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DESCRIPTION OF A NEW SPECIES OF *ISOMETRUS* EHRENBERG 1828 (SCORPIONES, BUTHIDAE) FROM THE ISLAND OF HAINAN, CHINA

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Abstract: One new species, *Isometrus* (*Reddyanus*) *hainanensis* sp. n., is described from the Island of Hainan on the South coast of China. The new species is characterized by moderate size, with respect to the genus, measuring from 34 mm (female) to 53 mm (male) in total length. General coloration pale yellow to reddish-yellow throughout body and appendages. Pectines with 15-15 teeth in male and 14-14 teeth in female; fulcra present. Telson elongated in males and more globular and round in females; aculeus short and curved; subaculear tooth strongly rhomboid, with five granules on the ventral surface. Tibial spurs absent. Pedipalp fixed and movable fingers with 7-7 rows of granules.
Key words: Scorpion, Buthidae, *Isometrus*, new species, Hainan Island, China.

Descripción de una nueva especie de *Isometrus* Ehrenberg 1828 (Scorpiones, Buthidae) de la isla Hainan, China
Resumen: Se describe una nueva especie, *Isometrus* (*Reddyanus*) *hainanensis* sp. n., de la isla de Hainan (costa sur de China). La nueva especie se caracteriza por su moderado tamaño con respecto al habitual del género (longitud total de la hembra 34 mm y del macho 53 mm). Coloración general de amarillo pálido a rojizo, tanto el cuerpo como los apéndices. Pectinas con 15-15 dientes en el macho y 14-14 en la hembra; fulcra presente. Telson alargado en los machos y más globular y redondeado en las hembras; acúleo corto y curvado; diente subaculear fuertemente romboide, con cinco gránulos en la superficie ventral. Espolón tibial ausente. Pedipalpo fijo y dedo móvil con 7-7 filas de gránulos.
Palabras clave: Scorpion, Buthidae, *Isometrus,* nueva especie, Isla Hainan, China.

Introduction

As already exposed in a recent publication (Lourenço *et al*., 2005), contributions to knowledge of the scorpion fauna of China began with descriptions such as those by Karsch (1879) and Simon (1880). Also during this period, other studies made reference to species from China (see Lourenço *et al*., 2005 for full references). Several years later, authors in the region including Wu (1936), Kishida (1939) and Takashima (1941, 1942, 1944, 1945, 1948, 1949, 1952), attempted to clarify existing knowledge of this fauna. Finally, in a recent paper Zhu *et al*. (2004) proposed a checklist of the scorpions of China. These contributions, however, brought few changes to the inventory of the Chinese scorpion fauna.

In comparison with scorpion faunas in other regions of the world (e. g. Lamoral, 1979; Williams, 1980; Lourenço, 1996, 2002), the diversity of Chinese scorpions appear to be rather low (Zhu *et al*., 2004). It is quite possible, however, that this fauna has been largely underestimated. Wu (1936) reported two families, four genera and four species of scorpion from China, whereas Zhu *et al*. (2004) listed five families, nine genera and 19 species for this fauna. Since the work of Wu (1936), no Chinese scholar has been really involved in the study of Chinese scorpions. The need to update taxonomy and nomenclature of Chinese scorpions is obvious. Although very intensive scorpion toxicological studies are being conducted in China, but the toxicologists are so little aware of scorpion taxonomy that they still use the species name "*Buthus martensi*" for the species, which has been transferred to the genus *Mesobuthus* Vachon over 50 years ago.

Very recently, and because an inventory of the entire Chinese scorpion fauna is now being compiled by one of the junior authors (JXQ), listing and description of all the material available in different collections appears as a priority (Zhu *et al*., 2004). The material used in the present study was found in the collections of the Muséum national d'Historie naturelle, Paris. It is rather old, but quite well preserved. The new species belongs to genus *Isometrus* Ehrenberg, 1828, subgenus *Reddyanus* Vachon (family Buthidae C.L. Koch, 1837).

