2017. Journal of Arachnology 45:112–122

A modified definition of the genus *Haplochernes* (Pseudoscorpiones: Chernetidae), with a new species from Hainan Island

Zhizhong Gao[1], **Feng Zhang**[1] and **Mark S. Harvey**[2]: [1]The Key Laboratory of Invertebrate Systematics and Application, College of Life Sciences, Hebei University, Baoding, Hebei 071002, China. E-mail: dudu06042001@163.com; [2]Department of Terrestrial Zoology, Western Australian Museum, Locked Bag 49, Welshpool DC, Western Australia 6986, Australia. Research Associate: Division of Invertebrate Zoology, American Museum of Natural History, 79th Street @ Central Park West, New York, New York 10024–5192, USA. Research Associate: Department of Entomology, California Academy of Sciences, Golden Gate Park, San Francisco, California 94103–3009 USA. Adjunct: School of Animal Biology, University of Western Australia, Crawley, Western Australia 6009, Australia. Adjunct: School of Natural Sciences, Edith Cowan University, Joondalup, Western Australia 6027, Australia. E-mail: mark.harvey@museum.wa.gov.au

Abstract. The pseudoscorpion genus *Haplochernes* Beier, 1932, is redescribed and restricted to those species of Chernetidae with only four setae on the cheliceral hand and a pair of moderately long, slender spermathecae. This new definition is shared by only two species: the type species *H. boncicus* (Karsch, 1881) from Japan and possibly Taiwan and *H. wuzhiensis* Gao and Zhang sp. nov. from Hainan Island, China. *Haplochernes madagascariensis* Beier, 1932 from Madagascar and *H. hagai* Morikawa, 1953 from Japan are treated as new synonyms of *H. boncicus*.

Keywords: taxonomy, morphology, Asia, Australasia

ZooBank: http://zoobank.org/References/4B621118-DAAB-478C-A82B-B49EE0E525ED

When initially described, the pseudoscorpion genus *Haplochernes* Beier, 1932 included 14 species from the Indo-Pacific region, with the most westerly species from Madagascar and the most easterly from Samoa. Some of the species originally included in the genus have since been removed to other genera, and several new species have been added including species from the Pacific region (Chamberlin 1938; Beier 1940, 1948; Morikawa 1953; Beier 1957, 1976b) and the island of Réunion, located in the south-western Indian Ocean (Mahnert 1975). There are currently 16 valid species of *Haplochernes* (Harvey 2013).

The type species *Chelifer boncicus* Karsch, 1881, originally described from Japan (Karsch 1881), was redescribed and comprehensively illustrated by Sato (1979b), in which the presence of only four setae on the cheliceral hand was noted and illustrated. This rather important difference suggested to us that most species of *Haplochernes*, which have five cheliceral setae, may be misplaced in the genus. Other major differences include the position of the internal series of trichobothria which extend to the distal half of the fixed chelal finger in *H. boncicus* and *H. madagascariensis* Beier, 1932 (Beier 1932; Sato 1979b), but are grouped basally in other species (e.g., Beier 1932, 1957, 1976b; Harvey 1988), and the position of trichobothrium *est* which is situated submedially in *H. boncicus* and *H. madagascariensis* (Beier 1932; Sato 1979b), but is located subbasally near trichobothrium *esb* in most other *Haplochernes* (e.g., Chamberlin 1938; Beier 1940, 1948, 1957, 1976b; Harvey 1988). To begin to unravel this conundrum, we present a redescription of *H. boncicus* based on the type specimens and other material from Japan, and describe a morphologically similar new species of *Haplochernes* from Hainan Island. In addition to the differences already noted above, we found that the spermathecae of *H. boncicus* are moderately long, curved and lack terminal bulbs, compared with the short spermathecae of other *Haplochernes* species which have enlarged round terminal bulbs (e.g., Harvey 1988). A new diagnosis of *Haplochernes* is presented, and the systematic position of the remaining species will be treated in a second paper (Harvey, unpublished data).

METHODS

This study is based on specimens that are lodged in the Museum of Hebei University, Baoding City, China (MHBU), Western Australian Museum, Perth (WAM) and the Museum für Naturkunde, Berlin (ZMB). The specimens were studied using temporary slide mounts prepared by immersion of the specimen in lactic acid at room temperature for several hours to days, and mounting them on microscope slides with 10 or 12 mm coverslips supported by small sections of 0.25, 0.35 or 0.5 mm diameter nylon fishing line. After study, the specimens were rinsed and returned to 75% ethanol with the dissected portions placed in 12 × 3 mm glass genitalia microvials (BioQuip Products, Inc.). Specimens were examined with either a Leica M165C and a Leica M205A stereomicroscope (ZZG, FZ), a Leica MZ–16A stereomicroscope (MSH), a Nikon YS100 (ZZG, FZ), an Olympus BH–2 or a Leica DM2500 (MSH) compound microscope, the latter fitted with interference contrast. Illustrations were made with the aid of a drawing tube attached to the compound microscopes. Measurements were taken at the highest possible magnification using an ocular graticule.

Terminology and mensuration mostly follow Chamberlin (1931), with the exception of the nomenclature of the pedipalps, legs and with some minor modifications to the

terminology of the trichobothria (Harvey 1992), chelicera (Judson 2007) and faces of the appendages (Harvey et al. 2012). The following abbreviations are used in the text. Chelal trichobothria: *b* = basal; *sb* = subbasal; *st* = subterminal; *t* = terminal; *ib* = interior basal; *isb* = interior subbasal; *ist* = interior subterminal; *it* = interior terminal; *eb* = exterior basal; *esb* = exterior subbasal; *est* = exterior subterminal; *et* = exterior terminal. Cheliceral setae: *gls* = galeal seta; *es* = exterior seta; *is* = interior seta; *ls* = laminal seta; *bs* = basal seta.

SYSTEMATICS

Family Chernetidae Menge, 1855
Subfamily Chernetinae Menge, 1855
Genus *Haplochernes* Beier, 1932

Haplochernes Beier, 1932: 108.

Type species.—*Chelifer boncicus* Karsch, 1881, by original designation.

Diagnosis.—*Haplochernes* is distinguished from all other chernetid genera by the combined presence of only 4 setae on the cheliceral hand (Figs. 2B, 4A, 5A, 6B) and the slightly curved, paired spermathecae that lack terminal bulbs (Figs. 2J, 4G, 6D).

Description (adult).—*Setae:* moderately long, generally straight, and many slightly dentate.

Chelicera (Figs. 2B, 4A, 5A, 6B): hand with 4 setae, *sbs* absent; movable finger with 1 long subdistal seta; rallum of 3 blades (Figs. 2C, 4C, 5C), only the most distal blade serrate, others smooth; galea with distal rami (Figs. 2B, 4B, 5B); lamina exterior present.

Pedipalp: robust; fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria (Figs. 2E, 4E, 5E): trichobothria *eb*, *esb, ib* and *ist* subbasal; *est* medial, midway between *esb* and *et*; *et* subdistal; *isb* and *it* submedial; *b* and *sb* subbasal; *st* slightly closer to *sb* than to *t*. Venom apparatus only present in movable chelal finger, venom duct terminating in nodus ramosus slightly basal to *t* (Figs. 2E, 4E, 5E); marginal chelal teeth juxtadentate, with accessory chelal teeth on retrolateral and prolateral margins of both fingers.

Carapace: evenly granulate (Fig. 2A); without eye-spots or with 1 pair of faint eye-spots (Fig. 2A); furrows present or absent; posterior margin straight.

Coxal region: manducatory process with small sub-oral seta on medial edge; median maxillary lyrifissure rounded and situated submedially; posterior maxillary lyrifissure rounded.

Legs (Figs. 2H, 4H & I, 5F & G, 6E & F): junction between femora and patellae of legs I and II strongly oblique; suture line between femora and patellae of legs III and IV strongly oblique; femora of legs III and IV much smaller than patellae; patellae and tibiae of legs III and IV without pseudotactile setae; tarsi of legs III and IV with long tactile seta; legs with subterminal tarsal setae arcuate and acute; all tarsi with slit sensillum on raised mound; arolium undivided, slightly shorter than claws; claws slender and simple.

