

Scorpiops ingens sp. n. and an updated key to the *Scorpiops* from China (Scorpiones, Euscorpiidae, Scorpiopinae)

Shijin Yin¹, Yunfeng Zhang², Zhaohui Pan³, Shaobin Li⁴, Zhiyong Di⁵

1 College of pharmacy, South Central University for Nationalities, Wuhan 430074, P.R. China **2** Department of Life Science, Tangshan Normal University, Tangshan 063000, P.R. China **3** Institute of Plateau Ecology, Agriculture and Animal Husbandry College of Tibet University, Linzhi 860000, P.R. China **4** College of Life Sciences, Yangtze University, Jingzhou 434025, P.R. China **5** School of Life Sciences, University of Science and Technology of China, Hefei 230027, P.R. China

Corresponding authors: Shaobin Li (shaobinli@yangtzeu.edu.cn); Zhiyong Di (zydi@ustc.edu.cn)

Academic editor: W. Lourenco | Received 8 December 2014 | Accepted 5 March 2015 | Published 8 April 2015

<http://zoobank.org/CCE9E535-87F4-42F4-A6A2-33B4A4F905E7>

Citation: Yin S, Zhang Y, Pan Z, Li S, Di Z (2015) *Scorpiops ingens* sp. n. and an updated key to the *Scorpiops* from China (Scorpiones, Euscorpiidae, Scorpiopinae). ZooKeys 495: 53–61. doi: 10.3897/zookeys.495.9085

Abstract

A new species, *Scorpiops ingens* sp. n., from Xizang, is described and illustrated. *Scorpiops ingens* sp. n. is characterized by yellow-brown color, large size (length of adults above 70.0 mm), small and dense granules on tegument, a pair of small median eyes, 17 external trichobothria (5 *eb*, 2 *esb*, 2 *em*, 4 *est*, 4 *et*), and 7 or 8 (usually 7) ventral trichobothria in the pedipalp patella, chela with a length/width ratio average of 2.2 in males and females, pedipalp chela fingers on adult females and males scalloped, pectinal teeth count 6–8, pectinal fulcra absent. With the description of this new species, the number of known species of *Scorpiops* from China is raised to 12. An updated identification key to *Scorpiops* from China is presented.

Keywords

China, Euscorpiidae, scorpion, *Scorpiops*, Xizang

Introduction

Recently, the diversity of *Scorpiops* species from China was highlighted (Qi et al. 2005; Di and Zhu 2009; Di et al. 2011, 2014). Kovařík and Ahmed (2009) referred to an unre-

solved, widespread *S. hardwickii* “complex” (12 species) which, in their opinion, included five species known from China (*S. atomatus*, *S. hardwickii*, *S. langxian*, *S. pococki*, and *S. tibetanus*). Di et al. (2011) suggested that *S. atomatus* and *S. tibetanus* should be excluded from *S. hardwickii* “complex” by morphological analysis results, and provided unifying features of *S. hardwickii* “complex” base on the species from China: (1) color red-brown to dark brown; (2) total length approximately 45–80 mm in adults; (3) fingers of pedipalps very strongly flexed (curved) in males, slightly flexed (undulated) in females; (4) ventral trichobothria on patella number 6–8; (5) pectinal teeth number 4–9; (6) length/width ratio of chela about 1.8–2.1; (7) fulcra absent; (8) patella with two small spinoid granules on the internal aspect. There are three species from China belonging to *S. hardwickii* “complex” after the revision provided by Di et al. (2011): *S. hardwickii*, *S. langxian*, and *S. pococki*. In fact, Qi et al. (2005: 29) pointed out the differences among *S. hardwickii*, *S. langxian*, and *S. pococki*: pedipalp chela manus almost as long as wide in *S. hardwickii*, while the pedipalp chela manus usually longer than its width in *S. langxian* and *S. pococki*; distance between median eyes much more than their diameter in *S. langxian*, while the distance between median eyes only slightly more than their diameter in *S. pococki*. Di et al. (2014) recorded 11 species in the updated checklist of scorpions from China based mainly on the literature: *S. atomatus* (Xizang), *S. hardwickii* (Xizang), *S. jendeki* (Yunnan), *S. langxian* (Xizang), *S. leptochirus* (Xizang), *S. lhasa* (Xizang), *S. luridus* (Xizang), *S. margerisonae* (Xizang), *S. petersii* (Xizang), *S. pococki* (Xizang), and *S. tibetanus* (Xizang).