The genus *Isometrus* Ehrenberg and its subgenera

The genus *Isometrus* was described by Ehrenberg (in Hemprich & Ehrenberg, 1828) with *Buthus* (*Isometrus*) *filum* Ehrenberg, 1828 [= *Isometrus maculatus* (DeGeer, 1778)], as type species by monotypy. Vachon (1972) proposes the division of the genus *Isometrus* in two subgenera: *Isometrus* Ehrenberg and *Reddyanus* Vachon. The diagnosis for the two subgenera are proposed only in a short key and based on the relative position of certain trichobothria. *Isometrus* would have the trichobothrium **db** of the fixed finger in a distal position in relation to the trichobothria **et** and **est**; the distance between external trichobothria of the femur, $\mathbf{e_1}$ and $\mathbf{e_2}$ being at least two to five times the distance between trichobothria $\mathbf{e_1}$ and $\mathbf{d_3}$ of the femur. In contrast, *Reddyanus* would present trichobothrium **db** in a basal position to **et**, situated between **et** and **est**; the distance between external trichobothria of the femur, $\mathbf{e_1}$ and $\mathbf{e_2}$ always less than two times the distance between $\mathbf{e_1}$ and $\mathbf{d_3}$.

Vachon (1972) places three species in the subgenus *Isometrus* and five in the subgenus *Reddyanus*, whereas five others remain without a precise classification. In the Catalog of the Scorpions of the World, Fet & Lowe (2000) place six species in the subgenus *Isometrus* and all the others (16) in the subgenus *Reddyanus*. In a recent revision of the genus by Kovařík (2003), this author places four species in the subgenus *Isometrus* and all the others (21) in the subgenus *Reddyanus*. This picture seems to indicate that the subgenus *Reddyanus* is much more diverse than the subgenus *Isometrus*. In its revision of *Isometrus*, Kovařík (2003) describes several new species, and among these one species from Vietnam and Thailand, *Isometrus* (*Reddyanus*) *petrzelkai* Kovařík. From the analysis of the Kovařík's (2003) revision, this species should be the closest one to the new species we described here. Unfortunately, the description of this species is poorly illustrated and we were unable to see the type material deposited in the personal collection of the author. A colour photograph of the holotype is, however, available in the author's website, and this allow us a comparative analysis of the coloration patterns of the two species. Moreover, we were able to examined some specimens of *Isometrus* from Vietnam, formerly determined by L. Fage as *Isometrus vittatus* Pocock. We suspected these do belong to the species *Isometrus* (*R.*) *petrzelkai* Kovařík. Subcuticular pigmentation can be very stable within buthid species populations (Lourenço, 1983; Lourenço & Cloudsley-Thompson, 1996), and therefore useful as a taxonomic characters in the definition of species.

Taxonomic treatment: description of the new species

BUTHIDAE C. L. Koch, 1837

ISOMETRUS Ehrenberg, 1828

***Isometrus* (*Reddyanus*) *hainanensis* sp. n.**
(Figs. 1-15, 17-19).

TYPE MATERIAL: 1 male holotype and 1 female paratype. China, Hainan Island, Southeast region, 24/XI/1931 (collector unknown). L. Fage det. as *Isometrus vittatus* Pocock. Deposited in the collections of the Muséum national d'Histoire naturelle, Paris (RS-1175).

ETYMOLOGIE: the specific name makes reference to the Island of Hainan, type locality of the new species.

DIAGNOSIS:
Scorpions of moderate to small size, with respect to the genus, measuring from 34 mm (female) to 53 mm (male). General coloration pale yellow to slightly reddish-yellow. Carinae and granulations moderate to weak. Pectines small; pectinal tooth count 15-15 for the male and 14-14 for the female. Dentate margins of fixed and movable fingers of pedipalp chela with 7 almost linear rows of granules. Subaculear tubercle strong and very rhomboid, with five ventral granules.