Abdomen: most tergites and sternites weakly divided (Fig. 3A & B). Anal plates (tergite XII and sternite XII) situated between tergite XI and sternite XI. Pleural membrane striate and slightly wrinkled, without setae. Spiracles simple, with spiracular helix.

Genitalia: male of typical chernetid conformation; female with a pair of medium length, thin, slightly curved spermathecae that lack terminal bulbs (Figs. 2J, 4G, 6D).

Description (tritonymph).—*Chelicera:* hand with 4 setae, *sbs* absent.

Pedipalp: fixed finger with 7 trichobothria, movable finger with 3 trichobothria (Fig. 2F); *isb* and *sb* absent.

Description (deutonymph).—*Chelicera:* hand with 4 setae, *sbs* absent.

Pedipalp: fixed finger with 6 trichobothria, movable finger with 2 trichobothria (Fig. 2G); *esb*, *isb, sb* and *st* absent.

Remarks.—The genus *Haplochernes* is here restricted to those species of Chernetidae with only four setae on the cheliceral hand and a single pair of thin, slightly curved spermathecae that lack terminal bulbs. While the majority of chernetids have five setae on the cheliceral hand, and others have six or more, very few have four setae and none have fewer than four. Those species that have four setae include some, but not all, species of *Americhernes* Muchmore, 1976, *Anaperochernes* Beier, 1964, *Coprochernes* Beier, 1976, *Neoallochernes* Hoff, 1947, *Rhopalochernes* Beier, 1932 and the sole species of *Meiochernes* Beier, 1957 (Beier 1957, 1964, 1976a; Muchmore 1976, 1992; Mahnert 1985; Harvey 1990; Heurtault 1998).

The only described species that conform to the diagnosis of *Haplochernes* presented here are *H. boncicus* and *H. hagai* Morikawa, 1953 from Japan and *H. madagascariensis* from Madagascar. We also describe a new species from Hainan Island. The other species of *Haplochernes* differ by the presence of five setae on the cheliceral hand, the subbasal position of trichobothrium *est* and the paired spermathecae with short ducts and enlarged receptacula (e.g., Harvey 1988), and their systematic position will be assessed in another publication (Harvey, unpublished data).

Haplochernes boncicus (Karsch, 1881)
Figs. 1, 2

Chelifer boncicus Karsch, 1881: 37.
Chelifer nipponicus Kishida, 1927: 954, fig. 1844 (synonymised by Judson, 2010: 11).
Haplochernes madagascariensis Beier, 1932: 110, fig. 127. **Syn. nov.**
Haplochernes hagai Morikawa, 1953: 350, fig. 2c–f. **Syn. nov.**

Type material.—*Syntypes of* Chelifer boncicus. JAPAN: 2 ♂, 3 ♀, no other locality data [F.K.W. Dönitz and F.M. Hilgendorf] (ZMB Arach-3514).

Holotype female of *Haplochernes madagascariensis*. MADAGASCAR: "N.W. Madagaskar", [J.M.] Hildebrandt (ZMB, Arachnida-3797).

Other material examined.—JAPAN: 2 ♂, 1 ♀, no other data (ZMB Arach-31982); 2 ♀, no other data, Hilgendorf (ZMB Arach-31983); 1 ♂, 1♀, no other data (ZMB Arach-31984); Gifu Prefecture: 1 ♂, 7 ♀, 1 tritonymph, 1 deutonymph, trail above Fuwa no Taki, Fuwa District, 35°24′50"N, 136°31′05"E, alt. 303 m, 3 June 2010, under tree bark, D. Harms, M.S. Harvey, Y. Konishi (WAM T129559–4, T130741, T130742).

Diagnosis.—*Haplochernes boncicus* is much smaller than *H. wuzhiensis* sp. nov., e.g., pedipalpal femur 0.585–0.87 (♂),

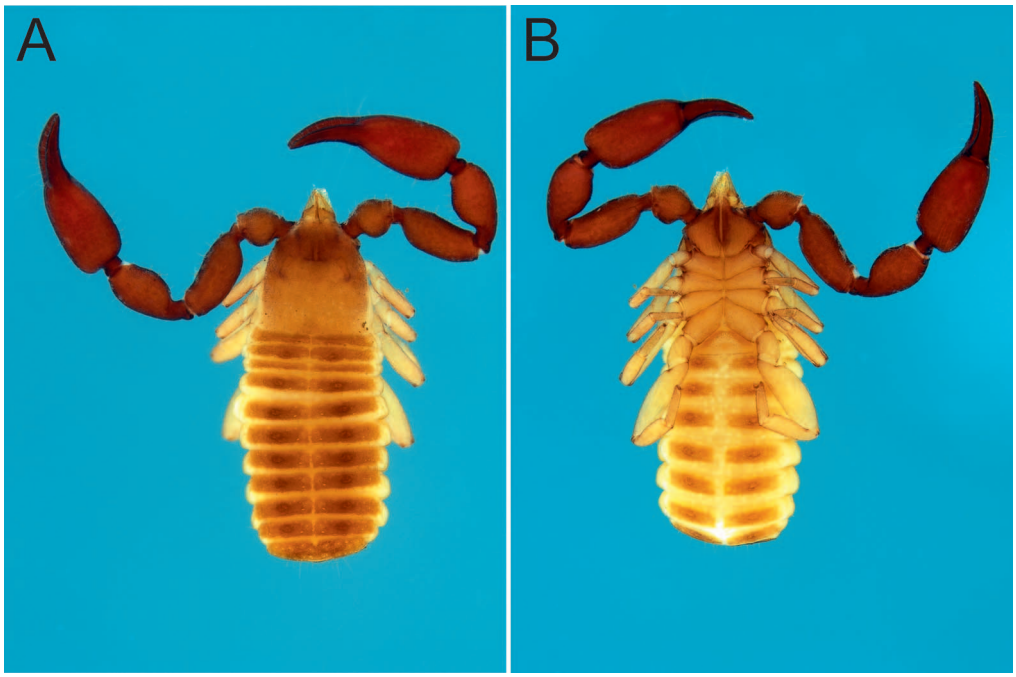

Figure 1.—*Haplochernes boncicus* (Karsch) (WAM T129560), female: A. Dorsal view. B. Ventral view.

0.655–0.79 (♀) mm, and chela (with pedicel) 1.05–1.46 (♂), 1.18–1.34 (♀) mm, compared with pedipalpal femur 1.20–1.25 (♂), 1.13–1.28 (♀) mm and chela (with pedicel) 2.15–2.16 (♂), 1.93–2.08 (♀) mm of *H. wuzhiensis*.

Description (adults).—*Color:* pedipalps deep red-brown, carapace red-brown, becoming paler in posterior half; legs yellow-brown (Fig. 1A, B).

Setae: most setae apically denticulate.

Chelicera (Fig. 2B): with 4 setae on hand and 1 subdistal seta (*gls*) on movable finger; seta *sbs* absent; *bs* dentate, *ls, is* and *es* smooth; with 2 dorsal lyrifissures and 1 ventral lyrifissure; galea of ♂and ♀ thick, with 5–6 small distal rami; rallum of 3 blades (Fig. 1C); serrula exterior with 18 (♂, ♀) blades; lamina exterior present.

Pedipalp (Fig. 2D): all surfaces, except chelal fingers, granulate; patella with 3 small sub-basal lyrifissures; without tactile setae; trochanter 1.87 (♂), 1.63 (♀), femur 2.60–2.79 (♂), 2.46–2.81 (♀), patella 2.03–2.24 (♂), 3.01–3.33 (♀), chela (with pedicel) 2.99–3.41 (♂), 3.01–3.33 (♀), chela (without pedicel) 2.95–3.24 (♂), 2.92–3.21 (♀), hand 1.59–1.84 (♂), 1.67–1.84 (♀) x longer than broad, movable finger 0.78–0.87 (♂), 0.85–0.90 (♀) x longer than hand. Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria (Fig. 2E): *eb* and *esb* situated basally, *est* situated slightly closer to *esb* than to *et*, *ib* and *ist* situated subbasally; *isb* and *it* situated medially, with *isb* closer to *it* than to *ist*; *t* situated subdistally, *st* situated slightly closer to *sb* than to *t*. Venom apparatus only present in movable chelal finger, venom duct long, terminating in nodus ramosus which is closer to *t* than to *st*. Chelal teeth rounded and juxtadentate; fixed finger with ca. 38 (♂), 43 (♀)teeth, plus 4 (♂), 7 (♀) retrolateral accessory teeth and 3 (♂), 1 (♀) prolateral accessory teeth; movable finger with ca. 42 (♂), 46 (♀) teeth, plus 7 (♂), 6 (♀) retrolateral accessory teeth and 2 (♂, ♀) prolateral accessory teeth; fixed finger with 1 retrolateral and 1 prolateral sense spots, movable finger with 1 retrolateral and 0 prolateral sense spots.