Material and methods

Identification and measurements were made using a Motic K700 stereomicroscope with an ocular micrometer. The photos were taken with a Canon (650D) camera. Measurements follow Sissom et al. (1990) and are given in mm. Trichobothrial notations follow Vachon (1974) and morphological terminology mostly follows Hjelle (1990). Research materials have been deposited in the Specimen Room of University of Science and Technology of China, Hefei, China (USTC).

Taxonomy

Family Euscorpiidae Laurie, 1896

Subfamily Scorpiopinae Kraepelin, 1905

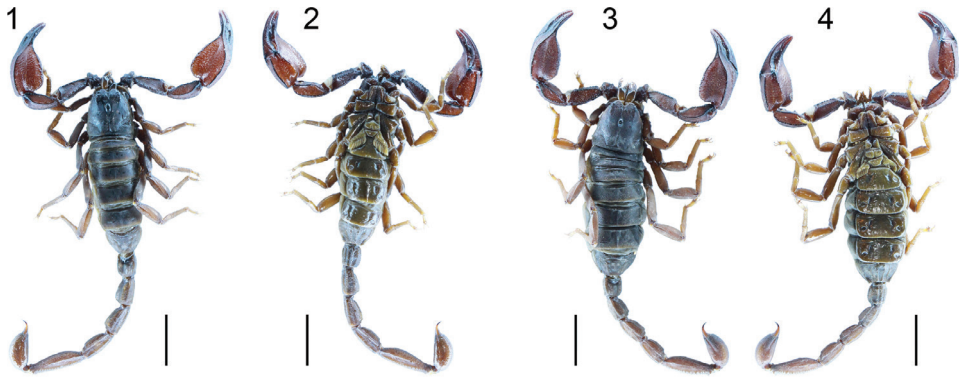
Genus *Scorpiops* Peters, 1861

***Scorpiops ingens* sp. n.**

<http://zoobank.org/D662B45D-6871-419F-9D3A-31EE4C53559D>

Figs 1–18

Type material. Holotype male (USTC), China: Xizang, Lhasa banlieue, 26/VII/2014, Zhiyong Di leg. (Ar.-USTC-XZLS1401); paratypes: 1 adult female, 1 immature fe-



Figures 1–4. Habitus of *Scorpiops ingens* sp. n. Dorsal and ventral habitus: **1–2** Male holotype (Ar.-USTC-XZLS1401) **3–4** Female paratype (Ar.-USTC-XZLS1402). Scale bar = 10.0 mm.

male, and 1 juvenile male, same data as holotype (Ar.-USTC-XZLS1402–1404) (kept in USTC).

Diagnosis. In accordance with the grouping of species proposed by Kovařík (2000) for the genus *Scorpiops*, the new species, which has 7 (rarely 8) trichobothria on the ventral surface of the patella, has to be placed in the *S. hardwickii* “complex” group. The new species differs from other members of the group in having yellow-brown color, larger size (length of adults above 70.0 mm), small and dense granules on the tegument, a pair of small median eyes and a lofty median ocular tubercle.

Comments. There are four close relatives from China distributed near to *S. ingens* sp. n.: *S. hardwickii*, *S. langxian*, *S. petersii*, and *S. pococki*. But *S. hardwickii*, *S. langxian*, and *S. pococki* with red-brown to black-brown color, body length no longer than 65 mm. Although *S. petersii* also above 75.0 mm, its carapace is not densely granulated, granules on its mesosoma are widely spaced, with the distance between them far greater than their size (Kovařík 2000: 193), while the granules are dense on the carapace and mesosoma of *S. ingens* sp. n.

Etymology. The specific name refers to the size of the morphology of the new species.

Description. Based on male holotype and female paratype.

Coloration. Mostly yellow to yellow-brown (Figs 1–4). Carapace yellow-brown with un conspicuous dark stripe (Figs 5, 7), median and lateral ocular tubercles black. Tergites and metasoma segments yellow-brown. Vesicle yellow-brown with a dark brown aculeus. Chelicerae yellow-brown, with fingers black-brown and gradually lighter toward the tip. Pedipalp yellow-brown, with the carinae black-brown. Legs yellow-brown. Claws yellow-brown with brown tips. Sternum and sternites yellow-brown (Figs 6, 8). Genital operculum, basil piece and pectines yellow (Figs 6, 8).

