mostly smooth except for the anterior region which is scattered with small granules. Behind the median ocelli are pair of shallow, smooth depressions (central transverse sulci), followed successively by a pair of median depressions (anterior part of posteromedian sulcus), and an oval depression (posterior part of posteromedian sulcus). These three groups of sulci are moderately deep, demarcated by granular intervals. Carapace surface mostly very finely granulated or shagreened. Granulation surrounding sulci somewhat denser and slightly coarser, while most sulci are completely smooth. Coarse granules scattered predominately along both sides of circumocular sutures.

Mesosoma (Figs. 6, 8–12, 14, 15). Pretergites surfaces smooth. Posttergites I–VI very finely and uniformly granular, granulation becoming coarser near posterior margins, acarinate, each with pair of very shallow submedian depressions; VII surface smooth, with pair of costate-granular dorsosubmedian and dorsolateral carinae reaching posterior margin of segment; coarse granules also present between the two pairs of carinae on tergite VII. Sternites III–VII surfaces entirely smooth, lustrous, acarinate, with scattered macrosetae; posterior margins with sparse row of macrosetae; sternites III–VI with very small, oval spiracles; sternite VII width 64.7% greater than length (table 1). Sternum type 1, pentagonal, posterior width 18.4% of length, lateral margins moderately recurved medially, ventral surface shallowly concave, posteromedian depression round, moderately developed, defined posteriorly by slight outer ridge. Pectines of moderate size relative to body; three marginal lamellae, proximal sclerite considerably longer, distal sclerite short but wider than medial sclerite; 9 or 10 median lamellae; fulcra present, very small. Proximal median lamella and basal pectinal tooth unmodified. Pectinal teeth present along entire posterior margin of each comb; 10 teeth.

Metasoma (Figs. 35–40). Metasoma short, total length 14.2% less than combined length of prosoma and mesosoma; segments I–V progressively increasing in length, I and II wider than long, III–V longer than wide (Table 1). Metasoma almost apilose, sparsely covered in short microsetae and macrosetae. Eight carinae on segments I and IV, ten on II and



Figures 9–12: *Qianxie solegladi* **gen**. **et sp**. **n**., female holotype, sternopectinal region (9, 11) and sternites (10, 12). **Figures 9–10**. Sternopectinal region (9) and sternites (10), under white light. **Figures 11–12**. Sternopectinal region (11) and sternites (12), under UV light.

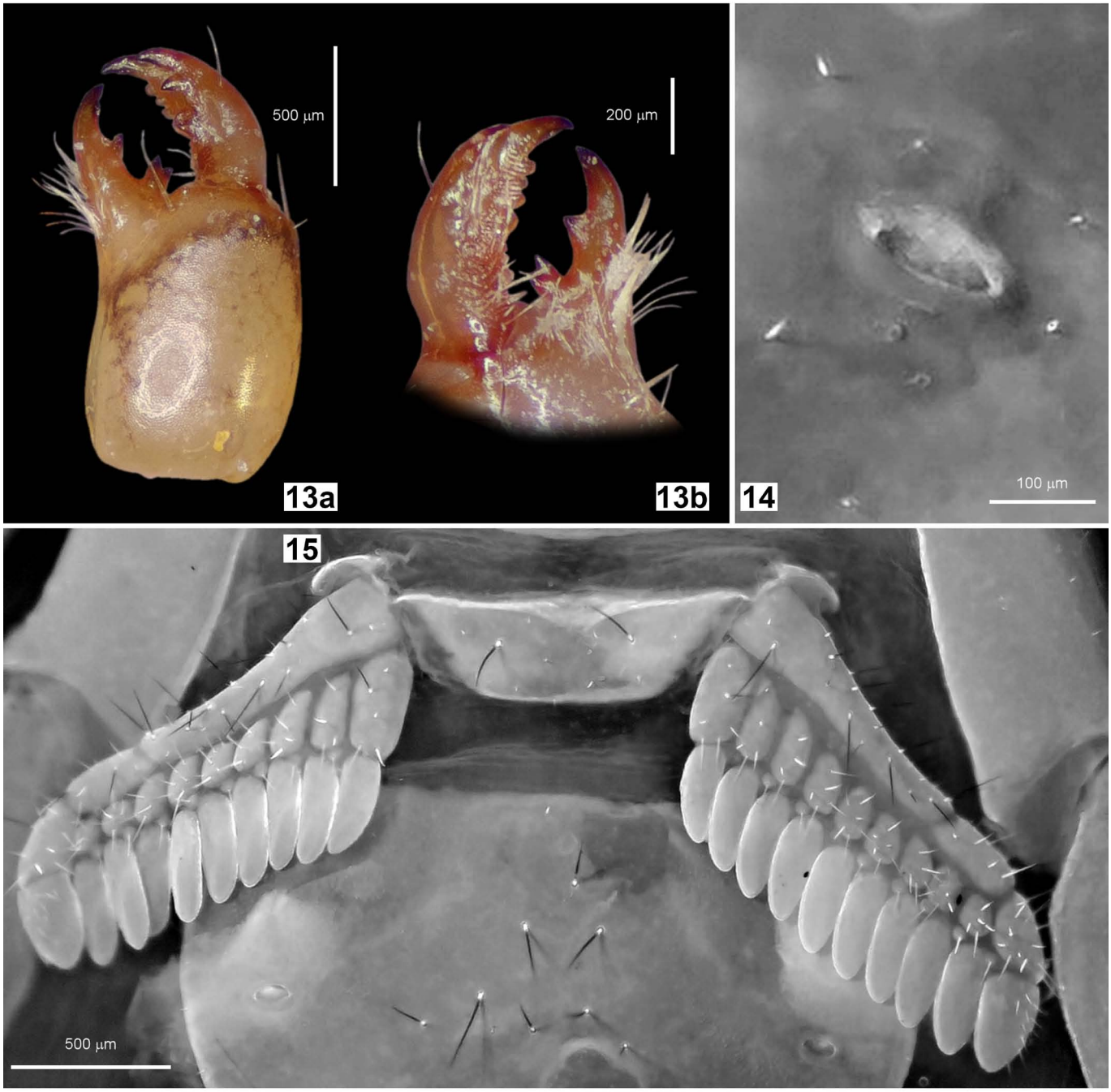
III, and nine on V. Dorsosubmedian carinae well developed, costate-granular throughout length of segments I–IV, absent on V; converging posteriorly. Dorsolateral carinae well developed, costate-granular throughout length of segments I–V; converging posteriorly on I–III and V, subparallel on IV. Dorsosubmedian and dorsolateral carinae of segments I–III each terminating posteriorly with slightly enlarged granule. Median lateral carinae well developed, costate-granular, but becoming obsolete anteriorly on segment I–III, indicated by 1 or 2 slightly larger granules medially on IV and V. Ventrolateral carinae well developed, costate-granular, but becoming obsolete anteriorly on segment I, continuous throughout length of II–V; diverging posteriorly on I, subparallel on II–IV and converging posteriorly on V. Ventrosubmedian carinae almost absent on segment I (slightly indicated at posterior margin), well developed, costate-granular, but becoming obsolete anteriorly on II, well developed, costate granular throughout length of III–V; progressively converging posteriorly on II–V (subparallel on II). Ventromedian carina absent from I–IV, obsolete on V, comprising a weak row of granules. Intercarinal surfaces smooth.

