

A NEW SPECIES OF THE GENUS *ALLOCHTHONIUS*
(PSEUDOSCORPIONES, PSEUDOTYRANNOCHTHONIIDAE)
FROM LIUPAN MOUNTAINS, CHINA, WITH THE DESCRIPTION
OF THE MALE OF *ALLOCHTHONIUS BREVITUS*

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A new pseudoscorpion species, *Allochthonius (Allochthonius) jingyuanus* sp. n., is described and illustrated from Liupan Mountains, China. The hitherto unknown male of *Allochthonius (Urochthonius) brevitus* Hu et Zhang, 2012 is described and illustrated.

Key words: pseudoscorpion, taxonomy, *Allochthonius*, new species.

INTRODUCTION

The family Pseudotyrannochthoniidae Beier, 1932 is composed of 52 described species in five genera (GAO & ZHANG 2013, HARMS & HARVEY 2013, HARMS 2013, HARVEY 2013, HU & ZHANG 2012). Only two genera, *Allochthonius* Chamberlin, 1929 and *Centrochthonius* Beier, 1931, have been reported from China. *Allochthonius* is currently divided into two subgenera, *Allochthonius (Allochthonius)* Chamberlin, 1929 and *Allochthonius (Urochthonius)* Morikawa, 1954, of which the former is composed of 14 species and 2 subspecies (HARVEY 2013, GAO & ZHANG 2013), and the latter includes 3 species and 6 subspecies (HARVEY 2013, HU & ZHANG 2012).

The genus *Allochthonius* is characterized by the absence of an epistomal process; cheliceral spinneret absent or sometimes present; movable cheliceral finger with numerous small, saw-like teeth; coxal spines only present on coxa I, consisting of a tubercle expanded terminally into a spray of 4–10 clavate processes, which extend anteriorly and more or less shield the apical process of coxa I. *Allochthonius* has been divided into two subgenera by MORIKAWA (1954), in essence the discrimination is between free-living, four-eyed forms (the subgenus *Allochthonius*) and eyeless or with only two reduced eyes cave forms (the subgenus *Urochthonius*), although some species are not found in caves.

While examining pseudoscorpion specimens collected from Liupan Mountains, Ningxia Hui Autonomous Region, China, we found a new species of *Allochthonius* belonging to the subgenus *Allochthonius (Allochthonius)*, which is here named *A. (A.) jingyuanus* sp. n. In addition, we also found nine adult specimens belonging to the subgenus *Allochthonius (Urochthonius)* in

the same location, which are identified as *A. (U.) brevitus* Hu et Zhang, 2012; the habitus and markings of the male specimens are similar to female *A. (U.) brevitus*. As a result, we believe both male and female are the species *A. (U.) brevitus*, we describe the male for the first time in this paper.

MATERIAL AND METHODS

The terminology used in this paper follows CHAMBERLIN (1931), HARVEY (1992) and JUDSON (2007). All specimens are preserved in 75% alcohol, and were examined and illustrated using a Leica 205A stereomicroscope with a drawing tube, which was also used for the measurements. Detailed examination was carried out with an Olympus BX53 general optical microscope. Temporary slide mounts were made in glycerol. All measurements are given in mm. The specimens are deposited in the Museum of Hebei University (MHBU), Baoding City, China.

The following abbreviations are used in the text for the trichobothria: *b* = basal; *sb* = sub-basal; *st* = sub-terminal; *t* = terminal; *ib* = interior basal; *isb* = interior sub-basal; *ist* = interior sub-terminal; *it* = interior terminal; *eb* = exterior basal; *esb* = exterior sub-basal; *est* = exterior sub-terminal; *et* = exterior terminal; *dx* = duplex trichobothria. 10-6-6-2-4, 28 refers to carapacial chaetotaxy: carapace with 28 setae, anterior margin with 10 setae and posterior margin with 4 setae.

TAXONOMY

Family Pseudotyranochthoniidae Beier, 1932

Genus *Allochthonius* Chamberlin, 1929

Subgenus *Allochthonius* Chamberlin, 1929

Allochthonius (Allochthonius) CHAMBERLIN, 1929: 154–155; MORIKAWA 1960: 98; HARVEY 1991: 132; HU & ZHANG 2011: 2168–2169; HU & ZHANG 2012: 243–248.

***Allochthonius (Allochthonius) jingyuanus* sp. n.** (Figs 1–3)

Type material. Holotype male (Ps.-MHBU-NX13080301): China, Ningxia Hui Autonomous Region, Jingyuan County, Liupan Mountains, Ecological Garden (35°21'N 106°18'E), alt. 2104 m, 3 August 2013, Zhizhong Gao. Paratypes: seven males (Ps.-MHBU-NX13080302–08) and five females (Ps.-MHBU-NX13080309–13), same data as for holotype.

Etymology. The specific name refers to the type locality.