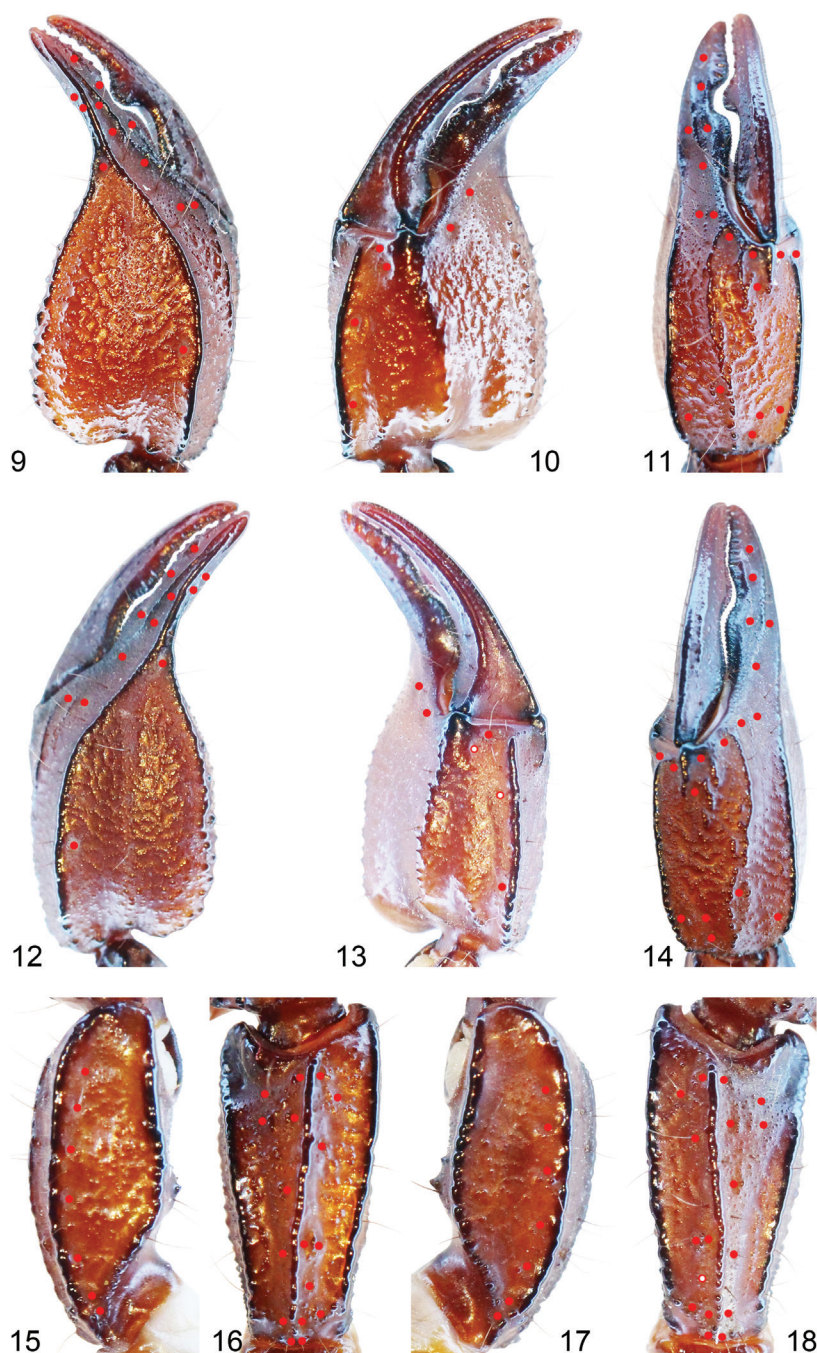
Morphology. Prosoma: Carapace coarse, with sparse and large granules in the area of the front of the eye region, with dense and minute granules in the area of the behind of the eye region; lateral furrow broad and flat; anterior median furrow broad and deep; posterior median furrow deep; anterior margin nearly smooth; posterior and lateral mar-



Figures 5–8. *Scorpiops ingens* sp. n. Male holotype: **5, 6.** **5** Carapace and tergite I– II. **6** Ventral aspect of prosoma. Female paratype (Ar-USTC-XZLS1402): **7, 8.** **7** Carapace and tergite I **8** Ventral aspect of prosoma.

gins and other parts with dense, minute granules (Figs 5, 7). Median eyes small and same as the first lateral eye, situated anterior to the center of the carapace; three pairs of lateral eyes, the third smallest. Median ocular tubercle high and smooth, with a median furrow, which having some granules. Lateral ocular tubercle with some big smooth granules.