RELATIONSHIPS: From its general morphology, *Isometrus* (*Reddyanus*) *hainanensis* sp. n. appears to be most closely related to *Isometrus* (*Reddyanus*) *petrzelkai* Kovařík, 2003, described from Vietnam. It can be distinguished from this last species by the following characters: (i) a much paler coloration, yellowish to slightly reddish-yellow, without any conspicuous spots. In contrast *I.*(*R.*) *petrzelkai* is yellowish but with brown spots over the pedipalps and legs, and a dominant blackish coloration over the carapace and tergites, (ii) the new species has metasomal segments carinae stronger, and males have five carinae on segment V; instead, the granulation on carapace is thinner than in *I.* (*R.*) *petrzelkai*, (iii) several morphometric values are distinct between the new species and *I.* (*R.*) *petrzelkai* (see Table I).

DESCRIPTION OF THE MALE HOLOTYPE.
Morphometric measurements in Table I.

Table I. Morphometric values (in mm) of male holotype and female paratype of *Isometrus* (*Reddyanus*) *hainanensis* sp. n. and idem for *Isometrus* (*Reddyanus*) *petrzelkai* Kovařík (after Kovařík, 2003). H: Holotype. P: Paratype

	I. (R.) *hainanensis* sp. n		*I* (R.) *petrzelkai*	
	H	P	H	P
Total length	53.4*	34.2*	47.0	37.1
Carapace:				
- length	4.9	4.6	4.3	4.1
- anterior width	2.9	2.8	-	-
- posterior width	4.6	4.6	4.0	4.1
Metasomal segment I:				
- length	4.7	3.1	3.7	2.4
- width	1.8	2.0	1.4	1.9
Metasomal segment V:				
- length	8.5	5.4	7.4	4.5
- width	1.3	1.4	1.5	1.5
- depth	1.5	1.6	-	-
Vesicle:				
- width	1.4	1.2	-	-
- depth	1.5	1.4	-	-
Pedipalp:				
- Femur length	4.9	4.0	4.2	3.6
- Femur width	1.5	1.3	1.1	1.2
- Patella length	5.5	4.7	4.7	4.2
- Patella width	2.0	1.9	1.7	1.6
- Chela length	8.4	7.4	7.8	6.6
- Chela width	2.1	1.8	1.9	1.6
- Chela depth	1.8	1.4	-	-
Movable finger:				
- length	4.5	4.3	3.9	3.8

* For the total length, we don't take in consideration the telson's length. If this value is added, the total length would be respectively 58.8 mm for male and 38.4 mm for female.

Coloration. Generally pale yellow to reddish-yellow. Prosoma: carapace yellowish with some vestigial spots or pigmented zones on the anterior margin; eyes surrounded by black pigment. Mesosoma: tergites yellowish. Metasoma: segments I to IV yellowish; segment V reddish-yellow. Vesicle reddish-yellow; aculeus reddish-yellow at the base and dark reddish at its extremity. Venter pale yellow. Chelicerae yellowish with pale brownish variegated spots on its anterior half; teeth reddish. Pedipalps: yellowish throughout, excepted for the chela fingers which are reddish; rows of granules on dentate margins of the fingers dark reddish. Legs pale yellow without spots.

Morphology. Prosoma: Anterior margin of carapace moderately emarginate. Carapace carinae almost obsolete, with only the anterior median carinae weakly developed. Intercarinal spaces with a thin but intense granulation. Median ocular tubercle anterior to the centre of the carapace; me-