Telson (Figs. 41–42). Telson large, sub-oval. Vesicle pyriform, 7.6% wider than metasomal segment V, with flattened dorsal surface and rounded ventral surface, height 37.8% of length; dorsal surface smooth, lateral surfaces with three pairs of obsolete, granular carinae and a shallow sulcus between the first pair on each side, ventral surfaces with two pairs of more developed, granular carinae; anterodorsal lateral lobes ('vesicular tabs') distinct, each with two spiniform granules; subaculear tubercle absent. Aculeus short, shallowly curved (tip broken in holotype).

Chelicerae (Figs. 13a, b). Fixed finger dorsal margin with four teeth (basal, median, subdistal, distal); basal and median teeth fused into bicusp; gap between median and subdistal teeth U-shaped; ventral surface with four small denticles (ventral accessory denticles). Movable finger dorsal margin with three teeth (dorsal distal, subdistal, median), without basal teeth; ventral margin with four or five blunt denticles (ventral accessory teeth) and serrula in distal third; dorsal distal and ventral distal teeth subequal. Ventral surface of fingers and manus with numerous long, dense setae.

Pedipalps (Figs. 16–34). Pedipalps relatively robust; segments almost apilose, sparsely covered in short microsetae and rarely macrosetae. Pedipalp femur length approximately 3 times greater than width. Femur with six carinae evident; promedian carina obsolete, reduced to few spiniform granules; prodorsal, proventral, and retrodorsal carinae well developed, costate-granular; dorsomedian carina weak, granular; retromedian carina weak, comprising short row of granules terminating medially; retroventral and ventromedian carinae vestigial to absent, reduced to few granules proximally; intercarinal surfaces almost smooth, partially with tiny granules. Pedipalp patella length approximately 2.4 times greater than width. Patella with six carinae evident; retrodorsal and retroventral carinae weakly developed, costate and smooth; prodorsal and proventral carina well developed, granular to costate granular; prolateral surface, dorsoventral projection ('anterior process') moderately developed, with obsolete prolateral carinae ('dorsal and ventral patellar spur carinae'), indicated by prominent pair of dorsal and ventral spiniform granules proximally, the dorsal more strongly developed; dorsomedian, retromedian, and ventromedian carinae absent; intercarinal surfaces smooth. Pedipalp chela relatively short and broad; manus strongly dilated, width 23% greater than height and length 50% greater than width. Chela with five carinae developed, other carinae obsolete or absent; dorsomedian carina moderately developed, reduced to row of granules at base of fixed finger, becoming obsolete proximally on manus; digital carina well developed, costate; dorsal secondary, subdigital and retromedian (retrolateral secondary) carinae almost absent (hardly indicated); secondary accessory and retroventral carinae entirely fused; retroventral carina well developed, costate, but granular at the proximal margin, with distal margin connected to retrolateral movable finger condyle; ventromedian carina weakly developed near prolateral movable finger condyle, reduced to few proximal granules; proventral carina weakly developed, costate; prodorsal carina obsolete, comprising series of isolated granules; promedian carina almost absent (hardly indicated); intercarinal surfaces smooth except for coarser, scattered granules on prolateral surface of manus, near base of fixed and movable fingers, granulation becoming very fine and extending onto fingers. Fixed and movable finger dentate margins sublinear or slightly sinuous, movable finger without proximal lobe and fixed finger without corresponding proximal notch, no proximal 'gap' evident when closed; median denticle rows comprising seven oblique and slightly imbricated subrows, decreasing in length distally; each subrow comprising large retrolateral denticle proximally, slightly offset (absent from proximal subrow, more prominent on subrows 2–6, several small median denticles, and large prolateral denticle distally, slightly offset (less prominent on the distal or 7th subrow); terminal denticle enlarged, located distally relative to the distal subrow; accessory denticles absent. Trichobothrial pattern orthobothriotaxic, Type D, femur in β configuration. Trichobothrium d_1 situated near trochanter, d_2 near prodorsal carina, d_3 at proximal end of dorsomedian carina, d_4 near retrodorsal carina, d_5 on prodorsal carina, and d_6 near middle part of dorsomedian carina. An additional trichobothrium was found only on the left femur and labeled as d_7. Total number of trichobothria on each pedipalp segment: femur, 12/13 (6/7 dorsal, 3 prolateral, 3 retrolateral); patella, 10 (3 dorsal, 1 prolateral, 6 retrolateral); chela, 13 (5 manus, 8 fixed finger). Total number of trichobothria per pedipalp, 35/36. Five or six trichobothria on femur, i_4, d_1, d_2, d_4, d_6 and d_7, one on patella, est_1, and one on chela fixed finger, ib_2, noticeably smaller than others ('petite').

Legs (Figs. 43–46). Leg I coxapophyses, distal margins unmodified (not spatulate or dilate) anteriorly. Legs I and II tibiae, retrolateral margins each with scattered macrosetae, without spurs; III and IV with spurs, smooth, without spinelets. Basitarsi with few scattered macrosetae, prolateral and retrolateral rows of moderate spinules, and pair of



Figures 13–15: *Qianxie solegladi* **gen**. **et sp**. **n**., female holotype, chelicera (13), respiratory spiracle (14) and pectines (15). **Figure 13**. Chelicera dorsal (a) and ventral (b) views. **Figure 14**. Sternite V, right spiracle, under UV light. **Figure 15**. Pectines, under UV light.

prolateral and retrolateral pedal spurs. Telotarsi with pair of ventrosubmedian rows of moderate spinules; proventral and retroventral rows of macrosetae absent, only few scattered macrosetae laterally; ungues short, distinctly curved, equal in length; dactyl pronounced, pointed.