Diagnosis. This new species is characterized by the following combination of characters: Epistomal process on carapace absent; carapace with 27 or 28 setae; anterior margin without protuberances; palm of chelicera with fine granulation; movable cheliceral finger with one acute tooth apically, 12–14 rounded, conspicuous middle teeth, and 7–8 pointed basal teeth; coxal spines

only present on coxa I, comprising a transverse series of 4–5 tridentate blades, each blade with a central spine terminally distinctly expanded as fan-shaped, all situated on a common tubercle; male pedipalpal femur 5.45–5.70 (female 5.54–6.00) times longer than broad; male chela 4.09–4.24 (female 3.82–3.86) times longer than broad; male movable finger 1.69–1.82 (female 1.73–1.79) times longer than palm.

Description. Male – Carapace, abdomen and legs slightly dark brown, other parts pale yellow (Fig. 1a).

Carapace (Figs 2a, 3b); subquadrate, somewhat shorter than broad, scarcely constricted posteriorly; nearly smooth, but the posterior part with squamous sculpturing; both pairs of eyes well developed and large, with the lens vaulted; eyes almost 1/2 diameter from each other, anterior pair of eyes one diameter from the anterior margin of the carapace; epistomal process absent, space between median setae straight or slightly recurved; chaetotaxy 10–6–6–2–4, 28, but occasionally a dwarf seta absent in either lateral side of anterior margin (9–6–6–2–4, 27).

Coxal area (Fig. 2e); two setae in the tip of manducatory process, one long and the other short. Bisetose intercoxal tubercle present; coxal spines only present on coxa I, consisting of a tubercle expanded terminally into a characteristic “spray” or “fan” of about 4–5 elevate processes which extend apically; setae P 3, I 4–5, II 5, III 6, IV 6.

Chelicera (Figs 2b, 3c); distinctly shorter than carapace; palm of chelicerae with 6 setae, of which a short one located laterally, a galeal seta located on middle of movable finger; palm with fine granulation. Fixed finger with 6 (rarely 5) conspicuous teeth, the apical one large and others small; movable finger with one apical acute tooth, 12–14 rounded, conspicuous middle teeth, and 7–8 pointed basal teeth; one lyrifissure at base of fixed finger; movable finger with a small spinneret hump on the tip. Serrula exterior with 15–16 lamellae; serrula interior with 12 lamellae. Rallum in two rows and composed of 10 blades with fine barbules, of which the posterior one shorter than the others (Fig. 2f).

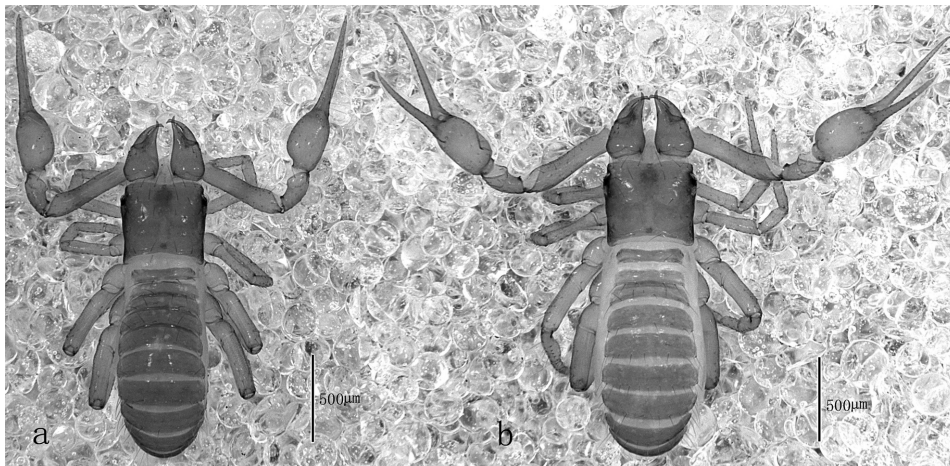


Fig. 1. *Allochthonius* (*Allochthonius*) *jingyuanus* sp. n.: a = holotype male, habitus, dorsal view; b = paratype female, habitus, dorsal view.