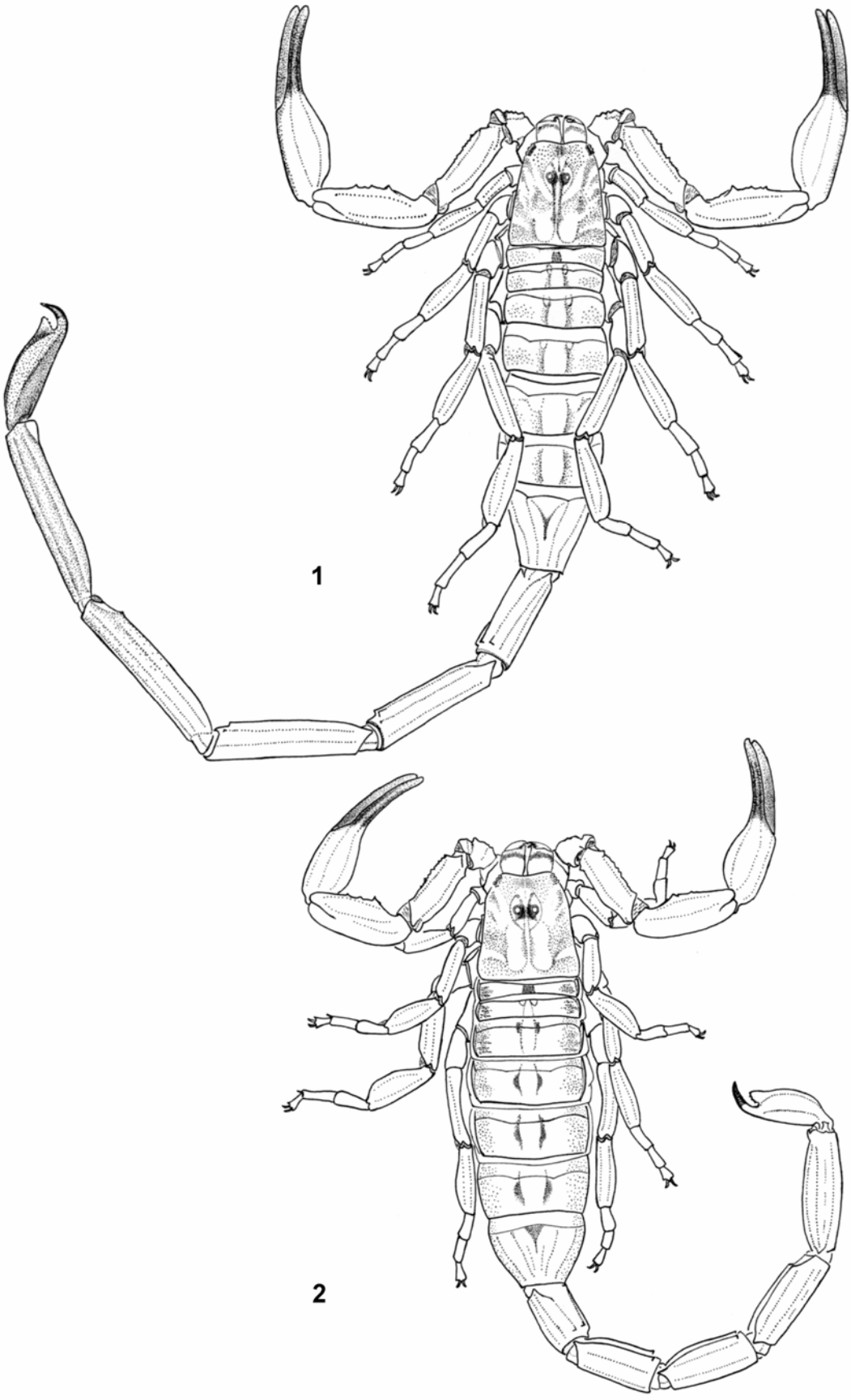

Fig. 1-2. Habitus of *Isometrus* (*Reddyanus*) *hainanensis* sp. n., **1.** male holotype. **2.** female paratype.