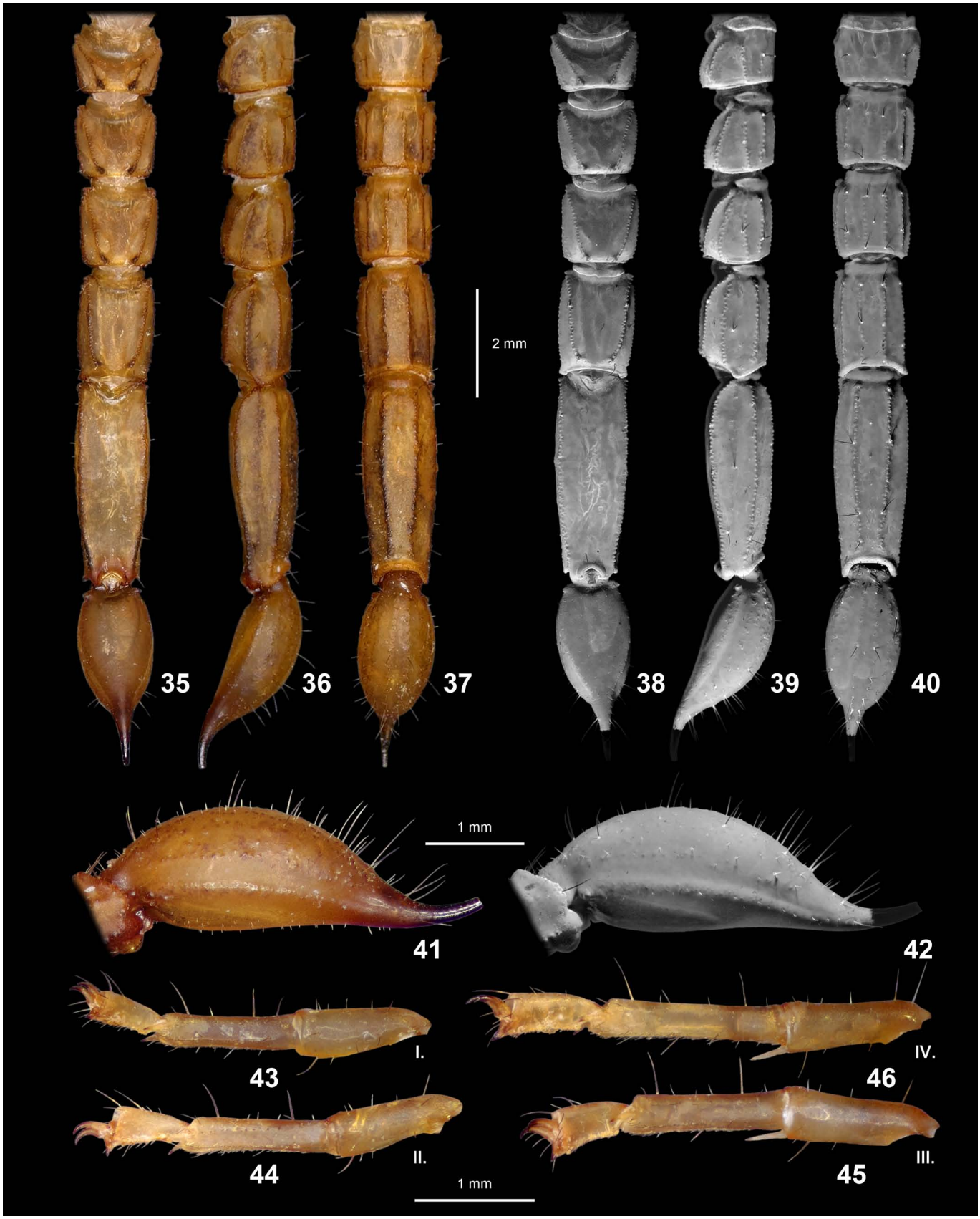
Hemispermatophore. Unknown.

Measurements. See Table 1.

Variation. Only one adult female specimen was available for examination; however, one adult male had also been collected from approximately the same locality in Luquan, Kunming, Yunnan Province, by the same collector on 27 September 2021 (Figs. 50–51). Based on the photos, the male possesses 11–12 pectinal teeth (Fig. 51) and appears to reach 30 mm (based on photos of comparison with hand by Hao He, pers. comm.), which suggests that females can be even larger. No other prominent sexual dimorphism was observed except for the relatively narrower mesosoma in the adult male. According to several photos of different individuals from other localities, the coloration of the new species may vary. Two adult females from Panzhihua, Sichuan Province, showed paler maculae on the carapace (see Fig. 53 for one of the females). It is

Figures 16–34: *Qianxie solegladi* **gen**. **et sp**. **n**., female holotype, pedipalp chela (16–18, 25–27), patella (19–21, 28–30), femur and trochanter (22–24, 31–33), and movable finger (34). **Figures 16–18**. Pedipalp chela, dorsal (16), external (17) and ventral (18) views, under white light. **Figures 19–21**. Pedipalp patella, dorsal (19), external (20) and ventral (21) views, under white light. **Figures 22–24**. Pedipalp femur and trochanter, dorsal (22), internal (23) and ventral (24) views, under white light. **Figures 25–27**. Pedipalp chela, dorsal (25), external (26) and ventral (27) views, under UV light. **Figures 28–30**. Pedipalp patella, dorsal (28), external (29) and ventral (30) views, under UV light. **Figures 31–33**. Pedipalp femur and trochanter, dorsal (31), internal (32) and ventral (33) views, under UV light. **Figure 34**. Movable finger, dorsal view, under UV light. The trichobothrial pattern is indicated in Figures 19–21, 25–26, 31–32.

important to note that an individual from Panzhihua, Sichuan was found to have a recessed anterior margin on the carapace (Fig. 52). Nevertheless, the developmental stage cannot be confidently determined (probably subadult), so this character could be ontogenetically variable. Most specimens observed to date exhibited either a straight (sublinear) or a slightly convex margin. The holotype female was gravid but died of unknown causes. Environmental temperature and humidity may not have been optimal, and these parameters need to be determined by investigating the microhabitat. Although



Figures 35–46: *Qianxie solegladi* **gen**. **et sp**. **n**., female holotype, metasoma and telson (35–40), telson (41–42), and left legs I–IV (43–46). **Figures 35–37**. Metasoma and telson, dorsal (35), lateral (36) and ventral (37) views, under white light. **Figures 38–40**. Metasoma and telson, dorsal (38), lateral (39) and ventral (40) views, under UV light. **Figures 41 and 42**. Telson lateral view, under white and UV lights, respectively. **Figures 43–46**. Left legs I–IV, retrolateral view, under white light.

subsequent observation of ontogenetic variation in the offspring was precluded (Figs. 47–49), dissection of the female retrieved about 33 developing eggs (Fig. 49), suggesting a recent fertilization event. Additional information about this species was recorded in advance, with videos of the living specimen available as supplemental data. Unfortunately, the habitus of the offspring cannot be determined now, but it was also uncertain whether the juveniles could have survived in the laboratory, since so little is known about the ecology of the new species.