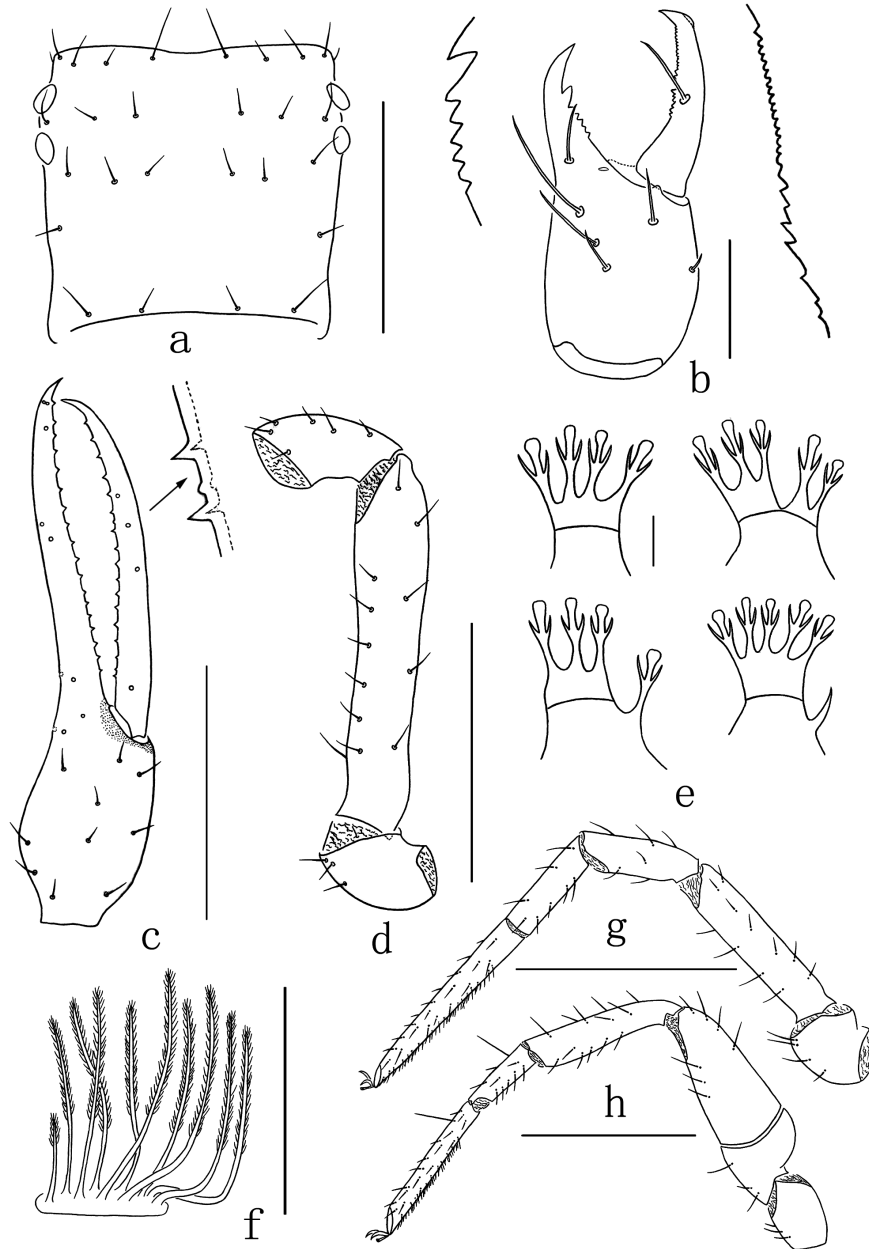


Fig. 2. *Allochthonius (Allochthonius) jingyuanus* sp. n., holotype, male: a = carapace, dorsal view, b = right chelicera, dorsal view, c = right chela, lateral view, d = right palp (minus chela), dorsal view, e = coxal spines on leg I (holotype and paratypes), f = rallum, g = right leg I, lateral view, h = right leg IV, lateral view. Scale bars: 0.01 mm (e), 0.1 mm (f), 0.2 mm (b), 0.4 mm (a, g), 0.5 mm (c, d, h).

Pedipalp (Figs 2c, 2d, 3a); chelal hand robust; chelal finger straight in dorsal view. Fixed finger with 18–19 acute teeth, middle ones larger than that in both ends; movable finger with 16 acute teeth, a tubercle between the tenth and eleventh, the two basal teeth smaller than others. Trichobothria: fixed finger with eight and movable finger with four; in addition, two special sensory hairs (DS) present, which near the tip of fixed finger; sensilla absent.

Abdomen ovate, tergites and sternites with numerous setae, tergal chaetotaxy I–XII: 4: 6: 7–8: 8–9: 10–11: 11–12: 13: 12–13: 13: 8–9: TT: 0; anterior genital operculum (Fig. 3d) with 8 setae, genital opening pit-like in the basal half, each side with 10–12 marginal setae; sternal chaetotaxy III–X: 20–22: 14: 12–15: 14–15: 14–15: 13–15: 13: 9.

Leg I (Figs 2g, 3e) and IV (Figs 2h, 3f); legs typical. Leg I and IV, trochanter and femur with squamous sculpture. Leg IV with a long tactile seta on both metatarsus (TS=0.19) and tarsus (TS = 0.20).

Female – Generally similar to male, but a little larger (Fig. 1b).

Tergal chaetotaxy I–XII: 4: 6: 8–9: 8: 12: 12–13: 14: 13–14: 10: 8–9: TT: 0; anterior genital operculum (Fig. 3g) with 15 setae, posterior margin with 20 marginal setae; sternal chaetotaxy III–X: 22: 14: 14: 14: 17: 17: 15: 10.

Measurements (length/breadth or depth in mm, ratios in parentheses). Male (holotype and paratype). Body length 1.46–1.59. Carapace 0.39–0.43×0.46–0.50 (0.83–0.86). Chelicera 0.40×0.19 (2.11), movable finger length 0.22. Palpal trochanter 0.17×0.12 (1.42), femur 0.57–0.62×0.10–0.11 (5.45–5.70), patella 0.24–0.25×0.12–0.13 (1.92–2.00), chela 0.86–0.94×0.20–0.23 (4.09–4.24), palm 0.32–0.33×0.20–0.23 (1.43–1.60), movable finger length 0.54–0.60 (1.69–1.82×palm). Leg I trochanter 0.14–0.15×0.11–0.12 (1.25–1.27), femur 0.30–0.34×0.07 (4.29–4.86), patella 0.17–0.21×0.06–0.07 (2.83–3.00), tibia 0.16–0.19×0.05–0.06 (3.12–3.40), tarsus 0.33–0.38×0.04–0.05 (7.40–8.25); leg IV trochanter 0.17–0.20×0.12–0.14 (1.42–1.46), femur+patella 0.48–0.52×0.18–0.20 (2.60–2.67), tibia 0.36–0.40×0.08–0.09 (4.44–4.75), metatarsus 0.17–0.19×0.05–0.07 (2.83–3.80), tarsus 0.35–0.40×0.04 (8.75–10.00).

