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A new species of *Mesobuthus* (Scorpiones: Buthidae) from Xinjiang, China, with notes on *Mesobuthus songi*

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Abstract. A new species, *Mesobuthus bolensis* from the Province of Xinjiang, in the Western region of China, is described. The new species can be defined by a densely granular carapace; carinae, granulation, and metasomal segment V without any dark pigmentation; carinae of carapace and pedipalp patella dispersively granular. Furthermore, restudy of the characters of *Mesobuthus songi* Lourenço, Qi & Zhu 2005, described from the southern region of Pulan, Xizang (Tibet), China led us to accommodate this species in the genus *Hottentotta* Birula, as a new combination *Hottentotta songi* (Lourenço, Qi & Zhu 2005).

Keywords: Scorpion, *Hottentotta*, new species, new combination

In comparison with scorpion faunas of adjacent regions (e.g., Vachon 1958; Tikader & Bastawade 1983; Fet 1989), the diversity of scorpions in the Province of Xinjiang appears to be rather poor. However, taking into account that this region of China remained inaccessible for several decades and considering its extensiveness, it is quite possible that this fauna has been largely underestimated. Early studies of the region of Xinjiang have been performed by foreign experts, in particular by the Russian scorpiologist Birula (1897, 1904, 1911, 1917). Subsequently, no other experts have been involved in the study of Xinjiang scorpions. Also, considering the particular climate of this area and the diversity of its environment, inventories seem far from complete. More recently, new studies have focused on this area again, and produce new interesting results, including the discovery of new species (Lourenço et al. 2009; Sun et al. 2009). As part of a global research project on the entire Chinese scorpion fauna, our research team is conducting intensive field work in Xinjiang. Among the scorpions found in this region, most specimens belong to the genus *Mesobuthus*. Two of these were collected in the northwest region of Xinjiang, and correspond to one more new species. The new species represents the sixth known species of this genus from China.

In this contribution we also restudy the characters of *Mesobuthus songi* Lourenço, Qi & Zhu 2005, recently described from the southern region of Pulan, Xizang (Tibet) in China. This new analysis led to the conclusion that most characters of this species most likely associate it to the genus *Hottentotta* Birula.

In previous publications (Fet & Lowe 2000), it was clearly pointed out that the relationships of *Mesobuthus* to other genera, and in particular to *Hottentotta*, remain poorly defined. This is particularly true for the species distributed in the Middle East, and also in China. Further analysis (e.g. Gantenbein et. al. 2003) is still needed for clarifying their respective positions.

METHODS

Specimens were examined and measured under a Leica M165c stereomicroscope with an ocular micrometer. Illustrations were produced using a Leica M165c stereomicroscope with a drawing tube. All measurements follow Stahnke (1970) and are given in millimeters (mm), except for the chela (Vachon 1952). Trichobothrial notations follow Vachon (1974) and morphological terminology mostly follows Hjelle (1990), except for the carinae of a pedipalp patella, which follows Soleglad & Fet (2003). The specimens used in this taxonomic work come from the Museum of Hebei University, Baoding (MHBU), and the Muséum national d'Histoire naturelle, Paris (MNHN). All illustrations and measurements of the new species were based on the male holotype (Ar.-MHBU-XJ0701) and the female paratype (Ar.-MHBU-XJ0610); illustrations and measurement of *Mesobuthus longichelus* Sun, Zhu & Lourenço 2009 were based on the female holotype (Ar.-MHBU-XJ0801); illustrations of *Hottentotta songi* were based on the female holotype (Ar.-MHBU-XZ3101).

TAXONOMY

Family Buthidae C.L. Koch 1837
Genus *Mesobuthus* Vachon 1950

Mesobuthus Vachon 1950:152–153.

Type species.—*Androctonus eupeus* C.L. Koch 1839, by original designation.

Diagnosis.—Total length 40–85 mm. Carinae of carapace granular, and central median, posterior median and lateral median carinae forming distinct shape of lyre. Dorsal trichobothria of femur arranged in β-configuration; trichobothrium *db* usually basal to *est* on the fixed finger, or on level with *est*; line joining trichobothria v_1 and v_2 of pedipalp chela perpendicular, or nearly perpendicular, to axis of movable finger articulation. Movable finger of pedipalp-chela with distinct granules divided into 10–14 rows and 4 terminal granules (not including the terminal denticle). Ventrolateral carinae of Metasoma segment V formed of disjunct and unequal granules, often enlarged posteriorly (Vachon 1950; Sissom 1990).

Distribution.—Species of *Mesobuthus* occur in Asia, Balkan Peninsula and Caucasia.