Affinities. The new species shares characters with both *Pseudochactas* and *Troglokhammouanus*, and appears to be intermediate between these two genera and their respective subfamilies. However, most of the important morphological characters are shared with *Troglokhammouanus*, except for a few traits in common with *Pseudochactas*. Relative to *Troglokhammouanus*, the new species is closer to *Pseudochactas* in the following aspects: (1) carapacial granulation relatively weak (strongly granulated in *T. steineri*); (2) pedipalp manus with dorsomedian, dorsal secondary, subdigital, and retromedian carinae absent, and ventromedian carina vestigial (dorsomedian, dorsal secondary and subdigital carinae vestigial, and retromedian and ventromedian carinae partial in *T. steineri*); (3) secondary accessory and retroventral carinae of the chela manus fused (incompletely fused in *T. steineri*); (4) counts for pectinal lamellae and teeth are 8–12 and 9–13 respectively (12–16 and 13–17 in *T. steineri*); (5) median lateral carinae of metasomal segments become obsolete anteriorly on III, vestigial or absent on IV (complete in *T. steineri*); (6) ventromedian carina obsolete on segment V (moderately developed, granular in *T. steineri*). The new species may further differ from *Troglokhammouanus* in the development of pedipalp carinae. Coloration was proposed as a subfamilial diagnostic character by Prendini et al. (2021) but is discounted here.

However, other features suggest a closer relationship with *Troglokhammouanus*, including some that could be diagnostic at a higher level in a phylogenetic context (e.g., shape of carapace and sternum). The overall carapace shape of the new species is closer to that of *Troglokhammouanus* in having a rounded dorsal profile. More specifically, the new species exhibits a slightly convex anterior margin (notably recessed in *Pseudochactas*) and curved posterolateral margins (angular and slanting in *Pseudochactas*). The degree of convexity is intermediate between the two genera and could be intraspecifically variable. All pseudochactids are characterized by a pair of circumocular sutures, yet it is important to point out that the circumocular sutures of the carapace do not actually connect posteriorly in *Pseudochactas*, which was a subfamilial diagnostic character proposed by Prendini et al. (2021). In their photos of *P. ovchinnikovi*, distinct pale lines can be seen at the posterior end of each suture, which causes an illusion that the circumocular sutures are connected posteriorly, leading to a U-shaped configuration. A re-examination of an individual of *P. ovchinnikovi* revealed that the two sutures gradually fade out behind the median ocular tubercle, surrounding the lateral side of the central transverse sulcus (exhibited as a pair of shallow, smooth depressions). The circumocular sutures are sharply incised anteriorly but become shallower and wider grooves or sulci from the middle section and fade out completely behind the median ocular tubercle. The sutures are then continued by irregular pale lines that either connect or cross with each other (Figs. 3–4). Some of these lines are disturbed by granules, thus no complete connection can be formed. However, in both the new genus and the other genus in the same subfamily, *Troglokhammouanus*, no pale lines are visible. As a result, at most, only the presence/absence of the pale lines should be considered as the subfamilial character instead. In the new species, no such lines are found, and the configuration of the sutures is similar to that of *Troglokhammouanus*. The distance between median ocelli is relatively greater than that of *Pseudochactas*, and more similar to that of *Troglokhammouanus*. In terms of the dorsoventral projection of patella, the degree of development is not as strong as in *Pseudochactas* but is similar to *Troglokhammouanus* (based on the vertical dimension between the spiniform granule at the tip and the prodorsal carina). As for the lateral margins of the sternum, both *Pseudochactas* and *Troglokhammouanus* are somewhat recurved medially, but there is a difference in the degree. The lateral margins of the sternum in *Pseudochactas* are more sublinear, but those of the new species are closer to *Troglokhammouanus*. Also, the ventral surface of the sternum of the new species is concave, which is identical with *Troglokhammouanus*. The spinules on legs I–IV basitarsi and telotarsi of the new species are longer than those of *Pseudochactas*, but not as long as those of *Troglokhammouanus* (cf. Prendini et al., 2021: 48, figs. 15a, 15b). Although this may be an intermediate character state, the spinules in the holotype are terminally truncate, indicating physical wear and breakage of their fine tips. Extrapolation of the intact morphology to acuminate spinules would place them in the length category of *Troglokhammouanus*.

The many similarities of the new species with *Troglokhammouanus* (8 characters), and closer geographic proximity, support its placement in the subfamily Troglokhammouaninae, while its differences from *Troglokhammouanus* (6 characters) motivate its placement in a new genus. Although there are several similarities in carination and pectinal characters between the new genus and *Pseudochactas* (5 characters), in other scorpions these are more often applied as diagnostic characters of species, rather than genera or subfamilies. In their integrated morphological and molecular phylogenetic analysis, Prendini et al. (2021: 29, fig. 9) found that the protruding anterior margin of the carapace, and longer tarsal spinules (characters 11 and 99 respectively) were unambiguous, unique synapomorphies for (Troglokhammouaninae + Vietbocapinae), clade, which would support placing the new species therein. The strong dorsoventral projection of the pedipalp patella, and the flat sternum (characters 51 and 97 respectively) were synapomorphies for Pseudochactidae, and these were absent in the new species. The systematic position of *Qianxie solegladi* **sp**. **n**. that is hypothesized here can be tested by phylogenetic reanalysis of pseudochactids.