Female (paratypes). Body length 1.65–1.83. Carapace 0.45×0.54–0.56 (0.80–0.83). Chelicera 0.44×0.21 (2.10), movable finger length 0.24. Palpal trochanter 0.21–0.23×0.14 (1.50–1.64), femur 0.72×0.12–0.13 (5.54–6.00), patella 0.26–0.30×0.13–0.16 (1.90–2.00), chela 1.07–1.08×0.28 (3.82–3.86), palm 0.38–0.40×0.28 (1.36–1.43), movable finger length 0.68–0.69 (1.73–1.79×palm). Leg I trochanter 0.16–0.17×0.13 (1.23–1.31), femur 0.36–0.37×0.08–0.09 (4.00–4.63), patella 0.22–0.23×0.07–0.08 (2.75–3.29), tibia 0.21×0.06 (3.50), tarsus 0.41–0.43×0.04–0.05 (8.60–10.25); leg IV trochanter 0.17×0.12 (1.42), femur+patella 0.58–0.59×0.21–0.22 (2.68–2.76), tibia 0.41–0.44×0.09–0.10 (4.40–4.56), metatarsus 0.20–0.21×0.06–0.07 (3.00–3.33), tarsus 0.42–0.44×0.05 (8.40–8.80).

Variation. 13 specimens (8 ♂, 5 ♀) were examined. These specimens are different in the shape of coxal spines: most of them with 4–5 blades arranged on a common tubercle; others with 3 blades arranged on a common tubercle, 1–2 blades aside; or 5 blades arranged on a common tubercle, one single spine aside (Fig. 2e).

Distribution. China (Ningxia).

Remarks. This new species can easily be distinguished from the six other Chinese species (*A. trigonus* Hu et Zhang, 2011, *A. fuscus* Hu et Zhang, 2011, *A. wui* Hu et Zhang, 2011, *A. sichuanensis* (Schawaller, 1995), *A. liaoningensis* Hu et Zhang, 2012, *A. exornatus* Gao et Zhang, 2013) by: the small size (*A. wui* much bigger, 1.46–1.59 vs 2.50), chaetotaxy of carapace 10–6–6–2–4, 28