Mesobuthus bolensis new species
(Figs. 2, 3, 5–11, 14–18, 21, 22; Table 1)

Material examined.—CHINA: *Xinjiang*, Holotype male, 15 km SW of Bole City, 44°44′N, 81°59′E, 31 July 2007, D. Sun & L. Zhang (Ar.-MHBU-XJ0701). Paratype: 1 female, area close to Yining County, 44°00′N, 81°32′E, 14 August 2006, F. Zhang, H. X. Ma & S. N. Liu (Ar.-MHBU-XJ0610).

Etymology.—The specific name refers to Bole, Xinjiang, China, the type locality of the new species.

Diagnosis.—Species of moderate to large size, with respect to the genus, reaching a total length of 57 mm in male and 71 mm in female. General coloration pale brownish-yellow to yellow; all carinae, granules and metasoma segment V without any dark pigment. Anterior median, central median, and posterior median carinae of carapace granular and somewhat dispersive; dorsointernal and dorsomedian carinae of patella dispersive granular. Tarsus and basitarsus with many long setae; tarsus ventrally with two longitudinal rows of long setae. Metasoma segments and aculeus elongate; aculeus longer than vesicle. Both movable and fixed fingers with 12 oblique rows of granules. Pectinal tooth count 28–12 (right pecten injured, not complete) in male and 22–22 in female. Trichobothrial pattern of Type A-β (Vachon 1974, 1975), orthobothriotaxic. Several similarities that justify *Mesobuthus bolensis* sp. n. to be undoubtedly associated with *Mesobuthus longichelus*: 1) similar general morphology, especially the metasoma segment I–IV and telson; 2) similar basic coloration; 3) both with 12 oblique rows of granules on movable fingers and with nearly same pectinal tooth number (all in females). However, the new species can be distinguished by the following features: 1) larger, reaching total length of 57 mm in male and 71 mm in female, vs. 52 mm in female for *M. longichelus*; 2) metasoma segment V without any dark pigment, whereas ventral and lateral surfaces of segment V of *M. longichelus* with inconspicuous variegated black pigment (Figs. 21–24); 3) carapace with much denser granules (Figs. 2–4); 4) anterior median, central median, and posterior median carinae of carapace and dorsointernal and dorsomedian carinae of patella dispersive granular, whereas those carinae not like that for *M. longichelus* (Figs. 2–5, 7, 12–13); 5) ventrolateral carinae of metasoma segment V granular, with posterior granules enlarged, whereas it is strongly marked posteriorly; with 2–4 strong and extroversive lobed granules in *M. longichelus* (Figs. 21–24); 6) chela manus more robust than that for *M. longichelus* (Figs. 14–17, 19–20).

Description.—Based on male holotype (Ar.-MHBU-XJ0701).

Coloration: Basically pale brownish-yellow to yellow, prosoma: carapace pale brownish-yellow, only eyes surrounded by black pigment. Mesosoma and metasoma: pale brownish-yellow; vesicle yellow and aculeus dark reddish to blackish on its extremity. Venter: pale brownish-yellow, except for the pectines, which are pale yellow. Chelicerae: pale brownish-yellow without any variegated pigmentation; teeth dark reddish. Pedipalps: yellow; rows of granules on dentate margins of the fingers blackish-brown. Legs: pale yellow without spots.