Carapace (Fig. 2A): evenly granulate; 1.02–1.21 (♂), 0.94–1.19 (♀) x longer than broad; with 1 pair of very faint eye-spots (♀) or eye-spots not visible (♂); with 56 (♂), 53 (♀) setae, including 8 (♂), 6 (♀) setae near anterior margin and 8 (♂), 10 (♀) setae near posterior margin; without furrows.

Coxal region: maxillae granulate anteriorly; coxae smooth; manducatory process somewhat pointed, with 3 apical acuminate setae, with 1 small sub-oral seta, and 23 (♂), 24 (♀) additional setae; median maxillary lyrifissure rounded and situated submedially; posterior maxillary lyrifissure rounded. Chaetotaxy of coxae I–IV: ♂, 12: 12: 14: 19; ♀, 10: 12: 11: 22.

Legs: junction between femora and patellae I and II strongly oblique to long axis; junction between femora and patellae III and IV very angulate; femora III and IV much smaller than patellae III and IV; femur + patella of leg IV 3.35 (♂), 3.07 (♀) x longer than broad; patella and tibia without 'pseudotactile' seta; tarsus IV with very long tactile seta located in basal half (Fig. 2H), TS ratio = 0.33 (♂), 0.29 (♀); subterminal tarsal setae arcuate and acute; claws not modified; arolium slightly shorter than claws.

Abdomen: tergites II–X and sternites III–X with faint median suture line. Tergal chaetotaxy: ♂, 10: 12: 10: 15: 20: 18: 17: 17: 17: 15: 16 (including 4 tactile setae): 2; ♀, 12: 12: 12: 14: 17: 17: 16: 15: 14: 13: 18: 2; all setae acuminate. Sternal chaetotaxy: ♂, 48: (2) 13 [3 + 3] (2): (2) 10 (2): 20: 18: 19: 17: 19: 16: 21 (including 4 tactile setae): 2; ♀, 28: (2) 12 (2): (2) 12 (2): 18: 18: 20: 16: 18: 15: 12 (including 4 tactile setae): 2. Sternite III of female with setae arranged in inverted-U (Fig. 2I). Spiracles with helix. Pleural membrane striate and slightly wrinkled, without setae.

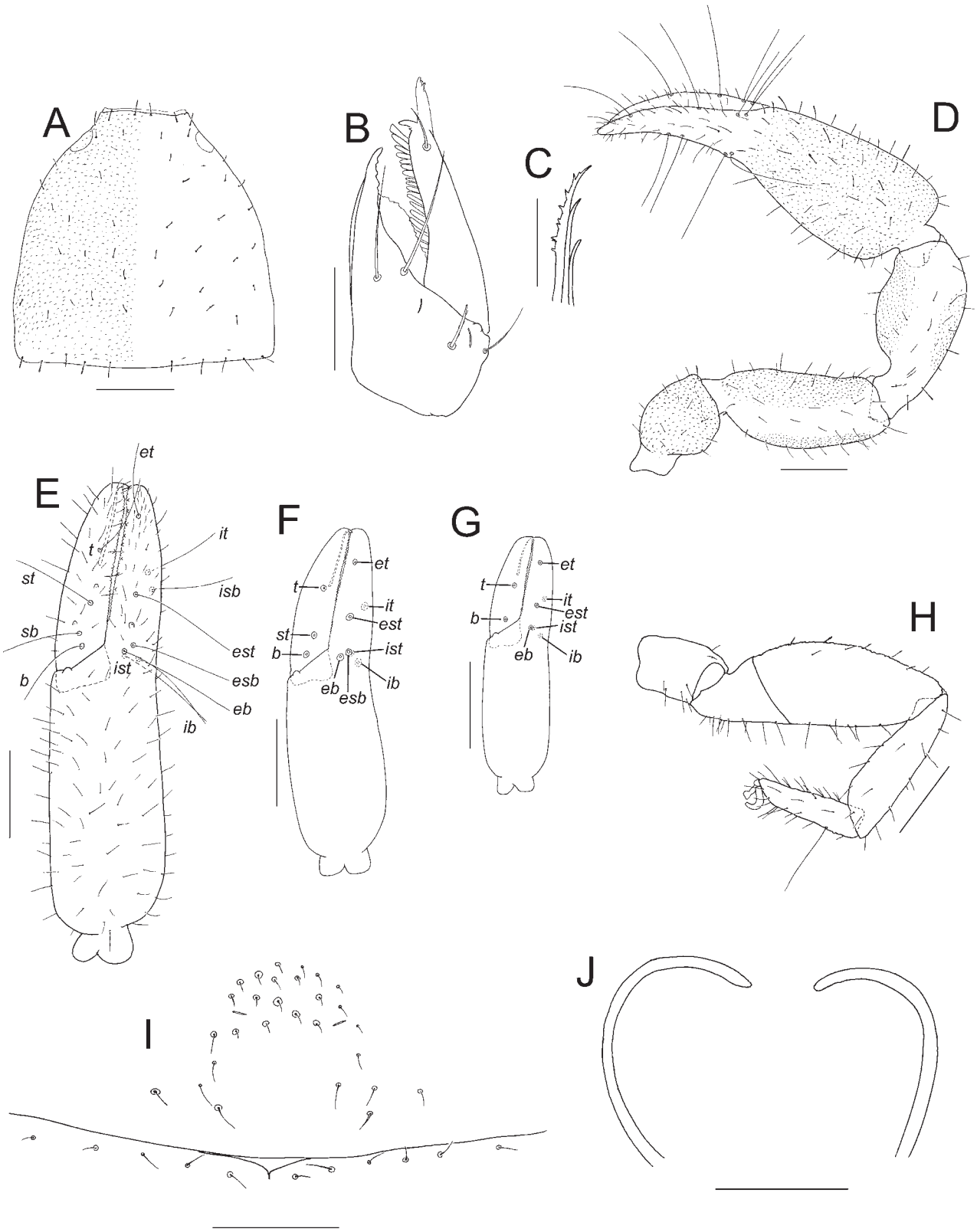

Figure 2.—*Haplochernes boncicus* (Karsch), female (WAM T129559), unless stated otherwise: A. Carapace. B. Right chelicera, dorsal view. C. Right rallum. D. Right pedipalp, dorsal view. E. Left chela, lateral view. F. Left chela, lateral view, tritonymph (WAM T129563). G. Left chela, lateral view, deutonymph (WAM T129564). H. Right leg IV, lateral. I. Genital sternites, ventral view. J. Spermathecae, ventral view. Scale lines = 0.25 mm (A, D–H); 0.1 mm (B, I, J); 0.05 mm (C).

Genitalia: male typical of Chernetidae, internal setae acicular and slightly curved; female with single pair of moderately long spermathecae, gently curved (Fig. 2J).

Dimensions (mm): males: WAM T130742, followed by other males (when measured): Body length 2.21 (2.36–3.04). Pedipalps: trochanter 0.44/0.235, femur 0.725/0.26 (0.585–0.87/0.225–0.325), patella 0.67/0.305 (0.545–0.805/0.25–0.36), chela (with pedicel) 1.26/0.37 (1.05–1.46/0.34–0.45), chela (without pedicel) 1.20 (1.01–1.39), hand length 0.68 (0.55–0.83), movable finger length 0.59 (0.525–0.66). Chelicera 0.255/0.14, movable finger length 0.205. Carapace 0.795/0.68 (0.755–0.92/0.625–0.86). Leg I: femur 0.25/0.145, patella 0.345/0.13, tibia 0.285/0.08, tarsus 0.245/0.07. Leg IV: femur + patella 0.67/0.20, tibia 0.445/0.125, tarsus 0.315/0.085, TS = 0.105.