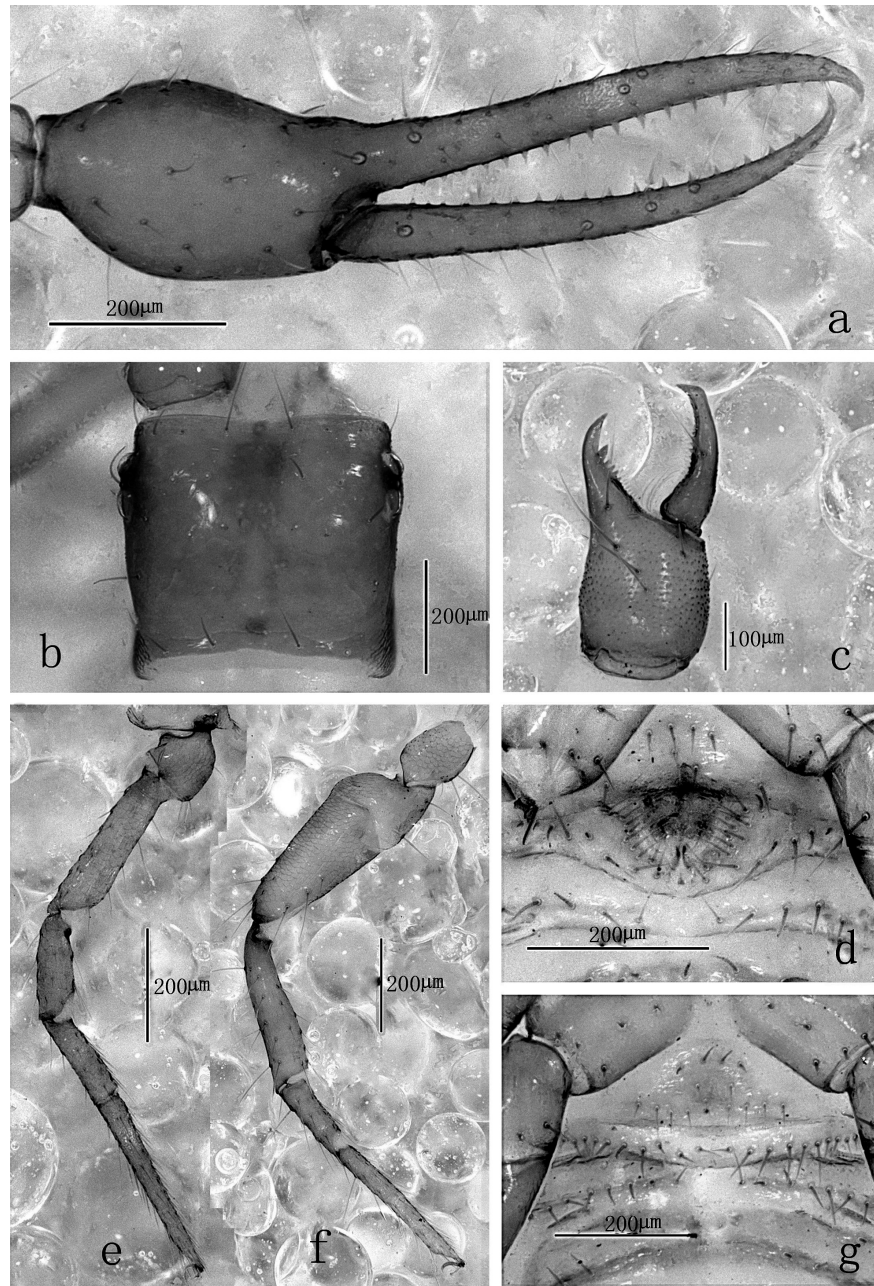


Fig. 3. *Allochthonius (Allochthonius) jingyuanus* sp. n.: a–f = holotype, male: a = right chela, lateral view, b = carapace, dorsal view, c = right chelicera, dorsal view, d = genital area, e = right leg I, lateral view, f = right leg IV, lateral view. g = female genital area.

(8-4-4-2-4, 22 in *A. wui*); pale yellow chelal hand (*A. fuscus* with a brown chelal hand); the number of coxal spines 4-5 (9-10 in *A. sichuanensis*); teeth on the chelal movable finger straight (teeth on the chelal movable finger retrorse in *A. liaoningensis*); lateral surface of chela smooth (with rounded whitish patches in lateral surface of chela in *A. exornatus*); anterior margin of carapace without triangular protuberances (with triangular protuberances *A. trigonus*).

The new species resembles *A. tamurai* Sakayori, 1999 from Japan, both of them epistomal process on carapace absent, but it differs from the latter by the chaetotaxy of carapace 10-6-6-2-4, 28 ((8-10)-(4-5)-(4-5)-2-4, 22-24 in *A. tamurai*) and additional teeth on cheliceral movable finger (22-24 *vs* 12-16); the new species also resembles *A. opticus* (Ellingsen, 1907) from Japan in chaetotaxy of carapace, but it can be distinguished from the latter by the teeth of the fixed cheliceral finger the apical one large and others small (both apical and basal ones large and others small in *A. opticus*) and by fewer coxal spines on coxa I (4-5 *vs* 8); the new species is similar to *A. buanensis* W. K. Lee, 1982 from South Korea in nearly size, but it can be separated from the latter by the number of setae of cheliceral palm (6 *vs* 5) and by the chaetotaxy of carapace 10-6-6-2-4, 28 (10-4, 24 in *A. buanensis*).

Allochthonius (Urochthonius) brevitus Hu et Zhang, 2012
(Figs 4-6)

Allochthonius (Urochthonius) brevitus Hu & Zhang, 2012: 246.

Type material examined. Female (holotype, Ps.-MHBUNX100731), CHINA: Ningxia Hui Autonomous Region, Liupan Mountains (35°20'N 106°20'E), 31 July 2010, Dongsheng Hu leg., deposited in MHBUN, examined.

Other material examined. 4 males (Ps.-MHBUNX13080114-17), 5 females (Ps.-MHBUNX13080118-22): China, Ningxia Hui Autonomous Region, Jingyuan County, Liupan Mountains, Longtan Forestry Station (35°23'N 106°20'E), alt. 2 010 m, 1 August 2013, Fubin Zhang.

Description – Male. Body light yellowish, chelicerae and palp reddish, carapace and tergites grey (Fig. 4a).

Carapace (Figs 5a, 6b); slightly shorter than broad (0.98–1.00 times in male) and constricted posteriorly, without eyes or eyespots; epistome absent; chaetotaxy 6-4-2-2-2, 26.

Coxal area (Fig. 5f); two setae on tip of manducatory process, one long and the other short. Coxa I each with 5 spines, arranged on a common tubercle, intercoxal tubercle with 2 setae; setae P 3, I 3-4, II 4, III 5, IV 5.

Chelicera (Figs 5d, 6c); cheliceral palm with 6 setae, laterally clearly tessellated, with tiny granulation; fixed finger with 13-14 teeth, of which the apical tooth larger than others, movable finger with 17-18 teeth of equal length; one lyrifissure at base of fixed finger; movable finger with a small spinneret hump in the tip; serrula exterior with 15 lamellae, serrula interior with 14 lamellae; rallum in two rows and composed of 10 blades with fine barbules, of which the posterior one shorter than the others (Fig. 5e).

Pedipalp (Figs 5b, 5c, 6a); femur 1.41–1.43 times longer than carapace; fixed chelal finger with 18–20 pointed teeth of equal length, the basal two shorter than others; movable finger with 17–18 marginal teeth and the basal two shorter, a tubercle between the tenth and eleventh. Trichobothria: fixed finger with eight and movable finger with four; in addition, two special sensory hair (DS) present, which near the tip of fixed finger.