Morphology: prosoma: anterior margin with a very weak median concavity and slightly serrate centrally. Carinae moderately strong, granular; anterior median, central median and posterior median carinae granular and somewhat dispersive, especially the central median carinae; central median carinae directly connected with posterior median carinae, and not with lateral median carinae; posterior median carinae terminating distally in a small spinoid process that extends distinctly beyond the posterior margin of the carapace. Carapace with coarse granules, especially in the anterior; intercarinal surfaces not smooth, finely to coarsely granular; furrows moderate. Median ocular tubercle slightly anterior to the center of carapace; median eyes separated by almost two ocular diameters; three pairs of lateral eyes. Mesosoma: tergite: I to VI tricarinate; all carinae moderately developed, strongly granular; each carina on I–VI terminating distally in a small spinoid process that extends very distinctly beyond the posterior margin of tergite; intercarinal surfaces moderately granular, exterior surfaces coarsely and densely granular; VII pentacarinate; two pairs of lateral carinae moderate to strong; median carinae weak, present only on proximal half; intercarinal surfaces smooth, exterior surfaces coarsely and densely granular. Sternites: III–VII smooth; lateral margins serrate; VII with four weakly marked carinae, granular. Pectines: moderately long; pectinal teeth 28–12 (right pecten injured, not complete). Metasoma: segments I to III with 10 carinae, segment IV with eight carinae; all carinae moderately strong, granular, except for the dorsal carinae, strong; median lateral carinae complete on segment I, only covered one third length of segment on II and obsolete, remaining one or two granules at distal end on III. Intercarinae surfaces on segments I to IV slightly concave and smooth, except for the surfaces between dorsal and dorsolateral carinae on segment I, which are weakly granular. Segment V pentacarinate; ventral carina moderate to strong; ventrolateral carinae granular, with posterior granules enlarged and serrate; dorsolateral carinae granular, moderately developed anteriorly, weakly to obsolete posteriorly; dorsal and lateral surfaces on V smooth; ventral smooth, except for few sparse granules. Telson smooth dorsally and weakly granular ventrolaterally; aculeus long, more than a half of telson length. Chelicerae: dentition as defined by Vachon (1963) for the family Buthidae. A weak subdistal tooth and two very small basal teeth on movable finger. Pedipalps: trichobothrial pattern: orthobothriotaxic A-β (Vachon 1974, 1975). Femur pentacarinate, moderately to strongly granular; ventrointernal carina with spinoid granules; dorsal surface not smooth, finely granular. Patella with eight carinae, very weakly to moderately granular; dorsointernal and dorsomedian carinae dispersive granular; intercarinal surface smooth. Chela smooth without carinae; both movable and fixed fingers with 12 oblique rows of granules; movable finger with a strong basal tubercle on dentate margin. Legs: Tarsus and basitarsus with many long setae; tarsus ventrally with two longitudinal rows of long setae; tibial spurs strong on legs III and IV; pedal spurs moderately developed on all legs.

Variation.—Based on female paratype (Ar.-MHBU-XJ0610).

There is some variation between the holotype and female paratype, particularly the sexual dimorphism. 1) anterior median carinae obsolete anteriorly; 2) carapace with much denser granules; 3) intercarinal surfaces weakly granular; 4) Sternite VII with four moderately marked carinae, granular; 5)