Females: WAM T129559, followed by other females (when measured): Body length 2.25 (2.54–3.15). Pedipalps: trochanter 0.444/0.272, femur 0.79/0.281 (0.655–0.77/0.25–0.29), patella 0.672/0.217 (0.635–0.70/0.285–0.335), chela (with pedicel) 1.313/0.402 (1.18–1.34/0.37–0.43), chela (without pedicel) 1.265 (1.15–1.30), hand length 0.670 (0.64–0.75), movable finger length 0.603 (0.575–0.63). Chelicera 0.294/0.155, movable finger length 0.224. Carapace 0.878/0.867 (0.74–0.90/0.685–0.81); eye diameter 0.085. Leg I: femur 0.270/0.154, patella 0.360/0.132, tibia 0.301/0.090, tarsus 0.273/0.072. Leg IV: femur + patella 0.736/0.240, tibia 0.484/0.134, tarsus 0.335/0.090, TS = 0.097.

Description (tritonymph).—*Color:* sclerotized portions generally pale yellow-brown.

Chelicera: with 4 setae on hand and 1 subdistal seta (gls) on movable finger; seta *sbs* absent; seta *bs* dentate, remaining setae acuminate; seta *bs* shorter than others; galea with 5 small distal rami; rallum with 3 blades; serrula exterior with 16 blades.

Pedipalp: trochanter 1.68, femur 2.37, patella 1.98, chela (with pedicel) 3.30, chela (without pedicel) 3.15, hand 1.75 x longer than broad, movable finger 0.87 x longer than hand. Fixed chelal finger with 7 trichobothria, movable chelal finger with 3 trichobothria (Fig. 2F): *eb*, *esb*, *ib* and *ist* situated subbasally, *est* situated slightly closer to *esb* than to *et*, *it* situated medially, and *st* much closer to *b* than to *t*. Venom apparatus only present in movable chelal finger, venom duct long, terminating in nodus ramosus near *t*. Fixed finger with 38 marginal teeth, plus 1 retrolateral and 1 prolateral accessory teeth; movable finger with 39 marginal teeth, plus 1 retrolateral and 3 prolateral accessory teeth.

Carapace: 1.05 x longer than broad; eye-spots not visible; with ca. 40 setae, with 4 near anterior margin and 7 near posterior margin; without furrows.

Coxal region: chaetotaxy of coxae I–IV: 7: 9: 8: 11.

Legs: tarsus IV with sub-distal tactile seta, TS ratio = 0.30.

Abdomen: tergal chaetotaxy: 8: 9: 7: 10: 12: 12: 13: 12: 12: 12: 15 (including 4 tactile setae). Sternal chaetotaxy: 7: (1) 8 (1): (1) 8 (1): 14: 15: 14: 15: 14: 13: 16 (including 4 tactile setae): 2.

Dimensions (mm): WAM T129563: Body length 1.89. Pedipalps: trochanter 0.345/0.205, femur 0.51/0.215, patella 0.475/0.24, chela (with pedicel) 0.99/0.30, chela (without pedicel) 0.945, hand length 0.525, movable finger length 0.455. Carapace 0.725/0.69.

Description (deutonymph).—*Color:* sclerotized portions generally pale yellow-brown.

Chelicera: with 4 setae on hand and 1 subdistal seta (*gls*) on movable finger; seta *sbs* absent; seta *bs* dentate, remaining setae acuminate; seta *bs* shorter than others; galea with 4 small distal rami; rallum with 3 blades; serrula exterior with 13 blades.

Pedipalp: trochanter 1.13, femur 2.24, patella 2.00, chela (with pedicel) 3.43, chela (without pedicel) 3.29, hand 1.88 x longer than broad, movable finger 0.78 x longer than hand. Fixed chelal finger with 6 trichobothria, movable chelal finger with 2 trichobothria (Fig. 2G): *eb*, *ib* and *ist* situated subbasally, *est* situated closer to *esb* than to *et*, and *it* situated medially. Venom apparatus only present in movable chelal finger, venom duct long, terminating in nodus ramosus distal to *t*. Fixed finger with 28 marginal teeth and no accessory teeth; movable finger with 36 marginal teeth and no accessory teeth.

Carapace: 1.06 x longer than broad; eye-spots not visible; with 34 setae, with 4 near anterior margin and 6 near posterior margin; without furrows.

Coxal region: chaetotaxy of coxae I–IV: 5: 5: 5: 5.

Legs: tarsus IV with sub-distal tactile seta, TS ratio = 0.29.

Abdomen: tergal chaetotaxy: 6: 6: 6: 6: 10: 8: 10: 10: 10: 8: 12 (including 4 tactile setae). Sternal chaetotaxy: 0: (1) 4 (1): (1) 6 (1): 10: 10: 10: 10: 10: 10: 11 (including 4 tactile setae): 2.

Dimensions (mm): WAM T129564: Body length 1.30. Pedipalps: trochanter 0.255/0.155, femur 0.37/0.165, patella 0.35/0.175, chela (with pedicel) 0.72/0.21, chela (without pedicel) 0.69, hand length 0.395, movable finger length 0.31. Carapace 0.58/0.545.

Remarks.—The syntypes of *C. boncicus* were collected by two German scientists: Friedrich K. W. Dönitz (1838–1912) and Franz M. Hilgendorf (1839–1904). Dönitz transferred to the Imperial Medical Academy in Tokyo in 1873, and was based in Japan for 13 years (Nuttall 2009). Hilgendorf was also based at the Academy, between 1873 and 1876 (Yajima 2007). The precise provenance of the specimens is not known. The vial originally contained six specimens, but only five were present when audited in 1999 (see http://www.biologie.uni-ulm.de/cgi-bin/herbar.pl?herbid=95200&sid=T&lang=e; accessed 22 January 2014), and when borrowed for the present study. As there are no appreciable differences between the syntypes and no taxonomic controversy of the species, we feel there is no need to designate a lectotype. The other three vials in the ZMB collection appear to be those mentioned by Ellingsen (1907, 1910) which also lack locality data other than Japan.

The species was briefly redescribed by Beier (1932), as *H. boncicus*, where illustrations of the pedipalp of a male and female were provided, probably based on the ZMB specimens. A more detailed redescription and additional illustrations were provided by Sato (1979b), in which the presence of only four setae on the cheliceral hand was first noted.

Two other taxa are included as synonyms of *H. boncicus*. *Chelifer nipponicus* Kishida, 1927, also with an unspecified type locality in Japan (Kishida 1927), was synonymized with *C. boncicus* by Judson (2010). *Haplochernes hagai* was described by Morikawa (1953) from three collections, all from

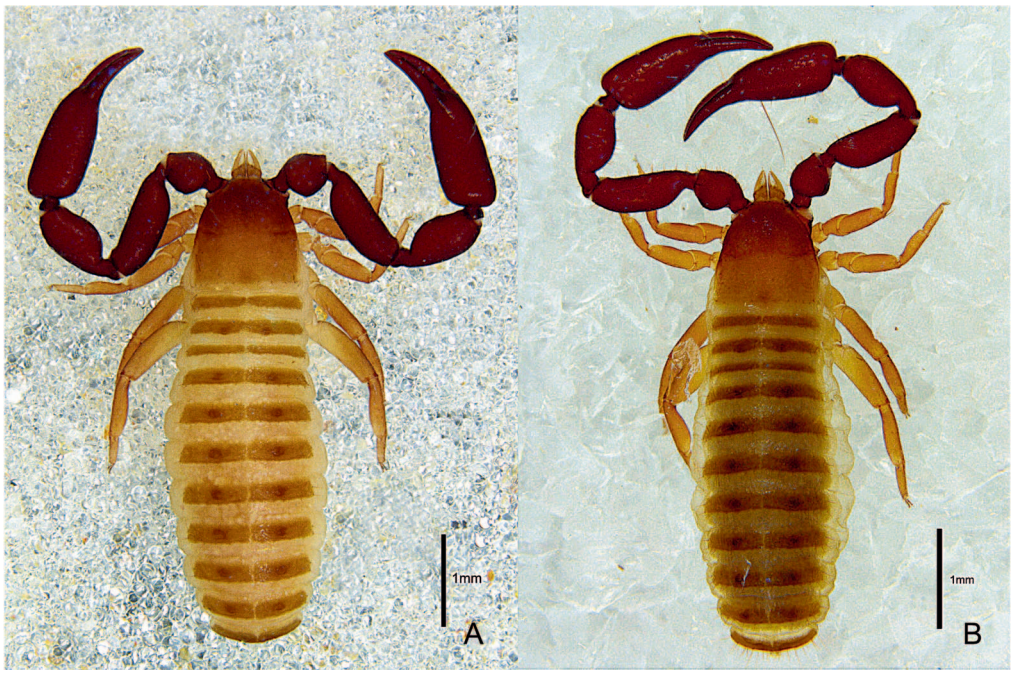

Figure 3.—*Haplochernes wuzhiensis* sp. nov., dorsal view: A. Female holotype. B. Male paratype.