Abdomen, tergal chaetotaxy I–XII: 4: 6: 7–8: 8–9: 10–11: 11–12: 13 (2 submedian tactile setae): 12–13 (2 submedian tactile setae): 13 (2 submedian tactile setae): 8–9 (2 submedian tactile setae): 2: 0; including long tactile setae on tergites VIII–X; anterior genital operculum (Fig. 6d) with 8 setae, genital opening pit-like in the basal half, 11–13 marginal setae on each side; sternal chaetotaxy III–IX: 14: 12–15: 14–15: 14–15: 13–15: 13: 9.

Leg I (Figs 5g, 6f) and IV (Figs 5h, 6g); leg I femur 1.47–1.53 times longer than patella, tarsus 1.89–2.20 times longer than tibia. Leg IV with two tactile setae present on metatarsus (TS = 0.28) and tarsus (TS = 0.18).

Female – Generally similar to male, but a little larger than the males (Fig. 4a).

Tergal chaetotaxy I–XI: 2: 6: 7: 7: 8–9: 7–8: 7 (2 submedian tactile setae): 6–8 (2 submedian tactile setae): 6 (2 submedian tactile setae): 2: 0; including long tactile setae on tergites VIII to X; anterior genital operculum (Fig. 6e) with 8 setae, posterior margin with 14–16 marginal setae; sternal chaetotaxy III–X: 14–16: 13–14: 14: 13–14: 12–13: 12: 12: 8.

Measurements: (length/breadth or depth in mm, ratios in parentheses). Male. Body length 1.50–1.59. Carapace 0.37–0.40×0.37–0.41 (0.98–1.00). Chelicera 0.40×0.19 (2.11), movable finger length 0.22. Palpal trochanter 0.16–0.18×0.10 (1.60–1.80), femur 0.52–0.57×0.11–0.12 (4.33–4.73), patella 0.23–0.26×0.11–0.12 (2.09–2.17), chela 0.80–0.84×0.16–0.18 (4.67–5.00), palm 0.27–0.29×0.16–0.18 (1.61–1.69), movable finger length 0.53–0.56 (1.93–1.96×palm). Leg I trochanter 0.11–0.13×0.09–0.10 (1.22–1.30), femur 0.26–0.28×0.06 (4.33–4.67), patella 0.17–0.19×0.06 (2.83–3.17), tibia 0.15–0.18×0.05 (3.00–3.60), tarsus 0.33–0.34×0.04 (8.25–8.50); leg IV trochanter 0.17–0.19×0.11–0.12 (1.55–1.58), femur+patella 0.42–0.46×0.15 (2.80–3.07), tibia 0.32–0.36×0.08 (4.00–4.50), metatarsus 0.15–0.17×0.05 (3.00–3.40), tarsus 0.32–0.34×0.04 (8.00–8.50).

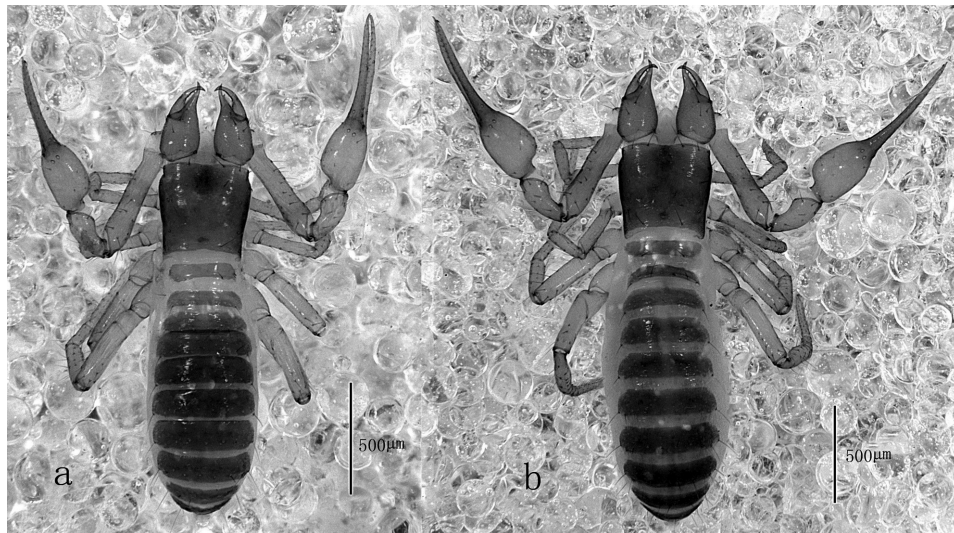


Fig. 4. *Allochthonius (Urochthonius) brevitus* Hu et Zhang, 2012, habitus (dorsal view): a = male, b = female.