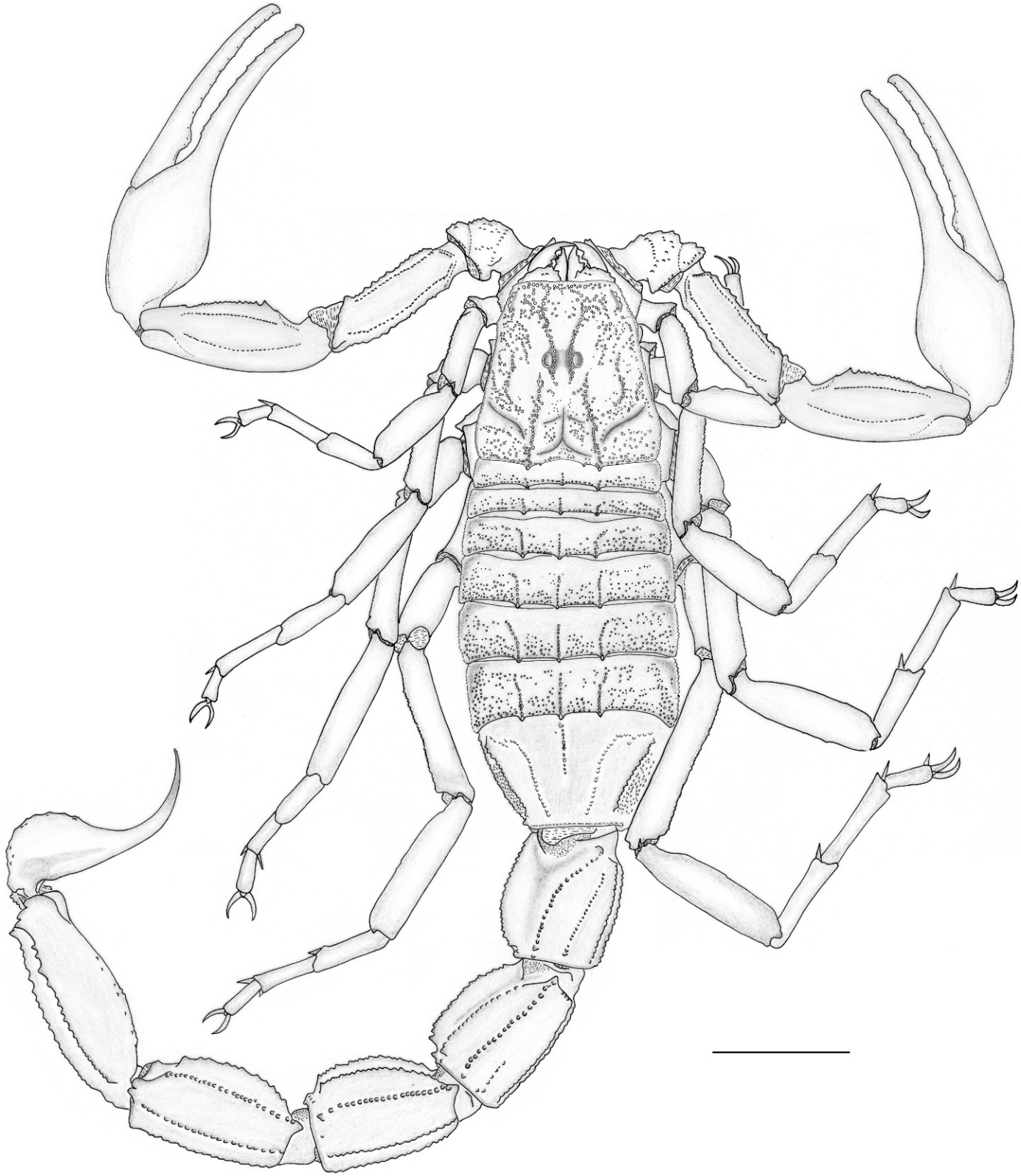
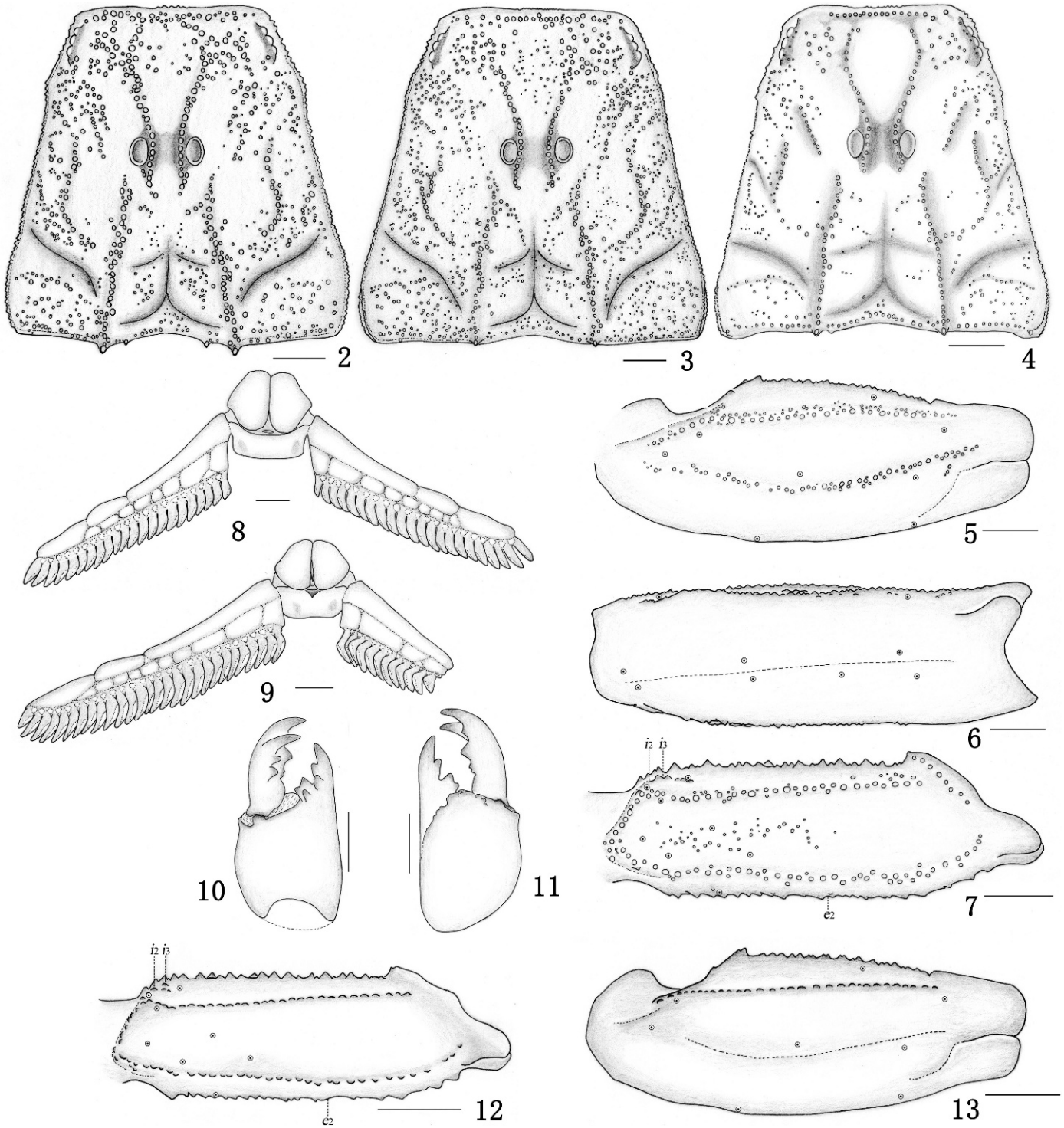