dian eyes separated by one ocular diameter. Three pairs of lateral eyes. Mesosoma: tergites I-VI with a median carina; obsolete on I, weak to moderate on II-VI. Tergite VII pentacarinate, with lateral pairs of carinae moderate to strong; median carinae present in proximal half, moderately developed. Intercarinal spaces with a thin granulation, less intense than that of carapace. Sternites almost smooth, with moderately long spiracles; sternite VII with four carinae. Pectines moderately long; pectinal teeth count 15-15. Metasoma: Segment I with 10 carinae, crenulate; II-IV with 8 carinae, moderately crenulate. Segment V with five carinae; one posterior spinoid granule on the dorsal carinae of segments I-IV. Dorsal furrows of all segments weakly developed, smooth; intercarinal spaces very weakly granular. Telson very weakly granular, almost smooth with one ventral carina; subaculear tubercle strong and rhomboid, with five granules on the ventral surface. Chelicerae with the dentition characteristic of the buthids (Vachon, 1963); two small basal teeth on movable finger. Pedipalps: Femur pentacarinate; all carinae moderately crenulate. Patella with 7 carinae, moderately crenulate; dorsointernal carinae with three spinoid granules. Chela with seven/eight carinae weakly crenulate. Intercarinal spaces weakly granular, almost smooth. Dentate margins on movable and fixed fingers composed of seven linear rows of granules. Trichobothrial pattern type A, orthobothriotaxic (Vachon, 1974); dorsal trichobothria of femur in β (beta) configuration (Vachon, 1975). Legs: ventral aspect of tarsi with a brush-like group of setae. Tibial spurs absent; pedal spurs present and moderately developed on legs III-IV

DESCRIPTION OF THE FEMALE PARATYPE.
Morphometric measurements in Table I.

Coloration. Generally pale yellow. Prosoma: carapace yellowish with some vestigial spots or pigmented zones on the anterior margin; eyes surrounded by black pigment. Mesosoma: tergites yellowish. Metasoma: all segments yellowish. Vesicle yellowish; aculeus yellowish at the base and reddish at its extremity; ventral granules on subaculear tubercle reddish. Venter pale yellow. Chelicerae yellowish with pale brownish variegated spots on its anterior half; teeth reddish. Pedipalps: yellowish throughout, excepted for the chela fingers which are reddish; rows of granules on dentate margins of the fingers reddish. Legs pale yellow without spots.

Morphology. Prosoma: Anterior margin of carapace moderately emarginate. Carapace carinae almost obsolete, with only the anterior median carinae weakly developed. Intercarinal spaces with a thin but intense granulation. Median ocular tubercle anterior to the centre of the carapace; median eyes separated by one ocular diameter. Three pairs of lateral eyes. Mesosoma: tergites I-VI with a median carina; obsolete on I, weak to moderate on II-VI. Tergite VII pentacarinate, with lateral pairs of carinae moderate to strong; median carinae present in proximal half, moderately developed. Intercarinal spaces with a thin granulation; in tergites I-III as for the carapace; on tergites IV-VII less intense than that of carapace. Sternites almost smooth, with moderately long spiracles; sternite VII with four carinae. Pectines moderately long; pectinal teeth count 14-14. Metasoma: Segments I-II with ten carinae, crenulate; III-IV with eight carinae, moderately crenulate. Segment V with five carinae; dorsolateral carinae incomplete on segment II; one posterior spinoid granule on the dorsal carinae of segments I-IV. Dorsal furrows of all segments weakly developed, smooth; intercarinal spaces very weakly granular. Telson very weakly granular, almost smooth with one lateral and one ventral carina; subaculear tubercle strong and rhomboid, with five granules on the ventral surface. Chelicerae with the dentition characteristic of the buthids (Vachon, 1963); two small basal teeth on movable finger. Pedipalps: Femur pentacarinate; all carinae moderately crenulate. Patella with 7 carinae, moderately crenulate; dorsointernal carinae with three spinoid granules. Chela with seven/eight carinae moderately crenulate. Intercarinal spaces weakly granular. Dentate margins on movable and fixed fingers composed of seven linear rows of granules. Trichobothrial pattern type A, orthobothriotaxic (Vachon, 1974); dorsal trichobothria of femur in β (beta) configuration (Vachon, 1975). Legs: ventral aspect of tarsi with a brush-like group of setae. Tibial spurs absent; pedal spurs present and moderately developed on legs III-IV.