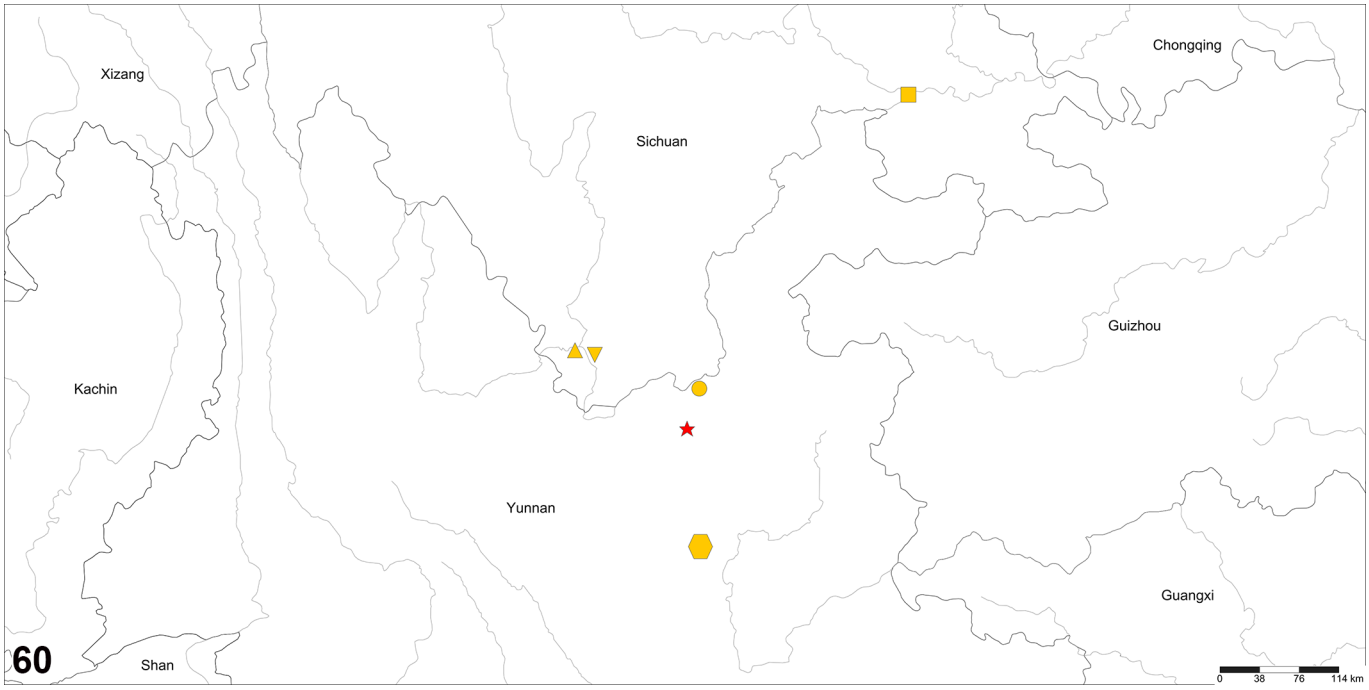
Figures 47–55: **Figures 47–49**: *Qianxie solegladi* **gen**. **et sp**. **n**., female holotype prior to examination. **Figure 47**. Gravid female in vivo habitus, showing developing eggs from the lateral side. **Figure 48**. Female holotype with the eggs, which were retrieved by injecting water into the mesosoma. **Figure 49**. All retrieved eggs. **Figures 50–55** Photographic records of specimens presumably conspecific with the new species (licensed images). **Figures 50–51**. Adult male from near the type locality, Luquan, Kunming, Yunnan in dorsal (50) and ventral (51) views. **Figure 52**. Individual from Panzhihua, Sichuan. **Figure 53**. Adult female from Panzhihua, Sichuan. **Figure 54**. Adult female from Hongge, Panzhihua, Sichuan. **Figure 55**. Individual from the road to Sichuan Electromechanical Institute of Vocation and Technology, Panzhihua, Sichuan.

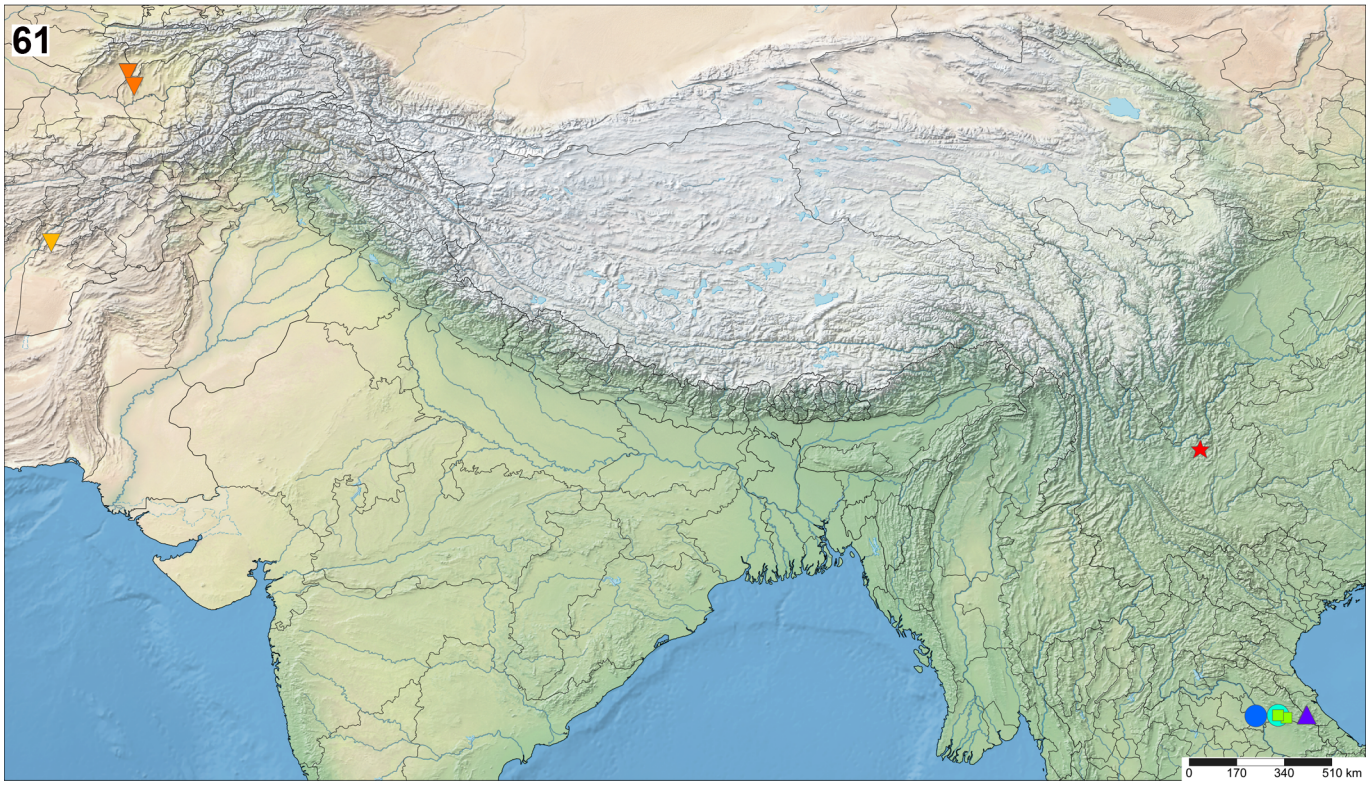
Figures 56–59: **Figure 56**. Photo of an individual found in Hejiangmen Square, Yibin, Cuiping, Sichuan (licensed image). **Figures 57–59**: The natural habitat in the type locality (photographs by He Hao). **Figure 57**. Pudu River and the hillsides on both banks. **Figure 58**. The tree where the male specimen was collected. **Figure 59**. The path on the low cliff at the bank of Pudu River.