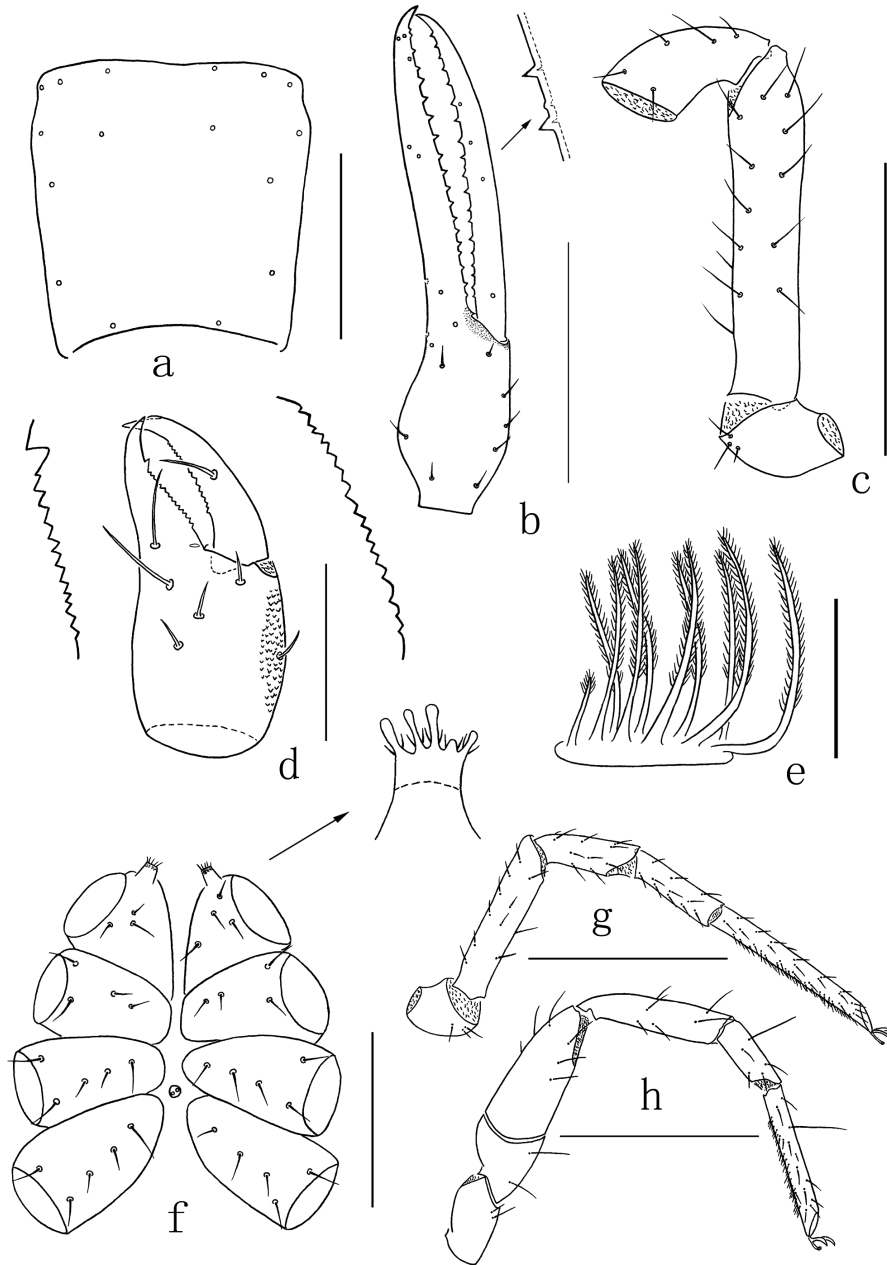


Fig. 5. *Allochthonius (Urochthonius) brevitus* Hu et Zhang, 2012, male: a = carapace, dorsal view, b = right chela, lateral view, c = right palp (minus chela), dorsal view, d = right chelicera, dorsal view, e = rallum, f = coxal areas of legs, ventral view, g = left leg I, lateral view, h = left leg IV, lateral view. Scale bars: 0.05 mm (e), 0.2 mm (d), 0.3 mm (a, f), 0.4 mm (g), 0.5 mm (b, c, h).