Mesosoma: Tergites are almost completely densely covered with equal minute granules in male holotype, posterior part with some bigger granules in female paratypes;



Figures 9–18. *Scorpiops ingens* sp. n. Male holotype: 9–11, 15–16. 9–11 Chela (right) dorsal and external, ventral and internal, and external aspects. 15–16 Patella (right) ventral and external aspects. Female paratype (Ar-USTC-XZLS1402): 12–14, 17–18. 12–14 Chela (left) dorsal and external, ventral and internal, and external aspects. 17–18 Patella (left) ventral and external aspects. The red dots and rings denote trichobothrial patterns of pedipalps, the red ring meaning vestigial.

Table 1. Measurements (in mm) of holotype (male, Ar.-USTC-XZLS1401) and paratype (female, Ar.-USTC-XZLS1402) of *Scorpiops ingens* sp. n.

	<i>Scorpiops ingens</i> sp. n.	
	Holotype	Paratype
Total length:	74.6	75.9
Carapace:		
-Length	8.7	9.6
-Anterior width	4.9	5.3
-Posterior width	8.9	9.8
Mesosomal segments:		
-Length	22.3	24.7
Metasomal segment I:		
-Length	4.6	4.5
-Width	4.0	4.1
-Depth	3.1	3.2
Metasomal segment II:		
-Length	5.1	5.2
-Width	3.6	3.7
-Depth	3.0	2.9
Metasomal segment III :		
-Length	6.3	5.5
-Width	3.3	3.5
-Depth	3.0	3.0
Metasomal segment IV:		
-Length	6.8	6.2
-Width	3.0	3.3
-Depth	3.0	3.0
Metasomal segment V:		
-Length	10.8	10.6
-Width	3.0	3.0
-Depth	3.0	3.2
Telson:		
-Length	10.0	9.6
-Width	3.8	3.6
-Depth	3.7	3.6
Pedipalp femur:		
-Length	7.0	8.1
-Width	3.1	3.3
-Depth	2.6	2.9
Pedipalp patella:		
-Length	7.0	7.6
-Width	3.1	3.5
-Depth	3.3	3.6
Chela:		
-Length	14.3	14.8
-Width (manus)	6.3	6.4
-Depth (manus)	4.8	5.0
Movable finger:		
-Length	9.0	9.4
Pectinal teeth (left/right)	7/7	6/6

from tergite II to VI the trace of a median carina first appears and gradually becomes distinct; on tergite VII with a distinct apophysis and two pairs of lateral carinae. Sternum pentagonal (Figs 6, 8). Pectinal teeth count 6–8 (rarely 8), fulcra absent (Figs 6, 8). Genital opercula subtriangular (Figs 6, 8). Sternites smooth and shiny (Figs 2, 4); segment VII ventrally with four weak carinae.

Metasoma: Tegument coarse. Segments I to V are longer than wide; segments I to V have 10-8-8-8-7 carinae, segments II–IV with a pair of vestigial lateral carinae; all carinae granular; on segment V, ventral carinae with larger serration. Vesicle smooth, with some granules and few setae.

Chelicerae: Tibiae smooth. Movable finger with 4 denticles on dorsal edge and 6 denticles on ventral edge (smaller in female). Fixed finger with 3 denticles on dorsal edge.

Pedipalps: Tegument of femur and patella coarse, tegument of chelae and ventral aspects of femur and patella smooth. Femur with dorsointernal, dorsoexternal, external, ventroexternal, ventrointernal carinae granulated, and internal carinae crenulated. Patella with dorsoexternal, dorsointernal, external, ventrointernal, ventroexternal carinae with large, smooth granules; two small spinoid granules present on the internal aspect. Trichobothrial pattern C, neobothriotaxic; patella with 17 external trichobothria (5 eb, 2 esb, 2 em, 4 est, 4 et) and 7 or 8 (usually 7) ventral trichobothria (Figs 15–18). Chela with 4 ventral trichobothria, with dorsal marginal, external secondary, and ventral internal carinae, all smooth; internal carina vestigial only with few large granules (Figs 9–14). Male pedipalp chela fingers stronger curved than females.

Legs: Tegument coarse except coxa and trochanter. Trochanter with few granules and setae. Femur dorsal surface densely granular and ventrally smooth, internally with 2 granular carinae. Patella dorsal surface densely granular and ventrally smooth, with dorsoexternal, dorsal and ventroexternal granular carinae. Tibiae with few setae, without spurs. Basitarsus with more setae, and two lateral pedal spurs. Tarsus ventrally with row of spinules. Ungues falcate.

Variation. Female and male: coloration and morphology are very similar. Number (left/right) of ventral trichobothria on the pedipalp patellae: two females with 8/7 and 7/7, two males with 7/7. Number of pectinal teeth: two females with 6/6, two males with 7/7 and 7/8. Measurements in Table 1.

