

A new species of the genus *Scorpiops* Peters, 1861 from Xizang, China (Scorpiones: Scorpiopidae)

Новый вид скорпионов рода *Scorpiops* Peters, 1861 из Тибетского автономного округа, Китай (Scorpiones: Scorpiopidae)

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КЛЮЧЕВЫЕ СЛОВА: Китай, новый вид, скорпион, систематика, Тибетский автономный округ.

ABSTRACT: A new species, *Scorpiops rufus* sp.n., from Xizang (China), is described and illustrated. The new species is mainly characterized by reddish-brown color, moderate size, carapace with small and dense granules, 17 (5 *eb*, 2 *esb*, 2 *em*, 4 *est*, 4 *et*) external and 6–8 (usually 7) ventral trichobothria in the pedipalp patella, chela with a length/width ratio about 2.5 in males and 2.6 in females, pedipalp chela fingers are scalloped in both sexes, pectinal teeth count 6 or 7 in males and 5 or 6 in females, pectinal fulcra absent. This brings the total number of species of *Scorpiops* Peters, 1861 recorded in China to 34.

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РЕЗЮМЕ: Дано иллюстрированное описание нового вида *Scorpiops rufus* sp.n., из Тибетского автономного округа Китая. Новый вид характеризуется рыже-коричневой окраской, средними размерами, карапаксом с мелкими и густо расположенными гранулами, 17 (5 *eb*, 2 *esb*, 2 *em*, 4 *est*, 4 *et*) наружными и 6–8 (обычно 7) внутренними трихоботриями на коленях педипальп, хелой с соотношением длины и ширины около 2,5 у самцов и 2,6 у самок, зубчатыми пальцами хелы педипальп у обоих полов, 6 или 7 зубцами гребневидных органов самцов и 5 или 6 — у самок, отсутствием фулькр на гребневидных органах. Таким образом, общее число видов рода *Scorpiops* Peters, 1861, известных в Китае, увеличивается до 34.

Introduction

In recent years, Kovařík *et al.* [2020] and Štáhlavský *et al.* [2020] revised the family Scorpiopidae Kraepel-

lin, 1905 and synonymized the previously accepted genera of the family Scorpiopidae, excepting *Parascorpiops* Banks, 1928, with the genus *Scorpiops* Peters, 1861. Lourenço & Ythier [2022] reclassified the genera of the family Scorpiopidae, proposed six subgenera of the genus *Scorpiops* (including *Alloscorpiops* Vachon, 1980, *Dasyscorpiops* Vachon, 1974, *Euscorpiops* Vachon, 1980, *Neoscorpiops* Vachon, 1980, *Plethoscorpiops* Lourenço, 2017 and *Scorpiops*). However, following the molecular phylogeny we created (unpublished), *Scorpiops rufus* sp.n. cannot be classified into any subgenus.

Scorpiops is the major genus of the family Scorpiopidae, distributed mainly in South and Southeast Asia. In China, the species of *Scorpiops* are found in Hubei, Xinjiang, Xizang and Yunnan [Lv *et al.*, 2023]. The new species described here raises the number of known *Scorpiops* species occurring in China to 34, and the total number of currently recognized species for the genus to 108.

Material and methods

The studied specimens were collected by hand and preserved in 75% ethanol. Illustrations and measurements were produced using a Leica M205 stereomicroscope. The photos were taken with a Canon 650D camera and a Leica M205FA stereomicroscope (with a digital color microscope camera Leica DFC495). Measurements (in mm) follow Sissom [1990]. Trichobothrial notations were done according to Vachon [1974], and the morphological terminology mostly follows Hjelle [1990]. The terminology of metasomal carination is that of Vachon [1952], and the terminology of pedipalp chela carinae follows Söglad & Sissom [2001]. The studied specimens are deposited in the Museum of Hebei University, Baoding, China (MHBHU).

Composition of the genus *Scorpiops* from China (in order of alphabetical)

Scorpiops asthenurus (Pocock, 1900) [Xizang]

Scorpiops atomatus Qi, Zhu et Lourenço, 2005 [Xizang]



Figs 1–4. Habitus of *Scorpiops rufus* sp.n. Dorsal and ventral habitus: 1, 2 — male holotype; 3, 4 — female paratype (Ar.-MHBUScXZRKZ2107270101). Scale bar = 12.0 mm.

Рис 1–4. Внешний вид *Scorpiops rufus* sp.n., дорсально и вентрально: 1, 2 — голотип самец; 3, 4 — паратип самка (Ar.-MHBUScXZRKZ2107270101). Масштаб 12,0 мм.