within the city of Tokyo. The species was later regarded as a subspecies of *H. boncicus* by Morikawa (1960), from which it was separated by the larger body length and pedipalps, lack of eye-spots, and lower numbers of accessory teeth on the chelal fingers. Although the type specimens of *H. hagai* have not been available for study, we have compared the original description with the other specimens examined for this study, including the type material, and cannot ascertain any features that would warrant *H. hagai* to be retained as a distinct species or subspecies. Therefore, *H. hagai* is treated as a junior synonym of *C. boncicus*.

Haplochernes madagascariensis was described from a single female collected in north-western Madagascar (Beier 1932, 1933), but has not been reported since. The holotype was collected by Johannes Maria Hildebrandt during an expedition to Madagascar (Beentje 1998). Beier (1932) distinguished *H. madagascariensis* from *H. boncicus* based on perceived differences in the relative lengths of the movable chelal finger which was claimed to be much shorter than the chelal hand (without pedicel) and the pedipalpal patella. Examination of the holotype shows that the chelal finger is indeed shorter than the chelal hand and the tibia, but not shorter than that found in *H. boncicus*. Therefore, we place *H. madagascariensis* as a synonym of *H. boncicus*.

Haplochernes boncicus has been previously recorded from numerous localities in Japan, all situated on the island of Honshu within the following Prefectures: Chiba, Kanagawa, Kyoto, Mie, Okayama, Saitama, Shimane, Tokyo and Yamagata (Sato 1978, 1979b, 1979a, 1980; Sato et al. 1988; Takano et al. 1989; Nakajima et al. 1991). The specimens reported here are the first from Gifu Prefecture. Beier (1932) also recorded *H. boncicus* from "Formosa", now known as Taiwan, but the material on which this was based has not been traced.

Haplochernes wuzhiensis Gao & Zhang, sp. nov.
Figs. 3–6

http://zoobank.org/?lsid=urn:lsid:zoobank.org:act:CD418092-9235-474B-A355-1D380A0DB440

Type material.—*Holotype female*. CHINA: Hainan Province: Hainan Island, Wuzhishan City, Wuzhishan Mountain [18°54′N, 109°39′E], alt. 703 m, 16 May 2011, Zhizhong Gao (Ps.-MHBU-HN110516).

Paratypes: CHINA: 6 ♂, 9 ♀, same data as holotype (MHBU).

Diagnosis.—*Haplochernes wuzhiensis* is much larger than *H. boncicus*, e.g., pedipalpal femur 1.20–1.25 (♂), 1.13–1.28 (♀) mm and chela (with pedicel) 2.15–2.16 (♂), 1.93–2.08 (♀) mm compared with pedipalpal femur 0.585–0.87 (♂), 0.655–0.79 (♀) mm, and chela (with pedicel) 1.05–1.46 (♂), 1.18–1.34 (♀) mm.

Description (adults).—*Color* (Fig. 3): mostly reddish brown, carapace and palps dark brown, remaining parts (legs, sternites and pleural membranes) light yellowish brown.

Setae: most setae apically denticulate.

Chelicera (Figs. 4A, 5A)*:* with 4 setae on hand and 1 subdistal seta (*gls*) on movable finger; seta *sbs* absent; *bs* apically dentate, *ls* and *es* smooth; with 2 dorsal lyrifissures and 1 ventral lyrifissure; with poorly-visible scale-shaped sculpture; galea thick, of ♂ with 5, of ♀ with 3 short distal rami; rallum of 3 blades, the distal blade dentate, the others smooth; serrula exterior with 20–22 (♂), 18–20 (♀) blades; lamina exterior present.

Pedipalps (Figs. 4D, 5D, 6A, 6G): most segments finely granulate, except for chelal fingers which are smooth; setae acuminate and weakly apically dentate; without tactile setae; trochanter with distinct rounded dorsal hump; proportions (based on 3 specimens): trochanter 1.39–1.70 (♂), 1.48–1.52