Distribution. This species is currently confirmed from Yunnan Province in China, and there is also one previous record from Luquan County, Kunming. It has further been recorded from Shekuai Village, Dongchuan District, Kunming, but that region is no longer easily accessible since the original residents moved to the city in 2019, and most of the roads are in disrepair. Additionally, there have been a number of reports from Sichuan Province (e.g., Panzhihua City, Figs. 52–55). The author was not able to travel there and collect material, due to the Covid-19 pandemic lockdown imposed on Shanghai. Nevertheless, the photographic evidence suggests that they are conspecific with the new species. The recorded localities are distributed along the river system that crosses the border between the two provinces (Jinsha River and Pudu River), i.e., in the southern region of Sichuan Province and the northern region of Yunnan Province. This species has been found at least since 2015 in Panzhihua City, Sichuan Province, but was misidentified as a juvenile of *Chaerilus* sp. (Fig. 52). It is also interesting to mention that one individual was observed in urban environment, in the Hejiangmen Square, Cuiping District, Yibin City, Sichuan Province in 2019 (Fig. 56), which is located along the bank of the Min River. This could either be evidence for synanthropic adaptation, or an accidental introduction, but scenic locations nearby may offer suitable habitats for this species. However, the author was unable to examine those specimens, since they were not preserved for study. Nevertheless, the photographic evidence shows a strong resemblance to the newly collected materials, and these anecdotal records are tentatively considered as the potential localities, pending further investigation of the Sichuan population. Aside from Panzhihua City, where multiple individuals were observed, one adult female was also found within the Liangshan Yi Autonomous Prefecture, but without accurate locality data (not included in the map, Fig. 60). Supposedly, the local population may be distributed along the Yalong River. An apparently unidentified pseudochactid was also reported from Chuxiong, Yunnan, and the Longchuan River valley might also be an important refuge for these ancient, relict scorpions. Based on two available photographs, the unidentified species differs from the new species in being immaculate, and in the presence of a bulge on the ventral surface of the vesicle. However, these differences could be a misjudgment due to low photograph quality.

Ecology. Based on the photos provided by collector of both the female holotype and the only known male specimen, it seems that this is a riparian species, distributed along a river system. Both specimens were found on the low cliff at the bank of the Pudu River. The substrate is mostly composed of gravel and rocks, with scattered small bushes (Fig. 59). Since only the mountain path has been searched, it is unclear whether this species also occurs on the slopes of both sides of the river, and its microhabitats is unknown (Fig. 57). According to the local people, the dry season lasts from September to June, during which rainfall is very sparse. The temperature already exceeds 30°C by April and approximates 40°C in sun exposed areas but is lower at night. It is interesting to note that both specimens were found above ground. The male specimen was found on a tree, at the level of about 1 m above ground (Fig. 58). The holotype female, however, was found on a wall, nearly 2 m above ground, in a human settlement, probably an abandoned pigsty. Hence, it is obvious that this species is quite capable of climbing rough vertical surfaces. The female holotype was gravid, showing that this species can be mobile and wander freely instead of sheltering in a burrow during gestation. Several other microhabitat photos of the records in Sichuan provided additional information. They showed that the microhabitat is characterized by clay soil rather than dry gravel. Specimens were often found under rocks, and among clods of soil. One adult female was found at the foot of the hills along a rural trail (Fig. 54). In Yunnan, both Shekuai County and Zhongping Village are close to the Pudu River, whereas in Sichuan, records of this species are distributed along the Jinsha River. The proximity to the river system and the relatively high humidity in some microhabitats suggest that although this species may be somewhat tolerant of aridity, it prefers habitats with higher humidity. The habitat and habitus of the new species are consistent with the lapidicolous ecomorphotype (*sensu* Prendini, 2001), or the lithophilous ecomorph (*sensu* Coelho et al., 2022).

Behavioral notes. Although the gravid female holotype failed to survive to parturition, several laboratory observations were made on its behavior, including video recordings. Unlike many small species in genera of somewhat similar habitus, such as *Liocheles* Sundevall, 1833 and *Scorpiops* Peters, 1861, the new species did not display any cataleptic response under predatory pressure (simulated by finger touching and pinching) and could not be turned over on its back. The author has observed *Liocheles australasiae* (Fabricius, 1775) and *Scorpiops jendeki* Kovařík, 2000 feign death by lying upside down and remaining motionless unless excessively stimulated, and only moving again after a protracted period of immobility. In contrast, the new species exhibited a rapid escape response with high velocity of locomotion for a scorpion in its size class. It could also remain immobile under weaker and briefer tactile stimulation. This subthreshold immobility was more frequently observed when moving the container, causing vibrations of the substrate. A long-distance escape response was not always evoked by repeated tactile stimulation, and locomotion sometimes terminated after a shorter travel distance. The new species was very aggressive and readily wielded its telson in defensive responses. The stinging response was elicited by either lateral or dorsal somatic tactile stimuli. It is unclear if this strongly aggressive behavior was related to the gravid state of the female. The high sensitivity to stimulation is in sharp contrast to the behavior of *Liocheles* and *Scorpiops* described above. It exhibited positive thigmotaxis, preferring to hide in crevices, and negative geotaxis, preferring to climb to higher elevations (consistent with the field observations). Exposure to UV light elicited an avoidance response of retreat into a shelter. However, this response was not always immediate.