Scorpiops bhutanensis Tikader et Bastawade, 1983 [Xizang]
Scorpiops hardwickii (Gervais, 1843) [Xizang]
Scorpiops ingens Yin, Zhang, Pan, Li et Di, 2015 [Xizang]
Scorpiops jendeki Kovařík, 1994 [Yunnan]
Scorpiops kamengensis (Bastawade, 2006) [Xizang]
Scorpiops kubani (Kovařík, 2004) [Yunnan]
Scorpiops langxian Qi, Zhu et Lourenço, 2005 [Xizang]
Scorpiops leptochirus Pocock, 1893 [Xizang]
Scorpiops lhasa Di et Zhu, 2009 [Xizang]
Scorpiops lüi (Di et Qiao, 2020) [Xizang]
Scorpiops longimanus (Pocock, 1893) [Xizang]
Scorpiops lourencoi Lv et Di, 2022 [Xizang]
Scorpiops lowei Tang, 2022 [Yunnan]
Scorpiops luridus Qi, Zhu et Lourenço, 2005 [Xizang]
Scorpiops margerisonae Kovařík, 2000 [Xizang]
Scorpiops novaki (Kovařík, 2005) [Xizang, Yunnan]
Scorpiops petersii Pocock, 1893 [Xizang]
Scorpiops puerensis (Di, Wu, Cao, Xiao et Li, 2010) [Yunnan]
Scorpiops rufus sp.n. [Xizang]
Scorpiops shidian Qi, Zhu et Lourenço, 2005 [Yunnan]
Scorpiops songi Di et Qiao, 2020 [Xizang]
Scorpiops taxkorgan Lourenço, 2018 [Xinjiang]
Scorpiops tibetanus Hirst, 1911 [Xizang]
Scorpiops tongtongi Tang, 2022 [Yunnan]
Scorpiops vachoni (Qi, Zhu et Lourenço, 2005) [Yunnan]
Scorpiops validus (Di et al., 2010) [Yunnan]
Scorpiops wrzecionkoi Kovařík, 2020 [Xizang]
Scorpiops xui (Sun et Zhu, 2010) [Yunnan]
Scorpiops yangi (Zhu, Zhang et Lourenço, 2007) [Yunnan]
Scorpiops zhangshuyuan (Ythier, 2019) [Yunnan]
Scorpiops zhui Lv, Lourenço et Di, 2023 [Chongqing]
Scorpiops sp. (Di et al., 2011; *Scorpiops jingshanensis* Li et al, 2016, nomen nudum) [Hubei]

Taxonomy

Family Scorpiopidae Kraepelin, 1905

Genus *Scorpiops* Peters, 1861

Scorpiops rufus sp.n.

Figs 1–37, Table 1.

TYPE MATERIAL: Holotype male (MHBU), China: Xizang, Rikaze City, 27/VII/2021, Zhiyong Di leg. (Ar.-MHBU-ScXZRKZ2107270201); paratypes: same location data as holotype, 2 male and 4 female paratypes (including 1 male immature) (Ar.-MHBU-ScXZRKZ1908220201; Ar.-MHBU-ScXZRKZ21072701, 01–04; Ar.-MHBU-ScXZRKZ2107270301).

ETYMOLOGY. The specific name refers to the color of body while living.

DIAGNOSIS. *Scorpiops rufus* sp.n. differs from all other species in the genus based on the following combination of characters: adult length 55.6–60.8 mm; yellowish-brown; carapace with small and dense granules; chelicerae reddish; pectinal teeth count 6 or 7 in males and 5 or 6 in females, fulcrum absent; patella of pedipalp with 17 (5 *eb*, 2 *esb*, 2 *em*, 4 *est*, 4 *et*) external and 6–8 (usually 7) ventral trichobothria; chelal trichobothria *Eb*₃ located in proximal half of manus between trichobothria *Dt* and *Db*, chela with four ventral trichobothria; chela with an average length/width ratio of 2.5 in males (*n* = 3) and 2.6 in females (*n* = 4); pedipalp chela fingers scalloped in both sexes, usually more

strongly in male; telson bulbous and granulate, annular ring absent.

DESCRIPTION. Based on holotype: Ar.-MHBU-ScXZRKZ2107270201.

Coloration (Figs 1, 2; after one year of preservation in alcohol). Base color uniformly yellowish-brown. Carapace dark yellowish-brown. Median and lateral ocular tubercles blackish. Tergites mostly dark yellowish-brown. Metasomal segments yellowish-brown; vesicle light yellowish-brown with a reddish aculeus. Chelicerae reddish. Pedipalps light reddish-brown. Legs yellowish-brown. Tarsal claws yellowish-brown. Sternum yellowish-brown. Sternites light yellowish-brown, segment VII yellowish-brown. Genital operculum and pectines yellowish.

Morphology. Prosoma (Figs 5–7). Carapace with dense, fine granulation, anterior portion of carapace with bigger granules; lateral furrow broad; anterior median furrow broad and shallow; posterior median furrow deep; median eyes situated anteriorly in relation to the center of carapace; three pairs of lateral ocelli with the posterior one very small. Median ocular tubercle with granules and median furrow. Lateral ocular tubercle with some coarse granules around lateral eyes.