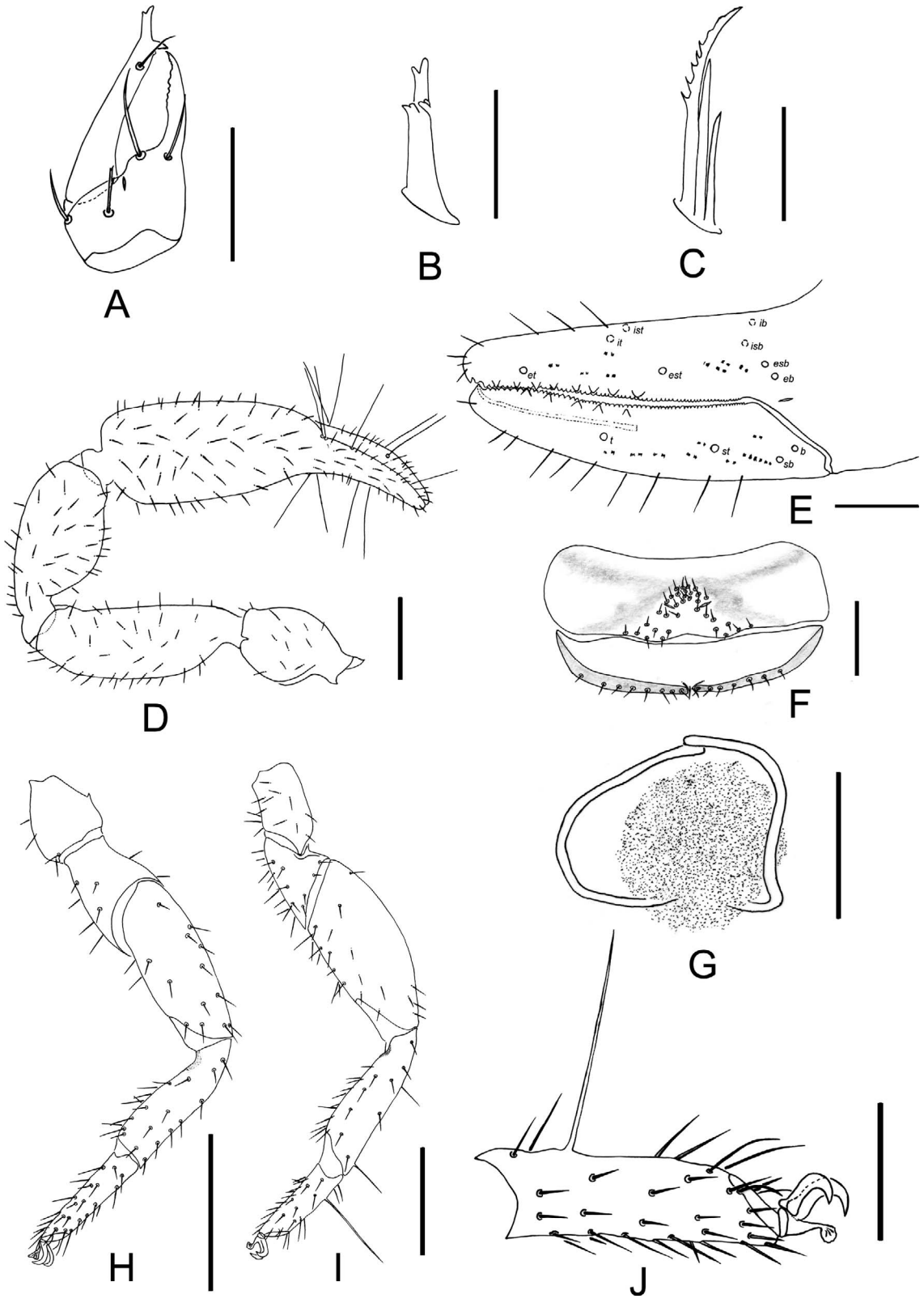

Figure 4.—*Haplochernes wuzhiensis* sp. nov., female holotype: A. Chelicera, dorsal view. B. Galea, dorsal view. C. Rallum. D. Left pedipalp, dorsal view. E. Right chelal fingers, lateral view. F. Genital operculum. G. Spermathecae. H. Leg I, lateral view. I. Leg IV, lateral view. J. Tarsus IV, lateral view. Scale lines = 0.5 mm (D, H, I); 0.2 mm (A, E–G, J); 0.05 mm (B, C).

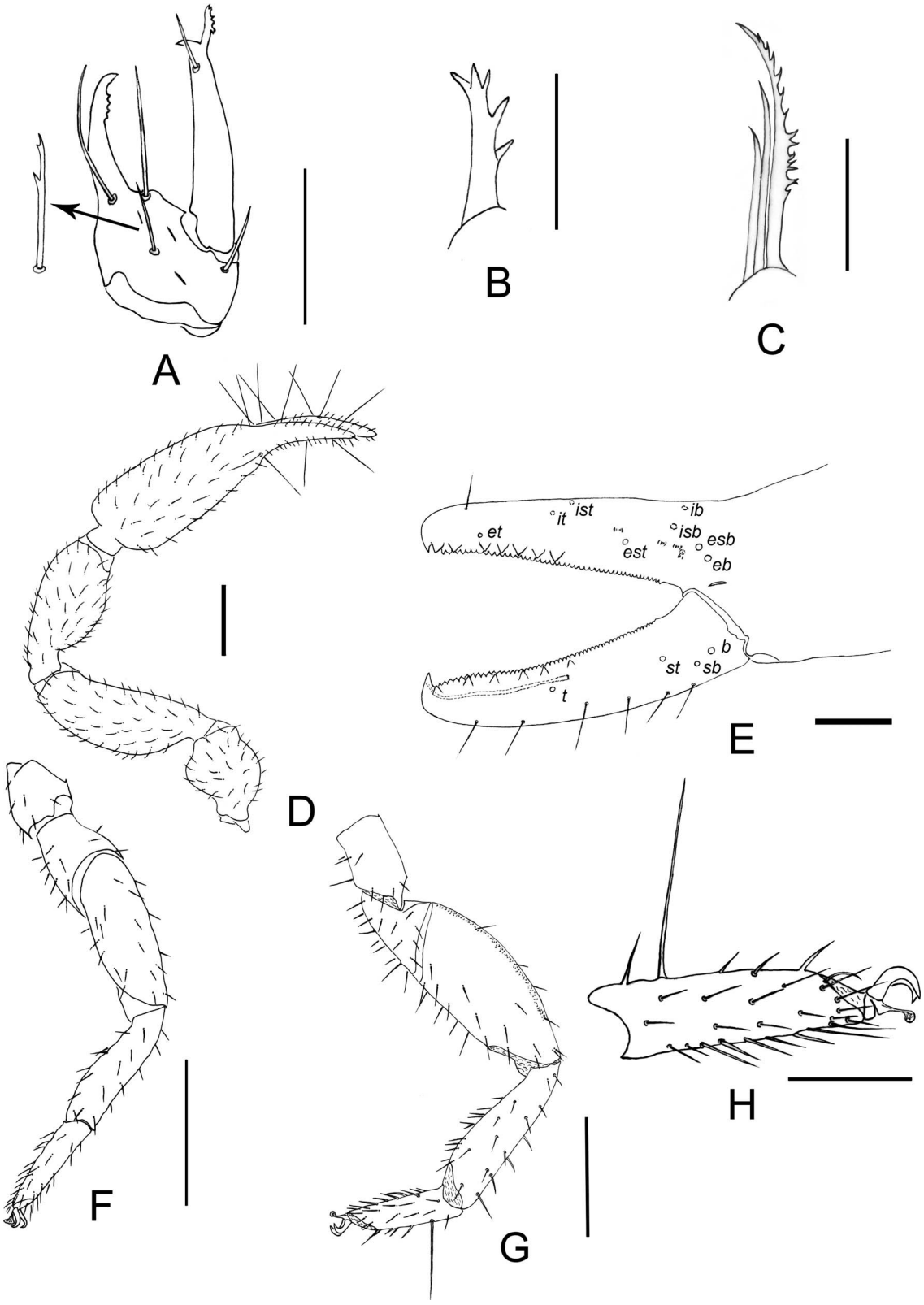

Figure 5.—*Haplochernes wuzhiensis* sp. nov., male paratype: A. Chelicera, dorsal view. B. Galea; dorsal view. C. Rallum. D. Left pedipalp, dorsal view. E. Right chelal fingers, lateral view. F. Leg I, lateral view. G. Leg IV, lateral view. H. Tarsus IV, lateral view. Scale lines =0.5 mm (D, F, G); 0.2 mm (A, E, H); 0.05 mm (B, C).