Figures 60–61: **Figure 60**. Map showing the type locality of *Qianxie solegladi* **gen. et sp. n.** and several potential localities. ★: type locality, Zhongping Village, Wumeng Township, Luquan County, Kunming City, Yunnan Province; ▲: a student found an individual in 2022 on his way to Sichuan Electromechanical Institute of Vocation and Technology, Panzhihua City, Sichuan Province; ▼: a collector found an adult female in the soil in Hongge Town, Panzhihua City, Sichuan Province, in 2022; ■: an observer found an individual in 2019, Hejiangmen Square, Yibin City, Cuiping District, Sichuan Province; ●: Shekuai Village, Dongchuan District, Kunming City, Yunnan Province; ⬢: an individual found at a construction site in 2020, Kunming City, Yunnan Province, accurate location unknown. **Figure 61**. Map showing the type locality of *Qianxie solegladi* **gen. et sp. n.** (★) and the confirmed localities of other Pseudochactidae species: *Pseudochactas* (inverse triangle), *Troglokhammouanus* (square), *Aemngvantom* (circle) and *Vietbocap* (triangle). *P. mischi* (▼), *P. ovchinnikovi* (▼); *T. steineri* (■); *A. lao* (●), *A. thamnongpaseuam* (●); *V. canhi* (▲).

Conservation status. Still little is known about the natural populations of the new species, but based on the localities recorded here, it seems that this species covers a relatively large area in the southwest region of China compared to most of the scorpion species found in Yunnan (no scorpions have been found in Sichuan except for the widespread buthid *Olivierus martensii*); the new species is basically distributed along the river valley. Besides the aforementioned occurrence in the urban square, there was also a report of an individual found near the construction site in Kunming City (photograph unavailable). Furthermore, a college student at Panzhihua University was stung by an individual at home in 2016. In this month, another student found an individual in his dormitory at Sichuan Electromechanical Institute of Vocation and Technology. This species is probably more adapted to anthropic environments and thus less vulnerable to human activities and urbanization than some other scorpions. Many records have demonstrated that this species lives in close proximity to human settlements in rural areas. It is unclear how far this species has adapted to disturbed environments, but it may be somewhat less threatened than burrowing species in superfamilies like Scorpionoidea Latreille, 1802 and Bothriuroidea Simon, 1880. However, accidental dispersal may account for its occurrence in urban areas. For example, it could be transported by horticulture plants from its original habitat. Nevertheless, much is unknown about the life history of this species, such as gestation period, litter size and postnatal development. Without adequate field investigation of its natural populations, protection of this unique new species is nonetheless warranted. Laws must be enacted against any potential threats to the survival of the new species, especially by targeted collecting and habitat destruction. Presumably, only one species is protected in parts of China, the widely distributed *O. martensii*. This legislation was passed in 2020 after a severe period of the Covid-19 pandemic, and the law will be violated by the collection of over 20 wild individuals. The law of protection for wild animals was first motivated by concern for human health but became a genuine conservation effort for previously neglected species of animals. *O. martensii* has long been used as food and medicine in China, and although there are some captive breeding farms, wild populations are still under pressure from collecting. *Mesobuthus thersites* (C. L. Koch, 1839) is another species that has been impacted severely by collecting in China, driven by the unnecessary desire for liquor infusion (scorpion wine). Since 2005, plentiful scorpion hunting 'armies' invaded Helan Mountains of the Ningxia Hui Autonomous Region to commercially exploit *O. martensii* and *M. thersites*, precipitating an abrupt decrease in the populations of these species. Apart from targeted collecting for food and medicine, environmental damage resulting from the reclamation of land and urbanization has caused a visible decline in wild scorpions. Many species have been seldom encountered again after their initial publication, especially those from relatively poorly developed areas like Xizang and Xinjiang. Conservation of arachnids has traditionally been neglected due to both their small, inconspicuous sizes and negative stereotypes held by the public. Recent publications are calling for greater attention to scorpion conservation (e.g., Monod et al., 2013; Ureta et al., 2020), but only three species are listed in Appendix II of CITES, namely *Pandinopsis dictator* (Pocock, 1888), *Pandinus gambiensis* Pocock, 1899 and *Pandinus imperator* (C. L. Koch, 1841). Moreover, another three species of scorpions are included in the IUCN Red List, i.e., *Afrolychas braueri* (Kraepelin, 1986), *Chiromachus ochropus* (C. L. Koch, 1837) and *Reddyanus deharvengi* (Lourenço & Duhem, 2010). Climatic and environmental changes due to anthropogenic activities and excessive targeted collection for food, medicine and venom extraction are the two main factors threatening wild scorpion populations (e.g., Lira et al., 2019, 2021; Zamani et al., 2021). In addition, the increasing demand of the pet trade may also imperil natural populations. On the other hand, compared to purposes of consumption, keeping scorpions as pets does have benefits in counteracting negative stereotypes of the public, and promoting education and knowledge about these animals if done ethically. However, taking Chinese breeders as an example, few people will post adequate scientific information about species of scorpions that they show online. Although it is not necessary to ban all scorpion trade, encouraging captive breeding and science popularization nationally will serve as a balanced approach to both keeping and protecting scorpions. In any case, the protection of natural habitats and the imposition of penalties for excessive collecting are the primary efforts being directed towards the conservation of scorpions in China.

Acknowledgements

I would like to express my greatest gratitude to the collector, Hao He (何豪), who helped collect the new species when I was not able to leave the city during the Shanghai pandemic lock-down. My gratefulness also goes to Dr. Graeme Lowe and Professor Victor Fet who kindly offered me valuable advice and reviewed the paper; Dr. Lowe further assisted with preparation of figures and provided detailed photos of *P. ovchinnikovi*. Thanks also to my friend, Tongtong (通通), who provided the photographs of the individuals in Panzhihua, Sichuan. Together with my friend, Wenxuan Dong (董文宣), he assisted me in gathering information about the new species. I would also like to thank two anonymous observers for granting permission to using the photographs of the individuals recorded in two anthropically disturbed environments.

References

COELHO, P., A. KALIONTZOPOULOU, P. SOUSA, M. STOCKMANN & A. MEIJDEN. 2022. Reevaluating scorpion ecomorphs using a naïve approach. *BMC Ecology and Evolution*, 22 (17): 1−10.

GROMOV, A. V. 1998. [A new family, genus and species of scorpions (Arachnida, Scorpiones) from southern Central Asia]. *Zoologicheskii Zhurnal*, 77 (9): 1003–1008. (in Russian, English summary; English translation: *Russian Journal of Zoology*, 2: 409–413).

HUANG, S.-B., G.-F. WEI, H.-S. WANG, W.-X. LIU, A. BEDOS, L. DEHARVENG & M.-Y. TIAN. 2021. Ganxiao Dong: A hotspot of cave biodiversity in northern Guangxi, China. *Diversity*, 13: 355.