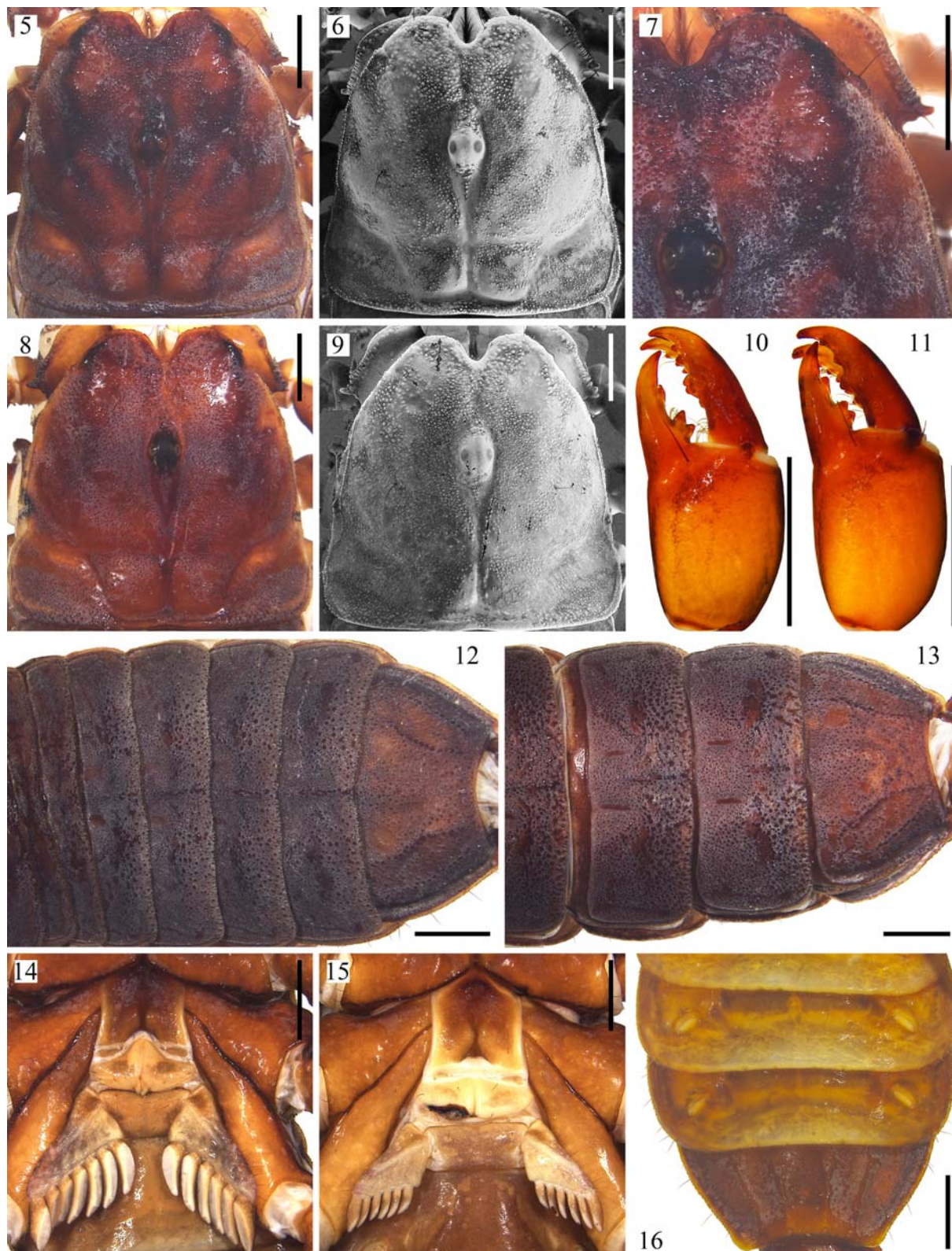
Chelicerae (Fig. 10). Tibiae smooth with many long hairs on ventral aspect. Fixed finger of chelicera with three large triangular teeth on inner margin; ventral of movable finger with seven teeth on inner margin, dorsal of movable finger with four teeth on inner margin.

Mesosoma. Tergites densely covered with thin granulation, posterior portion of tergites with bigger granules; tergites III to VII with a median carina; tergite VII with two pairs of lateral carinae (Fig. 12). Sternum pentagonal with few setae (Fig. 14). Pectinal teeth count 7/6, fulcrum vestigial (Fig. 14). Genital operculum subtriangular with genital papillae protruding and few setae (Fig. 14). Sternites III to VI smooth and shiny with few setae; segment VII ventrally with two carinae and few setae (Fig. 16).

Metasoma. Integument coarse with few setae. Segments II to V longer than wide; segments I to V with respectively 10-8-8-8-7 granular carinae; segments II to IV with a pair of vestigial lateral carinae; dorsal carinae strongly serrated; on segment V, ventral carinae with larger serration. Vesicle coarse, with granules and few setae (Fig. 17).