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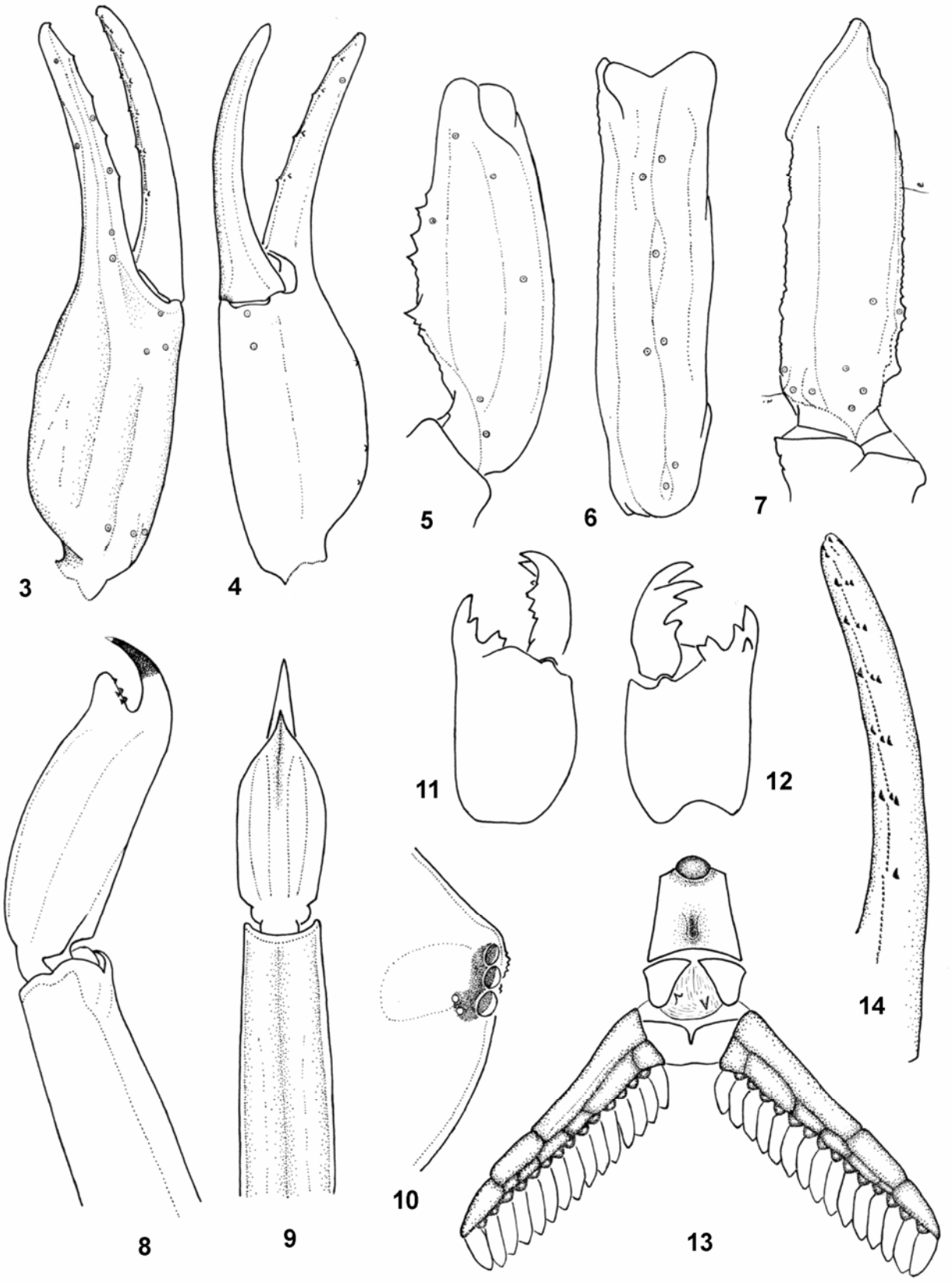