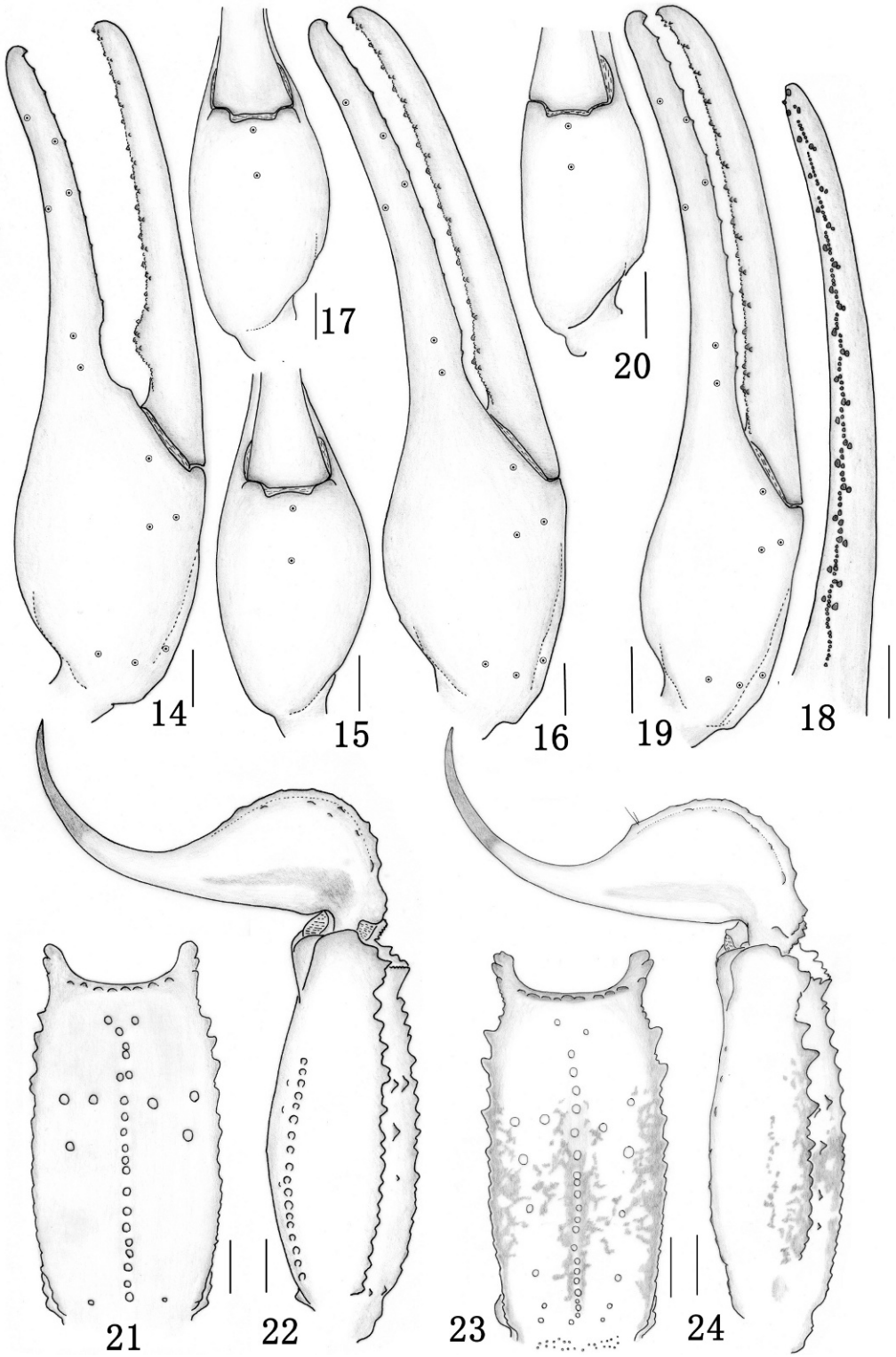