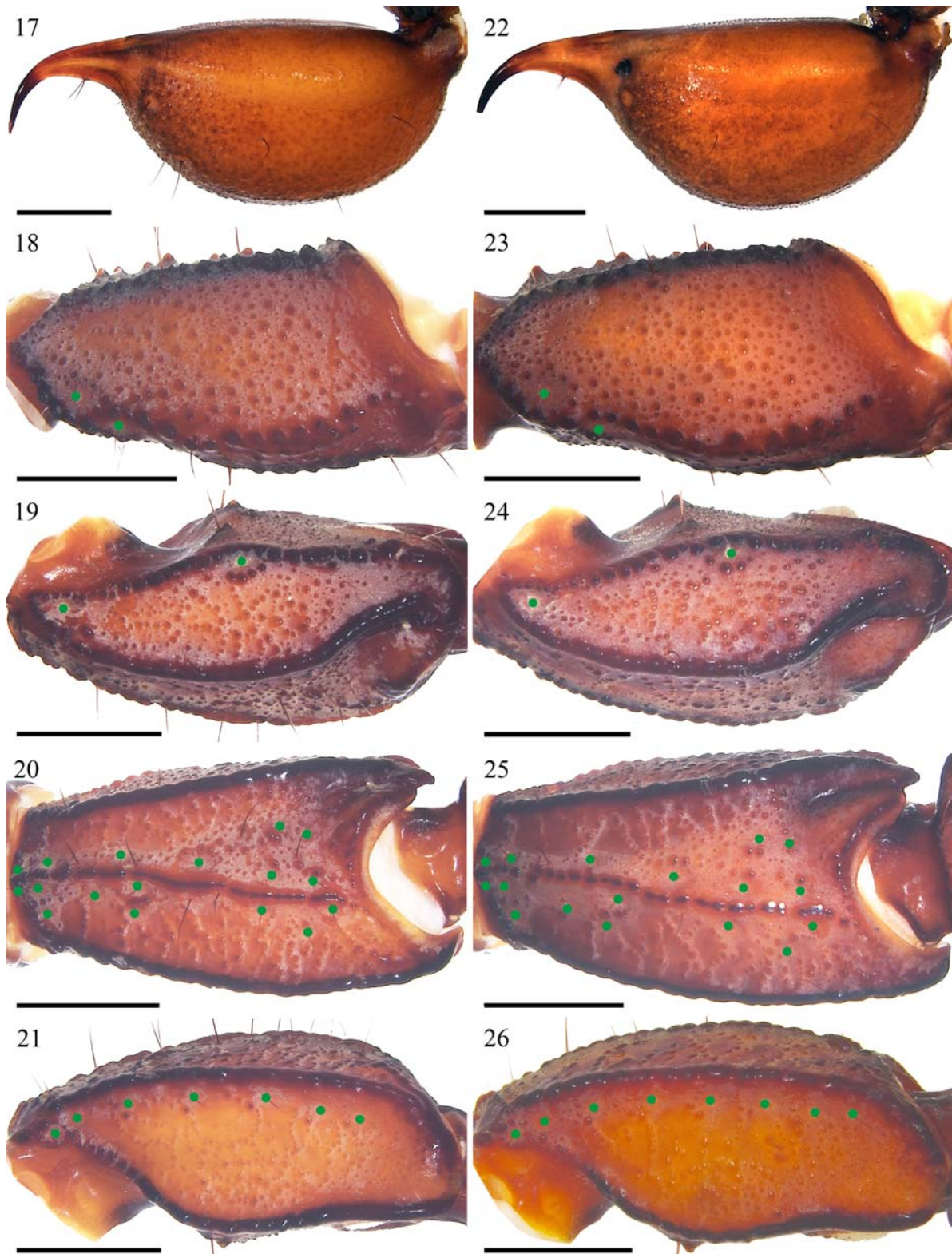
Pedipalps. Tegument not smooth with granulations and a few setae, especially on dorsal surface which densely granulated. Femur with dorsointernal, dorsoexternal, ventroexternal, external, ventrointernal carinae granulated, and internal carinae crenulated (Fig. 18). Patella with granules on the dorsointernal, dorsoexternal, ventrointernal, ventroexternal, and external carinae; two spinoid granules present on the internal surface (Figs 19–21). Trichobothrial pattern of type C, neobothriotaxic [Vachon, 1974]; patella with 17 external trichobothria (5 *eb*, 2 *esb*, 2 *em*, 4 *est*, 4 *et*), 8 (left) and 7 (right) ventral trichobothria (Fig. 21). Chela with four ventral trichobothria, all carinae granulated and coalesced except the dorsal secondary, subdigital, dorsal internal, interomedian, and ventromedian carinae vestigial; movable fingers, and fixed fingers with scalloped margins, a pronounced lobe in the movable finger and a corresponding notch in the fixed fingers (Figs 27–30).