Figs. 3-14. *Isometrus* (*Reddyanus*) *hainanensis* sp. n. Male holotype. **3-7.** Trichobothrial pattern. **3-4.** Chela, dorso-external and ventral aspects. **5-6.** Patella, dorsal and external aspects. **7.** Femur, dorsal aspect. **8-9.** Metasomal segment V and telson, lateral and ventral aspects. **10.** Lateral eyes, dorsal aspect. **11-12.** Chelicera, dorsal and ventral aspects. **13.** Sternum, genital operculum and pectines. **14.** Dentate margin of movable finger, showing rows of granules.

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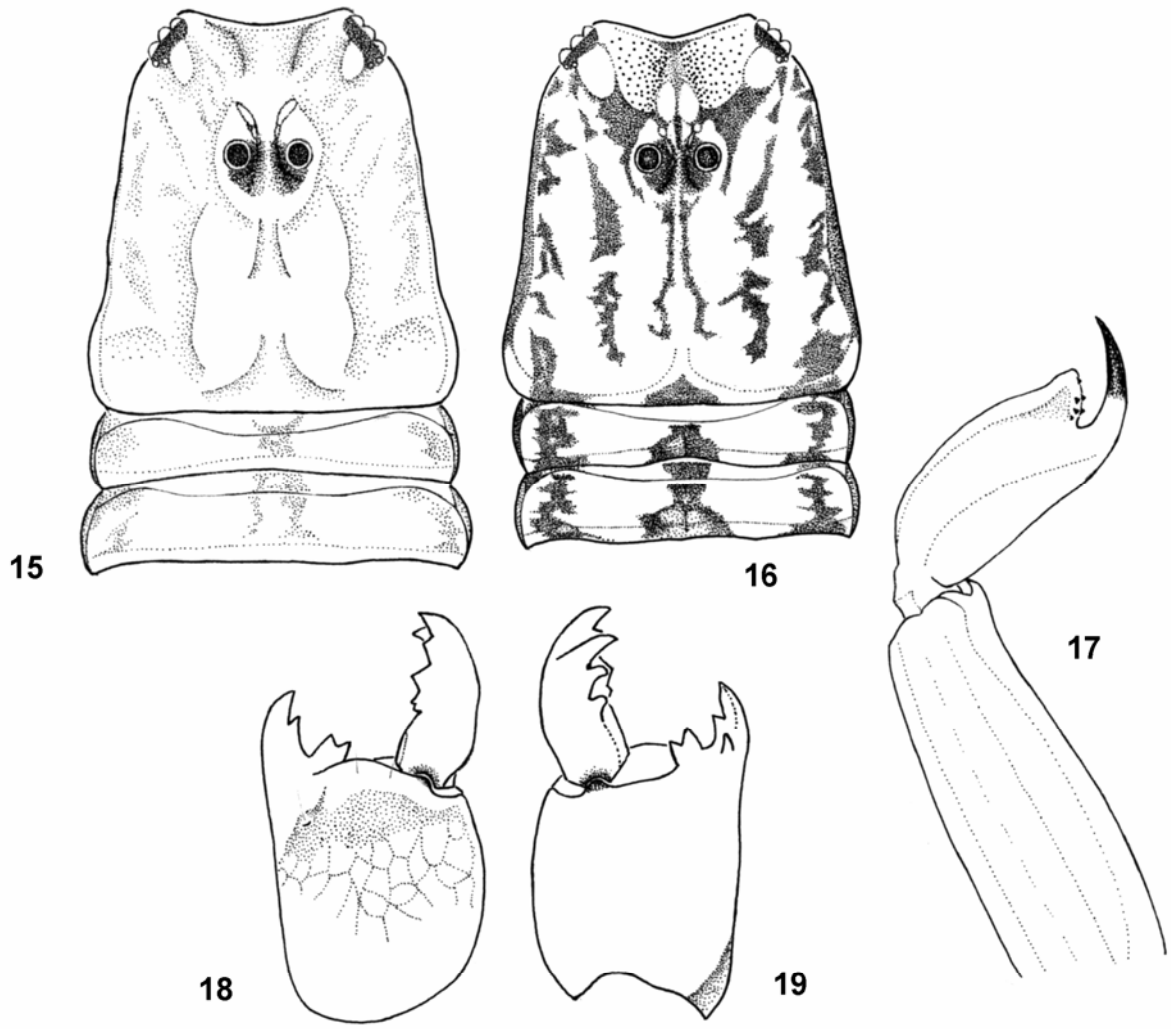