Habitat. Under stones on a hillside with ruderal vegetation.

Distribution. China (Xizang).

Updated key to species of *Scorpiops* from China

- 1 Fingers of pedipalps are straight or only slightly curved in both sexes2
- Fingers of pedipalps are curved in both sexes3
- 2 Ventral trichobothria on patella number 6 (7 rarely), total length 30.0–42.1 mm, pectinal teeth number 4–5, chela length to width ratio about 2.2.
..... *S. jendeki*

- Ventral trichobothria on patella number 7, total length 40.0–58.0 mm, pectinal teeth number 7–9, chela length to width ratio about 3.3–3.5 *S. leptochirus*
- 3 Manus length to width ratio visibly higher than 1 4
- Manus with similar length and width 9
- 4 Total length more than 65.0 mm 5
- Total length less than 65.0 mm 6
- 5 Ventral patella of pedipalps with 9 trichobothria *S. luridus*
- Ventral patella of pedipalps with 7 (rarely 6 or 8) trichobothria *S. petersii*
- 6 Dorsally flat manus of pedipalps and chela of both sexes, with length/width ratio: 2.1–2.2 (about 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 higher than 2.2 or total length higher than 50.0 mm 7
- 7 Total length less than 40.0 mm 8
- Total length 45.0–61.0 mm *S. tibetanus*
- 8 Chela of pedipalp length to width ratio about 2.6–3.0, dorsal surface of chela of pedipalp coarse *S. lhasa*
- Chela of pedipalp length to width ratio lower than 2.5, dorsal surface of chela of pedipalp smooth with luster *S. atomatus*
- 9 Yellow-brown color, length of adults above 70.0 mm *S. ingens* sp. n.
- Red-brown color, length of adults under 65.0 mm 10
- 10 Pedipalp chela manus almost as long as wide *S. hardwickii*
- Pedipalp chela manus usually longer than its width 11
- 11 Distance between median eyes much more than their diameter ... *S. langxian*
- Distance between median eyes only slightly more than their diameter *S. pococki*

Acknowledgments

We are grateful to Profs. Victor Fet and Wilson R. Lourenço for providing references. Sincere appreciation goes to Mr. Tao Li for the help to collect specimens. This work was supported in part by grants from the Fundamental Research Funds for the Central Universities (WK2070000056), the National Natural Sciences Foundation of China (30900239 and 81373379) and the Ministry of Science and Technology of the People's Republic of China (MOST grant no. 2014FY210200).

References

- Di ZY, He YW, Cao ZJ, Wu YL, Li WX (2011) The first record of the family Euscorpidae (Arachnida: Scorpiones) from Central China, with a key of Chinese species of the genus *Scorpiops*. *Euscorpius* 116: 1–11.

- Di ZY, Yang ZZ, Yin SJ, Cao ZJ, Li WX (2014) History of study, updated checklist, distribution and key of scorpions (Arachnida: Scorpiones) from China. *Zoological Research* 35: 3–19.
- Di ZY, Zhu MS (2009) One new species of the Genus *Scorpiops* Peters, 1861 (Scorpiones: Euscorpiidae, Scorpiopinae) from Xizang, China. *Zootaxa* 2030: 39–48.
- Hjelle JT (1990) Anatomy and morphology. In: Polis GA (Ed.) *The Biology of Scorpions*. Stanford Univ. Press, 9–63.
- Kovářík F (2000) Revision of family Scorpiopidae (Scorpiones), with descriptions of six new species. *Acta Societatis Zoologicae Bohemicae* 64: 153–201.
- Kovářík F, Ahmed Z (2009) Three new species of *Scorpiops* Peters, 1861 (Scorpiones: Euscorpiidae: Scorpiopinae) from Pakistan. *Euscorpius* 88: 1–11.
- Qi JX, Zhu MS, Lourenco WR (2005) Eight new species of the genera *Scorpiops* Peters, *Euscorpiops* Vachon, and *Chaerilus* Simon (Scorpiones: Euscorpiidae, Chaerilidae) from Tibet and Yunnan, China. *Euscorpius* 32: 1–40.
- Sissom WD, Polis GA, Watt DD (1990) Field and laboratory methods. In: Polis GA (Ed.) *The Biology of Scorpions*. Stanford University Press, Stanford, California, 445–461.
- Vachon M (1974) Etude des caracteres utilises pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. *Bulletin du Museum national d'Histoire naturelle*, Paris, 3e ser., 140: 857–958.