Legs. Integument coarse with few setae. Trochanter dorsal surface with some small granules. Femur dorsal surface densely granular. Patella dorsal surface densely granular. Tibiae without spurs (Fig. 34). Basitarsus with more setae, spurs, and two lateral pedal spurs (Fig. 34). Tarsus with row



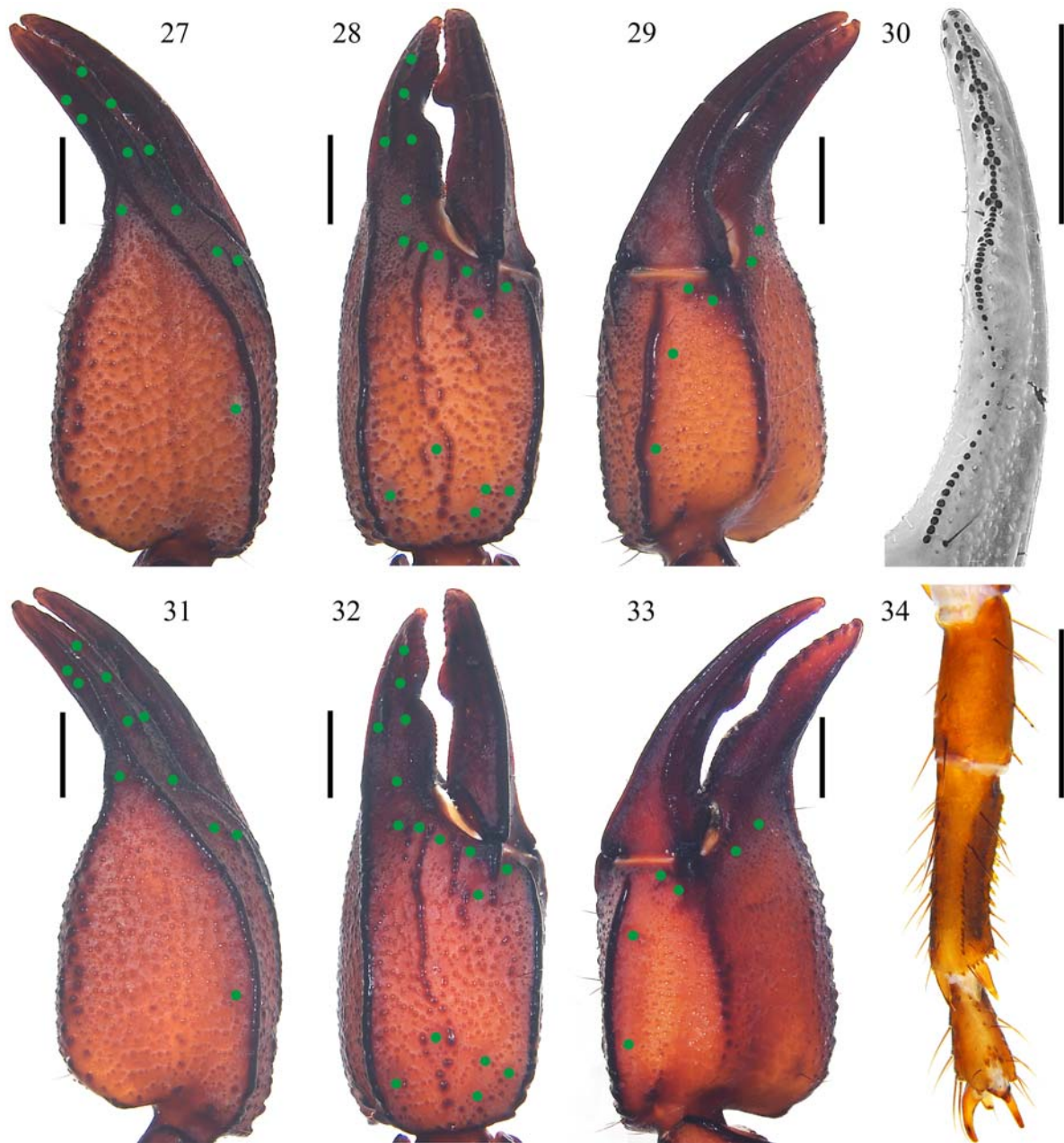
Figs 5–16. *Scorpiops rufus* sp.n. Male holotype (5–7, 10, 12, 14, 16); female paratype (Ar.-MHBUScXZRKZ2107270101; 8, 9, 11, 13, 15); 5, 8 — carapace; 6, 9 — carapace under UV light; 7 — eyes and nearby area; 10, 11 — chelicerae dorsal view; 12, 13 — tergites dorsal view; 14, 15 — sternopectoral area; 16 — sternite V–VII. Scale bars = 2.0 mm.

Рис 5–16. *Scorpiops rufus* sp.n. Голотип самец (5–7, 10, 12, 14, 16); паратип самка (Ar.-MHBUScXZRKZ2107270101; 8, 9, 11, 13, 15); 5, 8 — карапакс; 6, 9 — карапакс в УФ свете; 7 — глаза и окружающая область; 10, 11 — хелицеры, дорсально; 12, 13 — тергиты, дорсально; 14, 15 — область гребневидных органов; 16 — стерниты V–VII. Масштаб 2,0 мм.