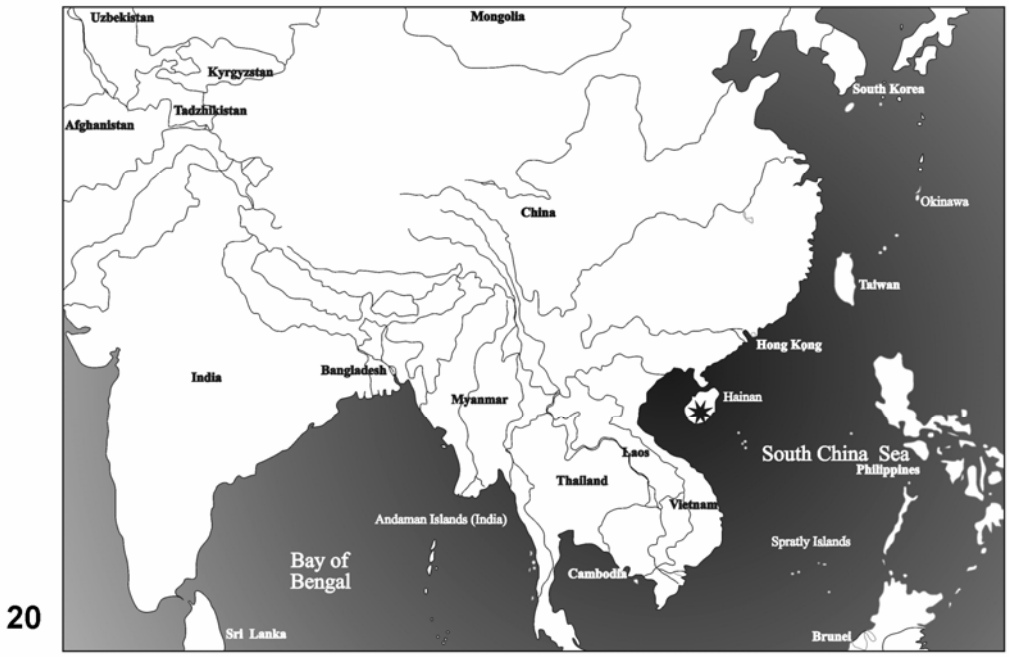

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Figs. 15-16. Carapace and tergites I-II, dorsal aspect, showing characteristic patterns of pigmentation. **15.** *Isometrus* (*Reddyanus*) *hainanensis* sp. n., female paratype. **16.** *Isometrus* (*Reddyanus*) *petrzelkai*, female from Vietnam. **Figs. 17-19.** *Isometrus* (*Reddyanus*) *hainanensis* sp. n., female paratype. **17.** Metasomal segment V and telson, lateral aspect. **18-19**. Chelicera, dorsal and ventral aspects. **Fig. 20.** Map of China and Hainan Island, showing the type locality of the new species (black star).