Figure 1.—*Mesobuthus bolensis* new species, male holotype, dorsal view. Scale bar = 5.0 mm.



Figures 2–13.—*Mesobuthus* species. 2, 9–11. *M. bolensis* new species, male holotype. 3, 5–8. *M. bolensis* new species, female paratype. 4, 12, 13. *Mesobuthus longichelus* Sun, Zhu & Lourenço, 2009, female holotype. 2–4. Carapace, dorsal aspect; 5, 6, 13. Palpal patella (5, 13. dorsal; 6. external); 7, 12. Palpal femur, dorsal aspect. 8, 9. Genital operculum and pectines, ventral aspect; 10, 11. Chelicera: 10. Ventral; 11. Dorsal. Scale bar = 1.0 mm.



Figures 14–24.—*Mesobuthus* species. 14, 15, 21, 22. *M. bolensis* new species, male holotype. 16–18. *M. bolensis* new species, female paratype. 19, 20, 23, 24. *M. longichelus* Sun, Zhu & Lourenço, 2009, female holotype. 14–17, 18, 19. Chela (14, 16, 19. Dorso-external; 15, 17, 20. Ventral); 18. Disposition of granulations on the dentate margins of the pedipalp chela movable finger, dorsal aspect; 21, 23. Metasomal segment V, ventral aspect; 22, 24. Metasomal segment V and telson, lateral aspect. Scale bar = 1.0 mm.

Table 1.—Morphometric values (in mm) of the holotype and paratype of *Mesobuthus bolensis* new species and female holotype of *Mesobuthus longichelus*.

	M. bolensis new species		*M. longichelus*
	♂ (holotype)	♀ (paratype)	♀ (holotype)
Total length	56.56	70.78	52.08
Carapace:			
Length	6.46	7.85	5.85
Anterior width	3.77	4.69	3.38
Posterior width	6.54	8.31	6.14
Metasomal segment:			
Length	4.69	5.46	3.81
Width	4.15	4.69	3.33
Metasomal segment:			
Length	5.23	6.00	4.71
Width	4.00	4.54	3.19
Metasomal segment:			
Length	5.54	6.46	4.95
Width	4.00	4.54	3.19
Metasomal segment:			
Length	6.00	7.00	5.48
Width	4.00	4.23	3.10
Metasomal segment:			
Length	6.69	8.77	6.14
Width	3.54	3.92	2.95
Depth	2.85	3.15	2.24
Telson:			
Length	7.08	7.85	6.23
Width	2.69	3.08	2.08
Depth	2.31	2.69	2.04
Aculeus length	4.00	3.92	3.39
Pedipalps:			
Femur length	5.69	6.54	5.05
Femur width	1.62	1.92	1.48
Patella length	6.62	7.77	6.10
Patella width	2.46	2.92	2.14
Chela length	11.62	13.92	10.62
Chela width	2.85	2.92	1.96
Chela depth	3.15	3.69	2.39
Movable finger length	8.00	9.77	7.62
Pectines:			
Tooth count (left-right)	28–12	22–22	22–23

* right pecten injured, not complete.

dorsal surface of femur of pedipalps moderately granular; 6) movable finger only with a weak basal tubercle.

Distribution.—This species is currently known only from China (Xinjiang).

Ecology.—This region in Xinjiang is comparatively rainy, which is the widest and driest province in China, with an average annual rainfall of 200–400 mm, mostly in the summer. The new species was found mainly in habitats composed of desertified grassland and low foothills, under rocks and clods. Its microhabitat is similar to *M. eupeus*, which is the dominant scorpion species in this region; in contrast, the new species is quite rare. We could not find any specimens in comparatively humid sand or sandy soil, while *M. eupeus* is abundant in this kind of microhabitat.

Genus *Hottentotta* Birula 1908

Androctonus: C.L. Koch, 1838:45.
Buthus (in part): Thorell, 1876:103.
Buthus (*Buthus*) (in part): Pocock, 1890:126.
Buthus (*Hottentotta*) Birula, 1908:141.
Hottentotta: Werner, 1934:269; Kovařík, 2007:1.
Buthotus (*Buthotus*): Vachon, 1979:236.
Mesobuthus (in part): Tikader & Bastawade, 1983:186; Lourenço, Qi & Zhu, 2005:3.
Hottentotta (*Hottentotta*): Francke, 1985:4.
Hottentotta (*Balfourianus*): Francke, 1985:4.

Type species.—*Scorpio hottentotta* Fabricius 1787, by original designation.

Diagnosis.—Total length 30–130 mm. Dorsal trichobothria of femur arranged in β-configuration; trichobothrium *db* on the fixed finger of pedipalp usually located between *est* and *et*, or may be on level with trichobothrium *est*, rarely between *est* and *esb*; line joining trichobothria v_1 and v_2 of pedipalp chela obliquely oriented relative to axis of movable finger articulation, with v_2 external to v_1. Movable finger of pedipalp-chela with distinct granules divided into 11–16 rows and 4–6 terminal granules (not including the terminal denticle). Ventrolateral carinae of fifth metasomal segment with all granules more or less equal in size and never lobate (Vachon & Stockmann, 1968; Sissom 1990; Kovařík 2007).