LIRA, A. F. A., S. I. A. FOERSTER, R. P. SALOMÃO, T. J. PORTO, C .M. R. ALBUQUERQUE & G. J. B. MOURA. 2021. Understanding the effects of human disturbance on scorpion diversity in Brazilian tropical forests. *Journal of Insect Conservation*, 25 (1): 147–158.

LIRA, A. F. A., L. M. PORDEUS, R. P. SALOMÃO, R. BADILLO-MONTAÑO & C .M. R. ALBUQUERQUE. 2019. Effects of anthropogenic land-use on scorpions (Arachnida: Scorpiones) in Neotropical forests. *International Journal of Tropical Insect Science*, 39: 211–218.

LORIA, S. F. & L. PRENDINI. 2014. Homology of the lateral eyes of Scorpiones: a six-ocellus model. *PLoSOne*, 9: e112913.

LOURENÇO, W. R. 2007a. First record of the family Pseudochactidae Gromov (Chelicerata, Scorpiones) from Laos and new biogeographic evidence of a Pangaean palaeodistribution. *Comptes Rendus Biologies*, 330: 770–777.

LOURENÇO, W. R. 2007b. Complements to the morphology of *Troglokhammouanus steineri* Lourenço, 2007 (Scorpiones: Pseudochactidae) based on scanning electron microscopy. *Euscorpius*, 59: 1–6.

LOURENÇO, W. R. 2012. The genus *Vietbocap* Lourenço and Pham, 2010 (Scorpiones: Pseudochactidae); proposition of a new subfamily and description of a new species from Laos. *Comptes Rendus Biologies*. 335: 232–237.

LOURENÇO, W. R. 2017. Second record of the genus *Troglokhammouanus* Lourenço 2007 from Laos, with the description of a new species (Scorpiones: Pseudochactidae). *Acta Arachnologica*, 66: 19–24.

LOURENÇO, W. R. & D.-S. PHAM. 2010. A remarkable new cave scorpion of the family Pseudochactidae Gromov (Chelicerata, Scorpiones) from Vietnam. *ZooKeys*, 71: 1–13.

LOURENÇO, W. R. & D.-S. PHAM. 2012. A second species of *Vietbocap* Lourenço and Pham, 2010 (Scorpiones: Pseudochactidae) from Vietnam. *Comptes Rendus Biologies*, 335: 80–85.

LOURENÇO, W. R., D.-S. PHAM & T. H. TRAN. 2018. The genus *Vietbocap* Lourenço and Pham, 2010 in the Thien Duong cave, Vietnam: a possible case of subterranean speciation in scorpions (Scorpiones: Pseudochactidae). *Comptes Rendus Biologies*, 341: 264–273.

MONOD, L., M. S. HARVEY & L. PRENDINI. 2013. Stenotopic *Hormurus* Thorell, 1876 scorpions from the monsoon ecosystems of northern Australia, with a discussion on the evolution of burrowing behaviour in Hormuridae Laurie, 1896. *Revue Suisse de Zoologie*, 120 (2): 281–346.

PRENDINI, L. 2000a. Phylogeny and classification of the superfamily Scorpionoidea Latreille 1802 (Chelicerata, Scorpiones): An exemplar approach. *Cladistics*, 16: 1–78.

PRENDINI, L. 2000b. A new species of *Parabuthus* Pocock (Scorpiones: Buthidae), and new records of *Parabuthus capensis* (Ehrenberg), from Namibia and South Africa. *Cimbebasia*, 16: 31–45.

PRENDINI, L. 2001. Substratum specialization and speciation in southern African scorpions: the Effect Hypothesis revisited. In V. Fet, and P.A. Selden (editors), *Scorpions 2001: in memoriam Gary A. Polis*: 113–138. Burnham Beeches, Bucks, U.K.: British Arachnological Society.

PRENDINI, L., V. L. EHRENTHAL & S. F. LORIA. 2021. Systematics of the relictual Asian scorpion family Pseudochactidae Gromov, 1998, with a review of cavernicolous, troglobitic, and troglomorphic scorpions. *Bulletin of the American Museum of . Natural History*, 453: 1–149.

PRENDINI, L., E. S. VOLSCHENK, 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: 211–248.

RAN, J.-C. & W.-C. YANG. 2015. A review of progress in Chinese troglofauna research. *Journal of Resources and Ecology*, 6 (4): 237–246.

SHARMA, P. P., C. M. BAKER, J. G. COSGROVE, J. E. JOHNSON, J. T. OBERSKI, R. J. RAVEN, M. S. HARVEY, S. L. BOYER & G. GIRIBET. 2018. A revised dated phylogeny of scorpions: phylogenomic support for ancient divergence of the temperate Gondwanan family Bothriuridae. *Molecular Phylogenetics and Evolution*, 122: 37–45.

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. *Proceedings of the Royal Society B, Biological Sciences*, 282: 20142953.

SOLEGLAD, M. E. & V. FET. 2001. Evolution of scorpion orthobothriotaxy – a cladistic approach. *Euscorpius*, 1: 1–38.

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.

SOLEGLAD, M. E., F. KOVAŘÍK & V. FET. 2012. A new species of *Pseudochactas* from Afghanistan (Scorpiones: Pseudochactidae). *Boletín de la Sociedad Entomológica Aragonesa*, 50: 89–98.

STAHNKE, H.L. 1971. Scorpion nomenclature and mensuration. *Entomological News*, 81: 297–316.

TANG, V. 2022. A standardized list of scorpion names in Chinese, with an etymological approach. *Euscorpius*, 350: 1–91.

URETA, C., E. J. GONZÁLEZ, M. RAMÍREZ-BARRÓN, G. A. CONTRERAS-FÉLIX & C. E. SANTIBÁÑEZ-LÓPEZ. 2020. Climate change will have an important impact on scorpion's fauna in its most diverse country, Mexico. *Perspectives in Ecology and Conservation*, 18 (2): 116–123.

VACHON, M. 1974. Étude des caractères utilisés pour classe les familles et les genres de Scorpiones (Arachnides). 1. La trichobothriotaxie en Arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les scorpions. *Bulletin du Muséum National d'Histoire Naturalle Paris, Zoologie*, (3) 104 (140): 857–958.

ZAMANI, A., I. E. SÄÄKSJÄRVI & L. PRENDINI. 2021. Amateur venom-extraction business may hasten extinction of scorpions. *Arachnologische Mitteilungen*, 61: 20–23.