Figs 17–26. *Scorpiops rufus* sp.n. Male holotype (17–21); female paratype (Ar.-MHBUScXZRKZ2107270101; 22–26): 17, 22 — telson lateral view; 18, 23 — pedipalp femur dorsal view; 19–21, 24–26 — pedipalp patella dorsal, external, and ventral views. Trichobothria indicated by green dots. Scale bar = 2.0 mm.

Рис. 17–26. *Scorpiops rufus* sp.n. Голотип самец (17–21); паратип самка (Ar.-МНБУ-ScXZRKZ2107270101; 22–26): 17, 22 — тельсон, латерально; 18, 23 — бедро педипальпы, дорсально; 19–21, 24–26 — колено педипальпы, дорсально, снаружи и изнутри. Трихоботрии обозначены зелеными точками. Масштаб 2,0 мм.



Figs 27–34. *Scorpiops rufus* sp.n. Male holotype (27–30, 34); female paratype (Ar.-MHBV-ScXZRKZ2107270101; 31–33): 27–29, 31–33 — pedipalp chela dorsal, external, and ventral views; 30 — dentate margin of movable finger under UV light; 34 — right leg I, retrolateral view. Trichobothria indicated by green dots. Scale bar = 2.0 mm.

Рис. 27–34. *Scorpiops rufus* sp.n. Голотип самец (27–30, 34); паратип самка (Ar.-MHBV-ScXZRKZ2107270101; 31–33): 27–29, 31–33 — хела педипальпы дорсально, снаружи и изнутри; 30 — зубчатый край подвижного пальца в УФ свете; 34 — правая нога I, ретролатерально. Трихоботрии обозначены зелеными точками. Масштаб 2,0 мм.

of short, stout median ventral spinules (Fig. 34). Tarsal ungues curved and hook-like (Fig. 34).

VARIATION. Illustrations of an adult female are provided (Figs 3, 4, 8, 9, 11, 13, 15, 22–26, 31–33). The coloration of adult females is lighter than that of male: carapace, tergites, and metasoma yellowish-brown, vesicle light yellowish-brown; pedipalps darker than male. Number (left/right) of trichobothria on the ventral surface of the pedipalp patellae: females with 6/7 ($n = 1$), 7/7 ($n = 1$), 7/8

($n = 1$), and 8/8 ($n = 1$), males with 7/8 ($n = 1$) and 7/7 ($n = 2$). Number (left/right) of pectinal teeth: females with 5/5 ($n = 1$), 5/6 ($n = 1$), 6/5 ($n = 1$) and 6/6 ($n = 1$), males with 6/7 ($n = 1$) and 7/6 ($n = 1$). Chela with an average length/width ratio of 2.6 in females ($n = 4$) and 2.5 in males ($n = 3$). Males pectinal teeth significantly larger than females.

MEASUREMENTS. See Table 1.

HABITAT. Found under stones in mountain bush (Figs 35–37).

Table 1. Measurements of holotype and paratype specimens of *Scorpiops rufus* sp.n. (in mm).
Таблица 1. Промеры голотипа и паратипа *Scorpiops rufus* sp.n. (в мм).

Sex	Male ScXZRKZ2107270201	Female ScXZRKZ2107270101
Total length:	55.6	60.8
Carapace: – Length – Anterior width – Posterior width	8.1 4.3 8.0	8.7 4.6 8.6
Mesosomal segments: – Length	12.3	19.3
Metasomal segment I: – Length – Width – Depth	3.3 4.0 3.3	3.1 3.6 3.0
Metasomal segment II: – Length – Width – Depth	4.4 3.8 3.3	4.1 3.5 3.2
Metasomal segment III: – Length – Width – Depth	4.7 3.6 3.5	4.4 3.4 3.1
Metasomal segment IV: – Length – Width – Depth	5.7 3.4 3.3	5.1 3.2 3.0
Metasomal segment V: – Length – Width – Depth	8.3 3.0 3.0	7.7 3.0 2.7
Telson: – Length – Width – Depth	8.8 3.9 3.9	8.4 3.8 4.1
Pedipalp femur: – Length – Width – Depth	5.4 2.4 2.4	6.1 2.6 2.5
Pedipalp patella: – Length – Width – Depth	5.9 2.1 3.1	6.1 2.3 3.1
Chela: – Length – Width (manus) – Depth (manus)	12.7 5.0 4.0	13.4 5.2 4.1
Movable finger: – Length	7.8	8.1



Figs 35–38. 35–37 — habitat of *Scorpiops rufus* sp.n. in Rikaze City (showing the color of different individuals); 38 — habitat of *Scorpiops lourencoi* in Rikaze City.

Рис. 35–38. 35–37 — местообитание *Scorpiops rufus* sp.n. в городе Шигадзе (показана окраска тел различных особей); 38 — местообитание *Scorpiops lourencoi* в городе Шигадзе.

DISTRIBUTION. Known only from Rikaze City, China (Fig. 39).