Distribution.—Species of *Hottentotta* occur in Africa, Middle East, parts of Asia.

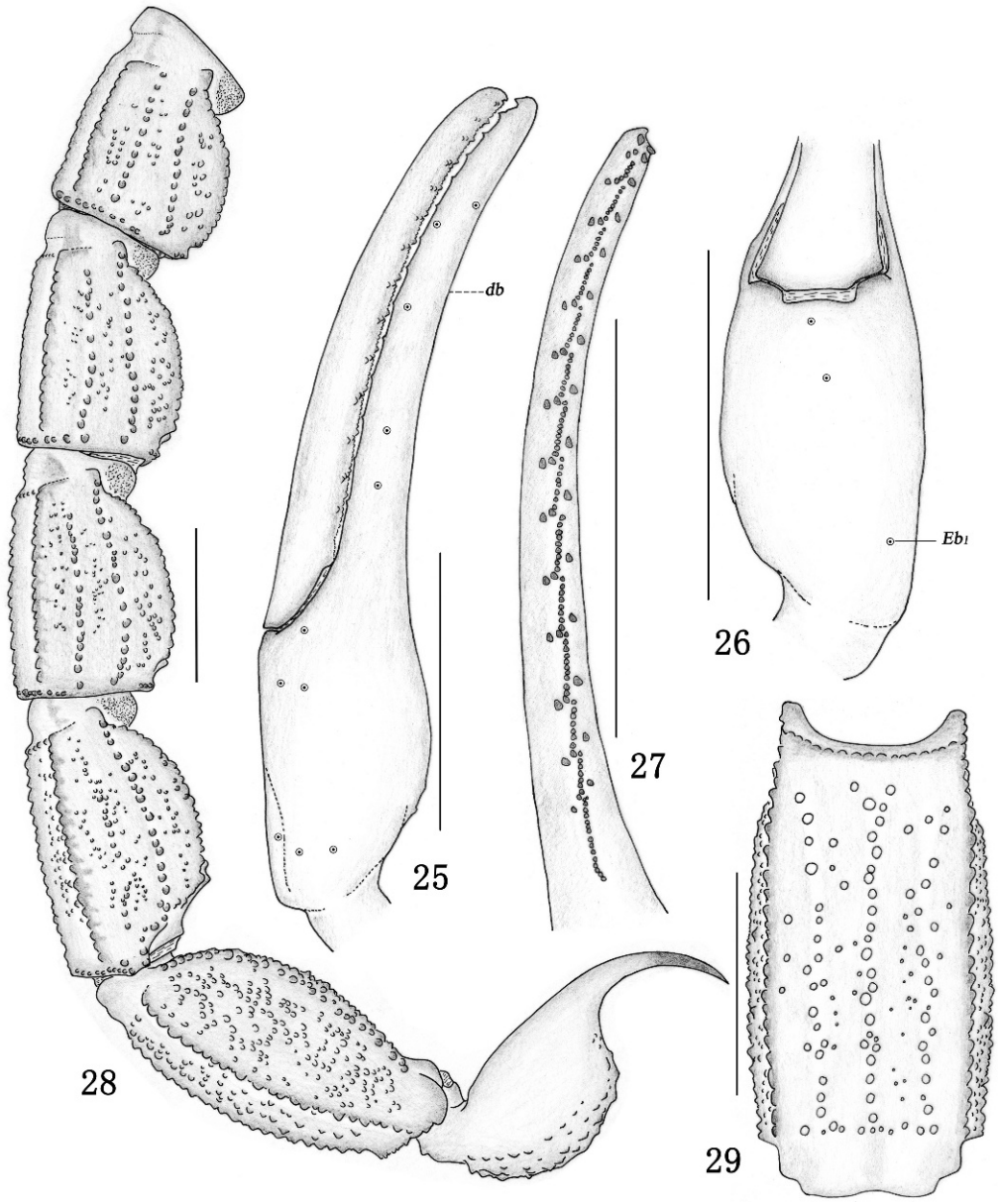
Remarks.—The study of the following characters, relative positions of trichobothria on the fixed finger and ventral surface of chela, ventrolateral carinae of metasoma segment V, led us to transfer the species *M. songi* to the genus *Hottentotta*.

Hottentotta songi (Lourenço, Qi & Zhu 2005) new combination (Figs. 25–29)

Mesobuthus songi Lourenço, Qi & Zhu 2005:3, figs. 1–17.