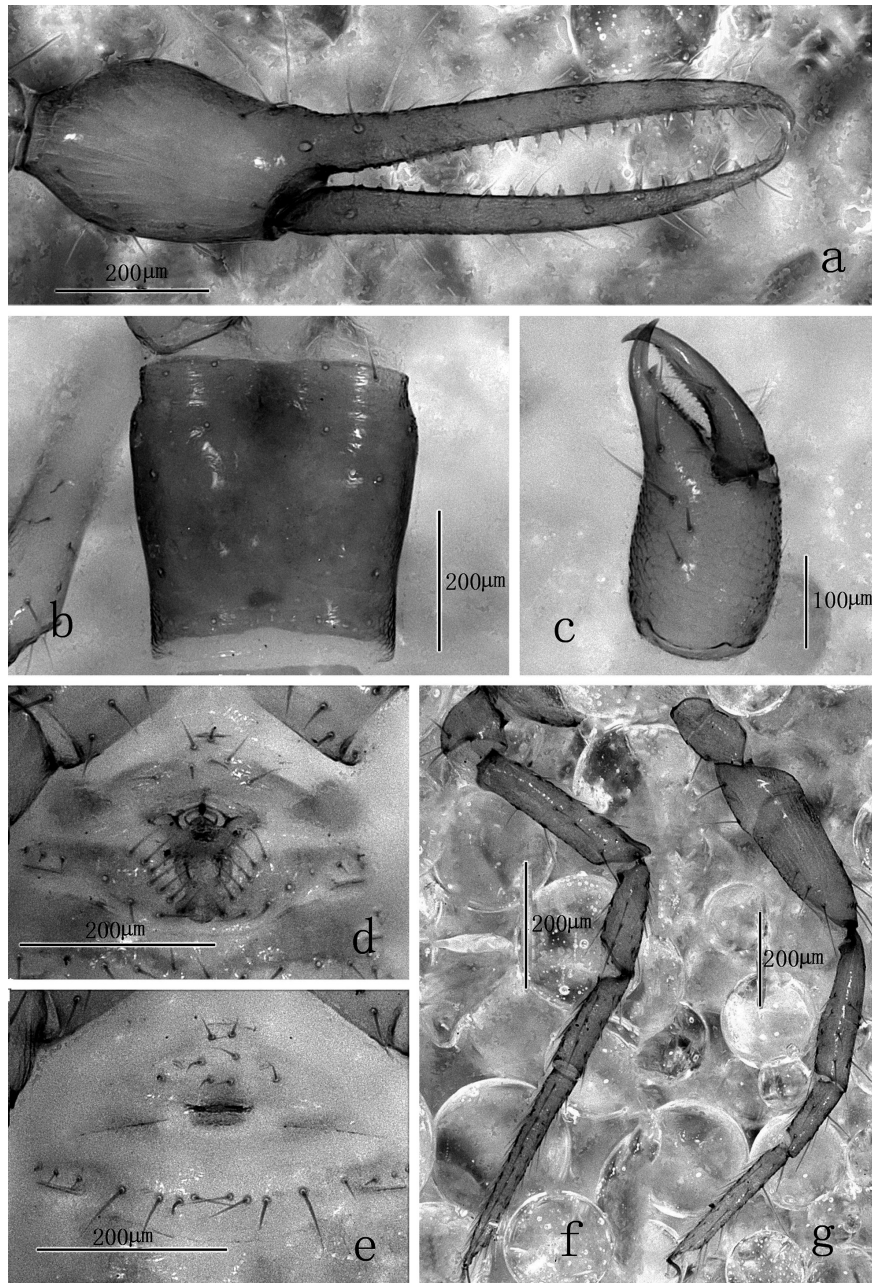


Fig. 6. *Allochthonius (Urochthonius) brevitus* Hu et Zhang, 2012, , male (a–d, f, g), female (e): a = right chela, lateral view, b = carapace, dorsal view, c = right chelicera, dorsal view, d = genital area of male, e = genital area of female, f = left leg I, lateral view, g = left leg IV, lateral view.

Female. Body length 1.83–1.96. Carapace 0.45–0.46×0.46–0.48 (0.96–0.98). Chelicera 0.46×0.22 (2.10), movable finger length 0.25. Palpal trochanter 0.20–0.21×0.13 (1.54–1.62), femur 0.64–0.67×0.13–0.14 (4.79–4.92), patella 0.28×0.13–0.14 (2.00–2.15), chela 0.98–1.01×0.23–0.24 (4.08–4.39), palm 0.35–0.44×0.23–0.24 (1.52–1.83), movable finger length 0.65–0.67 (1.48–1.91×palm). Leg I trochanter 0.14×0.11 (1.27), femur 0.34×0.07–0.08 (4.25–4.86), patella 0.21–0.22×0.07 (3.00–3.14), tibia 0.20×0.05–0.06 (3.33–4.00), tarsus 0.39–0.42×0.05–0.06 (7.00–7.80); leg IV trochanter 0.18–0.21×0.13 (1.38–1.62), femur+patella 0.48–0.50×0.17–0.18 (2.78–2.82), tibia 0.38–0.41×0.09 (4.22–4.56), metatarsus 0.20×0.05–0.06 (3.33–4.00), tarsus 0.39–0.40×0.05 (7.80–8.00).

Distribution. China (Ningxia).

Remarks. The specimens collected from Ningxia Hui Autonomous Region, Liupan Mountains belonging to *Allochthonius* (*Urochthonius*) by the following characteristics: eyes entirely absent; palp, chelicerae and legs relatively long and robust; coxal spines only present on coxa I; intercoxal tubercle present and with two setae; rallum with 10 pinnate blades.

After comparing with the type material, we identified the females as *A. (U.) brevitus* Hu et Zhang, 2012. There are little differences between the holotype and newly collected females except some ratios: pedipalpal femur 3.87× vs 4.79–4.92×; femur I 3.75× vs 4.25–4.86×; femur+patella IV 2.00× vs 2.78–2.82×; metatarsus IV 2.25× vs 3.33–4.00×. The habitus and markings of the male specimens are similar to female *A. (U.) brevitus*: without eyes or eyespots; epistome absent; chaetotaxy of carapace: 6–4–2–2–2 (26); the teeth of chela and chelicera are mainly the same with *A. brevitus*. In addition, the specimens and type species were collected from the same region. As a result, we believe both male and female are the species *A. (U.) brevitus*.

Hu and Zhang (2012) recorded the ratio of tarsus IV of the type material *A. brevitus*: 0.35×0.08 (4.38), however, we re-measured it and the result should be 0.35×0.04 (8.75).

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