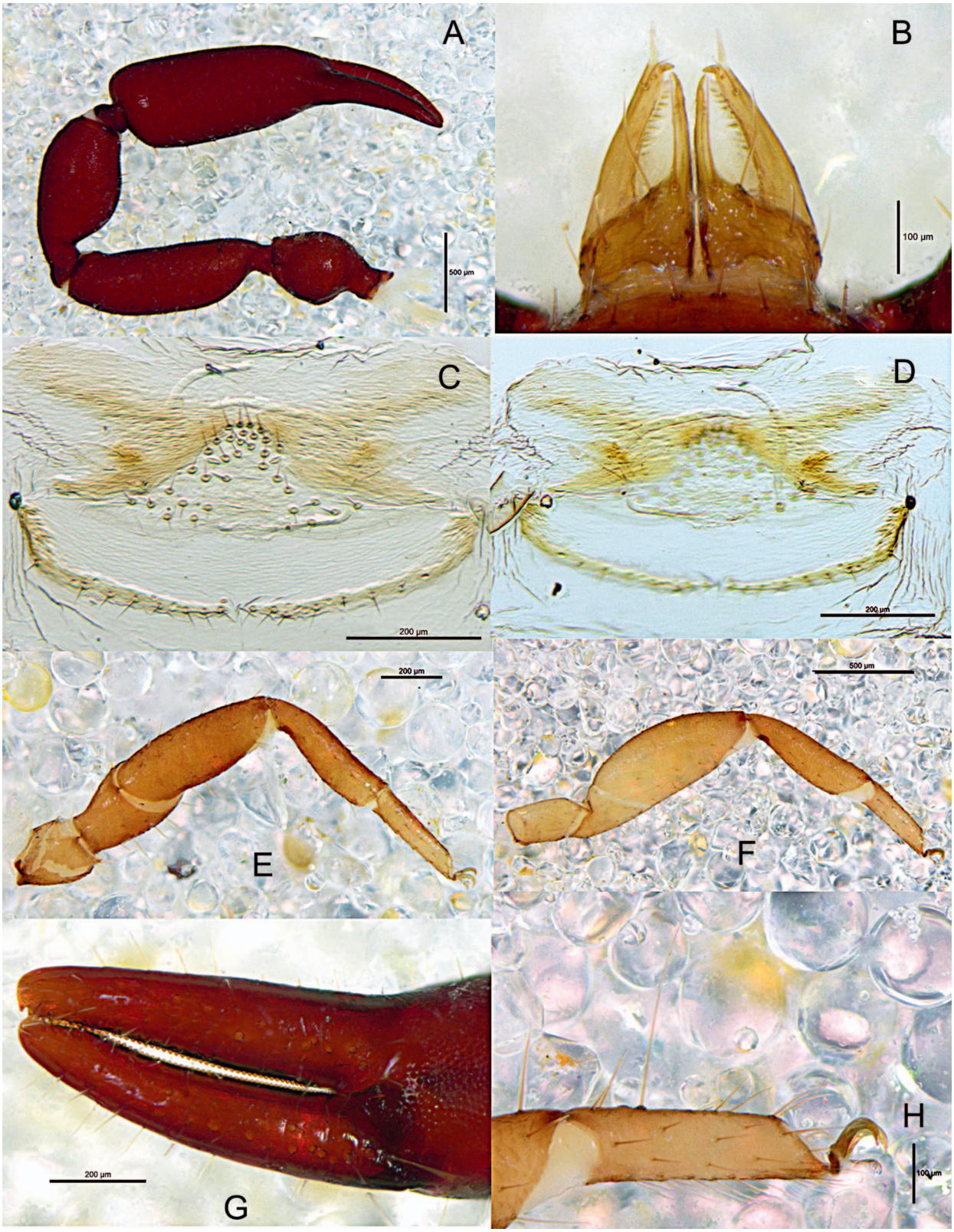

Figure 6.—*Haplochernes wuzhiensis* sp. nov., female holotype: A. Left pedipalp, dorsal view. B. Chelicera, dorsal view. C. Genital operculum. D. Spermathecae. E. Leg I, lateral view. F. Leg IV, lateral view. G. Right chelal fingers, lateral view. H. Tarsus IV, lateral view.

(♀), femur 2.93–2.98 (♂), 2.88–3.04 (♀), patella 2.23–2.50 (♂), 2.15–2.27 (♀), chela (with pedicel) 3.84 (♂), 3.50–3.52 (♀), chela (without pedicel) 3.57–3.62 (♂), 3.32–3.39 (♀), hand (with pedicel) 2.32–2.55 (♂), 2.24–2.29, hand (without pedicel) 2.20–2.28 (♂), 2.07–2.11 x longer than broad; movable finger 0.60– 0.66 (♂), 0.67–0.68 (♀) times as long as hand (with pedicel), and 0.66–0.70 (♂), 0.72–0.74 (♀) times as long as hand (without pedicel). Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria (Figs. 4E, 5E): *eb* and *esb* situated basally, *est* situated slightly closer to *esb* than to *et*, *ib* and *ist* situated subbasally; *isb* and *it* situated medially, with *isb* closer to *it* than to *ist*; *t* situated subdistally, *st* situated slightly closer to *sb* than to *t*. Venom apparatus only present in movable chelal finger, venom duct long, terminating in nodus ramosus slightly basal to *t*. Chelal teeth rounded and juxtadentate; fixed finger with 44–46 (♂, ♀) teeth, plus 1–2 (♂), 2–3 (♀) retrolateral and 6–8 (♂), 5–6 (♀) prolateral accessory teeth; movable finger with 54–56 (♂), 40–44 (♀) teeth, plus 2–3 (♂), 1–2 (♀) retrolateral and 3–5 (♂), 4–5 (♀) prolateral accessory teeth.

Carapace (Fig. 3A, B): evenly and densely granulate; prozone darker than mesozone and metazone; slightly broader than long, 0.93–0.96 (♂), 0.96–1.00 (♀) times; eye-spots absent or very indistinct; with *ca*. 75 (♂), 80 (♀) setae, including 6 (♂, ♀) on anterior margin and 8 (♂), 8–10 (♀) on posterior margin; all setae acuminate and apically dentate; with 2 regularly granular transverse furrows, median furrow narrower and deeper, the subbasal one more or less indistinct and nearer to posterior margin.

Coxal region: maxillae with scale-like sculpturing; coxae smooth; manducatory process somewhat pointed, with 3 apical acuminate setae, with 1 small sub-oral seta, and *ca*. 23–25 (♂), 21–23 (♀) additional setae; median maxillary lyrifissure rounded and situated submedially; posterior maxillary lyrifissure rounded. Chaetotaxy of coxae I–IV: ♂, 13–15: 13–15: 14–16: 27–31; ♀, 16: 15: 17: numerous.

Legs (Figs. 4H & I, 5F & G, 6E & F): junction between femora and patellae I and II strongly oblique to long axis; junction between femora and patellae III and IV very angulate; femora III and IV much smaller than patellae III and IV; femur + patella of leg IV 3.00–3.06 (♂), 2.94–3.08 (♀) x longer than broad; patella and tibia without 'pseudotactile' seta; tarsus IV with very long tactile seta located in basal half (Figs. 4J, 5H, 6H), TS ratio = 0.30–0.31 (♂), 0.28–0.29 (♀); subterminal tarsal setae arcuate and acute; claws not modified; arolium slightly shorter than claws.

Abdomen: all tergites divided except tergite XI (Fig. 3A, B); with weakly scale-shaped sculpture; tergites III narrower than others. Tergal chaetotaxy: ♂, 6(7)–6: 7(6)–6(8): 6(7)–5(7): 9(8)–9(7): 9–10(9): 7(8)–9(8): 9(8)–9: 8(9)–9: 9(8)–8(9): 8(7)–7(8): 18(19) (13+6 long tactile setae): 2; ♀, 7(6)–6: 7–8: 6–8(7): 9(8)–9(7): 9–10(8): 8(10)–9(7): 10 (8)–9: 8(9)–7(8): 9(8)–8(9): 7–7(8): 18(19) (including 1–2 long tactile setae): 2. All sternites divided except VI, weakly scaly sculptured, setae slightly dentate and long, chaetotaxy of sternites IV–XI: ♂, 9(8)–10(9): 9(10)–12(10): 9(10)–10(11): 9–10(11): 9(10)–11(10): 9–9(10): 9(10)–9(10): 18 (include 4 long tactile setae): 2; ♀, 6(5)–6: 9(10)–11(9): 11(10)–10(11): 9(11)–10: 9(11)–9(11): 10–9(10): 9(10)–9(10): 18 (include 2 long tactile setae): 2 (simple and acuminate setae).

Genitalia: male typical of Chernetidae, internal setae acicular and slightly curved; female with a single pair of moderately long spermathecae, gently curved (Figs. 4G, 6D). Anterior genital operculum (sternite II) of ♂ with 30–34 setae, of ♀ with *ca*. 35 scattered setae (Figs. 4F, 6C).

Dimensions (mm): male: based on 3 specimens: Total length 4.20–4.75. Pedipalp: trochanter 0.64–0.68/0.40–0.46, femur 1.20–1.25/0.41–0.42, patella 1.03–1.18/0.46–0.47, chela (with pedicel) 2.15–2.16/0.56–0.87, chela (without pedicel) 2.00–2.03, hand (with pedicel) length 1.30–1.43, hand (without pedicel) 1.23–1.28, movable finger length 0.86–0.87. Carapace 1.00–1.13/1.10–1.18. Leg I: trochanter 0.25/0.20–0.21, femur 0.39–0.40/0.22–0.23, patella 0.55–0.56/0.21–0.22, tibia 0.48–0.49/0.12–0.13, tarsus 0.35–0.38/0.09. Leg IV: trochanter 0.40–0.41/0.23–0.24, femur + patella 1.05–1.10/0.35–0.36, tibia 0.72–0.73/0.19–0.20, tarsus 0.45–0.46/0.12, length of tactile seta 0.35–0.45.

Females: based on 3 specimens: Total length 4.75–5.00. Pedipalp: trochanter 0.64–0.68/0.42–0.46, femur 1.13–1.28/0.39–0.42, patella 0.98–1.08/0.43–0.50, chela (with pedicel) 1.93–2.08/0.55–0.59, chela (without pedicel) 1.83–2.00, hand (with pedicel) length 1.26–1.32, hand (without pedicel) length 1.16–1.22, movable finger length 0.84–0.90. Carapace 1.08–1.10/1.08–1.15. Leg I: trochanter 0.24–0.27/0.20–0.22, femur 0.35–0.40/0.23–0.25, patella 0.51–0.57/0.19–0.21, tibia 0.45–0.49/0.13–0.14, tarsus 0.35–0.36/0.09. Leg IV: trochanter 0.39–0.44/0.23, femur +patella 1.00–1.11/0.34–0.36, tibia 0.66–0.70/0.20, tarsus 0.43–0.44/0.12, length of tactile seta 0.38–0.40.