COMMENTS. *Scorpiops rufus* sp.n. can be distinguished from other *Scorpiops* species from China, and in particular from sympatric *Scorpiops lourencoi* Lv et Di, 2022 from Rikaze City, by the following features: (i) body color is yellowish-brown, while reddish-black for *S. lourencoi*; (ii) pedipalp patella usually with 7 ventral trichobothria, while 9 are observed for *S. lourencoi*; (iii) sexual dimorphism of chela weaker with an average length/width ratio of 2.5 in males and 2.6 in females, while 1.9 in males and 2.4 in females for *S. lourencoi*; (iv) chelal movable finger proportionally longer with smaller denticles on the cutting edge, while shorter with larger and fewer denticles in *S. lourencoi* (see Lv & Di [2022: fig. 92]); (v) granules of chela smaller and form reticulate configuration, while conspicuously larger without obvious patterns in *S. lourencoi*; (vi) external surface of chela exhibits partially discontinuous carinae formed by granules, while no distinct carinae are observed in *S. lourencoi*; (vii) pedipalp patellae with weaker internal apophyses, while they are conspicuous in *S. lourencoi*; (viii)

basitarsi longer with numerous setae, while proportionally shorter with fewer setae; (ix) pectines proportionally shorter with pectinal teeth proportionally longer, while the condition is converse in *S. lourencoi* (see Lv & Di [2022: figs 75, 77]); (x) pectinal fulcra absent in the new species but present in *S. lourencoi*. *Scorpiops tibetanus* Hirst, 1911 is similar to the new species, but can be readily distinguished by the following features: (i) body color is yellowish-brown, while reddish-black for *S. tibetanus*; (ii) chela with an average length/width ratio of 2.5 in males and 2.6 in females; versus 2.0 in both sexes for *S. tibetanus*; (iii) telson, annular ring absent, while present in *S. tibetanus*; (iv) vesicle more bulbous in both sexes with the ventral convex point situated medially in adult males, while this point is located anteriorly (closer to the anus) in adult male *S. tibetanus*; (v) pectines proportionally shorter in adult males, while the distal tips reach the coxa-trochanter articulations in adult male *S. tibetanus* (see Lv & Di [2022: fig. 43]). *Scorpiops songi* Di et Qiao, 2020 is closest in phylogenetic relationship (unpublished) to the new species and can be distinguished by the following features: (i) body color is