Material examined.—CHINA: *Xizang (Tibet)*, male holotype, southern region of Pulan, low valley of the Kongque River, near border with Nepal, 30°09′–30°15′N, 81°10′–81°18′E (estimated), July 1931, collector unknown (MNHN). Paratypes: 8 females and 7 males (MNHN), 1 female (Ar.-MHBU- XZ3101), 2 males (Ar.- MHBU- XZ3102–03), collected with holotype.

Diagnosis.—Total length reaching 69 mm (male) and 80mm (female). General coloration reddish-yellow to reddish-brown,with blackish zones on the carinae of the body. Carinae and granulations strongly marked on carapace, tergites and metasomal segments. Trichobothrial pattern: orthobothriotaxic A-β (Vachon 1974, 1975). Trichobothrium *db* on the fixed finger of pedipalp located between *est* and *et* (Fig. 25); line connecting trichobothrium v_1 with v_2 not vertical to the joint of mobile finger markedly (Fig. 26).



Figures 25–29.—*Hottentotta songi* (Lourenço, Qi & Zhu, 2005), new combination, female paratype: 25, 26. Chela: 25. Dorso-external; 26. Ventral. 27. Disposition of granulations on the dentate margins of the pedipalp chela movable finger, dorsal aspect; 28. Metasomal segments I–V and telson, lateral aspect; 29. Metasomal segment V, ventral aspect. Scale bar = 5.0 mm.

Fixed and movable fingers with 13 oblique rows of granules in males and females, and with four terminal granules (Fig. 27). Intercarinal spaces of metasoma strongly granular, denser from segment I to segment V; ventrolateral carinae of metasoma segment V moderate to strong granular, with all granules more or less equal in size, especially never lobate and larger posteriorly (Figs. 28, 29). Pectinal tooth count 31–34 in males and 27–29 in females. Very intense setation on body and pedipalps.

Description.—See Lourenço, Qi & Zhu (2005).

Distribution.—China (Xizang).

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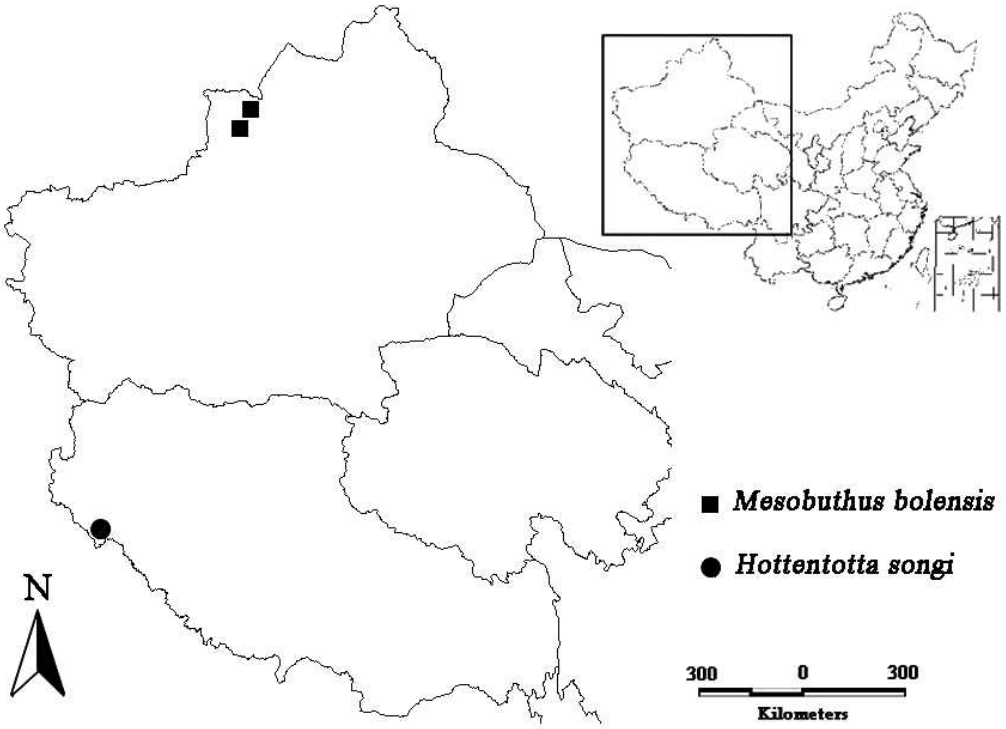

Figure 30.—Known distribution of *Mesobuthus bolensis* new species and and *Hottentotta songi* (Lourenço, Qi & Zhu, 2005).

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