Etymology.—The specific name refers to the type locality, Wuzhishan.

ACKNOWLEDGMENTS

We are very grateful to Jason Dunlop (ZMB) for the loan of the type specimens of *Chelifer boncicus* and *Haplochernes madagascariensis*, and to Dr. Volker Mahnert for his generous helpful comments. This work was supported by the National Natural Science Foundation of China (No. 31372154), and also by the Ministry of Science and Technology of the People's Republic of China (MOST Grant No. 2015FY210300). MSH thanks Danilo Harms and Yuki Konishi for their assistance and companionship during a trip to Japan which resulted in collection of fresh specimens of *H. boncicus*.

LITERATURE CITED

Beentje, H. J. 1998. J. M. Hildebrandt (1847–1881): notes on his travels and plant collections. Kew Bulletin 53:835–856.

Beier, M. 1932. Pseudoscorpionidea II. Subord. C. Cheliferinea. Tierreich 58:i–xxi, 1–294.

Beier, M. 1933. Revision der Chernetidae (Pseudoscorp.). Zoologische Jahrbücher, Abteilung für Systematik, Ökologie und Geographie der Tiere 64:509–548.

Beier, M. 1940. Die Pseudoscorpionidenfauna der landfernen Inseln. Zoologische Jahrbücher, Abteilung für Systematik, Ökologie und Geographie der Tiere 74:161–192.

Beier, M. 1948. Über Pseudoscorpione der australischen Region. Eos, Madrid 24:525–562.

Beier, M. 1957. Pseudoscorpionida. Insects of Micronesia 3(1):1–64.

Beier, M. 1964. Die Pseudoscorpioniden-Fauna Chiles. Annalen des Naturhistorischen Museums in Wien 67:307–375.

Beier, M. 1976a. Neue und bemerkenswerte zentralamerikanische

Pseudoskorpione aus dem Zoologischen Museum in Hamburg. Entomologische Mitteilungen aus dem Zoologischen Museum in Hamburg 5(91):1–5.

Beier, M. 1976b. The pseudoscorpions of New Zealand, Norfolk and Lord Howe. New Zealand Journal of Zoology 3:199–246.

Chamberlin, J.C. 1931. The arachnid order Chelonethida. Stanford University Publications, Biological Sciences 7(1):1–284.

Chamberlin, J.C. 1938. New and little-known false-scorpions from the Pacific and elsewhere (Arachnida - Chelonethida). Annals and Magazine of Natural History (11) 2:259–285.

Ellingsen, E. 1907. On some pseudoscorpions from Japan collected by Hans Sauter. Nyt Magazin for Naturvidenskaberne 45:1–17.

Ellingsen, E. 1910. Die Pseudoskorpione des Berliner Museums. Mitteilung aus dem Zoologischen Museum in Berlin 4:357–423.

Harvey, M.S. 1988. Pseudoscorpions from the Krakatau Islands and adjacent regions, Indonesia (Chelicerata: Pseudoscorpionida). Memoirs of the Museum of Victoria 49:309–353.

Harvey, M.S. 1990. New pseudoscorpions of the genera *Americhernes* Muchmore and *Cordylochernes* Beier from Australia (Pseudoscorpionida: Chernetidae). Memoirs of the Museum of Victoria 50:325–336.

Harvey, M.S. 1992. The phylogeny and classification of the Pseudoscorpionida (Chelicerata: Arachnida). Invertebrate Taxonomy 6:1373–1435.

Harvey, M.S. 2013. Pseudoscorpions of the World, version 3.0. Western Australian Museum, Perth. Accessed 4 February 2016. Online at http://museum.wa.gov.au/catalogues-beta/pseudoscorpions

Harvey, M.S., P.B. Ratnaweera, P.V. Udagama & M.R. Wijesinghe. 2012. A new species of the pseudoscorpion genus *Megachernes* (Pseudoscorpiones: Chernetidae) associated with a threatened Sri Lankan rainforest rodent, with a review of host associations of *Megachernes*. Journal of Natural History 46:2519–2535.

Heurtault, J. 1998. Pseudoscorpions of the genus *Rhopalochernes* (Chernetidae) from Panama and Venezuela. Journal of Arachnology 26:442–446.

Judson, M.L.I. 2007. A new and endangered species of the pseudoscorpion genus *Lagynochthonius* from a cave in Vietnam, with notes on chelal morphology and the composition of the Tyrannochthoniini (Arachnida, Chelonethi, Chthoniidae). Zootaxa 1627:53–68.

Judson, M.L.I. 2010. A review of K. Kishida's pseudoscorpion taxa (Arachnida, Chelonethi). Acta Arachnologica 59:9–13.

Karsch, F. 1881. Diagnoses Arachnoidarum Japoniae. Berliner Entomologische Zeitschrift 25:35–40.

Kishida, K. 1927. [Arachnida]. Pp. 958–971. *In* Nihon Dobutsu Zukan [Figuraro de Japanaj Bestoj = Illustrated Encyclopaedia of the Fauna of Japan]. (S. Hirase, S. Hozawa, A. Izuka, et al. eds.). Hokuryukwan & Co., Tokyo (in Japanese).

Mahnert, V. 1975. Pseudoskorpione der Insel Réunion und von T.F.A.I. (Djibouti). Revue Suisse de Zoologie 82:539–561.

Mahnert, V. 1985. Weitere Pseudoskorpione (Arachnida) aus dem zentralen Amazonasgebiet (Brasilien). Amazoniana 9:215–241.

Morikawa, K. 1953. Notes on Japanese Pseudoscorpiones. II. Family Cheiridiidae, Atemnidae and Chernetidae. Memoirs of Ehime University (2B) 1:345–354.

Morikawa, K. 1960. Systematic studies of Japanese pseudoscorpions. Memoirs of Ehime University (2B) 4:85–172.

Muchmore, W.B. 1976. Pseudoscorpions from Florida and the Caribbean area. 5. *Americhernes*, a new genus based upon *Chelifer oblongus* Say (Chernetidae). Florida Entomologist 59:151–163.

Muchmore, W.B. 1992. Cavernicolous pseudoscorpions from Texas and New Mexico (Arachnida: Pseudoscorpionida). Texas Memorial Museum, Speleological Monographs 3:127–153.

Nakajima, H., M. Takano, H. Sato & A. Tashiro. 1991. [Faunistic data of moths, myriapods, and pseudoscorpions in the Tanzawa area, Japan]. Proceedings of the Society of Private High School in Kanagawa-ken 3:1–17.

Nuttall, G.H.F. 2009. In Memoriam. Wilhelm Dönitz. Parasitology 5:253–261.

Sato, H. 1978. [Faunistic data on Japanese pseudoscorpions]. Atypus 72:39–42.

Sato, H. 1979a. [Faunistic data on Japanese pseudoscorpions. II]. Atypus 74:42–44.

Sato, H. 1979b. [Pseudoscorpions from Mt. Takao, Tokyo. (An introduction to morphology of pseudoscorpion)]. Memoirs of the Education Institute for Private Schools in Japan 64:79–105.

Sato, H. 1980. [Kanimushi, Japan - natural history]. Heredity 34:85–91.

Sato, H., M. Takano & H. Nakajima. 1988. [Faunistic data of moths, myriapods, and pseudoscorpions in the Miura peninsula, Japan]. Proceedings of the Society of the Private High School in Kanagawa-ken 63:12–24.

Takano, M., A. Tashiro, H. Sato & H. Nakajima. 1989. [Faunistic data of moths, myriapods, pseudoscorpions and land snails from the Hakone, Central Japan]. Ibid. Heisei 1:59–77.

Yajima, M. 2007. Franz Hilgendorf (1839–1904): introducer of evolutionary theory to Japan around 1873. Geological Society, London, Special Publications 287:389–393.

Manuscript received 21 June 2016, revised 6 Octoer 2016.