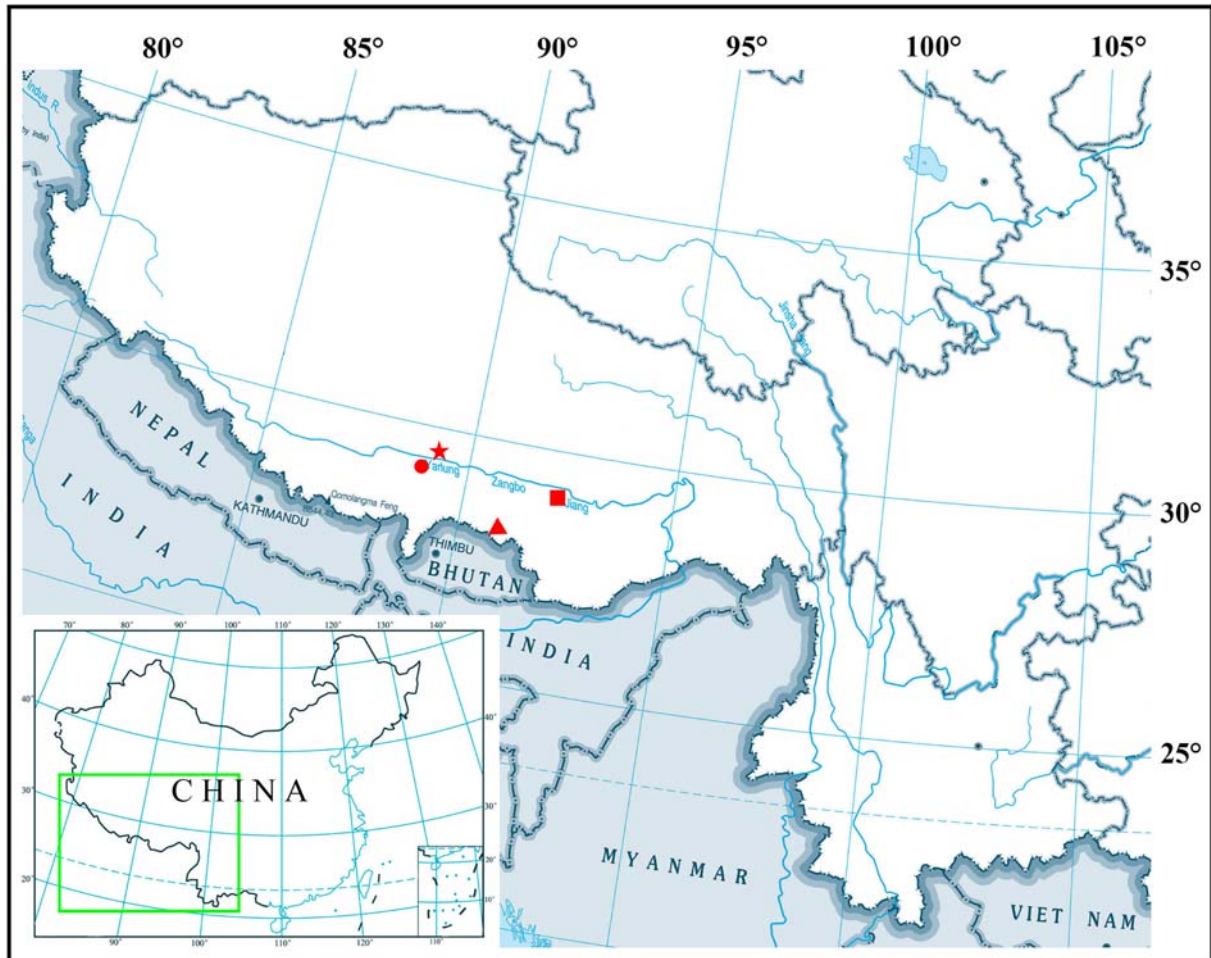


Fig. 39. Distribution map of *S. lourencoi* (circle), *S. rufus* sp.n. (star), *S. songi* (triangle), and *S. tibetanus* (square).

Рис. 39. Карта распространения *S. lourencoi* (кружок), *S. rufus* sp.n. (звездочка), *S. songi* (треугольник) и *S. tibetanus* (квадрат).

yellowish-brown, versus light yellow-brown in *S. songi*; (ii) length of adults 55.6–60.8 mm, while more than 61.0 mm in *S. songi*; (iii) pedipalp chela shape conspicuously different in adult males with *S. songi* having a much broader manus; (iv) external surface of chela exhibits partially discontinuous carinae formed by granules, while they are strong and almost continuous in *S. songi*; (v) pedipalps (especially the femur) proportionally shorter and stouter, while longer and thinner in *S. songi*; (vi) pedipalp patellae with weaker internal apophyses, while they are conspicuous in *S. songi*; telson more bulbous in both sexes, while more elongate in *S. songi*.

UPDATED KEY TO CHINESE SPECIES OF THE GENUS *SCORPIOPS* WITH CHELAL TRICHOBOTHRIA *eb*, LOCATED IN THE PROXIMAL HALF OF THE MANUS BETWEEN TRICHOBOTHRIA *dt* AND *db* (MODIFIED FROM LV & DI [2022])

1. Pedipalp chela fingers with non-scalloped (nearly straight) margins in both sexes 2
- Pedipalp chela fingers with scalloped margins in male adults 4
2. Chela length-to-width ratio > 3.0 3
- Chela length-to-width ratio < 3.0 *S. jendeki*

3. Total length 40.0–58.0 mm, chela length-to-width ratio ~ 3.3–3.5 *S. leptochirus*
- Total length 35.2 mm (male holotype), chela length-to-width ratio ~ 3.2 *S. taxkorgan*
4. Manus length-to-width ratio visibly > 1 5
- Manus with similar length and width 12
5. Total length > 61.0 mm usually 6
- Total length < 61.0 mm usually 8
6. Red brown, ventral patella of pedipalps with 7 (rarely 6 or 8) trichobothria *S. petersii*
- Lighter than red brown 7
7. Ventral patella of pedipalps with 7 or 8 trichobothria, pectinal teeth count 7 in males and 6 in females *S. songi*
- Ventral patella of pedipalps with 9 trichobothria, pectinal teeth count 9/10 in male holotype and 8 in female paratype *S. luridus*
8. Dorsally flat manus of pedipalps and chela of both sexes, with length/width ratio: 2.1–2.2 (~ 2.1 in males and 2.2 in females), total length 40.0–50.0 mm in adults *S. margerisonae*
- Dorsally round manus of pedipalps or at least the chela of one sex, with length-to-width ratio > 2.2 or total length > 50.0 mm 9
9. Body length ~ 45.0–61.0 mm 10

- Body length < 40.0 mm 11
- 10. Patella of pedipalp with 17 (5 *eb*, 2 *esb*, 2 *em*, 4 *est*, 4 *et*) external trichobothria *S. lourencoi*
- Patella of pedipalp with 18–20 (5 *eb*, 2 *esb*, 2 *em*, 5 *est*, 4–6 *et*) external trichobothria *S. wrzecionkoi*
- 11. Chela of pedipalp length-to-width ratio ~ 2.6–3.0 *S. lhasa*
- Chela of pedipalp length-to-width ratio < 2.5 *S. atomatus*
- 12. Yellow-brown color, length of adults > 70.0 mm *S. ingens*
- Length of adults < 65.0 mm 13
- 13. Yellowish-brown *S. rufus* sp.n.
- Red-brown to red-black color *S. hardwickii* complex (*S. hardwickii*, *S. sp* (Di *et al.* [2011]; named as “*Scorpiops jingshanensis*” by Li *et al.* [2016]; currently as a *nomen nudum* followed ICZN), *S. tibetanus*)

Disclosure statement

No potential conflict of interest was reported by the authors.

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